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The gender pay gap in Austria: *Tamensi movetur!**

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Abstract

Policies to reduce the gender pay gap feature prominently on the political agenda and interventions in the labor market are frequently proposed, claiming a persistent wage gap. We examine the change of the gender wage gap in Austria between 2002 and 2007 with new data from administrative records and find that it declined from 24% in 2002 to 19% in 2007. We observe that women's improved educational attainments were partly offset by a shift in the demand for skilled workers that disadvantaged unskilled labor. The main determinant of this decline is however the improvement of women's relative position in unobserved characteristics.

Keywords: gender wage differentials, wage inequality, decomposition, matched employer-employee data

JEL classification: J31, J71

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1 Introduction

The gender pay gap is allegedly persistent. One puzzling fact is that women are constantly improving their relative position by acquiring formal education or becoming more attached to the labor market, but still they earn less than men. Policies to reduce the gender pay gap therefore feature prominently on the political agenda and interventions in the labor market are frequently proposed.

In Spring 2010, for example, the Vice-President of the European Commission, Viviane Reding, in a statement to the press is quoted as, “I am deeply concerned that the gender pay gap has barely fallen over the last 15 years and in some countries it is even increasing” (European Commission, 2010*b*). These concerns lead to the adoption of a strategy for equality between women and men in September 2010 which, among other policies, will provide “more funding ... to research institutions who implement structural change to increase the gender awareness of their human resource management” (European Commission (2010*a*), p 9).

However, there are few studies that rigorously examine the change of the gender pay gap over time with appropriate data and techniques. Most evidence is obtained from comparisons of average wages, which often do not account for observed differences in, for example, schooling or experience. In fact, the evidence that accompanied Ms. Reding’s statement is merely the difference between men’s and women’s average gross hourly earnings, without any adjustment for differences in formal education, labor market experience or working time.

Rigorous econometric analyzes of the gender wage gap in OECD countries estimate it between 10 and 25 per cent of men's mean wages. Studies typically find that the gap is wider at higher incomes. See for example, Blau and Kahn (2003), Olivetti and Petrongolo (2008), or Arulampalam, Booth and Bryan (2007). The gap appears to have closed over the past decades and Black and Spitz-Oener (2010) conclude that some part of the closing of the gap is due to skill-biased technological change that has worked in favor of women. Other researchers, for example, Antonczyk et al. (2010) for Germany, find that the overall gender wage gap changed only slightly between 2001 and 2006, except at the bottom of the wage distribution, where men are doing extremely poorly.

In a meta analysis, Weichselbaumer and Winter-Ebmer (2005) find that the gender wage gap has declined over the last 30 years and that a large part is due to differences in observed characteristics.¹ The gender pay gap does not only depend on observable characteristics such as education or experience, but as a growing literature is showing there are systematic gender differences in risk aversion and competitiveness. Women tend to be more risk averse than man (Croson and Gneezy, 2009) and are more likely to shy away from competition (Niederle and Vesterlund, 2007). This may cause differences in promotion and thus lead to differences in wages. Riley-Bowles et al. (2005) show that men and women also differ in their wage bargaining with men typically bargaining more aggressively than women.²

¹Weichselbaumer and Winter-Ebmer (2007) also find that countries with a higher degree of product market competition and countries adopting equal opportunity legislation have smaller gender wage gaps, while countries with institutions that protect women from dangerous and strenuous work tend to have higher wage gaps.

²For a recent survey, see (Bertrand, 2010).

According to past research, the gender wage gap in Austria did hardly change during the 1990s (Böheim, Hofer and Zulehner, 2007), but women have become more educated and are ever more attached to the labor market than before. These developments have been accompanied by legal efforts to ensure equal opportunities for men and women. In addition, skill-biased technological change increased demand for skilled workers. This higher demand resulted in relatively higher wages for skilled workers, but lowered wages for unskilled workers in the service sector, work that is typically undertaken by women. It is therefore not clear, if these changes have translated into more equal pay for men and women over time and if, at least for Austria, there is an empirical justification to intervene in the labor market on the grounds of unfair wage discrimination.

To investigate the persistence of the gender wage gap in Austria over the time between 2002 and 2007, we use the decomposition approach suggested by Juhn, Murphy and Pierce (1993).³ This technique permits the decomposition of changes of the gender wage gap over time into a portion due to gender specific factors and a portion due to differences in the overall level of wage inequality. With this technique we account for differences in observed characteristics such as education or labor market experience and also for differences in unobserved characteristics such as labor market attachment, statistical discrimination or attitudes towards risk and competition.

For the empirical analysis, we merged data from Austrian tax records with social security records and augmented these with personal characteristics

³See also Blau and Kahn (1992, 2003) for applications to the gender pay gap.

from the Austrian micro-censuses of the years 2002 and 2007. The data provide detailed information on hourly wages, educational attainment and workplace characteristics. The data also include the reasons for and the length of work interruptions, such as unemployment spells or the birth of a child, over the careers of workers.

Over these five years, we estimate that the gender wage gap shrank by about five percentage points from 24% in 2002 to 19% in 2007. These five percentage points represent a relatively great gain for women of about 21% of the average gender wage gap in 2002. The narrower gender wage gap is the result of two developments, where the first is that women improved their average formal education which was also supported by the convergence of the returns to education between men and women. The other development was the improvement of women's relative position in unobserved characteristics over time.

Women have become more numerous among high school graduates and among university graduates. This change has worked in favor of a narrower gender pay gap. In addition, the returns to higher education (the prices) of men and women have converged and this also contributed to a narrower gender pay gap. However, a fall in the price of unskilled labor in general and the price of unskilled female labor in particular did prevent to close the gender pay gap even further. Over this period, the relative high number of women who have only compulsory schooling did not fall and, consequently, Austria experienced a segmentation into well educated and less educated women.

The change in unobserved characteristics could have been caused by, for example, women’s stronger attachment to the labor market or less statistical discrimination by employers. The relative composition of female workers has on average shifted towards groups that are better rewarded in the labor market.

2 Background

Böheim et al. (2007) investigate the development of the gender wage gap in Austria between 1983 and 1997, whether or not segregation by sex in industries affected the wage gap and whether or not there is evidence of a “glass ceiling”. According to their study, women earned, after considering observable characteristics, on average about 17 per cent less than men because of other, unobserved factors. It is common to interpret this unobserved factor as discrimination against women. For 1997, the mean wage gap that cannot be explained was 14 per cent, using men’s wages as the reference wage distribution, again accounting for observable differences. Pointner and Stiglbauer (2010) analyze the changes in the Austrian wage distribution between 1996 and 2002 and Grünberger and Zulehner (2009) use more recent data from the EU-SILC 2004-2006. Grünberger and Zulehner (2009) estimate the mean wage gap not attributable to observables to some 12 per cent. These studies, however, lacked detailed information on workers’ careers and career interruptions or workers’ firm characteristics.

Formal education of Austrian women and their labor market attachment

have steadily increased throughout the last decades. Austrian women have overtaken men in terms of formal qualification in 1999 and have nowadays on average more formal qualification than men. This increase in human capital was accompanied by increasing participation in the labor market. Figure 1 plots employment and unemployment rates for men and women. Women's employment rates increased steadily since the 1990s and it is currently just below 70%, some 10 percentage points below the employment rate of men. Unemployment rates are about 5% for both men and women. The increase in women's labor market participation is to a large part owed to women who have not (yet) taken maternity leave. Fewer women have career breaks (these tend to be shorter than a few decades ago) and this arguably has also reduced their "disadvantages" in the labor market and possibly reduced the gender wage gap.

A large part of the gender pay gap cannot be explained by productive characteristics such as education or experience, which is interpreted by many researchers as evidence for discrimination against women. This interpretation is however contested, usually because of methodological arguments. Because it is difficult to pin down the characteristics of workers, their wages and the association between unobserved characteristics and the wages, many researchers are sceptical if the gender wage gap exists at all. Critics include e.g., Kunze (2008), who stresses that the fundamental research question is if, after accounting for differences in work histories and other qualifications, a gender wage differential does exist at all.⁴

⁴She identifies the existence of the glass ceiling as another question that warrants empirical research.

Weichselbaumer and Winter-Ebmer (2005) conclude their meta-study of 260 studies with the observation that the unexplained component of the gender wage gap, despite the improvement of data over time, shows no decline over time. They also stress that the most important ingredient in explaining the wage difference between men and women is the availability of good data. The optimal data to investigate these questions are rich longitudinal employer-employee matched data and, although data availability has improved over the last decade, many previous studies did not have access to detailed data. Poor data may lead to misleading interpretations of findings. If, for example, the unexplained part of the wage gap were due to omitted variable bias and not to discrimination, the implications for economic policy are probably different.

3 Data and summary statistics

We combine data from several Austrian administrative sources to construct a novel data set to overcome potential weaknesses in earlier studies. Data are from the Austrian General Income Report for 2007, which itself uses data from tax records, the quarterly Austrian micro-censuses of 2007 and from the Austrian social security records.⁵ An anonymous personal identifier allows the combination of these data, which provides us with data for the analysis of gender wage differences.⁶ The merged data contain human capital

⁵The Austrian General Income Report is described in Statistik Austria (2009) and in Rechnungshof (2008). The social security records are described in Zweimüller et al. (2009).

⁶To ensure anonymity, the actual merging of the data has been handled by an authorized third party. No data that would allow identification of individual persons has been made available to us.

variables, such as education and experience, workplace characteristics, such as the number of women or the fraction of young workers in a particular workplace, and also complete work histories since 1972. The sample size corresponds to the number of observations in the micro-censuses.

The Austrian General Income Report, published every other year, provides statistics on the income of all employees, self-employed persons and pensioners in Austria. The Report uses data from tax records; wage data are based on approximately 8.4 million pay slips collected by the Austrian tax authorities and provide information on gross yearly income, paid taxes, paid social contributions and extra compensations. The tax data do not contain information on the number of hours worked and, in addition, taxes are individual data and it is not possible to build household information from the official tax records. For the purposes of the Austrian General Income Report, the tax data are combined with data from the Austrian micro-censuses to generate household level information and to obtain information on e.g., hours worked or formal qualifications. It is therefore an excellent source of information on wage income for employees (Statistik Austria, 2008).

The Austrian micro-census is a quarterly panel survey which collects information on private households. It is representative of the Austrian population and contains information on about 80,000 individuals per year. Every quarter, a fifth of the sample is renewed. The micro-census provides information on hours worked per week, education and detailed information on individual and household characteristics, but it does not contain income information.

Zweimüller and Winter-Ebmer (1994) showed that it is necessary to ac-

count for differences in actual rather than potential experience. In order to obtain data on actual career interruptions, we use data from Austria social security records. These contain information on individual work experience, tenure and characteristics of the workplace, such as industry or region. The data also include the reasons for and the length of work interruptions such as unemployment spells or the birth of a child. In addition, firm identifiers permit the construction of workplace characteristics such as the number of women or the fraction of young workers in a particular workplace.

Combining the information on the hours worked per week from the micro-census, the yearly gross and net income from the tax records and the number of days worked per year from the social security allows us to compute exact hourly gross and net wages.

For the decomposition of the gender wage gap over time, we similarly obtained data for 2002. We again merged tax records, the Austrian micro-census of 2002 and information from the Austrian social security records. The data from the micro-census for 2002 include one of four quarterly surveys and cover about 20,000 individuals. Some categories in the micro-census changed over time and some minor adjustment to categories were required, however, no adjustments to variables from the tax records and the social security were necessary.⁷

The combination of the micro-census, the tax records and the social security data provides hourly wages and detailed information on the actual

⁷Note that the data are a combination of two cross-sections and, despite the sources, are not a panel. Because the micro-census is a rotating panel, we cannot obtain personal characteristics, such as hours worked, over time.

workplace and a worker's career. Because the data are mainly obtained from administrative sources, the data are reliable and, for the parts that were obtained from surveys, representative for the Austrian population. Our estimating sample consists of workers in the private sector, who were between 16 and 60 years of age and who worked for at least one hour per week. To account for possible seasonal fluctuations, we restrict our sample to workers who worked for at least 270 days in each year. The sample consists of 3,031 women in 2002 and 5,448 in 2007. There are 6,230 men in 2002 and 11,041 in 2007. (The sample for 2007 is larger, because for 2002 we have only one of four quarterly surveys.)

Table 1 provides summary statistics of our estimating sample. We calculate the gross (net) hourly wage as the ratio of the gross (net) yearly income over the product of number of days employed and the average number of hours worked by day. Wages are deflated to the year 2002. On average, men earned some €16.46 gross per hour in 2002 and women about €12.04, a difference of about €4.02, or about 28.8%. In 2007, the difference was slightly less, it was on average about €3.62, or 23.2%. In 1997, it was about 23.3% (Böheim et al., 2007).

The amount of formal education is probably the most important determinant of the wage. However, women in our sample had on average more formal education than men, which would typically result in higher rather than lower wages. The descriptive statistics show that women gained formal education between 2007 and 2002, which, other things equal, would lead us to expect a decrease of the gender wage gap. More women had high school diplomas

in 2007 than in 2002 and the number of university graduates increased also. For men, we find also a trend towards higher formal qualifications between 2002 and 2007, it is however less marked than it is for women. At the lower end of the educational distribution, women appear to obtain only compulsory education, whereas men tend to have completed an apprenticeship.

Turning to other determinants of wages, we see that women were on average two years younger than men. Their average labor market experience difference was about 3.5 years shorter than men's, owing to motherhood and child care responsibilities. The summary statistics also show that fewer women than men were married, possibly indicating differences in productivity.

The differences in wages might also be related to differences of the firms in which women and men worked. The summary statistics support such an hypothesis since, for example, women worked in smaller firms than men did. Furthermore, more women than men worked in the public sector (not shown in Table 1) and wages in the public sector are typically more equal than in the private sector (Böheim et al., 2010). Whether this is the outcome of a selection process or already due to discrimination against women is beyond the scope of the current analysis.⁸

However, it should be noted that there are marked differences in the distribution across sectors, for example in 2007, the majority of women (24.9%) worked in the retail sector and the majority of men (37.0%) in manufacturing. Women are predominantly office workers, while men are typically

⁸See Bertrand (2010) for a recent overview of the economic literature on these issues.

working in crafts. Not only do we observe differences in the occupations in which men and women worked, there is also clear evidence for differences in within-firm hierarchies as merely 4% of women, in contrast to some 7% of men, had an executive position. The distinction between blue-collar and white-collar workers is, for all practical purposes, irrelevant, because reforms in the early 2000s abolished the remaining differences between blue-collar and white-collar contracts. However, it is owed to tradition that more men than women are employed as blue-collar workers.

4 Methods

Since it is evident from the descriptive statistics that men and women differ in their average characteristics, it is therefore not unexpected that their average wages do also differ. However, the political debate centers on the question of how much of this difference is justified, i.e., due to differences in characteristics, and how much is unjustified, i.e., due to unfair treatment of women. The discussions also wish to clarify when or how much of women's catching up in the educational attainment and labor market experience will contribute to a closing of the gender pay gap.

To answer these questions, we use decomposition techniques as our main tool of analysis and follow Juhn et al. (1993), who have devised a method that allows to decompose differences in the gender wage gap over time into a portion due to gender specific factors and a portion due to differences in the overall level of wage inequality.

Suppose that wages for a worker i in period t is given by the following equation:⁹

$$Y_{it} = X_{it}B_t + \sigma_t\theta_{it},$$

where Y_{it} is the log of wages, X_{it} is a vector of explanatory variables, B_t is a vector of explanatory coefficients, θ_{it} is a standardized residual (i.e., with mean zero and variance one for each point in time), and σ_t is the period's residual standard deviation of wages (i.e., the unexplained level of wage inequality among men).

The average male-female wage gap for period t is given by:

$$D_t \equiv Y_{mt} - Y_{ft} = (X_{mt} - X_{ft})B_t + \sigma_t(\theta_{mt} - \theta_{ft}),$$

$$D_t \equiv Y_{mt} - Y_{ft} = \Delta X_t B_t + \sigma_t \Delta \theta_t,$$

where the m and f subscripts refer to male and female averages and Δ indicates the average male-female difference for the variable immediately following. The pay-gap difference between two periods t and s can then be decomposed as follows:

$$D_t - D_s = (\Delta X_t - \Delta X_s)B_s + \Delta X_t(B_t - B_s)$$

$$+ (\Delta \theta_t - \Delta \theta_s)\sigma_s + \Delta \theta_t(\sigma_t - \sigma_s),$$

where the first term is the contribution of differences in observed labor market

⁹Our notation follows Blau and Kahn (1992).

qualifications X in a period to the gender wage gap. The second term is the impact of different prices across periods for given characteristics. The third term measures the effect of differences in the relative residual wage position of men and women over time, i.e., the relative ranking of women within the male residual wage distribution. Such differences in rankings may reflect gender differences in unmeasured characteristics or the impact of labor market discrimination against women. The fourth term measures differences in residual inequality (unobserved prices) over time.

5 Estimation results

Table 2 presents the results from the Blinder-Oaxaca decomposition of the gender wage gap separately for 2002 and 2007.¹⁰ The difference in mean wages in 2002, using the men's wages as the reference distribution, indicates that about one third of the gap can be attributed to observed characteristics. The majority of the gap remains unexplained. The gender wage gap at the mean declined between 2002 and 2007. For 2007, the decomposition indicates that a larger portion of the gap can be attributed to observed characteristics, leaving a smaller unexplained part. Using women's wages as the reference distribution does not result in a different pattern. For all our analyzes below, it matters little whether we use men's or women' wage distribution as the reference wage distribution. Overall, we see that the explained part of the gap is larger and that the unexplained part is smaller in 2007.

Table 3 presents the estimated coefficients from the wage regressions. They

¹⁰See Blinder (1973) and Oaxaca (1973).

indicate, for example, that more formal education or more experience is associated with higher wages, and unemployment spells or periods of parental leave are associated with lower wages. Wages clearly differ by the type of workplace and they are typically higher in larger workplaces, in banks and in urban areas. We also find evidence for an association between wages and the gender composition of the workplace. Both men and women are estimated to have a significantly lower wage the more women are employed in a firm. However, the ratio of women's to men's wages in the firm is estimated to have a negative relationship with men's wages only, for women we do not find such an association.

The estimates also show that returns to characteristics have changed between 2002 and 2007. We see that returns to formal education have, relative to compulsory education, increased. Premia for higher formal education for men and women have converged, also reflecting a convergence of women's and men's school or university choice. However, women with an apprenticeship have gained less than men with an apprenticeship compared to individuals who only finished compulsory schooling. The changes in returns to experience, tenure or interruptions were minor. We also find that in 2007, in contrast to 2002 when men received a marriage premium and women a marriage penalty, marital status is no longer relevant for the wage determination of women. Foreign workers earned in 2007, in contrast to 2002, on average higher wages than Austrian workers. Other changes in returns are minor. In 2002, wages were higher in cities than in rural areas, this difference is no more relevant in 2007.

Table 4 tabulates the decomposition of the explained wage gap, using Juhn et al.'s (1993) approach. This approach attributes the change in the explained part of the wage gap into a component based on changes in the characteristics, into a component based on changes in prices and into a component which is due to simultaneous change in characteristics and prices. We find that the change of the explained part of the gender wage gap, 0.025 (0.018) in the male-based (female-based) decomposition, is due to a large shift in the characteristics, which was offset by the simultaneous change in both characteristics and prices.

Table 5 tabulates the decomposition of the unexplained wage gap. The first column shows the change in the unexplained wage gap, which was -0.075 (-0.068) in the male-based (female-based) decomposition. The second column, labeled "quantity effect", reflects that part of the change that can be attributed to changes in the groups' differences in unobserved characteristics. The third column, labelled "price effect", gives the estimate for that part of the change in the unexplained component of the gender wage gap which is due to changes in residual inequality, i.e., changes in unobserved prices. The last column, "interaction", adjusts for simultaneous changes.

Overall, we estimate that the gender wage gap decreased over time and that this smaller gap was mainly due to a smaller unexplained component of the wage gap. The smaller unexplained component of the gender wage gap was caused by a change in the unobserved characteristics. Such a change is caused by, for example, a stronger attachment to the labor market or less statistical discrimination. The change in unobserved prices is estimated to

have contributed little to the change over time. In fact, using the male-based decomposition we estimate a small *increase* of the unexplained part, whereas the female-based decomposition yields a small *decrease*. Similarly, the simultaneous change in characteristics and prices is estimated to have contributed little towards a lower unexplained component of the gender wage gap.

Tables 6 and 7 present detailed analyzes of which characteristics contributed to the aggregate changes presented in Table 4. The quantitatively most important differences in the gender wage gap between 2002 and 2007 were, according to these estimates, the changes in the education and the occupational structures. The equalizing effect of more formal education started earlier, Pointner and Stiglbauer (2010) document such an effect already for the years 1996 and 2002. Although women gained from more formal education and a convergence of the returns to education to men's returns to education, the overall changes in the educational structure led to *an increase* of the gender wage gap. This increase is due to the unfavorable development for the price of unskilled labor in general and the price of unskilled labor of women in particular. The changes in the occupational structure led to an increase in the gender wage gap reflecting the employment of women in low paying service occupations, while the change in returns to characteristics led to a lower gender wage gap.

6 Summary and conclusions

We investigated the extent, persistence, and socio-economic determinants of the gender wage gap in Austria for the years 2002 and 2007. We use the approach suggested by Juhn et al. (1993) to decompose the gender wage gap over time. Analyzing new matched employer-employee data for Austria, our descriptive analyzes confirm earlier results, i.e., women earn on average less than men, they have on average more formal education than men, but have on average less workplace experience, probably due to child bearing. Taking observed differences between women and men into account, we find that about 50% of the wage gap is due to “fair” discrimination, i.e., observable differences in characteristics. However, the remaining part of the wage gap between women and men cannot be explained by such characteristics. Part of this difference might be caused by unobserved characteristics, e.g., attitude and commitment, however, it is likely that (some of) this difference is caused by unfair discrimination against women.

We further find that women became more attached to the labor market between 2002 and 2007 and that their formal education increased over time. In terms of returns to characteristics, we find that premia for higher formal education have converged between men and women. In consequence, the gender wage gap shrank by five percentage points from 24% in 2002 to 19% in 2007. The main determinant of this decline is the decline in the difference in the residual wage gap induced by an improvement of women’s relative position in unobserved characteristics. We also observe that women’s improved educational attainments were offset by a shift in the demand for skilled workers

that disadvantaged unskilled labor.

Our results suggest that there were two main reasons for a narrower gender pay gap. Women had obtained more formal education and improved their unobserved characteristics. Policies which aim to close the gender pay gap should therefore focus on strategies which lead to more formal education and better unobserved characteristics. Policies that aim to increase women's educational attainments are frequently implemented, e.g., efforts to increase the number of female students in the technical sciences.

Policies that aimed at improving women's formal education helped them in obtaining more formal education. More formal education, as we have shown, lead to a narrower gender pay gap. Other observed characteristics which are associated with higher wages, such as labor market experience or managerial positions, could also be targeted by appropriate policies. For example, making it easier for parents to combine family and career will also improve women's labor market experience, which will probably lead to more equal wages for men and women.

It is, however, more difficult to target the unobserved characteristics. The difference in unobserved characteristics could be caused by differences in tastes, e.g., stemming from differences in risk aversion, or it could also be that women are discouraged from obtaining certain skills. Since we do not know to true reason for the difference in unobserved characteristics, we are cautious to provide policy conclusions. However, it has been shown that if workers know the distribution of wages, they are more likely to bargain more efficiently. Policies that provide information on paid wages should thus

provide women with better chances in obtaining fair wages. In addition, policies which help workers to more labor market attachment should also improve women's position in the distribution of unobserved characteristics.

References

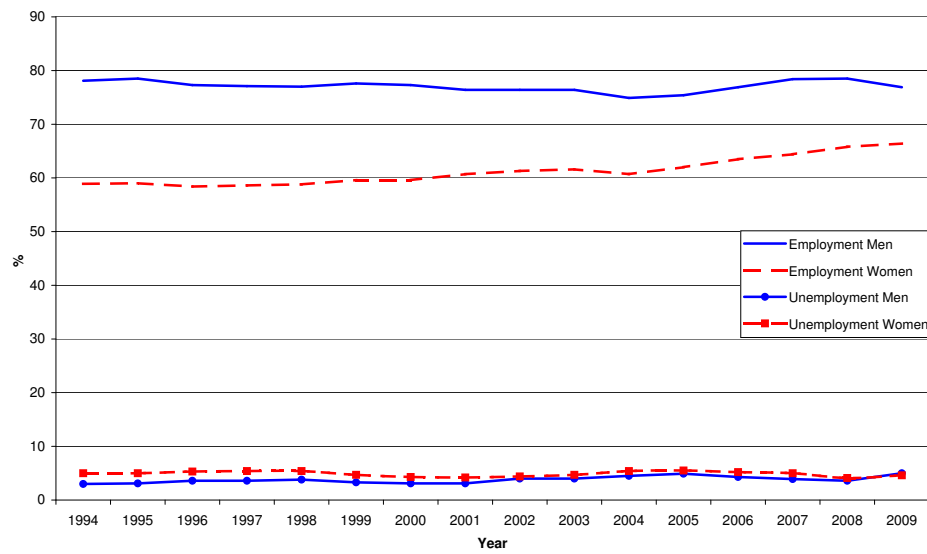
- Antonczyk, Dirk, Bernd Fitzenberger and Katrin Sommerfeld (2010), ‘Rising wage inequality, the decline of collective bargaining, and the gender wage gap’, *Labour Economics* **17**(5), 835–47.
- Arulampalam, Wiji, Alison L. Booth and Mark L. Bryan (2007), ‘Is there a glass ceiling over Europe? Exploring the gender pay gap across the wage distribution’, *Industrial and Labor Relations Review* **60**(2), 163–186.
- Bertrand, Marianne (2010), *Handbook of Labor Economics*, Vol. 4B, North-Holland, chapter New Perspectives on Gender, pp. 1545–1592.
- Black, Sandra E. and Alexandra Spitz-Oener (2010), ‘Explaining women’s success: technological change and the skill content of women’s work’, *Review of Economics and Statistics* **92**(1), 187–94.
- Blau, Francine D. and Lawrence M. Kahn (1992), ‘The Gender Earnings Gap: Learning from International Comparisons’, *American Economic Review* **82**(2), 533–538.
- Blau, Francine D. and Lawrence M. Kahn (2003), ‘Understanding international differences in the gender pay gap’, *Journal of Labor Economics* **21**(1), 106–44.
- Blinder, Alan S. (1973), ‘Wage discrimination: Reduced form and structural estimates’, *Journal of Human Resources* **18**(4), 436–55.
- Böheim, René, Helmut Hofer and Christine Zulehner (2007), ‘Wage differences between Austrian men and women: semper idem?’, *Empirica* **34**(3), 213–29.
- Böheim, René, Klemens Himpele, Helmut Mahringer and Christine Zulehner (2010), Determinants of wage differences between men and women in Austria. Working Paper.
- Crosos, Rachel and Uri Gneezy (2009), ‘Gender Differences in Preferences’, *Journal of Economic Literature* **47**(2), 448–474.
- European Commission (2010a), ‘Actions to implement the strategy for equality between women and men 2010–2015’, *Commission Staff Working Document, SEC 1079/2*.

- European Commission (2010b), ‘Press release’, (**Access 25.1.2011**).
http://ec.europa.eu/unitedkingdom/press/press_releases/2010/pr1017_en.htm.
- Grünberger, Klaus and Christine Zulehner (2009), ‘Gender-specific wage gaps in Austria’, *WIFO Monatsberichte (monthly reports)* **82**(2), 139–50.
- Juhn, Chinhui, Kevin M. Murphy and Brooks Pierce (1993), ‘Wage inequality and the rise in returns to skill’, *Journal of Political Economy* **101**, 410–42.
- Kunze, Astrid (2008), ‘Gender wage gap studies: Consistency and decomposition’, *Empirical Economics* **35**(1), 63–76.
- Niederle, Muriel and Lise Vesterlund (2007), ‘Do women shy away from competition? Do Men Compete Too Much?’, *Quarterly Journal of Economics* **122**(3), 1067–1101.
- Oaxaca, Ronald L. (1973), ‘Male-female wage differentials in urban labor markets’, *International Economic Review* **14**, 693–709.
- Olivetti, C. and B. Petrongolo (2008), ‘Unequal Pay or Unequal Employment? A Cross-Country Analysis of Gender Gaps’, *Journal of Labor Economics* **26**(4), 621–654.
- Pointner, Wolfgang and Alfred Stiglbauer (2010), ‘Changes in the Austrian structure of wages, 1996–2002: Evidence from linked employer-employee data’, *Empirica* **37**(2), 105–25.
- Rechnungshof, ed. (2008), *Bericht des Rechnungshofes gemäß Art. 1 §8 Bezügebegrenzungs-gesetz, BGBl. I Nr. 64\1997. 2006 und 2007*, Der Rechnungshof, Vienna, Austria.
- Riley-Bowles, Hannah, Linda C. Babcock and Katherine McGinn (2005), ‘Constraints and Triggers: Situational Mechanics of Gender in Negotiation’, *Journal of Personality and Social Psychology* **89**(6), 951–965.
- Statistik Austria, ed. (2008), *Statistik der Lohnsteuer 2007*, Statistik Austria, Vienna.
- Statistik Austria, ed. (2009), *Standard-Dokumentation. Metainformationen. (Definitionen, Erläuterungen, Methoden, Qualität) zum Allgemeinen Einkommensbericht 2008. Bearbeitungsstand: 25.05.2009*, Statistik Austria, Vienna.

- Weichselbaumer, Doris and Rudolf Winter-Ebmer (2005), ‘A meta-analysis of the international gender wage gap’, *Journal of Economic Surveys* **19**(3), 479–511.
- Weichselbaumer, Doris and Rudolf Winter-Ebmer (2007), ‘The effects of competition and equal treatment laws on gender wage differentials’, *Economic Policy* **22**(50), 235.
- Zweimüller, Josef and Rudolf Winter-Ebmer (1994), ‘Gender wage differentials in private and public sector jobs’, *Journal of Population Economics* **7**, 271–85.
- Zweimüller, Josef, Rudolf Winter-Ebmer, Rafael Lalive, Andreas Kuhn, Jean-Philippe Wüellrich, Oliver Ruf and Simon Büchi (2009), Austrian Social Security Database, Working Paper 0903, NRN: The Austrian Center for Labor Economics and the Analysis of the Welfare State. <http://www.labornrn.at/wp/wp0903.pdf>.

A Graphs and Tables

Figure 1: Employment and unemployment rates, Austria, 1994–2009.



Source: Eurostat.

Table 1: Summary statistics, mean (S.D.).

	2002		2007	
	Men	Women	Men	Women
Gross hourly wage (€)	16.457 (9.572)	12.036 (7.673)	15.570 (7.290)	11.948 (5.452)
<i>Formal education</i>				
Compulsory schooling	.133	.237	.153	.230
Apprenticeship	.616	.373	.575	.349
Secondary school	.071	.163	.074	.160
High school	.137	.181	.136	.195
Craftsmen diploma	.008	.008	.012	.015
University degree	.036	.037	.050	.052
<i>Other human capital variables</i>				
Age	37.427 (1.461)	36.164 (1.916)	37.441 (11.301)	35.577 (11.615)
Experience	17.744 (8.862)	14.208 (8.610)	18.359 (1.467)	14.748 (9.700)
Tenure	11.036 (8.290)	1.245 (7.440)	9.352 (8.585)	7.988 (7.355)
Length of Interruptions	.436 (.733)	.722 (1.121)	.597 (1.043)	1.003 (1.573)
Married	.637	.513	.647	.491
Austrian citizenship	.928	.904	.912	.913
<i>Worker status</i>				
Blue-collar worker	.634	.343	.503	.265
White-collar worker	.366	.657	.497	.735
Executive position	.041 (.198)	.040 (.195)	.074 (.261)	.040 (.195)
<i>Firm specific variables</i>				
Firm size	4.815 (1.842)	4.740 (1.939)	4.750 (1.811)	4.651 (1.883)
Average age in the firm	36.854 (4.279)	36.570 (4.490)	37.666 (4.468)	37.505 (4.527)
Ratio female to male workers in the firm	.257 (.200)	.538 (.244)	.265 (.202)	.531 (.243)
Ratio female to male wages in the firm	.786 (.198)	.787 (.295)	.783 (.203)	.789 (.290)
Worker turnover in the firm	1.130 (5.508)	1.231 (3.822)	4.306 (292.636)	41.658 (105.422)

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Table 1 – continued from previous page.

	2002		2007	
	Men	Women	Men	Women
<i>Occupation</i>				
Administrative officers	.041	.040	.081	.039
Researchers	.034	.051	.045	.035
Engineers and equivalent non-technical jobs	.124	.045	.197	.226
Office workers	.094	.358	.197	.308
Sales and other services	.077	.245	.084	.186
Craftspersons	.394	.070	.055	.041
Assembly workers	.162	.092	.307	.035
Unskilled workers	.075	.098	.094	.131
<i>Industry</i>				
Agriculture	.010	.015	.010	.010
Mining	.005	.001	.005	.002
Food products and beverages	.032	.029	.033	.040
Textile	.011	.042	.011	.023
Leather	.003	.006	.002	.005
Wood and products of wood	.020	.008	.027	.013
Paper and paper products	.028	.025	.024	.021
Coke, refined petroleum products	.001	.001	.002	0.00
Chemicals and chemical products	.021	.021	.017	.015
Rubber and plastics products	.015	.014	.016	.013
Glassware	.017	.014	.020	.011
Metals	.104	.055	.090	.029
Machinery and equipment	.050	.012	.062	.023
Office, accounting and computing machinery	.039	.035	.040	.029
Motor vehicles	.023	.012	.026	.013
Manufacture of other products and recycling	.041	.014	.021	.010
Electricity, gas and water supply	.021	.004	.017	.008
Whole sale and retail	.132	.249	.127	.273
Construction	.196	.024	.150	.041
Hotels and restaurants	.026	.095	.027	.109
Transport, storage and communications	.080	.063	.072	.064
Financial intermediation	.043	.090	.052	.087
Real estate	.004	.023	.011	.019
Business services	.047	.085	.052	.085
Other services	.031	.063	.036	.057
<i>Population density</i>				
High	.490	.397	.262	.341
Medium	.259	.255	.271	.251
Low	.251	.348	.467	.408

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Table 1 – continued from previous page.

<i>Region</i>	2002		2007	
	Men	Women	Men	Women
Burgenland	.096	.093	.081	.084
Lower Austria	.130	.143	.128	.128
Vienna	.091	.163	.090	.134
Carinthia	.072	.077	.100	.093
Styria	.135	.105	.121	.100
Upper Austria	.176	.146	.148	.117
Salzburg	.089	.087	.104	.119
Tyrol	.116	.102	.106	.109
Vorarlberg	.095	.084	.122	.116
Number of observations	4,991	1,768	8,907	3,444

Table 2: Blinder-Oaxaca decomposition of wage differentials.

	year	difference	explained gap	unexplained gap
<i>Male-based</i>				
	2002	.305	.121	.184
	2007	.256	.147	.109
	Difference	-.050	.025	-.075
<i>Female-based</i>				
	2002	.305	.069	.236
	2007	.256	.087	.168
	Difference	-.050	.018	-.068

Note: Results from Blinder-Oaxaca decompositions. Dependent variable is the logarithm of hourly wages. Number of observations: 6,759 in 2002 and 12,351 in 2007.

Table 3: OLS estimates of wage regressions.

	2002		2007	
	Men	Women	Men	Women
<i>Education</i> (reference group: compulsory school)				
Apprenticeship	0.061 (0.01)	0.059 (0.02)	0.263 (0.01)	0.180 (0.01)
Secondary school	0.142 (0.02)	0.102 (0.03)	0.297 (0.01)	0.234 (0.02)
High school	0.210 (0.02)	0.213 (0.03)	0.451 (0.01)	0.374 (0.02)
Technical college	0.101 (0.05)	0.394 (0.08)	0.493 (0.03)	0.519 (0.04)
University	0.460 (0.03)	0.373 (0.05)	0.660 (0.02)	0.637 (0.03)
Experience	0.038 (0.00)	0.031 (0.00)	0.050 (0.00)	0.048 (0.00)
Experience squared \times 100	-0.083 (0.01)	-0.055 (0.01)	-0.099 (0.00)	-0.098 (0.01)
Tenure	-0.000 (0.00)	0.007 (0.00)	0.008 (0.00)	0.012 (0.00)
Tenure squared \times 100	0.026 (0.01)	-0.000 (0.01)	0.009 (0.00)	-0.002 (0.01)
Length of interruptions	-0.067 (0.01)	-0.030 (0.02)	0.015 (0.01)	0.002 (0.01)
Length of interruptions \times 100	0.910 (0.35)	0.457 (0.29)	-0.243 (0.09)	-0.056 (0.11)
Married	0.075 (0.01)	-0.039 (0.01)	0.052 (0.01)	0.005 (0.01)
<i>Citizenship</i> (reference group: others)				
Austrian citizenship	0.055 (0.02)	0.006 (0.03)	-0.071 (0.01)	-0.038 (0.02)
<i>Population density</i> (reference group: high)				
Medium	0.009 (0.01)	0.061 (0.02)	-0.000 (0.01)	-0.005 (0.02)
Low	0.043 (0.01)	0.064 (0.02)	-0.012 (0.01)	-0.029 (0.01)
<i>Worker status</i> (reference group: white collar)				
Blue collar worker	-0.079 (0.01)	-0.041 (0.02)	-0.099 (0.01)	-0.051 (0.02)
Log Firm size	0.032	0.024	0.040	0.027

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Table 3 – continued from previous page

	2002		2007	
	Men	Women	Men	Women
Average age in the firm	0.003	0.003	0.004	0.002
Ratio female to male workers in the firm	-0.193	-0.219	-0.228	-0.186
Ratio female to male wages in the firm	-0.117	0.057	-0.154	0.032
Worker turnover in the firm	-0.002	-0.001	-0.000	-0.000
Constant	1.902	1.657	1.803	1.749
	(0.06)	(0.09)	(0.04)	(0.06)
Number of observations	4991	1768	8907	3444
Adjusted R-squared	0.51	0.52	0.63	0.61

Notes: Estimation results from OLS regressions. Dependent variable is the logarithm of hourly wages. Standard errors in parenthesis. All regressions control for occupation, industry and region effects.

Table 4: Decomposition of the change of the explained gap between 2002 and 2007.

	change in the explained gap	quantity effect	price effect	interaction effect
Male-based	.025	.057	.031	-.062
Female-based	.018	.049	.030	-.061

Notes: Results from Juhn-Murphy-Pierce decompositions. Dependent variable is the logarithm of hourly wages. Number of observations: 6,759 in 2002 and 12,351 in 2007.

Table 5: Decomposition of the change of the unexplained gap between 2002 and 2007.

	difference in the unexplained gap	quantity effect	price effect	interaction effect
Male-based	-.075	-.081	.021	-.014
Female-based	-.068	-.065	-.005	.002

Notes: Results from Juhn-Murphy-Pierce decompositions. Dependent variable is the logarithm of hourly wages. Number of observations: 6,759 in 2002 and 12,351 in 2007.

Table 6: Detailed decomposition of the difference in the predicted gap (male-based).

	difference in predicted gap	quantity effect	price effect	interaction Q x P
Total	.025	.057	.031	-.062
Education (overall)	.013	-.004	.024	-.007
Experience (overall)	.008	-.012	.021	-.002
Tenure (overall)	.008	.003	.002	.003
Length of interruptions (overall)	-.011	-.001	-.011	.002
Industry (overall)	.003	.002	-.003	.004
Region (overall)	.000	-.001	.001	-.000
Occupation (overall)	-.004	.002	-.007	.001
Blue-collar worker	-.001	.004	-.006	.001
Population density (overall)	.004	.007	.005	-.009
Married	-.001	.002	-.003	-.001
Austrian	-.001	-.001	-.003	.003
Firm size	.002	.001	.001	.000
Average age in the firm	-.000	-.000	.000	-.000
Ratio female to male workers in the firm	.006	-.003	.010	-.001
Ratio female to male wages in the firm	.001	.001	.000	.000
Worker turnover in the firm	.000	.058	-.000	-.057

Notes: Results from Juhn-Murphy-Pierce decompositions. Dependent variable is the logarithm of hourly wages. Number of observations: 6,759 in 2002 and 12,351 in 2007. Overall effects are reported for specific groups of regressors such as education, experience, tenure, industry, occupation, population density and region.

Table 7: Detailed decomposition of the difference in the predicted gap (female-based).

	difference in predicted gap	quantity effect	price effect	interaction Q x P
Total	.018	.049	.030	-.061
Education (overall)	.001	-.005	.010	-.004
Experience (overall)	-.003	-.007	.011	-.006
Tenure (overall)	.009	.004	.003	.002
Length of interruptions (overall)	-.003	-.001	-.004	.001
Industry (overall)	.003	.005	-.002	-.001
Region (overall)	-.005	-.001	-.005	.001
Occupation (overall)	.019	.018	.017	-.015
Blue-collar worker	-.000	.002	-.003	.001
Population density (overall)	.004	.011	.009	-.016
Married	.006	-.001	.006	.001
Austrian	-.000	-.000	-.001	.001
Firm size	.001	.001	.000	.000
Average age in the firm	-.001	-.000	-.000	.000
Ratio female to male workers in the firm	-.012	-.004	-.010	.001
Ratio female to male wages in the firm	-.000	-.000	.000	.000
Worker turnover in the firm	-.000	.028	-.000	-.028

Notes: Results from Juhn-Murphy-Pierce decompositions. Dependent variable is the logarithm of hourly wages. Number of observations: 6,759 in 2002 and 12,351 in 2007. Overall effects are reported for specific groups of regressors such as education, experience, tenure, industry, occupation, population density and region.