GENDER PAY GAP:
EVIDENCE FROM THE CZECH PRIVATE COMPANY

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Abstract: *The aim of this article is to find out if in the analyzed company there exists a pay discrimination between women and men. If so, how big it is and what impact it has on real salaries. In the analyzed company the survey was focused on the salaries' differentiation of random sample of 30 women and 30 men working on the same or similar positions, enrolled in the same pay scales and working full time. The prerequisite for the distribution of salaries in the population was a normal distribution. The construction of two-sided confidence interval for estimating salary variation in the population was based on χ2 distribution and give us a reply on the question at what interval the standard deviation of salaries in the population of all men and women in the company can be expected with 95% probability. For this purpose, there was used the estimate of variance of the population. Findings show a still occurring gender pay gap.*

Keywords: *Equal Pay, Sex Bias, Gender Discrimination, Salaries Differentiation, Estimate of Variance of the Population.*

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1.   INTRODUCTION

As Armstrong (2005) has stated: "discrimination arises when equals are treated unequally" (p. 131). Historically, the position of women and men on the labor market has changed and is related to the social status of women, the possibility of obtaining and then apply their education and the legitimacy of being economically self-sufficient and independent of men. First women obtained work based on their care skills. Already here we can see the beginnings of the gender segregation of labor which is still a significant cause of unequal pay. During the war, women were pragmatically allowed to enter the labor market and were recruited into the male professions because of the lack of male labor. After the war, the economic emancipation of women and their participation in the labor market was generally supported. However, family and household care still remain the domain of the woman till today. Historically, inequality between men and women has concerned segregation into different occupations as well as unequal pay. The Czech labor market has retained these specifics even after the revolution in 1989 till today. Economic theories monitor the influence of gender, age, education, the number of years of work, the influence of maternity and career breaks, the influence of market segregation, the influence of legislative activities and legal norms, the institutional influence of trade unions and so on. Maternity has a major impact on women's wages and careers. There are still lots of employers who perceive parenthood as incompatible with careers or full-time job based on statistically unsubstantiated assumptions of frequent absence of mothers at work or false unsubstantiated assumptions about the lack of leadership and management skills which are assessed as psychologically demanding and very time-consuming and therefore gender predetermined for men. According to Armstrong et all (2005), "Extended pay ranges, especially where progression is based on length of service, will favor men who are much less likely than women to have career breaks and may therefore progress further and faster" (p. 133). According to the research made by Hodges et all (2010), fathers in the labor market receive the so-called paternal bonus (i.e. higher wages) compared to mothers and childless men on the assumption that they are a stable and loyal workforce in connection with fulfilling a breadwinner role. Hultin and Szulkin (2003) confirm that where are more women managers, there is a lower level of internal gender segregation and women managers pay more attention to gender equality issues, including equal pay. According to Song et all (2019), "Gender pay equity is a desirable social value and an important strategy to fill every organizational stratum with gender-diverse talent to fulfill an organization's goals and mission." (p. 830). Yamamoto et all (2019) investigates how educational attainment affects occupational choice for men and women in urban and rural areas. Rafferty (2019) examines the effects of discrimination based on race, ethnic background, nationality, religion, sex, age, disability and sexual orientation on skill underutilization and under-skilling in 30 European countries. He stated, "People who experienced a variety of forms of workplace discrimination were more likely to report over-skilling, defined as having skills for more demanding roles than required for their job." Kronberg (2019) found "men often receive greater merit rewards than women for the same performance." He also stated, "gender disparities are significant only when supervisors have discretion over merit increases." According to Larraz et all (2019), "As long as men earn more per hour on average than women, gender wage inequality (understood as the differences on wage between each man and each woman will remain)" (p. 18). They stated, „vast majority of directors and senior executives working for big companies are men is at the root of the problem" (p. 19). Sato et all (2019) stated, "job segregation by gender is one major cause of the widely observed gender pay gap and that there are also gender differences in developmental job assignment for broader job experience". Bargain et all (2019) found evidence that the gender wage gap at the bottom of the wage distribution may be effectively reduced by a national minimum wage. (p. 532) According to Maume et all (2019), "As European countries have mandated quotas for women's representation on boards, and as women have increasingly

entered the ranks of management, a persistent gender gap in managerial pay remains." Cook et all (2019) stated, "the more direct influence women have over compensation decisions, the smaller the compensation gap." (p. 1292). The Ministry of Labor and Social Affairs on the official webpage informs that the gender pay gap was 21,1 %. Krizkova et all (2018) found "comparing internationally, the Czech Republic ranks among the countries in which wage variability, or more precisely wage inequality, significantly increased between 2002 and 2016 (p. 9). She stated, "The Czech Republic is a country with one of the highest levels of gender pay inequality." (Krizkova et all, 2018, p. 99).

2. METHODOLOGY

The estimate of variance of population σ^2 is a sample variance which is a distortion-free and consistent estimate, i.e.

$$\sigma^2 = s'^2_x \tag{1}$$

where sample variance is calculated according to the relationship:

$$s'^2_x = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n - 1} \tag{2}$$

In constructing the confidence interval, we assume that the quantity

$$\frac{(n-1)s'^2_x}{\sigma^2} \tag{3}$$

has χ^2 distribution with $v = n - 1$ degrees of freedom. The confidence interval is derived from the relationship

$$P\left(\chi^2_{\frac{\alpha}{2}} < \frac{(n-1)s'^2_x}{\sigma^2} < \chi^2_{1-\frac{\alpha}{2}}\right) = 1 - \alpha \tag{4}$$

Adjusting the inequality in parentheses we get a two-sided $100(1 - \alpha)\%$ confidence interval for variance in the population

$$\frac{(n-1)s'^2_x}{\chi^2_{1-\frac{\alpha}{2}}} < \sigma^2 < \frac{(n-1)s'^2_x}{\chi^2_{\frac{\alpha}{2}}} \tag{5}$$

Where $\chi^2_{\frac{\alpha}{2}}$ and $\chi^2_{1-\alpha}$ are quantiles of the distribution with $v = n - 1$ degrees of freedom. For more information please see (Hindls et all, 2006).

Hypothesis testing used in this paper is based on a random sample, there was verified if the average of the population μ is equal to a certain value of μ_0. The null hypothesis is formulated H_0:$\mu = \mu_0$. Alternative hypothesis is in the following practical case formulated H_1:$\mu < \mu_0$. Assuming that the variance in the population is known, we select the following formula as the test criterion

$$U = \frac{\bar{x} - \mu_0}{\sigma}\sqrt{n} \tag{6}$$

If we do not know the variance of the population, we estimate it by the sample variance

$$U = \frac{\bar{x} - \mu_0}{s'_x}\sqrt{n} \tag{7}$$

3. SURVEY OF MEN´S AND WOMEN´S SALARIES IN THE CZECH PRIVATE INDUSTRIAL COMPANY

The survey on differentiation of women´s and men´s salaries was focused on target group of technical economic employees who work in the same or in the similar position and are included in the same pay scale. According to information received from HR their salaries differ by personal bonuses, commute surcharges, long-term loyalty bonuses etc. Totally 816 employees in the technical-economic professions work in the company. 60 employees working in the same or similar position were randomly selected. 30 salaries of women were compared with 30 salaries of men. There was studied if there is any influence of parenting on salaries of women and men in this random sample. The assumption is that the distribution of salaries in the population of all technical-economic staff is normal. On the random sample there were calculated average salaries and standard deviations of both group and compared together. In the following Table 1 "X" represents salary "f(x)" represents distribution function of the normal distribution and "F(x)" represents the probability density function of the normal distribution both graphically shown on Figure 1.

Table 1. Salaries of women and men and calculations
of distribution functions of the normal distribution
Source: own calculations

Women				Men			
X	Mother	f(x)	F(x)	X	Father	f(x)	F(x)
28121	NO	0,0564683	0,0000645	31150	NO	0,0375458	0,0000435
28453	NO	0,0812507	0,0000854	31630	NO	0,0636644	0,0000663
28479	NO	0,0834932	0,0000871	32080	NO	0,0993112	0,0000928
28970	YES	0,1349503	0,0001232	32110	NO	0,1021247	0,0000947
29150	YES	0,1583808	0,0001372	32730	NO	0,1736279	0,0001364
29340	YES	0,1858474	0,0001519	32856	NO	0,1913479	0,0001449
29340	YES	0,1858474	0,0001519	32890	NO	0,1963131	0,0001472
29460	YES	0,2046294	0,0001611	33450	NO	0,2887123	0,0001816
29589	YES	0,2260296	0,0001707	33543	YES	0,3058288	0,0001864
29609	NO	0,2294572	0,0001721	33550	NO	0,3071352	0,0001868
29780	YES	0,2599217	0,0001841	33680	NO	0,3318266	0,0001930
29805	YES	0,2645441	0,0001857	33750	NO	0,3454401	0,0001960
30035	YES	0,3089373	0,0001999	33890	NO	0,3732597	0,0002013
30210	YES	0,3447455	0,0002090	33910	YES	0,3772924	0,0002020
30345	NO	0,3733747	0,0002149	34230	YES	0,4433515	0,0002099
30760	NO	0,4651765	0,0002256	34580	YES	0,5173859	0,0002119
30990	NO	0,5172022	0,0002262	34596	NO	0,5207755	0,0002118
31020	NO	0,5239855	0,0002260	34670	NO	0,5364288	0,0002112
31098	NO	0,5415847	0,0002252	34750	YES	0,5532874	0,0002102
31150	YES	0,5532745	0,0002244	35134	YES	0,6323629	0,0002003
31240	NO	0,5733922	0,0002226	35469	YES	0,6971478	0,0001856
31280	NO	0,5822756	0,0002216	35509	YES	0,7045320	0,0001836
31295	NO	0,5855964	0,0002212	35958	YES	0,7811795	0,0001569
31709	NO	0,6740744	0,0002045	36449	YES	0,8501820	0,0001239
31790	YES	0,6904627	0,0002001	36587	YES	0,8666253	0,0001145
31879	NO	0,7080418	0,0001949	37239	YES	0,9274699	0,0000734
32020	NO	0,7348984	0,0001859	37432	YES	0,9405974	0,0000628
32352	YES	0,7927837	0,0001623	37591	YES	0,9499468	0,0000549
33467	NO	0,9263203	0,0000793	37628	YES	0,9519446	0,0000531
34468	NO	0,9781536	0,0000296	38514	YES	0,9836209	0,0000217

The probability density functions of the normal distribution of womens´ and mens´ salaries

Distribution functions of the normal distribution of womens´ and mens´ salaries
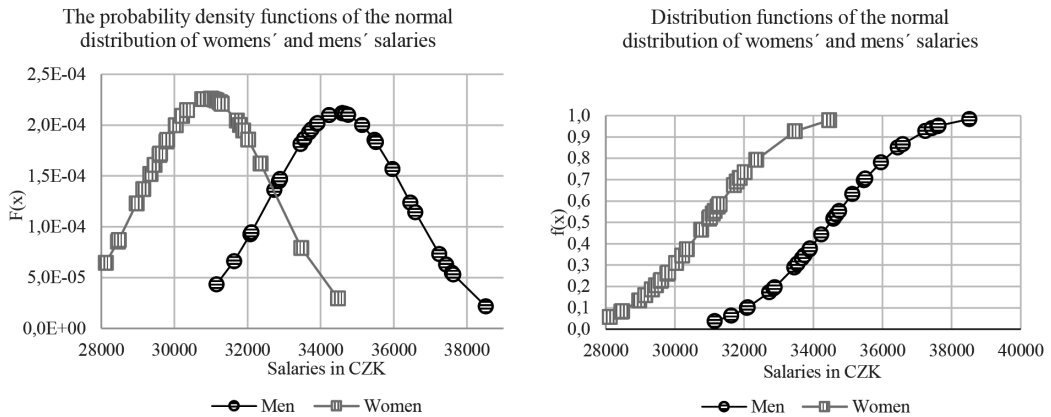
Figure 1. Distribution of women´s and men´s salaries in the random sample
Source: own calculations

Table 2. Gender statistics calculated from the random selected population
in the analysed company
Source: own calculations

Statistics	Women	Men	Ratio	Differences		All
				Rel.	Abs.	
Average	30573	34585	88%	12%	4012	32579
Median	30553	34405	89%	11%	3853	32095
Max	34468	38514	89%	11%	4046	38514
Min	28121	31150	90%	10%	3029	28121
Standard deviation	1451	1902	76%	24%	451	2624

The median salary is the real salary of the employee in the middle of the salary distribution. The average salary is the sum of all earnings in the population under review divided by the number of women and/or men in the population. The average has the advantage that it counts all the earnings in the sample, but it is disadvantageous in that it is influenced by limit values that distort it to some extent. In the random sample the average gross salary in 2019 was 32.579 (men: 34.585 CZK; women: 30.573 CZK). The median gross monthly salary in the sample in 2019 was 32.095 CZK (men: 34.405 CZK; women: 30.553 CZK). It is possible to say that men earn in average 4.012 CZK a month more than women. The average monthly salary of women is 88 % of the average monthly salary of men. In other words, women are remunerated on average 12 % less per month than men.

Table 3. Gender comparison with focus on an influence of parenthood on salaries
Source: own calculations

Average salary	Women		Difference		Men		Difference	
	Mother	Childless	Abs.	Rel.	Father	Childless	Abs.	Rel.
	30075	30955	-880	-3%	35908	33074	2834	9%

The data in Table 3 show that mothers earn monthly less compared to childless women (abs. -880 CZK, rel. -3 %). In contrast, fathers earn monthly more than childless men (abs. 2.834 CZK, rel. 9 %).

The next task is to find out at what interval the standard deviation of the salaries of technical-economic workers in the whole analyzed company could be expected with 95% probability. For this

purpose, a two-sided confidence interval was used for estimating the salary variance of technical-economic workers in the company which is compiled according to Formula 4.

Table 3. Gender estimation of salary variance - all female and male population in the company
Source: own calculations

Women		Men		All	
$\frac{(30-1)1451^2}{45,7} < \sigma^2 <$	$\frac{(30-1)1451^2}{17,7}$	$\frac{(30-1)1902^2}{45,7} < \sigma^2 <$	$\frac{(30-1)1902^2}{17,7}$	$\frac{(30-1)2624^2}{45,7} < \sigma^2 <$	$\frac{(30-1)2624^2}{17,7}$
$1156 < \sigma < 1857$		$1515 < \sigma < 2435$		$2090 < \sigma < 3359$	

The standard deviation of salaries in the company can be expected with 95% confidence at the interval of $1156 < \sigma < 1857$ for women, at the interval of $1515 < \sigma < 2435$ for men and at the interval of $2090 < \sigma < 3359$ for both sexes.

According to published information on the website of the Czech Ministry of Labor and Social Affairs the difference between the average salary of a woman and the average salary of a man is almost CZK 7.000 per month. The total pay gap in the Czech Republic is 21.1% which has been stable in the long-term since 2002. Comparing with findings in the random sample in the analyzed company the difference looks better: abs. CZK 4.012 and rel. 13 %. Can the difference be attributed to chance, or is there a sign of an improvement in the gender pay gap in this company? Let´s make a testing hypothesis. The null hypothesis in this case is H_0: $\mu = 7000$. Unilateral alternative hypothesis H_1: $\mu = 4012$. The test is performed at the significance level $\alpha = 0,05$. The test criterion value is calculated using the Formula 7.

$$U = \frac{4012 - 7000}{2624}\sqrt{60} = -8,8205$$

In the one-sided test and the given level of significance $\alpha = 0,05$, the critical range is given by a set of values lower than -1.645, i.e. $W = \{U; U \leq -1,645\}$. The null hypothesis is rejected in favor of the alternative hypothesis at the 5% significance level because the test criterion value $-8,8205 < -1,645$. Thus, with a 5% risk of error, it can be argued that the gender pay gap in the analyzed company is lower than Czech national one and the difference found between the national gender pay gap and the company gender pay gap found in the random sample cannot be attributed to chance.

4.   FUTURE RESEARCH DIRECTIONS

Fair pay, flexible working conditions, seeking work life balance are key issues especially for women with children. Gender stereotypes are still deeply rooted in the Czech society. A next future research could be directed to answer a question: "Why Czech women (or women generally in the west type of culture) are not usually able to negotiate the same wages as men". The next efforts could be focused on finding ways to minimize wage inequalities, wage discrimination and strengthen employment protection in the form of law and also in the form a stronger role of trade unions to eliminate specific negative gender stereotypes and promote fair pay and work-life balance free of sex bias. Using a regression analysis, it is possible to determine how much of the total value of the gender pay gap can be explained by sub-factors such as length of work experience, age or education etc. Unexplained value will than represent a value of direct discrimination. It would be also interesting to research what average wage cuts a Czech woman will have for each of her new-born child as a result of her career break and the related maternity penalization.

5. CONCLUSION

There is still a significant gap nationally between the earnings of men and women. According to government information, the gender pay gap has consistently been around 21 % since 2002.

In the analysed company the gender pay gap calculated on the random sample is 12 %. The hypothesis test determined that the difference between the company and national gender pay gap can be considered as significant in terms of improving the gender pay gap. Analysis shows that earnings increase with higher percentage of men in a given job and decrease with an increasing proportion of women. Looking at the performance of individual employees' gender pay inequality rates vary without directly correlating with productivity as well as human capital-related characteristics. Focusing on women, the so-called motherhood penalty still works, women with children achieve lower incomes than childless women and women (with or without children) achieve less than men in the analyzed company. In the random sample men on the same job earn more than women (abs. 4.012 CZK, rel. 12 %). The comparison of mothers and childless women shows that mothers earn less compared to childless women (abs. -880 CZK, rel. -3 %). In contrast, fathers earn more than childless men (abs. 2.834 CZK, rel. 9 %). In the random sample men with higher salaries were fathers. It can be argued, therefore, that male salaries were increased for their role as breadwinners, while the employer froze women's salaries during their career breaks due to their maternity leave and mothers are then penalized for their maternity. Even though mothers can reduce their income tax by claiming a tax relief to a dependent child, as well as men, but it can be claimed by only one of parents, they still do not equal the salary of childless women working in the same position. Even in the analyzed company, trade unions focus on wage increases, but they do not pay attention to gender inequalities and wage discrimination against women. Woman 's efforts to negotiate individual pay and rewards could be an example of what is not expected of women based on gender stereotypes. A woman can more often face negative reactions if she goes beyond what is understood as usual, normal and legitimate for women in a given society and culture, because according to gender stereotypes a such behavior is not expected of her. On the contrary, the negotiations on pay and rewards is expected to man as a breadwinner and is therefore generally understood as an acceptable behavior.

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