The effects of competition and equal treatment laws on the gender wage differential

by

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Working Paper No. 0307

July 2002

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Abstract

This paper evaluates the impact of economic and legal variables on wage differentials between men and women. Since Becker (1957) economists have argued that competitive markets eliminate discrimination in the long run. On the other hand, practically all countries have enacted some sort of law mandating equal treatment of men and women. This paper uses a new international data set on the gender wage gap, which is constructed via a meta-analysis of existing studies. The findings show that both increased competition and the enactment of equal treatment laws reduce the gender wage gap.

1 Introduction

The literature on the economics of discrimination has started with Becker's seminal study in 1957. He argued that employers (like customers or coworkers) might have a "taste for discrimination" and maximize utility, not profit, by employing preferably men and paying them higher wages. As a consequence, competition should expunge discrimination in the long run, since non-discriminatory employers can produce at lower costs. Many economists have since stressed the effect of competition on discrimination. Non-governmental organizations and politicians, on the other hand, have fought for equal treatment laws to combat discrimination. As a result such laws became increasingly common over the last decades.

While since the 70s an immense number of empirical studies has investigated the existence of gender wage gaps or discrimination for different countries, very few of these studies related these wage gaps directly to Becker's theory of the effect of competition on discrimination.[1] Although there have been some studies on the effects of competition in selected industries (Ashenfelter and Hannan, 1986; Black and Strahan, 2001), no broad international studies have been conducted to assess the impact of these effects. Likewise, papers on the impact of equal treatment laws generally concentrated on investigating one single country only (see e.g. Neumark and Stock (2001) for a recent U.S. survey).

To our knowledge, this is the first paper to investigate the effect of competition and equal treatment law on an international level. One reason why these highly important issues have not been examined earlier is the lack of international data. While micro data exist for most countries and allow national investigations, which have been conducted in vast numbers, international data is sparse. This study takes advantage of the fact that a large number of national studies already has been done in the past and constructs its data via the method of meta-analysis. We collect all accessible published values for gender wage gaps for different countries and make them comparable by the use of meta-regression analysis. In the meta-regression analysis we use all the information on how an estimate of the gender wage gap was obtained: for example, we assess the impact of different empirical methodologies the researchers have used or the kind of data they had access to. This rich data set is subsequently

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[1] See Altonji and Blank (1999) for a recent overview of research on gender (and race) differentials in the labor market. Costumer discrimination has been studied mainly for sports markets (Kahn, 1991), but also for other markets (Holzer and Ihlanfeldt, 2001).

supplemented with information on competition and equal treatment laws, which allows us to investigate, how big the often-proclaimed impact of these two factors really is.

2 Why are there international differences in the gender wage gap?

To our knowledge Blau and Kahn (1992, 1996, and 2003) are the only authors who previously investigated the gender wage differential on a broad international level.[2] Their particular interest is to analyze how general wage inequality and wage-setting institutions affect the observed gender wage gap in a country. To examine this issue in their 1992 and 1996 papers they use micro data from the International Social Survey Program (ISSP) and decompose international differences in the gender wage gap into a part due to gender specific factors and a part due to differences in the pay structure. They show that the general wage inequality in a country has a quantitatively big effect on the gender wage gap, since women are typically on the lower end of the wage distribution. In their 2003 paper they regress various gender gaps on wage inequality and female labor supply and find, that a more compressed male wage structure as well as a lower female net supply leads to lower gender pay gaps. Moreover, collective bargaining reduces the wage differential.

In our study we focus on two other factors, which might affect the gender wage gap: competition and equal treatment legislation.

2.1 Competition and discrimination

In his seminal work (1957) Becker argued that employers can have a "taste for discrimination".[3] To indulge their tastes, these utility maximizing entrepreneurs pay men higher wages and hire fewer women than would be profitable. Since non-discriminatory firms make higher profits they should compete discriminators out of the market in the long run. If there is market power, however, owners of firms with a large market share earn higher profits than their competitive counterparts, which allows them to continue "consuming"

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[2] Antecol (2002) conducted a "quasi-international" study where she compared the gender wage gaps of US immigrants of different ethnic origins with the wage gaps in their respective countries.
[3] Becker also analyzes coworker and customer discrimination.

discrimination. When managers and owners are not the same person, monitoring of managers by capital owners will increase with competition and give managers less opportunity to forgo profits for discrimination. If market power is high, however, discriminating managers are more likely to go unnoticed. Likewise, in a regulated industry, firms are often not allowed to make excessive profits; in such a case, managers can hide part of these excessive profits from the regulatory body by consuming them in form of discrimination.

A number of studies have investigated the effect of market competition on discrimination. Ashenfelter and Hannan (1986) analyzed the effect of market concentration in the banking industry. The advantage of this sector is the geographically limited nature of competition, which allows for variability in the degree of concentration within one industry. They found a negative and significant impact of market concentration on the share of female employees in one firm.[4] Black and Strahan (2001) recently investigated the banking sector further and tested the effect of deregulation in this industry. Their results show that deregulation caused male wages to fall much stronger than female wages, which indicates that in the previously protected market rents were mainly shared with men. Another study by Black and Brainerd (1999) looks at the effect of increased competition on women's relative wages where they compare the effect of trade in concentrated and unconcentrated sectors. They demonstrate that an increase in product market competition due to international trade reduces the gender wage gap. Hellerstein et al. (2002) examine profitability and sex composition of a firm's workforce and find that among firms with high market power, those with a large share of female employees obtain higher profits. However, no evidence is found that discriminatory firms are punished through lower growth nor are ownership changes related to the gender composition of the workforce.[5]

To our knowledge no international investigation of the effect of competition on the gender wage differential has been conducted so far.

2.2 Equal treatment law

For anglo-saxon countries there is an established literature looking at the impact, fairness and adequateness of equal treatment laws. Neumark and Stock (2001) review and extend the U.S. literature on the impact of equal pay laws by taking state-level anti-discrimination laws into

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[4] The authors also give an overview over earlier studies on the effect of competition on discrimination.
[5] Winter-Ebmer (1995) looked at the effect of labor market concentration (monopsony) on the gender wage gap.

account. They conclude that these laws boosted relative earnings of female workers, but led to a decline of relative employment rates. Gunderson (1994) gives an overview over the effects of national equal treatment laws for Canada, Britain, Australia and the US. International comparisons are much more difficult to find. Obviously, an international comparison of regulations protecting women from discrimination is difficult because of fundamental differences in national institutions and legislation. However, the existence of international conventions, such as the CEDAW and the ILO conventions, allows such a comparison nevertheless.

The Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) has been adopted by the UN General Assembly in 1979 and progresses earlier human rights conventions by addressing the specific nature of discrimination against women and aiming at "all forms" of disadvantages women suffer. With ratification, states commit themselves to undertake a number of measures to end discrimination, e.g. to adopt the principle of equality of men and women in their legal system and to establish institutions to guarantee the protection of women against discrimination by persons, organizations or enterprises. Furthermore, state parties regularly have to report to a committee, which monitors states' compliance with the convention and asserts which measures to combat discrimination a state still has to take.[6]

Similarly, the ILO (International Labour Organization in Geneva) sets international labor conventions which states have to ratify before they become legally binding. Either states must adopt national labor laws to fulfill the conventions, or, in some countries, the conventions are directly binding on employers and workers. Concerning equal treatment of men and women, two conventions are directly applicable: the Equal Remuneration Convention (C100) was adopted in 1951 and demands equal pay for work of equal value. It directly aims at combating discrimination against women in wages. The Discrimination (Employment and Occupation) Convention (C111) is slightly more general and was adopted in 1958. It prohibits different forms of discrimination (access to training, employment, conditions of employment etc.) on grounds of sex, race, ethnic background, religion, political opinion or social origin.

The CEDAW and the ILO conventions have sometimes been criticized as having no substantial meaning ("no teeth") since the organizations setting these standards have no means

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[6] Despite the achievements of CEDAW (for an overview see Schöpp-Schilling, 1998), the convention has some obvious limitations to its efficiency. For example, it can be ratified with a large number of reservations, which in part are substantial, and there are no sanctions. With the optional protocol, however, the previous handicap that no individual complaints to the committee were allowed, was eliminated in the year 2000.

to actually enforce them. Chau and Kanbur (2001), however, demonstrate that the ratification of an ILO convention is not random. The authors conclude that costs of ratification actually do exist and that ratification leads to higher domestic standards.[7] Bookmann (2001) also looks at the ratification of ILO conventions and finds marked differences in the timing of signing such conventions: In industrialized countries, after 3 (20) years 10% (40%) of conventions are ratified, developing countries ratify after 3 (20) years only 2% (15%); i.e. there is significant variation in signing such conventions. Generally, political constellations as well as the implicit costs of signing determine the ratification of a convention.

Besides ILO C100 and C111, which explicitly aim at combating discrimination, ratification of two additional conventions was included in our study. As Chang (2000) notes, these labor standards aim at "protecting women generally because of their sex, based on attitudes toward their capabilities and appropriate role in society" (p. 1672). In particular, these are convention 45, which prohibits women's underground work, and C89, which prohibits women's night work. Contrary to ILO C100 and C111, which combat discrimination, these regulations in fact restrict women's occupational choices and represent a work ban against women in certain jobs. Consequently, it is expected that these regulations, contrary to the others, *increase* the observed gender wage differential. Our variable "work ban index" counts how many of the two conventions a state had signed at a certain point in time.

3   Data and research method

The data for this study comes from our meta-analysis on the gender wage gap (Weichselbaumer and Winter-Ebmer, 2002) for which we collected all accessible published estimates of the gender wage gap. In November 2000 we searched the Economic Literature Index for any reference to: "(wage* or salar* or earning*) and (discrimination or differen*) and (sex or gender)". This search strategy led to 1541 references; in a first step we excluded theoretical papers. Among the remaining studies, only those estimates of papers were included in the meta data where authors controlled for differences in endowments of men and women. This could simply be done by including a sex dummy in a wage regression or - as in most cases - by conducting a Blinder-Oaxaca wage decomposition.

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[7] The ILO labor standards have become prominent in discussions on international trade and trade policies of the World Trade Organization (see Brown, 2001, for a survey). Singh (2001) gives a survey over the vast theoretical literature in the field.

The Blinder-Oaxaca decomposition allows that productive characteristics of men and women are rewarded differently by estimating wages for the different groups g, males and females, separately:

$$W_{gi} = \beta_g \, X_{gi} + \varepsilon_{gi}, \qquad\qquad (1.2)$$

where $g = (m, f)$ represents the two sexes; W_{gi} is the log wage and X_{gi} the control characteristics of an individual i of group g.

The total wage differential between men and women can then be decomposed into an explained part due to differences in characteristics and an unexplained residual. The difference in mean wages can be written as:

$$\overline{W_m} - \overline{W_f} = (\overline{X_m} - \overline{X_f})\hat{\beta}_m + (\hat{\beta}_m - \hat{\beta}_f)\overline{X_f} \equiv E + U, \qquad\qquad (1.3)$$

where W_g and X_g denote the mean log wages and control characteristics of group g and $\hat{\beta}_g$ represents the estimated parameters from equation (1.2). While the first term stands for the effect of different productive characteristics (the endowment effect E), the second term represents the unexplained residual U, which is due to differences in the estimated coefficients for both groups and is often referred to as "discrimination effect". In the following we will concentrate on the explanation of this unexplained residual U, which - like the coefficient of a sex dummy in a wage regression - we will call the "*gender wage residual*".

For the meta data set we collected all estimates for gender wage residuals, dummies as well as the unexplained gender wage gap U from Blinder-Oaxaca decompositions and its derivatives.[8] In total, 263 papers provided us with the respective estimates for differences in wages of men and women with identical characteristics in 62 countries. The meta data cover a time span from 1963 to 1997. Obviously, the collected estimates are based on different data sets with their specific characteristics; also different methods and specifications have been used to gain the results. However, meta-regression analysis allows to evaluate the effect of different data characteristics and econometric methods on the result reported by the use of a simple regression, where the gender wage residual is explained by the characteristics of the concerned study (Stanley, 2001). Using this method, we could estimate what each paper would have reported if a standard method and data set had been used and make the results comparable.

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[8] For extensions of the B-O decomposition see e.g. Brown et al. (1980), Reimers (1983), Cotton (1988), and Neumark (1988).

Competition

Typically in industry studies, four-firm concentration ratios or Herfindahls are used as indicators for competition in an industry. For an economy at large, such measures are not available. Therefore, we use the Index of Economic Freedom assembled by the Fraser Institute, Vancouver (Gwartney, et. al, various years). This index has the explicit aim to measure economic freedom, which is characterized by a lack of regulation, no government intervention in markets and, generally, a high degree of competition. The index comprises seven sub-components: size of government, structure of the economy and the use of markets, price stability, freedom to use alternative currencies, property rights, freedom in international exchange and freedom in financial markets. It also includes the mean tariff rates as a part of the international exchange section. The index has been designed to capture the degree of economic freedom in a society and has been used in many studies to explain development and growth.[9] The index is available for 1970 up to 1999 for every five years; we use interpolated values to match our data.[10]

Equal treatment law

Data for the ratification of CEDAW were obtained from Wistat, Women's Indicators and Statistics Database, Version 4, by the United Nations. Since some reservations substantially devalue ratification, these were taken into account in the coding of the corresponding variable. While article 2 is fundamental to the convention, reservations to other articles are less crucial.[11] Data on ratification of ILO conventions were taken from the ILOLEX web-page.[12]

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[9] Academic publications using the Economic Freedom index are listed under the following URL: www.freetheworld.com/papers.html

[10] In a previous version we have also tried tariff rates (trade taxes as a percentage of revenues) as a measure for protection from foreign competition using data from Frankel and Rose (2001). This indicator has the disadvantage that its importance and relevance varies by country size, because larger countries typically have a lower share of foreign trade. Moreover, the amount of intra-country competition is totally ignored. Berik et al. (2002) use import penetration as a competition indicator in the analysis of gender wage gaps in Korea and Taiwan and fail to find the expected effect which might be due to their flawed competition indicator.

[11] See data appendix for respective coding.

[12] http://webfusion.ilo.org/public/db/standards/normes/

4   Results

Figure 1 shows that in the raw data, in fact, a negative correlation exists between the degree of economic freedom in a country at a point in time and the calculated gender wage residual. To explore this relation more formally, we use the technique of meta-regression analysis. In a first step, we estimate a meta-regression model following Stanley and Jarrell (1998) including a list of variables, which characterize the data and econometric technique the authors used as well as a time trend.[13]

To examine whether competition and equal treatment laws can explain gender wage residuals internationally, we extend this simple meta-regression by including variables for competition, equal treatment laws and other country-specific socio-economic factors. As we have several observations per country and period, we weigh the data to give each country-time cell an equal weight. Moreover, a clustering approach is used to correct for possibly downward-biased standard errors. A negative correlation between equal treatment laws and the gender wage residual could also be caused by endogeneity of the political variables. Therefore, in the next section, we use IV techniques to control for this problem. Finally, we have to address a major problem of meta-regression-analysis: are all data points equally reliable? So far we treated all data points alike; however, one might want to account for the different quality of the underlying research by using an appropriate weighting scheme. We suggest several such schemes in the final section.

4.1   The effect of laws and competition on the gender wage gap

As ratification of the ILO conventions C100 and C111 highly correlate (0.75) with each other, we present results based on C111 only in Table 1 and results based on an "equal treatment law index" which adds up the ratification of CEDAW, ILO C100 and C111 in Table 2.

The first Column in each of these Tables presents a base specification, where we include only the meta-regression variables describing the characteristics of the individual gender wage gap study i (i.e., method, data characteristics etc.), our variables for equal treatment law and competition as well as a time trend. In the next two Columns we

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[13] See Weichselbaumer and Winter-Ebmer (2002) for a more detailed description and for specification and robustness checks. The included meta-regression-variables are: 14 variables for data set selection (like data source, restricted data set to never-married individuals, minorities, etc.), 9 variables for econometric methods (like Blinder-Oaxaca, dummy variable approach, use of IV or Heckman sample selection or panel data methods),

incrementally include other variables, dummies for continents, socio-economic indicators like fertility rate, GDP per capita and female activity rates as well as indicators for the religious composition of the population[14]. In the final Column we run a fixed-effects model by additionally including a set of country dummies.

As can be seen from Table 1 we find that countries having signed the CEDAW convention or the ILO convention 111 prohibiting discrimination have significantly lower gender wage residuals. The effects are relatively high: signing CEDAW reduces the wage gap by 3-5 log points, the ILO C111 causes a decrease by 7-13 log points. Labor standards, on the other hand, that try to protect women by prohibiting women's night and underground work have a counterproductive effect. As these work bans reduce access to jobs for females, they lead to occupational crowding and lower wages: the wage gap rises between 4 and 11 log points if the country signed one "protective" ILO convention. A higher rate of economic freedom reduces the gender wage gap significantly; if the country is ranked one point higher in the ten-point scale on economic freedom the gender wage gap drops between 1.4 and 4.4 log points. As the standard deviation of economic freedom is 1.7, the impact of competition on the gender wage gap is relatively big.

Size of government is one component in the construction of the Economic Freedom Index. The bigger the government sector, the lower economic freedom. However, previous research has shown consistently, that wage differentials in the public sector are lower than those in the private sector of an economy.[15] As a result, the quantitative impact of competition is even underestimated by using the Economic Freedom Index, because the impact of public sector employment would go in the opposite direction than that of competition as such.

All measured effects of law and competition are fairly robust across specifications, interestingly the biggest effects for all of these variables can be found in the fixed-effects model. The inclusion of additional socio-economic variables does not change our results considerably. Fertility rates and female participation rates do not seem to influence the gender wage residual once legal issues and economic freedom are controlled for: the coefficients are generally insignificant and their signs change often. Countries with a high proportion of Confucians (which is mainly South Korea and Taiwan) have a relatively low gender wage gap, whereas those with a high Muslim and Jewish percentage tend to have higher gaps.

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21 variables for inclusion of specific human capital control variables (as well as their respective quality) in the underlying log wage regressions plus a variable for the sex of the researcher.

[14] These data are only cross-sectional data relating to the late eighties and were taken from Sala-i-Martin (1997).

[15] See Weichselbaumer and Winter-Ebmer (2002) for international evidence from a meta-regression.

Table 2 presents the same specifications using the "equal treatment law index". The results corroborate the aforementioned conclusions: this composite index always has a significantly negative sign, leaving the other variables practically unchanged.

4.2 Instrumenting for signing international conventions

A causal interpretation of the impact of signing an equal treatment law is not possible at this stage because ratification may simply measure the predisposition of a country towards gender equality. For example, a country may sign such a law if the gender wage gap is low in the first place because in such a case the "costs" of signing – in terms of having to change policies involuntarily – would be low. Another potential problem would be that the signing of an international law is domestically not binding and therefore inconsequential. Our measured (negative) coefficients would reflect something else then. Chau and Kanbur (2001) strongly argue that this is not the case and that the signing of such international laws is not costless. Samson and Schindler (1999) also make the case that states, today, do not ratify conventions for "window-dressing" purposes because they "are aware that they will be held to account through the supervisory system" (p. 214).[16] However, in order to address this issue of causality, we need to find instruments that can predict the signing of such laws, but which do not directly affect the countries' gender wage gaps.

Two instrumental strategies will be ventured. Chau and Kanbur (2001) explain the signing of International Labor Standards by – amongst others – peer group effects: "if our peers do sign this international law, we will also sign." To implement this idea for each country we use the ratification standard for CEDAW, ILO C100 and C111 of its geographic neighbors. Insofar as the immediate neighbors can proxy peer groups, an impact on the ratification of the international laws should be given. On the other hand, an equal treatment law in the neighboring country is highly unlikely to influence the gender wage gap in the original country.[17]

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[16] For instance, the Neue Zürcher Zeitung of June 20, 2003 reports about the yearly ILO session in Geneva, where several countries, among them Belarus, Myanmar, Colombia, Cameroon and Libya have been reprimanded.
[17] An argument could be made that the instrument is invalid, because it falls prey to a missing variables problem: geographical neighbors might share the same Zeitgeist or social attitudes and therefore a correlation between gender wage gaps in neighboring countries is to be expected. As Bookmann (2001) shows, political variables are strongest in determining the signing of ILO conventions. Therefore, to render the instrument invalid, you must assume that the elections in your neighbor countries have a direct impact on the gender wage residuals in your own country.

The second instrumental strategy uses a state's willingness to bind itself by international treaties: if a state is generally willing to sign international agreements, it may also be more inclined to sign the ILO conventions on equal treatment. As indicators for the willingness to bind oneself internationally, we used the ratification of the other ILO core conventions on forced labor, freedom of association, the right to organize and minimum working age (C29, C87, C98, C105 and C138)[18]. As these conventions have nothing to do with equal treatment of men and women, they should exert no separate influence in the wage gap equations.

Results of the instrumented regressions are reported in Table 3 for the equal treatment law index. The IV regressions shown use the most complete specifications from Table 2, i.e. Col. (3) including all control variables as well as a fixed-effects approach corresponding to Col. (4). The IV procedure does not change the main message: regardless of the instrument used, signing an international convention reduces the gender wage residual considerably: the more so in the fixed-effects estimates. Precision in the fixed effects models is somewhat lower, because of the unbalanced panel aspect of the data: in some countries there are very few observations. The other variables do not change much. Statistics like a marginal R^2 and an F-test for the inclusion of the instruments in the first stage regression are very big, showing a big influence of the instruments on the endogenous regressors.

4.3 Weighting the studies

Another problem concerns the quality of the original gender wage gap studies. Our meta data set – and the analysis so far – treats all studies found in the literature alike, i.e. all estimates from the papers found in the Economic Literature Index search get equal weight in the regressions. However, if there are quality differences between the studies one would like to weight studies accordingly. In Table 4 we suggest four different weighting schemes[19] to check for robustness of our results. Columns (1) – (4) present the different weighting schemes using all control variables, whereas Columns (5) – (8) additionally use country fixed-effects.

Any researcher in the field of gender wage differentials has probably his or her own priors which studies are good or bad, but for our study we had to look for general indicators for "quality", which are operational and can be replicated. At first, we look at journal quality

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[18] These, together with the two equal treatment conventions and the convention on child labor (C182 in 1999), are considered the eight core ILO conventions.

[19] The proposed weighting schemes are always in addition to the appropriate weighting for time and country which has been used already above.

and apply the citation-based journal rankings from Laband and Piette (1994) as weights. This scheme is agnostic about our own priors of study quality, but assumes that the peer-review process does a good gate-keeping job in letting the most reliable studies be published in the best journals.[20] A drawback of this approach is that non-US and non-UK studies often find it much harder to get access to top-notch international journals. Therefore US and UK studies implicitly get a higher weight by our procedure. Another quality or precision indicator is the number of observations an estimate of the gender wage residual is based on. Consequently, we use sample size in the log wage regressions as a weighting scheme in Cols. (2) and (6). Since a higher number of control variables for individual productivity in a wage regression reduces the problem of unobserved heterogeneity, the quality of a gender wage gap estimate should increase with the number of controls used.[21] In Cols. (3) and (7), therefore, the number of regressors in the underlying wage equations is used as a weighting scheme. Finally, the coefficient of determination, R^2, is an obvious quality indicator for a wage regression. Therefore in Cols. (4) and (8) we use the average R^2 of the male and female wage regressions as weights.[22]

The results in Table 4 present a fairly robust picture and corroborate the aforementioned results. With one exception, the effect of equal treatment laws as well as of competition lies within a similar range as in the non-weighted models. The effect of work bans is very consistent compared to the non-weighted scheme, in some specifications it is even higher.

5   Conclusions

In this paper we investigated the effect of competition and equal treatment law on the gender wage gap. For our test we used a new international data set constructed by meta-analysis which is substantially richer and covers a longer time span than any other data set available. Not only are comparable micro data for a similarly large number of countries non-existent, also national micro data for such a vast number of different countries would not be obtainable for any individual researcher. Our meta data consist of all published estimates of previously

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[20] We assigned the lowest weight to non-journal publications like chapters in books or working papers.

[21] This approach could have the disadvantage, that some studies use too many or inappropriate control variables, like e.g. professional position, which might be caused by unequal treatment itself.

[22] An obvious candidate for such a weighting scheme would be the standard error of the calculated Blinder-Oaxaca wage differential. However, this is calculated only by Silber and Weber (1999).

conducted studies on the national level with the best data locally obtainable. The estimates for the gender wage residuals were made comparable by using all the relevant information about research method and data quality of the respective study as control variables.

We then used this extensive information to examine the reasons for the gender wage differential on an international level. Do market forces and equal treatment laws successfully combat discrimination? The answer to both of these questions is yes: Countries with a higher economic freedom have a lower gender wage residual than others. This confirms Becker`s theory, that increased competition erases discrimination, and supports the results of recent industry-specific papers using a completely different method. Even though the Economic Freedom Index is not a strict operationalization of Becker's concept of competition, it non the less allows the interpretation that if market forces are allowed to work more freely in an economy – which is the prime objective of this index – the gender wage gap would be lower.

It also seems that the ratification of international conventions supporting equal treatment of men and women has a strong and significant impact on the gender wage residual. While one might suspect that equal treatment laws are signed by societies which have a general tendency for equal treatment of the sexes, instrumental variables estimates – taking care of possible endogeneity of the signing of international conventions – are supporting our conclusion that it is the ratification of anti-discrimination laws which causes equal treatment. Moreover, another result speaks against the hypothesis, that the signing of international conventions is just a consequence of a national stance towards equal treatment rather then being causal for gender wage gaps: whenever a country has signed "protective conventions" – which were designed to protect women against unpleasant working conditions – gender wage residuals increase. This is exactly what the theory of crowding in the labor market would predict, but it does not back the hypothesis that societies with a generally women-friendly climate have lower gender wage gaps.

There is an ongoing discussion whether gender wage residuals, calculated by using sex dummies or a Blinder-Oaxaca decomposition, are measuring sex discrimination or just residual wage gaps which are due to unexplained heterogeneity between the sexes. It might be that the data on the human capital of individuals is simply not capturing all relevant productive characteristics. Our results show that the gender wage residual is consistently lower in the case of higher competition and in the presence of equal treatment laws. This indicates that at least part of the gender wage residual might be due to discrimination.

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6 Data-Appendix

Published papers used in the Meta-analysis: http://www.econ.jku.at/weichsel/work/meta_papers.pdf

Fertility rates, economic activity rates, CEDAW ratification from Wistat, Women's Indicators and Statistics Database, Version 4, United Nations.

CEDAW: Convention on the Elimination of All Forms of Discrimination against Women

> Coding:
>
> CEDAW not ratified: 0
> CEDAW ratified, reservation art. 2: 1
> CEDAW ratified, reservation art. 4, 5, 7, 9, 11, 13, 15, 16: 2
> CEDAW ratified, reservation art. 29(1): 3
> CEDAW ratified without reservation: 4

ILO (International Labour Organization) conventions: data on ratification of ILO conventions from the ILO web-site: http://webfusion.ilo.org/public/db/standards/normes/

> ILO C100: Equal Remuneration Convention, Date of signing: 1951
>
> ILO C111: Discrimination (Employment and Occupation) Convention, 1958
>
> ILO C45: Underground Work (Women) Convention, 1935
>
> ILO C89: Night Work (Women) Convention, 1948
>
> ILO C29: Forced Labor Convention, 1930
>
> ILO C87: Freedom of Association and Protection of the Right to Organize Convention, 1948
>
> ILO C98: Right to Organze and Collective Bargaining Convention, 1949
>
> ILO C105: Abolition of Forced Labor Convention, 1957
>
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Journal Ranking from Laband and Piette (1994), rankings based on impact adjusted citations per character in 1990, citations to articles published 1985-1989.

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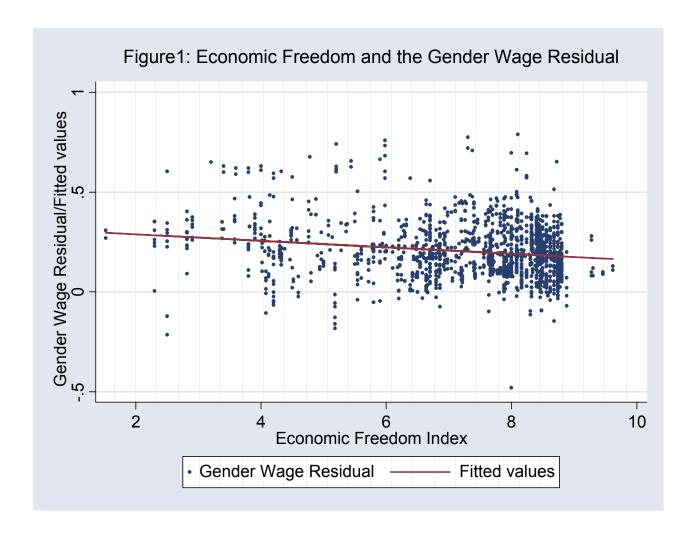
Religion from Sala-I-Martin (1997).

Figure1: Economic Freedom and the Gender Wage Residual

Table 1: The impact of competition and equal treatment laws on the gender wage gap I[23]

	(1)	**(2)**	**(3)**	**(4)**
CEDAW	-0.052	-0.039	-0.033	-0.043
	(0.020)*	(0.024)	(0.014)*	(0.025)
ILO C111	-0.066	-0.078	-0.089	-0.131
	(0.023)**	(0.016)**	(0.013)**	(0.079)
Work ban index (0-2)	0.036	0.037	0.036	0.108
	(0.015)*	(0.010)**	(0.014)*	(0.057)
Economic freedom index (0-10)	-0.014	-0.024	-0.027	-0.044
	(0.006)*	(0.011)*	(0.015)	(0.011)**
Fertility rate		0.003	-0.010	0.012
		(0.018)	(0.024)	(0.024)
Female activity rate		-0.001	0.001	0.001
		(0.001)	(0.001)	(0.003)
GDP per capita		0.001	-0.001	-0.003
		(0.002)	(0.002)	(0.004)
Proportion catholic			-0.025	
			(0.083)	
Proportion hindu			-0.026	
			(0.085)	
Proportion muslim			0.067	
			(0.123)	
Proportion jewish			0.122	
			(0.074)	
Proportion confucian			-0.206	
			(0.134)	
Proportion buddhist			0.017	
			(0.145)	
Continent fixed effects	No	Yes	Yes	No
Country fixed effects	No	No	No	Yes
Observations	1530	1530	1530	1530
Adjusted R^2	0.38	0.44	0.46	0.59

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

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[23] All regressions in Tables 1-4 also include the variables enumerated in footnote 13, including a time trend.

Table 2: The impact of competition and equal treatment laws on the gender wage gap II

	(1)	(2)	(3)	(4)
Equal treatment law index (0-3)	-0.035 (0.008)**	-0.035 (0.006)**	-0.042 (0.006)**	-0.055 (0.021)*
Work ban index (0-2)	0.036 (0.014)*	0.036 (0.010)**	0.032 (0.015)	0.088 (0.042)*
Economic freedom index (0-10)	-0.013 (0.005)*	-0.022 (0.011)	-0.027 (0.015)	-0.043 (0.010)**
Fertility rate		0.000 (0.016)	-0.015 (0.023)	0.013 (0.024)
Female activity rate		-0.000 (0.001)	0.001 (0.002)	0.002 (0.003)
GDP per capita		0.001 (0.003)	-0.001 (0.002)	-0.003 (0.004)
Proportion catholic			-0.011 (0.092)	
Proportion hindu			-0.052 (0.096)	
Proportion muslim			0.041 (0.134)	
Proportion jewish			0.125 (0.071)	
Proportion confucian			-0.297 (0.145)	
Proportion buddhist			-0.005 (0.163)	
Continent fixed effects	No	Yes	Yes	No
Country fixed effects	No	No	No	Yes
Observations	1530	1530	1530	1530
Adjusted R^2	0.37	0.43	0.45	0.59

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

Table 3: Instrumental variables estimates

\Instrument used	Neighboring countries	Neighboring countries	Other ILO conventions	Other ILO conventions
Equal treatment law index (0-3)	-0.045 (0.015)**	-0.155 (0.061)*	-0.053 (0.011)**	-0.123 (0.051)**
Work ban index (0-2)	0.032 (0.016)	0.106 (0.063)	0.031 (0.016)	0.100 (0.050)
Economic freedom index (0-10)	-0.027 (0.016)	-0.052 (0.013)**	-0.030 (0.013)*	-0.050 (0.012)**
Continent fixed effects	Yes	No	Yes	No
Country fixed effect	No	Yes	No	Yes
Marginal R^2 in first stage	0.05	0.006	0.14	0.085
F-test in first stage	86.6	31.6	208.24	28.7
Observations	1530	1530	1530	1530
Adjusted R^2	0.48	0.60	0.48	0.62

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

Table 4: Robustness check using weights for quality of underlying study

Weighting schemes	(1) journal rank	(2) # of observations	(3) # of regressors	(4) r^2	(5) journal rank	(6) # of observations	(7) # of regressors	(8) r^2
Equal treatment law index (0-3)	-0.029	-0.055	-0.051	-0.042	-0.005	-0.019	-0.046	-0.027
	(0.005)**	(0.008)**	(0.006)**	(0.009)**	(0.017)	(0.021)	(0.016)**	(0.015)
Work ban index (0-2)	0.064	0.063	0.037	0.032	0.046	0.103	0.067	0.019
	(0.016)**	(0.019)**	(0.017)*	(0.010)**	(0.039)	(0.045)*	(0.050)	(0.067)
Economic freedom index (0-10)	-0.025	-0.014	-0.033	-0.013	-0.014	-0.009	-0.035	-0.018
	(0.015)	(0.009)	(0.010)**	(0.013)	(0.015)	(0.009)	(0.013)*	(0.013)
Fertility rate	-0.008	-0.020	-0.020	-0.002	-0.035	0.002	0.008	0.024
	(0.032)	(0.009)*	(0.013)	(0.024)	(0.025)	(0.025)	(0.019)	(0.028)
Female activity rate	-0.004	0.006	-0.001	0.001	-0.008	0.005	-0.001	-0.001
	(0.003)	(0.002)**	(0.002)	(0.002)	(0.006)	(0.006)	(0.004)	(0.005)
GDP per capita	-0.002	-0.004	-0.002	-0.002	-0.001	-0.003	-0.003	-0.002
	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.004)	(0.003)	(0.005)
Proportion catholic	-0.198	0.046	-0.019	0.053				
	(0.096)*	(0.074)	(0.068)	(0.062)				
Proportion hindu	-0.166	0.061	-0.061	-0.028				
	(0.187)	(0.118)	(0.050)	(0.071)				
Proportion muslim	0.117	0.124	-0.015	0.073				
	(0.114)	(0.080)	(0.118)	(0.110)				
Proportion jewish	-0.055	0.266	0.101	0.196				
	(0.050)	(0.077)**	(0.056)	(0.081)*				
Proportion confucian	-0.082	-0.102	-0.293	-0.152				
	(0.202)	(0.082)	(0.064)**	(0.154)				
Proportion buddhist	0.132	-0.158	0.029	-0.198				
	(0.226)	(0.060)*	(0.156)	(0.084)*				
Continent fixed effects	Yes	Yes	Yes	Yes	No	No	No	No
Country fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Observations	1530	1223	1530	909	1530	1223	1530	909

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Adjusted R^2	0.68	0.80	0.52	0.44	0.74	0.84	0.61	0.56

Robust standard errors in parentheses   * significant at 5%; ** significant at 1%