Competition and the Gender Wage Gap: New Evidence from Linked Employer-Employee Data in Hungary, 1986-2003

Anna Lovász
University of Washington
Labor Project, Central European University

Draft of March 7, 2008.

Abstract
The overall gender wage gap fell from .31 to .15 between 1986 and 2003 following the transition to a free market in Hungary. During the same time period, firms faced increased competition from both new domestic and foreign firms due to the rapid liberalization measures implemented by the government. Becker's (1957) model of employer taste discrimination implies that employers that discriminate against women may be forced out of the market by competition in the long run, leading to a fall in the gender wage gap. I test this implication using data from the Hungarian Wage and Earnings Survey covering 1986-2003. I estimate the effect of variation in various measures of product market competition, including trade variables, on the within-firm endowment-adjusted gender wage gap, making use of the fact that I am able to follow firms over time. The estimates show a significant negative relationship between product market competition and the within-firm gender wage gap.

I am grateful to Shelly Lundberg, John Earle, Lan Shi, Judith Thornton, Richard Startz, Álmos Telegdy, and Stepan Jurajda for the guidance they provided. The research in this paper was supported by the Marie Curie fellowship at the Economics Department of the Central European University in Budapest and the Center for Economic Research and Graduate Education in Prague. The harmonized data was provided by the Economics Institute of the Hungarian Academy of Sciences, and cleaned further at the Labor Project of the Central European University.

I. Introduction

There has been a well-documented decline in the overall gender wage gap in Hungary during the transition from the socialist system to a free market economy. The average wage of women working in the private sector was 68 percent of men's in 1989, while by 1999 it had reached 82 percent.[1] Similar tendencies were observed in the other transitional countries of Central and Eastern Europe[2], seemingly contradicting one of the alleged achievements of socialism: gender equality in the labor market. Several studies have sought to explain the reasons behind this apparent beneficial effect of the transition to a free market on women's relative wages. The results paint a more ambiguous picture than suggested by this statistic alone, bringing attention to some of the possible drawbacks of market liberalization on the relative job market situation of women in transitional economies, for example, disproportionate job losses of the low-skilled.[3]

A possibility for a more positive explanation underlying the observed decline in the wage gap is suggested by Becker's (1957) model of employer taste discrimination, which implies that in the long run, increased competition may act as a downward force on the wage gap by reducing employers' ability to discriminate against women and other minorities. Employers that pay male employees a wage premium in order to indulge discriminatory tastes, thus accruing additional costs, are unable to compete with others who do not have such preferences as the opening of the product market to new entrants

[1] Source: Wage and Earnings Survey of the National Employment Office of Hungary

[2] Brainerd (2000) found decreasing male-female wage gaps in Slovenia, Hungary, the Czech Republic, Poland, Estonia, East Germany, and Slovakia, but an increase in the gap in countries of the former Soviet Union. See also Newell and Reilly (2001), and Ogloblin (1999).

[3] Hunt (2002) found that over half of the decline in the gender wage gap in East Germany was due to exits from employment of the low-skilled, who were disproportionately women.

forces a move towards more efficient production. All else equal, firms in less competitive product markets should exhibit higher levels of employer discrimination since rents are available for indulging such tastes. The model thus implies a negative correlation between the level of product market competition and employer taste discrimination, and highlights the positive role of competition in achieving equality in the labor market.

As a consequence of the rapid liberalization measures implemented in Hungary following the transition in 1990,[4] the level of competition in its markets increased significantly within a few years. Firms faced competition from domestic entrants, foreign companies, and in the form of imports.[5] Employers had to adapt quickly to the new, more competitive environment by increasing efficiency, which may explain some of the drop in the overall gender wage gap through a fall in employer discrimination. The rapid and extensive economic changes and the suitability of the data that is available make the transition in Hungary an ideal setting for a test of this implication of Becker's model. Hungary is also well-suited to this analysis due to the fact that it abandoned central planning, including strict wage grids seen in other communist countries, as early as 1968.[6] This means we are able to observe employer level wage discrimination prior to the transition, allowing us to study of the effect of changes in market competition on such discrimination.

In this paper, I conduct an empirical test of Becker's implication by capturing the effects of the variation in the competitive environment faced by employers over time on

[4] The Appendix provides a summary of major market reforms in Hungary during and following the transitional period.

[5] The number of registered economic organizations increased from 391 thousand to 1.1 million by 1998, and eighty percent of the GDP was produced by the private sector. Foreign direct investment streamed into the country, totaling roughly sixty billion dollars between 1989-1998. (GKI)

[6] Koltay (2002) states that although wage-setting following the transition was theoretically based on the principle of bargaining freedom, in reality, employers' decisions and the impact of market forces played the most important role.

the wage outcomes of female workers relative to male workers at their firms. The data used comprises a large sample of workers and firms drawn from the Hungarian Wage and Earnings Survey (WES)[7], a matched employer-employee dataset that covers the pre- and post-transition time period from 1986 to 2003. The size of the data, covering roughly 90,000 workers and 3000 firms each year, and the length of the time covered give a unique opportunity for determining the relationship between competition and discrimination in the long run. The fact that the WES matches workers to firms, and that it is a panel dataset in terms of firms leads to many improvements over previous studies that used industry or firm level data alone. The worker variables available in the data allow me to control for basic worker characteristics which determine productivity, while the firm level variables can capture firm-specific characteristics. Compared to studies that use a single year of data, I am able to estimate the effect of changes in competition levels within industries over time, which mitigates the possible problem of unobserved characteristics of industries. The large size of the WES sample allows me to test the implication using a larger number of observations than used in previous studies.

The empirical approach used in this paper is comprised of two stages, using a weighting procedure based on Wooldridge (2003). First, I estimate a within-firm gender wage gap separately for each year of the data, while controlling for observable worker characteristics, in order to obtain the within-firm adjusted gender wage gap, an upper bound for employer discrimination.[8] I then test whether higher levels of competition in the firms' product markets, measured by various competition variables, are correlated

[7] The WES dataset is collected by the Hungarian National Employment Office, and was provided for use in this research by the Economics Institute of the Hungarian Academy of Sciences.
[8] Using an estimate of the within-firm wage gap corresponds to the assumptions of Becker's model, where the decision to discriminate is made at the firm level, by the employer.

with lower wage gaps within firms. A crucial issue in performing this test is the accurate measurement of competition faced by firms. I address this issue by carefully determining the level of industrial aggregation to be used in calculating competition measures, and by constructing a variety of measures suggested in previous literature to fully capture the level of competition in the relevant market of the firms. The relevant market must include competition from both domestic and foreign producers, as both constrain employer's ability to discriminate against specific groups of workers. I use domestic market concentration ratios and price cost margins to capture the former, as well as import and export measures that capture the effects of foreign competition.

Various specifications are used to test the robustness of the results to functional form and different competition measure specifications. The estimation results support Becker's implication of a negative relationship between the level of competition in the product market and employer taste discrimination across all specifications. The preferred estimate, which limits the estimated coefficients to within-industry effects, suggests that a change from fully monopolistic to fully competitive market (from a concentration ratio of one to zero) decreases the log gender wage gap by 0.06. Based on the 0.2 drop in the average concentration ratio between 1986 and 2003, the effect of the higher level of competition faced by firms can account for roughly 7 percent of the 0.18 drop in the average within-firm log wage gap. Increased competition through trade also has a significant negative effect on discrimination: the estimated coefficient of import penetration is -0.08, while that of industry export share is -0.12. This means that the effect of increased competition from exports can account for 7 percent of the drop in the overall wage gap on average, while increased competition from imports accounts for 1

percent. The negative significant relationship remains robust in various specifications, including when domestic market competition is measured using the price cost margin instead of the concentration ratio.

The remainder of the paper will be organized as follows: section II reviews previous studies on competition and the gender wage gap. Section III describes Becker's model of employer discrimination, its implications, and the general specification used in the empirical tests. Section IV describes data and sample characteristics, the evolution of the overall and the unexplained gender wage gap in Hungary 1986-2003, and the construction of the measures of competition. Section V presents and discusses the results of the estimation. Section VI concludes.

II. Previous Literature

Several recent studies estimate the relationship between industry level gender wage gaps and competition measures.[9] Black and Brainerd (2004) estimate the impact of increased levels of imports on the industry-level residual wage gap in concentrated versus non-concentrated sectors using CPS data for 1977-1994. They find that increased competition through trade contributed to the narrowing of the US gender pay gap during that time period. On the other hand, Reilly and Dutta (2005) examine the relationship between industry-specific gender pay gaps and different measures of trade in India, but

[9] Rather than testing the relationship between the wage gap and competition measures, some previous studies used alternative approaches to test Becker's implication: Ashenfelter and Hannan (1986) find a significant negative relationship between banks' market power and their share of female employment. Hellerstein, Neumark and Troske (2002) test the relationship between profitability and ratio of females employed, and finds evidence that firms with higher female employment are more profitable, supporting Becker's theory.

find little evidence that trade measures are determinants of the gap. Black and Strahan (2001) focus on the effect of government deregulation in the banking industry. They find that prior to deregulation, rents were shared disproportionately with male workers compared to females, and that increased competition following the deregulation led to a rise in the relative wages of women. The availability of matched employer employee data allows for some improvements over industry level analysis. I am able to account for the role of firm and worker characteristics, and selection of workers in explaining the overall wage gap, and use a much higher number of observations for testing the effects of competition than analysis done at the industry level.

Meng and Meurs (2004) propose a methodology that can be used to study the firm's role in determining the gender wage gap by estimating a firm-specific gender wage premium for each firm in a single year. The premium is drawn from the firm fixed effects coefficients of wage regressions on separate male and female samples. They estimate the effect of competition on this gap using basic dummy variables[10] to proxy for degree of market competition faced by the firm, based on data from French and Australian surveys from 1992 and 1995. Though this is not the main goal of the paper, the authors find evidence that competitive market forces reduce discrimination in Australia, but no significant effect in the case of France. As this test is performed for a single year of data, they cannot control for unobservable characteristics that may differ in competitive industries relative to non-competitive industries and lead to a bias in the estimated effect of competition on discrimination, while this paper does so using data from several years. The rapid and extensive changes in competition during the time period covered by the

[10] As this is not the focus of their paper, the authors use only very rudimentary measures of competition based on surveyed manager's responses to some basic questions regarding the market they are in.

data capture changes in wage setting policies of employers in response to shocks to the competitive environment they faced. Since the Hungarian WES data follows firms over time, I am able to capture not only variation in competition levels among different industries, but also variation within industries over time.

III. Model and Empirical Specification

Becker's Model of Employer Taste Discrimination

Becker's 1957 model of employer taste discrimination has been widely cited as the basis for the analysis of the gender wage gap and the part of it that is due to discrimination by employers. In his model, some employers have a personal preference for employing males rather than females. Hiring a female worker rather than an equally qualified male worker gives them some positive disutility, depending on their personal preferences. Alternatively, employers prefer a lower ratio of female to male workers, and the amount of disutility they suffer from hiring female workers is dependent upon the ratio female workers in their firm.

Employers can be thought of as maximizing their individual utility function, which reflects the "cost" of hiring a certain ratio[11] of females:

$$U(\pi,F/M) = \pi - d(F/M) = f(M+F) - w_m M - w_f F - d(F/M)$$

where f(M+F) is the production function of the firm, F and M are the number of female and male workers at the firm, w_m and w_f are the wages of males and females, and d is a

[11] In this paper, I assume that it is the ratio of females in the firm that matters to the employer, not the absolute number. This maintains consistency with empirical evidence that firms hire a mix of both male and female employees, while a model where the number of female employees matters to the employer would suggest otherwise.

constant reflecting the employer's disutility from employing a higher ratio of female workers. The value of d is constrained by variables that affect the employer's ability to discriminate. The constant d varies among employers (by firm,) its value is greater than zero for discriminating employers, and equals zero if the employer is non-discriminatory.

Solving for the first order conditions of the employer's utility maximization problem gives us:

$$MPL = w_f + d/M$$

$$MPL = w_m - d(F/M^2)$$

where MPL is the marginal product of labor.

The first order conditions suggest that in equilibrium, the wage paid to male workers is higher than that paid to female workers: $w_m > w_f$. Employers can adjust the cost of hiring women by adjusting the ratio of females in the firm. Those who are less discriminatory, or have a lower d, hire relatively more women. Employers who indulge their discriminatory tastes will hire a lower than profit-maximizing ratio of female workers, and share part of their rents with male workers in the form of higher wages. The difference between the wage of a female worker and a male worker is composed of the difference in productivity between the two, and a firm-specific gender wage gap that reflects the part of the rents he receives beyond his productivity:

$$w_m - w_f = (MPL_m - MPL_f) + [d_j/M_j + d_j(F_j/M_j^2)] = (MPL_m - MPL_f) + \text{gender gap}_j$$

For a male worker and a female worker at firm j with equivalent characteristics this becomes:

$$w_m - w_f = \text{gender gap}_j$$

The firm gender wage gap varies by employer, and is constrained by the availability of rents to be paid to male employees. An employer whose firm operates in a

relatively more competitive market, and thus captures lower rents, will pay a lower gender premium to men relative to women than if the firm faced a less competitive setting, where more rents are available to indulge discriminatory tastes. In the long run, if there is an increase in the amount of competition in a product market, employers who pay a gender premium will be forced out of the market, as they will be unable to compete with non-discriminating firms due to the higher cost. Thus the model implies a negative relationship between product market competition and the firm level gender wage gap.

Empirical Specification

The empirical strategy for testing this relationship is composed of two stages, using a weighting scheme based on Wooldridge (2003)[12]. The first stage in the process is the estimation of the dependent variable in Becker's implication, the within-firm adjusted gender wage gap for each firm in each year. This reflects the part of the within-firm gender wage gap that is not explained by differences in the productive characteristics of male and female workers, and thus represents discrimination by the employer. The gap varies among firms within each industry according to each employer's preferences, but is constant for each worker within firms. The variable used to measure the gap needs to capture the firm level variation in the gender wage gap that remains after we account for the differences in observable productive characteristics of male and female workers.

The within-firm gap is estimated by running an OLS regression of the following wage equation within each firm for each year of the worker level dataset:

$$\ln w_i = \alpha + \beta X_i + \gamma M_i + u_i \,,$$

[12] See also Chapter 10 in Wooldridge (2002).

where lnw_i is the log real wage of worker i, X_i includes the observable characteristics of worker i (education, experience, and experience squared),[13] M_i is a gender dummy equal to one if the worker is male, and u_i is the error term. The coefficient estimate of the male dummy, the estimated within-firm gender gap, is retrieved for each firm, giving the dependent variable in the second stage:

$$\gamma_{jt} = gap_{jt} = \text{adjusted gender wage gap at firm j in year t.}$$

The gap can only be estimated for firms with at least two male and two female workers in the sample, though this was further limited to firms with at least ten of each in the preferred specifications. There is a variation in the noisiness of the gap estimates among firms based on the number of workers observed. The gap estimate becomes more precise for large firms with a high number of observations. To account for this variation, the standard error of the estimate is also retrieved so that the inverse of the squared standard errors can be used to weight each firm year observation in the second stage regression. This weighting scheme allows more weight to be given in the second stage test to observations where the estimation of the within-firm gap is more precise compared to observations whose estimated gaps may be noisier due to low number of observed workers.

The second stage regressions, estimated on the firm level dataset pooled for all years, will be of the general form:

$$gap_{jt} = \alpha + \beta_1 * CM_{kt} + \beta_2 * X_{jt} + e_{jt} ,$$

[13] Though the specification with only these worker variables is preferred due to the inherent endogeneity issues of including occupation variables in wage equations, the within-firm and within-occupation gap was also estimated with occupation dummies included in the controls. The results of the second stage test were qualitatively similar to those included in the paper, and are available upon request.

where gap_{jt} stands for the estimated wage gap for firm j at time t, CM_{kt} stands for various functions of the measures of competition for industry k at time t, X_{jt} includes additional controls, and e_{jt} is the error term. If increased competition does lead to a fall in employer discrimination, as suggested in Becker's model, we expect the estimated coefficient of CM_{kt} to have a negative sign.

In order to assess the robustness of the results, the implication is tested under numerous specifications. Competition is measured using several different linear and non-linear functions of domestic market competition measures, such as the Hirschman-Herfindahl index and the price cost margin, and the trade variables: import penetration and export share. The controls in X_{jt} always include dummy variables for each year in order to capture economy-wide trends, while the second set of regression specifications include industry fixed effects as well. In these cases, the estimated coefficients of CM_{kt} represent within industry effects, and thus capture the effect of variation in competitiveness on employer discrimination within an industry over time. The industry fixed effects estimate alleviates bias due to any unobserved industry characteristics, and is thus the preferred specification. The equations are estimated for both the full sample and a sample limited to manufacturing industries, as the measurement of trade and competition is often more accurate in the case of goods than services. Finally, an alternative implication of Becker's theory is tested as a further robustness check, which suggests that if employers were hiring a lower than profit maximizing number of female workers, increased competitive pressures should have raised the ratio of female workers within firms.

IV. Data and Measures of Competition

Data Description

The Hungarian Wage and Earnings Survey (WES) is collected by the National Employment Office since 1986, with subsequent surveys in 1989, 1992, and annually since until 2003. This means that the data covers the period before the transition, as well as during and after the changes, allowing for the study of the full effect of liberalization on the gender wage gap. The survey includes a dataset of workers with basic worker characteristics, characteristics of the firm of their employment, and a code that identifies the firm they work for. This code can be used to link each worker to a second dataset of firms, which contains more detailed firm characteristics. Workers cannot be followed over time in the data, but specific firms have identical codes in each year, so the matched employer-employee dataset is a panel in terms of firms, but not workers.

The sample frame for the WES included all full time workers from tax-paying legal entities with double-sided balance sheets that employed at least 20 employees in 1986, extended to firms with at least 10 workers in 1995, and from 1999 on to micro-firms as well. In 1986 and 1989, workers were selected into the sample using a random design based on fixed intervals of selection, with every seventh production worker and every fifth non-production worker selected in 1986, and every tenth worker regardless of type selected in 1989. Starting from 1992, workers were selected into the sample based on their date of birth: production workers were included if their birth date fell on either the 5^{th} or the 15^{th} of any month, and non-production workers if it fell on the 5^{th}, 10^{th}, or 15^{th} of a month.

The sample selected for this paper is limited to private sector firms with at least 20 employees in order to maintain consistency over all years of data. The sample was further limited to firms that have at least two male and two female workers in the survey to allow for the calculation of gender differences within each firm.[14] The resulting dataset contains observations on roughly 1.2 million workers from 15 thousand firms, representative of the Hungarian labor force in terms of industry, region and size when weights are used to correct for the sampling differences between production and non-production workers, as well as for under-sampling of small firms and firm non-response.[15] Worker characteristics in the matched dataset - used to estimate the firm level residual wage gap - include monthly gross real wage, gender, education (four categories: elementary, vocational, high school, university), age and potential experience, and occupation. Firm characteristics of the WES include firm employment, industry, region, revenue, export sales, and ownership. Table 1 provides some basic summary statistics of the WES data sample.

[14] The sample is restricted to firms with at least ten men and ten women in the preferred specification, to reduce random noisiness of the estimated within-firm gender wage gap.

[15] Worker weights are constructed using information on the number of production and non-production workers employed in each sampled firm. Firm weights are based on industry and size data from the National Tax Authority, which contains firm-level information on every double-entry bookkeeping firm in Hungary.

Table 1: Summary Statistics of the Wage and Earnings Survey Sample, 1986-2003

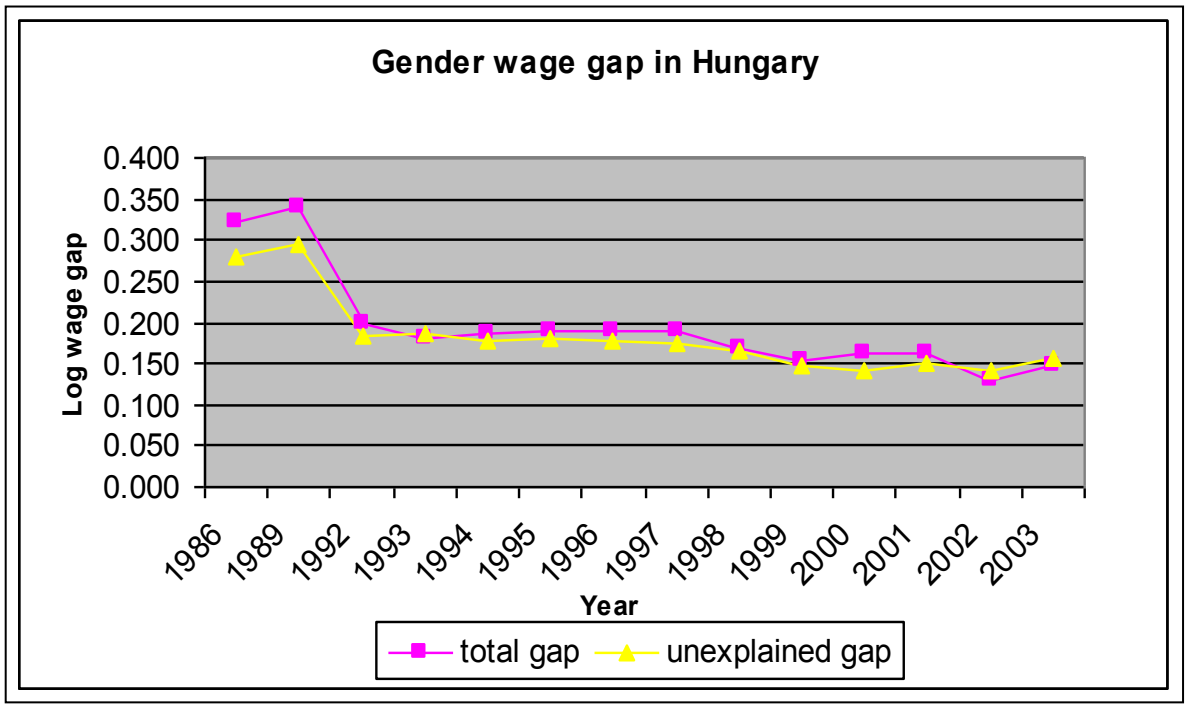
Year	Number of workers	Average real wage	Percent female in dataset	Number of firms	Number of firms in manufacturing	Average number of employees
1986	98,274	100,156	41.0%	2,839	851	10,227
1989	113,762	114,153	41.0%	3,626	1,072	9,776
1992	83,084	108,522	43.1%	2,887	841	10,809
1993	81,813	112,466	44.3%	2,857	881	9,722
1994	86,750	118,124	43.5%	3,411	1,166	8,136
1995	87,132	105,421	43.2%	3,299	1,199	7,551
1996	82,397	108,155	42.9%	3,199	1,215	7,120
1997	71,868	111,222	43.2%	2,991	1,154	6,354
1998	80,692	114,917	42.2%	3,153	1,247	5,842
1999	80,968	122,641	42.0%	3,297	1,283	5,690
2000	88,842	124,776	43.3%	3,680	1,396	5,368
2001	86,854	130,061	43.3%	3,629	1,400	5,281
2002	93,685	138,778	41.4%	3,525	1,354	4,641
2003	95,936	140,601	42.4%	3,523	1,357	4,492

Source: Author's calculations based on WES dataset.

The Wage and Earnings Survey data was previously used by Campos and Jolliffe (2004) to study the changes in the gender wage gap up to 1998. They found that in Hungary, the overall (unconditional) log gender wage gap declined from 0.31 to 0.19 between 1986 and 1998. Roughly 0.11 of the total change was due to a decline in the portion of the wage gap that is unexplained by observable characteristics, even after controlling for labor market selection. Figure 1 shows the total log wage gap and

estimated unexplained wage gap in Hungary, estimated using the same methodology on the Wage and Earnings Survey sample used in this paper, with additional years up to 2003.

Figure 1.: The evolution of the overall and the endowment-adjusted gender wage gap in Hungary 1986-2003



Data from the Wage and Earnings Survey 1986-2003. Workers included from firms in the private sector which have at least twenty employees. The unexplained log gender wage gap is estimated using a standard Mincerian wage equation with controls for worker education, potential experience, industry, and region of employment. Specification does not include firm fixed effects.

The overall gender wage gap for private sector workers fell from a high of .34 in 1989 to .20 by 1992, and continued to fall at a slower rate to .15 by 2003. Relative changes in observable characteristics do not explain much of the fall in the wage gap, the unexplained gap falls from .29 in 1989 to .15 in 2003. Although Campos and Jolliffe interpret this residual wage gap as the "discrimination component," and it is clear that this component explains most of the decline in the overall wage gap, we cannot tell

whether any fall in discrimination was due to the changes in the competitive environment during and after the transition, since this specification of the model does not include variables measuring the level of competition.

Measures of Competition

One key aspect in testing Becker's implication is the correct measurement of product market competition facing each firm. I use various measures and specifications in order to address the major issues with measuring competition as outlined by previous literature, and to serve as robustness checks for the estimation results. One main issue discussed frequently is the importance of defining accurately the relevant product market of each firm. Bikker and Haaf (2002) define the relevant market as being inclusive of all suppliers of a good who are actual or potential competitors, so its definition has a product dimension as well as a geographical dimension. Ideally, these markets could be defined based on actual product data of the firms. However, this is not available for the firms in the WES, so analysis must be based on their industrial classification codes. The markets are defined at the three-digit SIC level, as the two-digit level proved too broad, while the four-digit level is too disaggregated, and does not contain enough observations for analysis in some industries.[16]

The regional aspect of the market definition is addressed by the inclusion of trade variables. The import variable captures competition from foreign producers selling in the domestic market. These obviously force employers to increase efficiency, for example,

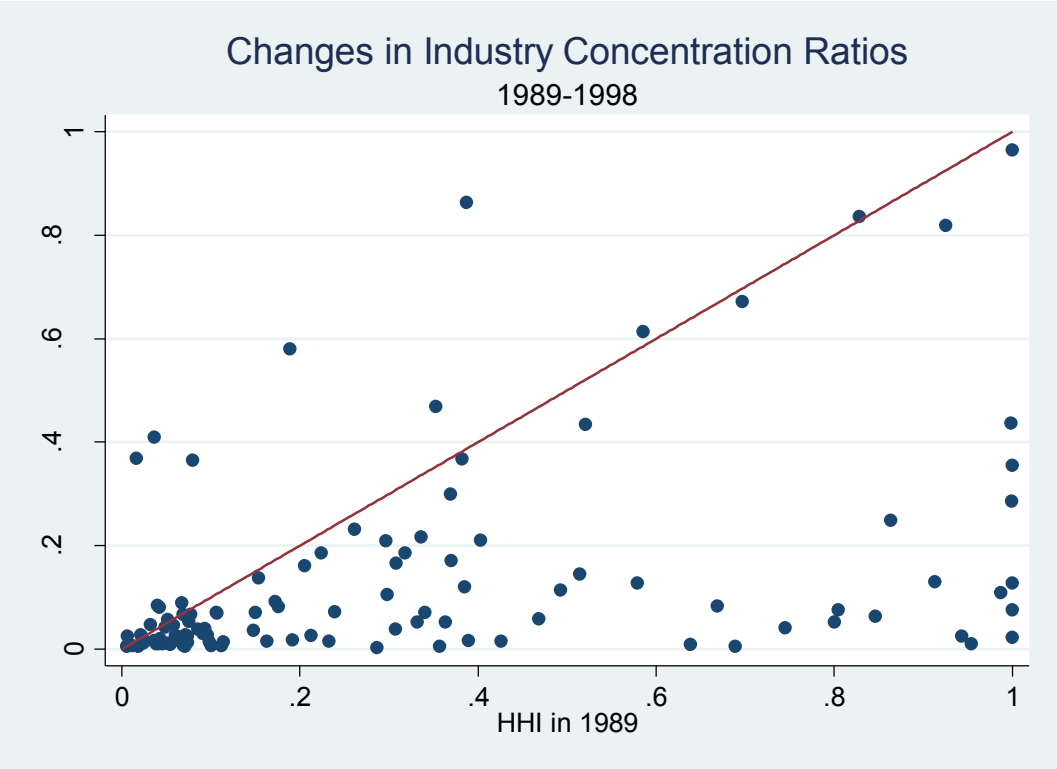
[16] The test of Becker's implication was also performed using the two-digit level competition measures. These also showed a smaller, though still significant negative relationship between competition and the within-firm gender wage gap.

by decreasing discriminatory behavior, in order to be able to compete. The export variable pertains to the involvement of domestic producers in the global markets. A higher export share in an industry reflects a more competitive setting, as firms that export are, in general, also forced to be more efficient.

The most common domestic market competition measures used in Industrial Organization literature are concentration ratios and the price cost margins.[17] I calculate the Hirschman-Herfindahl index (HHI) for each three-digit industry in each year based on the firm revenue information given in the WES survey. The index ranges from 0 to 1, with a value of zero representing perfect competition, and a value of one representing a fully monopolistic market. Alternatively, the four-firm concentration ratio was also calculated based on the market share of the largest four firms in each industry. The results were not significantly different using this measure, and preference is given to the Hirschman-Herfindahl index due to the fact that it takes all firms producing in an industry into account. To assess the amount of variation in the concentration ratio within industries over time, Figure 2.a plots the concentration ratio for each three-digit industry in 1986 versus the concentration ratio in 1998.

[17] See Boone, van Ours, and van der Wiel (2007) for an assessment of the performance of these competition measures.

Figure 2.a.: Changes in the Hirschman-Herfindahl Concentration Index in Hungary between 1989 and 1998

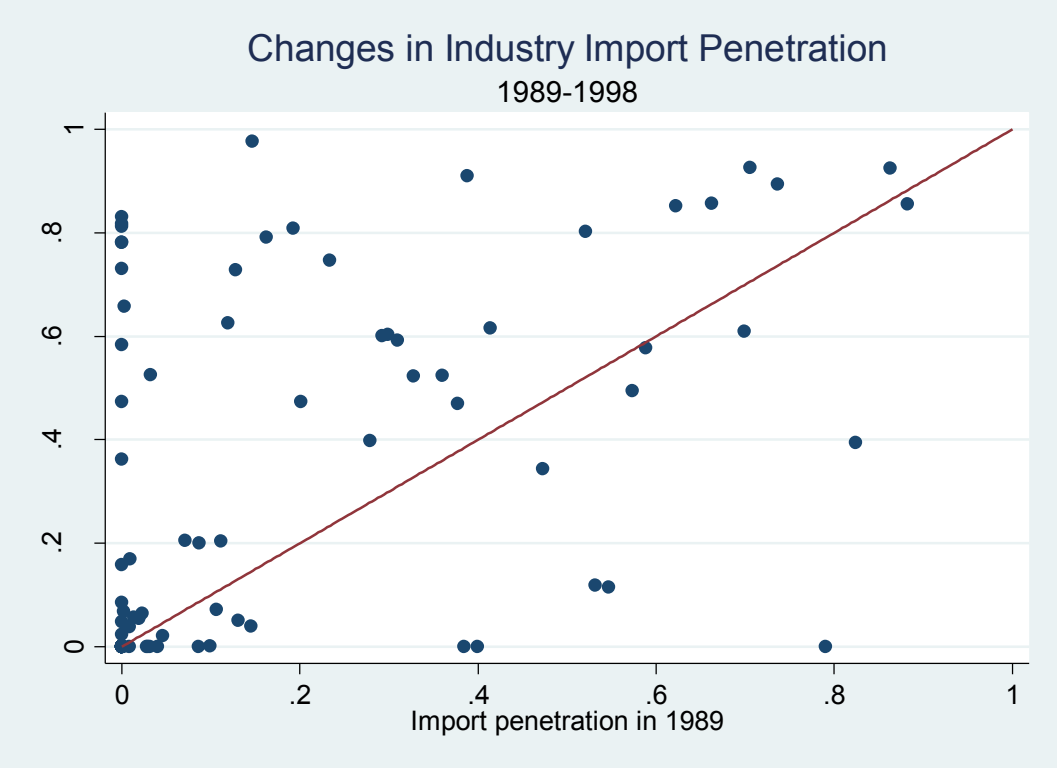


Source: Wage and Employment Survey

The 45 degree line in the graph theoretically represents points where the concentration ratio remained unchanged between 1989 and 1998. Some industries seem to fall near this line, especially those with concentration levels near zero, which were highly competitive to begin with. The points representing the majority of the industries fall below the 45 degree line, which means that in these markets, the concentration ratio fell between 1989 and 1998, competition increased. Market concentration increased in a few industries, mostly some specialized manufacturing industries, such as office equipment or forest machinery. Overall, the graph suggests there has been a lot of change in the competition levels faced by firms during the time period covered by the data.

The trade variables used to capture competition from foreign firms also display high levels of variation across years and among industries. The import penetration ratios[18] are calculated, at the three-digit SIC level, using nominal import data provided by the Institute of Economics of the Hungarian Academy of Sciences. Figure 2.b shows the import penetration levels of the industries in 1989 plotted against the levels in 1998.

Figure 2.b.: Changes in Import Penetration Ratio by Three-digit Industry in Hungary between 1989 and 1998



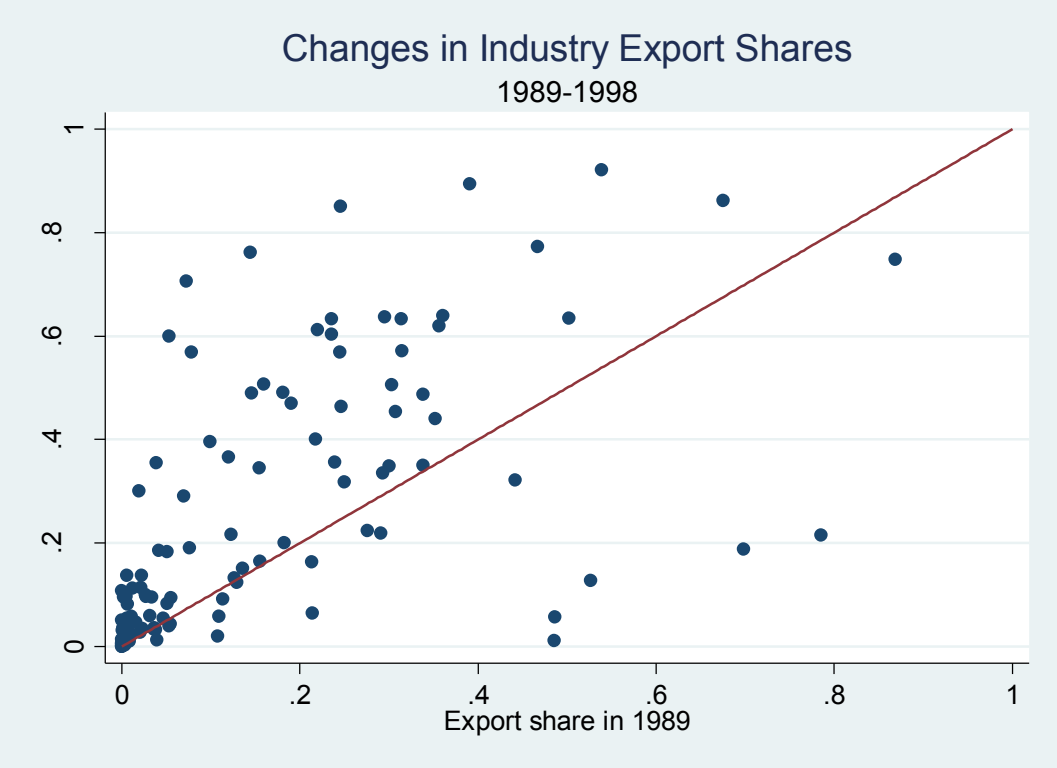
Again, the 45 degree line represents no change in import penetration. Few industries appear to be unchanged during the time period, with some points clustered at import levels of zero. The majority of the points in the graph lie above the line,

[18] Import penetration ratio is calculated as imports divided by the sum of industry sales revenue and imports less export sales.

suggesting that import penetration levels increased in most industries. Many points lie near the vertical line representing zero imports in 1989, representing industries where new trade relations were made following the transition. Some markets appear to have decreased import dependence, mostly those with strong ties to former Soviet Block markets.

Three digit industry level export shares[19] are calculated using firm export revenue and sales revenue data from the Wage and Employment Survey. Figure 2.c shows the changes in export share during the time period.

Figure 2.c.: Changes in Export Share by Three-Digit Industry in Hungary between 1986 and 1998



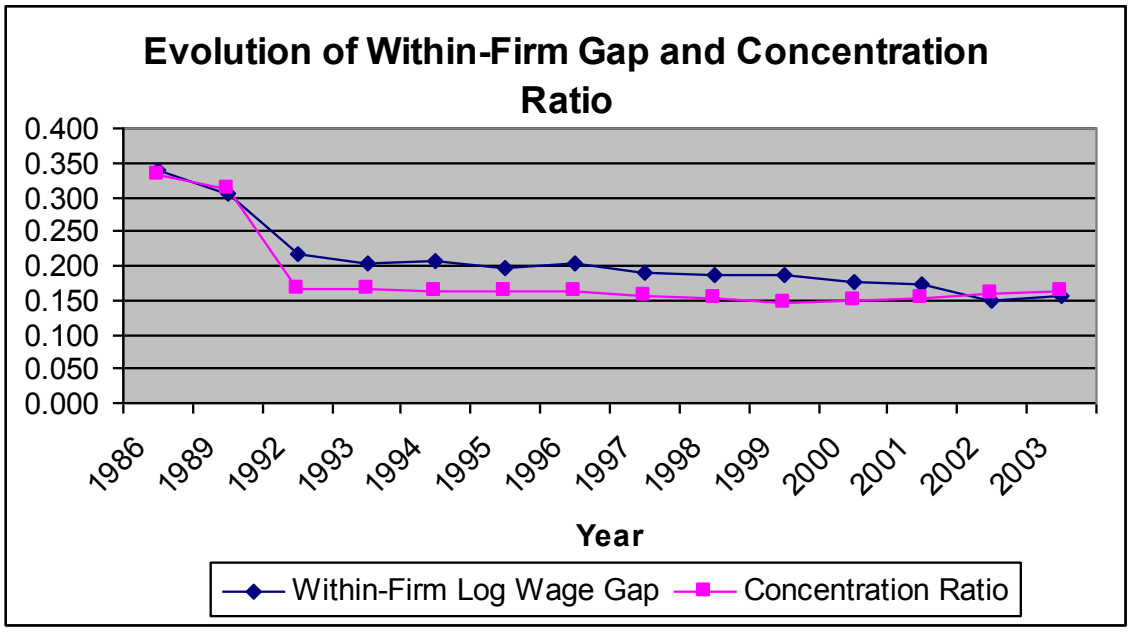
[19] Export share is calculated as total 3 digit industry export sales divided by industry sales revenue.

Again, the majority of the points lie above the 45 degree line, suggesting that export shares increased between 1989 and 1998 in most industries. Industries which formerly catered to communist allies lost some of their export markets, and show a fall in export shares. The graphs representing export and import variables both show rapid and extensive change in competition during the time period covered by the WES data. This supports the idea that the data can be used very effectively in testing Becker's implication regarding the effect these changes have on employer discrimination.

V. Estimation Results

A quick look at the evolution of the mean firm level gender wage gap and the mean domestic market concentration from 1986 to 2003, seen in Figure 3, seems to reinforce the validity of the implication. On average, the premium paid to male workers dropped from .28 in 1986 to .14 in 2002. During the same period, the mean concentration fell from .34 to .16. The average firm gender wage gap and market concentration seem show a clear positive relationship, supporting the notion that increased competition led to lower discrimination. This figure, however, can obviously only be interpreted as circumstantial evidence of a negative correlation between competition and discrimination. It is the estimated effect of variation in competitive levels among industries and across time on the wage gap at firms that shows whether the fall in the wage gap was caused by the increased competition in markets.

Figure 3: The Evolution of the Mean Within-firm Log Gender Wage Gap and Mean Industry Concentration, 1986-2003



Source: Hungarian Wage and Employment Survey 1986-2003. Within-Firm Wage Gap refers to the estimated within-firm log gender wage gap adjusted for basic worker characteristics (education, potential experience). The Concentration Ratio is the Hirschman-Herfindahl Index calculated at the three-digit industry level.

To test whether this is the case, I use the within-firm gender wage gap, estimated in the first stage regression as outlined in section III, and the various competition measures to run the second stage regressions of the form:

$$gap_{jt} = \alpha + \beta_1 * CM_{kt} + \beta_2 * X_{jt} + e_{jt} ,$$

where gap_{jt} stands for the estimated gender wage gap for firm j at time t, CM_{kt} the measures of competition for industry k at time t, X_{jt} includes additional controls, and e_{jt} is the error term. If increased competition does lead to a fall in employer discrimination, as suggested in Becker's model, we expect the estimated coefficient of CM_{kt} to have a negative sign. In the regression specifications, the concentration ratio is subtracted from one and referred to as domestic competition. This variable still ranges from 0 to 1, but

increased competition is represented by an increase in the variable, and its expected sign in the test is negative as it is in the case of the other measures.

Table 2 presents the results of the second stage regressions run on the WES sample of firms for whom we observe at least ten men and ten women each in the employee dataset. The second stage regressions are all weighted by the inverse square of the standard error of the firm gap estimated in the first stage, as described in section III. In the base specifications, the sample of firms is treated as a cross-section sample, with dummy variables included for each year to capture economy-wide trends. Robust standard errors of the estimates are shown in parentheses. The sample used in the first three specifications includes all industries, while specifications 4 and 5 are limited to the manufacturing sector only.

Table 2.: Second Stage Regression Results

	All industries			**Manufacturing**	
	1	2	3	4	5
1-HHI	-.051** (.019)	-.062** (.021)	-.058** (.021)	-.108** (.040)	-.093** (.031)
Import penetration	.	.029 (.026)	-.082** (.019)	-.018 (.020)	-.035 (.022)
Export share	.	-.059* (.022)	-.121** (.038)	-.038 (.031)	-.163** (.039)
Year dummies	Y	Y	Y	Y	Y
Industry FE	N	N	Y	N	Y
Weighted	Y	Y	Y	Y	Y
Number of observations	7752	7752	7752	3696	3696
R squared	.422	.492	.654	.426	.569

Data from the Wage and Earnings Survey for Hungary 1986-2003. Sample includes private sector firms with at least 20 employees, and at least ten men and ten women included in the survey. Dependent variable is firm level residual wage gap δ_j. 1-HHI is the domestic competition measure, the difference of one and the Hirschman-Herfindahl Index. Dummies for each year are included in all specifications. ** denote significance at the 1% level, * at the 5% level. Industry-year robust standard errors are shown in parentheses.

The results indicate a significant negative relationship between domestic market competition and the firm gender wage gap across all specifications, supporting Becker's implication. The second column labeled as specification 1 includes only the domestic market competition as an explanatory variable, without the trade variables. The coefficient estimate of -.051 suggests that complete lack of competitive pressures in a product market may lead to a log wage gap that is as much as .051 higher than it would be in a perfectly competitive setting. The second specification adds the two trade variables as explanatory variables. The estimated effect of domestic competition increases to -.062, and is significant at the 1% level. In other words, the estimate suggests that the gender wage gap would be 6.2 percentage points lower in a competitive market than an otherwise identical monopolistic one. Import penetration has a positive insignificant estimated coefficient in this specification. Export share, on the other hand, has a significant coefficient of -.059. This means an industry where firms produce only in order to export to the global market has a gender wage gap that is .059 lower than in an industry where firms produce only for the domestic market.

Specification 3 also includes industry fixed effects at the three-digit SIC level, the level of aggregation of the competition measures. This serves the same purpose as would the use of differenced data, in that it eliminates bias due to unobservable industry characteristics. The estimated coefficient of the competition measures should be interpreted as a within industry effect in this case, which capture the effect of variation over time in competition levels. This is the most stringent test of Becker's implication, in that the estimated effect of competition is independent of specific industry characteristics. The results indicate a significant negative relationship between competition and the firm

gender wage gap for all three competition measures, supporting the theoretical implication. The coefficient of domestic market competition (1-concentration index) is -.058, significant at the 1% level. This means if domestic competition increased from 0 to 1 (the concentration ratio fell from 1 to 0) in an industry, the log gender wage gap would fall by .058. The economy-wide average domestic competition level rose by .2 between 1986 and 2003, while the average log gender wage gap fell by .18. This means that the increase in competition may account for roughly 7 percent of the fall in the gender wage gap. The estimated coefficient of import penetration is -.082, and that of export share is -.121, both significant at the 1% level, further supporting the implication. Based on the average changes in import penetration and export share over the time period, the effect of increased competition from imports may explain 1 percent of the fall in the gender wage gap, while increased competition from higher export levels may explain 7 percent of the decline.

Specifications 4 and 5 limit the sample of firms to only those in the manufacturing industry, to address the issue that product market competition and trade may be more accurately measured in this sector. Specification 5 includes industry fixed effects, while specification 4 does not. The estimated coefficient of the domestic competition remains negative and significant over both specifications, ranging from -.093 to -.108. The coefficients of import penetration and export share are negative but insignificant in specification 4. The coefficient estimate of export share becomes significant when industry fixed effects are added. The estimated effect of export share is especially high in the manufacturing sector in the final specification, suggesting an industry which produces

fully for the world market has a .16 lower log wage gap than one that produces for the domestic market alone.

Price Cost Margin as Domestic Competition Measure

The alternative measure to the concentration ratio frequently used in Industrial Organization literature is the price cost margin. This can be calculated easily from the WES data as market aggregate profits divided by market aggregate revenues, and provides an opportunity for a robustness check. Table 3 shows the results of the second stage test with the price cost margin as the domestic competition measure instead of the concentration ratio.

Table 3.: Price Cost Margin Results

	All industries		Manufacturing	
Competition	-.137** (.051)	-.104** (.035)	-.305** (.075)	-.074** (.031)
Import penetration	.014 (.034)	.055 (.036)	-.095 (.091)	-.020 (.063)
Export share	-.018 (.032)	-.042 (.045)	-.059* (.026)	-.056 (.046)
Year dummies	Y	Y	Y	Y
Industry FE	N	Y	N	Y
Weighted	Y	Y	Y	Y
Number of obs.	4608	4608	3303	3303
R squared	.453	.639	.495	.621

Data from the Wage and Earnings Survey for Hungary 1986-2003. Dependent variable is firm level residual wage gap δ_j. Sample includes private sector firms with at least 20 employees, and at least ten men and ten women included in the survey. Dummies for each year are included in all specifications. ** denote significance at the 1% level, * at the 5% level. White sandwich estimators are used to calculate industry-year robust standard errors, shown in parentheses.

The first two specifications include the full sample of industries, while the last two are restricted to the manufacturing sector. The first and third columns do not contain industry fixed effects, while the second and fourth do. The results support the implication that increased competition lowers employers' ability to discriminate. Domestic market competition, measured as the price cost margin, has a significant negative relationship with the firm level gender wage gap. Evaluating the size of the estimated coefficients is more difficult here than in the case of the concentration ratio, as the price cost margin has a bigger range and no simple interpretation. The trade variables have a negative sign as well, but they lose their significance in these specifications in most cases.

Non-linear Functions of Competition Measures

The base specifications of the second stage regression presented so far all assumed that the gender wage gap is a linear function of the different competition measures. The regressions in Table 4 relax this assumption, and examine the relationship between discrimination and some nonlinear functions of the domestic market competition measures (Hirschman-Herfindahl Index and Price Cost Margin), the import penetration ratio, and export share. The first two specifications in Table 4 interact functions of the two domestic competition measures and import penetration. The other specifications interact the export share variable as well. The final two columns include industry fixed effects, while the first four do not. The interacted variables all increase as competition increases (since I include the functions 1-HHI and –PCM in the case of the domestic measures), so they should all affect the gender wage gap in the same direction. The

interaction terms are expected to have a negative estimated coefficient in all specifications based on Becker's implication.

Table 4.: Results with Functions of Competition Measures

	1	2	3	4	5	6
Function	(1-HHI) *imp	-PCM *imp	(1-HHI) *imp*exp	-PCM *imp*exp	(1-HHI) *imp*exp	-PCM *imp*exp
Competition	-.089** (.025)	-.143** (.054)	-.087* (.038)	-.149** (.058)	-.085* (.032)	-.108** (.036)
Year dummies	Y	Y	Y	Y	Y	Y
Industry FE	N	N	N	N	Y	Y
Weighted	Y	Y	Y	Y	Y	Y
Number of obs.	4608	4608	4608	4608	4608	4608
R squared	.459	.453	.456	.454	.628	.639

Data from the Wage and Earnings Survey for Hungary 1986-2003. Dependent variable is firm level residual wage gap δ_j. Sample includes private sector firms with at least 20 employees, and at least ten men and ten women included in the survey. The explanatory variable is an interaction of 1-Hirschmann Herfindahl index (1-HHI), import penetration ratio (imp), the negative of the price cost margin (-PCM), and the export share (exp). Dummies for each year are included in all specifications. ** denote significance at the 1% level, * at the 5% level. White sandwich estimators are used to calculate industry-year robust standard errors, shown in parentheses.

The results consistently indicate a significant negative relationship between competition and the wage gap. When domestic competition is measured by one minus the concentration ratio, the estimated coefficient of the combined competition measure is roughly -.09 in all three cases. Thus a unit change in the interaction term would result in a 9 percent fall in the gender wage gap. In the price cost margin specifications, the coefficient ranges from about -.11 to -.15, and is significant at the 1 percent level in all cases.

Ratio of Females Employed

An alternative implication of Becker's theory provides us with an opportunity for a final robustness check of the results. Discriminating employers not only pay a wage premium to men, but also hire a less than profit maximizing ratio of female workers. Higher levels of competition (a lower concentration ratio) should thus lead to a higher ratio of female workers in firms as competition drives employers to act more efficiently. Table 5 presents the results on the effect of competition on the firm level female ratio for some simple specifications.

Table 5.: Results with Ratio of Females as the Dependent Variable

	1	2	3
Competition	.377** (.106)	.581** (.153)	.056* (.021)
Import penetration	.	.000 (.000)	.000 (.001)
Export share	.	.569** (.143)	.408* (.161)
Year dummies	Y	Y	Y
Industry FE	N	N	Y
Number of obs.	7752	7752	7752
R squared	.207	.231	.548

Data from the Wage and Earnings Survey for Hungary 1986-2003. Dependent variable: ratio of females at firm j. Sample includes private sector firms with at least 20 employees, and at least ten men and ten women included in the survey. Dummies for each year are included in all specifications. ** denote significance at the 1% level, * at the 5% level. White sandwich estimators are used to calculate industry-year robust standard errors, shown in parentheses.

The results support the previous results from the firm premium regressions. A higher level of domestic market competition is correlated with a higher ratio of female employees in firms, and higher levels of exports are correlated with higher female ratios

as well. The estimated coefficient of import penetration is near zero and insignificant. Overall, these results again suggest that gender discrimination by employers exists, and competition puts pressure on discriminating employers.

VI. Conclusion

This paper tests the implications of Becker's (1957) employer taste discrimination model using data from Hungary 1986-2003, a period in which the country's market, and thus the environment faced by firms, underwent extensive liberalization. Results indicating that increased competition led to a fall in the gender wage gap due to lower discrimination give a positive explanation for some of the observed fall in the overall wage gap. A dataset of about 1.2 million workers – roughly 90 thousand for each year covered by the survey – is used to estimate the within-firm residual gender wage gap after controlling for differences in observable characteristics of workers. The variation in this measure among firms, and over time within the same firm, is used to test both the implications of the model: that higher levels of competition mean lower levels of discrimination by employers all else equal, and increases over time in competition lead to decreases in gender wage discrimination and thus a fall in the overall gender wage gap. Competition is measured both by domestic market concentration, the price cost margin, and measures of trade to capture the full range of competitive pressures faced by firms in the post-transitional era.

The results support the hypothesis that competition constrains employers' ability to discriminate by lowering the rents available in an industry. Domestic market

competition has a significant negative relationship with the level of the firm level gender wage gap, and a decrease in the concentration ratio – or increase in the level of competition – leads to a fall in the firm gender gap. The estimated impact of increased domestic competition can account for roughly 7 percent, while increased competition from trade can explain 8 percent of the fall in the economy-wide average log gender wage gap. However, in certain industries that changed from fully or nearly monopolistic markets to almost fully competitive, the change in domestic competition alone may account for roughly a third of the fall in the firm level gender wage gap. The results presented in this paper provide new evidence supporting the implication of Becker's discrimination model that increased competition lowers employers' ability to discriminate by demanding more efficient behavior in their hiring and wage setting practices.

References

Abowd, John and Kramarz, Francis. "The Analysis of Labor Markets Using Matched Employer-Employee Data," Handbook of Labor Economics, 1999, 3: 2629-2710.

Aghion, P., N. Bloom, R. Blundell, R. Griffith and P. Howitt: "Competition and innovation: an inverted U relationship." Quarterly Journal of Economics 1988(2):701–728.

Ashenfelter, Orley and Hannan, Timothy. "Sex Discrimination and Product Market Competition: The Case of the Banking Industry," The Quarterly Journal of Economics, 1986, 101(1): 149-174.

Becker, Gary. *The Economics of Discrimination*, Chicago: University of Chicago Press, 1957.

Berik, Gunseli. "International Trade and Wage Discrimination: Evidence from East Asia," Policy Research Working Paper No. 3111, The World Bank, 2003.

Bikker, J., and K. Haaf: "Measures of competition and concentration in the banking industry: a review of the literature." *Economic and Financial Modelling 9*, 2002, 53-98.

Black, Sandra and Strahan, Philip. "The Division of Spoils: Rent-Sharing and Discrimination in a Regulated Industry," *The American Economic Review*, 2001, 91(4): 814-831.

Black, Sandra and Brainerd, Elizabeth. "Importing Equality? The Effects of Increased Competition on the Gender Wage Gap," *Industrial and Labor Relations Review*, July 2004, 57(4).

Boone, J., J. van Ours, and H. van der Viel: "How (not) to measure competition." Tilburg University, Center for Economic Research Discussion Paper #2007-32. April 2007.

Borjas, George and Ramey, Elizabeth. "Foreign Competition, Market Power, and Wage Inequality," The Quarterly Journal of Economics, 1995, 110(4): 1075-1110.

Brainerd, Elizabeth. "Women in Transition: Changes in Gender Wage Differentials in Eastern Europe and the Former Soviet Union." *Industrial and Labor Relations Review*, 2000, 54(1): 138-162.

Broadman, Harry (ed.) "From Disintegration To Reintegration: Eastern Europe and the Former Soviet Union in International Trade," The World Bank, 2005.

Campos, Nauro and Jolliffe, Dean. "After, Before and During: Returns to Education in Hungary (1986-1998)." William Davidson Institute Working Paper No. 475, 2002.

Campos, Nauro and Jolliffe, Dean. "Does Market Liberalization Reduce Gender Discrimination? Econometric Evidence from Hungary 1986-1998." William Davidson Working Paper Institute Working Paper No. 678, 2004.

Cotton, Jeremiah. "On the Decomposition of Wage Differentials." *The Review of Economics and Statistics*, 1988, 70(2): 236-243.

Dutta, Puja and Reilly, Barry. "The Gender Pay Gap and Trade Liberalisation: Evidence for India," PRUS Working Paper No. 32, 2005.

Earle, John S. and Telegdy, Álmos. "Ownership and Wages: New Evidence from Linked Employer-Employee Data in Hungary, 1986-2003," Draft of January 2007.

Falzoni, Anna; Venturini, Alessandra and Villosio, Claudia. "Wage Differentials and International Trade in Italy Using Individual Micro Data 1991-1996," IZA Discussion Paper No. 1204, 2004.

Gupta, Nabanita and Rothstein, Donna. "The Impact of Worker and Establishment-level Characteristics on Male-Female Wage Differentials: Evidence from Danish Matched Employer-Employee Data," Centre for Labour Market and Social Research, Working Paper 01-09, 2001.

Heinze, Anja. "Gender Earnings Gap in German Firms: The Impact of Firm Characteristics and Institutions," ZEW Discussion Paper No. 06-020 (ftp://ftp.zew.de/pub/zew-docs/dp/dp06020.pdf.)

Horvàth, Hedvig, Hudomiet, Peter and Kézdi, Gàbor. "Labour Market Trends, 2000-2003," TARKI Social Report Reprint Series No 11, 2005.

Hunt, Jennifer. "The Transition in East Germany: When is a Ten Point Fall in the Gender Wage Gap Bad News?" *Journal of Labor Economics*, 2002, 20(1): 148-169.

Jurajda, Stepan. "Gender Wage Gap and Segregation in Late Transition." *Journal of Comparative Economics*, 2003, 31(2): 199-222.

Kertesi, Gàbor and Köllő, Jànos. "Economic Transformation and the Revaluation of Human Capital – Hungary, 1986-1999," Research in Labor Economics, 2002, 21: 235-273.

Köllő, Jànos. "Wage Setting Practices: Some Indirect Observations," in Fazekas, Kàroly and Jenő Koltay (eds.), *The Hungarian Labour Market: Review and Analysis, Budapest, Institute of Economics*, 2002 (http://econ.core.hu/hirek/kiadv.html#konyvek.)

Koltay, Jenő. "Wage Setting: Institutions and Practices," in Fazekas, Kàroly and Jenő Koltay (eds.), *The Hungarian Labour Market: Review and Analysis, Budapest, Institute of Economics*, 2002 (http://econ.core.hu/hirek/kiadv.html#konyvek.)

Meng, Xin. "Gender earnings gap: the role of firm-specific effects," Labour Economics, 2004, 11: 555-573.

Meng, Xin and Meurs, Dominique. "The gender earnings gap: effects of institutions and firms – a comparative study of French and Australian private firms," Oxford Economic Papers, 2004, 56: 189-208.

Némethné, Katalin Pál. "Small Open Economies: the Benefits of Foreign Direct Investment," Presentation at the 1st International Conference of Association of South Eastern European Economic Universities. Thessaloniki, May 24-27, 2000.

Newell, Andrew and Reilly, Barry. "The Gender Gap in Transition from Communism: Some Empirical Evidence." *Economic Systems*, 2001, 25:287-304.
Oaxaca, Ronald. "Male-Female Wage Differentials in Urban Labor Markets." *International Economic Review*, 1973, 14(3): 693-709.

Nickell, S.: "Competition and Corporate Performance." Journal of Political Economy, 1996. 104:724–746.

Oaxaca, Ronald and Ransom, Michael. "On discrimination and the decomposition of wage differentials," Journal of Econometrics, 1994, 61: 5-21.

Ogloblin, Constantin. "The Gender Earnings Differential in the Russian Transition Economy." *Industrial and Labor Relations Review*, 1999, 52(4): 602-627.

Reilly, Barry. "The Gender Pay Gap in Russia during the Transition, 1992-96." *Economics of Transition*, 1999, 7(1): 245-264.

Stiglitz, J.: Handbook of industrial organization. 1987. Vol. I Elsevier Science Publishers

Wooldridge, Jeffrey M. *Econometric Analysis of Cross Section and Panel Data.* Cambridge, MA: MIT Press, 2002.

Wooldridge, Jeffrey M. "Cluster-Sample Methods in Applied Econometrics," *The American Economic Review*, 2003, 93(2): 133-138.

Appendix

Overview of market reforms in Hungary 1988-1998

The end of the 1980s was characterized by deep economic and political crises in most Central Eastern European countries, stemming from the general collapse of the centrally planned economic systems. In Hungary, high levels of centralization and concentration led to increasingly high levels of expenditure by the government - the revenues redistributed by the state budget were close to seventy percent of the GDP[20] - while economic performance was low, the GDP falling steeply. The state budget deficit continued to expand, hurting opportunities for development, while also hindering firms' production through high tax rates. Similar situations of crisis led to social and economic reforms in all of the countries of the former Eastern Bloc, though they differed widely in speed of implementation, depth of change, and success.

Hungary was more fortunate than many of its neighbors in the respect that even preceding the transition, it enjoyed a relatively more liberal and advanced economy. In 1968, the Stalinist goal of self-sufficiency was replaced by the "New Economic Mechanism," which reopened Hungary to foreign trade, gave limited freedom to the workings of the market, and allowed a limited number of small businesses to operate in the services sector. By 1988, Hungary had also developed a two-tier banking system and some basic corporate legislation, paving the way for the drastic reforms market reforms that soon followed.

Despite the continuous loosening of the centrally planned economy, Hungary was experiencing a severe lack of investment in both agriculture and industry from the 1970s, and a sharp rise in its net foreign debt, from $1 billion in 1973 to $15 billion in 1993,

---

[20] See, for example, Katalin Némethné Pàl "Small Open Economies: The Benefits of Foreign Investment", Presentation at the 1st International Conference of Association of South Eastern European Economic Universities. Thessaloniki, May 24-27, 2000.

mostly due to consumer subsidies and unprofitable state enterprises. The shape of company structure according to size was like that of an upside-down pyramid, with very few small companies, some medium sized ones, and a huge set of large companies. Within companies, organizational level and management skills were out of date, and productivity was extremely low.

The process of moving the economy away from the centrally planned system to a market-driven one was a difficult one, with both expected and unforeseen problems along the way. In addition to measures of liberalization that needed to be undertaken, namely those of eliminating price controls and relaxing trade protection, transitional economies also faced further tasks: abolishing state orders and procurement, production, and monopolies, as well as the centralized allocation of foreign exchange. Liberalization, in this case, involved freeing prices, trade, as well as entry from state controls.

The government of József Antall initiated major reforms between 1990-1994 with rapid price and trade liberalization, a revamped tax system, and a nascent market-based banking system. However, reduced exports to the former Soviet bloc and shrinking industrial output contributed to a sharp decline in GDP, while government overspending continued to hinder the economy: the budget and current account deficits approached 10% of GDP. In 1995 the government of Gyula Horn implemented an austerity program, along with aggressive privatization of state-owned enterprises and an export-promoting program, in order to reduce indebtedness and cut the current account deficit.

These initial regulations were made without the benefit of prior experience and somewhat hastily, and produced many subsequent problems. Every new government had its own ideas about the best strategy for privatization, but due to the lack of domestic capital, encouraging foreign investment was an important element throughout the transitional years, as it is today. The rapid liberalization measures seemed to have paid off, the entrepreneurial sector began to flourish as a result: the number of registered economic organizations increased from 391 thousand to 1.1 million. The move from state-owned enterprises to private sector production was rapid: by 1998, eighty percent of the GDP was produced by the private sector. Foreign direct investment streamed into the country, totaling roughly sixty billion dollars since 1989. Roughly two-thirds of

manufacturing was foreign-owned, as well as seventy percent of financial institutions, and ninety percent of the telecom sector.

Table: Composition of subscribed capital of companies according to owners, 1992-1998

	1992	1996	1998
State	58,9	22,5	13,3
Local government	5,1	7,5	7,6
Private person, domestic	9,8	12,6	11,2
Company, domestic	12,4	20,5	26,2
Foreigners	10,1	31,5	37,6
Others	3,7	5,4	4,1
Total	100,0	100,0	100,0

Source: GKI – Economic Research Institute of Hungary

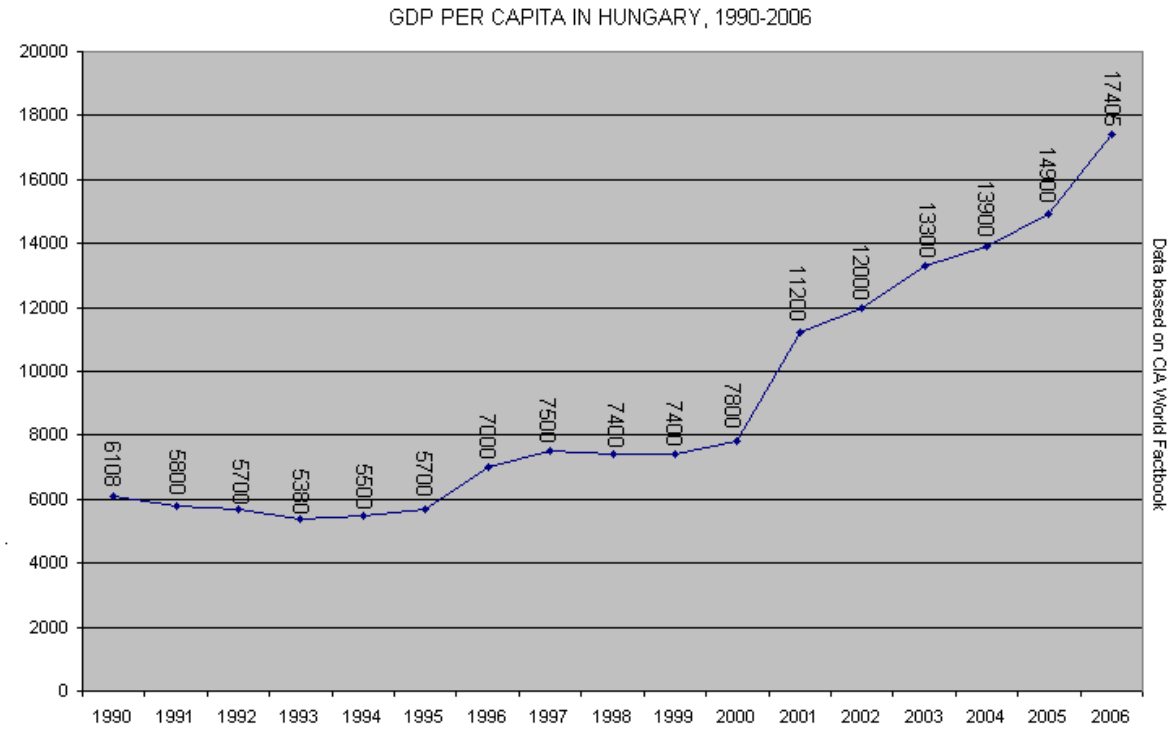
The transition to a market-based economy was not without its costs: it was accompanied by severe socio-economic problems and tensions. All the countries in the region faced the loss of their former export markets when the former Soviet bloc became inoperative, which was accompanied by a drop in domestic demand, as well as a simultaneous recession in the Western European export markets. Hungary's GDP declined about 18% from 1990 to 1993 and grew only 1%–1.5% annually up until 1996. Unemployment rose rapidly, to a maximum of about 12% in 1993, and inflation rates were above twenty percent a year until 1997.

After a few years, in which major restructuring of the industry took place, exports began to rise, aided by the settlement of multinational companies in Hungary. Trade gradually shifted from the former markets of the Comecon towards the west: while sixty-five percent of trade was conducted with the Soviet bloc countries prior to 1989, by 1997 seventy percent was with the European Union, and eighty percent with the countries of the OECD. The strong export performance began to boost GDP growth and industry production, while inflation was brought under control, remaining under ten percent a year.

Table: GDP, inflation rate, industrial production

Year	GDP*	GDP % of previous year	CPI as % of previous year	Industrial production as % of previous year
1991	2 498,3	88.1	135	81.6
1992	2 942,7	96.9	123	84.2
1993	3 548,3	99.4	122.5	103.9
1994	4 364,8	102.9	118.8	109.7
1995	5 614,0	101.5	128.2	104.6
1996	6 893,9	101.3	123.6	103.2
1997	8 540,7	104.6	118.3	111.1
1998	10 087,4	104.9	114.3	112.5
1999	11 393,5	104.2	110	110.4
2000	13 150,8	105.2	109.8	118.1
2001	15 274,9	103.8	109.2	103.6
2002	17 203,7	103.3	105.3	102.6

Source: Hungarian Central Statistics Office
*in billion Forints



Source: CIA World Factbook