Determinants of the Gender Pay Gap in the Czech Republic and Selected European Countries

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Abstract:

The goal of the article is to analyse determinants of the gender pay gap in selected European countries. For my analysis, I used different types of data published by Eurostat, OECD, the Czech Statistical Office and the Ministry of Labour and Social Affairs of the Czech Republic. Determinants have been estimated using multiple regression analysis in selected European countries including the Czech Republic. The article is also focused on the Czech Republic data on the gross average salary in private and public sectors according to gender and administrative regions. Results show that the maternity benefits and a complicated situation in the labour market, where full-time jobs are preferred, and moreover the parental allowances are strong drivers of the gender pay gap in the Czech Republic. This implies that the issue of the gender pay gap in the Czech Republic is rather structural, influenced by the social system and the labour market features. Future research should take into consideration the tax allowances as well (specific tax credits on children and a spouse).

Keywords: Gender Pay Gap; Equal Pay; Czech Republic; EU; OECD.

JEL classification: J31; J39.

1 Introduction

The issue of the gender pay gap (GPG) is relevant in current research, but it is also popular among the EU countries' policymakers. GPG is a significant indicator of pay inequality between men and women in the labour market. Some countries have adopted specific regulation and have implemented an equal pay system of companies and institutions, *e.g.* Iceland and the UK. It is important to emphasise, that the issue of sizes of GPG is just a tool for how we can identify if some structural problems occur in the economy or not. The goal is to design suitable and flexible measures to help especially women to have children while keeping their position in the labour market.

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The goal of the article is to analyse determinants of GPG in selected European countries. The article is also focused on the Czech Republic data on the gross average salary in private and public sectors according to gender and administrative regions.

2 Literature Review

Addabbo and Favaro (2011) verified whether GPG varies between high- and low-educated workers, they used as explanatory variables education, experience, job tenure *etc.* The wage loss of women relative to men ranges between 4.5 and 11.3% if highly educated, and between 11.7% and 16.1% if low-educated.

Carillo and Sapio (2012) focused on discrimination in the public and private sectors, and they found out that female graduates employed in the public sector earn on average 14% less than male graduates in the same sector and GPG was even wider in the private sector, 24.5%.

Mussida and Picchio (2014) studied GPG by educational attainment in Italy. For low-educated workers was the average GPG 17%, and for high-educated workers 15% (7%/26% at the 10th/90th percentile).

Bonhomme and Hospido (2013) matched tax data to micro-level social security records in Spain and they found out that GPG is highest at the bottom of the distributions; men earn 20–30% more than women. The median of GPG was 13%. Salinas-Jiménez *et al.* (2013) focused on Spanish wage in a survey, in which women earn on average 22% less than men and GPG is larger amongst highly educated workers.

Vieira *et al.* (2003) studied data in Portugal, where women earn 29% less than men on average. Cardoso *et al.* (2012) have also focused on GPG in Portugal; women earn about 26% less than men. He has taken into consideration the workers' age, tenure, and fixed effects. Figueiredo *et al.* (2015) studied GPGs of graduates in Southern Europe and focused on GPG decomposition.

Goldin (2014) found out that GPG in pay would be considerably reduced and might vanish altogether if firms did not have an incentive to disproportionately reward individuals who laboured long hours and worked particular hours.

Lundborg *et al.* (2017) analysed if there is any link between the motherhood and future earnings of women. They explained the decline in annual earnings by women working less when children are young and getting paid less when children are older.

Magda and Sałach (2020) studied the GPG among domestically and foreign-owned companies in Poland. They explained that GPGs are larger in foreign-owned

companies than in domestic firms. Moreover, they found out that women earn less than men in the foreign-owned sector, but they have a higher range of wage premia. In domestic companies, men receive higher wage premia than women.

Buckman and Jackson (2021) analysed the relationship between gender and faculty salaries in Georgia (higher education institutions) in 2018. They found out that female professors receive significantly lower salaries than male professors. Even in female-dominant disciplines, males earned significantly more money than females. Frank (2020) found out that gender pay inequality has been persistent in the UK despite the Equal Pay Act from 1970 and for universities since 2010. GPG among British academics in 2016–2017 was 11.1%.

3 International Comparison

Wage inequality by gender can be expressed by GPG and this indicator is systematically estimated by Eurostat. GPG affects tax revenues and social security contribution revenues in long-term period, because of the lower level of incomes of females. Therefore, is important to find out what are the determinants of GPG, especially from the public finance of view.

Another issue is the rigidity of the labour market, *e.g.* the offer of part-time jobs for women, sick days, home office *etc.* and parameters of the social system (length of maternity leave and parental leave).

Tab. 1 indicates GPG in an unadjusted form in EU countries in 2017. It should be emphasised that this indicator is broader and more general rather than the adjusted GPG indicator. The highest level of GPG has been estimated for Estonia, the Czech Republic, Germany, and the UK. The lowest level of GPG has been estimated for Belgium, Italy, Luxembourg, and Romania. The average level of GPG is about 16%. The Median for 28 EU countries and Switzerland is 15.1%.

Tab. 1 GPG in unadjusted form (% of average gross hourly earnings of men, 2017)

Country	2010	2014	2017
European Union – 27 countries (from 2020)	15.8	15.7	14.5
European Union – 28 countries (2013–2020)	17.1	16.6	15.6
Euro area – 19 countries (from 2015)	17.0	16.8	15.5
Belgium	10.2	6.6	5.8
Bulgaria	13.0	14.2	14.3
Czech Republic	**21.6**	**22.5**	**21.1**

Country	2010	2014	2017
Denmark	17.1	16.0	14.8
Germany	22.3	22.3	20.4
Estonia	27.7	28.1	24.9
Ireland	13.9	13.9	14.4
Greece	15.0	12.5	n/a
Spain	16.2	14.9	13.5
France	15.6	15.5	15.6
Italy	5.3	6.1	5.0
Latvia	15.5	17.3	19.8
Lithuania	11.9	13.3	15.2
Luxembourg	8.7	5.4	2.6
Hungary	17.6	15.1	14.0
Malta	7.2	10.6	13.2
Netherlands	17.8	16.2	15.1
Austria	24.0	22.2	20.7
Poland	4.5	7.7	7.0
Portugal	12.8	14.9	10.8
Romania	8.8	4.5	2.9
Slovenia	0.9	7.0	8.4
Slovakia	19.6	19.7	20.1
Finland	20.3	18.4	17.2
Sweden	15.4	13.8	12.5
United Kingdom	23.3	20.9	20.8
Switzerland	17.8	17.4	17.0

Source: Eurostat, 2018.

More detailed information about the situation in GPG is expressed in Tab. 2; data were sourced from the OECD (2015) database. The table indicates the situation according to the level of education obtained (below upper secondary and tertiary education). Most of the observed countries have higher GPG for tertiary educated people in comparison with below upper secondary educated people. The highest level of GPG for upper secondary educated people is in Estonia and the lowest rate

is in Sweden. The Czech Republic has a higher GPG for tertiary educated people (30.7%) than the GPG for below upper secondary educated population (19%).

Tab. 2 GPG in mean full-time, full-year earnings, by levels of education, 25–64 years old, 2015 or latest year (in %)

Country	Year	Below upper secondary education	Upper secondary and post-secondary education	Tertiary education
Belgium	2017	10.6	8.3	13.5
Slovenia	2017	17.4	14.0	16.9
Spain	2016	20.0	22.4	17.8
Latvia	2017	26.7	28.2	19.8
Greece	2017	30.1	19.6	21.3
Sweden	2017	15.3	17.9	21.9
United Kingdom	2017	22.9	28.3	22.4
Netherlands	2017	13.0	16.7	22.9
Finland	2016	19.3	21.6	23.1
Australia	2016	17.5	23.1	23.6
Denmark	2017	16.9	19.0	24.1
OECD Average		21.8	21.8	24.4
Lithuania	2014	20.5	20.6	24.5
Austria	2017	23.9	17.8	24.6
Germany	2017	20.0	13.6	25.9
Estonia	2017	37.9	36.7	27.3
Portugal	2017	22.4	25.4	27.9
Ireland	2017	24.1	22.7	28.2
France	2015	21.7	19.9	28.9
United States	2017	29.5	29.5	29.0
Poland	2016	25.2	19.8	29.1
Italy	2015	20.0	23.4	29.7
Czech Republic	**2015**	**19.0**	**20.7**	**30.7**
Slovak Republic	2017	25.7	25.7	30.9
Hungary	2017	12.6	12.7	32.5

Source: OECD, 2015.

The average rate of GPG for OECD countries is 25.9% (tertiary educated) and 22.2% (below upper secondary educated). The Median for OECD is 26.3% (tertiary educated) and 21.1% (below upper secondary educated). According to these data is rather significant, that the level of obtained education has an impact on GPG and on average higher educated women face a higher level of GPG in most OECD countries. In fact, that means their salaries are lower in comparison to men's salaries.

Eurostat also publishes data about the GPG according to NACE activity (see Tab. 3). The level of GPG varies and it is influenced by the gender characteristic of each sector or by stronger regulation (public administration). The highest values of GPG are in NACE Financial and insurance activities sector, which is typical for higher skilled and educated professionals. Also, the GPG reaches a higher level in the Information and communication sector in comparison with other sectors. It should be noticed that average annual earnings in these two sectors are above average. Average annual earnings in the Czech Republic in all NACE sectors were almost EUR 13,000 in 2014, whereas average annual earnings in the Financial and insurance activities sector were EUR 22,033 and in the Information and communication sector EUR 22,353. In several countries and sectors, the GPG was negative, *e.g.* Bulgaria (Administrative and support service activities) −24.3%; nevertheless, this observation is not typical. The values have varied in the Education, Human health and social work activities and Arts sectors.

Tab. 3 Unadjusted GPG by economic activity (in %, NACE, selected EU countries)

Country	NACE codes									
	G	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**
Belgium	12.0	11.5	19.8	3.4	15.2	9.0	n/a	2.7	−1.1	0.8
Bulgaria	13.6	18.1	23.6	17.9	3.1	−24.3	6.7	8.2	28.0	6.1
Czech Republic	24.6	32.8	39.5	15.0	24.0	9.6	14.1	24.4	25.7	13.0
Denmark	17.8	17.4	19.0	9.5	19.8	2.3	6.0	5.3	9.3	9.2
Germany	23.7	25.1	27.9	12.7	30.7	14.3	7.7	12.7	20	31.9
Estonia	31.6	25.8	40.2	12.0	29.0	11.1	10.9	16.5	29.6	18.3
Spain	23.3	13.4	20.5	24.1	20.9	15.8	8.5	7.4	25.6	11.9
France	15.7	11.4	30.6	11.6	22.2	8.2	12.5	17.3	15.0	30.1
Croatia	24.3	14.3	25.0	14.7	12.7	−3.5	12.9	19.8	27.3	14.9
Italy	15.2	18.6	18.3	n/a	29.1	8.8	n/a	n/a	27.6	n/a
Latvia	24.2	16.2	29.8	13.8	14.6	6.2	−0.4	−11.5	17.3	13.6

Country	NACE codes									
	G	J	K	L	M	N	O	P	Q	R
Lithuania	21.0	28.2	38.1	12.9	16.8	13.2	4.1	1.0	28.0	10.2
Hungary	17.3	20.6	32.4	8.7	17.4	5.0	9.3	17.2	18.7	37.5
Netherlands	25.7	17.4	28.1	17.4	22.3	9.1	1.0	10.1	20.6	20.0
Austria	21.5	21.7	28.1	24.9	30.0	17.7	n/a	23.6	11.1	23.7
Poland	27.0	25.9	30.4	7.4	14.9	1.8	15.1	4.8	13.6	10.7
Portugal	16.0	11.7	23.6	18.9	19.4	16.9	n/a	10.8	28.2	45.8
Romania	11.8	16.3	28.2	10.6	1.8	−24.2	3.3	9.4	8.5	13.3
Slovenia	16.8	16.7	22.6	−3.7	−0.9	10.6	6.1	13.8	19.7	14.7
Slovakia	31.1	29.4	33.5	23.5	16.7	5.2	23.2	13.9	27.0	17.7
Finland	20.0	12.9	29.1	16.3	14.6	12.4	14.4	12.5	23.5	10.5
Sweden	13.4	10.2	25.5	8.1	12.3	3.2	5.2	8.2	9.9	7.9
United Kingdom	22.2	18.2	34.2	21.9	23.7	11.3	12.8	20.1	25.4	42.7

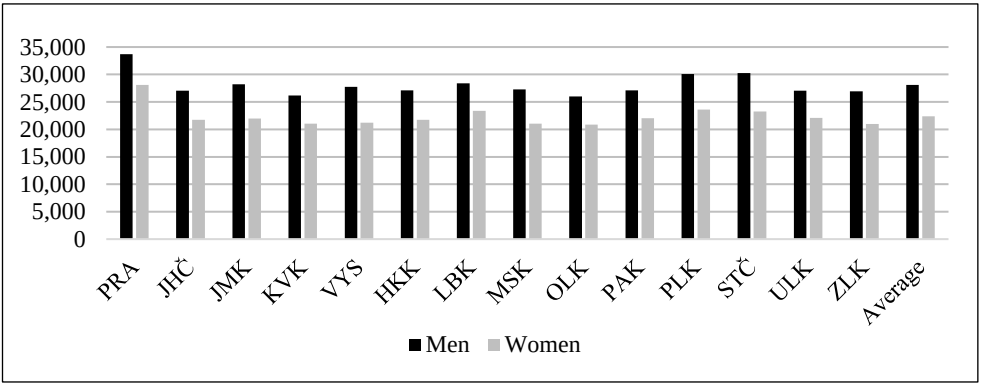
Source: Eurostat, 2018.

Note: NACE codes: G – Wholesale and retail trade; repair of motor vehicles and motorcycles, J – Information and communication, K – Financial and insurance activities, L – Real estate activities, M – Professional, scientific, and technical activities, N – Administrative and support service activities, O – Public administration and defence; compulsory social security, P – Education, Q – Human health and social work activities, and R – Arts.

4 GPG in Private and Public Sectors in the Czech Republic

The following section deals with the issue of the GPG in private and public sectors in the Czech administrative regions. Fig. 1 indicates the gross average salaries per month in the private sector in the Czech Republic according to the administrative regions (14 regions) and gender. The average gross salary for men in the private sector in the Czech Republic was CZK 28,069 and for women CZK 22,354. In all administrative regions, the gross average salaries of men are higher than the salaries of women. Data are based on the Ministry of Labour and Social Affairs database. The real GPG in the private sector is more significant in comparison with the public sector GPG.

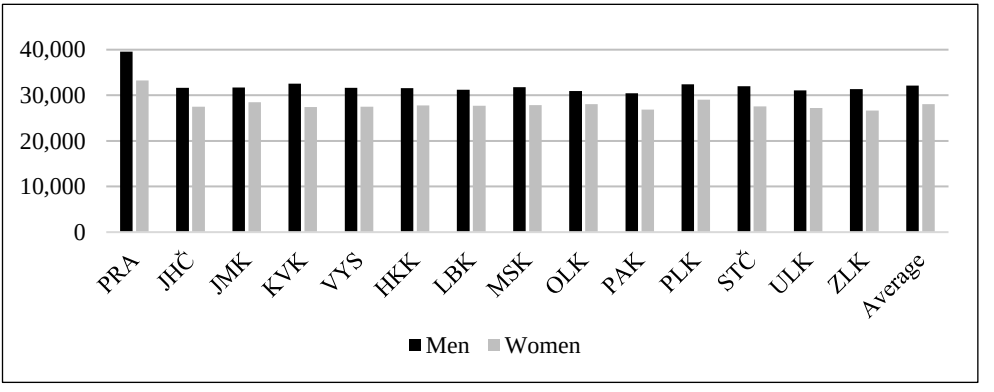
Fig. 1 Gross average salary per month in private sector (in CZK, Czech regions, 2017)



Source: Ministry of Labour and Social Affairs, 2017.
Note: PRA – Prague, JHČ – South Bohemian Region, JMK – South Moravian Region, KVK – Karlovy Vary Region, VYS – Vysočina Region, HKK – Hradec Králové Region, LBK – Liberec Region, MSK – Moravian-Silesian Region, OLM – Olomouc Region, PAK – Pardubice Region, PLK – Plzeň Region, STČ – Central Bohemian Region, ULK – Ústí nad Labem Region, and ZLK – Zlín Region.

Fig. 2 indicates the gross average salaries per month in the public sector in administrative regions according to gender. The average GPG is less significant in comparison with the private sector, but the GPG is still evident. The difference is caused by the wage regulations in the public sector, contrary to the private sector.

Fig. 2 Gross average salary per month in public sector (in CZK, Czech regions, 2017)



Source: Ministry of Labour and Social Affairs, 2017.

Tab. 4 illustrates the GPG in 14 administrative regions in the Czech Republic in both sectors – private and public. The highest GPG for the private sector is in the Central Bohemian Region 23.07% and in Moravian-Silesian Region 22.85%. On the contrary, the lowest GPG for the private sector is in Prague (the capital city). This is probably driven by the competitiveness of the local labour market. Prague's labour market is special within the context of other regions. In 2018 was the rate of unemployment 2.2% in the Czech Republic, but in Prague 1.3% only, which was the lowest level of all 14 regions. Also, the rate of economic activity was the highest 65.3% in comparison with the national average 60.6%. Average and mean values are almost identical for both sectors, 20.38% is an average and 19.81% is a mean value for the private sector and 12.59% is an average and 12.45% is a mean value for the public sector.

Tab. 4 GPG in private and public sector (in %, Czech regions, 2017)

Region	Private Sector	Public Sector
Prague	16.58	15.92
South Bohemian	19.60	13.14
South Moravian	22.09	10.10
Karlovy Vary	19.51	15.58
Vysočina	23.56	13.08
Hradec Králové	19.87	11.95
Liberec	17.66	11.23
Moravian-Silesian	22.85	12.31
Olomouc	19.75	9.33
Pardubice	18.83	11.70
Plzeň	21.44	10.41
Central Bohemian	23.07	13.90
Ústí nad Labem	18.37	12.58
Zlín	22.11	15.02
Average	20.38	12.59
Mean Value	19.81	12.45

Source: Ministry of Labour and Social Affairs, 2017.

5 Research Design

For the OLS model, I used the data published by Eurostat and OECD in the public database in 2017 and 2018. I analysed data from a total of 22 countries (Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom). Tab. 5 includes all types of indicators I considered relevant for my analysis. The dependent variable is a percentage of the general gender pay gap in each observed country. Independent variables were basically chosen from current literature research, especially attained education: Addabbo and Favaro (2011), Mussida and Picchio (2014), Salinas-Jiménez *et al.* (2013), Buckman and Jackson (2021), and Frank (2020). I also considered the so-called motherhood penalty (see Lundborg *et al.*, 2017) by analysing maternity and parental leave. And finally, I tried to analyse the impact of the labour market (see Goldin, 2014) and job flexibility considering the economic activity, female employment share, part-time employment share, female part-time share, monthly minimum wage ratio *etc.*

All variables have been considered for my analysis; some of them were irrelevant for further conclusions, as can be seen in Section 6. This approach is called from general to specific.

Tab. 5 Description of Variables

Variable	Description
GPG_GENERAL	Gender pay gap in %
GPG_TERTIARY_EDU	Gender pay gap for tertiary educated population in %
EMPLOY_F_SHARE	Female employment as a % of total employment
SELFEMPLOY_F_SHARE	Female self-employment as a % of female employment
PARTTIME_SHARE	Part-time employment as a % of employment
FEMALE_PARTTIME	Female part-time employment as a % of female employment
MATERNITY_LEAVE	Maternity leave (number of weeks)
PARENTAL_LEAVE	Parental leave (number of weeks)
MATERNITY_RATIO	Maternity leave as a % of 52 weeks
PARENTAL_RATIO	Parental leave as a % of 52 weeks
INACTIVITY_BELOWUPSEC	Economic inactivity of below upper secondary educated population in %

Variable	Description
$INACTIVITY\_UPPERSEC$	Economic inactivity of upper secondary educated population in %
$INACTIVITY\_TERTIARY$	Economic inactivity of tertiary educated population in %
$MINWAGE\_RATIO$	Monthly minimum wage as a proportion of average monthly earnings in %
$HOURS\_WEEK$	Average number of usual weekly hours of work in main job, by sex, professional status, full-time/part-time and economic activity (from 2008 onwards, NACE Rev. 2) in hours
$HOURS\_WEEK\_RATIO$	Share on EU-28 average in 2017 (37.1 hours) in %

Source: Eurostat, 2018; OECD, 2015.

I used the standard statistical test for heteroscedasticity (White's Test), multicollinearity diagnostics and the test of the normality of residuals as well. The models contain so-called information criteria: Aiko, Hannan-Quinn and Schwarz criteria, which deal with insufficient "penalty" of the excessive number of regressors using an adjusted coefficient of determination. Chow's test evaluates the stability of the model, and this test was considered in all regression models. Level of significance used in my models is: $^{*}\alpha = 0.1$, $^{**}\alpha = 0.05$, and $^{***}\alpha = 0.01$.

The final equation used in model 3 is expressed below:

$$GPG_i = \beta_0 + \beta_1 SELFEMPLOY\_F\_SHARE_i + \beta_2 FEMALE\_PARTTIME_i + \beta_3 MATERNITY\_LEAVE_i + \beta_4 PARENTAL\_LEAVE_i + \beta_5 INACTIVITY\_UPPERSEC_i + \beta_6 INACTIVITY\_TERTIARY_i + \varepsilon_i, \quad (1)$$

while the variables for the i-th country are specified in Tab. 5.

6 Results and Discussion

Model 1 included results from general to specific variables. I considered all relevant variables, but some of them I excluded because of the weak statistical results ($MINWAGE\_RATIO$, $HOURS\_WEEK$, $HOURS\_WEEK\_RATIO$). Because of the strong collinearity between variables $PARTTIME\_SHARE$ and $FEMALE\_PARTTIME$, I did not consider this model relevant anymore. Also, the constant value is negative. After some tests, I have excluded the $EMPLOY\_F\_SHARE$ and $PARTTIME\_SHARE$ variables in Model 2.

Model 2 excluded two variables mentioned above; therefore, the constant was no longer negative and more statistically significant. There was a positive relationship between GPG and female part-time employment. Also, there was a positive

relationship between maternity and parental leave on GPG. On the other hand, there was a negative relationship between female self-employment and GPG also variable of economic inactivity of the upper secondary educated population had negative relation.

Model 3 (see Tab. 6) excludes another variable *INACTIVITY_BELOWUPSEC* with the low statistical significance in model 2. All variables are statistically significant. Positive relation has female part-time employment, maternity leave, parental leave, and economic inactivity of a tertiary-educated population. Negative relation can be observed in two variables female self-employment and economic inactivity of an upper secondary-educated population. The adjusted *R*-squared score is acceptable (0.67).

Tab. 6 Model OLS 3 (excluded 3 variables)

	Coefficient	**Std. error**	***t*-ratio**	***P*-value**	
Const	12.7709	4.30523	2.966	0.0141	**
SELFEMPLOY_F_SHARE	−0.546537	0.244619	−2.234	0.0495	**
FEMALE_PARTTIME	0.259888	0.0673503	3.859	0.0032	***
MATERNITY_LEAVE	0.197400	0.0838287	2.355	0.0403	**
PARENTAL_LEAVE	0.0627450	0.0155838	4.026	0.0024	***
INACTIVITY_UPPERSEC	−1.02490	0.270296	−3.792	0.0035	***
INACTIVITY_TERTIARY	0.608375	0.251854	2.416	0.0363	**
Mean dependent var				14.48235	
S. D. dependent var				5.198706	
Sum squared residues				89.72502	
S. E. of regression				2.995413	
R-squared				0.792507	
Adjusted *R*-squared				0.668011	
F(9, 7)				6.365740	
P-value (*F*)				0.005532	
Log-likelihood				−38.26201	
Akaike criterion				90.52403	
Schwarz criterion				96.35652	
Hannan-Quinn criterion				91.10379	

Source: Authorial computation.

Model 3 gives the best results and deals satisfactorily with statistical tests; however, the heteroscedasticity persists. The ordinary least squares method provides unbiased and consistent point estimates of regression parameters even if the homoscedasticity requirement is not met.

An economic interpretation of this model shows that the decrease in the share of self-employed females in the economy will cause an increase in the GPG by 1 percentage point. Or rather it will change the ratio between self-employed and employed females. Also, female part-time jobs increase the GPG, this labour market rigidity was analysed by Goldin (2014), and she proves the more hours an employee works, the higher salary he or she gets. The total length of maternity and parental leave increases the gender pay gap; this may prove the issue of the "motherhood penalty" (Lundborg *et al.*, 2017). Finally, the economic inactivity of the tertiary-educated population increases the gender pay gap. The lack of working experience of tertiary educated individuals must have a significant impact on the GPG. The gender pay is probably influenced by the structure of the labour market, the attained education of employees, their working experience, and by the willingness to work more hours per week.

7 Conclusion

Although these are the initial results of my research, it can be stated that the GPG is a more complex issue than just a question of educational attainment. GPG is largely influenced by the flexibility of the labour market itself. Based on my analysis, it can be carefully stated that part-time work is probably not a way to eliminate GPG. Also, the length of maternity and parental leave causes distortions in the labour market.

GPG is probably significantly affected by employees' work experience. Thus, women caring for children have a clear disadvantage compared to men, which is reflected in lower wages (motherhood penalty). I would like to emphasise that this probably cannot be regulated by any law, but rather by a spontaneous response of the labour market and employers.

GPG also affects public finance, respectively the tax revenues of each country. If there is a pay gap between men and women, then women contribute less to the tax and social system in the long run. In some countries, years of childcare are considered to determine the retirement age; due to the demographic situation, in some countries this is no longer considered. However, it should be emphasised that the level of lifetime income affects the level of future pension in retirement, which is another consequence of inequality between men and women. Into consideration should also be taken the tax gap in current tax revenues and potentially higher tax revenues caused by this pay inequality.

GPG cannot probably be explained by factors in the labour market side only. The Czech tax system offers a lot of extra tax credits for individuals or families with children. In my further research, I will take into consideration the specific tax deductions or credits dedicated to families or individuals with children.

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