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Faculty of Social Sciences
Institute of Economic Studies

RIGOROUS THESIS

Inter-industry Wage Differentials in the Czech Republic

Author: **Mgr. Stanislav Hofman**

Supervisor: **doc. Ing. Vladislav Flek CSc.**

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Declaration of Authorship

The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.

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Signature

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Abstract

This thesis examines inter-industry wage differentials in the Czech Republic, using the European Union – Statistics on Income and Living (EU-SILC 2009) survey as its primary data source. Findings show that, even after controlling for the large number of workers and jobs characteristics, wage differences based on industry affiliation still persist. The variation among inter-industry wage differentials amount to approximately 5 percent, with a maximum wage level difference of 25 percent between the financial sector and agriculture. By applying two distinct methodologies, we tested the hypothesis that the inter-industry wage differentials are actually caused by a higher concentration of workers with better unmeasured abilities in higher-paying industries. Neither of the two methods rejected the unobserved ability hypothesis. Finally, our analysis also shows that the inter-industry wage differentials can be, to a certain extent, attributed to rent-sharing and different labour turnover costs across sectors.

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Author's e-mail	stanislav.hofman@googlemail.com
Supervisor's e-mail	flek.v@centrum.cz

Abstrakt

Tato práce zkoumá meziodvětvové mzdové rozdíly v České republice za použití údajů o zaměstnancích získaných domácím výzkumem EU-SILC 2009. Výsledky našeho zkoumání ukazují, že mzdové rozdíly mezi sektory zůstávají přítomny i po zahrnutí mnoha dalších významných faktorů. Rozptyl těchto meziodvětvových mzdových rozdílů se pohybuje okolo 5 procent. Největší mezisektorový rozdíl ve mzdách v celkové výši 25 procent pozorujeme mezi finančním sektorem a zemědělstvím. Za použití dvou odlišných postupů byla testována hypotéza, že meziodvětvové mzdové rozdíly jsou způsobeny nezahrnutím nepozorovatelných vlastností pracovníků do mzdových rovnic. Žádná ze dvou metod tuto hypotézu nezamítla. Výsledky analýzy ale také ukazují, že meziodvětvové mzdové rozdíly jsou do jisté míry způsobeny rozdílnou úrovní sdílení zisků firem s jejich zaměstnanci a také nákladů spojenými s fluktuací zaměstnanců.

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E-mail autora	stanislav.hofman@googlemail.com
E-mail vedoucího práce	flek.v@centrum.cz

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Acronyms

ČMKOS	Czech-Moravian Confederation of Trade Unions
ČSÚ	Czech Statistical Office
ELCA	Enterprise-level Collective Agreement
EU-SILC	European Union – Statistics on Income and Living
HLCA	Higher-level Collective Agreement
IPSC	Average Earnings Information System
ISCO	International Standard Classification of Occupations
OLS	Ordinary Least Squares
VŠPS	Labour Force Survey
White OLS	OLS with White heteroscedasticity-consistent standard errors
WLS	Weighted Least Squares

1 Introduction

In a fully competitive economy, market forces should ensure that workers with the same abilities earn identical wages. However, since the publication of the seminal article by Krueger and Summers (1988), the theory of a competitive wage has been challenged by many studies for different countries. Supporters of the non-competitive wage theory usually explain these differentials as a result of rent sharing – a positive relationship between industry profits and industry wage premia. On the other hand, some authors claim that the observed wage differentials are merely a consequence of omitting unobserved workers' attributes in estimates of wage functions.

Previous studies aimed at wage differentials in the Czech Republic usually examined only part of the problematic. For instance, Basu et al. (2004) focused on industry wage differentials and rent-sharing, but without taking workers individual characteristics into account. In Magda et al. (2009) we find estimates of inter-industry wage differentials for the Czech Republic, but without a further analysis of their sources.

Therefore the primary aim of this master thesis will be to analyse inter-industry wage differentials in the Czech Republic in a more complex manner. Furthermore, we will strive to identify their sources and relative importance based on both competitive and non-competitive wage theories. Specifically, we will attempt to find answers to the following questions:

- Are inter-industry wage differentials present in the Czech Republic? If yes, to what extent?
- Do they result from industry differences in ability to pay or unobserved workers ability?
- Can industry profit-per-worker help to explain the inter-industry wage differentials?

To address these questions we employ three different data sets: the European Union – Statistics on Income and Living (EU-SILC), the Average Earnings Information System (IPSV) and the statistical surveys conducted by the Czech Statistical Office

(ČSÚ). The first database contains information on individual workers (gross wage, education, experience, gender, etc.) and their jobs (type of occupation, number of hours spent at work, industry affiliation, etc.). The last two data sets provide information on sectoral union coverage, items of average labour costs, firm size and certain financial variables (profit per worker, value added, sales, etc.)

The thesis is then organized as follows. The next section introduces the main theoretical explanations for differences in sectoral wage premia from the perspective of both competitive and efficiency wage theories, presenting some empirical evidence in favour of both groups. Section 3 then describes the data used to identify and analyse inter-industry wage differentials in the Czech Republic. Section 4 estimates the Mincer-type wage equation and examines the magnitude and dispersion of inter-industry wage differentials, along with other relevant wage determining factors. Section 5 tests the unobserved ability explanation of the differentials. Section 6 then focuses on explanation of the inter-industry wage differentials from the point of view of efficiency wage theories, with an emphasis on rent-sharing. Finally, the last section summarizes our main findings.

2 Theory and Empirical Evidence

In a fully competitive economy, market forces should ensure that workers with the same abilities earn identical wages. However, since the publication of the seminal article by Krueger and Summers (1988), the theory of the competitive wage has been challenged by many studies in different countries (UK – Benito (2000), Switzerland – Ferro-Luzzi (1994), Belgium – Plasman *et al.* (2006), Portugal – Hartog *et al*. (2000), Netherlands – Hartog *et al.* (1997), etc.). Supporters of the non-competitive wage theory explain these differentials as a result of the efficiency wage behaviour of firms. On the other hand, some authors claim that the observed wage differentials are a consequence of omitting unobserved workers' abilities in the estimates of wage functions, thus still leaving the competitive theory valid.

In this section we discuss the possible competitive (subsection 2.1) and non-competitive theoretical explanations (subsection 2.2) for inter-industry wage differentials and present empirical evidence in favour of both groups. Subsection 2.3 is then dedicated to the existing evidence on inter-industry wage differentials in the Czech Republic. Conclusions regarding the existing research on industry wage differentials are then summarized in the last subsection.

2.1 Competitive Explanations

The Competitive theory offers two possible explanations of observed inter-industry wage differentials – compensating differences and unobserved ability. The first explains high wages in some industries as a form of compensation for certain undesirable aspects of working conditions, as in mining or metallurgy. The second, on the other hand, says that wage differentials result from differences in workers' unobserved abilities (productivity, reliability, industry-specific skills, etc.), which are not fully captured in the data sets on individuals.

To test the importance of compensating differences on inter-industry wage differentials, Krueger and Summers (1988) estimate two wage equations with- and

without the inclusion of job characteristic variables (weekly hours, hazardous dummy variable, etc.). By comparing the results between those equations they conclude that working conditions can't clearly explain the pattern of inter-industry wage differentials.

The unobserved ability hypothesis is more difficult to test, with no methodology consensus on how to determine the significance of factors, that can't be fully measured. Krueger and Summers (1988), for example, estimate two equations; now with- and without workers' observed quality variables (education, age, experience, etc.). They argue that the unobserved ability of a worker is highly correlated with his observed quality. The industry wage effects, if caused by omitting unobserved labour quality variables, should then be significantly reduced after including observed labour quality variables. However, the standard deviation of inter-industry wage differentials changed only slightly after adding the observed quality variables. Krueger and Summers therefore conclude that the industry wage differentials can hardly be attributed to unobserved worker ability.

A reaction to the Krueger and Summers rejection of the unobserved ability explanation was presented in the work of Murphy and Topel (1990). Their methodology is based on the theory that industries differ in their requirements for labour abilities, both observable and unobservable and that workers are sorted according to these industry demands. Moreover, they argue that if sorting occurs for observable characteristics, it also occurs for unobservable. To test the sorting hypothesis they conducted a regression of the estimated industry wage differentials on observable worker characteristics. Their results then show that the observable worker qualities function within industries in the same way as they do across industries that support the sorting ability hypothesis and, thus also, the competitive wage theory.

Interesting approaches to determine the role of unobserved ability were presented by Blackburn and Neumark (1991) and Björklund *et al*. (1997). Authors of both studies claim that their methods, unlike classical first difference estimators of cross-sectional data, are less sensitive to bias.[1] Blackburn and Neumark (1991) test

[1] They argue that studies which use first-differenced regressions to eliminate the components of unmeasured ability also assume that unmeasured ability is time-invariant. However, a worker who

the unobserved ability hypothesis by including two intelligence test scores, which represent the fixed effects of workers ability, into the standard wage equation. Their estimates indicate that only approximately one tenth of the variation of inter-industry wage differentials in the USA is attributable to unobserved ability. Using data on siblings, Björklund *et al.* (1997) reach a different conclusion, as their results indicate that 50 percent of inter-industry wage dispersion in the USA is attributable to an unobserved ability common to brothers. For Denmark, Finland, Norway, and Sweden, only 11–24 percent of the industry wage dispersion can be attributed to unobserved ability.

A new approach in evaluating the contribution of unobserved quality, using cross-sectional data, was developed by Martins (2004). Currently his methodology represents the most sophisticated technique for testing the unobserved quality hypothesis on cross-sectional data. For that reason, his approach will be also applied in our study. Martins suggests testing the role of unobserved worker quality on wage differentials by applying quantile regressions. He argues that if the unobserved ability hypothesis holds, then workers with better unmeasured qualities should be more concentrated at the top of the conditional wage distribution and in high-wage industries than at the bottom of the conditional wage distribution and in low-wage industries. Given this methodology his results from Portuguese data show little impact of unobserved ability on inter-industry wage differentials. However, following the same procedure, Plasman *et al.* (2006) demonstrate a significant role of unobserved ability in Belgian data. The authors then conclude that the non-competitive forces may not be so strong in determining wage differentials as Martins (2004) presents.

Another way to approach the unobserved quality issue is to use longitudinal data and examine workers who change jobs across industries. The advantage of this method is the inclusion of the fixed effect of workers quality, since it remains unchanged. Using this type of data, Gibbons and Katz (1992) conclude that the differences between old and new wages earned by workers who changed industry

changes emploeyers (within or across industries) also changes his investment incentives and thus hi unobserved productivity. The authors therefore conclude that workers' productivity is determined endogenously.

affiliation resemble the industry wage differentials estimated by Krueger and Summers (1988). On the other hand, results from Vaïniomaki and Laaksonen (1995) show that after controlling for individual fixed effects industry wage differentials remain present but decrease dramatically. Similar results were found by Benito (2000) and Carruth *et al.* (2004) on British data and by Abowd et al. (1999) and Goux and Maurin (1999) on French data.

Although no authors deny the presence of unobserved ability in the wage determination process there is no consensus regarding its explanatory power. Studies applying cross-sectional data in most cases reject the unobserved ability hypothesis. On the other hand, most studies that analysed the longitudinal data provide evidence in favour of the unobserved ability explanation. However, a disadvantage of this approach is the relative shortage of observations of workers who changed sector affiliation.

2.2 Non-competitive Explanations

2.2.1 Theoretical Models

The efficiency wage hypothesis argues that in some markets wages are determined by more than labour supply and demand. Specifically, this hypothesis stresses the incentive of employers to pay their employees more than the market-clearing wage in order to increase their productivity or reduce turnover and monitoring costs. The key assumption is that worker productivity is endogenous and depends positively on wages that workers get paid. The wage level is a part of the production function and, at the same time, an instrument a firm sets to maximize profit. Firms that have variable production functions can then set various wages. Several models have been developed to explain the behaviour of firms in setting the optimal wage level.[2] All of them share the common implication that firms' efficiency wage behaviour causes involuntary unemployment.

In the shirking model, described in Shapiro and Stiglitz (1984), employers face a moral hazard on the part of their employees, who, once they get job, may shirk during work. Knowing that labour monitoring is both imperfect and expensive, firms

[2] For detailed overview on the efficiency wage models see Yellen (1984).

tend to create opportunity costs to shirking on the part of their employees. Therefore, firms set wages above their competitive level and simultaneously threaten to fire those who are found shirking, so workers will face a higher probabilistic loss. Since all firms proceed the same way, wages are raised above the market clearing level, thus creating an involuntary unemployment, that amplifies the probabilistic loss. This model then explains wage differentials across industries as a result of varied monitoring costs.

However, this model has some weaknesses.[3] The first is a strong assumption that all workers are identical. The second is the fact that, once opportunity costs are created, employees responsible for monitoring become less watchful. As a consequence, workers once again begin shirking. The model also fails with more sophisticated employment contracts, or other incentives to prevent shirking, such as promotion. All these imperfections lower the value of the model in explaining inter-industry wage differentials.

In another version of the efficiency wage model, firms pay wages above market clearing due to high the costs of replacing workers (search, recruitment, training).[4] The labour turnover model can explain inter-industry wage differentials, under the assumption that turnover costs differ significantly across sectors. For example, low-skill and labour-intensive firms tend to have lower turnover costs that enable them to afford lower wages.

The adverse selection model extends the efficiency wage models for the heterogeneity of workers with respect to their ability, which is positively related to their reservation wage. [5] Another substantial assumption of the model is the imperfect ability of firms to recognise the ability of workers. According to this model, firms pay above market wages to attract better qualified workers, which they would lose if they offered lower wages. With respect to inter-industry wage differentials, the model implies that sectors demanding higher qualification or having higher costs of measuring labour quality will also offer higher wages.

[3] See Lazear (1981) or Eaton and White (1982)
[4] See Salop (1979)
[5] See Weiss (1980)

The last groups of models are the sociological models, as introduced by Akerlof (1982). In the gift-exchange model, the firm can raise workers effort by paying them a gift in the form of wages in excess of the minimum they require. The fair wage model of Rabin (1993) adjusts this proposition and states that a worker will increase his productivity if he is convinced that his wage is fair. The latter then has some interesting implications. Firstly, the wage should be paid equally to all groups and occupations in a firm in order to be considered fair. The model also predicts that firms or sectors where worker cooperation is crucial, pay higher wages. Moreover, if workers consider it fair for a firm to share its rent, then the model also predicts a positive relation between wages and profits.

2.2.2 Empirical Evidence

Following the efficiency wage theories, several studies have identified three main measurable factors, each of which proved significant in explaining inter-industry wage differentials.[6] The factors are: (i) levels of unionization, (ii) firm or establishment size and (iii) rent-sharing or the ability to pay.

It is evident that these factors are not independent of one another and their role in explaining the wage differentials is based on the efficiency wage models discussed above. For example, in the Bulow and Summers (1986) model, costs to detect shirking rise with the number of employed workers. Larger firms therefore pay higher wages in order to reduce their monitoring costs. Akerlof and Yellen (1990) further conclude that big companies are more likely to be monopolists and earn extra rents, and *vice versa*. In order to sustain market, power they must also enhance labour productivity by sharing part of their rents with workers, as implied by the fair wage model. The role of unions is then perceived as an amplifier of rent-sharing, as described in the Nash bargaining model or the right-to-manage model. [7]

Although these factors closely relate to each other, for clarity we classify the empirical evidence on inter-industry wage differentials, based on these factors, separately. However, when going through the subsection, relations among the factors

[6] Table 1 show main results of studies that examine inter-industry wage differentials in many countries not only in Europe, but also in the USA, Brazil or Pakistan.
[7] See Hilderth and Oswald (1997) and Nickell and Andrews (1983).

should be kept in mind. Also, based on the findings of the studies discussed below, proxies for the level of unionization, firm size and ability to pay will be finally used in our analysis for evaluating the role of efficiency wage models in explaining inter-industry wage differentials in the Czech Republic.

Table 1: Empirical studies on inter-industry wage differentials

Authors (year)	Data used	Main findings
Arbache J. S., Dickerson A., Green F. (2003)	1981- 1999 Brazilian data from Pesquisa Nacional por Amostras de Domicílios (PNAD)	Estimated inter-industry wage differentials from cross-section household surveys show little change over 18 years despite substantial industrial and trade reforms
Benito (2000)	1991 and 1994 the British Household Panel Survey	The results from cross-sectional analysis show a strong positive relation between wage differentials and industry profitability even after controlling for individual characteristics. However in panel data analysis the importance of industry affiliation is significantly lowered.
Edin P. A., Zetterberg J. (1992)	1984 Household Market and Nonmarket Activities survey (HUS) from Sweden	The magnitude of the observed industry wage differentials in Sweden is smaller than in the USA, probably because of different levels of unionization. Moreover the differentials in Sweden can be explained by labour quality and working conditions.
Ferro-Luzzi (1994)	1991 Swiss Labour Force Survey (SLFS)	The conclusion is ambiguous. On one hand, the high correlation between industry premia and tenure is not in accordance with the efficiency wage theory. On the other hand, some results indicate, that unobserved ability may explain a significant part of industry wage differentials.

Genre, Momferatou, Mourre (2005)	1995 Structural Analysis database (STAN) of OECD, national data from nine eurozone countries, UK and USA	Wage differentials are correlated with a majority of worker characteristics (education, type of employment, …) and sectors or firm-specific factors (firm size, capital intensity, …). On the other hand, some likely significant factors, such as average profit share or import penetration ratios display a low correlation.
Hartog J., Pereira P.T., Vieira J. A. C. (2000)	1982 to 1992 (except 1990) cross-sectional data (Quadros de Pessoal) from Portugal	Despite different levels of corporatism, inter-industry wage dispersions in Portugal resemble those observed in the USA and Canada. On the other hand, a decline in the magnitude of inter-industry wage differentials during the 1990s is attributed to increasing levels of centralization.
Hartog J., Van Opstal R., Teulings C. N. (1997)	1979, 1985 and 1989 Wage Structury Survey from the Netherlands	Evidence from the Netherlands suggests, that industry wages are more affected by the macroeconomic situation than by factors predicted by efficiency wage theories.
Jaffry S., Ghulam Y., Shah V. (2006)	Labour Force Survey (LFS) from Pakistan between 1990 - 1991 and 2003 - 2004	The empirical findings show the existence of inter-industry wage differentials; petroleum, financial institutions and fishing are the highest paid and agriculture, retail trade and personal and household services are lowest paid sectors. The authors conclude that most of the differentials may be explained by the required qualification and job conditions in the particular industry.

Lucifora (1993)	Italian Ente Nazionale Idrocarburi-Istituto (ENI-IRI) survey for 1985	Analyses of the Italian manufacturing industry wage structure support the hypothesis of a rent-sharing explanation. Worker characteristics and compensating differentials have less explanatory power.
Magda I., Rycx F., Tojerow I., Valsamis D. (2009)	2002 European Structure of Earnings Survey conducted by Eurostat for eleven European countries	The magnitude and dispersion of industry wage differentials differ across European countries, despite a similar hierarchy of sectors in terms of wages. Results further suggest that the differentials are more dispersed in countries with lower levels of corporatism.
Plasman *et al.* (2006)	1995, 1999 and 2002 Belgian data from Structure of Earnings Survey (SES) and the Structure of Business Survey (SBS)	Using cross-sectional data, the hypothesis of the contribution of workers' unobserved ability can't be rejected. Nevertheless, rent-sharing seems to account for a larger fraction of inter-industry wage differentials, since their magnitude and dispersion reduce dramatically after controlling for profits in the wage equation.
Vaïniomaki, Laaksonen (1995)	Longitudinal data derived from the 1975, 1980 and 1985 Finnish census	Even after controlling for individual fixed effects industry affiliation can explain 2-3 percent (8 percent without fixed effects) of wage differentials.

Unionization

The labour market theory traditionally concludes that on average, unionized companies pay higher wages than otherwise comparable non- union, although that strongly depends on levels of competition and other economic factors.[8] Therefore,

[8] See Steward (1990) or Oswald (1982)

one would expect higher sectoral wages are associated with higher union coverage. However, the level of unionization as one possible explanation of inter-industry wage differentials was also described in Dickens (1986). He argues that employers raise wages to prevent unionization. His model therefore predicts that industries where firms face higher threats of unionization are forced to pay wages similar to the wage levels under collective bargaining. On the other hand, this effect can be reduced by the increase of labour supply in sectors of unionization from those experiencing high unionization, where workers may face higher involuntary unemployment.

In studies aimed at inter-industry wage differentials, individual union status has been found to be positively related to individual wage levels. To understand whether the presence of unions can explain wage differentials across sectors, separate estimations of union and non-union earnings, including industry extent of unionization has to be conducted. Two studies from Freeman and Medoff (1981) and Podgursky (1986), are pioneers in this field. The first study used micro-data from the 1973-75 Current Population Survey for manufacturing workers and found that union coverage in industries has strong impact on wages of union members but not on wages of non-members. Podgursky argues that the effect of union coverage on the wages might differ because of establishment size, since larger non-union employers face a higher threat of unionization. Using similar data sets and adding the establishment size variable in the estimated wage equations, he discovered that large non-union employers set their wages close to the union wage level, regardless of the level of unionization in their industry. To the contrary, small non-union employers pay wages below union level, also disregarding the level of unionization in their industry. Later, his findings were confirmed by Stewart (1987) and Andrews *et al.* (1998).

Unionization affects not only industry wage levels as such, but also its dispersion. Using Belgian micro-data, Rycx (2003) showed that inter-industry wage differentials are similar for different levels of wage bargaining, with correlation coefficients reaching almost 0.7, which is in accordance with the unionization threat hypothesis. However, the effect of collective bargaining is significant in determining the dispersion of inter-industry wage differentials, measured by the weighted adjusted standard deviation. Results indicate that dispersion is higher when wages are

collectively negotiated at the firm level than at the national and sector levels. Rycx's results are thus in accordance with findings of other studies, conducted for other countries (Gosling and Machin (1995), Fortin and Lemieux (1997), Magda *et al.* (2009))

The results of the studies mentioned above seem to follow Dickens' (1986) conclusion that companies where wages are not negotiated collectively follow suit of those with collective bargaining, to prevent unionization, attract the same pool of qualified workers and demonstrate wage fairness toward their employees. The positive observed wage differences of percentage units *ceteris paribus* between non-union and union wages are explained by Dickens as the saved cost to workers of organizing from non-union company perspective. Together with higher wage dispersion, the differences also signal that not all non-union companies copy the wage policies of those with collective bargaining.

Although most studies find a positive effect of union coverage on wages of union and non-union workers, their results also indicate that it is not a key factor in determining inter-industry wage differentials.

Firm Size

Company size or establishment size have often been found positively related to industry wage levels in many studies from Table 1, even after controlling for workers quality and job characteristics. According to Oi (1983) and Garen (1985), this phenomenon occurs because small entrepreneurs have comparative advantages in monitoring their employees that enable them to hire less experienced workers and more part-time employees.

In addition to that, Brown and Medoff (1989) identified four other possible explanations for this relation: (1) higher wages in large firms are a compensating factor for poorer working conditions; (2) larger firms face a higher threat of unionization; (3) large employers gain economic rents, of which workers extract a share; and (4) in order to attract enough employees above a minimum qualification, large employers must offer higher wages. In their analysis they only found evidence for the hypothesis that large companies hire better qualified workers. Other explanations were not confirmed. The wage size premium was independently

substantiated on the level of unionization. They thus concluded that the threat of unionization plays only a small part in determining the wage size premium. The other main finding was that the effect of employer size on wages remained almost unchanged by controlling for industry affiliation. This is in accordance with findings of Krueger and Summers (1986), who also concluded that employer size seems important in explaining intra-industry but not inter-industry wage differentials.

Similarly, other authors (Magda *et al.* (2009), Lucifora (1993)) claim that the main effects are monitored by the inclusion of the firm size variable in wage equations. Hartog *et al.* (1997) further suggests that the observed firm wage size effect is merely a side effect of rent-sharing.

Additionally to previous studies, Green *et al.* (1996) pointed out that little attention has been paid to the power of monopsony as the possible explanation for the employer wage size effect. In their study they found evidence that part of the effect was due to the monopsony power of firms in the labour market.

Rent-sharing and the Ability to Pay

From the evidence of the studies mentioned above, it seems neither unionization nor firm size, although significant and positively related, can fully explain inter-industry wage differentials. There is, therefore a conjecture that these parameters closely relate to companies profitability as the underlying factor that determines wage levels. This hypothesis is therefore in accord with the efficiency wage theories. Union models usually imply that workers use their bargaining power to force companies to share their rents in the form of higher wages. Similarly, in the Akerlof social models, the worker view of fairness is directly connected to a firm's ability to pay. Higher profits also enable firms to better manage their employees to the extent of reducing shirking, turnover and attracting better qualified workers.

Early studies focused on finding the best explanatory variable related to a firms' ability to pay. Even after including worker and industry characteristics, Pugel (1980) found strong positive impact of industry profitability on average wages paid by firms in the sector. It should be stressed, that Pugel didn't treat endogeneity of profits in his regression, since higher wages lower a company's profit. He also concludes that profitability is superior to concentration, as a proxy for market power

in determining inter-industry differences in wages. This was then confirmed by Freeman and Medoff (1981). Similarly, Krueger and Summers (1986), (1989) and Dickens and Katz (1986) also indicate that industries with more monopoly power and higher profits pay higher wages. Further evidence from different countries that inter-industry wage differentials result from the ability to pay at firm or industry levels can be found in Van Reenen (1993), Blanchflower *et al.* (1996), Benito (2000) and Margolis and Salvanes (2001), where the endogeneity of profits was taken into account. Only Genre *et al.* (2005) concludes that industry average profit shares have little impact on determining wages. However, their study relies only on restricted data sets and the computation of correlations.

Rent sharing is often examined in the context of bargaining power. When there is wage bargaining at firm or industry levels, the firm's or sector's performance tends to be crucial for wage setting. Results from Arai (2003) and Martins (2009), suggest that rent-sharing is not a specific feature of unionized sectors. However, detailed analysis on Belgian data by Rusinek and Rycx (2011) shows that in centralized industries (i.e. in industries where firm level wage negotiations are less common), wages are unrelated to profits if they are negotiated at industry levels and not at the firm level. Results in this field of research may significantly differ across countries depending on their level of corporatism.[9] On one hand, centralized wage negotiations can set relatively high standards that may also include profit-based wage benefits. On the other hand, centralized wage bargaining can't fully embrace the specific demands of all employers and employees, who would otherwise negotiate a certain level of rent-sharing. This effect can be mitigated by a high degree of coordination that may appear within a given bargaining level across industries or even between bargaining levels (i.e. among national, industry and firm level).

Since corporatist bargains depend on the presence of centralized wage negotiation institutions, many authors take the level of union centralization as a proxy for the level of corporatism. Holmlund and Zetterberg (1991) investigate the determination of industry wages in Sweden, Norway and Finland, as strongly

[9] "*Corporatism refers to the voluntary and informal coordination of conflicting objectives through national level bargaining among representatives of business, labor, and the state.*" Thelen K. (1994) pp. 109.

corporatist countries; the United States a weakly corporatist country and Germany as a moderate corporatist nation. The results from these countries show that industry wages respond more to sectoral productivity performance if the level of corporatism is low. Their results thus indicate that decentralization in wage setting leads to rent sharing, which is in favour of non-competitive wage theories. Contrary to that, Hartog *et al.* (2000) finds similar wage dispersions for Portugal, the US and Canadian industry differentials.

However, the concept of taking the level of union centralization as a basis for measuring the level of corporatism was criticized by Soskice (1990). He argues that coordination of employers in central wage negotiation is at least as important as the centralization of unions. Moreover, just the mere existence of centralized wage bargaining institutions does not guarantee that coordination among them actually occurs. All in all, neither empirical studies nor economic theory can give clear answers to what extent rent-sharing is influenced by the level of corporatism.

2.3 Evidence for the Czech Republic

Even during Communist era, industry wage disparities were present in the Czech Republic (see Večerník (1996, 2001, 2006)). Their distribution (favouring construction and manufacturing industry) changed after 1989, with the beginning of economic liberalization. Flek and Večerník (1998) investigate wage disparities in industries from 1993 to 1997 and find significant correlations between wages and profit per worker for the highest and lowest wage industries. Closely examining the wage leading industries, they argue that above average wages, except in mining and quarrying, can be paid because of high profitability and low labour unit costs among those industries. Evidence in favour of the rent-sharing explanation was also given by Basu *et al.* (2004) on 1989-93 firm data. In the estimated wage equation, they include industry dummy variables and sales per employee, which proved to be a good proxy for a firm's ability to pay.

All the studies mentioned above leave out workers and job characteristics in their analyses, reducing their results' relevance in explaining inter-industry wage differentials. The following studies (the estimated industry differentials are summarized in Table 2), included these factors to a certain extent in their analyses.

Adding education attainment and years of experience, Münich *et al.* (1999) conclude that men's inter-industry wage structures changed dramatically from 1989 to 1996 in favour of trade, transport and communications. Education, administration and, surprisingly, finance and insurance ended on an opposite trend.

Contrary to that, Večerník (2001, 2006) found that the banking and insurance sector advanced considerably after 1989. Other sectors, however, demonstrated a lower significance when additional variables were included. Večerník then concluded that occupational categories are much more important for earnings than industry affiliation, which explains only three percent of earnings disparities.

Table 2: Estimated inter-industry wage differentials for the Czech Republic

	Münich et al. 1999 *	Večerník 2001 **	Večerník 2006 ***		Magda et al. 2009 ****
year	1996	1996	1996	2002	2002
Agriculture	*Ref*	0.055	NA	NA	NA
Mining & Quarrying	0.092	NA	NA	NA	0.256 – 0.283
Construction	0.131	0.187	0.040	-0.006	-0.041
Manufacturing – food, textile	0.092	0.210	0.063	0.014	-0.292 – -0.028
Manufacturing – machinery	0.066	0.210	0.063	0.014	-0.167 – 0.191
Transport	0.146	0.213	0.075	0.096	0.005 – 1.370
Communication	0.146	0.213	0.075	0.096	0.531
Trade & Catering	0.163	0.162	*Ref*	*Ref*	-0.203 – 0.079
Health & Welfare	0.021	0.156	-0.087	-0.248	NA
Education	0.021	0.064	-0.002	-0.016	NA
Administration & Defense	0.021	0.587	0.096	-0.034	NA
Banking, Insurance & Real Estate	0.052	0.244	0.433	0.618	0.189 – 0.494
Intercept	*7.916*	*9.015*	*9.267*	*9.840*	*0.134*
Adjusted R^2	*0.19*	*0.395*	*0.454*	*0.460*	*0.428*

* unstandardized coefficient beta after controlling for education and work experience
** unstandardized coefficient beta after controlling for sex, education and work experience
*** unstandardized coefficient beta after controlling for sex, age and education
**** net inter-industry wage differentials controlling for employee, job and employer characteristics

The most detailed analysis of Czech inter-industry wage differentials was conducted by Magda *et al.* (2009) on the 2002 European Structure of Earnings Survey, containing data on firms (size, bargaining level), positions (sector of activity, type of occupation, region) and working employees (age, education, tenure, gross earnings, paid hours, sex, occupation, etc.). Their study shows that Czech industry dummy variables (the NACE two-digit level) remain significant even after controlling for those characteristics and are significantly correlated with other European countries' differentials.[10] Higher dispersion of the differentials in the Czech Republic compared with Western countries is then ascribed by authors to a less centralized and coordinated wage bargaining. Despite the number of included variables, their regression displays only moderate adjusted R^2 (0.428). This might be a consequence of the presence of multicollinearity, since most of the variables were significant, and omitting profit per worker variable in their equation as a proxy for the rent-sharing explanation.

2.4 Concluding Remarks

Despite the vast literature focusing on inter-industry wage differentials, their existence, grounds and consequences still remain unsettled. Here we provide our concluding remarks on the existing literature:

1. All in all, the existence of sectoral wage premia seems to represent the only consensus regarding research on inter-industry wage differentials, even though the importance of industry affiliation varies among studies, depending on estimated wage equation and applied data. In terms of applied methodology cross-sectional analyses predominate over longitudinal analyses.

[10] After including job and worker characteristics coefficients of industry dummy variables decline by 56 percent on average, but remain highly correlated (0,898) with industry coefficients without worker and job controls. Highest industry differential was reached by air transport (1,370) and lowest by leather manufacturing (-0,292). As far as comparison is concerned, correlations between the Czech Republic and other European countries vary between 0,351 (Lithuania) and 0,655 (Poland).

2. The role of unmeasured abilities in explaining inter-industry wage differentials remains ambiguous. This field trends toward the use of panel data, which allows control for individual fixed effects. Although panel data analyses usually support the unobserved ability explanation, their results rely on a relatively small number of observations of individuals who switched between sectors and should therefore be considered with caution.

3. One strand of the literature focused on explaining the differentials using efficiency wage models. Studies using matched worker-firm databases generally conclude that rent-sharing is partly responsible for the observed inter-industry wage differentials. Nevertheless, it is still unclear whether the relation between wages and profits is stronger in countries with little wage bargaining centralization and coordination or not.

4. International comparisons of inter-industry wage differentials are problematic and the findings should be considered with caution. The reasons behind this are differences in the datasets used and the specification of wage equations that individual studies applied. Different contributions of unobserved abilities to inter-industry wage differentials in each country and national institutional setting (such as collective bargaining institutions) present yet another issue for international comparisons.

Our conclusions regarding the existing literature correspond to those in Rycx and Tojerow (2007). The authors further conclude that the effect of international trade and product market regulations on inter-industry wage differentials is unclear. It is thus evident that the grounds and consequences of inter-industry wage differentials are not clearly determined and, therefore, additional research is needed.

3 Data

The data used in our study was obtained from three different surveys: the European Union – Statistics on Income and Living (EU-SILC), conducted by Eurostat, the Average Earnings Information System (IPSV), conducted by the Trexima company and the statistical surveys conducted by the Czech Statistical Office (ČSÚ).

3.1 EU-SILC

The EU-SILC represents the main source of data for our research. It gathers information on households and individuals on a long-term basis from all EU members, including the Czech Republic.[11] The most recent available data on Czech households and individuals is from the EU-SILC (2009) and refers to 2007.

For the purpose of our study we leave out all respondents who are not employed or self-employed. One imperfection of the database is that some respondents' characteristics, such as job position or type of contract, refer to a particular month in the survey year, while other characteristics concerning labour activity and income relate to the entire year. By including all these variables in our regressions, we discarded any respondents who changed their labour activity during the studied period. We also discarded those respondents whose sickness benefits created more than ten percent of their yearly gross income. Given these restrictions, the resulting final sample consists of 9 380 observations.

Since the EU-SILC does not include data regarding respondent hourly wages, we used other variables from the database to derive this information. Specifically, we divided the respondent gross yearly income by the number of months he/she was employed, the number of hours worked per week and the average number of weeks in a month.

[11] The EU-SILC database for the Czech Republic has been conducted by the Czech Statistical Office.

$$Gross\ hourly\ wage = \frac{Gross\ personal\ yearly\ income}{\#Months * 4.345 * (\#Hours\ per\ week)} \quad (1)$$

The gross yearly income represents the total remuneration paid by an employer to an employee, including enhanced rates of pay for overtime, allowances, supplementary payments and other forms of bonuses. The derived gross hourly wage might naturally be biased. First of all, it is assumed that the worker was employed the entire month. If not, the derived wage is underestimated. The second distortion could arise from reporting errors in the gross personal yearly income variable. In the survey, respondents may have omitted, under- or over-estimated their income. However, since the gross hourly wage stands for the dependent variable in our regressions, these potential distortions will not bias the estimated coefficients.

Apart from the derived hourly wage, the EU-SILC survey provides us with other characteristics on individuals as well as his/her job. Specifically, we find the following information: highest attained level of education, number of years spent in paid work, gender, citizenship, region of the residence, number of hours usually worked in a week, type of occupation (based on ISCO-88 classification), type of contract and job position, establishment size and the economic activity of the employer coded according to the NACE one-digit classification.[12] It should be stressed that the classification of economic sectors in the EU-SILC is less detailed than in other databases used for examining inter-industry wage differentials, which usually apply the NACE two-digit codes. This substantial handicap of the data source will naturally lead to less precise results of our analyses and thus less reliable conclusions.

3.2 ISPV and the Statistical Surveys of the ČSÚ

Average Earnings Information System (ISPV)

Since the EU-SILC is not a worker-firm matched database, we lack, among others, information regarding the level of wage bargaining for the respondent's employers.

[12] For more information on the applied variables, see Appendix A

To ascertain this data we used the Average Earnings Information System (ISPV) processed by the Trexima company for the Czech Ministry of Labour and Social Affairs. We derived the level of unionization from this database for every sector classified in the EU-SILC database. Although they are merely aggregated values, they help us examine the role of unions on inter-industry wage differentials.

The Czech labour law distinguishes two types of collective agreements: enterprise-level collective agreements (ELCA) and higher-level collective agreements (HLCA). In the case of wage bargaining at high-levels, union federations set industry agreements with employer associations. According to data from the Czech-Moravian Confederation of Trade Unions (ČMKOS), a total of 18 HLCAs were concluded during 2007, covering approximately 5 364 employers and 607 952 employees.[13] For some narrowly specified sectors, the HLCA can be further extended to other firms in that sector, even those that did not sign the agreement.[14] This binding extension of HLCAs covers an additional 3 975 employers. Therefore, the total number of workers covered by HLCAs increases to 970 466, which represents about 22 percent of all employees. In some firms, the agreements are complemented by ELCAs, which, however, cannot be in contradiction with the industry agreement. Therefore, in these cases arranged wages are usually above the level agreed to in sectoral agreements. In addition, collective agreements cover all workers, without regard as to whether they are or are not union members.

Therefore, instead of using sectoral trade union density, we used the database to compute union coverage rates for each type of collective agreement.[15] Specifically, we applied three shares: that share of workers whose wages are settled by no collective agreement, the share of workers covered by the ELCA and finally the share of workers covered by the HLCA, which also measures the level of wage bargaining centralization (see Table 3). As mentioned earlier, the company collective agreements may supplement those agreements concluded on the sectoral level. However, the IPSV survey doesn't distinguish whether the company level collective agreement is a

[13] The Czech-Moravian Confederation of Trade Unions is the dominant trade union federation in the Czech Republic.
[14] However, the extension of the HLCA does not apply to enterprises with fewer than 20 employees.
[15] Union density represents union members as a percentage of all employees in employment, while union coverage is a percentage of employees covered by a particular collective agreement

supplement to the HLCA or plays an independent part.[16] Since the last two shares might be biased, in our following analyses we primarily work with the shares of workers under no collective agreement. The shares can be also alternatively measured as a percentage of firms covered by a specific type of collective agreement. However, this procedure might be inadequate, as it emasculates large companies.

Table 3: Union coverage rates in the Czech Republic during 2007

NACE		HLCA	ELCA	No CA
A	Agriculture, forestry and fishing	62,1	17,7	10,2
B	Mining and quarrying	82,0	16,6	0,0
C	Manufacturing	5,1	50,4	44,2
D	Electricity, gas, steam and air conditioning supply	2,3	84,0	13,6
E	Water supply, sewerage and waste management	0,7	51,6	43,0
F	Construction	74,3	24,6	1,1
G	Wholesale, retail trade and repair of motor vehicles and motorcycles	5,7	19,2	73,8
H	Transportation and storage	1,1	69,8	25,6
I	Accommodation and food service activities	0,0	19,3	74,4
J	Information and communication	2,1	28,1	67,9
K	Financial and insurance activities	9,7	51,8	36,3
L	Real estate activities	0,0	45,2	51,8
M	Professional, scientific and technical activities	0,8	27,3	64,6
N	Administrative and support service activities	0,5	11,3	84,9
O	Public administration and defense, compulsory social security	1,5	94,4	2,9
P	Education	2,5	71,9	23,9
Q	Human health and social work activities	0,4	71,3	12,2
R - S	Arts, entertainment, recreation and other service activities	0,0	89,0	0,9
	Czech Republic - total	13,6	41,4	42,4

Source: ISPV (2007)

Although the Czech bargaining regime resembles those regimes in Western European countries in terms of institutional setting, the Czech Republic is

[16] The questionnaire of the ISPV firstly examines whether the company is covered by a collective agreement. If yes, then the company states what kind of collective agreement. Therefore, in case when the company signs a ELCA as a supplement to HLCA, both the ELCA and the HLCA can be filled out.

characterized by a low degree of centralization and coordination.[17.] Wage negotiations occur mostly at company level, with little or no coordination by upper-level associations. The comparison of union density rates and union coverage among EU member countries is then shown in a graph found in Appendix A.

Statistical surveys of the ČSÚ

The statistical surveys of the Czech Statistical Office (ČSÚ) represent the last group of our data sources. Specifically, the Labour Force Survey (VŠPS), the Statistical Survey in Business units (Questionnaire P 5-01) and the Statistical Survey for Entrepreneurs (Questionnaire P 4-01) provide us with information on sectoral main economic results (average profit, value added, trade margin and sales). They further provide general information (total number of enterprises by selected legal form, average registered number of employees, items of labour costs and job vacancy rate). The surveys are conducted on a yearly basis and cover all economic subjects registered in the Commercial register, as well as certain selected individual enterprises from the Trade register.

However, the statistical surveys may demonstrate significant biases in their results, since a substantial number of business units do not report all of the required information. For example, out of total number of registered companies and private entrepreneurs (after excluding non-profit institutions and households) nearly 200 000 failed to report the number of their employees for the year 2007. Generally, the fulfilment of company obligations to publish relevant compulsory information in the Czech Republic is very poor. Tomis (2011) conducted an analysis on the publication of financial statements by Czech companies. He found that, in 2005, only 31 percent of Czech business and joint-stock companies published their financial statements. His analysis further shows that mostly smaller firms tend to conceal this legally mandated information. Assuming the same company attitudes toward the statistical surveys, we may expect the databases to overestimate certain information, such as average profits or asset values. Still, the statistical surveys provide us with valuable information, which will be used in section 6 to analyse the relations between the inter-industry wage differentials and other potentially relevant sectoral characteristics.

[17] OECD Employment Outlook (2004) – information refer to year 2000

4 Inter-industry Wage Differentials

4.1 Methodology

The estimate of inter-industry wage differentials and their dispersion follows methodology developed by Krueger and Summers (1988). Their strategy is based on the estimation of a wage equation, which in our case looks as follows:

$$\ln w_i = \alpha + \sum_{j=1}^{J} \beta_j X_{j,i} + \sum_{k=1}^{K} \gamma_k Y_{k,i} + \sum_{l=1}^{L} \delta_l Z_{l,i} + \varepsilon_i \tag{2}$$

where w_i is the gross hourly wage of the individual i (for $i = (1, \dots N)$), X_j denotes individual and his/her job characteristics (3 dummy variables for highest attained education, years of work experience, number of hours worked in a week, 25 dummy variables for occupations and dummy variable for gender, citizenship, type of contract, managerial position and region) and Y_k is a vector of employer's characteristics (2 dummy variables for the establishment size). Finally Z_l represents 12 dummy variables of individual industry affiliation according to the NACE one-digit classification. Detailed information on variables is provided in Appendix B.

Since the regression of equation (2) estimates the industry differentials compared to one omitted industry dummy variable, their values have to be adjusted to get normalized industry differentials, so that the weighted mean differential is equal to zero. In order to do that we compute the employment-weighted average wage differential ρ, which also equals the negative value of the omitted sector differential:

$$\rho = \sum_{l=1}^{L} \bar{s}_l \hat{\delta}_l \tag{3}$$

Parameter $\hat{\delta}_l$ represents the estimated sector coefficient and $\bar{s}_l$ is the employment share of sector l. The normalized industry differentials are then obtained by

deducting employment-weighted average wage differential ρ from their estimated coefficients.

$$\begin{aligned} d_l &= \hat{\delta}_l - \rho \\ d_{L+1} &= -\rho \end{aligned} \qquad (\text{for } l = 1, \dots, L) \tag{4}$$

To test the significance of all industry wage differentials Zanchi (1998) suggests adjusting the estimated variance-covariance matrix as follows:

$$Var - Cov(\hat{\delta}_l^*) = (H - es^T)Var - Cov(\hat{\delta}_l)(H - es^T)^T \tag{5}$$

where H is a $((L+1) \times L)$ matrix constructed as the stack of a $(L \times L)$ identity matrix and a $(1 \times L)$ row of zeros, e is a $((L+1) \times 1)$ vector of ones, s^T is a $(1 \times L)$ vector of employment shares and $Var - Cov(\hat{\delta}_l)$ is the original variance-covariance matrix from equation (2). The variability in industry wage differentials is then measured by the standard deviation of the industry wage premia, adjusted for least squares sampling error and weighted by sectoral employment shares, better known as the weighted adjusted standard deviation (WASD):

$$WASD(d_l) = \sqrt{\sum_{l=1}^{L+1} \bar{s}_l \left(d_l - \frac{\sum_l^{L+1} d_l}{L+1} \right)^2 - \frac{\sum_l^{L+1} Var(\hat{\delta}_l^*)}{L+1} + \frac{\sum_{l=1}^{L+1} \sum_{j=1}^{L+1} Var - Cov(\hat{\delta}_l^*, \hat{\delta}_j^*)}{(L+1)^2}} \tag{6}$$

When estimating wage equations, there is usually difficulty applying independent common group variables that have only a few tens values on a dependent variable that has thousands of observations. In these kinds of regressions, when estimated by simple ordinary least squares (OLS), the t-statistics tend to be artificially large because of the presence of heteroscedasticity stemming from common group errors. Therefore, in recent studies authors apply OLS with heteroscedasticity-consistent standard errors (White-OLS) introduced by White (1980), which tackle the problems with common group errors. Another way to deal with heteroscedasticity is to employ weighted least squares (WLS), which gives us even more robust estimations.

4.2 Results

4.2.1 Estimated Wage Equation

Before examining the resulting inter-industry wage differentials, we briefly discuss the estimated coefficients covering employee, job and employer characteristics. As expected, OLS estimation indicated a strong presence of multicollinearity and heteroscedastic and not normally distributed error terms.[18] Therefore the use of robust estimators, both White heteroscedasticity-consistent standard errors (White OLS) and weighted least squares (WLS), was required. The values of the coefficients together with their significance levels and estimated standard errors are shown in Table 4. For the sake of comparison, we also include results from Magda *et al*. (2009), who estimated similar wage equation on Czech data from the 2002 European Structure of Earnings Survey (ESES) using White heteroscedasticity-consistent standard errors estimator as well.

Overall, our wage regressions can explain from 43 up to 48 percent of the total variation in individual hourly wages based on the estimation method. Similar explanatory power can be observed for wage regressions in many studies whose estimates were conducted on individual datasets. Nevertheless, most of the coefficients were significant and therefore their values can provide us with an insight into the wage determination process.

Employee characteristics

Applying three dummy variables for the highest attained level of education, the results from Table 4 show the substantial positive influence of education on wages for both estimates. Specifically, a worker with at least a lower secondary education earns 11 percent more than a worker with only primary or no qualification, but 8 percent less than a worker with upper secondary education. The highest wages are then gained by workers with some form of university degree, who earn 18 percent

[18] Both Breuch-Pagan and Shapiro-Wilk tests p-values came out below 0.001, the multicollinearity was diagnosed using *variance inflation factor* (VIF), with some variables exceeding tolerance level of 10.

Table 4: Estimated wage equation

(Dependent variable: Ln of individual gross hourly wages, including annual bonuses)

EU-SILC (2009)	White-OLS	WLS	White-OLS	ESES (2009)
intercept	4.421***	4.627***	0.134**	intercept
Employee characteristics				**Employee characteristics**
Education				Education
Primary or no degree	*Ref*	*Ref*	*Ref*	Primary or no degree
Lower secondary	0.102*** (0.0156)	0.097*** (0.0137)	0.043*	Lower secondary
Upper secondary & post-secondary educ.	0.175*** (0.0321)	0.172*** (0.0282)	0.205***	General upper secondary
			0.228***	Higher non-university short type
Tertiary	0.314*** (0.0216)	0.300*** (0.0178)	0.635***	University and non-university higher educ.
			0.694**	Post-graduate
Potential experience				Prior potential experience
Simple	0.023*** (0.0391)	0.022*** (0.0032)	0.010***	Simple
Square	-0.001*** (0.0002)	-0.001*** (0.0001)	-0.000***	Square
Cubic	0.000*** (0.000)	0.000*** (0.000)	0.000*	Cubic
				Seniority in the company
			0.057***	Simple
			0.001***	Square
Gender				Gender
Female	*Ref*	*Ref*	-0.266***	Female
Male	0.244*** (0.0094)	0.237*** (0.0078)	*Ref*	Male
Citizenship				
Foreign	*Ref*	*Ref*		
Czech	0.0798 (0.0483)	0.0438 (0.0305)		
Region				
Other	*Ref*	*Ref*		
Prague	0.156*** (0.0141)	0.165*** (0.0118)		

Table 4: Estimated Wage Equation – continue

EU-SILC (2007)	White-OLS	WLS	White-OLS	ESES (2009)
Job characteristics				**Job characteristics**
Hours of work				Hours of work
Logarithm	-0.273***	-0.360***	*Ref*	Full-time
	(0.0317)	(0.0191)		
			-0.074**	Part-time
			0.049**	Dummy for overtime
			0.070***	Dummy for atypical working hours
Type of contract				Type of contract
Temporary job	*Ref*	*Ref*	*Ref*	Open-ended
Permanent job	0.071***	0.0741***	0.233***	Fixed term
	(0.0127)	(0.0096)		
Managerial position			0.059***	Other
Non-supervisory	*Ref*	*Ref*		
Supervisory	0.151***	0.157***		
	(0.0109)	(0.0092)		
Occupation (ISCO 2 digits)	Yes	Yes	Yes	Occupation (ISCO 2 digits)
Employer characteristics				**Employer characteristics**
Establishment size				Establishment size
1 – 10 workers	*Ref*	*Ref*	*Ref*	10 - 49 workers
11 – 49 workers	0.083***	0.074***	0.042***	50 - 249 workers
	(0.0107)	(0.0091)		
			0.055***	250 - 499 workers
50 and more workers	0.158***	0.151***		
	(0.0112)	(0.0093)	0.088***	500 - 999 workers
			0.128**	> 1000 workers
				Level of wage bargaining
			Ref	National and/or sectoral level
			-0.011*	Company level
			0.051***	No bargaining
Industries (NACE 1 digit)	Yes	Yes	Yes	Industries (NACE 2 digits)
Adjusted R²	42.95	48.56	42.80	*Adjusted R²*
F-test	124.13***	165.07***	NA	*F-test*
Number of observations	9 380	9 380	584 968	*Number of observations*

heteroscedasticity-consistent standard errors are reported between brackets

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ coefficient significant at the 5, 1 and 0,1 per cent level

more than workers with upper secondary education.[19] University qualification thus represents the highest added value in terms of attained education. However, these wage gaps are smaller when estimated by WLS.

Comparing the estimates with other studies examining the effect of education on wages for the Czech Republic (see Table 5), our results demonstrate the lowest return to education. However, their higher estimated coefficients are probably a consequence of including less explanatory variables in the Mincer-type wage equation and applying less robust methods of estimation. As a result, their estimated coefficients partially absorb the effects of omitted variables. Still, using similar methodology, results from Magda *et al.* (2009) show a generally higher return to education comparing to our results, especially for the university level, whose value is doubled.

Table 5: Estimated return to education in the Czech Republic

	Jurajda (2005)	Münich et al. (2005)		Večerník (2012)	
year	2002	2002		2009	
gender	Both	Men	Women	Men	Women
Years of schooling	0.102	0.057	0.068	0.08	0.09
Primary or no education	–0.360	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Lower secondary	–0.272	0.335	0.315	0.14	0.08
Upper secondary	*Ref.*	0.307	0.359	0.36	0.41
University educ.	0.482	0.579	0.61	0.71	0.73
Experience				0.03	0.02
Experience^2/100				-0.07	-0.03

Results for work experience display a concave relation with hourly wages. The observed polynomial of order four represents the diminishing return of investment into human capital, such as training or work experience, and are in accordance with the human capital theory. Specifically, the return to a first year of experience ranges from 2,5 to 2,8 percent, depending on the method of estimation. However, the additional contribution of work experience gradually decreases and

[19] Conversion into percentage terms was done by taking the antilog (to base e) of the estimated dummy coefficient, subtracted it by 1 and multiplying by 100. For details see Gujarati (2004), page 333.

becomes negative after approximately 22 years of experience. Results from Magda *et al.* (2009) give a markedly lower importance to prior experience potential than ours. This is apparently caused by the separate embodiment of years spent in current job, which, in our case, are included in the experience potential variable.

Not surprisingly, the coefficient values show that one year spent in a current job has much greater weight than a year of experience obtained in any other company. Also, unlike prior experience potential, company seniority does not demonstrate diminishing return. Possible explanations include companies tending to reward the human capital investment specific to their requirements, or wanting to lower costs associated with labour turnover. This is in accordance with the homonymous efficiency wage model discussed in subsection 2.2.

Findings reported in Table 4 that relate to the gender dummy variable, show the existence of a substantial gender wage gap, even after controlling for individual and job characteristics. *Ceteris paribus*, women's hourly wages are up to 28 percent lower than those of men.[20] This result is in line with findings from studies examining the gender wage gap in the Czech Republic, as well as with Magda *et al.* (2009). Jurajda (2005) identifies a similar gender wage gap. He concludes that wage differentials between men and women might be a consequence of the segregation of women into low-wage jobs. Jurajda and Paligorova (2009) further show that the wage gap between men and women is greater in top managerial positions than in lower ranking positions. According to the authors, the main reason behind this is the lower frequency of female top managers in highest-paying companies. In addition, Mysíková (2007) concludes that part of gender wage gap can be attributed to the decision of potentially low-paid women not to participate in the labour market. Using a special questionnaire survey, Balcar *et al.* (2012) suggests that part of the wage gap between men and women might be caused by their different preferences between work and family, as well as psychological traits.[21]

The last two dummy variables that relate to employee characteristics refer to worker citizenship and the region of his/her residence. For foreigners living and

[20] The value was obtained by calculating this expression (exp(0.244)-1)*100, where 0.244 is the coefficient of the male dummy variable (for details see Gujarati (2004), page 333)

[21] For example: men want to excel in their job more than women and also tend to ask for wage increase more frequently than women

working in the Czech Republic, the wage evaluation is, on average 4 to 7 percent lower than their Czech counterparts. However, this coefficient is not statistically significant and should therefore be interpreted with caution. Although the region dummy variable relates to worker residence, it is reasonable to assume that it is also the same region where their place of work is located, since labour mobility in the Czech Republic is traditionally low.[22] With judiciousness, we can therefore say that, all other things being equal, workers tend to earn up to 18 percent more in the capital city of Prague than elsewhere in the republic.

Job characteristics

Surprisingly, Table 4 shows the number of hours worked has a negative influence on the gross hourly wage. This result may signify a positive discrimination of companies in favour of part-time workers, which, however, contradicts the findings of Magda *et al.* (2009). Another explanation relates to the derivation of the dependent hourly wage variable in equation (1), where *ceteris paribus* higher number of worked hours means lowered hourly wage. This is plausible in those situations when an employer works overtime without a wage premium. Once again, this interpretation conflicts with findings of Magda *et al.* (2009), where working overtime brings a 5 percent wage bonus. Given these contrasting results, the coefficient of the number of hours variable is probably negative due to a potential endogeneity bias. In most situations when employees cannot choose their working hours, the assumption of the exogenous variable is not likely to be fulfilled. Therefore this result should be interpreted with caution. The traditional way to account for this kind of bias is to apply instrumental variables that relate to working hours. However, such appropriate instruments are difficult of obtain. Nevertheless, for our purpose of examining inter-industry wage differentials this bias does not represent a considerable obstacle.

Table 4 also reveals a form of an approximate wage penalty of 7 percent against workers with only temporary (or limited) types of contract. Newly hired workers are usually employed under this form of contract. The wage gap then probably reflects the uncertainty of employers toward these workers in terms of their ability. There is, likewise, a wage differential of 16.5 percent in favour of workers

[22] see Erbenová (1995)

who supervise their colleagues. This finding is in line with the shirking model of Shapiro and Stiglitz (1984), which says that in order to prevent shirking companies spend additional money monitoring their employees.[23] The observed wage differential can then be interpreted as a premium for higher responsibility and autonomy within the company.

In the wage equation we also included 25 dummy variables for the type of occupation classified based on the two-digit ISCO codes. Of the total number only 7 variables were insignificant, usually those representing the lowest paid professions.[24] On the other hand, managers of both companies and small enterprises, as well as all types of professionals, belong among the best-paid occupations.

Employer characteristics

The EU-SILC database allows us to employ only one employer characteristic, which covers establishment size. Resulting coefficients then show a strong positive effect of employer size on worker wages. For example, employees working with 50 or more co-workers in one establishment or plant get paid 17 percent more than if their working group consists of only 10 people. Bulow and Summers (1986) explain this relation as the necessity of larger firms to pay higher wages in order to reduce monitoring costs and prevent shirking. Similar results were also obtained by Magda *et al.* (2009) for four establishment size dummy variables.

In addition, their database enabled them to control for the different levels of wage bargaining. They find that workers covered by a company collective agreements earn 1 percent less than workers whose wages are solely covered by sectoral collective agreement. On the other hand, companies with no collective wage bargaining pay their employees 5 percent higher wages than companies where wages are collectively negotiated. This indicative figure is in line with the “threat of unionization” phenomenon explained by Dickens (1986). The additional wage premium in favour of non-unionized workers is paid by companies thanks to the saved costs of union organization.

[23] The model has been discussed in subsection 2.2.

[24] Those occupations are: skilled agricultural and fishery workers, models, salespersons and demonstrators, drivers and mobile plant operators or stationary-plant and related operators.

4.2.2 Inter-industry Wage Differentials

Table 6 and Table 7 display inter-industry wage differentials in 2007, classified based on the NACE one digit sectors. The differentials were estimated by White-OLS and WLS on the basis of equation (2), using individual gross hourly wages including annual bonuses as the dependent variable. The tables show the values of both gross and net inter-industry wage differentials, as well as the percentage difference between wages of the average worker in industry l and the weighted average wages in the whole economy.[25] To get the percentage difference, we use the following formula:

$$\Delta_l(\%) = \left[\left(exp\left(\hat{\delta}_l\right) - 1\right) - \sum_{l=1}^{L} \bar{s}_l\left(exp\left(\hat{\delta}_l\right) - 1\right)\right] \cdot 100 \tag{7}$$

where $\hat{\delta}_l$ is the estimated coefficient of industry l and $\bar{s}_l$ is its employment share.

The results from both tables confirm the existence of substantial wage differentials between workers employed in different sectors, even after controlling for individual and job characteristics. Moreover, most of the differentials are statistically significant to at least at a 5 percent level, even when applying robust standard error estimators. The same conclusions also hold for the recalculated net inter-industry wage differentials in the second column, despite an overall decrease in the statistical significance of these figures.

From both tables we can see that the highest wages are paid in the financial and insurance sector and the public administration and defence sector. With all other characteristics fixed, the average worker in finance and insurance earns approximately 16 percent more than the average worker in the overall economy. A slightly lower industry premium (of between 13 and 14 percent) is present in public administration and defence. Another well-paid industry is the information and communication sector, with wage premium of 8,5 percent. Agriculture is at the bottom of the conditional wage distribution is, where the average worker's wage is

[25] Gross differentials are the estimated dummy variable coefficients of equation (2), whose values represent the wage difference between a specific industry and a reference industry, which, in our case, is agriculture. Net differentials, on the other hand, are the normalized gross differentials where the reference is not an industry but the entire economy. Therefore the weighted mean of the net inter-industry wage differentials is equal to zero. For details see subsection 4.1.

Table 6: Inter-industry wage differentials estimated by White-OLS

	Gross	Net	Δ_l
Agriculture, forestry and fishing (section A)	*Ref*	-0.103*** (0.006)	-9,92%
Industry, mining, manufacture and electricity, gas and water supply(sections B – E)	0.0904*** (0.020)	-0.012 (0.014)	-1,33%
Construction (section F)	0.0781** (0.024)	-0.024* (0.013)	-2,51%
Wholesale and retail trade and repair of motor vehicles and motorcycles (section G)	0.0757** (0.024)	-0.027* (0.015)	-2,80%
Transportation and storage (section H)	0.157*** (0.024)	0.054** (0.023)	5,41%
Accommodation and food service activities (section I)	0.0721* (0.031)	-0.030* (0.028)	-3,09%
Information and communication (section J)	0.182*** (0.034)	0.080** (0.027)	8,20%
Financial and insurance activities (section K)	0.252*** (0.034)	0.149*** (0.021)	15,93%
Real estate and administration (sections L – N)	0.133*** (0.028)	0.030** (0.014)	2,91%
Public administration and defence, compulsory social security (section O)	0.224*** (0.024)	0.122*** (0.021)	12,84%
Education (section P)	0.0724** (0.027)	-0.030** (0.015)	-3,09%
Human health and social work activities (section Q)	0.0819*** (0.024)	-0.021 (0.024)	-2,21%
Arts, entertainment, activities of households. as employers and other service activities (sections R – U)	0.0596 (0.031)	-0.043** (0.019)	-4,34%
F-test relative to the sectoral dummies	13.49***		

Inter-industry wage differentials are estimated on the basis of equation (2) where the dependent variable is the ln of individual gross hourly wages. The net inter-industry wage differentials were computed following Krueger and Summer (1987) methodology and their standard errors (reported in brackets) were computed according to Zanchi (1998) methodology – see subsection 4.1 for detail.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ coefficients significant at the 5, 1 and 0,1 per cent level

Table 7: Inter-industry wage differentials estimated by WLS

	Gross	Net	Δ_l
Agriculture, forestry and fishing (section A)	*Ref*	-0.110*** (0.006	-10,25%
Industry, mining, manufacture and electricity, gas and water supply(sections B – E)	0.0991*** (0.020)	-0.010 (0.013)	-1,25%
Construction (section F)	0.0857*** (0.023)	-0.024* (0.011)	-2,52%
Wholesale and retail trade and repair of motor vehicles and motorcycles (section G)	0.0769*** (0.022)	-0.033*** (0.012)	-3,11%
Transportation and storage (section H)	0.158*** (0.022)	0.049** (0.019)	5,13%
Accommodation and food service activities (section I)	0.0736** (0.027)	-0.036* (0.021)	-3,40%
Information and communication (section J)	0.198*** (0.029)	0.089*** (0.022)	8,67%
Financial and insurance activities (section K)	0.264*** (0.029)	0.154*** (0.015)	16,21%
Real estate and administration (sections L – N)	0.132*** (0.025)	0.023* (0.012)	2,53%
Public administration and defense, compulsory social security (section O)	0.252*** (0.023)	0.143*** (0.022)	14,02%
Education (section P)	0.0721** (0.026)	-0.037** (0.015)	-3,45%
Human health and social work activities (section Q)	0.0864*** (0.024)	-0.023 (0.019)	-2,33%
Arts, entertainment, activities of households. as employers and other service activities (sections R – U)	0.0691* (0.027)	-0.041** (0.019)	-4,26%
F-test relative to the sectoral dummies	22.42***		

Inter-industry wage differentials are estimated on the basis of equation (2) where the dependent variable is the ln of individual gross hourly wages. The net inter-industry wage differentials were computed following Krueger and Summer (1987) methodology and their standard errors (reported in brackets) were computed according to Zanchi (1998) methodology – see subsection 4.1 for detail.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ coefficients significant at the 5, 1 and 0,1 per cent level

ceteris paribus 10 percent lower than the wage of the average worker in the overall economy. Other sectoral wage differentials don't differ so markedly from the average and their values vary between -4 and 5 percent. Nevertheless, we still must keep in

mind that our classification of sectors is not very detailed and ignores some potentially high-paying sectors such as electricity and gas supply (included in the industry, mining, manufacture and electricity, gas and water supply sector), or air transport (included in the transportation and storage sector). Therefore, given more detailed industry classification, we would most likely obtain different inter-industry wage differentials.

From other studies examining inter-industry wage differentials in the Czech Republic, our results most closely correspond to those obtained by Večerník (2006), who examined inter-industry wage differentials for 2002.[26] On the other hand, the estimated sectoral wage structure for 1996 reported by Münich *et al.* (1999) and Večerník (2001), differs substantially from our results. Nevertheless, these disparities are most likely a consequence of the specific period of the Czech economy during the transformation in 1990s.

Table 8 shows the weighted adjusted standard deviations (WASD) of the industry wage differentials at the NACE one-digit level for our wage equation (2).[27] Individual WASD were calculated after gradually excluding employer, job and employee characteristics explanatory variables from the equation (2). Not surprisingly, we found that the dispersion in industry wage differentials decreases gradually as the number of included explanatory variables increases. This indicates that additional job and worker characteristics included in the wage equation might further reduce the importance of sectoral affiliation. Indeed, the WASD obtained from wage equation regressed with only industry dummy variables comes out twice as high as the WASD with control for employee and job characteristics. Given the moderate R^2 of our regressions, there are still some missing explanatory variables in our model that can decrease the WASD. This finding can be understood as evidence in favour of the unobserved ability hypothesis. However, results from Magda *et al.* (2009) show that the dispersion of inter-industry wage differentials is larger when applying the NACE two-digit rather than the NACE one-digit dummy variables. Moreover, the potentially missing variables (such as profit per worker or firm size) in

[26] See subsection 2.3 on page 22 for detail
[27] The equation (6) for calculating the WASD can be found in subsection 4.1 on page 32.

our wage equation may relate more to the efficiency wage theory rather than the competitive theory.

Table 8: Inter-industry weighted adjusted standard deviations (WASD)

	White-OLS	WLS	Magda *et al*. (2009)
Including only sectoral dummies	0.113	0.118	0.219
Controlling for employee characteristics:	0.073	0.079	0.145
Controlling for employee, job and employer characteristics	0.048	0.054	0.123

To get a more detailed insight into the wage determination in individual industries we estimated the wage equation (2) separately for each sector of the economy. Table 9 andTable 10 summarize the resulting coefficients which were estimated by the White-OLS estimator. Looking at finance and insurance as the best paying sector, we observe the highest return to education, which is almost as twice as high as any other sector. Moreover, it also demonstrates the highest return on an additional year of experience which again greatly exceeds the estimated values from other sectors.

All these figures imply considerable wage gaps between the best and worst qualified employees in this sector. On the other hand, the wage premium for managerial positions and permanent job contracts and the intercept values belong among the lowest ones. Nevertheless, the high values for worker ability variables might indicate quick career progress, accompanied by wage increases. This „motivation" policy might be one of the reasons the financial sector is paying such high salaries. Unlike the finance and insurance sector, which are markedly distinguished from other sectors in terms of coefficients and industry wage premiums, we observe no noticeable deviation of the estimated coefficients for the public administration and defence sector (sector O), which ranked as second best paid. The possible explanation might lie in the character of a public sector which is strongly regulated.

At the very bottom of the wage scale we identified agriculture and the combined sectors of arts, entertainment and other service activities, with wage penalties of minus 10 and minus 4.2 percent respectively. As follows from Tables 9

and 10, these sectors show the lowest values of coefficients for education and experience variables, which, in addition to that, were statistically insignificant. Although figures from some sectors contradict it, there seems to be a correlation between industry wage premia and returns to education and work experience. However, this conclusion does not support either of the two explanation theories of inter-industry wage differentials, since it does not state whether the level of wages paid stems from more productive work (unobserved ability) or the greater ability of firms to reward their employees.

Table 9: Estimated wage equations for sectors A to I by NACE classification

NACE sections	All	Agricul-ture	Manufac-ture and	Construc-tion	Wholesale & trade	Transpor-tation	Accomo-dation
intercept	4.421***	4.89***	4.76***	4.43***	4.44***	4.96***	5.63***
Employee characteristics							
Education							
Primary or no degree	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Lower secondary	0.102***	0.0612	0.0809**	0.083	0.127**	0.0741	0.191***
	(0.016)	(0.053)	(0.024)	(0.049)	(0.047)	(0.079)	(0.056)
Upper secondary & post-secondary	0.175***	0	0.0224	0.210	0.306	0.0849	0.729***
	(0.032)	.	(0.078)	(0.131)	(0.213)	(0.121)	(0.120)
Tertiary	0.314***	0.188	0.256***	0.320***	0.401***	0.471***	0.493*
	(0.022)	(0.107)	(0.039)	(0.091)	(0.069)	(0.116)	(0.206)
Potential experience							
Simple	0.023***	0.0132	0.024***	0.028***	0.015**	0.043***	0.0245*
	(0.0391)	(0.013)	(0.004)	(0.008)	(0.006)	(0.009)	(0.011)
Square	-0.001***	-0.000	-0.001***	-0.001*	-0.000	-0.00***	-0.001
	(0.0002)	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cubic	0.000***	-0.000	0.000**	0.000	0.000	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.00)
Gender							
Female	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Male	0.244***	0.168***	0.300***	0.212***	0.251***	0.154**	0.192***
	(0.009)	(0.010)	(0.014)	(0.054)	(0.028)	(0.054)	(0.049)
Citizenship							
Foreign	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Czech	0.0798	0.143**	0.0191	0.114	0.269	-0.360***	-0.176
	(0.048)	(0.048)	(0.071)	(0.054)	(0.311)	(0.099)	(1.18)
Region							
Other	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*

Prague	0.156***	0	0.209***	0.149**	0.196***	0.136**	0.246**
	(0.014)	.	(0.045)	(0.042)	(0.039)	(0.044)	(0.074)
Job characteristics							
Hours of work							
Logarithm	-0.273***	-0.499***	-0.368***	-0.338**	-0.242*	-0.281*	-0.311**
	(0.032)	(0.124)	(0.067)	(0.107)	(0.117)	(0.127)	(0.112)
Type of contract							
Temporary job	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Permanent job	0.071***	0.0190	0.0871***	0.0308	0.068	0.006	0.0144
	(0.013)	(0.067)	(0.023)	(0.039)	(0.036)	(0.063)	(0.061)
Managerial position							
Non-supervisory	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Supervisory	0.151***	0.0013	0.140***	0.0412	0.154***	0.231***	0.203**
	(0.011)	(0.063)	(0.019)	(0.038)	(0.031)	(0.053)	(0.068)
Occupation (2 digits)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Employer characteristics							
Establishment size							
1 – 10 workers	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
11 – 49 workers	0.083***	0.066	-0.005	0.118**	0.0721**	0.0512	0.110*
	(0.011)	(0.065)	(0.024)	(0.036)	(0.025)	(0.051)	(0.045)
50 and more workers	0.158***	0.113*	0.089***	0.208***	0.142***	0.149**	0.150
	(0.011)	(0.112)	(0.023)	(0.046)	(0.031)	(0.051)	(0.082)
Adjusted R²		36.4	39.5	32.3	45.2	29.8	36.6
Number of observ.		315	3306	703	1030	685	328

heteroscedasticity-consistent standard errors are reported between brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ coefficient significant at the 5, 1 and 0,1 per cent level

Table 10: Estimated wage equations for sectors J to R-U by NACE classification

NACE sections	Commu-nication	Finance	Real estate	Public admin.	Educa-tion	Health services	Arts & Entertain.
intercept	3.89***	3.59***	3.91***	4.39***	4.66***	4.31***	4.5***
Employee characteristics							
Education							
Primary or no degree	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Lower secondary	0.152	0.444	0.077*	0.188	0.086*	0.113*	0.0479
	(0.101)	(0.417)	(0.090)	(0.099)	(0.056)	(0.044)	(0.095)
Upper secondary & post-sec. educ.	0.515	0.319	0.176	0.233	0.134	0.219***	0.0502
	(0.272)	(0.423)	(0.134)	(0.120)	(0.081)	(0.058)	(0.178)
Tertiary	0.397**	0.805	0.310**	0.326**	0.322***	0.241***	0.0552

	(0.119)	(0.420)	(0.107)	(0.104)	(0.062)	(0.057)	(0.166)
Potential experience							
Simple	0.0102	0.047**	0.0234*	0.0241**	0.0238**	0.00772	0.0203*
	(0.019)	(0.016)	(0.01)	(0.007)	(0.008)	(0.007)	(0.012)
Square	0.000	-0.001	-0.001	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cubic	-0.000	0.000	0.000	-0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender							
Female	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Male	0.150	0.226**	0.130**	0.221***	0.156***	0.177***	0.255***
	(0.084)	(0.079)	(0.048)	(0.035)	(0.032)	(0.042)	(0.061)
Citizenship							
Foreign	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Czech	0.298	0	0.350**	0	0.181	0.001	-0.146
	(0.185)	.	(0.129)	.	(0.160)	(0.107)	(0.151)
Region							
Other	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Prague	0.180*	0.227***	0.212***	0.0891*	0.0025	0.114**	0.134
	(0.076)	(0.066)	(0.047)	(0.042)	(0.06)	(0.039)	(1.57)
Job characteristics							
Hours of work							
Logarithm	-0.0843	-0.223*	-0.167	-0.063	-0.382**	-0.218**	-0.299
	(0.279)	(0.260)	(0.191)	(0.159)	(0.059)	(0.071)	(0.168)
Type of contract							
Temporary job	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Permanent job	0.312*	0.0553	0.076	0.0036	0.0719	0.0835*	0.0672
	(0.138)	(0.086)	(0.067)	(0.07)	(0.042)	(0.035)	(0.067)
Managerial position							
Non-supervisory	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Supervisory	0.255***	0.104	0.232***	0.164***	0.150***	0.125***	0.0958
	(0.069)	(0.092)	(0.066)	(0.035)	(0.029)	(0.031)	(0.093)
Occupation (2 digits)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Employer characteristics							
Establishment size							
1 – 10 workers	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
11 – 49 workers	0.119	0.116	0.0791	0.155**	0.110***	0.107***	0.104**
	(0.089)	(0.085)	(0.057)	(0.051)	(0.029)	(0.03)	(0.061)
50 and more	0.236*	0.148	0.187**	0.195***	0.156***	0.153***	0.190***

workers	(0.096)	(0.094)	(0.060)	(0.049)	(0.036)	(0.03)	(0.075)
Adjusted R²	47.5	59.2	49.7	47.2	62.5	56.1	48.2
Number of observ.	192	187	391	656	716	632	239

heteroscedasticity-consistent standard errors are reported between brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ coefficients significant at the 5, 1 and 0,1 per cent level

Since other variables seem not to exhibit any coherence with the inter-industry wage premia, we merely mention some notable results from Table 9 and Table 10 without a reference to their sectoral differentials.

- As can be seen in the sectors of manufacture, electricity and gas supply, accommodation and food service, information and communication and the financial sector, (NACE codes B-E, I, J and K), a higher level of attained education doesn't necessarily result in higher wage levels. Particularly in the sector of accommodation and food service activities and the sector of information and communication, workers holding university degrees tend to earn less than those who only completed the upper secondary level. This result indicates that some workers in these sectors got their required knowledge elsewhere than at university.

- The biggest disparity between men's and women's wages (35 percent) is present in the sector of mining, manufacture and electricity, gas and water supply. On the contrary, the information and communication sector demonstrates the lowest gender wage gap of just 16 percent.

- Even though the nationality dummy variable results are insignificant in the wage equation for the whole economy, we observe a marked variation for individual sectors.[28] This may, however, be a consequence of the low representation of foreigners used in the regressions.

- People working in the sector of arts, entertainment and other service activities earn significantly more (29 percent) if their job is located in Prague.[29] Similar

[28] This holds true, especially between the sector of transportation and storage where foreigners earn 43 percent less than Czech workers and the real estate and administration sector, where, on the contrary, foreigners earn 42 percent more than Czechs
[29] As we mentioned earlier, even though it relates to worker residence, we also assume it as a proxy for the location of place of work

regional wage differentials can be also observed for the finance and insurance sector, as well as real estate and administration. On the contrary, the wage level of employees working in school systems doesn't depend on where their workplaces are located.

- The strongest effect of the establishment size on wages is present in construction and the sector of information and communication. If we accepted the explanation of the shirking model, it would mean workers in those industries are most difficult to monitor or most likely to shirk. In the case of the information and communication sector, this interpretation is also supported by the high wage premium for supervising. Nevertheless, on the whole, there seems to be no correlation between the supervisory wage premium and the establishment size wage premium.

4.3 Summary

In this section we estimated the traditional Mincer-type wage equation by applying robust estimators on micro-level data from the EU-SILC survey. Overall, the results are satisfactory. The model demonstrates mediocre explanatory power (of adjusted R^2 equals to up to 48 percent), which is typical for these types of regressions. Most of the explanatory variables came out with strong statistical significance and the values of their estimated coefficients are in accordance with the labour market theories discussed in subsection 2.2.1.

Following the methodologies of Krueger and Summers (1988) and Zanchi (1998), we identified the inter-industry wage differentials for 13 sectors, with classifications based on the NACE one-digit codes. The results confirmed the presence of wage differentials across sectors even after controlling for a large number of individual and job characteristics. The variation of the inter-industry wage differentials amounts to approximately 5 percent (measured by the WASD), with a maximum wage level difference of 25 percent between the financial and agriculture sectors. Nevertheless, the mere existence of these inter-industry wage differentials fails to support the efficiency wage theories, to the detriment of competitive wage theory.

The objective of the following two sections will be to determine to what extent are sectoral wage premia (or penalties) a consequence of omitting certain worker characteristics in our model, and to what extent they result from company intensives or capacity to pay wages above a competitive level

5 Inter-Industry Wage Differentials and Unobserved Abilities

In the previous section we confirmed the existence of inter-industry wage differentials on individual datasets, which include numbers of both employee and job characteristics. Although the existence itself may serve as evidence in favour of the efficiency wage theory, the competitive wage theory offers other rational explanations. These include compensating differentials for job characteristics and unobserved worker ability (productivity). While working conditions might be important for some industries, for example mining or metallurgy, we will focus primarily on the unobserved ability explanation as an alternative to the efficiency wage models. The basic idea is that industries have variable requirements for labour quality and therefore workers are sorted based on their heterogeneous abilities, which are largely unobserved.

5.1 Methodology

We chose two approaches to analyse the relevance of unobserved ability for explaining inter-industry wage differentials. Both are based on the estimation of our wage equation (2) from subsection 4.1.

The first approach follows the methodology of Murphy and Topel (1990), who extend the traditional Mincer-type wage equation with two auxiliary regressions:

$$\ln w_i = \alpha + \sum_{j=1}^{J} \beta_j X_{j,i} + \sum_{k=1}^{K} \gamma_k \mathrm{Y}_{k,i} + \varepsilon_i \tag{8}$$

$$\hat{\delta}_{l,i} = \mathrm{c} + \sum_{j=1}^{J} \varphi_j X_{j,i} + \sum_{k=1}^{K} \vartheta_k \mathrm{Y}_{k,i} + \mu_i \tag{9}$$

The first wage equation is the same as equation (2) from subsection 4.1, but without industry dummy variables. The latter then apply the same regressors as the previous

equation but replace the dependent variable with the estimated net industry wage differentials $\hat{\delta}_l$ from equation (2). Equation (9) thus gives us information concerning the extent to which industry wage premiums (or penalties) are paid to workers with better observable characteristics. Murphy and Topel (1990) argue that industries differ in their requirements for labour quality which leads to the sorting of workers on labour markets according to their both observable and unobservable abilities. This sorting behaviour of companies is in accordance with the unobserved ability explanation and its presence thus provides evidence in favour of the competitive wage theory.

Therefore, if the differentials are actually caused by unobserved labour ability, then the estimated coefficients of worker characteristics $\hat{\beta}$ and $\hat{\varphi}$ should have the same sign. Murphy and Topel further suggest estimating the two auxiliary equations only for workers with longer work experience. Their logic is that, for those workers, the process of searching for suitable jobs has ended, because they have probably found a job that corresponds to both their observed and unobserved abilities. Again, if the unobserved ability hypothesis holds, we should observe the same signs for the estimated coefficients $\hat{\beta}$ and $\hat{\varphi}$.

The second approach introduced by Martins (2004), is based on quantile regressions of the wage equation (2). Unlike classical regressions, quantile regressions consider the impact of the regressors at specific quantiles of the distribution of the dependent variable. Martins' method involves computations of regressions at the mean and at the 10th and 90th percentiles of wage distribution. Martins' analyses is based on the assumption that workers with better unobserved characteristics are probable to be found at the top of the conditional wage distribution and are mostly concentrated in high-wage sectors. Therefore, if unobserved ability is significant in explaining wage differentials across sectors two results are likely to be observed:

- differences between the 10th and 90th quantiles of the wage distribution will be larger for high-wage sectors than for low-wage sectors, and
- a highly positive correlation between the mean and the 90th quantile premia

5.2 Results

Sorting model

Table 11 shows the estimates of equations (8) and (9) for the entire sample and the subsample of experienced workers, along with the earlier wage equation from section 4 (first column). As conditions require, we find the same signs for all estimated coefficients in both equations. In other words, the observable worker abilities that increase wages within industries also tend to work similarly for industry wage premia. Moreover, the relative magnitude of those characteristics is comparatively similar (with the Pearson correlation coefficient of 0.64).

For example, workers with university degree earn approximately 14 percent more than workers having only upper secondary education and, on average, they tend to work in industries that pay 0.6 percent higher wages in that educational relationship. Alternatively, those living (and working) in Prague get paid 17 percent more than if their residences were located outside of the capital city and are likely to be employed in sectors with 1 percent higher wages. Noteworthy is the coefficient value for the gender effect. We observe, that only 0.5 percent of the total 28 percent gender wage gap can be attributed to the segregation of men into better paying industries. All the results support the sorting hypothesis of Murphy and Topel (1990), where workers, standing in a queue for job, are sorted based on their observable characteristics. Thus, given the evidence, we conclude that the demand for individual ability differs across industries, which follows the unobserved ability explanation.

The results of the regressions for workers with more than 15 years experience provides further evidence for our previous finding. Indeed, the signs and magnitudes of the coefficients remain almost unchanged compared to those estimated for unrestricted samples of workers. The only observable exception is, ironically, the effect of experience. For this variable we observe not only a significantly lower value, but also opposite signs of the coefficients, which implies that for these workers, their working experience is only weakly related to industry wage premia. This follows our earlier hypothesis that, after 15 years spent in employment, workers tend to settle in a job most suitable for them, so that the sorting process no longer persists.

Table 11: White-OLS estimates of equations (8) and (9)

EU-SILC (2007)	Original Wage Equation	Full Wage	Full IWD	Experienced (+15 years) Wage	Experienced (+15 years) IWD
Employee characteristics					
Education					
Primary or no degree	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Lower secondary	0.102***	0.108***	0.005**	0.097***	0.004
	(0.0156)	(0.015)	(0.0021)	(5.08)	(1.38)
Upper secondary & post-secondary educ.	0.175***	0.192***	0.011***	0.166***	0.014*
	(0.0321)	(0.0318)	(0.0045)	(3.92)	(2.46)
Tertiary	0.314***	0.327***	0.017***	0.311***	0.0112**
	(0.0216)	(0.0208)	(0.0002)	(11.75)	(3.10)
Potential experience					
Simple	0.023***	0.024***	0.001***	0.004	-0.0003
	(0.0391)	(0.0021)	(0.000)	(0.31)	(0.000)
Square	-0.001***	-0.001***	-0.000**	-0.000	-0.000
	(0.0002)	(0.000)	(0.000)	(0.000)	(0.000)
Cubic	0.000***	0.000***	0.000*	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender					
Female	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Male	0.244***	0.250***	0.005***	0.252***	0.00363*
	(0.0094)	(0.0091)	(0.0011)	(21.90)	(2.31)
Citizenship					
Foreign	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Czech	0.0798	0.099*	0.019***	0.0869	0.0179**
	(0.0483)	(0.0477)	(0.005)	(1.82)	(2.76)
Region					
Other	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Prague	0.156***	0.168***	0.0095***	0.161***	0.0116***
	(0.0141)	(0.0142)	(0.0018)	(9.11)	(4.81)
Adjusted R^2	42.95	41.89	18.04	42.14	19.89
F-test	124.13***	157.68***	53.96***	107.36***	36.60***
Number of observations	9 380	9 380	9 380	5788	5788

heteroscedasticity-consistent standard errors are reported between brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ coefficient significant at the 5, 1 and 0,1 per cent level

Quantile regressions

Table 12 presents the estimated coefficients for industries at the 10th and 90th percentiles of the wage distribution and the difference between these two quantiles. Although there are some exceptions, industry wage premia at the top of the

Table 12: Industry coefficients at the top and bottom percentiles of the wage distribution and their differences

	10th percentile	90th percentile	Difference
Agriculture, forestry and fishing (section A)	-0.061** (0.010)	-0.131*** (0.012)	-0.07** (0.02)
Industry, mining, manufacture and electricity, gas and water supply(sections B – E)	-0.015 (0.021)	0.002 (0.029)	0.017 (0.048)
Construction (section F)	-0.029 (0.020)	-0.047* (0.024)	-0.018 (0.044)
Wholesale and retail trade and repair of motor vehicles and motorcycles (section G)	-0.021 (0.019)	-0.022 (0.025)	-0.001 (0.043)
Transportation and storage (section H)	0.028* (0.032)	0.062* (0.041)	0.034* (0.071)
Accommodation and food service activities (section I)	-0.043* (0.039)	0.006* (0.046)	0.049* (0.083)
Information and communication (section J)	0.062* (0.040)	0.139*** (0.046)	0.077** (0.084)
Financial and insurance activities (section K)	0.081*** (0.027)	0.150** (0.032)	0.069** (0.057)
Real estate and administration (sections L – N)	0.002 (0.030)	0.064** (0.043)	0.062** (0.07)
Public administration and defence, compulsory social security (section O)	0.090** (0.023)	0.114** (0.064)	0.024* (0.084)
Education (section P)	0.009 (0.028)	-0.092** (0.031)	-0.101** (0.057)
Human health and social work activities (section Q)	0.047* (0.034)	-0.061* (0.040)	-0.108** (0.075)
Arts, entertainment, activities of households. as employers and other service activities (sections R – U)	-0.066* (0.034)	-0.015* (0.037)	0.051* (0.07)
F-test relative to the sectoral dummies			
Correlation between White OLS and the 10th quantile			0,87
Correlation between White OLS and the 50th quantile			0,98
Correlation between White OLS and the 90th quantile			0,92
Average difference for 3 higher-wage industries			0,06
Average difference for 3 lower-wage industries			0,01

heteroscedasticity-consistent standard errors are reported between brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ coefficient significant at the 5, 1 and 0,1 per cent level

conditional wage distribution generally come out higher than those at the bottom. Specifically, the average wage premia is 0.013 at the 90th quantile and 0.006 at the 10th quantile. We also observe higher differences among better paying industries. The average differential equals 0.06 for the three best-paying industries which is, by 5 basic points, above the average for the three lowest-wage industries. On the whole, the correlation between the inter-industry wage differentials estimated at the mean and quantile differences satisfies 0.59. Moreover, the inter-industry wage differentials, estimated at the mean, also show strong and positive correlations with the estimated median differentials.

The results obtained from the quantile regressions seem to fulfil the requirements specified by Martins (2004) to detect the presence of the unobserved ability factor. Nevertheless, the results are not completely unambiguous. First of all, the statistical significance of the industry quantiles differentials is not very strong. Moreover, the industry coefficients for the 10th and 90th percentiles are strongly correlated with the same intensity to the mean industry wage premia as well, which is not completely in line with the unobserved ability hypothesis. However, despite the same intensity, we still observe the lowest correlation with the bottom quantile of the wage distribution, which gives evidence of a slightly higher concentration of better qualified workers in better-paying industries.

5.3 Summary

In this section we tested the hypothesis of unobserved ability by applying two distinct approaches. Both provided some evidence in favour of the competitive wage theory. Specifically, by estimating industry wage premia on observable worker characteristics, as proposed by Murphy and Topel (1990), the results confirmed the hypothesis of different requirements for worker abilities across sectors. Moreover, we also found that the observable workers' abilities which increase wages within industries also tend to work in the same way for the inter-industry wage premia. In other words, the inter-industry wage differentials can be to a certain extent attributed to unobserved worker abilities.

These findings were partially confirmed by the quantile regression analysis, whose results indicated higher concentrations of better qualified workers in higher-

wage industries. Although there were some ambiguous results, the quantile analysis provided stronger evidence in favour of unobserved ability than the same analysis conducted by Plasman *et al*. (2006) or Martins (2004).

In sum, the results of both methods show that worker abilities are not randomly distributed across sectors Therefore, given the evidence, we may not reject the hypothesis that part of the industry wage differentials derives from unobserved abilities. Still, we must keep in mind that our analyses rely on less detailed segmentations of industries than is usually applied in similar studies.

6 Inter-industry Wage Differentials and Efficiency Wage Theories

This chapter focuses on explaining the inter-industry wage differentials from the perspective of the efficiency wage theory. As already discussed in subsection 2.2, most studies attribute the sectoral wage premia to three main measurable factors, which will be our primary concern as well. Those factors are: (i) levels of unionization, (ii) firm or establishment size and (iii) rent-sharing or ability to pay. To investigate the relevance of the efficiency wage models the inter-industry wage differentials estimated in subsection 4.2.2 will be compared to sectoral profit per worker, share of profit based bonuses, union and non-union coverage rates, personnel labour costs and labour costs by firm size. Since the EU-SILC database does not contain this type of information we will primarily rely on data from the IPSV survey and the statistical surveys of the ČSÚ.

6.1 Rent-sharing and Unionization

Rent-sharing

The able in Appendix C represents a detailed deconstruction of total hourly labour cost for individual sectors. Hourly labour cost is divided into the following items: wages and bonuses, wage-related benefits, non-insurance benefits, social insurance benefits, plus hiring and training costs. The first two categories are termed as direct costs, while the last three as indirect costs. The results derived from the statistical surveys show major differences in average hourly wages and total labour costs across the sectors similar to those we previously discovered on the data from the EU-SILC.[30] Yet there are some differences. In terms of total earnings, for instance, workers in the accommodation and food service activities sector are paid less than those in agriculture, which was previously identified in our analyses as the lowest

[30] See Table 6 in subsection 4.2.2.

paying sector. A detailed classification of sectors also reveals that there are significant disparities in wages across subsectors of industry.[31] Indeed, the average wage including bonuses for time worked in the electricity, gas and steam supply sector is almost twice that of average wages paid in the water supply and sewerage management sector. The larger proportion of those employed in manufacturing and water supply would then explain why the aggregated sector of mining and quarrying, manufacturing, electricity, gas, steam supply and water supply demonstrated the low wage premium.

Much more interesting than total wages are its individual components. Within the earnings category, base wages represent the primary item, amounting on average to 109 CZK (76 percent of average earning). Looking at individual sectors, we see the higher the total wage, the lower its share of the basic wage. This indicates that wages of those working in the best-paying industries increasingly consist of bonuses and other benefits. As far as other components of earnings are concerned, firms in most sectors pay additional bonuses for working overtime that amount to about 1.2 percent of hourly earnings. Financial and insurance companies are an exception since they pay their workers very little for additional time spent at work. In contrast, however, they pay their workers one of the largest share of total hourly earnings (6.5 percent) in the form of profit-sharing bonuses. Even a larger sharing of profits is found in the sector of electricity, gas and steam supply, which represents 8.4 percent of total earnings and 26 percent of all bonuses and benefits. Generally, profit based bonuses are strongly and positively correlated with average sectoral wages (with a correlation coefficient of 0.56). This implies that high average sectoral earnings are, in part, the result of a higher willingness of companies in those sectors to share their profits.

A similar correlation is also observed between the profit-sharing bonuses and inter-industry wage differentials estimated in subsection 4.2.2. This indicates that the observed differences in sectoral wages can be partially attributed to the varied levels of rent-sharing policy of companies in sectors. As anticipated, there also appears to be a positive relation between the industry wage premium and industry profitability.

[31] The subsectors are: mining and quarrying, manufacturing, electricity, gas and steam supply and water supply and sewerage management (columns 3 – 6 in the table in Appendix C)

Figure 2 shows plots of our estimated inter-industry wage differentials (vertical line) against the average sectoral profit per employee and profit based bonuses (horizontal lines). The overall pattern of results on the left hand side of the plots suggests a positive relation between the industry wage differentials and sectoral abilities to pay. However, after excluding the sector of finance and insurance which appears to be an outlier, the correlation coefficients decrease significantly.[32] This finding confirms that the analysis relying on a limited number of observations has low statistical power and our results should therefore be taken with caution.

Figure 1: Plots of the inter-industry wage differentials and sectoral profit based bonuses

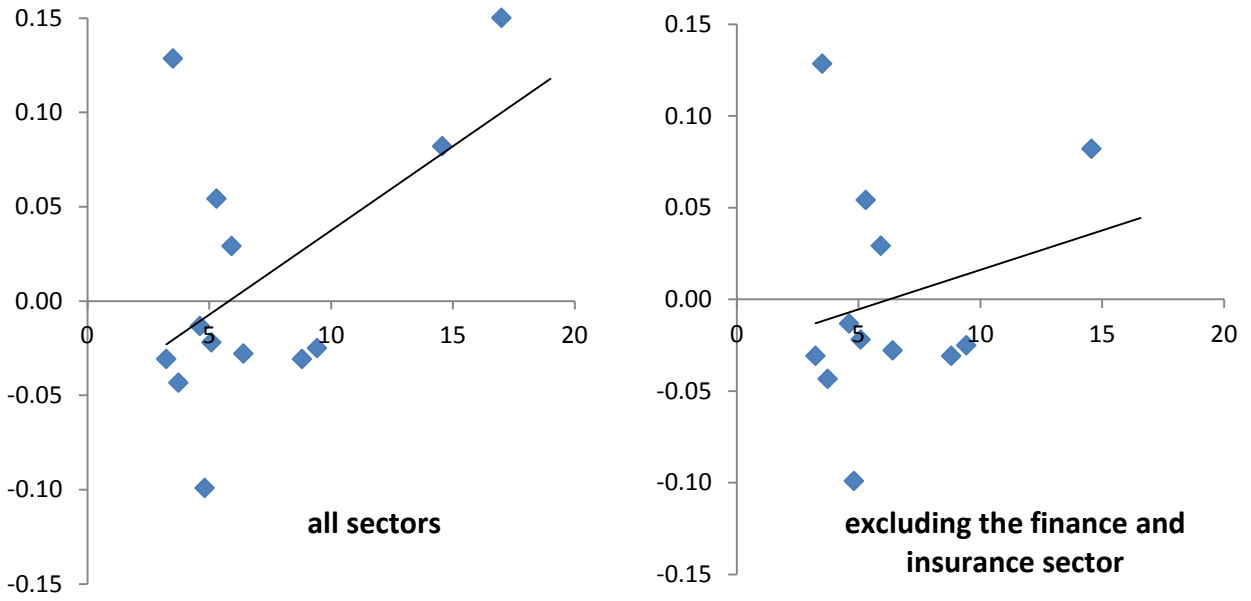
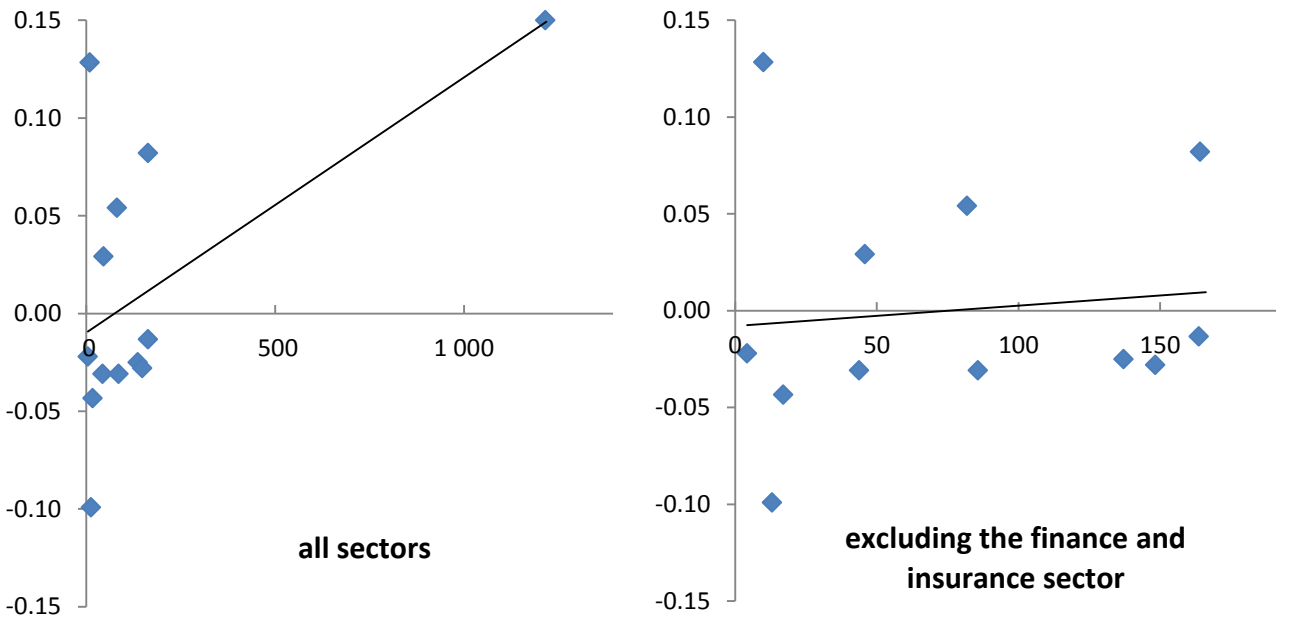


Figure 2: Plots of the inter-industry wage differentials and sectoral profit per employee



Unionization

Rent sharing is often examined within the context of wage bargaining. On one hand, the theoretical implication suggests that wages in centralized industries would respond less to firm-level profitability than in industries where wages are mostly set by company-level collective agreements. The reasoning behind this is that industry agreements generally tend to set high standards for the entire sector and thus disregard some individual company characteristics, which have subsequently limited influences on wages. On the other hand, stronger union organization increases worker negotiation powers and thus their ability to capture part of the firm's profit.

We may partially examine the role of unions in the process of rent sharing by combining the data on profit-related benefits from the statistical surveys of the ČSÚ and the data on sectoral union coverage rates from the ISPV.[33] Specifically, we examine correlations between the share of profit-based benefits on total wages and the share of workers covered by higher-level collective agreements (HLCA), enterprise-level collective agreements (ELCA) and no collective agreement at all. The resulting coefficients then seem to give more evidence in favour of the latter theoretical implication discussed above. The highest correlation of 0.16 was obtained for HLCA, then a correlation of 0.02 for ELCA and -0.12 for no existing collective agreement. Indeed, it appears that wage negotiation on industry levels helps workers capture a larger portion of company rents.

But what of relation between the union coverage rates and the inter-industry wage differentials? The figures in the first column of Table 13 show that wages in higher paying industries are usually negotiated at company level, rather than industry level. However, HLCA might be complemented by ELCAs, whose usually rearranged wages are above the level of sectoral agreements. Therefore, in the case of ELCAs, the value of the correlation might be overestimated to the detriment of HLCAs. More interesting results are presented in the second column. It shows the correlations between the inter-industry wage differentials and a multiple of the amount of profit per worker and the shares of workers covered by different types of collective agreements. Thus the multiple puts sectoral profitability into the context of

[33] See the data and relating notes in subsection 3.2.

wage bargaining. As we previously discovered, inter-industry wage differentials are positively associated with (non-adjusted) profit per worker, where correlation resulted in 0.58. Similar correlations may also be observed in profit per worker, adjusted for the share of employees covered by ELCAs and no existing collective agreement. The latter value comes out even slightly above the initial correlation of non-adjusted profitability. On the other hand, a higher share of workers covered by industry agreements, which may serve as a proxy for the level of union centralization, seems to weaken the profitability - wage premia effect.

Table 13: Correlations of the inter-industry wage differentials and union and non-union coverage rates

	not adjusted for profit-per-worker	adjusted for profit-per-worker
Higher-level Collective Agreement	-0.36	0.32
Enterprise-level Collective Agreement	0.24	0.58
no Collective Agreement	0.07	0.59

All in all, our findings are ambiguous. On one hand, centralized wage negotiation appears to amplify rent-sharing. On the other hand, the inter-industry wage differentials seem to be unaffected by the levels of unionization in sectors. These unclear results only confirm that the process of wage bargaining is very complex and its thorough examination would require matched firm-worker datasets, with more detailed classifications of sectors.

6.2 Labour Turnover Costs and Firm Size

Labour Turnover Costs

The labour turnover model offers another theoretical explanation for inter-industry wage differentials.[34] The central theory is that firms are motivated to increase wage levels if they face higher labour turnover costs. Therefore, if inter-industry wage differentials are really a consequence of varied labour turnover costs, we would observe a positive relation between the sectoral wage premia and costs associated with search, recruitment and training.

[34] See subsection 2.2 for details.

The second part of the Table in Appendix C provides a detailed deconstruction of indirect labour costs. Within the category of indirect costs, personnel costs represent only a small fraction of 4.6 percent. Still, one finds that both recruitment and vocational training costs are strongly and positively correlated with wages paid for time worked (correlation coefficients of 0.68 and 0.89 respectively). Moreover, we find an even stronger relation to both recruitment and training costs, with estimated inter-industry wage differentials, where correlation coefficients increase to 0.86 and 0.94 respectively. The latter figure indicates that sectors in which firms invest more into the human capital of their workers also tend to pay them higher wages. This finding has two distinct explanations. Firstly, thanks to training, workers increase their price in the labour market, which leads to demanding a higher wage.[35] This conclusion is in line with the competitive theory and our previous findings from section 5.2, where we found that sectors with higher industry wage premia also require better qualified workers. However, the strong relation between wages and training costs can also mean that firms pay above average wages because, after investing into training, they hope to prevent workers from leaving.

The wage-recruitment costs relationship, on the other hand, presents clearer evidence in favour of labour turnover. The logic behind this is that, if some firms find unfilled vacancies more costly, they are willing to spend more sources to speed up the matching process. Higher recruitment costs are thus an indication that better paying industries must face higher labour turnover costs, subsequently creating an incentive to pay wages above competitive levels. We can therefore assume that higher average wage levels in certain industries are at least partially caused by higher labour turnover costs.

Firm Size

The last subsection is dedicated to an examination of firm size – wage effect as a possible explanation for our estimated inter-industry wage differentials.[36] Table 14 shows components of labour cost varying with size of firm. With the exception of

[35] Naturally, there is a question to what extent the training is company specific and whether it can be further used in other sectors or firms. Answering this question is extremely difficult and demands a comprehensive survey among companies.
[36] Theoretical explanations together with empirical evidence were discussed in the subsection 2.2.

firms numbering workers between 100 and 499, we observe that wages and social security contributions increase with firm size. Only personnel costs and social benefits are found, without an exception, to increase monotonically with size. It also appears that smaller firms place more emphasis on wages rather than on non-wage benefits, compared to bigger firms.

Table 14: Components of monthly labour cost by firm size

Num. of employees	Total labour costs	Wages and salaries	Payments for days not worked	Social benefits	Statutory social security contributions	Personnel costs
1 - 9	22 456	15 144	1 424	56	5 757	114
10 - 19	26 291	17 359	1 846	198	6 645	157
20 - 49	27 705	18 115	2 085	228	7 011	164
50 - 99	33 835	21 949	2 676	298	8 565	221
100 - 249	32 687	20 941	2 475	502	8 099	380
250 - 499	33 532	21 429	2 542	571	8 227	464
500 - 999	33 955	21 509	2 656	582	8 311	513
1000 and more	38 562	23 975	2 922	926	9 282	819

Source: ČSÚ (2008)

However, as can be seen in the Table in Appendix D, the positive relation between labour costs and firm size does not hold for every sector in the economy. Specifically, in the sectors of wholesale and retail trade (section G), accommodation and food service activities (section I), information and communication (section J), finance and insurance (section K), real estate activities (section L), professional a scientific activities (section M) and arts, entertainment and other service activities (sections R and S), firms under 500 employees tend to demonstrate the highest labour costs (both wages and benefits).

It seems, that labour costs increase monotonically with firm size only in non-service sectors, such as agriculture, manufacturing or construction. Moreover, in the sectors listed, one finds both high-paying (finance and insurance, information and communication) as well as low-paying industries (accommodation and food service activities, arts, entertainment and other service activities). Firm size therefore appears to have no particular effect on inter-industry wage differentials.

6.3 Summary

This section focuses on examining inter-industry wage differentials from the perspective of efficiency wage theories. In the analyses, we used aggregated data on sectors and computed correlations to find relations between inter-industry wage differentials and factors that the efficiency wage models identified as potentially relevant.

Specifically, both profit-based benefits and profit per worker were found to be positively related with inter-industry wage differentials. We also found that inter-industry wage differentials can be partially attributed to sectoral differences in labour turnover costs. On the other, firm-size and levels of wage bargaining centralization seem to have only a limited effect on the differentials. However, the analysis was conducted on limited number of observations causing its results to be sensitive to outliers. Therefore, our previous findings should be considered with caution.

7 Conclusion

The goal of this master thesis was to examine the magnitude and causes of inter-industry wage differentials in the Czech Republic. Specifically, we focused on finding whether these differentials derive from sectoral differences in the unobserved ability of the labour force or from an ability to pay. For this purpose, we relied upon three different data sets: the European Union – Statistics on Income and Living (EU-SILC), the Average Earnings Information System (IPSV) and the statistical surveys conducted by the Czech Statistical Office (ČSÚ).

To investigate wage disparities across sectors we estimated the traditional Mincer-type wage equation by applying robust estimators on micro-level data from the EU-SILC survey. Overall, the results obtained were satisfactory. The model demonstrated mediocre explanatory power (of adjusted R^2 equals to up to 48 percent), which is typical for these types of regressions. Most of the explanatory variables included were strongly statistically significant and the values of the estimated coefficients were in accordance with labour market theories.

Following the methodology of Krueger and Summers (1988) and Zanchi (1998) we identified inter-industry wage differentials for 13 sectors, classified based on the NACE one-digit codes. The results confirmed the presence of wage differentials across sectors, even after controlling for a large number of individual and job characteristics. The variation of the inter-industry wage differential amounts to approximately 5 percent (measured by the WASD), with a maximum wage level differential of 25 percent between the financial and agriculture sectors.

The hypothesis of unobserved ability was tested by applying two distinct approaches. Both provided evidence in favour of the competitive wage theories. Specifically, by estimating industry wage premia on observable worker characteristics, the results confirmed the hypothesis of varied requirements for worker abilities across sectors. Moreover, we also found that the observable worker abilities that increase wages within industries also tend to work similarly for industry wage premia. In other words, the inter-industry wage differentials can be to a certain

extent attributed to unobserved worker abilities. These findings were partially confirmed by the quantile regression analysis, whose results indicated higher concentrations of better qualified workers in higher-wage industries. Therefore, given the evidence, the hypothesis that part of industry wage differentials derives from unobserved abilities was not rejected.

Unlike the previous analyses, examination of the inter-industry wage differentials from the perspective of efficiency wage theories relied only upon aggregated data on sectors and computations of correlations. Specifically, both profit-based benefits and profit per worker were found to be positively related with sectoral wage premia. We also found that the inter-industry wage differentials can be partially attributed to sectoral differences in labour turnover costs. Even so, firm-size and levels of wage bargaining centralization seem to have only limited effects on the differentials.

Nevertheless, our results are not entirely conclusive. First of all, unlike other similar studies, our analyses were not conducted on matched firm-worker databases, which prevented us from including many relevant variables (level of wage bargaining, profit per worker) in our regressions. Moreover, the EU-SILC dataset works with less detailed classifications of sectors, highest level of attained education and establishment size. The classification of sectors especially caused some potential high paying industries (electricity, gas, steam and air conditioning supply or mining and quarrying) not to appear in our final results. In the case of unobserved ability, though both our applied methods found some evidence in favour of competitive theory, neither was able to control for fixed effects. Therefore, further research in this area should apply panel data analysis. The long and the short of it is that the greatest challenge to this area of research lies in finding detailed data sets

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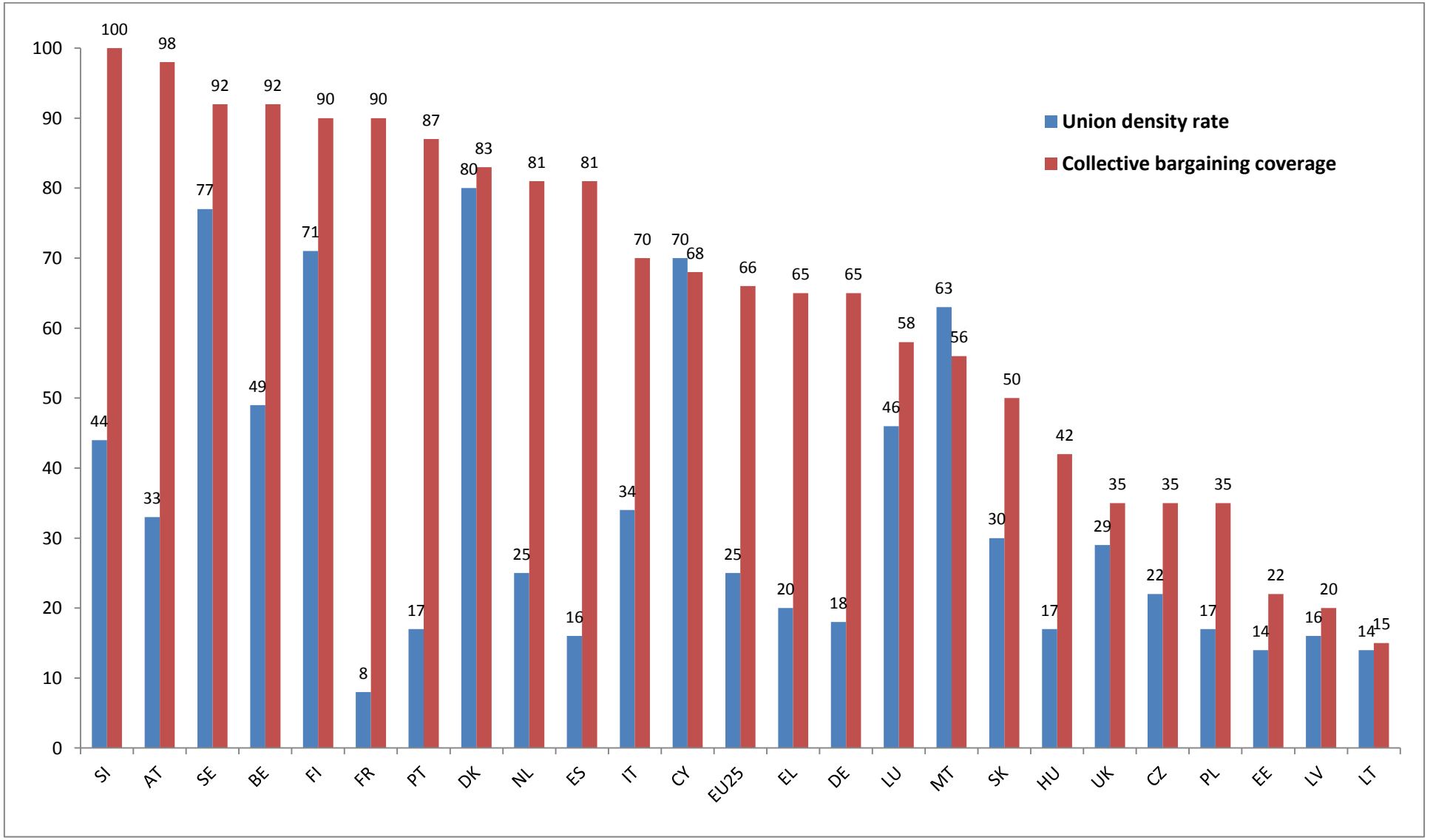
Appendix A: Union density and Coverage rate in the EU Countries.



Source: EIRO (2007)

Appendix B: Description of the EU-SILC data

Dependent variable - $log(w)$
Gross hourly wage: The total remuneration in CZK without tax and social contribution deduction, including wages and salaries paid in cash for time worked plus bonuses such as holiday payments, thirteenth month payment, company car, luncheon vouchers, etc. but excluding other bonuses such as business travel, redundancy payment, etc. Gross hourly wage is computed by dividing gross yearly income by the number of hours worked per week and the number of weeks spent in a paid work in the last year $$Gross\ hourly\ wage = \frac{Gross\ personal\ yearly\ income}{\#Months * 4{,}345 * (Hours\ per\ week)}$$
Individual characteristics - X_j
Education: The highest level of an educational programme the person has successfully completed. The educational classification to be used is the International Standard Classification of Education (ISCED 1997 classification): 1. primary or no education (*Ref*) 2. lower secondary education 3. upper secondary education (including post-secondary non tertiary education) 4. tertiary (first stage of tertiary education and second stage of tertiary education)
Experience: Number of years spent in paid work - the number of years, since starting the first regular job, that the person has spent at work, whether as an employee or self-employed
Gender: 1 Male 2 Female (*Ref*)
Region: The region of the residence of the individual at the date of interview 1 Prague 2 Other (*Ref*)
Citizenship: 1 Czech

2 Other (*Ref*)
Job characteristics - X_j
Hours: Number of hours usually worked per week in main job, including extra hours.
Managerial position: 1 supervisory 2 non-supervisory (*Ref*)
Type of contract: 1 permanent job/work contract of unlimited duration 2 temporary job/work contract of limited duration (*Ref*)
Occupation (ISCO-88 classification): 11 Legislators, senior officials and managers (*Ref*) 12 Corporate managers 13 Managers of small enterprises 21 Physical, mathematical and engineering science professionals 22 Life science and health professionals 23 Teaching professionals 24 Other professionals 31 Physical and engineering science associate professionals 32 Life science and health associate professionals 33 Teaching associate professionals 34 Other associate professionals 41 Office clerks 42 Customer services clerks 51 Personal and protective services workers 52 Models, salespersons and demonstrators 61 Skilled agricultural and fishery workers 71 Extraction and building trades workers 72 Metal, machinery and related trades workers 73 Precision, handicraft, craft printing and related trades workers 74 Other craft and related trades workers 81 Stationary-plant and related operators 82 Machine operators and assemblers 83 Drivers and mobile plant operators 91 Sales and services elementary occupations 92 Agricultural, fishery and related labourers 93 Labourers in mining, construction, manufacturing and transport

Employer's characteristics - Y_k
Establishment size: Number of persons working at the local unit 1 between 1 and 10 persons (*Ref*) 2 between 11 and 49 persons 3 50 persons and more
Industry variables - Z_l
Industry affiliation (NACE 1 digit): SECTION A — Agriculture, forestry and fishing (*Ref*) SECTIONS B-E: • Mining and quarrying • Manufacturing • Electricity, gas, steam and air conditioning supply • Water supply, sewerage, waste management and remediation activities SECTION F — Construction SECTION H — Transportation and storage SECTION I — Accommodation and food service activities SECTION J — Information and communication SECTION K — Financial and insurance activities SECTIONS L-N: • Real estate activities • Professional, scientific and technical activities • Administrative and support service activities SECTION O — Public administration and defence, compulsory social security SECTION P — Education SECTION Q — Human health and social work activities SECTIONS R-U: • Arts, entertainment and recreation • Other service activities • Activities of households as employers; Undifferentiated goods- and services-producing activities of private households for own use • Activities of extraterritorial organisations and bodies

Appendix C: Hourly labour costs across sectors by item of labour costs

	CR Total	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas and steam supply	Water supply; sewerage management	Construction	Wholesale and retail trade	Transportation and storage	Accommodation and food service activities	Information and communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical activities	Administrative and support service	Public administration and defence	Education	Health and social work activities	Arts, entertainment and recreation	Other service activities
1. TOTAL WAGES FOR TIME WORKED	143	105	188	135	220	129	141	142	146	90	237	279	146	192	94	164	133	132	115	114
basic wages	109	81	117	101	151	96	108	113	109	74	184	204	125	157	77	120	100	95	92	96
bonuses paid at fixed periods	15.0	12.4	31.4	17.8	21.8	15.4	18.6	17.7	15.0	9.4	30.1	36.0	11.8	18.7	8.4	7.4	5.0	5.5	8.7	8.9
bonuses based on economic results	6.0	4.8	7.8	4.3	9.9	5.5	9.4	6.4	5.3	3.2	14.6	17.0	4.9	9.5	2.9	3.5	8.8	5.1	3.7	2.9
bonuses paid from profit	**0.4**	**0.2**	**0.2**	**0.4**	**8.7**	**1.1**	**0.1**	**0.3**	**0.1**	**0.1**	**0.9**	**1.9**	**0.1**	**0.3**	**0.1**	**0.2**	**0.1**	**0.4**	**0.7**	**0.2**
periodic bonuses	1.8	0.6	12.6	2.1	10.7	2.9	1.6	0.6	2.2	0.3	1.5	3.0	1.7	2.3	0.5	3.5	1.0	0.6	1.5	0.9
overtime additional pays	1.2	1.3	2.0	1.6	1.3	1.3	1.0	0.6	1.8	0.5	0.7	0.3	0.2	0.3	0.6	1.3	0.4	3.0	0.4	0.3
other premium	7.6	3.0	15.0	5.5	11.3	4.0	1.6	2.0	10.0	1.6	2.3	1.5	1.2	2.6	3.3	25.0	14.9	19.3	7.3	3.4
bonuses for being on call to work	0.4	0.1	0.9	0.2	2.0	1.2	0.1	0.0	0.7	0.0	1.6	0.4	0.2	0.0	0.1	1.4	0.0	1.5	0.1	0.1
other wages	1.9	1.8	1.6	2.1	3.5	1.4	0.5	1.1	1.7	0.2	1.8	15.7	0.4	0.9	1.0	1.8	2.2	1.7	1.0	1.7
2. WAGE COMPENSATION	16.9	12.7	27.4	17.2	24.9	14.8	15.7	14.3	17.4	8.7	24.5	28.9	13.6	18.9	8.7	18.5	22.8	15.3	12.3	12.3
paid leave	14.6	9.9	21.1	13.7	22.0	12.8	13.1	12.5	14.8	7.7	22.8	27.0	12.6	17.6	7.6	16.6	21.7	14.5	11.4	11.3
paid idle time and other impediments on employer's side	0.2	0.1	0.5	0.4	0.2	0.0	0.1	0.0	0.4	0.0	0.1	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
paid impediments on employee's side	0.6	0.5	1.7	0.8	1.6	0.5	0.4	0.2	0.6	0.1	0.4	0.7	0.2	0.2	0.1	1.6	0.8	0.3	0.2	0.1
paid public holidays	1.5	2.1	4.1	2.2	1.1	1.5	2.0	1.6	1.6	0.9	1.1	0.9	0.7	1.1	1.0	0.2	0.3	0.5	0.7	0.8
1. - 2. DIRECT COSTS	**160**	**118**	**216**	**152**	**245**	**144**	**157**	**157**	**163**	**98**	**262**	**308**	**159**	**211**	**103**	**183**	**156**	**147**	**128**	**126**

	CR Total	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas and steam supply	Water supply; sewerage management	Construction	Wholesale and retail trade	Transportation and storage	Accommodation and food service activities	Information and communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical activities	Administrative and support service activities	Public administration and defence	Education	Health and social work activities	Arts, entertainment and recreation	Other service activities
3. SOCIAL BENEFITS	3.4	1.9	5.2	2.9	8.7	4.2	2.4	2.4	4.0	0.8	7.2	9.6	2.0	3.2	1.5	10.4	1.5	2.0	3.2	1.9
housing contributions	0.5	0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.0	0.0	0.2	5.9	0.0	0.1	0.1	0.0
company cars also for private purposes	0.6	0.2	0.4	0.6	1.0	0.6	1.0	0.7	0.3	0.2	3.4	2.5	0.3	0.8	0.3	0.1	0.0	0.2	0.2	0.4
contributions to catering	1.9	1.4	3.8	1.9	4.7	2.9	1.3	1.6	2.3	0.6	2.9	5.1	1.4	2.1	1.1	2.9	1.1	1.1	2.7	1.3
expenditures from social fund	0.5	0.2	1.0	0.3	2.6	0.7	0.1	0.1	1.3	0.1	0.7	0.9	0.3	0.3	0.0	1.5	0.3	0.7	0.2	0.1
4. SOCIAL COSTS AND EXPENDITURES	57.6	43.3	86.0	55.7	92.3	52.3	55.1	55.4	60.2	34.7	92.6	104	57.3	74.8	36.0	66.7	55.4	52.8	45.3	44.6
statutory social security contributions	55.3	41.6	44.1	52.9	82.7	50.2	53.7	53.9	55.8	33.9	87.2	97.3	55.4	73.1	35.3	64.2	54.9	51.9	44.5	43.8
non-statutory social security contributions	1.2	1.0	2.6	1.4	3.7	1.6	0.9	0.7	2.6	0.3	2.3	5.0	0.8	0.8	0.3	0.5	0.3	0.6	0.4	0.4
severance pay	1.0	0.5	2.1	1.3	5.2	0.4	0.4	0.8	1.7	0.4	2.8	1.8	0.7	0.7	0.2	2.0	0.1	0.2	0.4	0.3
5. PERSONNEL COSTS	**2.9**	**1.3**	**2.8**	**3.1**	**7.0**	**2.1**	**2.4**	**1.6**	**3.1**	**1.6**	**5.2**	**8.9**	**1.6**	**2.7**	**2.2**	**7.7**	**1.0**	**1.1**	**0.9**	**1.0**
recruitment costs	**0.5**	**0.0**	**0.1**	**0.4**	**0.5**	**0.1**	**0.3**	**0.3**	**0.5**	**0.1**	**1.2**	**2.1**	**0.3**	**0.6**	**0.6**	**2.0**	**0.1**	**0.1**	**0.0**	**0.1**
vocational training costs	**1.2**	**0.3**	**0.7**	**1.2**	**4.3**	**1.0**	**1.1**	**0.7**	**1.3**	**0.5**	**3.3**	**6.0**	**0.8**	**1.7**	**0.6**	**2.4**	**0.4**	**0.5**	**0.3**	**0.6**
other personnel costs	**0.3**	**0.1**	**0.6**	**0.3**	**0.70**	**0.06**	**0.11**	**0.12**	**0.3**	**0.04**	**0.46**	**0.6**	**0.08**	**0.08**	**0.2**	**1.3**	**0.03**	**0.03**	**0.03**	**0.1**
6. TAXES AND SUBSIDIES	-0.3	0.0	-0.5	-0.3	-0.1	-0.2	-0.1	0.0	0.0	0.0	-0.5	0.1	-0.4	-0.3	-1.0	-0.9	0.1	-0.6	-0.9	-2.5
3. - 6. INDIRECT COSTS	63.7	46.6	93.6	61.4	107	58.4	59.9	59.4	67.3	37.0	104	123	60.6	80.4	38.7	84.0	58.0	55.4	48.5	45.0
1. - 6. TOTAL LABOUR COSTS	**224**	**164**	**309**	**214**	**353**	**202**	**217**	**216**	**231**	**135**	**366**	**431**	**220**	**291**	**142**	**267**	**214**	**203**	**176**	**171**

Source: ČSÚ (2008)

Appendix D: Hourly labour costs by NACE section and size of reporting unit

	Labour costs, total	Wages	Payments for days not worked	Social benefits	Social security contributions statutory	Personnel expenditures
A - Agriculture forestry and fishing	**164.06**	**104.79**	**12.72**	**1.93**	**41.59**	**1.72**
1 - 9, employees	145.49	96.16	10.47	0.07	37.50	0.29
10 - 19, employees	152.19	98.93	11.61	1.09	38.90	0.71
20 - 49 employees	153.93	99.72	11.80	1.38	39.12	0.99
50 - 99 employees	162.57	104.12	12.63	1.86	41.62	1.23
100 - 249 employees	164.51	105.10	13.06	1.81	41.61	1.85
250 - 499 employees	179.78	113.43	14.12	3.07	45.01	2.86
500 - 999 employees	147.24	94.30	11.22	2.77	37.24	0.64
1000 or more employees	219.14	130.67	16.56	6.00	53.40	7.29
B - Mining and quarrying	**309.10**	**188.14**	**27.41**	**5.24**	**77.10**	**8.88**
1 - 9, employees	208.47	136.16	15.13	1.30	52.67	0.73
10 - 19, employees	205.67	133.83	15.09	1.79	52.14	1.67
20 - 49 employees	218.61	141.66	15.81	2.01	54.89	3.13
50 - 99 employees	234.63	151.78	18.17	2.50	59.11	1.74
100 - 249 employees	252.92	160.18	21.13	4.22	61.89	3.46
250 - 499 employees	278.99	176.03	22.21	5.29	68.17	3.95
500 - 999 employees	217.73	137.62	16.95	2.71	54.34	4.70
1000 or more employees	333.31	200.10	30.54	5.80	83.42	11.10
C - Manufacturing	**213.63**	**135.04**	**17.21**	**2.85**	**52.94**	**2.79**
1 - 9, employees	152.83	101.63	10.49	0.47	39.17	0.13
10 - 19, employees	166.23	108.92	11.99	1.30	42.34	0.70
20 - 49 employees	172.45	112.63	12.52	1.52	43.82	0.80
50 - 99 employees	198.70	128.85	15.48	2.18	50.01	1.06
100 - 249 employees	204.55	130.16	16.12	2.70	51.05	2.88
250 - 499 employees	218.68	137.93	18.04	3.43	53.92	2.92
500 - 999 employees	230.68	144.02	19.42	3.50	56.54	3.38
1000 or more employees	254.23	156.37	21.48	3.87	61.93	4.93
D - Electricity, gas and steam supply	**352.77**	**219.96**	**24.92**	**8.67**	**82.72**	**9.59**
1 - 9, employees	218.57	147.70	15.27	0.46	53.75	0.19
10 - 19, employees	226.43	146.22	16.52	3.17	57.28	1.96
20 - 49 employees	248.69	158.23	19.18	3.52	61.79	4.55
50 - 99 employees	245.73	151.87	17.28	5.40	60.96	5.49
100 - 249 employees	296.49	188.33	19.91	6.50	70.62	7.12
250 - 499 employees	367.57	228.58	25.90	9.26	86.63	12.14
500 - 999 employees	363.74	221.27	24.98	14.32	86.24	9.67
1000 or more employees	446.76	276.87	31.77	11.28	101.58	13.67

E - Water supply; sewerage, waste management	**202.01**	**128.82**	**14.80**	**4.17**	**50.21**	**2.13**
1 - 9, employees	171.02	114.28	11.38	0.43	43.98	0.43
10 - 19, employees	188.47	123.33	12.86	2.39	47.58	1.67
20 - 49 employees	181.89	118.96	12.56	2.41	46.22	0.84
50 - 99 employees	176.48	115.48	12.96	1.93	44.42	0.87
100 - 249 employees	183.21	115.86	13.82	4.36	46.00	1.79
250 - 499 employees	222.29	138.54	17.37	5.95	53.61	3.74
500 - 999 employees	228.27	145.16	16.45	5.15	56.35	2.64
1000 or more employees	249.73	155.57	18.43	6.88	60.71	4.06
F - Construction	**216.65**	**141.10**	**15.65**	**2.44**	**53.68**	**1.41**
1 - 9, employees	148.65	99.27	10.17	0.17	38.16	0.07
10 - 19, employees	149.37	99.31	9.96	0.97	37.59	0.40
20 - 49 employees	155.48	103.38	10.32	1.08	39.00	0.46
50 - 99 employees	244.77	160.87	17.24	1.47	61.29	1.61
100 - 249 employees	332.08	213.28	25.39	4.86	80.30	2.49
250 - 499 employees	250.35	162.20	18.46	4.72	60.94	1.43
500 - 999 employees	282.02	176.33	22.75	5.49	70.42	4.03
1000 or more employees	333.92	211.17	25.95	6.99	80.71	4.50
G - Wholesale and retail trade	**216.01**	**142.36**	**14.25**	**2.40**	**53.89**	**1.51**
1 - 9, employees	148.69	100.48	9.10	0.40	38.14	0.13
10 - 19, employees	200.65	133.58	13.05	1.36	50.33	1.25
20 - 49 employees	222.97	148.17	14.56	1.61	55.78	1.67
50 - 99 employees	362.86	239.51	25.58	2.13	91.10	2.28
100 - 249 employees	236.06	152.38	15.37	3.88	57.23	4.36
250 - 499 employees	229.01	148.64	15.60	5.53	54.67	1.65
500 - 999 employees	184.62	120.06	12.54	3.21	46.20	0.88
1000 or more employees	191.07	124.14	12.38	3.90	47.96	0.77
H - Transportation and storage	**230.51**	**145.88**	**17.37**	**3.96**	**55.80**	**4.43**
1 - 9, employees	148.40	99.18	9.50	0.73	37.79	0.13
10 - 19, employees	164.73	109.43	10.89	1.15	41.52	0.51
20 - 49 employees	174.19	115.84	11.49	1.25	43.83	0.58
50 - 99 employees	246.60	162.34	17.20	1.48	61.80	1.63
100 - 249 employees	201.27	129.61	14.55	2.88	49.54	2.01
250 - 499 employees	201.82	130.25	14.30	2.58	50.56	1.83
500 - 999 employees	263.04	171.96	20.10	4.14	59.89	3.17
1000 or more employees	265.03	162.51	21.18	6.11	63.11	7.92
I - Accomodation and food service activities	**135.42**	**89.66**	**8.73**	**0.84**	**33.94**	**0.72**
1 - 9, employees	94.60	64.77	5.39	0.14	24.12	0.06
10 - 19, employees	106.70	71.54	6.74	0.51	26.91	0.20
20 - 49 employees	119.67	79.67	7.82	0.76	30.01	0.35
50 - 99 employees	209.37	137.60	14.68	1.22	52.34	1.27
100 - 249 employees	191.36	124.26	12.18	1.67	46.94	2.83
250 - 499 employees	171.72	111.96	11.89	1.49	43.25	1.13
500 - 999 employees	170.09	112.47	11.05	1.04	42.44	1.27
1000 or more employees	136.15	88.38	8.54	1.22	34.31	0.47

J - Information and communication	**366.20**	**237.31**	**24.45**	**7.17**	**87.22**	**5.36**
1 - 9, employees	202.87	135.65	11.72	1.05	51.17	0.11
10 - 19, employees	261.18	175.05	16.12	2.66	63.41	2.25
20 - 49 employees	274.11	183.72	17.00	2.95	66.19	2.31
50 - 99 employees	293.36	190.61	19.45	4.78	72.65	2.79
100 - 249 employees	448.81	291.60	31.43	11.76	108.68	4.10
250 - 499 employees	496.31	322.35	33.28	8.49	116.29	10.47
500 - 999 employees	469.35	299.55	31.82	13.36	107.86	8.32
1000 or more employees	408.09	259.21	28.14	9.14	95.56	8.20
K - Financial and insurance activities	**430.90**	**278.96**	**28.88**	**9.63**	**97.25**	**7.14**
1 - 9, employees	188.40	128.06	11.11	1.27	46.67	0.55
10 - 19, employees	354.38	234.55	22.47	5.41	83.85	4.09
20 - 49 employees	410.44	269.31	25.91	6.91	96.67	4.70
50 - 99 employees	518.89	341.82	35.18	10.87	117.59	6.65
100 - 249 employees	479.41	310.13	32.48	11.96	108.54	7.17
250 - 499 employees	503.23	316.80	35.60	12.83	115.90	7.72
500 - 999 employees	387.36	246.00	27.62	11.79	89.57	3.35
1000 or more employees	439.76	285.04	29.19	9.45	97.95	8.51
L - Real estate activities	**220.01**	**145.83**	**13.61**	**2.00**	**55.44**	**1.89**
1 - 9, employees	139.07	96.16	6.90	0.25	35.34	0.03
10 - 19, employees	224.03	149.11	14.04	1.88	56.67	0.75
20 - 49 employees	232.88	154.46	14.96	2.14	59.07	0.79
50 - 99 employees	503.76	334.38	32.50	3.90	129.31	1.08
100 - 249 employees	276.40	176.33	19.07	4.73	67.32	5.88
250 - 499 employees	254.68	157.46	17.12	4.05	61.49	12.17
500 - 999 employees	175.55	112.06	11.73	4.45	43.07	3.53
1000 or more employees	204.66	125.33	16.48	5.03	50.27	7.63
M - Professional, scientific and technical activities	**290.91**	**191.58**	**18.93**	**3.23**	**73.10**	**1.65**
1 - 9, employees	174.82	118.69	10.12	0.38	44.93	0.13
10 - 19, employees	264.47	175.75	16.71	2.14	66.89	1.30
20 - 49 employees	273.45	181.57	17.35	2.30	69.19	1.48
50 - 99 employees	470.02	312.29	30.51	3.00	120.07	1.82
100 - 249 employees	353.54	228.31	23.57	7.63	86.68	2.95
250 - 499 employees	348.92	224.05	25.57	5.25	85.47	3.36
500 - 999 employees	289.07	185.72	20.98	4.04	73.21	2.75
1000 or more employees	328.99	209.38	23.25	5.20	82.28	2.76
N - Administrative and support service activities	**141.84**	**94.44**	**8.70**	**1.49**	**35.28**	**0.67**
1 - 9, employees	147.31	100.05	8.66	0.20	37.33	0.22
10 - 19, employees	141.33	94.39	9.35	1.12	35.28	0.34
20 - 49 employees	143.83	95.97	9.52	1.21	35.84	0.27
50 - 99 employees	134.38	90.15	7.85	1.22	33.84	0.11
100 - 249 employees	138.62	96.19	9.04	1.50	35.63	0.72
250 - 499 employees	142.62	92.33	8.95	2.14	35.14	1.06
500 - 999 employees	148.39	96.32	8.95	1.92	35.92	1.62
1000 or more employees	141.70	93.61	8.07	1.61	34.71	0.61

O - Public administration and defence; compulsory social security	**266.98**	**164.49**	**18.53**	**10.41**	**64.21**	**2.49**
1 - 9, employees	140.01	99.27	9.08	0.15	36.51	0.06
10 - 19, employees	165.96	113.00	11.54	2.14	43.13	0.54
20 - 49 employees	181.99	122.32	12.76	2.65	46.86	1.05
50 - 99 employees	227.65	147.45	17.35	3.98	56.34	1.14
100 - 249 employees	238.71	153.18	18.07	4.60	60.10	1.37
250 - 499 employees	252.09	162.03	18.51	5.22	63.11	1.39
500 - 999 employees	259.55	166.34	19.14	5.82	64.25	1.43
1000 or more employees	298.23	177.56	19.87	15.48	69.72	3.56
P, - Education	**213.73**	**132.92**	**22.84**	**1.46**	**54.94**	**0.47**
1 - 9, employees	154.91	101.14	13.97	0.02	40.70	0.02
10 - 19, employees	184.59	115.92	19.28	1.13	47.66	0.19
20 - 49 employees	206.43	128.57	22.48	1.37	53.49	0.21
50 - 99 employees	203.01	125.32	22.93	1.12	52.80	0.32
100 - 249 employees	221.68	133.98	23.71	1.85	55.52	0.99
250 - 499 employees	235.64	149.38	22.53	2.08	58.18	0.55
500 - 999 employees	263.19	163.34	26.33	2.75	67.76	1.30
1000 or more employees	281.44	177.56	27.74	2.61	70.99	1.22
Q - Human health and social work activities	**202.84**	**132.19**	**15.30**	**2.03**	**51.88**	**0.93**
1 - 9, employees	158.12	103.64	11.56	1.90	39.74	0.01
10 - 19, employees	161.56	104.24	14.20	1.37	41.57	0.30
20 - 49 employees	174.10	110.95	16.27	1.02	45.09	0.39
50 - 99 employees	164.51	108.13	14.00	1.35	43.41	0.24
100 - 249 employees	180.72	117.35	13.66	2.02	46.52	0.73
250 - 499 employees	199.23	129.74	14.68	1.95	50.72	0.95
500 - 999 employees	210.98	136.67	15.57	2.23	54.10	1.16
1000 or more employees	227.69	149.15	16.27	2.40	57.72	1.26
R - Arts, entertainment and recreation	**176.05**	**115.28**	**12.30**	**3.20**	**44.54**	**0.75**
1 - 9, employees	164.32	110.38	11.41	0.14	42.02	0.06
10 - 19, employees	160.96	106.04	10.74	2.10	41.30	0.47
20 - 49 employees	165.33	108.39	11.33	2.63	42.26	0.60
50 - 99 employees	169.84	112.03	12.29	3.29	43.56	0.21
100 - 249 employees	178.82	116.48	13.19	3.73	46.21	0.86
250 - 499 employees	218.42	142.89	15.09	3.72	50.53	3.10
500 - 999 employees	185.27	120.73	12.66	3.79	46.86	0.27
1000 or more employees	171.76	110.32	11.48	5.30	43.62	0.67
S - Other service activities	**171.22**	**113.96**	**12.25**	**1.88**	**43.80**	**0.79**
1 - 9, employees	151.93	104.45	10.76	0.20	40.35	0.04
10 - 19, employees	164.94	110.31	11.78	1.37	42.19	0.42
20 - 49 employees	166.38	110.13	12.37	1.65	42.31	0.63
50 - 99 employees	180.61	118.38	13.46	2.23	46.27	0.48
100 - 249 employees	200.07	129.07	13.83	4.26	49.22	2.07
250 - 499 employees	172.54	120.40	11.66	2.39	45.93	1.07
500 - 999 employees	176.15	113.57	12.50	2.38	43.31	1.69