Borradores de ECONOMÍA

Wage differentials across economic sectors in the Colombian formal labour market: evidence from a survey of firms

Por:
Ana María Iregui B.
Ligia Alba Melo B.
María Teresa Ramírez G.

Núm. 629
2010

BANCO DE LA REPÚBLICA
COLOMBIA

tá - Colombia - Bogotá - Colombia - Bogotá - Colombia - Bogotá - Colombia - Bogotá - Colombia - Bogotá - Colombia - Bogotá - Col

WAGE DIFFERENTIALS ACROSS ECONOMIC SECTORS IN THE COLOMBIAN FORMAL LABOUR MARKET: EVIDENCE FROM A SURVEY OF FIRMS[♣]

Ana María Iregui B.
airegubo@banrep.gov.co

Ligia Alba Melo B.
lmelobec@banrep.gov.co

María Teresa Ramírez G.
mramirgi@banrep.gov.co

Abstract

The existence of wage differentials across sectors is a widely observed phenomenon. This paper provides new elements for understanding inter- and intra-sectoral wage differentials in Colombia by analysing a wage-setting survey of 1,305 firms and by emphasizing the role of firm characteristics. A descriptive analysis of the survey confirms the existence of substantial wage differentials across sectors and occupational positions in the country. We found positive wage differentials with respect to the average for the different occupational groups in the electricity, gas, water and mining sector, financial services and the manufacturing sector, and strong negative wage differentials in agriculture, forestry and fishing. When analysing the wage differential within each occupational group, higher wage dispersion is observed in the case of managers, followed by professionals. The lower wage dispersion for the least qualified jobs could be associated with the existence of a minimum wage in Colombia. We also estimate cross-section models for each occupational group and sector to account for the importance of firm characteristics in explaining wage differentials.

Keywords: wage differentials, survey of firms, labour market, cross-section estimation

JEL Classification: J30, J31; C21

[♣] The authors are senior researchers with the Research Unit of the Deputy Governor's Office at Banco de la República (Central Bank of Colombia). They would like to thank Cindy Moreno and Karina Acosta for their research assistance. The participation of the firms that agreed to complete the survey also is appreciated. The opinions expressed herein are those of the authors and do not necessarily reflect the views of Banco de la República or its Board of Directors.

I. Introduction

The existence of wage differentials across sectors of the economy is a widely observed phenomenon and has been documented extensively in literature. In fact, there is empirical evidence of substantial wage differentials across industries for workers who have similar characteristics and perform comparable jobs. This literature dates back to the evidence provided by Slichter (1950), who found that managerial policy is important in determining inter-industry wage differences. Later, in the 1980s, studies by several authors renewed interest in the topic. For example, Dickens and Katz (1987) and Krueger and Summers (1987) found the pattern of inter-industry wage differentials was consistent across countries and for workers of different ages and degrees of skill, and in different occupational groups.[1] Recent studies also show these differentials are persistent over time and across countries, and are not necessarily explained by workers' characteristics (e.g., Du Caju et al., 2010; Genre et al., 2005; Osburn, 2000). Table A.1 in the appendix contains a sample of recent empirical studies on wages differentials across industries.

Inter-industry wage differentials are analyzed in the literature by means of competitive models in which these differentials could be explained by worker characteristics, job characteristics and temporary disequilibria in labour demand or supply when the labour market is segmented. Therefore, in the long run, wage differentials reveal differences in

[1]Dickens and Kats (1987) presented a survey of empirical studies of industry attributes and wages using average earnings data and worker characteristics; Krueger and Summers (1987) did a survey of selected studies on wages and profitability; Groshen (1991a) reviewed a sample of empirical studies on within-industry wage effects and also on industry wage effects; and Du Caju et al. 2010) presented a survey of indicative studies on cross-country inter-industry wage differentials.

individual labour productivity (Genre et al., 2005). In these models, wage differentials also could compensate for non-pecuniary job features that have an effect on the worker's utility, such as the availability of social benefits or atypical working conditions; on the other hand, they could be the result of unmeasured differences in labour quality (Dickens and Katz, 1987).

However, empirical evidence appears to disagree with the competitive theories. Krueger and Summers (1988) reported that even after controlling for individual and job characteristics significant wage differentials remain. Alternative explanations for inter-industry wage differentials have emerged, based on non-competitive models (e.g., Du Caju et al., 2010; Osburn, 2000; Krueger and Summers, 1987; Dickens and Katz, 1987). They focus on the reasons, other than individual and job characteristics, why firms may pay higher than equilibrium wages.

Non-competitive explanations might be associated with rent–sharing mechanisms extended by employers to their workers, encouraged by the need to pay efficiency wages or by the strong bargaining power of their employees. These explanations also are closely related to the reasons cited in the literature for preventing wage cuts during difficult economic times (e.g., Campbell and Kamlani, 1997; Agell and Lundborg, 2003; Iregui et al., 2010). In particular, efficiency wage models suggest firms want to pay more than the competitive wage in order to select the most productive workers, to increase workers' effort, to reduce shirking by employees, to lower turnover costs, and to increase workers' morale and motivation. According to this model, if efficiency wage pay differs across industries, the

optimal wage will differ among industries, and workers with similar characteristics will be paid differently, depending on their industry affiliation.

Bargaining power models, in turn, are associated with the influence of unions and the insider-outsider theory. With these models, the payment of a premium wage is associated with workers' power to negotiate their wages. Thus, the presence of collective agreements in some industries could explain higher wages. According to the insider-outsider theory, firms are reluctant to fire their employees (insiders) and to hire unemployed workers (outsiders) at lower wages, because of the cost involved in hiring and training new employees.

As noted by Dickens and Katz, (1987) and Genre et al. (2005), non-competitive theories indicate that wage differentials are affected not only by workers attributes, but also by industry and firm characteristics that do not necessarily affect workers' utility. According to these theories, sector specific characteristics and firm characteristics may play a role in explaining wage differentials; as a result, the relationship between wages and individual productivity weakens (Genre et al., 2005). For instance, Krueger and Summers (1986, p.26) found that "higher wages tend to be paid in industries that are concentrated, have high profits, and have relatively small labour shares."

In Colombia, wage differentials across economic sectors have not received enough attention in the literature.[2] Among the exceptions, we found the recent papers by Urrutia and Ruiz (2010), Mesa et al. (2008) and Gracia et al. (2001). For example, Urrutia and Ruiz (2010) analyse the average real wages of different economic activities using quarterly information for the period 1980-2006.[3] The authors show that financial services and electricity, gas and water were the sectors with the highest real wages throughout this period. Moreover, these sectors were the only ones to experience real wage growth during the same period. The other five sectors demonstrated little wage dynamics in real terms.

In addition, Mesa et al. (2008) studied the existence of segmentation in the labour markets of the seven main Colombian cities in 2001-2005, with segmentation being understood as the existence of differences in wage distributions by city and economic sector[4] that are not explained by workers' productivity. To evaluate wage differentials among cities and economic sectors, the authors used several non-parametric tests to compare wage distributions. They also estimated Mincer equations with city and sector-fixed effects to capture wages differentials that are not explained by human capital accumulation. The results provide evidence of labour market segmentation in Colombia. In particular, the

[2] The study of wage differentials in Colombia has been concentrated on an analysis of wage differentials between public and private workers (e.g., Arango et al., 2004), between male and female workers (e.g., Arango et al., 2004; Galvis, 2010; Hoyos et al., 2010), among regions (e.g., Jaramillo et al., 2000; Galvis, 2010), between formal and informal sectors (e.g., Ortiz et al., 2007), and between educational levels (e.g., Posso, 2008).

[3] Urrutia and Ruiz (2010) included seven sectors in their analysis: manufacturing; trade; electricity, gas and water; construction; transport, storage and communication; social services; and financial services. The information is taken from the *Household Survey* and from the historical statistics of the National Planning Department.

[4] Mesa et al. (2008) considered eight economic sectors: agriculture and mining; trade; restaurants and hotels; construction; electricity, gas and water; financial services; manufacturing; social services; and transport and communication. The data are from the *Household Survey*.

estimations indicate the existence of important wage differences among cities and economic sectors, even after controlling for human capital accumulations.

Finally, although Gracia et al. (2001) do not analyse wage differential across economic sectors, they studied wage differentials specifically within the activities in the manufacturing sector. These differentials are persistent over time and could not be attributed solely to differential skills or working conditions, which suggests non-competitive wage setting. The authors also found the participation of labour in the rents of oligopolistic industries with market power is an important factor in explaining the differences in real wages during the period 1974-1994.

The purpose of the present paper is to provide new insights for understanding inter- and intra-sectoral wage differentials, since each economic sector has its own wage and labour market dynamics. This is done by using a wage-setting survey of 1,305 Colombian firms. In this study we will emphasize the role of sector and firm characteristics as possible determinants of wage differentials in the Colombian formal labour market.

This paper is divided into five sections, apart from the introduction. In the second section, we describe the data used, as well as the definition of wage differentials. The third section contains an analysis of inter-sectoral wage differentials, their main stylized facts, and the role of firm characteristics in determining such differentials. Section four looks at wage

differentials within sectors and within occupational groups. The final section the conclusions.

II. Wage Differentials: Data and Definitions

The analysis presented in this paper is based on a unique survey of 1,305 Colombian firms carried out by Iregui et al. (2009) during the first half of 2009. The survey was designed to explore wage-setting mechanisms, the nature and sources of wage rigidities, and the link between wages and prices. It also collected data on several firm characteristics, such as the economic sector where firms operate, the kind of labour contracts they use, the existence of collective agreements, and different types of remuneration, among other features.

The survey has an advantage in that it uses a representative sample of firms, which allowed us to generalize the results to the population under study; namely, 39,004 small, medium and large enterprises[5] that are legally constituted and represent all economic sectors, aside from the public sector.[6] The firms are located in 13 major cities,[7] which account for 70% of the formal employment in Colombia. The survey was directed to human resource personnel involved with wage policies, who should be able to answer the questions for different occupational groups (managers, professionals, technicians and assistants, and unskilled

[5] Firms with less than 10 employees were excluded.
[6] The firms are grouped into nine economic sectors: agriculture, forestry and fishing; trade; construction; electricity, gas, water and mining; manufacturing; financial services; transport, storage and communication; education and health; and "other" services. The public sector was excluded, because the wages of public employees are set mainly by government decree.
[7] The cities are Bogotá, Bucaramanga, Barranquilla, Cali, Cartagena, Medellín, Manizales, Pereira and their metropolitan areas. Barrancabermeja, Buga, Tuluá, Girardot and Rionegro also were included.

workers). It is important to mention that all the results presented hereafter are generalized to the population.[8]

The data provided by the survey were used to describe the current wage structure and to explore the main determinants of wage differentials, not only across economic sectors, but also within sectors. Average monthly base wages, our variable of interest, were reported by each surveyed firm, according to occupational group.

This variable was used to calculate the observed wage differentials; that is, raw differentials with no control for employee and/or firm characteristics. Across sectors, wage differentials are defined as the percentage difference between a sector's average wage and the average for the entire economy, by occupational position. Within sectors, wage differentials are defined as the percentage difference between a firm's average wage and the average for sector where it operates.

To calculate sectoral wage differentials, we first define the average base wage in sector j and occupational position p, as follows:

$$w_{j,p} = \frac{\sum_i w_{i,p,j}}{Total\ number\ of\ firms_{j,p}}$$

where $w_{i,p,j}$, corresponds to the average monthly base wage reported by firm (i), for occupational position (p) and sector (j).

[8] The coefficients of variation (*cve*) were calculated for each answer. The coefficients obtained did not exceed 5%, which is an indicator of the reliability of the population estimates.

The sectoral wage differential of sector *j* and occupational position *p* is then given by:

$$d_{j,p} = ln\left(w_{j,p}/w_p\right)$$

$$w_p = \frac{\sum_{i,j} w_{i,p,j}}{Total\ number\ of\ firms_p}$$

where $d_{j,p}$ corresponds to the sectoral wage differential of sector j and occupational position p; $w_{j,p}$ is the average wage of sector j and occupational position p, and w_p corresponds to the average wage of occupational position *p*.

Next, wage differentials within sectors are calculated as:

$$d_{i,p,j} = ln\left(w_{i,p,j}/w_{j,p}\right)$$

where $d_{i,p,j}$ corresponds to the wage differential of firm i for occupational position p and sector j.

III. Inter-sectoral Wage Differentials

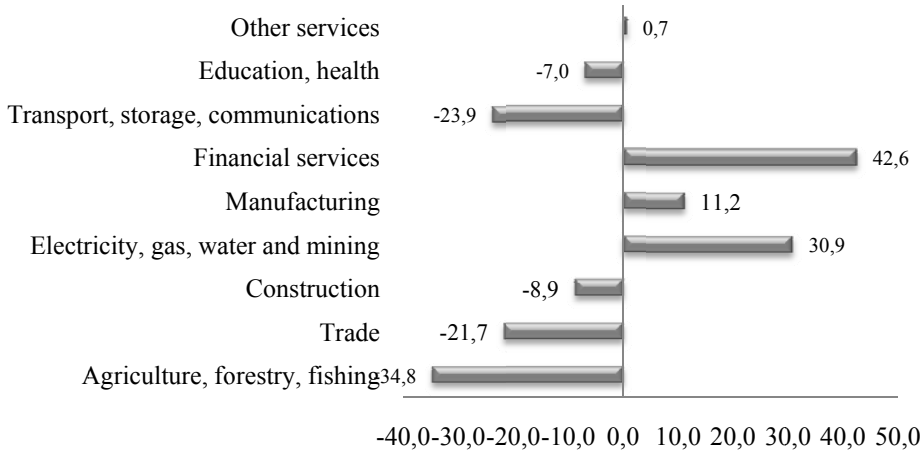
A. Stylised Facts

Descriptive evidence confirms the existence of substantial differences in average base wages across economic sectors and occupational positions. Figure 1 shows the percentage deviation of average base wages in each sector from the average base wage for the economy as a whole. Clearly, there is a great degree of wage dispersion across sectors and occupational positions, with strongly positive wage differentials (more than 40% in financial services and in electricity, gas, water and mining for managers and unskilled

workers, respectively) and strongly negative ones (more than 30% for managers in agriculture, forestry and fishing). The figure also shows that wages for all occupational groups are above average in financial services, electricity, gas, water and mining, and manufacturing; similar results were found by Urrutia and Ruiz (2010) for the period 1980-2006. For the European Union, Genre et al. (2005) and Genre et al. (2009) found the highest wages also are paid in financial intermediation and the electrical sector, while the lowest are paid in agriculture.[9]

Figure 1
Inter-sectoral Wage Differentials by Occupational Position (%): 2009

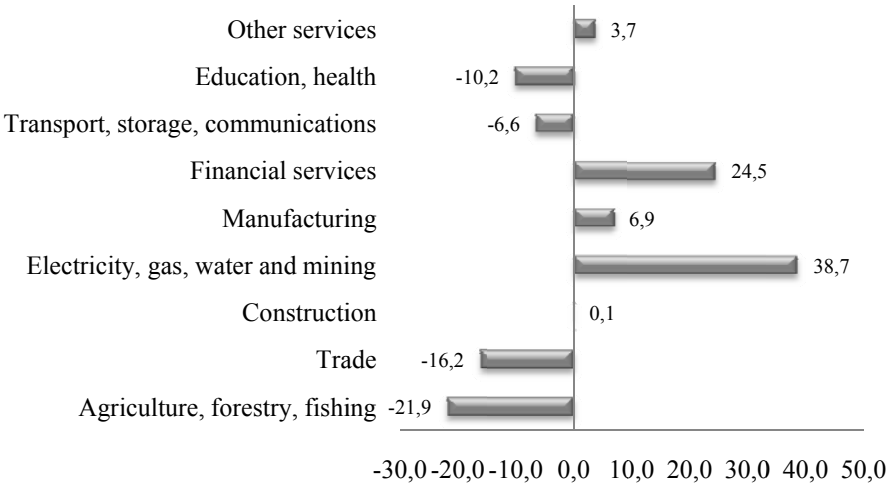
a. Managers



[9]The European Commission (2003) also found that wages in the countries of the European Union are above average for financial intermediation and real estate and business services, energy and electricity, and certain selected manufacturing sectors.

Figure 1 (Continued)
Inter-sectoral Wage Differentials by Occupational Position (%): 2009

b. Professionals



c. Technicians and Assistants

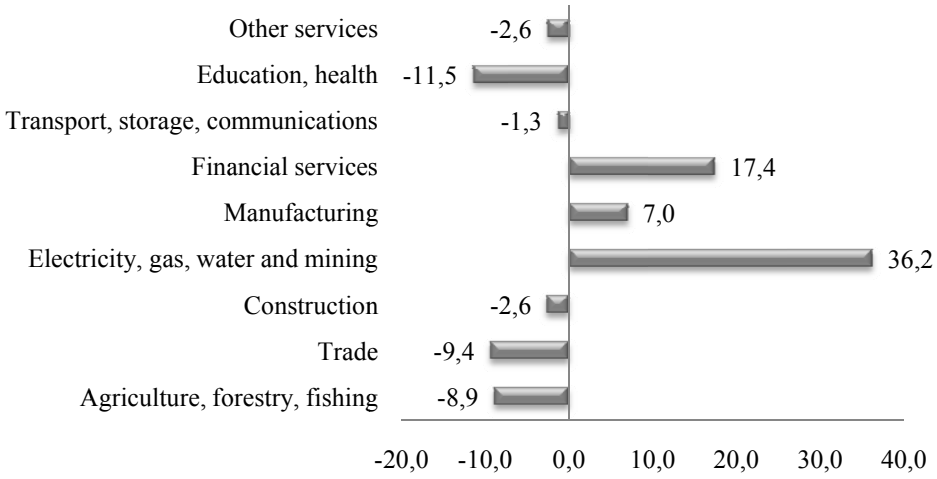
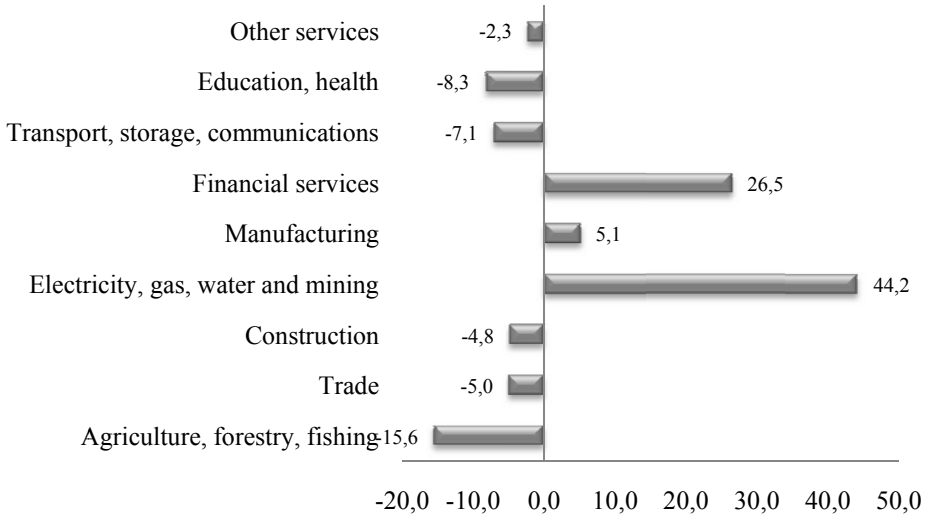


Figure 1 (Continued)
Inter-sectoral Wage Differentials by Occupational Position (%): 2009

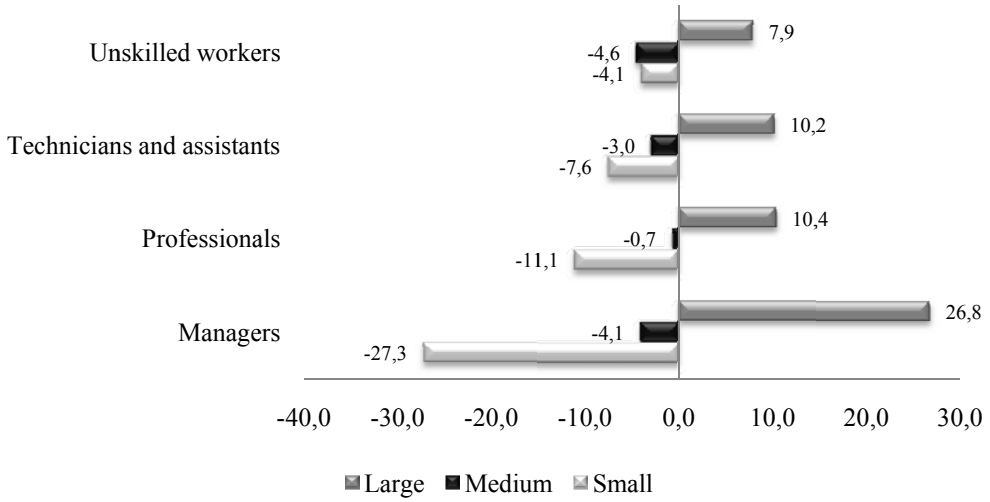
d. Unskilled Workers



Source: Authors' calculations.

Several studies also have documented a positive relationship between firm size and wages (e.g., Krueger and Summers, 1987; European Commission, 2003; Genre et al., 2005; Genre et al., 2009). According to our results, average wages in large firms (more than 200 employees) exceed total average wages by more than 26.8% in the case of managers, by more than 10% for professionals and technicians and assistants, and by more than 8% for unskilled workers. Conversely, medium-sized firms (between 51 and 200 employees) and small ones (between 11 and 50 employees) pay wages below average for all occupations. The striking wage differentials between managers in small and large firms are worth mentioning. In the former, they receive wages 27.3% below average; in the latter, they receive 26.8% above average. In the case of unskilled workers, the differences are not as significant (Figure 2).

Figure 2
Wage Differentials by Firm Size and Occupational Group (%): 2009

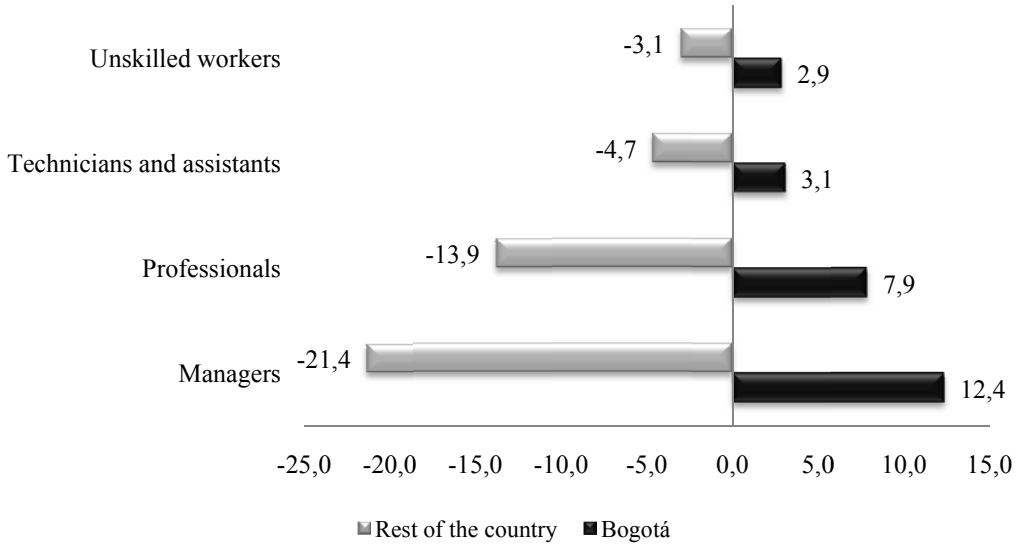


Source: Authors' calculations.

Furthermore, average wage differentials were calculated by occupational group and firm location. In this case, the firms located in Bogotá (the nation's capital) and the firms located in the rest of the country were compared to the national average. The results indicate that average wages in the firms located in the capital exceed the national average for all occupational groups, whereas average wages in the rest of the country are below average. It is worth mentioning that the more qualified the labour force, the larger the wage differential with respect to the national average (Figure 3).

Figure 3

Wage Differentials by Firm Location and Occupational Group (%): 2009



Source: Authors' calculations.

Next, Table 1 shows percentage sectoral wage differentials and their ranking. The results confirm there is a substantial spread in these differentials. For example, they range from a high of 44.2% for unskilled workers in the electricity, gas, water and mining sector to a low of -34.8% for managers in agriculture, forestry and fishing. Financial services also pay high wages for all occupational positions, while trade and transport, storage, and communications pay rather low wages.

Table 1
Sectoral Wage Differentials (%): 2009

Sector	Managers	Rank	Professionals	Rank	Technicians and assistants	Rank	Unskilled workers	Rank
Financial services	42.6	1	24.5	2	17.4	2	26.5	2
Electricity, gas, water, mining	30.9	2	38.7	1	36.2	1	44.2	1
Manufacturing	11.2	3	6.9	3	7.0	3	5.1	3
Other services	0.7	4	3.7	4	-2.6	5	-2.3	4
Education, health	-7.0	5	-10.2	7	-11.5	9	-8.3	8
Construction	-8.9	6	0.1	5	-2.6	6	-4.8	5
Trade	-21.7	7	-16.2	8	-9.4	8	-5.0	6
Transport, storage, communications.	-23.9	8	-6.6	6	-1.3	4	-7.1	7
Agriculture, forestry, fishing	-34.8	9	-21.9	9	-8.9	7	-15.6	9

Note: The first column shows the percentage by which each sector average is above (+) or below (-) the average for the economy.
Source: Authors' calculations.

Dickens and Katz (1987) and Krueger and Summers (1987) mentioned that it is important to consider different types of workers when analysing wage differentials for understanding inter-sectoral wage structures. In particular, they found a stable wage structure among workers in different occupations, suggesting that wage differentials might not only reflect worker and/or job characteristics. According to our results, wage differentials across economic sectors show a similar pattern for workers in different occupational positions. In fact, the ranking of wage differentials reported in Table 1 shows, sectors that pay high wages generally do so for all occupational groups and vice versa. In addition, we find high correlation coefficients among observed wage differentials for managers, professionals, technicians and assistants, and unskilled workers, ranging from 0.82 to 0.97, which indicates wage differentials are very similar across occupations (Table 2).

Table 2
Wage Differential Correlation Coefficients: 2009

	Managers	Professionals	Technicians and assistants	Unskilled workers
Managers	1.00	0.93	0.82	0.89
Professionals	0.93	1.00	0.95	0.96
Technicians and assistants	0.82	0.95	1.00	0.97
Unskilled workers	0.89	0.96	0.97	1.00

Source: Authors' calculations.

Following Genre et al. (2005), we consider some sector specific characteristics that could explain wage differentials. Specifically, we look at average labour productivity, the firm's profitability, capital intensity, and the share of compensation of employees to value added.

These sectoral indicators were calculated using information from the Colombian national accounts. The average for the period 2001-2007 is presented in Table 3.

Table 3
Sectoral Indicators: Averages for 2001-2007

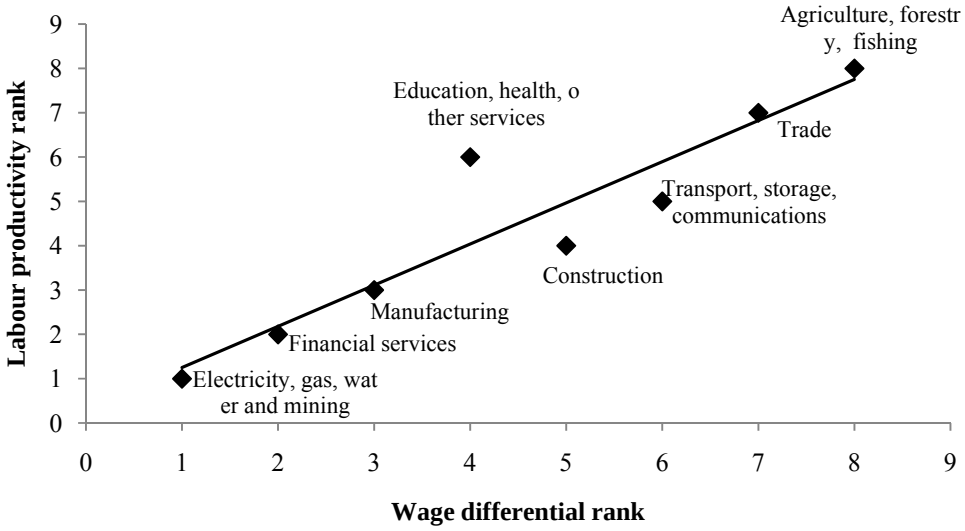
Sector	Real value added per employee (COP$ million)	Gross operating surplus/ value added (%)	Gross operating surplus/ compensation of employees (%)	Compensation of employees / value added (%)
Agriculture, forestry, fishing	5.9	3.6	15.1	23.7
Trade	6.2	10.5	23.4	45.3
Construction	12.5	57.3	294.8	20.4
Electricity, gas, water, mining	77.9	77.8	665.6	11.9
Manufacturing	14.7	50.0	159.7	31.9
Financial services	28.1	61.0	379.1	16.1
Transport, storage, communications	12.2	32.6	135.0	24.1
Education, health	10.1	11.6	17.0	68.7
Other services	10.1	12.4	36.7	33.8
Total	12.1	34.1	96.9	35.3

Source: DANE and authors' calculations.

According to Genre et al. (2005), although labour productivity is widely influenced by worker characteristics, it may reflect specific conditions in the economic sector, such as production technology and the intensity of competitive pressures. The indicator of labour productivity, measured as real value added per employee, has a positive correlation with inter-sectoral wage differentials. In Figure 4, we compare average labour productivity to wage differential rankings, where rank 1 indicates the sector with the highest positive differential and the sector with the highest real value added per employee. We find that sectors with higher average productivity employ workers with higher wages. The

correlation coefficient between both rankings is 0.93.[10] In particular, electricity, gas, water and mining, financial services, and manufacturing are the sectors with the highest labour productivity and the highest positive wages differentials in Colombia. Conversely, agriculture, forestry and fishing, trade, and transport, storage and communications are the sectors with the lowest labour productivity and the lowest wages differentials (e.g., wages below the national average).

Figure 4
Average Rank: Labour Productivity and Wage Differential



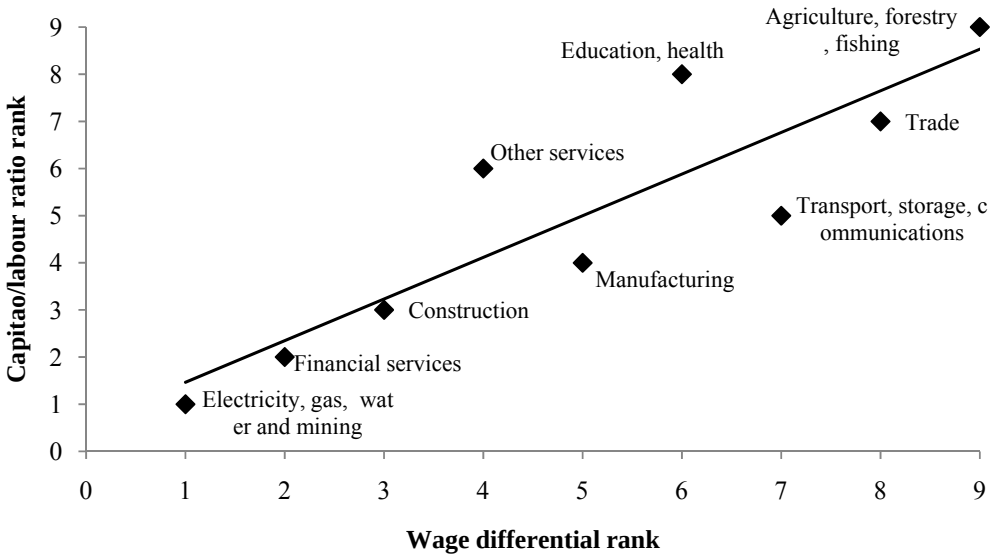
Source: DANE and authors' calculations.
Note: In the wage differential, rank, 1 indicates the sector with the highest positive differential. In the labour productivity rank, 1 corresponds to the sector with the highest labour productivity employee.

Similarly, when the ranking of wage differentials is compared to a proxy of capital intensity, measured as the ratio of gross operating surplus to compensation of employees, a positive relationship is observed, since more observations are located around the diagonal.

[10] Urrutia and Ruíz (2010) found similar results. During the period 1990-2006, there is a high positive correlation between real wages and labour productivity.

In this case, rank 1 indicates the sector with the highest positive differential and the highest capital/labour ratio. The correlation coefficient between both variables comes to 0.88 (Figure 5). Capital-intensive sectors could be associated with non-competitive theories to explain wages differentials, such as efficiency wages, rent- sharing, and bargaining power theories. Capital-intensive sectors normally might require more qualified workers to manage specialized equipment, which could give workers more power to negotiate higher wages. For example, the electricity, gas, water and mining sector has the highest wage differential and the highest capital-intensive indicator.

Figure 5
Rankings: Capital / Labour Ratio and Wage Differentials

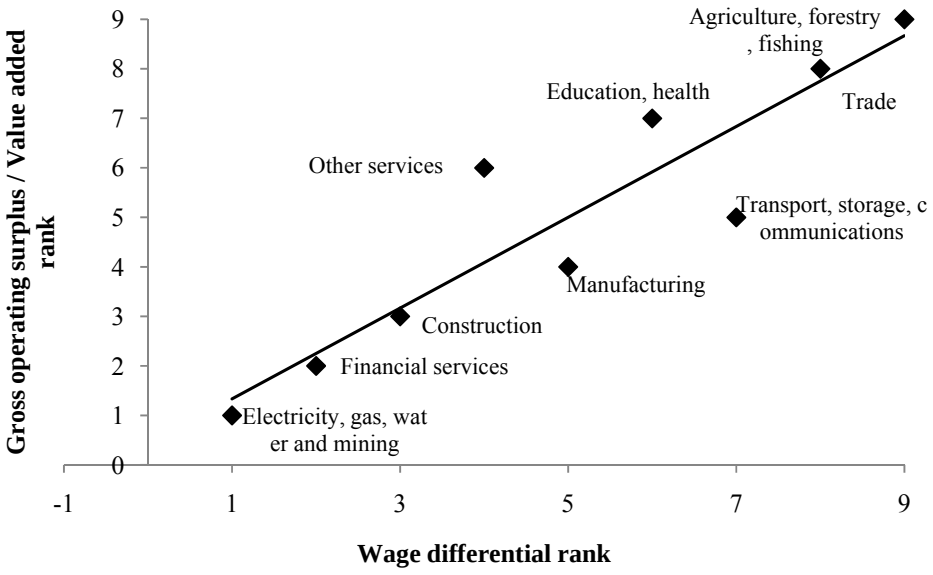


Source: DANE and authors' calculations.
Note: In the wage differential rank, 1 indicates the sector with the highest positive differential. As for the capital / labour ratio, rank 1 corresponds to the sector with the highest ratio.

The presence of rent-sharing mechanisms could be associated with the profitability of the sector, which also could be an indicator of market power. Thus, sectors with higher profits

should pay higher wages. Figure 6 plots the rankings of the profitability indicator, measured as the ratio of gross operating surplus to d value added, and the wage differentials for each sector. In this case, rank 1 indicates the sector with the highest positive differential and the highest profit share. We found a positive relationship between the two variables; the ranking of profitability closely follows the ranking of wages differentials. The correlation coefficient between both indicators is 0.92. Once again, electricity, gas, water and mining and the financial services sectors are at the top of the rankings. As previously mentioned, this is consistent with international evidence.

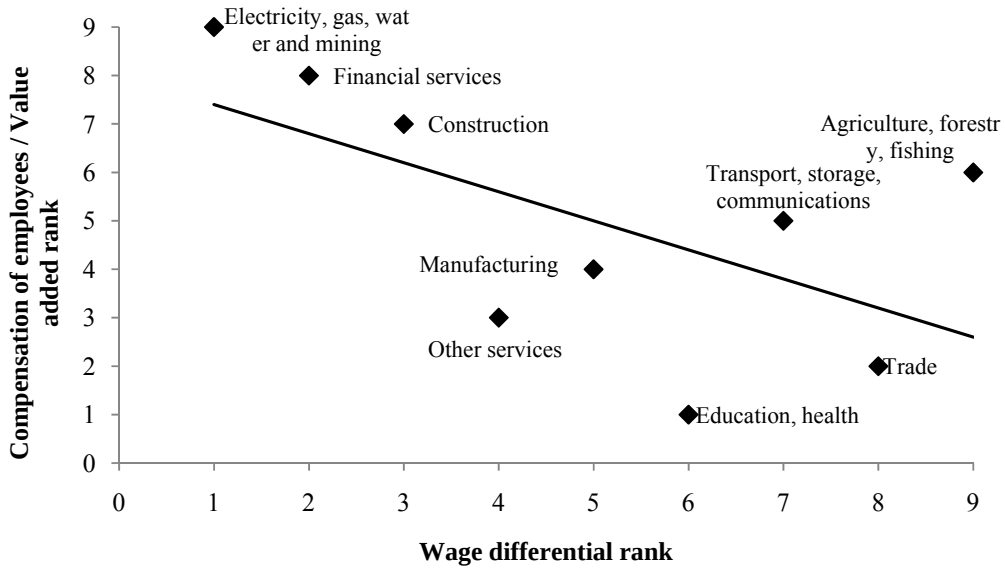
Figure 6
Profit- share Rank and Wage Differential Rank



Source: DANE and authors' calculations.
Note: In the wage differential rank, 1 indicates the sector with the highest positive differential. In the gross operating surplus to value-added rank, 1 corresponds to the sector with the highest share.

Finally, Figure 7 compares the wage differential ranking of the different sectors to their respective ratios of compensation of employees to value added, where rank 1 indicates the sector with the highest positive differential and the highest compensation of employees to value-added share. We find a negative relationship between both variables; specifically, sectors with higher positive wage differentials have low labour shares in value added. In particular, electricity, gas, water and mining and the financial services sectors have the highest wage differentials and the highest compensation to value-added ratio, which confirms what we found earlier (e.g., Figure 5).

Figure 7
Rankings: Compensation of Employees to Value-added and Wage Differentials



Source: DANE and authors' calculations.
Note: In the wage differential rank, 1 indicates the sector with the highest positive differential. In the compensation of employees to value added, rank 1 corresponds to the sector with the highest share.

In addition to sectoral differences, results not reported here show firm profitability is more important in explaining wage differentials in the case of managers, whereas average labour productivity is more important in the other occupations.

B. Determinants of Wage Differentials: The Role of Firm Characteristics

In the previous section, we provided evidence of significant wage differentials across economic sectors in Colombia. These differentials are observed in all occupational groups, suggesting that sector and firm characteristics are important determinants. This result is consistent with the findings of certain empirical studies for several countries (e.g., Krueger and Summer, 1987; Genre et al, 2005).

In this section, we study the effect of firm characteristics on wage differentials by estimating cross-section models for each occupational group, using the information provided by our survey.[11] According to the literature, firm characteristics can be important in explaining wage dispersion (e.g., Magda et al., 2008; Oh et al., 2007; Gannon et al., 2007).

The dependent variable is measured by the difference between the average monthly base wage reported by firm i for occupational position p and sector j and the average wage for each occupational group (p), $d_{i,p,j} = ln\left(w_{i,p,j}/w_p \right)$. The explanatory variables include eight dummy variables to indicate the economic sector where the firm operates, considering

[11] This survey did not ask about worker characteristics.

the financial sector as the reference category. We also include a dummy variable to identify the firms located in Bogotá, the nation's capital (*region*), and allow for differences in firm size by including the number of employees (*log (No. employees*)). Furthermore, several variables were included to take into account the characteristics and composition of the labour force; namely, the share of managers and professionals (*skilled workers*), the percentage of workers earning the minimum wage (*minimum wage earners*), and the share of employees on a permanent employment contract (*permanent workers*). In addition, there is a dummy variable that takes the value of *1,* if the firm has any form of collective agreement (*collective agreements*).

We also included dummy variables to account for the presence of flexible benefits and variable pay, which could affect the setting of base wages. The use of flexible benefits, which correspond to a formal plan whereby employees can choose among different employer-paid benefits or take cash, has increased recently in the country, especially in the case of managers. In fact, 30% of Colombian firms use benefits of this kind.[12] Variable pay is a form of compensation that links employee remuneration to some measure of job performance; commissions on sales or earnings are an example. According to our survey, this type of payment is used by 57% of the firms, especially in the trade, financial services and manufacturing sectors. Finally, labour costs as a share of total costs were included to assess the impact of labour intensity on wage differentials.

[12] See Iregui et al. (2009).

Table 4 presents the results of the estimations for all occupational groups. They show the electricity, gas, water and mining sector is the only one with a positive coefficient, which is significant only in the case of professionals and technicians and assistants. This indicates that, on average, the electricity, gas, water and mining sector is the only one with wage differentials higher than the financial sector, which is the reference category.

In the case of managers, we also found the share of employees on permanent contracts and the presence of collective agreements have a positive and significant impact when it comes to explaining wages differentials, suggesting that bargaining power has a positive effect on increasing wages. It is worth noting that there are more collective agreements in sectors with higher wages differentials. For instance, while 17% of firms, on average, have some form of collective agreement, this proportion is around 30% in financial services, electricity, gas, water and mining, and the manufacturing sectors. On the contrary, in the case of professionals, the presence of collective agreements and the share of workers on a permanent contract do not have a significant impact on wage differentials.

Furthermore, firm size and location have a significant effect on wage differentials. In particular, larger firms and those located in the country's capital have higher wage differentials. The presence of flexible benefits also has a positive impact on wage differentials in the case of managers, where this alternative form of payment is more common. Conversely, the share of workers with minimum wages has a negative and significant impact on wage differentials.

Table 4
Effects of Firm Characteristics on Wage Differentials
(Cross-section Estimates, Weighted)

Variables	Managers		Professionals		Technicians and assistants		Unskilled workers	
Agriculture, forestry, fishing	-0.239**	(0.111)	-0.175*	(0.096)	-0.034	(0.072)	-0.229***	(0.073)
Trade	-0.323***	(0.094)	-0.203**	(0.089)	-0.099	(0.066)	-0.181**	(0.071)
Construction	-0.058	(0.110)	0.005	(0.095)	-0.036	(0.072)	-0.167**	(0.076)
Electricity, gas, water, mining	0.014	(0.122)	0.210**	(0.105)	0.180**	(0.085)	0.060	(0.098)
Manufacturing	-0.191**	(0.098)	-0.066	(0.086)	-0.013	(0.066)	-0.166**	(0.074)
Transport, storage and comm.	-0.343***	(0.100)	-0.141	(0.091)	-0.077	(0.069)	-0.221***	(0.074)
Education and health	-0.336***	(0.105)	-0.202**	(0.095)	-0.194***	(0.069)	-0.235***	(0.076)
Other services	-0.197**	(0.100)	-0.069	(0.090)	-0.088	(0.069)	-0.160**	(0.074)
Region	0.212***	(0.041)	0.145***	(0.034)	0.020	(0.027)	0.021	(0.020)
Log (No. employees)	0.143***	(0.017)	0.062***	(0.015)	0.045***	(0.009)	0.016**	(0.007)
Minimum wage earners (%)	-0.708***	(0.077)	-0.390***	(0.059)	-0.377***	(0.039)	-0.286***	(0.030)
Flexible benefits	0.103**	(0.044)	0.015	(0.038)	0.010	(0.027)	-0.006	(0.022)
Variable pay	-0.018	(0.044)	-0.002	(0.035)	-0.049*	(0.025)	-0.003	(0.020)
Collective agreements	0.171***	(0.059)	0.108**	(0.047)	0.100***	(0.037)	0.168***	(0.034)
Labour costs (%)	-0.001	(0.001)	0.001	(0.001)	0.001	(0.001)	0.000	(0.001)
Permanent workers (%)	0.227***	(0.084)	0.076	(0.062)	0.086*	(0.045)	0.028	(0.036)
Worker with fixed term contracts (%)	-0.095	(0.092)	-0.132*	(0.071)	-0.088*	(0.049)	-0.073**	(0.036)
Women (%)	0.075	(0.100)	-0.109	(0.081)	-0.118**	(0.056)	-0.174***	(0.039)
Pseudo R2	0.3377		0.1992		0.1949		0.2632	

Notes: Robust standard errors in parentheses. (*), (**) and (***) denote statistical significance at 10, 5 and 1 percent, respectively.
Source: Authors' calculations.

The proportion of female workers has a negative impact on wage differentials in the case of technicians and assistants, as well as unskilled workers, suggesting that women generally are paid less than their male counterparts.[13] It should be noted that this negative impact is higher in the case of unskilled workers. Moreover, in all occupational groups, as the share of workers on fixed-term contracts increases, wage differentials tend to decrease. This could be associated with their lack of bargaining power.

Additionally, we estimate a cross-section regression that includes sector-specific characteristics, such as sector profitability, labour productivity, the capital/labour ratio and the share of compensation of employees to value added.[14] Firm characteristics have similar signs and significance, as before. With regard to sector characteristics, the results suggest that rent-sharing mechanisms associated with more profits could be reflected in wage premiums for managers. In turn, labour productivity is more important in the case of professional, technicians and assistants, and unskilled workers, suggesting that higher wages could be related to the efficiency wage theory.

[13] For a recent study of the earnings gender gap in Colombia, see Hoyos et al. (2010).
[14] The results are available from the authors upon request.

IV. Wage Differentials: Intra-sector and Within Occupational Groups

A. Within Occupational Groups

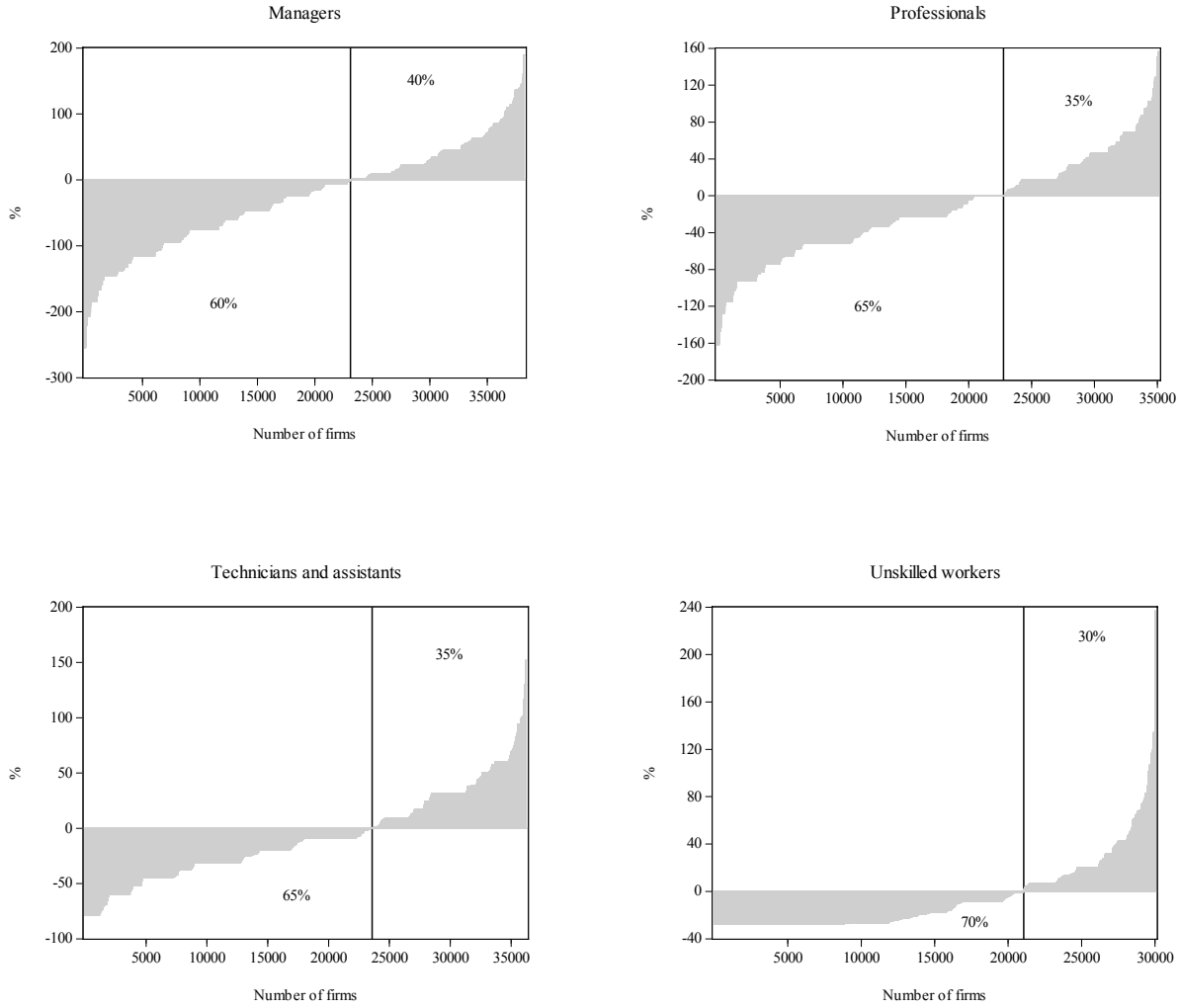
Despite the fact that wage differentials are very similar across occupations, there is a great dispersion within each occupational group, especially in the case of managers and professionals. The standard deviation in 2009 was COP$5,032,630 for managers and COP$1,491,731 for professionals. In the case of technicians and assistants, and unskilled workers, the standard deviations were COP$ 498,633 and COP$ 287,640, respectively. The lower dispersion of wages for unskilled workers could be explained by the fact that their remuneration is closely related to the minimum wage.

The distribution of wage differentials for each occupational group can be observed in Figure 8.[15] In all cases, the percentage of firms with wages below the occupational average (the area below the zero line) is larger than the percentage of firms that paid wages above average (the area above the zero line). In the case of unskilled workers, although 70% of the firms paid wages below average, wage dispersion is less than for the other occupational groups (e.g., the standard deviation of wage differentials is 29.8, whereas the average wage differential is -5.5). The most wage dispersion is observed in the case of managers, followed by professionals. In fact, the standard deviation of wage differentials is 74.9 in the case of managers and 53.2 in the case of professionals, while the standard deviation of base

[15] Wage differentials were calculated as the difference between the average wage in each firm and the average wage in each occupational group.

wages is around COP$5 million and close to COP$1.5 million for managers and professionals, respectively (Table 5). As mentioned, the smaller amount of wage dispersion for the least qualified jobs could be associated with the existence of a minimum wage in Colombia.[16]

Figure 8
Wage Differentials by Occupational Groups: 2009



Source: Authors' calculations.

[16] According to the results of our survey, the minimum wage in 60% of the firms corresponds to the one set at the national level (the rest have minimum wages above that amount), see Iregui et al. (2009).

Table 5
Base Wages and Wage Differentials: Summary Statistics by Occupational Group: 2009

	Wage level (COP$)		Wage differentials (%)	
	Average	Standard deviation	Average	Standard deviation
Managers				
Above average	10,883,078	5,169,713	45.2	38.4
Below average	3,412,895	1,526,697	-74.2	51.7
Total	6,368,775	5,032,630	-27.0	74.9
Professionals				
Above average	4,054,124	1,484,399	42.8	30.5
Below average	1,674,893	500,219	-45.6	33.5
Total	2,509,975	1,491,731	-14.6	53.2
Technicians and assistants				
Above average	1,617,115	493,374	35.4	26.0
Below average	812,365	158,937	-31.8	20.8
Total	1,093,414	498,633	-8.3	39.3
Unskilled workers				
Above average	942,856	391,531	31.3	29.5
Below average	531,022	46,672	-21.2	8.4
Total	653,837	287,640	-5.5	29.8

Source: Authors' calculations.

B. Intra-sectoral Wage Differentials

Additional evidence of wage differentials is found when analysing the wages firms pay within each sector. Although the highest average wages are paid in financial services, electricity, gas, water and mining, and the manufacturing sector, we observed a great deal of dispersion in all sectors and occupational groups. In general, the percentage of firms that

paid wages below the sectoral average is higher than the percentage of firms that paid wages above that average.

In all sectors, wages paid to managers present the most dispersion, with average wages in some firms exceeding or falling below the sectoral average by about 200% (Figure A1 in the Appendix). The standard deviation of wage differentials varies between 57% in the financial services sector and 79% in electricity, gas, water and mining, and manufacturing (Table 6). Furthermore, it is important to point out that the percentage of firms in all sectors with wages below average is higher for unskilled workers, although wage dispersion in this occupational group is lower[17] (Figure A1 in the Appendix and Table 6).

Finally, to analyse wage dispersion at the sectoral level, we evaluate the impact of firm characteristics on wage differentials by estimating cross-section models for each sector, using the same set of regressors as in the previous model. According to the literature, firm characteristics can be important determinants of wage dispersions. For instance, by analysing wage structure at the establishment level in six manufacturing industries in the United States, Groshen (1991b) found that firm characteristics can account for about 50% of the establishment wage differential. The dependent variable is measured by the difference between the average monthly base wage reported by firm *i* for occupational position *p* and in sector *j* and the average wage for each occupational group (*p*) in sector j, $d_{i,p,j} = ln\left(w_{i,p,j}/w_{j,p} \right)$.

[17] The electricity, gas, water and mining sector is an exception, due to the high degree of heterogeneity among the firms included and the highly specialised workers that some firms require.

Table 6
Base Wages and Wage Differentials:
Summary Statistics by Occupational Group and Economic Sector, 2009

	Wage Level (COP$)		Wage Differentials (%)	
	Average	Standard Deviation	Average	Standard Deviation
Managers				
Agriculture, forestry and fishing	4,498,397	3,415,406	-20	63
Trade	5,129,170	4,037,716	-26	73
Construction	5,832,499	3,765,181	-19	61
Electricity, gas, water, mining	8,681,447	6,942,606	-29	79
Manufacturing	7,122,331	5,637,216	-30	79
Financial services	9,749,291	5,650,184	-15	57
Transport, storage, communications	5,029,145	3,330,895	-21	67
Education and health	5,937,362	4,012,406	-20	63
Other services	6,413,726	5,517,379	-29	77
Professionals				
Agriculture, forestry and fishing	2,017,067	1,118,554	-12	48
Trade	2,135,550	1,316,858	-14	51
Construction	2,511,533	1,238,954	-11	48
Electricity, gas, water, mining	3,698,251	2,363,729	-18	61
Manufacturing	2,687,345	1,568,558	-14	53
Financial services	3,207,576	1,662,733	-13	51
Transport, storage, communications	2,352,492	1,382,199	-13	49
Education and health	2,266,203	1,182,919	-12	48
Other services	2,603,631	1,479,933	-14	53
Technicians and assistants				
Agriculture, forestry and fishing	999,792	339,466	-5	32
Trade	995,555	431,457	-7	36
Construction	1,065,140	433,406	-7	38
Electricity, gas, water, mining	1,571,836	890,410	-14	53
Manufacturing	1,171,695	472,512	-7	37
Financial services	1,301,613	561,341	-9	41
Transport, storage, communications	1,079,499	532,802	-9	40
Education and health	974,571	329,001	-5	32
Other services	1,065,117	556,162	-10	42
Unskilled workers				
Agriculture, forestry and fishing	559,551	103,149	-1	16
Trade	622,306	258,176	-5	27
Construction	623,262	161,407	-3	24
Electricity, gas, water, mining	1,015,992	981,372	-20	54
Manufacturing	687,469	283,914	-6	31
Financial services	851,772	347,344	-7	37
Transport, storage, communications	609,414	197,062	-4	25
Education and health	601,355	175,277	-3	23
Other services	638,398	267,796	-5	30

Source: Authors' calculations.

In most sectors and for all occupational positions, the results generally indicate that wages in firms located in Bogotá tend to be higher than the sectoral average, compared to those located in other cities of the country, as well as in larger firms. As expected, there is a negative and significant impact on wage differentials as the share of employees earning minimum wages increases (Tables 7a, 7b, 7c and 7d)[18]. Nevertheless, the effect of firm characteristics on wage differentials will depend on sectors and/or occupational groups.

In the case of managers, firm's location in Bogotá and its size have a positive impact on wage differentials for firms in trade, construction, manufacturing, transport, storage and communications, and other services. On the contrary, the share of minimum wage earners has a negative impact on firms in trade, construction, manufacturing, financial services, transport, storage and communications, education and health and "other" services. The share of workers with permanent contracts, as an indicator of bargaining power, has a positive impact on wage differentials in firms operating in trade and other services; for firms in financial services, this variable has a negative impact on wage differentials, which could suggest that managers in this sector are not necessarily appointed with permanent contracts.

The presence of collective agreements has a positive and significant impact on wage differentials in the manufacturing sector, where 33% of firms have some form of collective

[18] To save space, we list only the sign and significance of the coefficients. The complete set of results may be obtained from the authors upon request.

agreement. Conversely, the share of workers with fixed-term contracts has a negative impact on wage differentials in construction, financial services, and the transport, storage and communications sectors. Finally, the percentage of women, as a share of total personnel, has a positive impact on wages in firms operating in three sectors: agriculture, forestry and fishing; construction and transport; storage and communications.

In the case of professionals, as was true for managers, firm size and location have a positive impact on wage differentials, especially in construction and "other" services, while the share of minimum wage earners has a negative effect on firms operating in trade, construction, manufacturing, financial services, transport, storage and communications, education and health, and "other" services. The presence of collective agreements is important in both the trade and education and health sectors. Moreover, the share of workers with fixed term contracts has a negative impact on wage differentials in the construction and transport, storage and communications sectors.

Contrary to the case of managers, the percentage of women as a share of total personnel has a negative impact on the wages of technicians and assistant in firms operating in the trade and transport, storage and communications sectors. Nevertheless, the positive impact is maintained in the case of the construction sector, although the percentage of women in this sector is very small, which could suggests that firms with women among their personnel pay higher wages.

Finally, in the case of unskilled workers, firms with collective agreements in the trade sector and in electricity, gas, water and mining, and the manufacturing sector tend to pay wages above the sectoral averages. On the contrary, as the share of female workers increases, firms in agriculture, forestry and fishing, manufacturing and "other" services sectors tend to pay less than average wages.

Table 7a
Effects of Firm Characteristics on Wage Differentials by Economic Sector: Managers
(Cross-section Estimates, Weighted)

Explanatory variables	Agriculture, forestry, fishing	Trade	Construction	Electricity, gas, water, mining	Manufacturing	Financial services	Transport, storage comm.	Education and health	Other services
Region	+	+***	+**	+	+**	+	+**	+	+**
Log (No. employees)	+	+***	+***	+***	+***	+*	+***	+***	+***
Minimum wage earners (%)	-	-***	-***	-*	-***	-*	-***	-***	-***
Flexible benefits	+	+	+	+	-	+	+	+	+*
Variable pay	-	+	-	+	+	-	-	-**	-
Collective agreements	+	+	+	+	+**	-	-	+	+
Labour costs (%)	+*	+	+	-*	-	+	-	+	-
Permanent workers (%)	-	+**	-	+	+	-***	-	+	+***
Workers with fixed term contracts (%)	-	+	-**	-	-	-***	-*	+	+
Women (%)	+*	-	+**	+	-	+	+*	-	+
Pseudo R2	0.1311	0.2684	0.2942	0.4276	0.4727	0.2750	0.2486	0.3530	0.2875

Notes: (+) and (-) denote positive and negative coefficients, respectively. (*), (**) and (***) denote statistical significance at 10, 5 and 1 percent, respectively.
Source: Authors' calculations.

Table 7b
Effects of Firm Characteristics on Wage Differentials by Economic Sector: Professionals
(Cross-section Estimates, Weighted)

Explanatory variables	Agriculture, forestry, fishing	Trade	Construction	Electricity, gas, water, mining	Manufacturing	Financial services	Transport, storage comm.	Education and health	Other services
Region	+	+***	+**	+	+	+	+	+	+**
Log (No. employees)	+**	+	+***	+***	+***	+	+	+	+*
Minimum wage earners (%)	-	-**	-**	-	-***	+	-**	-**	-***
Flexible benefits	+	+	-	+	-	-	+	+	+
Variable pay	-	+	-	+	+	-	-	-	-
Collective agreements	-	+*	+	+	+	+	+	+***	+
Labour costs (%)	+	+*	-	-	-	+	-	-	+
Permanent workers (%)	-	+	+	-	-	-	-	+**	+
Workers with fixed term contracts (%)	-	+	-**	-	-	-	-*	+	-
Temporary workers (%)	-	+	-	-	+	+**	+	-	-
Women (%)	+	-	+	+	-	-	+	+	-
Pseudo R2	0.1544	0.1767	0.2874	0.3399	0.2595	0.2022	0.1307	0.2643	0.2229

Notes: (+) and (-) denote positive and negative coefficients, respectively. (*), (**) and (***) denote statistical significance at 10, 5 and 1 percent, respectively.
Source: Authors' calculations.

Table 7c
Effects of Firm Characteristics on Wage Differentials by Economic Sector: Technicians and Assistants
(Cross-section Estimates, Weighted)

Explanatory variables	Agriculture, forestry, fishing	Trade	Construction	Electricity, gas, water, mining	Manufacturing	Financial services	Transport, storage comm.	Education and health	Other services
Region	+	+**	+	+	-	-	+	+***	-
Log (No. employees)	+**	+	+***	+*	+***	+**	+	+***	+
Minimum wage earners (%)	-	-***	-***	-**	-***	-**	-***	-	-***
Flexible benefits	-	+	+	+*	+	-	+	-*	-
Variable pay	-	-	-	+	+	-*	-	-	-
Collective agreements	+	+	-**	-	+	-	+	+	+
Labour costs (%)	-	+	-	-	-	+**	+	+	+
Permanent workers (%)	+	+*	+	-	+	-*	+	+***	+
Workers with fixed term contracts (%)	+	-	-	-*	-	-*	+	+	-
Temporary workers (%)	+	+	-*	-	+	+	-	+*	-
Women (%)	-	-**	+*	-	+	-	-**	+	-
Pseudo R2	0.1148	0.2197	0.2402	0.3239	0.2452	0.3551	0.1910	0.3338	0.1334

Notes: (+) and (-) denote positive and negative coefficients, respectively. (*), (**) and (***) denote statistical significance at 10, 5 and 1 percent, respectively.
Source: Authors' calculations.

Table 7d
Effects of Firm Characteristics on Wage Differentials by Economic Sector: Unskilled Workers
(Cross-section Estimates, Weighted)

Explanatory variables	Agriculture, forestry, fishing	Trade	Construction	Electricity, gas, water, mining	Manufacturing	Financial services	Transport, storage comm.	Education and health	Other services
Region	-	+*	+	+**	-	-	-	+*	+*
Log (No. employees)	+	+	+*	+	+	+	+**	+*	-
Minimum wage earners (%)	-***	-***	-***	-	-***	-	-***	-	-***
Flexible benefits	-	+	+	-	-	-	+*	-	+
Variable pay	+	+	+	+	+	-	+	-	+
Collective agreements	+	+**	-	+***	+**	+	+	+	+
Labour costs (%)	+	+	-	+*	-	+	-	-	+
Permanent workers (%)	+	+	-	-	+	-	+	+	-
Workers with fixed term contracts (%)	-	-	-*	-	-	-	-	-	-
Temporary workers (%)	-***	+	-	-	-	+	+	-	+
Women (%)	-***	-	+	+	-**	-	-	+	-**
Pseudo R2	0.2650	0.1870	0.3618	0.5100	0.2721	0.5633	0.2338	0.2345	0.893

Notes: (+) and (-) denote positive and negative coefficients, respectively. (*), (**) and (***) denote statistical significance at 10, 5 and 1 percent, respectively.
Source: Authors' calculations.

V. Conclusions

This paper provides new elements for understanding inter- and intra-sectoral wage differentials in Colombia by analysing a unique wage-setting survey of 1,305 firms and emphasizing the role of firm characteristics.

The existence of wage differentials across sectors is a widely observed phenomenon. The results for Colombia confirm the existence of substantial wage differentials across sectors and occupational positions. We found positive wage differentials with respect to the average for the economy in the different occupational groups, in electricity, gas, water and mining, in financial services and manufacturing, and strong negative wage differentials in agriculture, forestry and fishing. The results also show wages are higher in larger firms and in those located in the capital, exceeding the national average for all occupational groups.

We used cross-section estimations to explain wage differentials, taking into account firm characteristics. In general, we found the share of employees on permanent contracts and the presence of collective agreements have a positive and significant impact on explaining wages differentials, suggesting that bargaining power has a positive effect on increasing wages. The presence of flexible benefits also has a positive impact on wage differentials in the case of managers, where this alternative form of payment is more common. The proportion of female workers has a negative impact on wage differentials in the case of technicians and assistants, and unskilled workers, suggesting that women generally are paid less than their male counterparts.

Across sectors, in general, wage differentials show a similar pattern for workers in different occupational positions, suggesting that wage differentials might not only reflect worker and/or job characteristics. For this reason, as an additional exercise, we consider some sector-specific characteristics that could explain wage differentials. The results suggest that rent-sharing mechanisms associated with more profits could be reflected in wage premiums for managers. In turn, labour productivity is more important in the case of professionals, technicians and assistants, and unskilled workers, suggesting that higher wages could be related to the efficiency wage theory.

Finally, when analysing wage differentials within each occupational group, more wage dispersion is observed in the case of managers, followed by professionals. The smaller amount of wage dispersion for the least qualified jobs could be associated with the existence of a minimum wage in Colombia. In turn, when analysing, intra-sectoral wage differentials, we found that, in general, the percentage of firms that paid wages below the sectoral average is higher than the percentage of firms that paid wages above average. In all sectors, managers' wages show the most dispersion. Furthermore, it is important to point out that, in all sectors, the percentage of firms with wages below average is higher for unskilled workers, although there is less wage dispersion in this occupational group. When evaluating the impact of firm characteristics on wage differentials within the different economic sectors, we found that wages in the different occupational groups in most sectors tend to be higher than the sectoral average in the case of firms located in Bogotá, compared to those located in other cities of the country, and in the larger firms, as measured by the number of employees.

References

Alexopoulos, M. (2006). Efficiency wages and inter-industry wage differentials. University of Toronto, Department of Economics, Mimeo, December. Available at: http://www.chass.utoronto.ca/~malex/EWdiff.pdf.

Arango, L.E., Posada, C.E. & Uribe, J.D. (2004). Cambios en la estructura de los salarios urbanos en Colombia (1984-2000). Banco de la República, *Borradores de Economía*, No. 464.

Arbache, J.S. (2001). Wage Differentials in Brazil: Theory and Evidence. *The Journal of Development Studies*, 38 (2), (December), 109–130.

Benito, A. (2000). Inter-industry Wage Differentials in Great Britain. *Oxford Bulletin of Economics and Statistics*, 62 (Special Issue), 727-746. Retrieved from EconLit with Full Text database.

Björklund, A., Bratsberg, B., Eriksson, T., Jäntti, M., & Raaum, O. (2007). Inter-Industry Wage Differentials and Unobserved Ability: Siblings Evidence from Five Countries. *Industrial Relations*, 46 (1), 171-202.

Carruth, A., Collier, W., & Dickerson, A. (2004). Inter-industry Wage Differences and Individual Heterogeneity. *Oxford Bulletin of Economics and Statistics*, 66 (5), 811-846.

Casado-Díaz, J. & Simon, H. (2008). Industry Wage Premia and Collective Bargaining Revisited: Evidence from Spain. *Applied Economics Letters*, 15 (4-6), 477-481. Retrieved from EconLit with Full Text database.

Christopoulou, R., Jimeno, J., & Lamo, A. (2010). Changes in the wage structure in EU countries. European Central Bank, *Working Paper Series,* No. 1199, (May), Frankfurt am Main, Germany.

Christopoulou, R., & Kosma, T. (2009). Skills and Wage Inequality in Greece: Evidence from Matched Employer-Employee Data, 1995-2002. Hellenic Observatory, European Institute, London School of Economics, Papers on Greece and Southeast Europe, *GreeSE Paper,* No 26, May.

Dickens, W., & Katz, L.F. (1987). Inter-industry wage differences and industry characteristics. In: Lang, K., & Leonard, J. (Eds.). *Unemployment and the structure of labour markets*, p. 48-89. London: Basil Blackwell.

Du Caju, P., Kátay, G., Lamo, A., Nicolitsas, D., & Poelhekke, S. (2010). Inter-industry wage differentials in EU countries: What do cross-country time-varying data add to the picture? *Journal of the European Economic Association,* 8 (2-3), 478-486.

Erdil, E., & Yetkiner, I.H. (2001). A comparative analysis of inter-industry wage differentials: industrialized versus developing countries. *Applied Economics*, 33 (13), 1639-1648.

European Commission (2003). Employment in Europe 2003: Recent Trends and Prospects. Luxembourg: Office for Official Publications of the European Communities.

Ferreira, P. (2009). The sources of inter-industry wage differentials. Institute for Social & Economic Research, *ISER Working Paper,* 2009-13, (March), University of Essex, Colchester, United Kingdom.

Gannon, B., Plasman, R., Rycx, F., & Tojerow, I. (2007). Inter-Industry Wage Differentials and the Gender Wage Gap: Evidence from European Countries. *The Economic and Social Review*, 38 (1), (Spring), 135-155.

Galvis, L. A., 2010. Diferencias salariales por género y región en Colombia: Una aproximación con regresión por cuantiles, Banco de la República, *Documentos de Trabajo sobre Economía Regional*, No. 131

Genre, V., Kohn, K., & Momferatou, D. (2009). Understanding inter-industry wage structures in the Euro area. European Central Bank, *Working Paper Series,* No. 1022, (March), Frankfurt am Main, Germany.

Genre, V., Momferatou, D., & Mourre, G. (2005). Wage diversity in the Euro area: An overview of labour cost differentials across industries. European Central Bank, *Working Paper Series,* No. 24, (February), Frankfurt am Main, Germany.

Gracia; O.; Hernández, G., & Ramírez; J.M. (2001). Diferenciales salariales y mercados laborales en la industria colombiana. *Desarrollo y Sociedad* No. 48.

Groshen, E. (1991a). Five reasons why wages vary among employers. *Industrial Relations,* 30 (3), (Fall), 350-381.

Groshen, E. (1991b). Sources of Intra-Industry Wage Dispersion: How Much Do Employers Matter? *The Quarterly Journal of Economics*, 106 (3), 869-884.

Hoyos, A, Ñopo, H., & Peña, X. (2010). The Persistent Gender Earnings Gap in Colombia, 1994-2006. Universidad de los Andes, Facultad de Economía, *Documento CEDE,* No. 32.

Iregui, A.M., Melo, L.A., & Ramírez, M.T. (2009). Formación e incrementos de salarios en Colombia: Un estudio microeconómico a partir de una encuesta a nivel de firma. Banco de la República, *Borradores de Economía,* No. 582, (December), Bogotá, Colombia.

Jaramillo, C.F., Romero, C.A., & Nupia, O. (2000). Integración en el mercado laboral colombiano: 1945-1998. Banco de la República, *Borradores de Economía*, No. 148.

Krueger, A.B., & Summers, L.H. (1987). Reflections on the inter-industry wage structure. In: Lang, K., & Leonard, J. (Eds.). *Unemployment and the structure of labour markets*, p.17-47. London: Basil Blackwell.

Krueger, A.B., & Summers, L.H. (1988). Efficiency Wages and the Inter-Industry Wage Structure. *Econometrica,* 56 (2), 259-293.

Magda, I., Rycx, F., Tojerow, I., & Valsamis, D. (2008). Wage differentials across sectors in Europe: An east-west comparison. The Institute for the Study of Labour (IZA), *Discussion Paper Series,* No. 3830, (November), Bonn, Germany.

Mesa, D.C., García, A.F., & Roa, M. (2008). Estructura salarial y segmentación en el mercado laboral de Colombia: Un análisis de las siete principales ciudades, 2001-2005. Universidad del Rosario, Facultad de Economía, *Serie Documentos de Trabajo*, No. 52.

Oh, Y., Park, S., & Kim, Y. (2007). A Comparative Analysis of Inter-industry Wage Differentials: Before and after the Korean Financial Crisis. *Applied Economics,* 39(10-12), 1387-1397. Retrieved from EconLit with Full Text database.

Ortíz, C.H, Uribe, J.I., & García, G.A. (2007). La segmentación del mercado laboral colombiano en la década de los noventa. *Revista Economía Institucional*,. 9(16), 189-221.

Osburn, J. (2000). Interindustry wage differentials: patterns and possible sources. *Monthly Labor Review*, 123 (2), 34-46.

Pointner, W., & Stiglbauer, A. (2010). Changes in the Austrian structure of wages, 1996-2002: Evidence from linked employer-employee data. *Empirica* , 37 (2), 105-125.

Pollan, W. (2009). How large are wage differentials in Austria? *Empirica,* 36 (4), 389–406.

Posso, C. (2008). Desigualdad salarial en Colombia 1984-2005: Cambios en la composición del mercado laboral y retornos a la educación post-secundaria. Banco de la República, *Borradores de Economía*, No 529.

Rycx, F. (2002). Inter-industry Wage Differentials: Evidence from Belgium in a Cross-National Perspective. *De Economist*, 150 (5), 555-568. Retrieved from EconLit with Full Text database.

Slichter, S.H. (1950). Notes on the structure of wages. *Review of Economics and Statistics,* 32 (1), 80-91.

Urrutia, M., & Ruiz, M. (2010). Ciento sesenta años de salarios reales en Colombia. *Ensayos Sobre Política Económica*, No. 63. Forthcoming.

Appendix 1
Table A.1
Sample of Recent Empirical Studies

Studies	Country	Data and period covered	Main results
Christopoulou, Jimeno and Lamo (2010)	Nine EU countries (Austria, Belgium, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Spain).	The European Structure of Earnings Survey (SES), two time waves: 1995 and 2002. The Social Security General Registry (or a similar registry) is used to obtain information on firm characteristics and on a random sample of their employees.	Market development has been driving wage changes, largely by affecting not only the returns to employee and jobs characteristics, but also by inducing compositional shifts. Instead, composition effects (derived from changes in age, gender or education), had a minor contribution to the observed wage dynamics.
Du Caju, Kátay, Lamo, Nicolitsas and Poelhekke (2010)	Eight EU countries (Belgium, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Spain).	The European Structure of Earnings Survey (SES), 1995 and 2002.	Inter-industry wage differentials are significant and persist over time. They could reflect efficiency wages and rent-sharing mechanisms, which are more likely in industries with higher collective agreement coverage.
Pointner and Stiglbauer (2010)	Austria, between 1996 and 2002.	The European Structure of Earnings Survey (SES), 1996 and 2002.	A small increase in wage dispersion between 1996 and 2002, due to composition (such as gender, education and age) and market-driven effects (such as changes in returns and changing workplace characteristics). Higher female participation increased wage dispersion in the bottom half of wage distribution, whereas the rise in educational attainment increased wages in the top half.
Genre, Kohn and Momferatou (2009)	Eight Euro Area countries (Austria, Belgium, Finland, France, Germany, Italy, The Netherlands, and Spain).	OECD Structural Analysis Database and the European Union Labour Force Survey, 55 industries, 1991-2002.	There are large and persistent wage differentials across sectors of the euro area economy. Both workforce and firm-related characteristics contribute considerably to explain them. The analysis also captures the importance of idiosyncratic factors, especially for some industries such as agriculture or the health sector.

Table A.1 (Continued)
Sample of Recent Empirical Studies

Studies	Country	Data and period covered	Main results
Ferreira (2009)	Portugal	*Quadros de Pessoal*, longitudinal data set with matched information on workers and firms, 1986-2000 (1990 was excluded)	After controlling for all types of heterogeneity, wage differentials are found to be considerable and persistent across industries. The main sources of the differentials are firm compensation policies, whereas unmeasured labour quality is not as important.
Pollan (2009)	Austria	Index of Contractual Wage Rates (*Tariflohnindex*), 2003	Huge wage differentials are found for selected industries. This fact, coupled with the existence of a great number of collective agreements, provides evidence against the hypothesis that inter-industry wage differentials are due to unobserved worker abilities. Instead, they support a rent sharing explanation.
Christopoulou and Kosma (2009)	Greece	Greek Structure of Earnings Survey (SES), 1995 and 2002.	Wage inequality increased, especially for men and those on the upper tail of the wage distribution. Skills have contributed considerably to wage inequality, mainly through the composition effects of education and tenure. Employer or job characteristics appear to be driving composition effects at the upper end of the wage distribution, as well as price effects across the board.
Magda, Rycx, Tojerow, and Valsamis (2008)	Belgium, Italy, the Netherlands, Norway, Portugal, Spain, Latvia, Lithuania, the Czech Republic, Poland, Slovakia.	European Structure of Earnings Survey (ESES), 2002.	Substantial differences were found in earnings across sectors of all countries, even when controlling for employee, job and employer characteristics. The hierarchy of sectors in terms of wages appears to be rather similar in Eastern and Western European countries. The wage structure is more compressed in countries with a higher proportion of workers who are covered by collective agreements or are members of trade unions.

Table A.1 (Continued)
Sample of Recent Empirical Studies

Studies	Country	Data and period covered	Main results
Casado-Díaz and Simon (2008)	Spain	Spanish Structure of Earnings Survey, 1995	Inter-industry wage differentials are driven by minimum wages set in industry through collective bargaining. A high dispersion of inter-industry wage differentials is found, which is not common in countries with centralized collective bargaining.
Björklund, Bratsberg, Eriksson, Jäntti and Raaum (2007)	Denmark, Finland, Norway, Sweden, and the United States.	Denmark: Fertility database and tax records, 1980–1995. Finland: Quinquennial census panel and tax record, 1970 – 1995. Norway: Register of all residents (January 1, 1993) and Statistics Norway. Sweden: Several registers held by Statistics Sweden. The United States: National Longitudinal Survey of Youth (NLSY).	Data on brothers are used to account for unmeasured abilities shared by siblings. In the Nordic countries, only a small proportion of wage variability can be attributed to unobserved ability, whereas these unmeasured factors could explain up to fifty percent of the U.S. industry-wage variation. The contribution of inter-industry wage differentials to total wage variation is larger in the Nordic countries than in the US.
Oh, Park and Kim (2007)	Korea	Survey Report on Wage Structure (SRWS) by the Ministry of Labour, 1995 and 1999.	The authors find that, after the crisis, variables such as firm size, region, gender, tenure and education became more relevant in the determination of wages. They also found wider inter-industry wage differentials and changes in the wage structure.
Gannon, Plasman, Rycx and Tojerow (2007)	Belgium, Denmark, Ireland, Italy, Spain, and the United Kingdom	The European Structure of Earnings Survey, 1995.	Significant inter-industry wage differentials were found in all countries, for both sexes, even when controlling for working conditions, individual and firm characteristics. Wage dispersion is larger in countries with decentralised collective bargaining. The authors also find that industry effects on the gender wage gap fluctuate sharply across European countries, which can be explain, to a great extent, by the segregation of women in lower paying industries.

Table A.1 (Continued)
Sample of Recent Empirical Studies

Studies	Country	Data and period covered	Main results
Genre, Momferatou and Mourre (2005)	Austria, Belgium, Finland, France, Germany, Italy, Spain, the Netherlands, Portugal, the United Kingdom and the United States.	The Structural Analysis Database (STAN) of the Organisation for Economic Cooperation and Development (OECD), 1980-1999.	Average wages in the service sector are lower than in manufacturing. This gap increased with time and is influenced by labour force skills or hours worked. The strong growth in part-time employment contributed to a further increase the gap between average wages in services and in manufacturing. The widening of the gap could be related to the growth in labour productivity, which was three times higher in manufacturing than in services during the 1990s.
Carruth, Collier and Dickerson (2004)	United Kingdom	First eight waves of the British Household Panel Survey (BHPS), 1991 – 1998.	In cross-section wage equations, worker and firm characteristics explain about 55% of observed differences in raw industry wage differentials and a little more than half of the total wage dispersion. Around 90% of the total variation in wages can be explained by observed and unobserved differences between individuals.
Erdil and Yetkiner (2001)	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, the United Kingdom, the United States, Brazil, Chile, Argentina, Korea, Mexico, the Philippines, Turkey, Singapore.	The Structural Analysis Industrial Database (STAN) of the Organization for Economic Cooperation and Development (OECD) and The United Nations Industrial Development Organization (UNIDO) Industrial Statistics Data Base, 1970-1992.	The authors confirm the existence of wage differentials, a high degree of wage differential stability among industries for OECD and NICs, and a growing inequality in wage differentials. They also find the factors that cause inter-industry wage differentials at the country level are important at the cross-country level, although the source of wage differentials appears to be different between OECD countries and NICs.

Table A.1 (Continued)
Sample of Recent Empirical Studies

Studies	Country	Data and period covered	Main results
Arbache (2001)	Brazil	Micro-data from the *Pesquisa Nacional por Amostras por Domicílio* (PNAD) of the *Instituto Brasileiro de Geografia e Estatística* (IBGE). Aggregate data from the *Relatório Anual de Informações Sociais* (RAIS) of the Ministry of Labour, for various years between 1984 and 1998.	The wage structure did not change between 1984 and 1998, a period characterised by successive inflation stabilisation plans and market-oriented economic reforms. Some evidence that wage determination is affected by unmeasured abilities and that the efficiency wage theory (i.e., turnover, monitoring and sociological models) plays an important role on the wage formation in manufacturing is found. On the contrary, the author found no evidence to support the compensating wage differentials theory.
Osburn (2000)	United States	The Occupational Employment Statistics (OES) survey, 1996, 1997, 1998.	The author finds that industry wage differentials are related to occupations most closely associated with the primary activity of the firm. Therefore, inter-industry wage differentials might reflect a motivational role in the use of higher wages, which might be contingent on the production technology.
Benito (2000)	Great Britain	British Household Panel Survey (BHPS), first four waves	After controlling for human capital and demographic characteristics, a significant variation in relative wages was found. Evidence of a positive relationship between the estimated differentials and industry profitability and concentration was found.

Figure A.1
Wage Differentials by Economic Sector

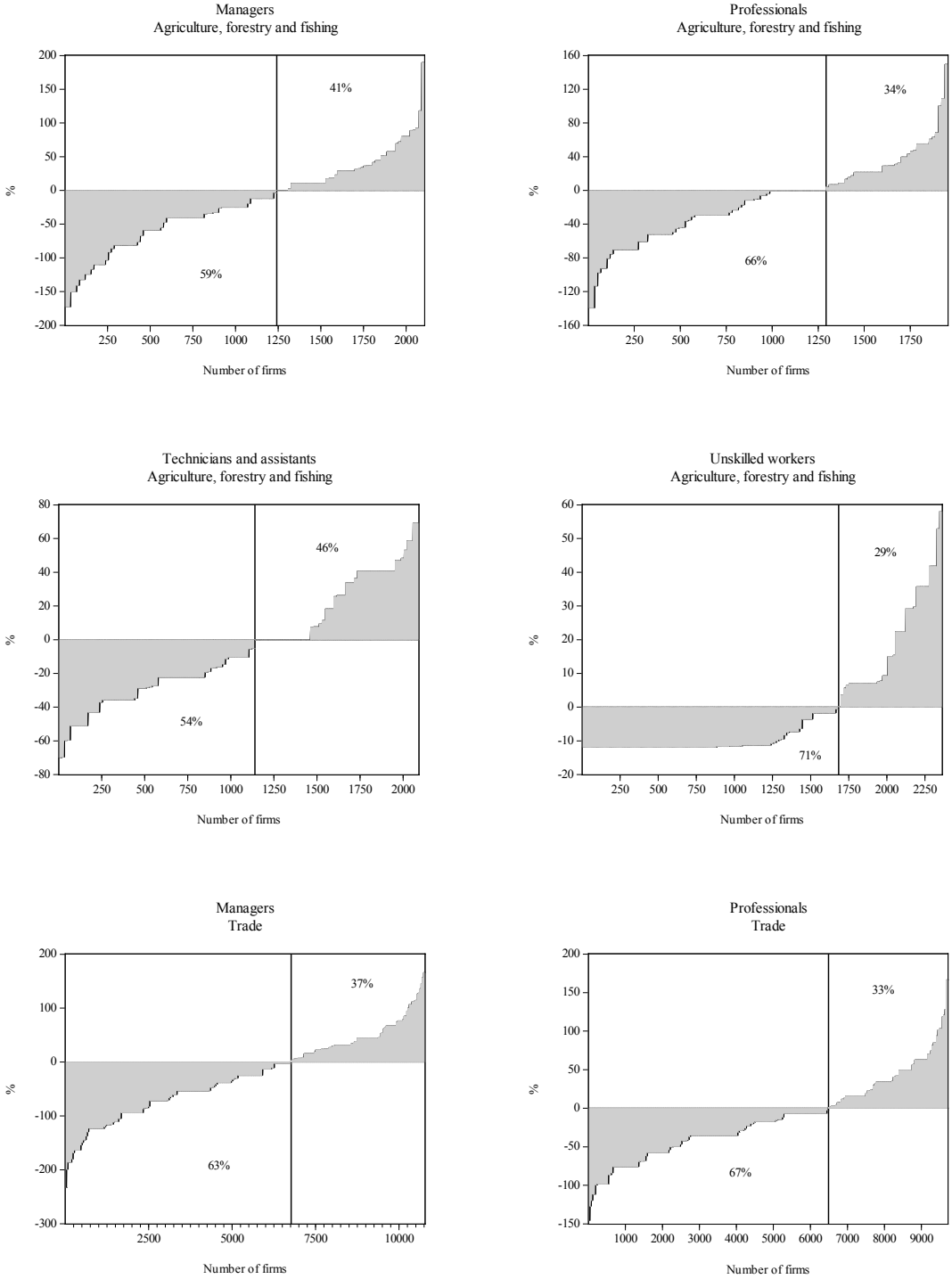
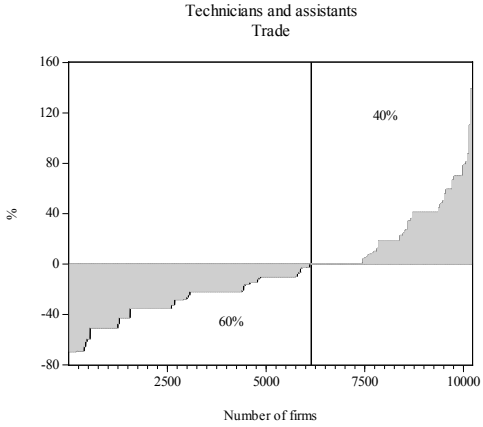
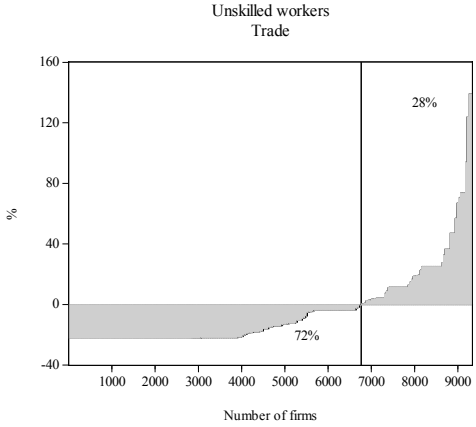
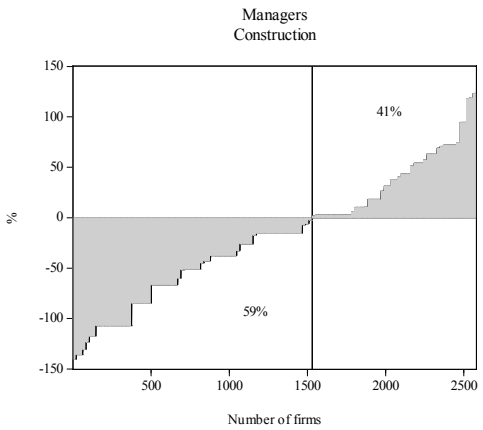
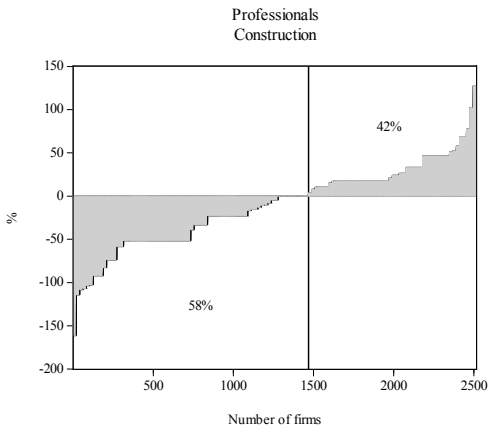


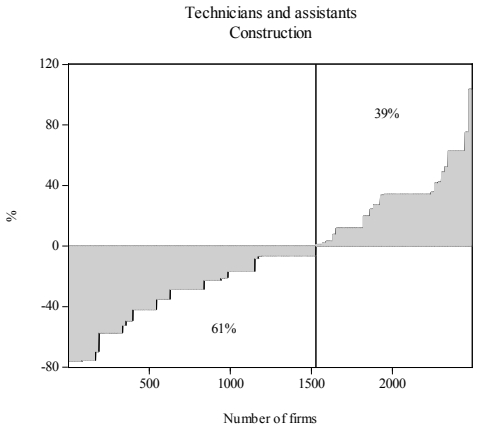
Figure A.1 (Continued)
Wage Differentials by Economic Sector











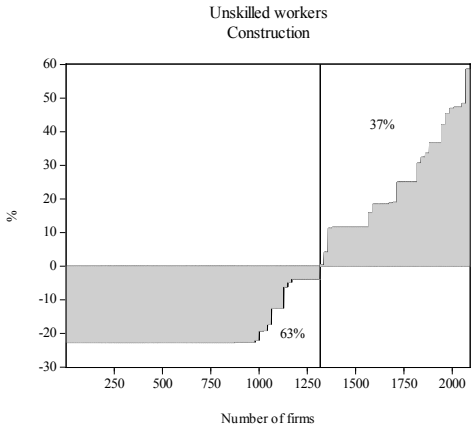
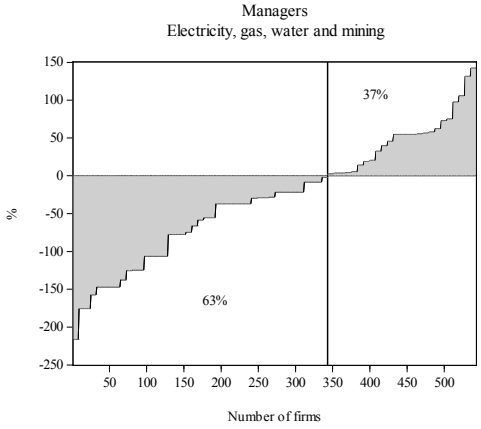
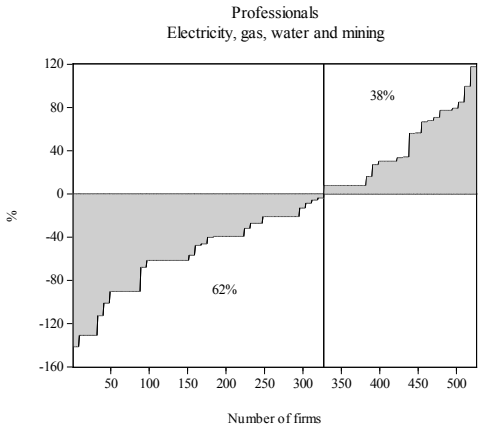
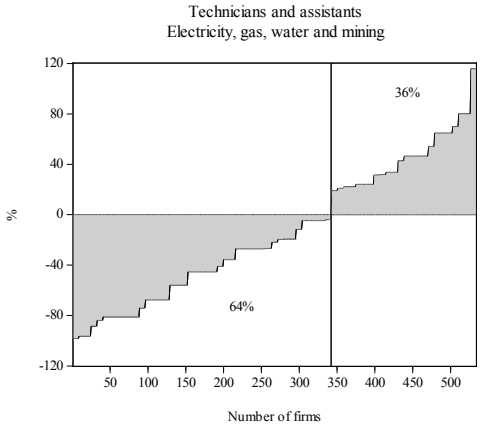
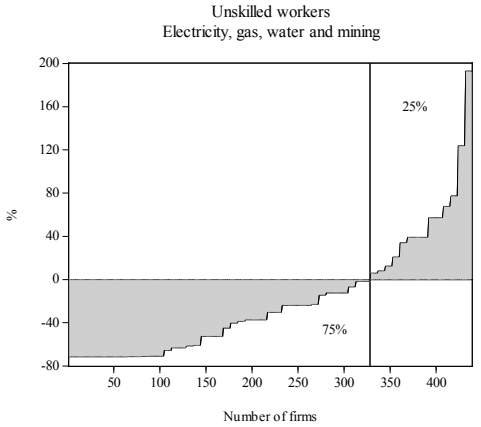


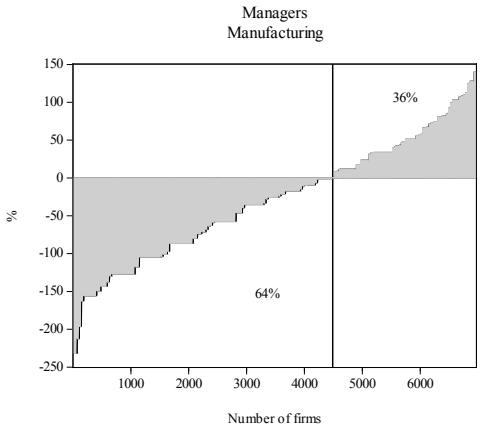
Figure A.1 (Continued)
Wage Differentials by Economic Sector











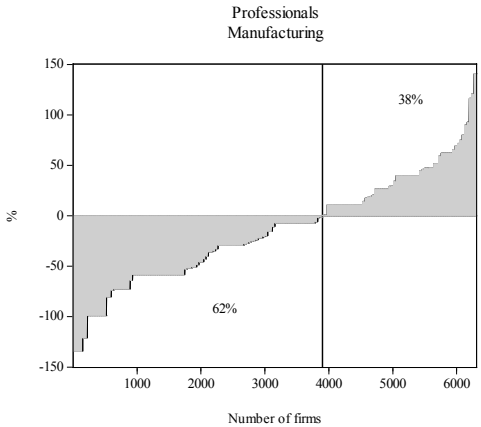


Figure A.1 (Continued)
Wage Differentials by Economic Sector

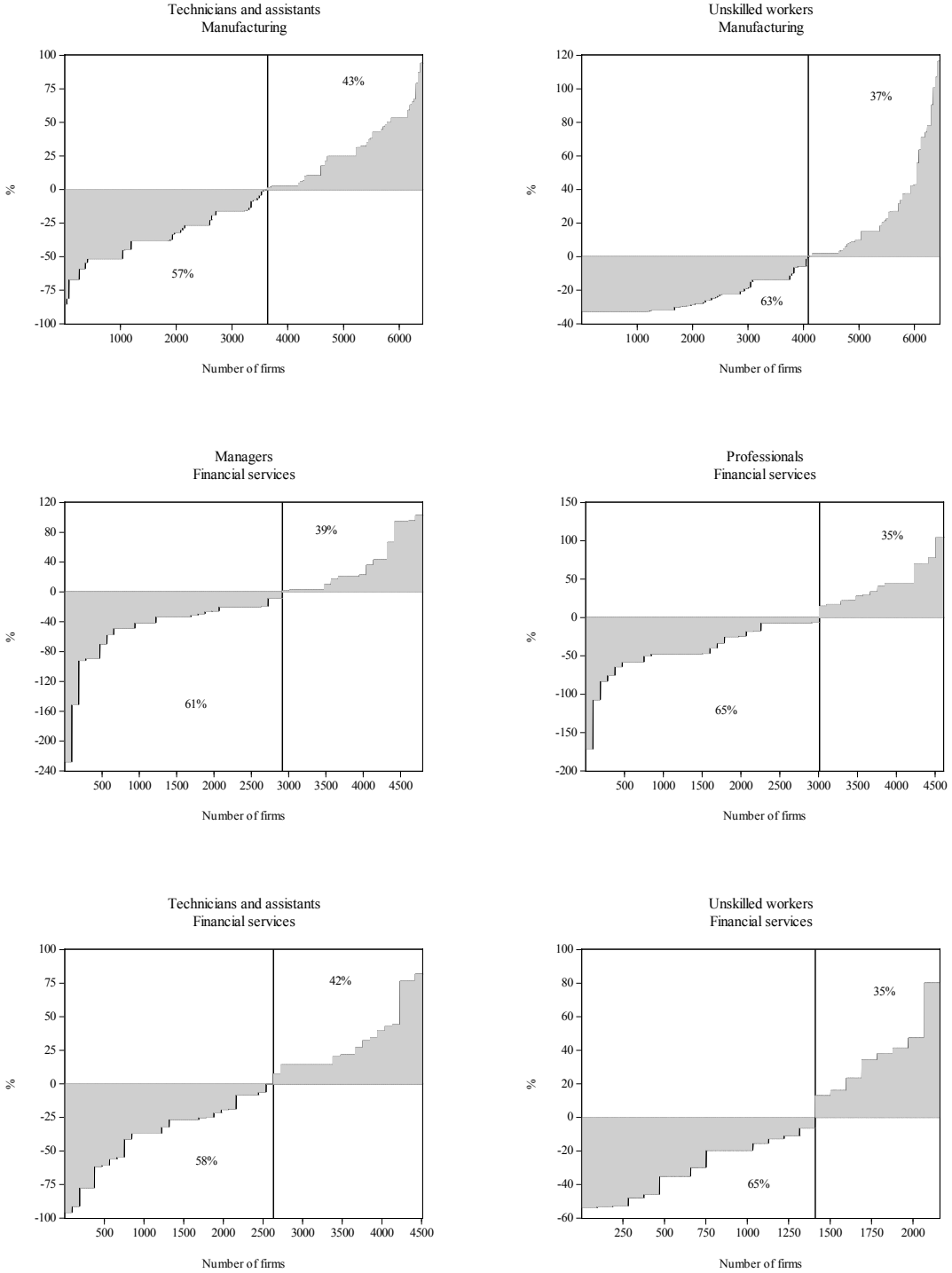
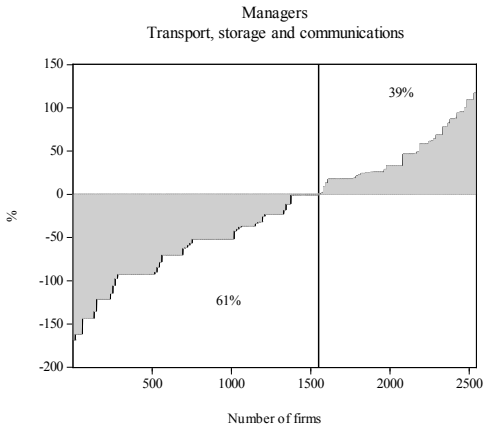
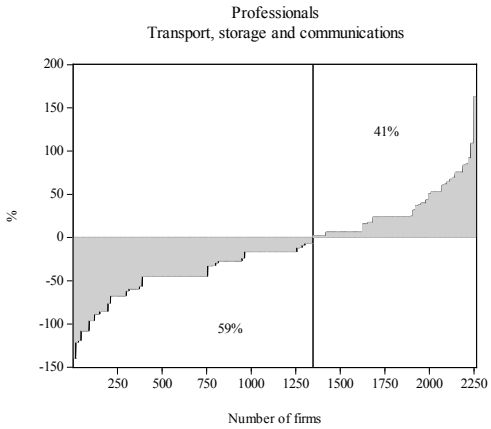
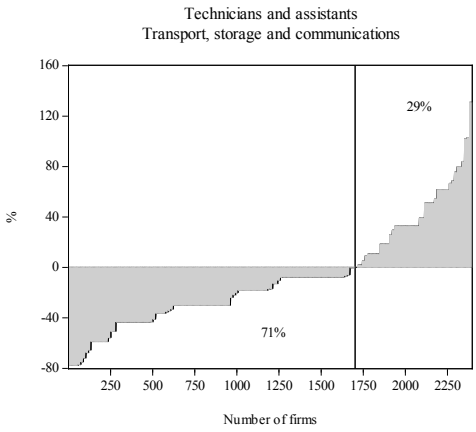
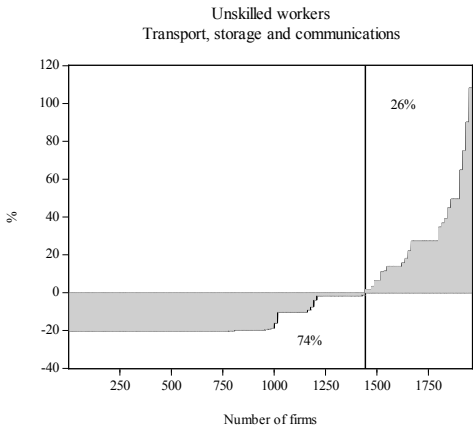


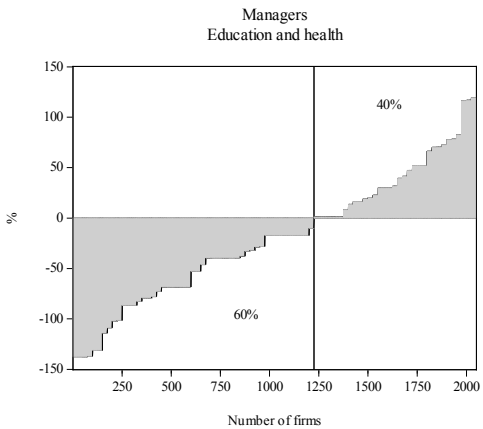
Figure A.1 (Continued)
Wage Differentials by Economic Sector











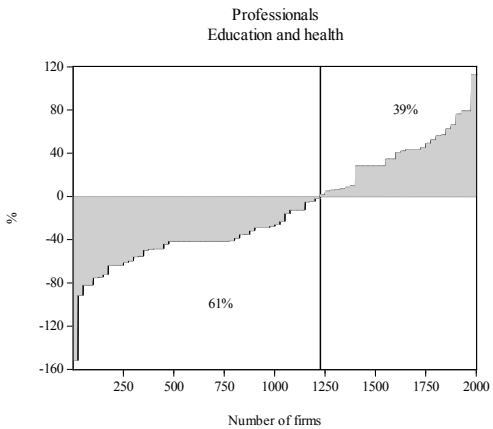
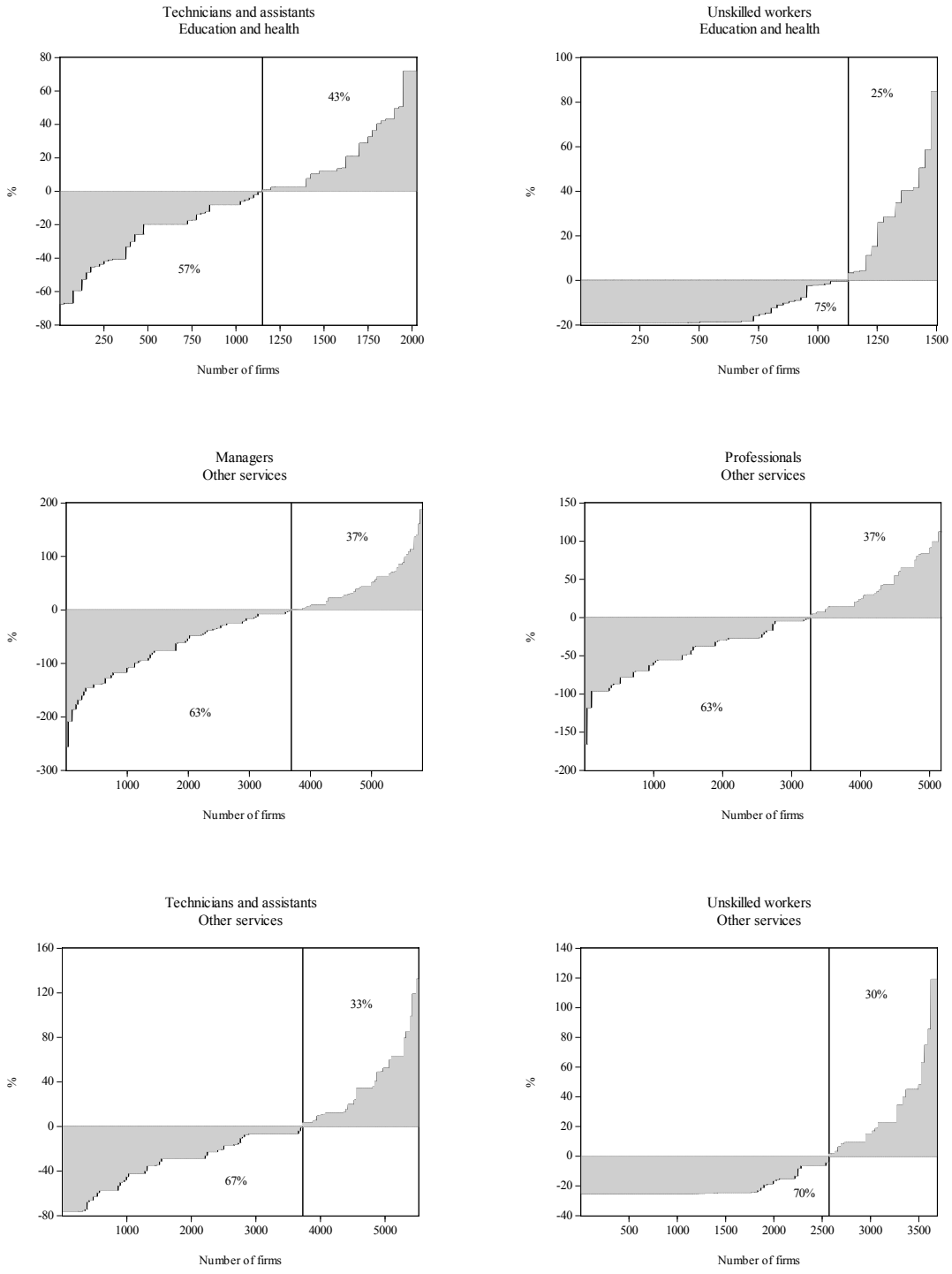


Figure A.1 (Continued)

Wage Differentials by Economic Sector



Source: Authors' calculations.