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Importing Equality?
The Effects of Increased Competition on the Gender Wage Gap

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Abstract

It is now well documented that the gender wage gap declined substantially in the 1980s, despite rising overall wage inequality. While Blau and Kahn (JoLE 1997) attribute much of this improvement to gains in women's relative labor market experience and other observable characteristics, a substantial part of the decline in the gender wage gap remains unexplained, and may be due to reduced discrimination against women in the labor market. This paper tests the hypothesis (based on Becker 1957) that increased globalization in the 1980s forced employers to reduce costly discrimination against women and thus accounted for part of the "unexplained" improvement in the gender pay gap.

To test this hypothesis, we calculate the change in the residual gender wage gap across industries (as well as cities) over time using CPS data from 1977 - 1994, and test the correlation between this measure and changes in import shares. The wage data are further broken down by the type of market structure in an industry, i.e. whether the industry is concentrated or competitive. Since concentrated industries face little competitive pressure to reduce discrimination, an increase in competition from increased trade should lead to a reduction in the residual gender wage gap. We use a difference-in-differences approach to compare the change in the residual gender wage gap in concentrated versus unconcentrated sectors, using the latter as a control for changes in the gender wage gap that are unrelated to competitive pressures. The findings indicate that increased competition through trade did contribute to the narrowing of the gender wage gap, suggesting that, at least in this sense, trade may benefit women relative to men.

I. Introduction

In his seminal work on the economics of discrimination, Gary Becker (1957) made the startling claim that increased competition in the product market would reduce or eliminate discrimination against women and minorities in the long run. This implies a positive relationship between market power and employment discrimination: because discrimination is costly in the sense that discriminating employers forego profits in order to indulge their 'taste for discrimination', employers with market power will be able to practice discrimination to a greater extent than employers with little market power. The theory also has dynamic implications in that changes in the relative employment and earnings of the discriminated groups will depend in part on changes in market power. Focusing on women in particular, increased product market competition in an industry (or region) over time should reduce earnings and employment disparities between men and women, all else equal.

The recent narrowing of the gender earnings gap in an era of increased competition through international trade and deregulation might seem to offer supportive evidence of this theory. Yet researchers analyzing the causes of the improvement in female relative wages have largely ignored this possibility, focusing instead on changes in women's observable characteristics.[1] Blau and Kahn (1997), for example, analyze the sources of change in the gender wage gap from 1979-1988 and conclude that women's gains in work experience and occupational status explain much of the improvement in women's relative wages in recent years. They also note that the unexplained part of the difference in men's and women's average pay fell substantially, which they attribute to an improvement in women's unobserved labor market skills,

[1]Important contributions to understanding changes in the gender wage gap include Goldin (1990), O'Neill and Polachek (1993), and Blau and Kahn (1997); Blau (1998) provides a broad overview of changes in the economic status of women from 1970 to 1995.

or to reduced labor market discrimination against women (or both). While these researchers and others have suggested a number of plausible reasons for declining gender discrimination in the labor market – despite waning federal anti-discrimination efforts in recent years – the idea that increased product market competition may have benefited women has not been explored. This paper tests the hypothesis, based on Becker's theory, that increased competition in the 1980s forced employers to reduce costly discrimination against women and thus accounted for part of the "unexplained" improvement in the gender pay gap.

Did employers face increased competition in the 1980s? At least in some industries, it appears that they did: a number of industries faced deregulation in the mid-to-late 1970s and early 1980s (such as the banking, trucking, telecommunications and airline industries), and many industries faced intensified competition in the form of increased imports from foreign competitors. This paper focuses on the latter form of increased competition, and attempts to answer the question: has increased trade contributed to the improvement in relative female wages? Did the market step in where the federal government left off, and force (at least some) employers to reduce discrimination in order to remain viable in an increasingly competitive world?

We test this idea using both the Current Population Survey and the 1980 and 1990 Censuses, and examine the relationship between changes in trade and changes in the gender wage gap across industries as well as across metropolitan areas. The wage data are broken down by concentrated and competitive industries. Since concentrated industries face little competitive pressure to reduce discrimination, an increase in competition from increased trade should lead to a greater reduction in the gender wage gap than in competitive industries. We use a difference-in-differences approach to compare the change in the gender wage gap in concentrated versus unconcentrated sectors, using the latter as a control for changes in the gender wage gap that are

unrelated to competitive pressures. To preview the results, the empirical work supports the hypothesis that increased competition through trade has narrowed the pay gap between men and women; this result is consistent across a number of different specifications (including controls for changes in unionization) and appears insensitive to the choice of data set used.

The positive perspective on trade implicitly adopted in this idea clearly contradicts the spirit of recent research on the links between trade and the structure of wages; this research has largely focused on the contribution of trade to rising wage inequality in the United States, and particularly on the link between trade and the deteriorating fortunes of less skilled workers. While analysts disagree on the size of the impact of trade on wage inequality and relative employment, there is little disagreement over the sign: for less skilled workers, trade hurts.[2] Our results indicate that, in contrast to this perspective, trade may actually reduce residual wage inequality between men and women, at least in the manufacturing sector.

II. The setting: some circumstantial evidence

A variety of circumstantial evidence provides support for the idea that trade may influence the gender wage gap. The first piece of evidence is given by the similar trend in the gender wage gap and imports as a share of GDP over time, as illustrated in Figure 1. Until the early 1980s, both series were relatively flat: the median gender wage ratio remained fairly constant, at around 0.60, and imports as a share of GDP hovered at about 7 percent, with a slight upward trend beginning in the late 1960s. In the early 1980s the two series both begin to increase dramatically, and followed a similar trend until the end of the decade. In the early 1990s the two series

[2]For an overview of the literature on trade and wage inequality, see Freeman (1995) and the references therein.

diverged somewhat, as the narrowing in the gender wage gap outpaced the rise in the import share. Taken as a whole, however, the two series generally appear to move together.

In addition to the recent trends, historical data also suggest a relationship between trade and the gender wage gap. The attention given to 'globalization' in the popular press in recent years gives the impression that economic integration is at a level never before achieved in United States history. Yet most careful observers realize that the recent experience marks the *second* period of significant global integration in U.S. history. The first period of international integration occurred in the late nineteenth century, when declining transportation costs and relatively open borders contributed to the open flow of goods, capital and people across countries. In fact, it was only the mid-1970s that trade as a share of GDP (i.e., imports plus exports) in the U.S. achieved the level it had reached in 1915, at about 15 percent of GDP. Remarkably, this earlier period of globalization, like the current one, coincided with a narrowing of the gender wage gap: a substantial improvement in female relative wages occurred from the mid-nineteenth to the early twentieth century.[3] After that period, the gender wage ratio remained relatively constant until its recent narrowing, dating from the mid-to-late 1970s.

A third piece of circumstantial evidence on the relationship between trade and the gender wage gap is that the gender wage gap narrowed more for high school graduates than for college graduates in the 1980s (Katz and Murphy 1992). Since less educated workers appear to be more concentrated in trade-sensitive industries than more educated workers (Bednarzik 1993), this observation – otherwise difficult to explain -- also suggests that competition in the form of trade

[3]It is difficult to make precise statements about male and female relative wages in the nineteenth century, because a consistent measure of the gender wage gap is unavailable for many years. Goldin (1990), however, reports that the gender wage ratio among full-time manufacturing workers rose from about 48 percent in 1850 to 57 percent in 1914. Female relative wages also improved dramatically during the Great Depression, but that improvement seems to have been temporary.

may have benefited women relative to men in the 1980s.

III. Conceptual framework

A. The Becker model of employer discrimination

Becker's 1957 treatise on discrimination began by focusing on employers' personal preferences as a source of discrimination, arguing that some employers had a 'taste for discrimination' and would be willing to pay to indulge this taste.[4] As Gary Becker himself put it some forty years ago:

> If an individual has a "taste for discrimination," he must act *as if* he were willing to pay something, either directly or in the form of a reduced income, to be associated with some persons instead of others. When actual discrimination occurs, he must, in fact, either pay or forfeit income for this privilege. This simple way of looking at the matter gets at the essence of prejudice and discrimination. (p. 14)

Employers with a 'taste for discrimination' against women will hire fewer than the profit-maximizing number of women, employing more men who are equally skilled yet more highly paid. As a result, non-discriminating employers can drive discriminating employers out of the market because discrimination is costly: employers who discriminate against women sacrifice profits in order to indulge their taste for discrimination. In a perfectly competitive market, the wage gap between men and women of equal skills will eventually disappear, as discriminators are forced by market pressure to change their discriminatory practices or are bought out by non-discriminating firms.

Because product market competition plays an important role in these ideas, this suggests a link between market structure and the ability of an employer to practice discrimination:

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[4]Becker also analyzed the effects of discrimination by co-workers and by customers; the focus here is on his model of employer discrimination.

discriminating employers with market power, (presumably) earning positive economic profits, will be able to survive longer in the market than those operating in a competitive market with zero economic profits. Therefore, the gender wage gap should be smaller in competitive markets than in concentrated markets, all else equal.[5] This prediction appears to provide a relatively simple test of the neoclassical theory of labor market discrimination.

A strand of the literature on labor market discrimination has focused on testing this implication of Becker's theory regarding the relationship between market power and discriminatory practices. One of the most compelling studies in this vein examined employment practices in the banking industry, and found a negative and statistically significant relationship between market power in local banks and the share of female employment in each bank – thus confirming the predictions of Becker's theory (Ashenfelter and Hannan 1986).[6] More recently, Black and Strahan (1999) study the effect of increased competition resulting from deregulation in the banking sector on discrimination against women. They find that there has been a significant improvement in the relative wages of women as a result of deregulation. Hellerstein, Neumark and Troske (1997) test the relationship between profits and female employment across firms with market power, and find that firms that employ relatively more women have higher profits, as the theory predicts. They also test whether firms that discriminate grow more slowly than firms that do not discriminate, but find little support for this hypothesis. However, the five-year period they examine regarding the latter hypothesis is probably too short to adequately test that relationship.

Unlike most previous researchers, we choose to focus our analysis on one of the key

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[5]See Becker (1957) and Goldberg (1982) for more detailed discussions regarding the conditions required for this relationship to hold.

[6]This study also summarizes the early evidence from other studies on the relationship between employment discrimination and product market power.

dynamic implications of the Becker model, that changes in the competitive environment will lead to changes in the gender wage differential, rather than examining the static correlation between product market competition and the gender wage (or employment) gap at any one point in time. We take this approach because the primary concern is understanding the apparent change in discrimination against women in the 1980s and 1990s and, more specifically, how much a reduction in discrimination due to increased trade might have contributed to the substantial decline in the gender wage gap over this period.[7]

B. Methodology

Testing the simple prediction that increased competition from trade leads to declining discrimination against women and thus a declining gender wage gap is less straightforward than it appears, however. In considering the period from the late 1970s to the present, for example, it is evident that there are numerous reasons why the gender wage gap has narrowed over this period, and many of these reasons are unrelated to increased competitiveness in product markets. The increase in women's labor market experience (which has been shown to have contributed significantly to the narrowing of the gender wage gap), for example, may complicate the empirical analysis with the possibility of a misleading link between trade and the gender wage gap. If, for some reason, women's labor market experience increased by more in trade-impacted industries than in non-trade-impacted industries, simple empirical tests may indicate that trade contributed to the narrowing of the differential, rather than the underlying true cause of increased female labor market experience. Therefore it will be important to control for differing changes in observable

[7]For evidence that rising imports act to increase competition in an industry (albeit using Turkish data), see Levinsohn (1993).

characteristics across industries and regions that may confound the results. As a first step toward this goal, we test the links between trade and the residual gender wage gap, i.e. the gender wage gap that remains after one controls for differences in education and potential labor market experience between men and women.

It is equally important to control, if possible, for differing changes in women's unobserved characteristics that may have contributed to differing improvements in relative female pay across industries; such changes are speculated to have contributed to the narrowing of the 'unexplained' portion of the gender wage gap in the 1980s (Blau and Kahn 1997). These unobserved characteristics might include, for example, a stronger commitment to the labor force or to one's career, or to improved ability or underlying productivity of women relative to men.

In order to purge our estimates of bias due to these omitted variables, we use a difference-in-differences methodology that (conceptually) groups our observations along two lines: (1) industries that were and were not hit by a trade shock in the period under study and (2) concentrated and competitive industries. The difference-in-differences estimator will eliminate bias due to omitted variables that (1) have a common value for all trade-impacted or non-trade-impacted industries, such as shocks to economic conditions in manufacturing industries and (2) have a common value for all concentrated or competitive industries, such as worker ability or labor force attachment. In other words, the results will indicate the impact of trade on the gender wage gap in concentrated industries relative to competitive industries, netting out any factors that have affected the gender wage gap in manufacturing industries, trade-impacted industries as a whole or concentrated industries as a whole.[8] Conceptually, we calculate the following

[8]Although trade may have similar effects in the non-manufacturing sector, the empirical analysis focuses on the manufacturing sector because trade data are unavailable for the non-manufacturing sector. In addition, several industries in the non-manufacturing sector were affected by deregulation during the same time period (for example, trucking, airlines, banking, and telecommunications), and it would be difficult to

differences in the gender wage gap:

$$\left[\begin{array}{c}\text{trade impacted}\\ \text{concentrated}\end{array} - \begin{array}{c}\text{non-trade impacted}\\ \text{concentrated}\end{array}\right] - \left[\begin{array}{c}\text{trade impacted}\\ \text{competitive}\end{array} - \begin{array}{c}\text{non-trade impacted}\\ \text{competitive}\end{array}\right]$$

which is equivalent to estimating the following equation:

$$\Delta_t(\ln(wage)_{im} - \ln(wage)_{if}) = \alpha + \beta\Delta_t trade_i + \gamma concen_i + \psi(\Delta_t trade * concen)_i \qquad \textbf{(1)}$$

where $\Delta_t trade_i$ is the change in the import share in industry *i*, and $concen_i$ is an indicator variable equal to one if the industry was concentrated in 1977.[9] The inclusion of the dummy variable for concentrated industries allows for a differential change in the gender wage gap for concentrated industries relative to competitive industries. The marginal effect of trade on concentrated industries relative to competitive industries is represented by the ψ coefficient; this is the primary parameter of interest.

This approach implicitly assumes that discrimination against women did (or does) indeed exist, at least at the beginning of the period under study, and that this discrimination was reflected in lower wages for women relative to equally skilled men. While clearly a controversial issue, two recent careful studies suggest that this is the case. These studies compared men and women with very similar human capital investments and labor market skills, and found that a wage gap of 10 - 15 percent still exists even when one includes detailed controls for work and skill characteristics

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isolate these effects from the effects of trade.

[9]This approach is similar in spirit to that of Borjas and Ramey (1995), which examines the relationship between wage inequality and foreign competition by comparing the effect of imports in concentrated versus competitive industries (that work did not use an explicit difference-in-differences methodology, however). As in that work, we also use 1977 concentration ratios to determine if an industry is concentrated and do not let this vary over the sample time period. This is a more stringent test than if industry concentration were allowed to vary over time, since that would add noise to the variable of interest.

(Wood, Corcoran and Courant 1993; Weinberger 1998). These studies suggest that gender discrimination did persist, at least in the1980s.

IV. Data

The primary data source for the empirical work is the March Demographic Supplement to the Current Population Survey (CPS) from 1977 through 1994. Although this data set is not ideal for the test outlined above – in particular it lacks a measure of actual labor market experience – it is preferable to other large data sets due to the relatively long time period over which consistent measures of income and other variables are available, and due to the large sample sizes which enable analysis across industries and metropolitan areas. The 1977 - 1994 period is chosen because 1977 was the first year in which a relatively large number of metropolitan areas is identified in the CPS, and trade data are available only through 1994.[10]

The sample is defined similarly to that in Borjas and Ramey (1995), which in turn matched the data refinements described in Katz and Murphy's (1992) study of the wage structure. The sample includes individuals aged 18 to 64 who worked full-time in the civilian sector in the year prior to the survey; a "full-time" worker is defined as one who worked at least thirty hours in their usual work week and worked more than 48 weeks in the previous year. Self-employed individuals and individuals working without pay are excluded from the analysis. The wage data refer to real weekly or hourly earnings in the previous year in 1982 dollars; wages were deflated by the Consumer Price Index. As in the works cited above, workers earning less than $67 in

[10]In practice, we could use CPS data up through 1995, which reports earnings data for 1994. However, we did find that results were sensitive to the choice of 1994 earnings data as an endpoint. While results using 1991 and 1992 earnings data as endpoints are consistent with the results using 1993 earnings data as an endpoint, the 1994 earnings data did not give consistent results. Because it seems as though the 1994 earnings data are somehow different, we chose to exclude these results and present results with 1993 earnings data as the endpoint.

weekly wages in 1982 dollars are excluded from the analysis, and the wages of workers whose earnings are topcoded are multiplied by 1.45. Industries in which male or female employment comprises less than 10 percent of total employment are also excluded from the sample.

Two additional sources of information on earnings, work and demographic characteristics are used to test the sensitivity of the results to the choice of data set: the 1980 and 1990 Censuses, and the Outgoing Rotation Groups of the CPS.[11] The codes for the Metropolitan Statistical Area (MSA) in the Censuses were matched over time in a manner consistent with Jaeger et al (1998).

The trade data are from the National Bureau of Economic Research (NBER) Trade Database compiled by Robert Feenstra (1996). The impact of trade on an industry is measured using import shares, which are calculated as the ratio of imports (measured as the cost in freight (CIF) value of imports) to domestic shipments; the latter data are from the NBER Manufacturing Productivity database and are described in Bartelsman and Gray (1996).[12] The industry-level import shares are aggregated at the three-digit level based on the1980 Census definition. Across MSAs, the impact of trade is measured as the import share for the MSA, calculated as the average of the import shares of the industries in the MSA weighted by the number of workers in that industry in that MSA.

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[11]Census data were obtained from the IPUMS project at the University of Minnesota. For more information, see Rugles and Sobek (1997) or their webpage at **http://www.ipums.umn.edu.**

[12]Although one could also use (imports + exports)/domestic shipments as a measure of the impact of trade, many recent studies examining the relationship between trade and labor market outcomes has used the import share measure, so the same practice is followed here. See Borjas and Ramey (1995), Horn and Eastman (1997) and Kletzer (1996a, 1996b) for studies that follow this approach. It should also be noted that import shares are a conservative measure of the impact of trade on an industry, because the threat of imports alone may force employers to act more competitively and reduce discrimination. As a result, the import share measure likely underestimates the impact of trade on employer behavior. We also tested the sensitivity of our results by using (imports+exports)/domestic shipments as a measure of the impact of trade; the results were consistent with those presented here.

An industry is classified as a concentrated industry if the four-firm concentration ratio was .40 or greater in 1977, based on the Census of Manufacturers conducted in that year.[13] This determination was made at the beginning of the sample period in order to exclude the possibility that changes in concentration were due to increased trade. Appendix Table A lists the concentrated and non-concentrated industries in the sample based on this definition.

Finally, the dependent variable used for most of the analysis is the change in the residual gender wage gap over the period. To calculate this variable, the log wage is first regressed on four categorical education variables, age, age squared, and a non-white dummy variable; this regression is estimated for the pooled sample of men and women in each year of interest.[14] The residual gender wage gap is then generated as the difference in the average residual wage for men and women, calculated at the industry- or MSA-level. Although one could also include controls for occupation in the log wage equation, they are excluded here because one form of discrimination against women may have occurred through the types of jobs available to them. By excluding any controls for occupation, the results will measure the effect of increased competition through trade on employers' behavior regarding wages directly as well as indirectly through occupational changes.

Given that this study uses the change in the gender wage gap as the dependent variable, which is in itself a difference in log (residual) wages, it is clear that measurement error in this variable may affect the precision of the estimates. As discussed in Angrist and Krueger (1998)

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[13]We tested the sensitivity of the results to this choice of a cutoff and found the results to be insensitive. In addition, we also tried using the price-cost margin in 1977 as another measure of industry concentration; this produced similar results. Following Borjas and Ramey (1995), a CIC manufacturing industry was considered concentrated if the majority of workers in the industry were in concentrated four-digit (SIC) industries.

[14]The four education categories are: less than high school, high school, some college, and college or more. These education classifications are reasonably consistent with those suggested in Jaeger (1997).

and Bound et al (1994), the reliability of earnings data declines when earnings are expressed as year-to-year changes rather than as levels. Although this measurement error does not bias the coefficient estimates, it does increase the standard errors of the coefficient estimates and thus reduces the statistical significance of the results. On the other hand, the above studies also indicate that the reliability of earnings estimates increases when one analyzes changes in earnings over longer periods; because this study examines changes over a seventeen-year period, it is less likely that measurement error will affect the results in a significant way.

VI. Results

Table 1 reports the results of estimating equation (1) using data from the March CPS across manufacturing industries over the 1976 - 1993 period.[15] In this equation, the change in the industry-level residual gender wage gap is regressed on the change in the import share in the industry over the period, a dummy variable that equals one if the industry was concentrated in the beginning of the period, and the interaction of these two terms. The dependent variable is the change in the residual gender wage gap from 1976 to 1993, so that declines in this variable indicate improving female relative wages over the period. The positive and statistically significant coefficient on the concentrated industry dummy variable in the first column of Table 1 indicates that the residual gender wage gap increased in concentrated industries relative to competitive industries, or in other words the gender wage gap declined more in competitive industries than in concentrated industries. The positive coefficient on the 'change in import share' variable indicates that the gender wage gap grew more in industries that experienced greater increases in imports relative to industries that experienced little or no competition from increased trade. While this

[15]The observations are weighted by the inverse of the sampling variance of the dependent variable.

result may appear to contradict the theory discussed above -- i.e., that if trade is a form of competition, increased trade in an industry should reduce the gender wage gap relative to industries with no increase in trade -- a second effect of trade on relative wages would work in the opposite direction. This effect is the impact of trade on the wages of less-skilled workers relative to more-skilled workers: if trade disproportionately hurts less-skilled workers, as recent research has suggested,[16] and women comprise a disproportionate share of less-skilled workers, then trade will also affect relative wages of men and women through this route. If this is the case, one would expect trade to reduce women's wages relative to men's wages, and an increase in the gender wage gap should be observed in trade-impacted industries (or, the gender wage gap should narrow more slowly in trade-impacted industries). The positive coefficient on the import share variable appears to indicate that this negative impact of trade on female relative wages outweighs the positive 'competitive' impact of trade.

The key variable of interest for this paper, however, is the interaction between the concentrated industry dummy variable and the change in import share variable. A negative coefficient would indicate that the gender wage gap has declined more in concentrated industries that experienced a trade shock *relative* to competitive industries that were also affected by trade. The coefficient on this term is indeed negative and statistically significant, indicating that trade-impacted, concentrated industries do in fact experience reductions in their residual gender wage gap relative to competitive industries also hit by trade. The coefficient suggests that a 10 percentage point increase in import share in a concentrated industry would lead to approximately a 6.6 percent decline in the residual gender wage gap. The standardized coefficient is presented in

[16]See, for example, Murphy and Welch (1991), Wood (1994), and Borjas and Ramey (1995).

brackets.[17] To understand the economic importance of this estimate, the average increase in import share in concentrated industries accounts for a decline in the residual gender wage gap in manufacturing of approximately .034 log points. (The overall decline in the residual gender wage gap was approximately .14 log points during this period.) However, this positive effect is offset by the rising residual gender wage gap in concentrated industries relative to competitive industries and by the rising residual gender wage gap due to increasing imports as a whole.

The second column of Table 1 shows the results of estimating equation (1) using the residual gender wage gap of hourly earnings as the dependent variable; the coefficient estimates are similar to those in column 1, indicating that the results are insensitive to the choice of weekly versus hourly wages. The last two columns of Table 1 increase the number of observations by dividing the time period into two periods (the nine-year differences) and three periods (the six-year differences), respectively. In both cases, the coefficient of interest is negative and statistically significant, and the standardized coefficients suggest that the magnitudes are similar.

Table 2 tests the sensitivity of these results to the choice of data set. While the March CPS is an appropriate data set in the sense that its sample size is larger than that of any longitudinal survey and because it contains consistent measures of the variables of interest over the entire period under study, it is limited in that the cell sizes used for estimating equation (1) (i.e, industry by year by gender) may be small. To increase the cell size, equation (1) is also estimated using the CPS Outgoing Rotation Group surveys as well as the 1980 and 1990 Censuses.

The CPS Outgoing Rotation Group surveys are approximately three times as large as the

[17]Standardized coefficients are presented to enable comparison across different regressions. The standardized coefficient is the estimated coefficient multiplied by (standard deviation of the independent variable / standard deviation of the dependent variable).

March supplement, a strong advantage for the empirical work undertaken here. However, the Outgoing Rotation Group begins only in 1979, and it does not include information on the number of weeks worked in the previous year. The latter problem prevents us from conditioning on strong labor force attachment (number of weeks worked) as we did with the March CPS. Despite these differences, however, the results presented in the first two columns of Table 2 using the Outgoing Rotation Groups are quite similar to those of Table 1 that used the March CPS. The coefficient on the interaction of concentrated industry and change in import share is still negative (and still significant, although marginally); in addition the standardized coefficient suggests a magnitude consistent with the estimates based on the March CPS.

The last column of Table 2 presents the results using the 1980 and 1990 Censuses 1% sample. The obvious advantage in using Census data is that the sample size is extremely large and therefore the industry cell sizes are much larger than in the case of both CPS data sets. However, because the data span only ten years, there is less variation in the change in import shares over the period.[18] Nevertheless, the estimated coefficient on the interaction term is still negative and statistically significant and, again, of the order of magnitude suggested by the other data sets.

To this point, the analysis has focused on testing the impact of trade across industries. This is appropriate because we are interested in how trade, as a form of increased competition, differentially affects wages in competitive versus concentrated manufacturing industries.[19] This approach would be less appropriate if one believed that the changes in the gender wage gap in manufacturing industries due to increased trade had spillover effects into non-manufacturing

[18]The 1970 Census is not used because there are fewer MSA indicators in that Census than in the later Censuses.

[19]Numerous other studies use industry-level data to examine the effects of trade; see, for example Kruse (1988), Revenga (1992), Gaston and Trefler (1994), Kletzer (1996a, 1996b), Horn and Eastman (1997), and Campa and Goldberg (1998).

industries. This argument, for example, is similar to the argument given in Borjas and Ramey (1995) for analyzing the impact of trade on skill differentials across metropolitan areas rather than across industries. In that paper, the authors argue that the declining relative wages and employment of less-skilled workers in concentrated industries due to trade had spillover effects on the wages of less-skilled workers in the competitive sector of the economy; as a result it is appropriate to analyze the impact of trade across local labor markets rather than across industries.

While spillover effects are unlikely to be strong in the case of changes in the gender wage gap, we nevertheless test the sensitivity of the results to this assumption by estimating equation (1) at the MSA level. The results of these tests are presented in Table 3; the tests are conducted using both the March CPS and the 1980 and 1990 Censuses.[20] In this case, the MSA residual gender wage gap is calculated as the employment-weighted average of the residual gender wage gap for each industry in manufacturing in the MSA.[21] The import share is calculated similarly, as the employment-weighted average of the import share in each manufacturing industry in the MSA; the concentration variable is defined as the share of workers employed in a concentrated industry in the MSA. As indicated in Table 3, the results at the MSA level are essentially the same as the estimates at the industry level. The coefficients appear larger, but this is because the interaction term is now the percentage of employment in the MSA that is in concentrated industries, interacted with the change in the import share at the MSA level, instead of a zero-one dummy variable indicating whether or not an industry is concentrated interacted with the increased trade at the industry level. The first two columns show the results of estimating

[20]The CPS Outgoing Rotation Group data sets are not used for the MSA level estimation because they lack consistent MSA identifiers over the relevant time period.

[21]We include only manufacturing workers in the MSA estimation. This assumes that manufacturing and non-manufacturing workers are not close substitutes for one another.

equation (1) across MSAs using the March CPS over the entire1976 - 1993 period, using weekly and hourly earnings, respectively. These results are consistent with the industry level results, and the coefficients on the interaction term are negative and significant. The results are also similar when the 1980 and 1990 Census data are used, but the interaction term is no longer statistically significant. Note that the adjusted R-squared is negative in all cases, suggesting that these regressions explain little of the variation in the changes in the residual gender wage gap across metropolitan areas. This is likely due in part to the relatively small variation in import shares and concentrated industries across MSAs compared with the variation in these variables across industries (see Appendix Table 1 for means and standard deviations of these and other variables).

One factor that may affect the results that has thus far been omitted from the discussion is the change in unionization rates over the period. If, as seems likely, concentrated industries tended to be more unionized than competitive industries, and men are more highly unionized on average than women, then the decline in unionization rates over this period would likely reduce the gender wage gap more in concentrated industries than in competitive industries. Moreover, if import shares rose more in concentrated industries than in competitive industries during this time, the change in the import share in these regressions may simply be acting as a proxy for the change in unionization rates, and the results may simply reflect the impact of the erosion of union power rather than the impact of trade on the wage structure.[22]

To test this possibility, column 1 of Table 4 includes the change in the percentage of workers unionized in each industry in the regression. The results are virtually identical to those without unionization, suggesting that the results do not reflect changes in unionization rates

[22]Note that these two forces are likely related to one another; see Horn and Eastman (1997) for an analysis of the impact of increased trade on union density.

within industries.

Another factor that may affect the results is technological change. In order to get the results we observe, it would have to be the case that trade-impacted *competitive* industries face skill-biased technological change over this time period. The technological change would increase demand for skilled workers, driving up the wages for skills, both observed and unobserved. Because women are disproportionately low-skilled, we would see a rise in the gender wage gap in trade-impacted competitive industries relative to trade-impacted concentrated industries.[23] In order to test this theory, we regressed the percentage of workers in each education group (as a proxy for skill group) in each industry on the same independent variables as above. If we observe changes in the observable skills differentially by concentrated and trade-impacted industries, that might suggest that unobservable skills are changing in a similar manner. However, when we do estimate the relationship between skill composition and concentrated trade-impacted industries relative to trade-impacted competitive industries, we find no evidence of systematic changes in observable skills.

Finally, two additional specification tests are implemented in order to verify that increased competition through trade does indeed reduce the ability of employers to discriminate. These tests are based on further predictions of the Becker employer discrimination model, one regarding the relative employment of women and the other regarding the relative wage of minorities. Regarding the former, Becker's theory predicts that as discrimination is driven away, not only will women's relative wages increase but their relative employment will increase as well. We have already shown that as competition increases, women's relative wages increase. We now test the

[23]Note that, because we are controlling for education and age, these changes would have to be based on unobservable skills and not just observable skills, assuming that unobserved skill is correlated with observed skill.

second prediction of the theory: that women's relative employment will increase as well. The second column of Table 4 reports the results of regressing the change in the percentage of women employed in an industry on the same right-hand side variables: the concentrated industry dummy, the change in import share over the 1976-1993 period, and the interaction of the two terms. Although it is not statistically significant, the coefficient on the interaction suggests that as industries face more competition from international trade, concentrated industries increase their relative employment of women more than competitive industries do; this is consistent with Becker's prediction and lends further support to the idea that trade has induced employers to reduce costly discrimination against women.[24]

Since Becker's theory originally attempted to explain the consequences of racial discrimination, it is fitting to test whether the same predictions regarding wage differentials and market competition hold if one examines the racial wage gap rather than the gender wage gap. Although the forces influencing the relative the wages of minorities may have differed greatly from those influencing the relative wages of women in this period, one might still expect competitive pressures to affect a firm's ability to discriminate against minorities in the same way that competitive pressures would affect its ability to discriminate against women. Therefore, a final test is to examine how the minority residual wage gap (defined as the difference in the average residual wage of white men in an industry minus the average residual wage of nonwhite men in an industry) in a concentrated industry is affected by trade relative to how the gap in a competitive industry is affected by trade. Because of the limited number of minorities working in the manufacturing industries in the sample, we use the CPS Outgoing Rotation data set to

[24]These gains in female relative employment also suggest that the improvement in relative female wages in trade-impacted, concentrated industries was not due to women disproportionately dropping out of the labor force due to the impact of trade in these industries.

increase the sample size. Table 4, Column 4 presents the results of estimating equation (1) using the change in the minority residual wage gap from 1979 to 1993 as the dependent variable. Although not statistically significant, the coefficient on the interaction term is negative and of the same magnitude as earlier estimates for the gender wage gap. This lends further support to the hypothesis that increased competition through trade reduces the employer's ability to discriminate, and is particularly compelling because, unlike the gender wage gap, the racial wage gap did not narrow during this period.

VI. Conclusion

Women's gains in relative wages over the last two decades have been remarkable, particularly because these gains occurred during an era of rising wage inequality that would typically be expected to hurt workers earning below-average wages. Researchers have identified several measurable improvements in women's labor market skills that account for some of the relative wage gains won in this period; the remainder of the gains are generally attributed to improvements in unmeasured labor market skills or to reduced discrimination against women.

While there are few obvious ways to directly test the effects of reduced discrimination on the gender wage gap – particularly regarding changes in discrimination that are simply due to changes in social values or norms – this paper argues that part of the decline in discrimination may result from market forces and can therefore be tested. Following Becker (1957), since discrimination is costly in the sense that discriminating employers must forego profits in order to indulge their 'taste for discrimination,' firms with market power can "afford to" continue discriminatory practices for longer periods than can firms in competitive markets earning zero economic profits. Thus, the loss of market power in an industry is likely to increase the relative

wages and employment of women in that industry.

This idea is tested across manufacturing industries in the United States by assuming that increased international trade in recent years acted as a form of increased competition in some industries. The difference-in-differences approach compares the impact of trade in concentrated versus competitive industries, and enables us to net out the gains in relative female wages that occurred over the period for other reasons. The results indicate that the residual gender wage gap narrowed more rapidly in concentrated industries that experienced a trade shock than in competitive industries that experienced a trade shock. Moreover, the results are reasonably consistent across a variety of specifications and data sets.

Although it is unlikely that increased trade had a substantial impact on the overall gender wage gap in the economy – the manufacturing sector currently comprises only about 15 percent of the U.S. workforce – the empirical work in this paper suggests that the impact of trade on the structure of wages should be viewed in a more positive light than has recently been the case. Although trade may increase wage inequality by (modestly) reducing the relative wages of less-skilled workers, at the same time it appears to benefit women by reducing the ability of firms to discriminate..

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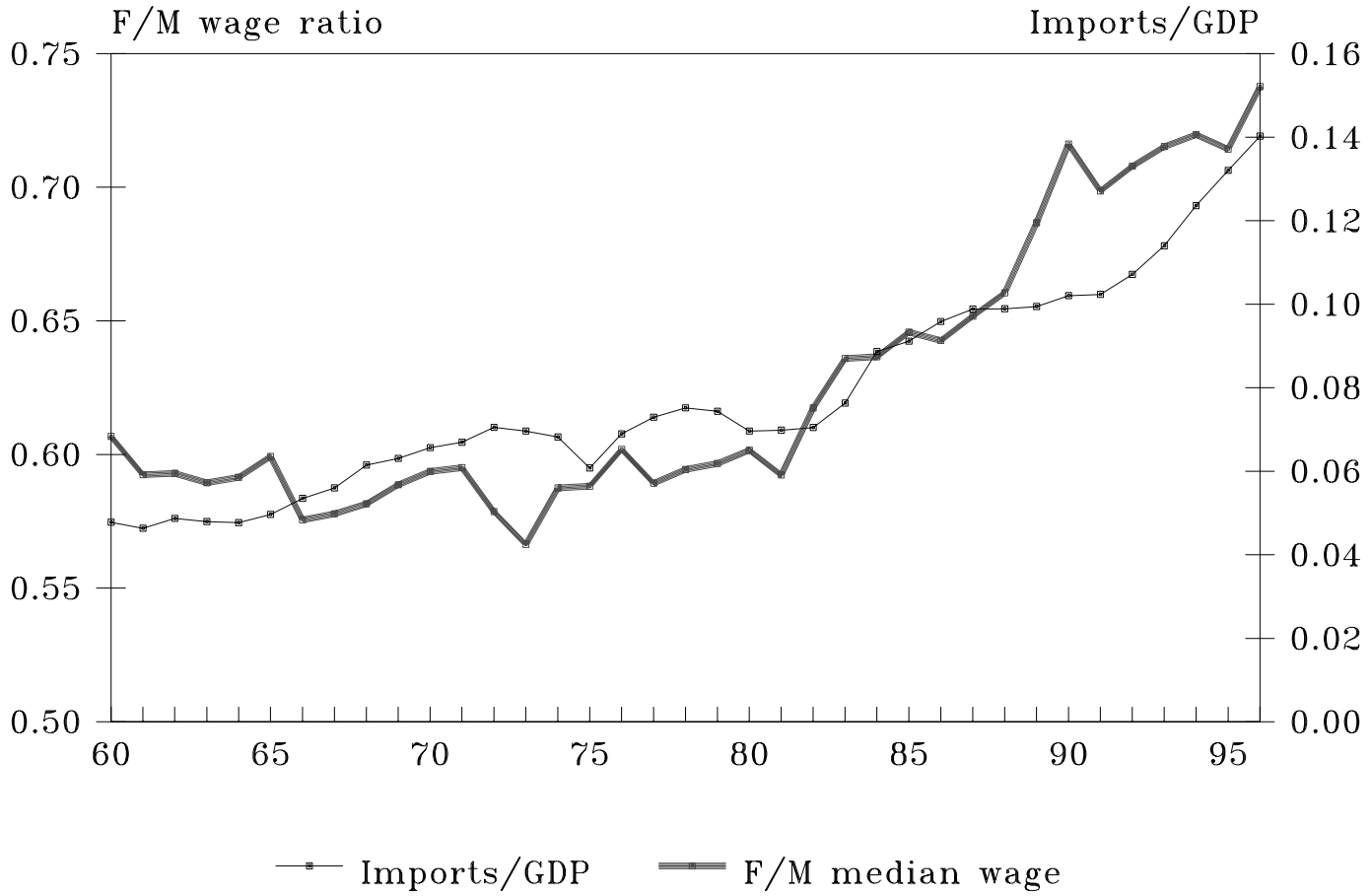
Figure 1. Trends in female/male median wages (full-time workers) and imports as a share of GDP (1992 dollars)



Sources: Gender wage gap: U.S. Bureau of the Census, Current Population Reports, Imports/GDP: U.S. Dept. of Commerce, National Income and Product Accounts

Table 1
Industry Level Regression Results
CPS Difference-in-differences
(Standard errors in Parenthesis)
[Standardized Coefficient in Brackets]

Dependent Variable: Change in Residual Gender Wage Gap	1976-1993 Weekly Earnings	1976-1993 Hourly Earnings	9 year differences Weekly Earnings	6 year differences Weekly Earnings
Concentrated industry[a]* Change in import share[b]	-.66** (.28) [-.249]	-.65** (.28) [-.248]	-.63** (.28) [-.278]	-.57* (.31) [-.168]
Concentrated industry	.19** (.06)	.19** (.06)	.08** (.03)	.07** (.03)
Change in import share	.27** (.13)	.27** (.13)	.20 (.15)	.16 (.16)
N =	63	63	132	207
Adjusted R^2 =	.1253	.1260	.0339	.0178

[a] A concentrated industry is defined as an industry with a four-firm concentration ratio greater than or equal to .40 in the 1977 Census of Manufacturers.
[b] Import share is defined as imports/domestic shipments.
** is statistically significant at the 5% level of significance.
* is statistically significant at the 10% level of significance
The observations are weighted by the inverse of the sampling variance of the dependent variable.
Standardized coefficients are the coefficient*(standard deviation of independent variable/standard deviation of dependent variable)

Table 2
Industry Level Regression Results
(Standard errors in Parenthesis)
[Standardized Coefficient in Brackets]

	CPS Outgoing Rotation 1979-1993		Census 1980-1990
Dependent Variable: Change in Residual Gender Wage Gap	Weekly Earnings	Hourly Earnings	Weekly Earnings
Concentrated industry[a] * Change in import share[b]	-.24 (.15) [-.305]	-.25* (.15) [-.317]	-.13* (.07) [-.302]
Concentrated industry	.07** (.03)	.07** (.03)	.02* (.01)
Change in import share	.04 (.09)	.04 (.09)	.06* (.03)
N =	64	64	74
Adjusted R^2 =	.0344	.0415	.0321

[a] A concentrated industry is defined as an industry with a four-firm concentration ratio greater than or equal to .40 in the 1977 Census of Manufacturers.
[b] Import share is defined as imports/domestic shipments.
** is statistically significant at the 5% level of significance.
* is statistically significant at the 10% level of significance
The observations are weighted by the inverse of the sampling variance of the dependent variable.

Table 3
MSA Level Regression Results
(Standard errors in Parenthesis)
[Standardized Coefficient in Brackets]

	CPS 1976-1993		Census 1980-1990
Dependent Variable: Residual Change in the Gender Wage Gap	Weekly Earnings	Hourly Earnings	Weekly Earnings
Percent in concentrated industry[a] * Change in import share[b]	-6.25* (3.37) [-1.10]	-6.42* (3.31) [-1.13]	-2.97 (2.51) [-.594]
Percent in concentrated industry	.80* (.47)	.80* (.46)	.21 (.19)
Change in import share	2.59* (1.35)	2.69** (1.34)	1.51 (1.02)
Change in unemployment rate	.36 (.93)	.30 (.92)	-.25 (.33)
N =	43	43	132
Adjusted R^2 =	-.0027	-.0056	-.0037

[a] A concentrated industry is defined as an industry with a four-firm concentration ratio greater than or equal to .40 in the 1977 Census of Manufacturers. 'Percent in concentrated industry' is the employment-weighted average of the share of workers employed in a concentrated industry in each MSA.
[b] Import share is defined as the employment-weighted average of the import share in each industry in the MSA.
** is statistically significant at the 5% level of significance.
* is statistically significant at the 10% level of significance
The observations are weighted by the inverse of the sampling variance of the dependent variable.

Table 4
Regression Results
Specification Checks
CPS Difference-in-differences
(Standard errors in Parenthesis)
[Standardized Coefficient in Brackets]

	Unions	Employment	Minority
Dependent Variable:	Change in Residual Gender Wage Gap	Change in Percentage of Women Employees	Change in Residual white/nonwhite wage gap
	1976-1993 weekly wages	1976-1993 employment	outgoing rotation 1979-93
Concentrated industry[a] * Change in import share[b]	-.95* (.51) [-.315]	.17 (.12) [.261]	-.35 (.26) [-.318]
Concentrated industry	.22** (.08)	.001 (.02)	.01 (.04)
Change in import share	.29** (.14)	-.15 (.06)	.06 (.17)
Change in unionization	.07 (.30)		
N =	58	66	65
Adjusted R^2 =	.1141	.0702	.0098

[a] A concentrated industry is defined as an industry with a four-firm concentration ratio greater than or equal to .40 in the 1977 Census of Manufacturers.
[b] Import share is defined as imports/domestic shipments.
** is statistically significant at the 5% level of significance.
* is statistically significant at the 10% level of significance
The observations are weighted by the inverse of the sampling variance of the dependent variable.

Appendix Table 1
Summary Statistics
(Standard Deviations in Parentheses)

	Industry			MSA	
	CPS 1976-1993	Census data	Outgoing Rotation	CPS 1976-1993	Census data
Change in residual gender wage gap in manufacturing (weekly earnings)	-.138 (.157)	-.066 (.031)	-.068 (.089)	-.186 (.159)	-.075 (.060)
Change in residual gender wage gap in manufacturing (hourly earnings)	-.135 (.156)		-.068 (.089)	-.185 (.159)	
Percent in concentrated industry*change in import share	.052 (.101)	.037 (.072)	.051 (.113)	.043 (.028)	.029 (.012)
Percent in concentrated industry	.309 (.466)	.354 (.481)	.301 (.462)	.349 (.152)	.376 (.113)
Change in import share	.097 (.275)	.079 (.115)	.086 (.270)	.121 (.045)	.076 (.020)
Change in union membership	-.137 (.078)	-.032 (.053)	-.130 (.069)	-.175 (.037)	-.047 (.029)
Change in unemployment rate				.001 (.027)	-.002 (.016)
N=	63	74	64	43	132

Appendix Table A

Concentrated Industries		**Non-concentrated Industries**	
CIC Code	*Industry: Not Trade Impacted*[1]	*CIC Code*	*Industry: Not Trade Impacted*
110	grain mill products	100	meat products
130	tobacco manufacturers	101	dairy products
140	dyeing & finishing textiles, except wool & knit	102	canned & preserved fruits & vegetables
180	plastics, synthetics, resins	111	bakery products
182	soaps, cosmetics	112	sugar & confectionery products
250	glass & glass products	120	beverage industries
262	misc. nonmetallic mineral & stone products	121	misc. food prep. & kindred products
270	blast furnaces, steelworks, rolling and finishing mills	141	floor coverings, except hard surfaces
280	other primary metal industries	142	yarn, thread & fabric mills
291	metal forgings & stampings	150	misc. textile mill products
292	ordnance	160	pulp, paper, paperboard mills
310	engines & turbines	161	misc. paper & pulp products
311	farm & machinery equipment	162	paperboard containers & boxes
352	aircraft & parts	181	drugs
360	ship & boat building & repairing	190	paints, varnishes, related products
361	railroad & locomotive equipment	191	agricultural chemicals
		192	industrial & misc. chemicals
		200	petroleum refining
		201	misc. petroleum & coal products
		230	logging
		232	wood buildings, mobile homes
		241	misc. wood products
		242	furniture & fixtures
		251	cement, concrete, gypsum, plaster products
		271	iron & steel foundries
		282	fabricated structural metal products
		290	screw machine products
		300	misc. fabricated metal products
		341	radio, T.V., communications equipment
		370	cycles & misc. transportation equipment
		372	optical & health services supplies
		390	toys, amusement, sporting goods
CIC Code	*Industry: Trade Impacted*	*CIC Code*	*Industry: Trade Impacted*
380	photographic supplies & equipment	132	knitting mills
381	watches, clocks, clockwork operated devices	151	apparel & accessories, except knit
210	tires, inner tubes	152	misc. fabricated textile products
252	structural clay products	211	other rubber products, plastics footwear, belting
261	pottery & related products	220	leather tanning & finishing
312	construction & material handling machines	221	footwear, except leather & plastic
321	office & accounting machines	222	leather products, except footwear
322	electronic computing equipment	231	sawmills, planning mills, millwork
340	household appliances	281	cutlery, hand tools, other hardware
342	electrical machinery, equipment, supplies	320	metalworking machinery
351	motor vehicles and motor vehicle equipment	331	machinery, except electrical
		371	scientific & controlling instruments
		391	misc. manufacturing industries

[1] A trade-impacted industry is defined as one in which the import share increased by at least .10 between 1976 and 1993. A concentrated industry is defined as having a four-firm concentration ratio of greater than .40 in 1977.