The Impact of Organizational Changes on Aggregate Inequality:

The Case of Downsizing*

Paper presented at the American Sociological Association Annual Meeting,
San Francisco, August, 2004

DRAFT: Comments welcome.

August 4, 2004

Leslie McCall
Department of Sociology
Rutgers University
New Brunswick, NJ 08854

* I gratefully acknowledge the financial support of the National Science Foundation (SES-0136410) and the excellent research assistance of Sung Won Kang.

ABSTRACT

Corporate restructuring has been widespread and yet there has been little empirical analysis of the relationship between organizational changes and rising aggregate wage inequality. This paper focuses on one piece of this relationship: the impact of establishment size and establishment size changes (i.e., "downsizing") on levels and changes in wage inequality in U.S. cities over the 1970 to 2000 period. Organizational structures associated with more formal and equitable employment relations—as measured by larger average establishment size, more (less) employment in large (small) establishments, and a greater share of all establishments that are large—are associated with lower levels of wage inequality, particularly at the top of the distribution and among women. However, these findings hold only for the earlier years (1969 and 1979), suggesting that these organizational forms no longer have the impact they once had (so it would not matter whether "downsizing" has been as dramatic as many have assumed). Consistent with this interpretation, the 1980s was the only decade of the three in which a decline in establishment size resulted in a significant increase in inequality, net of controls for other factors associated with rising wage inequality. These transformations fit very well with the timing of rising wage inequality and the spread of organizational restructuring in the 1980s.

INTRODUCTION

While it is well known that large firms are more likely than small firms to have internal labor markets in which wages are higher and wage dispersion lower than in the external labor market, the extension of the size-wage relationship to the wider labor market and to the *overall* distribution of wages has been the subject of little empirical analysis. Likewise, while "downsizing" is seen by the public as a key feature of the new economy that results in greater job insecurity for white collar as well as blue collar workers, we have little systematic knowledge of either the extent and nature of downsizing itself or of its impact on wages and especially overall wage inequality.

In large part this is due to a lack of adequate data rather than to a lack of insight, for both downsizing and outsourcing have been widely associated with the recent period of rising inequality in previous research and writing (e.g., Cappelli 1999). Still, the association has not been empirically examined. This limits the discussion of the institutional basis of rising inequality to two factors that are more amenable to empirical investigation: the decline of unions and the minimum wage. Although both are important, neither captures the kinds of wider organizational changes prompted by increasing shareholder activism, deregulation, mergers and acquisitions, and other drivers of organizational change that are perceived to be widespread. Such organizational changes—symbolized by, among other things, downsizing, outsourcing, and increased executive pay—would seem to have played a key intervening role in the relationship between macroeconomic changes in the competitive environment of firms and increasing inequality among workers. At a minimum, understanding such changes brings us a step closer to understanding the organizational infrastructure of inequality, or, to put it differently, the *mechanisms* by which wages became more dispersed and unequal.

This shift in emphasis from exogenous economic changes to organizational mechanisms is not entirely new. For example, academic researchers are in the midst of rethinking the role of technology

in rising inequality, or at least how its impact cannot be separated from how corporations implemented the new technologies (e.g., Black and Lynch 2001, Card and Dinardo 2002). What generates controversy now is not whether organizational transformations are integral to technological and other exogenous shocks, but rather the extent to which the *form* of organizational change is strictly dictated by exogenous changes. Some argue that firms may choose to either adjust or not, but a particular form of organizational change is nevertheless the most efficient (e.g., Bresnehan et al. 2000, Holstrom and Kaplan 2001). Others argue that a wider range of efficient choices exist, even within the new competitive environment, and that some of those choices have more adverse effects on workers than others (e.g., Appelbaum et al. 2003).

I am not in a position to assess the efficiency argument in this paper. That is something best left to in-depth comparisons of closely matched firms in the same product market or to comparisons of macroeconomic and labor market outcomes among nations subject to the same exogenous factors (e.g., Appelbaum et al. 2000). My objective instead is to examine the relationship between organizational changes and rising *aggregate inequality* in the United States, in much the same way that others have examined the impact of deunionization, another factor that could be seen as organizational in nature, as well as derivative of broader competitive conditions.

The first step in assessing the impact of corporate restructuring on rising overall wage inequality is to establish a reduced-form relationship between the two. I begin in this paper by operationalizing corporate restructuring in terms of changes in firm size[1], or what has popularly become known as downsizing. Firm size is also a common proxy for the presence of internal labor markets (e.g., DiPrete 1993). Does the distribution of employment across firms of different sizes have an independent effect on overall wage distributions? Has this effect changed, and if so, could it be the

[1] For the sake of simplicity, and to be consistent with a more conceptually-oriented discussion, I use the term "firm" size instead of "establishment" size, which is the unit of measurement that I use in the empirical analysis. Previous research has shown that both are important and similar in their implications for wages and inequality (e.g., Oi and Idson 1999).

result of a breakdown in internal labor markets? Have firms "downsized", as is widely perceived, and has this downsizing affected overall levels of inequality, after controlling for other well known explanations of inequality? I examine these questions in an analysis of the impact of firm size and firm size changes on levels and shifts in wage inequality across a matched panel of cities in 1970, 1980, 1990, and 2000.

PREVIOUS RESEARCH

What can be said about the relationship between firm size and aggregate inequality must be inferred from research into the relationship between firm size and wages. Although the relationship is a strong one empirically, even after controlling for occupation, industry, and other observable characteristics of workers, its causes are much debated. They generally fall into three main categories (for reviews, see Groshen 1991, Sorensen 1994, and Oi and Idson 1999). Although each category provides a different explanation of the size-wage relationship, it is possible to think of elements of all three categories as contributing to the social contract between employers and employees in large firms and establishments.

In the first category are sorting explanations. Productivity is considered to be greater in large firms because economies of scale allow (1) a more efficient internal system of matching the skills of workers to jobs and/or (2) a greater investment in capital (or some other critical factor of production) that attracts more skilled and productive workers to begin with. In fact, the observed skills of workers in terms of education, age, and tenure are greater in larger firms than in smaller ones, as is the intensity of capital. Economists theorize that unobserved skills must be greater as well, justifying higher wages. Second are explanations that emphasize the use of incentives to elicit effort and long-term loyalty in order to minimize the high costs of monitoring in large workplaces and training in the use of specialized equipment. Such incentives include "efficiency wages": higher wages, chances for

promotion, and benefits such as health care and pensions, all of which lead to lower turnover. One part of this package of incentives involves norms of fairness, in which workers are more productive and loyal over the long-term if they perceive themselves to be treated fairly, relative to both others in the firm (particularly in teams) and outside the firm. Another part simply involves the desire by employers to increase the cost and fear of job loss (for a summary, see Wright 2000).

Finally, a third category of explanations focuses on the creation of rents in large firms with market power (e.g., in industries with high concentration ratios and profitability). The rents are "shared" with workers in the form of higher wages. Unions are an obvious agent of such redistribution of rents, but it is often assumed that non-union firms adopt similar policies as a union-avoidance strategy. Importantly, in each of these explanations, it is not just the most productive workers that benefit but rather all workers in large firms, resulting in positive employer size effects in all occupations.[2]

What do these explanations about the relationship between employer size and wages imply about the relationship between employer size and *inequality*? Norms of fairness and the redistribution of rents clearly imply both higher average wages and greater equality of compensation than would otherwise exist *within* large firms. All else equal, the greater efficiency that results from a better match of workers to jobs, as hypothesized by the first category of explanations, should also contribute to less wage dispersion within large firms, *if* wage dispersion results from the inefficient allocation of human resources (and it is not clear that it does). Although I know of no systematic research that measures wage dispersion within large versus small firms, industries with larger firm sizes, such as manufacturing, do tend to have lower levels of inequality.

[2] In addition, regulations such as ERISA require that some forms of non-wage compensation be distributed equally and large employers are more likely to provide such benefits in the first place.

But how is overall inequality, *outside* of the firm, affected? The most obvious effect is a compositional one; higher average wages in large firms lifts average wages overall, and presumably average wage levels at the bottom and in the middle of the large firm hierarchy benefit disproportionately. The presence of large firms should also affect the overall efficiency of matching workers to jobs, reducing wage dispersion (again, assuming that true returns to skills would not result in greater rather than less dispersion). In addition to compositional effects, several aspects of the above theories suggest that firms compete for the best available workers in part by paying them higher wages than they can receive elsewhere. If labor markets are tight, or skilled labor is perceived to be in short supply, other firms will have to compete with large firms to attract high-quality workers. Even in the absence of genuine skill shortages, firms could bid up wages as a way to enhance their reputations as leading firms in their region or sector. The adoption of union-type policies at non-union workplaces in unionized regions would be an example of this process.

Finally, to the extent that large firms form business relationships with other firms, and thus influence compensation policies in other firms, higher and more equitable wage norms could be extended beyond the boundaries of the large firm. The role of managerial discretion and networks is critical here as well. Assuming that wage variation is caused in part from the exercise of managerial discretion across firms, fewer firms should result in less overall wage dispersion. Thus, overall, all else being equal, the organization of production into large firms should reduce levels of inequality, as a result of the unique composition of large firms and the influence of large firm behavior.

The discussion so far has considered only the static relationship between employer size and wages. Empirical and theoretical work on this relationship was developed primarily during the era in which, contrary to competitive labor market theory, internal labor markets emerged; therefore, the literature focused on explaining their emergence rather than their decline. Internal labor markets also

emerged during a period of declining or at least stable levels of inequality. Because large employers paid higher wages across the board, the internal labor markets associated with them also became associated implicitly with lower levels of *income* inequality (though not *racial* or *gender* inequality).[3] When inequality began to rise and corporations began to restructure in ways that suggested a breakdown in internal labor markets, an association between declining internal labor markets and rising inequality developed. What was the nature of that association?

Many of the changes that firms underwent from the 1970s to the present were prompted by accusations of inefficiency, bloat, and misaligned managerial incentives at large, conglomerate firms (e.g., see Useem 1996, Fligstein 2001). Stock market valuations were low in the 1970s relative to asset valuations, leading owners to demand better stock market performance. The "owners" who became most active were large institutional investors responsible for ever larger pension fund accounts and private corporate raiders who thought they could profit from the gap between stock and asset values. Aided and abetted by principal-agent theory in economics, which held that the agents (i.e., managers) lacked the proper incentives to act in the best interests of principals (i.e., owners), a wave of hostile takeovers threatened managers to restore stock performance or be taken over.

A crucial point to appreciate is that mismanagement was considered to be an important *independent* cause of lagging performance by those pushing for corporate restructuring. That is, reforms were not targeted solely toward acquiring new technologies or outsourcing production to lower waged countries, as might be the case if skill-biased technological change and increasing trade competition were the only causes of the decline in US competitiveness. Thus, in addition to real changes in demand brought about by increased competition from globalization and deregulation and by

[3] During the heyday of internal labor markets, they were associated with the primary sector's hoarding of privileged jobs for white men, leaving secondary and informal sector employment to women and minorities.

changing technologies, existing corporate governance, finance, and compensation structures were identified as a leading culprit of lagging performance.

The types of restructurings that were requested or imposed by owners had the flavor of both downsizing and increasing inequality: selling off unprofitable or unrelated divisions, permanently laying off workers in such divisions, eliminating unnecessary layers of middle management and outsourcing non-core functions (i.e, reducing internal labor market ladders), reducing benefits, demanding union concessions, and dramatically increasing the performance-based component of executive compensation (e.g., via stock options). In Bennett Harrison's (1994) words, corporations were to become "lean and mean". Downsizing entered the public lexicon in the late 1980s with such books as Robert Tomasko's *Downsizing* (1988) and Katherine Newman's *Falling from Grace* (1988). Harrison and Bluestone's *The Great U-Turn* (1988) specifically tied corporate restructuring in the form of mergers and acquisitions, for example, with rising wage inequality.

However, finding concrete evidence of the breakdown of internal labor markets, and especially of its impact on rising inequality, has been difficult because of the lack of aggregate data linking corporate practices to the compensation of employees within those corporations. Thus far the focus has been on measuring changes in internal labor markets by measuring changes in tenure and job stability. Firm tenure rates do not appear to have declined significantly, nor has job stability (but this is a matter of debate, see Newmark 2000). More recent research has looked at firm size effects more directly.[4] Oi and Idson (1999), for example, report an increase in the ratio of average wages in large firms (1000+ employees) to small firms (1-24 employees) from 1.329 in 1979 to 1.375 in 1983; the ratio then declined to 1.244 in 1993. Levine et al. (2002) report that the large firm wage premium fell from 18.5 percent in 1979 to 14.2 percent in 1993, relative to firms with employees with less than 100 employees

[4] For microdata analyses, researchers have used the CPS special supplements on firm size to measure changes in the impact of large firm size on wages. For macrolevel analyses, researchers have used the Census Bureau's Enterprise Statistics.

(and net of worker and other employer characteristics). Similarly, they estimated that the medium firm size wage premium (100-999 employees) declined from 10.7 to 7.5 percent over the same period.

These declines in the large firm wage premium have occurred precisely over the period in which downsizing gained popular notice and inequality rose most rapidly, but they say nothing about shifts in the size of firms per se. The pay practices of large firms could have changed—for a number of reasons—without a change in the actual size distribution of firms. Recent evidence indicates both that firm size has declined and that the decline has not been as dramatic as was assumed. Oi and Idson (1999) report, for example, that "a shift in the industrial structure of the economy away from goods towards services pushes the size distribution toward the left" (p. 2180). But they also document an increase in small-firm employment only in the manufacturing sector. Baumol, Blinder, and Wolff (2003) document an average increase in firm size in growing industries, such as retail and service industries, and a decrease in declining industries, such as manufacturing. That is, their investigation reveals that "small-size" industries are not growing primarily by adding more small firms but rather by increasing the size of firms. Similarly, manufacturing firms are not simply shutting down large factories; they are also reducing the size of existing factories. Average overall firm size, therefore, has not exhibited significant change.

Since overall firm size has not declined dramatically and yet the large firm wage premium has declined significantly, the behavior of large firms and small firms appears to be converging. Indeed, Baumol et al.'s (2003) results suggest that the industrial mix in different firm-size categories must be increasing. Levine et al. (2002) investigated the convergence of characteristics and the return to characteristics in large and small firms over the 1979 to 1993 period in an attempt to account for the decline in the large firm wage premium. In terms of returns, they found that the largest single change was an unexplained decline in the intercept gap, suggesting that "large firms are paying less simply

because they are large" (p. 73). Returns to specific characteristics linked to skill-biased technological change, such as education, declined in large firms relative to small firms. Moreover, the human capital-related characteristics of workers (i.e., age, tenure, and education) in large and small firms converged slightly. Nor did Baumol et al. find that downsizing in manufacturing firms on average led to improvements in productivity, even though it was associated with increased profits (thus wages must have declined). Thus it does not appear that either the skill mix at large firms has become increasingly skewed toward higher skilled workers, or that downsizing at large firms has increased productivity, as might be suggested by those who attribute the large firm size wage premium to the sorting of higher-quality workers (as measured by unobservable skills) into large firms. Taken as a whole, new research suggests a trend toward increasing heterogeneity throughout the size distribution of firms.

What do these trends imply about the impact of organizational changes on rising inequality? Since downsizing in manufacturing firms did not result in increased productivity, and neither observed skills nor returns to observed or unobserved skills have increased in large firms relative to small firms, Levine et al. (2002) and Baumol et al. (2003) acknowledge that a weakening of wage-setting norms and institutions, such as internal labor markets and the "social contract" between employers and employees, is a possible explanation of the decline in firm size effects (in Levine et al.'s study) and worker compensation (in Baumol et al.'s study).

A breakdown in the social contract could have occurred for two reasons: because of a different industrial mix among large firms, in which the industries that first developed internal labor markets are a declining share, or because of a breakdown in the social contract among traditional large firms, or both. Since both of the above studies control for industry, the increasing heterogeneity of industries among large firms cannot be the sole influence. Nevertheless, any analysis of firm level effects will need to control for the industry mix of employment in order to discern an independent effect of firm

size on the distribution of wages. Since overall firm size and the size distribution of firms have not changed substantially on average (see below for additional evidence), downsizing per se may be a less central indicator of organizational changes than a shift in the *effect* of large firm size itself. Both will be examined in the empirical analysis.

DATA AND MODELS

To examine the impact of firm size and employer size changes on the full distribution of wages, I exploit the wide range of variation in both employer size distributions and wage inequality across cities in the United States. I merge data at the city level from three sources. First, I construct measures of log hourly wage differentials (90/10, 90/50, and 50/10) from the weighted Public Use Microdata Samples (PUMS) of the Census of Population for 1970, 1980, 1990, and 2000. Each measure is constructed for all workers and separately for men and women. These measures are unadjusted for personal characteristics and were constructed from annual wages and salary in the previous year, the number of weeks worked in the previous year and the usual number of hours worked per week in the previous year. They include workers aged 16-64 and exclude workers in the bottom 1 percent of the hourly wage distribution and those above 1.45 times the value of the hourly wage for an individual earning the top-code of income and working 35 hours per week for 50 weeks of the year. The self-employed, agricultural workers and military personnel are all excluded as well. These selection criteria conform to those used by Katz and Autor (1999), as do the descriptive trends in hourly wage differentials presented in Table 2.

Second, I construct measures of employer size from the Country Business Patterns (CBP) database, which provides population counts of total employment by *establishment* size categories for every county in the United States. These data were collected by hand for 1969 and were available

electronically for 1979, 1989, and 1999, which correspond to the years in which earnings were available in the PUMS data, since respondents reported on income in the year prior to the census survey. Several variables were constructed from these data, including, for each city and year: average establishment size, estimated percent of employment in large establishments (500 or more), estimated percent of employment in small establishments (1-20), large establishments as a percent of all establishments, and very large establishments (1000 or more) as a percent of all establishments. Employment shares within employment size categories were estimated using the mid-point of the employment size category (i.e., 10 for the 1-20 category). For the largest size category, the national average employment in that size category was used to estimate employment in large establishments (because actual employment as well as number of establishments is provided for each size category at the national level). Since the 1969 data did not include size categories above 500, this is our measure of large establishments for all four years. We use the 1000 employment-size category for 1979, 1989, and 1999 analyses only.

After exhaustive comparisons of the CBP data with other sources of firm and establishment data (none of which provides the geographical and longitudinal detail and coverage of the CBP), we decided that our most internally and externally consistent measures of establishment-size-related employment excluded retail employment. Thus all years and measures of data in the analyses exclude the retail sector. We also note that the selection of establishment rather than firm size data is a consequence of data availability at the city level. However, both Baumol et al. (2003) and Levine et al. (2002) replicated their analyses with establishment data wherever possible and find similar results. In addition, Oi and Idson's (1999) review provides plenty of evidence that establishment size has as strong an effect on wages as firm size does. Descriptive statistics on the average establishment size and

the distribution of employment by establishment size at the national and city level are presented in Table 1 and are discussed below.

Third, I construct measures of other city-level economic and demographic variables related to inequality from additional sources. The Regional Economic Information System (REIS) provides an independent measure of total non-farm payroll employment by county, and a dataset constructed from Current Population Survey data by McPherson and Hirsch provides union membership and coverage rates for cities. Unfortunately, unionization rates by city are only available from 1984 to the present. As a result, for the earlier years (1969 and 1979), I use a single measure of unionization per city, averaged from the 1989 and 1999 values. All other city-level economic and demographic variables are constructed from the weighted IPUMS data. These include (in percents): the unemployment rate, the share of employment in trade-sensitive manufacturing industries (see list in Appendix Table 2), the share of employment in high-technology manufacturing industries (see list in Appendix Table 2), the share of immigrants in the adult population, and the share of the college-educated in the adult population. The first three variables were constructed as a share of adult workers, ages 16-64 in non-farm and non-military industries.

The variables constructed from these various data sets were merged by year and city for a sample of 115 cities. The major obstacle to constructing a consistent panel of cities is that the boundaries of cities have changed dramatically as a result of population growth and suburbanization. Various researchers have been working on this problem, however, and it is now possible to apply their approaches to the entire time period. The approach I use here is developed by the team of researchers at the University of Minnesota's Integrated Public Use Microdata Samples (IPUMS) project. Their coding scheme has been used in a few studies already (e.g., Costa and Kahn 2000). Based on this coding scheme, I selected the 115 cities that were available in all of the last 4 census years. My dataset

is therefore biased toward older cities, but it allows for the growth of boundaries in those cities over time. The construction of all city-level variables conforms to this definition by using aggregated county-level data for each year, since the county composition of the cities may change over time. The only exception is the measure of unionization, which was unavailable at the county level.

In terms of the representativeness of the sample of 115 cities, Panel A of Appendix Table 1 indicates that the sample is composed of roughly two-thirds to three-quarters of the population (63 percent in 1970, 73 percent in 1980, 75 percent in 1990 and 63 percent in 1990). Panel B of Appendix Table 1 further indicates that levels and trends in hourly wage differentials are similar in and out of sample; if anything, differentials are greater within the sample. Thus we are relatively confident that our sample is not unreasonably skewed in terms of either trends in and levels of wage inequality or establishment size (which is discussed below and the figures are presented in Table 1).

The effect of establishment size on overall levels of log hourly wage differentials was tested using a wide variety of functional and specification forms. Models were tested with and without weighted data, with and without corrections for correlated errors, with and without corrections for heteroskedasticity, with and without random and fixed effects. The results are mostly robust to these alternative specifications. The models that I present are all weighted by the total weighted size of the sample that was used to construct the wage differentials (individually-varying weights were introduced for the first time in the 1990 census and are also contained in the 2000 census). When more than one year of data is pooled, I use the total sample across all four years for a given city as the weight for that city in each year. This was done to prevent disproportionate weighting of later years (which have larger sample sizes). All standard errors are corrected for heteroskedasticity using robust standard errors. In all models with data pooled across the more than one year, fixed effects in the form of dummy variables for each city (minus one) and year (minus one) are included. For reasons that will

become clear later, I focus on separate levels equations for each year and then on a pooled model that includes 1979 and 1989 data only. This permits a relatively unrestricted examination of the effect of establishment size across years and of establishment size changes over the 1980s, the purported decade of downsizing. Finally, for each model specification, nine models are estimated: one for each combination of the three wage differentials ($90^{th}/10^{th}$, $90^{th}/50^{th}$, and $50^{th}/10^{th}$) and the three groups of workers (all, male, and female).

RESULTS

Both national and city-level trends in the distribution of employment by establishment size are presented in Table 1. From this table it is clear that the distributions at the national and city levels are very similar and conform to the trends found in previous research using other data sources. At both the national and city levels, employment in large establishments (500 or more) declined modestly by three percentage points in the 1970s and again in the 1980s but then stabilized in the 1990s (see panel A). Meanwhile, employment in small establishments (1-20) increased by several percentage points in the 1970s and 1980s and then declined slightly in the 1990s. The mid-sized category of 100-249 workers experienced a roughly two percentage point increase over the entire time period.

At both the national and city levels, average establishment size was relatively constant over the 1970s and then declined in the 1980s, from an average of 17.7 employees per establishment in 1979 to 16.0 in 1989 among cities, and from 19.2 to 16.6 in the nation as a whole (see panel B). Average establishment size then increased slightly in the 1990s. Variation in average establishment size (excluding the retail sector) across cities has clearly declined over time, especially during the 1980s, but it remains substantial relative to variation over time at the national level. The range varied from 10.5 to 33.9 in 1969 and from 10.9 to 22.0 in 1999. In sum, then, average employment size, variation

in average employment size, and employment in large establishments all declined between 1969 and 1999. These declines were not as dramatic as one might have expected, but they were concentrated in the decade of downsizing, the 1980s.

The last panel of Table 1 presents a correlation matrix of establishment size variables and other explanatory variables that are most closely correlated with establishment size. The establishment size variables are, not surprisingly, highly intercorrelated; consequently, they are entered in separate models. It is also important to note that the establishment size variables are not as highly correlated with other explanatory variables as one might expect. The highest correlation is between average establishment size and employment in trade-sensitive manufacturing (.455), which declines significantly over time from .50 in 1969 to .24 in 1999 (results not shown). Moreover, unionization rates are hardly correlated with average establishment size at all, even in 1989 and 1999 when the measure is more accurate; in fact, the correlation turns negative in these later years. Even though average firm size has not changed substantially over time, the heterogeneity of large firms apparently has, reinforcing the need to control for industrial shifts related to trade and technology and other competing explanations.

To begin, the gross, unconstrained effects of establishment size on levels of wage inequality for each year are shown in the first panel of Table 3. Each line and column combination represents a different model with a different combination of wage differential and year. These models estimate the effect of average establishment size on the three different wage differentials for the three different groups of workers and for each of the four years in the panel. For example, the estimate of negative 0.0094 in the first line and column of Table 3 indicates that for each 1-person increase in the average size of establishments across cities in 1969, the $90^{th}/10^{th}$ wage differential among all workers decreases

by .94 percent. This translates into a roughly 20 percent difference in the level of wage inequality between the city with the lowest average establishment size (10.5) and the city with the highest (33.9).

As a whole, the results from the entire set of year-by-year cross-sectional models presented in panel A of Table 3 replicate these findings. Specifically, a strong and consistent pattern of negative effects emerges for the early years (i.e., 1969 and 1979), and is either weaker or insignificant in the later years (i.e., 1989 and 1999). For example, the absolute value of the coefficients for the effect of average establishment size on the $90^{th}/50^{th}$ differential for the combined male and female sample increases from -0.0059 in 1969 to -0.0106 in 1979 and then declines to -0.0042 in 1989 and 1999. Interactions with year in pooled samples indicate that these are statistically significant differences in effects over time (using a Wald test). The only exception to the declining significance of average establishment size is a lingering significant effect on the $90^{th}/50^{th}$ differential among women that is equivalent in size to earlier years. This effect, however, disappears when controls are added in panel C. These baseline results suggest that average establishment size once had the effect of reducing inequality but no longer does.

The remainder of Table 3 replicates the models in panel A with controls first for basic demographic and economic conditions, such as population size and unemployment rate, in panel B and then for the entire set of controls for other explanations of inequality in panel C. In these panels, only the coefficient for the establishment size variable of interest is reported. The average establishment size effect is robust to basic demographic and economic controls in panel B and the remaining panels indicate a continuing, significant negative effect in 1979, particularly for women, but also for the combined sample and occasionally for men as well. Between 1979 and 1989, pooled models with average establishment size interacted with year indicate that these effects are significantly different in the two years for (1) the $90^{th}/10^{th}$ differential among men, women, and the combined sample and (2)

the $90^{th}/50^{th}$ differential among women and the combined sample. Indeed, the establishment size effect on inequality among women is greater in the full models (panel C) than in the bivariate models (panel A). Labor markets with large establishments apparently tend to have other features that exert a positive effect on wage differentials among women. The full set of coefficients for all variables in the 1979 models are presented in Table 4 and they indicate that the unemployment rate, the share of immigrants and the college-educated, and trade-sensitive manufacturing employment all serve to increase levels of wage inequality among women (discussed in further detail below).

Panels D-G replace average establishment size with other measures of establishment size and continue to control for the full set of explanatory variables. Four other measures of establishment size are examined: the estimated percent of employment in large establishments (500 or more) in panel D, the percent of all establishments that are large (500 or more) in panel E, the percent of all establishments that are very large (1000 or more) in panel F (and which is not available in 1969), and the estimated percent of employment in small establishments (1-20) in panel G.

The establishment size effect is quite robust to these other measures. The share of employment in small establishments has a particularly strong impact in both 1969 and 1979. The percent of all establishments that have 1000 or more employees is added to test whether the "threshold" for what counts as a large establishment grew over time, leading to a falsely weak effect of the establishment size variables that use the 500+ demarcation in the later years. But this variable follows the same trends as the others; it is significant in 1979 but not in the later years. In fact, the coefficient for the $90^{th}/50^{th}$ differential turns positive, though it is insignificant. At any rate, the estimated share of employment in small establishments and the average establishment size variables ought not to be affected by shifting thresholds of "large" over time as the population and labor force grows. Both of these variables show little effect in 1989 and 1999.

To gain a better sense of the other factors that affect levels of wage inequality across cities, the coefficients from the full models in 1979 are presented in Table 4. Many of the effects are as expected. Unionization has a strong negative effect among both men and women, and the effect is to compress the top of the distribution rather than the bottom. The unemployment rate has a strong positive effect among both men and women, and the effect is particularly strong and consistent in widening inequality at the bottom of the distribution. This is pattern is also found for the share of the adult population that is college-educated, suggesting a relatively higher median wage in cities with more educated populations. The share of immigrants also increases wage dispersion, but surprisingly it does so by widening disparities in the top half of the distribution, perhaps by relatively lower wages at the median and at the bottom. Finally, employment in trade-sensitive manufacturing industries reduces inequality at the top, similar to the effect of unionization, but only for men. In addition, it significantly widens inequality at the bottom for both men and women. Of course, in absolute terms, it is possible that all wages are relatively higher while the wage distribution itself becomes more dispersed (at the bottom). At a minimum, it appears that these kinds of industrial conditions can potentially limit compensation at the top, as appears to be the case for the effect of large establishment size as well.

Large employers no longer appear to have an independent effect in reducing overall wage inequality, though it is unclear exactly why: whether existing large employers changed their behavior or the composition of large employers has changed (e.g., by industry). This suggests that downsizing as such may not be as important as changes taking place *among* large employers. Nevertheless, there were distinctive changes in establishment size during the 1980s. Whereas average establishment size remained constant over the 1970s and actually increased somewhat in the 1990s, it clearly declined in the 1980s (see panels A and B of Table 1). This is consistent with popular understandings of the 1980s as the decade of downsizing. Did this downsizing occur within cities or across cities? If it occurred

within cities, did it have an independent effect on changes in wage inequality, which were greatest in the 1980s?

The fixed effect models in Table 5 test for this possibility. Specifically, they test whether changes in establishment size within cities resulted in a greater change in inequality than at the national level (which is captured by a year dummy), net of the impact of other significant changes in economic and demographic conditions, except for unionization, which is not available in 1979 at the city level, and net of any other "permanent" characteristics of each city that may affect levels of inequality (which is captured by the fixed effects). The models with significant effects were further tested using clustered standard errors, which control for correlated errors within the same city (results not shown). These specifications are very strict, but the results were nevertheless robust. A decline in average establishment size significantly increased inequality over the 1980s for the combined population and for women. The effect was concentrated at the top of the distribution, resulting in an increase in the $90^{th}/50^{th}$ wage differential (see panel B). The effect at the bottom of the female distribution was significant at the .10 level of probability (see panel C). These results are replicated in panels D-G using other measures of changes in the size distribution of establishments.

In the (city-level) aggregate, then, a decline in establishment size had a significant, independent effect on rising inequality. The effect is net of increases in unemployment and immigration (which, oddly, did not have much of an effect) and declines in manufacturing industries affected by increasing international competition and technological change. It is possible that changes in unionization would alter these results, reducing the coefficients on establishment size in the female equation to insignificance. However, other studies have shown that deunionization had its largest impact on inequality among men and not among women (e.g., Dinardo et al., 1996). The minimum wage is another factor that is missing from these models, and Dinardo et al. show that it does have a

disproportionate effect on women's wages, but the effect tends to be concentrated at the bottom of the distribution rather than at the top, where establishment size seems to have its greatest influence. And even for men, panel F suggests that when a measure of "very" large establishments is used (1000 or more), downsizing seems to matter.

DISCUSSION AND CONCLUSION

The effect of establishment size on aggregate inequality within cities is significant and robust to a wide range of functional and specification form. Average establishment size and the percent of employment in large establishments (500 or more) are negatively associated with the $90^{th}/10^{th}$ and $90^{th}/50^{th}$ wage differentials; employment in small establishments (1-20) is positively associated with the $90^{th}/10^{th}$ and $90^{th}/50^{th}$ wage differentials. Labor markets with large average establishment size and disproportionate employment in large firms have lower levels of wage inequality. The results in the city and year fixed effects models indicate a similarly strong effect on changes in inequality over time. Declines in average establishment size and large establishment employment contribute to greater inequality over time (and vice versa), particularly for women. The impact of employment in small establishments is consistent with this pattern. As the share of employment in small establishments increases, the $90^{th}/10^{th}$ and $90^{th}/50^{th}$ wage differentials widen as well. The $50^{th}/10^{th}$ wage differential is less strongly associated with each of the four measures of establishment size and is more sensitive to specification. Generally speaking, however, when significant, the effects are the same as for the other wage differentials: positive and increasing with declines in establishment size and negative and increasing with increases in establishment size.

Although we should remain cautious in drawing firm conclusions from these models until further controls are added, particularly at the individual level and by using a measure of residual

inequality as the outcome, the results provide five insights into the sources of wage inequality. First, organizational structures associated with more formal and equitable employment relations—as measured by larger average establishment size, more employment in large establishments, and less employment in small establishments—are strongly associated with lower levels of wage inequality. These findings hold for levels as well as changes (over the 1980s—the decade of downsizing) in organizational structure and wage inequality, and net of measures of the prevailing alternative explanations of rising inequality. Thus as organizational structures have moved away from these organizational forms, wage inequality has increased.

Second, and perhaps as important, large establishment size as such ceased to have this ameliorative effect on levels of wage inequality by 1989. Thus even if the overall size distribution of establishments did not change over time, wage inequality would have grown because large establishments no longer played the role they once did in compressing the wage structure. The size distribution of establishments in fact has not changed as much as is commonly assumed in discussions of widespread "downsizing". But yet the *nature* of large-establishment employment seems to have changed, either because of changes in industrial composition (e.g., more services and less manufacturing) or because equity norms and internal labor markets were eroded even in traditionally large establishments that stayed the same size or grew, or both. Admittedly, establishment size can serve as only a very rough measure of equity norms, but its effect on wages has been surprisingly strong and durable, at least until recently. Given that other industrial conditions were controlled in the models, it appears that something other than compositional effects are at play.

Third, and related, the impact of organizational factors comes out most clearly in the female sample, perhaps because the female wage distribution has never been as affected as the male wage distribution by industrial conditions, or at least it hasn't in exactly the same way. In other words, the

impact of organizational factors are not confounded as much by the other industrial factors included in the equations that reduce the significance of the establishment size variable on the male wage differentials, such as unionization and trade-sensitive manufacturing employment. Alternatively, this is yet another example of how the sources of female and male wage inequality differ, and how gender differences can illuminate alternative sources of inequality (e.g., McCall 2000).

Fourth, the stronger impact of establishment size on the $90^{th}/50^{th}$ differential as compared to the $50^{th}/10^{th}$ differential suggests that large establishment size was most effective in compressing the top of the wage distribution rather than the bottom. Large establishments in labor markets appeared to contribute to lower inequality by reigning in excessive pay at the top rather than by raising relative pay at the bottom or in the middle. In the new environment of the 1980s, employers may have had greater license to increase compensation for those at the top without offending customs of equity within the establishment. Finally, these transformations also fit very well with the timing of rising wage inequality and the spread of establishment-level changes in the 1980s.

REFERENCES

Autor, David H., Lawrence F. Katz, and Alan B. Krueger. 1998. "Computing Inequality: Have Computers Changed the Labor Market?" *Quarterly Journal of Economics* 113(4): 1169-1214.

Appelbaum, Eileen, Thomas Bailey, Peter Berg, and Arne Kalleberg. 2000. *Manufacturing Advantage: Why High-Performance Work Systems Pay Off*. Ithaca: Cornell University Press.

Appelbaum, Eileen, Annette Bernhardt, and Richard Murnane, eds. 2003. *Low Wage America*. New York: Russell Sage Foundation.

Baumol, William, Alan Blinder, and Edward Wolff. 2003. *Downsizing in America: Reality, Causes and Consequences*. Russell Sage Foundation.

Berman, Eli, John Bound, and Zvi Griliches. 1994. "Changes in the Demand for Skilled Labor within U.S. Manufacturing Industries: Evidence from the Annual Survey of Manufactures." *Quarterly Journal of Economics* 109: 367-97.

Black, Sandra E., and Lisa M. Lynch. 2001. "Have to compete: the impact of workplace practices and information technology on productivity." *The Review of Economics and Statistics* 83(3): 434-445.

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

Bresnahan, Timothy, Erik Brynjolfsson, and Lorin Hitt. 2000. "Technology, Organization, and the Demand for Skill." Pp. 145-193 in M. Blair and T. Kochan, eds., *The New Relationship: Human Capital in the American Corporation*. Brookings Institution.

Cappelli, Peter. 1999. *The New Deal At Work*. Cambridge, MA: Harvard Business School Press.

Card, David and John DiNardo. 2002. "Skill-Biased Technological change and rising Wage Inequality: Some Problems and Puzzles." National Bureau of Economic Research Working Paper 8769.

Costa, Dora L., and Matthew E. Kahn. 2000. "Power Couples: Changes in the Locational Choice of the College Educated, 1940-1990." *Quarterly Journal of Economics* November:1287-1315.

DiPrete, Thomas A. 1993. "Industrial Restructuring and the Mobility Response of American Workers in the 1980s." *American Sociological Review* 58(1): 74-96.

Groshen, Erica. 1991. "Five Reasons Why Wages Vary Among Employers." *Industrial Relations* 30:350-381.

Fligstein, Neil. 2001. *The Architecture of Markets*. Princeton University Press.

Fortin, Nicole and Thomas Lemieux. 1997. "Institutional Changes and Rising Wage Inequality: Is There a Linkage?" *Journal of Economic Perspectives* 11(2):75-96.

Harrison, Bennett and Barry Bluestone. 1988. *The Great U-Turn*. New York: Basic Books.

Holstrom, Bengt and Steven Kaplan. 2001. "Corporate Governance and Merger Activity in the United States: Making Sense of the 1980s and 1990s." *Journal of Economic Perspectives* 15(2):121-144.

Katz, Lawrence and David Autor. 1999. "Changes in the Wage Structure and Earnings Inequality." Pp. 1463-1555 in O. Ashenfelter and D.Card, eds., *The Handbook of Labor Economics, Volume 3*. Elsevier Science.

Levine, Davod I., Dale Belman, Gary Charness, Erica L. Groshen, and K.C. O'Shaughnessy. 2002. *How New is the "New Employment Contract"?: Evidence from North American Pay Practices*. Kalamzoo, MI: W.E. Upjohn Institute.

Mangum, Garth, Donald Mayall, and Kristin Nelson. 1985. “The Temporary Help Industry: A Response to the Dual Internal Labor Market.” Industrial and Labor Relations Review 38(4).

McCall, Leslie. 2000. "Gender and the New Inequality: Explaining the College/Non-College Wage Gap in U.S. Labor Markets.” *American Sociological Review* 65(2): 234-255.

Neumark, David, ed. 2000. *On the Job: Is Long-term Employment a Thing of the Past?* New York: Russell Sage Foundation.

Oi, Walter Y. and Todd L. Idson. 1999. “Fiirm Size and Wages.” Pp. 2165-2214 in the *Handbook of Labor Economics: Volume 3*, edited by O. Ashenfelter and D. Card. Elsevier Science.

Sorensen, Aage. 1994. “Firms, Wages, and Incentives.” Pp. 504-528 in N. Smelser and R. Swedberg, eds., *The Handbook of Economic Sociology*. New York: The Russell Sage Foundation.

Useem, Michael. 1996. *Investor Capitalism: How Money Managers are Changing The Face of America*. Basic Books.

Wright, Erik Olin, 2000. “Class, Exploitation, and Rents: Reflections on Sorensen’s ‘Sounder Basis’”. *American Journal of Sociology* 105:1559-1571.

Table 1
Descriptive Statistics for Establishment Size Variables

A. Employment Distribution by Establishment Size Category (excluding retail sector)

National	1~20	21~49	50~99	100~249	250~499	500+	1000+
1969	20.53%	13.10%	10.58%	14.31%	10.74%	30.74%	N.A.
1979	22.47%	13.73%	11.22%	14.94%	10.57%	27.07%	17.95%
1989	23.80%	14.20%	11.61%	15.56%	10.20%	24.65%	16.25%
1999	22.67%	14.02%	11.47%	16.24%	10.54%	25.06%	16.42%
MSA Mean							
1969	21.38%	14.32%	11.00%	14.94%	9.96%	28.41%	N.A.
1979	22.81%	14.75%	11.31%	15.75%	10.08%	25.30%	17.58%
1989	25.15%	15.25%	11.46%	16.38%	9.61%	22.15%	15.14%
1999	23.63%	14.95%	11.48%	17.33%	10.43%	22.15%	15.07%

B. Average Establishment Size [standard deviation and range over 115 MSAs]

National		All Employment		All Employment, except Retail	
	1969	15.945		18.342	
	1979	16.465		18.045	
	1989	15.003		15.674	
	1999	15.794		16.304	
MSA Mean					
	1969	17.601	[3.409, 9.513-26.067]	19.911	[4.661, 10.468-33.867]
	1979	17.678	[2.792, 10.792-24.149]	19.222	[3.696, 11.042-29.294]
	1989	15.971	[2.245, 10.611-20.525]	16.609	[2.699, 10.559-21.927]
	1999	16.975	[2.173, 10.760-20.964]	17.483	[2.495, 10.949-22.197]

C. Correlations among Establishment Size Variables Across 115 MSAs, 1969-1999 pooled (excluding retail sector)

	Ave. Estab. Size	% Emp in 500+	% Estabs.in 500+	% Estabs in 1000+	% Emp. In 1-20	% Emp. In Trade Mfg.
Ave. Estab. Size						
% Emp. in 500+	0.780					
% Estabs. in 500+	0.686	0.762				
% Estabs. in 1000+	0.834	0.819	0.443			
% Emp. in 1-20	-0.857	-0.786	-0.765	-0.715		
% Emp. in Trade Mfg.	0.455	0.278	0.168	0.309	-0.223	
% Immigrants	-0.328	-0.237	-0.161	-0.256	0.291	-0.314

Notes: In panel A, the 500+ category includes employment in all establishments with 500 or more employees. Percentages sum to 100 up to and including this category.
Sources: County Business Patterns for 1969, 1979, 1989, 1999.

Table 2
Descriptive Statistics for Wage Differentials

		MEAN	Standard Dev.	MIN	MAX
ALL					
1969	90/10	1.521	0.0997	1.302	1.823
1979	90/10	1.563	0.0747	1.385	1.731
1989	90/10	1.632	0.0729	1.463	1.869
1999	90/10	1.626	0.0786	1.460	1.848
1969	90/50	0.697	0.0633	0.543	0.883
1979	90/50	0.771	0.0614	0.580	0.902
1989	90/50	0.782	0.0462	0.669	0.916
1999	90/50	0.794	0.0443	0.656	0.899
1969	50/10	0.825	0.7670	0.607	1.069
1979	50/10	0.793	0.0723	0.662	1.086
1989	50/10	0.850	0.0559	0.732	1.100
1999	50/10	0.832	0.0550	0.684	1.022
MEN					
1969	90/10	1.330	0.1399	1.046	1.800
1979	90/10	1.533	0.0952	1.265	1.765
1989	90/10	1.653	0.0860	1.396	1.833
1999	90/10	1.650	0.0883	1.418	1.917
1969	90/50	0.614	0.0692	0.475	0.838
1979	90/50	0.649	0.0941	0.433	0.869
1989	90/50	0.724	0.0736	0.529	0.882
1989	90/50	0.771	0.0620	0.580	0.926
1969	50/10	0.716	0.0895	0.538	0.962
1979	50/10	0.884	0.0758	0.718	1.062
1989	50/10	0.929	0.0776	0.777	1.247
1999	50/10	0.879	0.0687	0.708	1.087
WOMEN					
1969	90/10	1.501	0.0960	1.277	1.796
1979	90/10	1.374	0.0888	1.150	1.592
1989	90/10	1.509	0.0727	1.323	1.805
1999	90/10	1.545	0.0778	1.379	1.769
1969	90/50	0.753	0.0606	0.627	0.946
1979	90/50	0.708	0.0480	0.614	0.836
1989	90/50	0.745	0.0525	0.647	0.904
1999	90/50	0.773	0.0489	0.673	0.924
1969	50/10	0.748	0.0787	0.540	0.973
1979	50/10	0.667	0.0570	0.524	0.828

1989	50/10	0.763	0.0480	0.644	0.901
1999	50/10	0.771	0.0579	0.662	0.961

Notes: Sample includes non-self-employed, non-agricultural workers aged 16-64 with positive hourly wages above the 1 percentile rank of the hourly wage distribution and below 1.45 times the top-code of hourly wages at 35 hours per week and 50 weeks of work. The hourly wage differential for each city is estimated from weighted data. The cross-city mean is an unweighted mean.
Source: Public Use Microdata Samples of the Census of Population for 1970, 1980, 1990, and 2000.

Table 3
The Effects of Establishment Size Variables on Wage Differentials Across 115 Cities: Cross-Section Estimates by Year (WLS, robust standard errors in parentheses)

MODELS	1969	1979	1989	1999
A. Average Establishment Size, No Controls				
ALL				
90/10	-.0094(.0020)**	-.0057(.0020)**	-.0007(.0028)	-.0034(.0040)
90/50	-.0059(.0016)**	-.0106(.0014)**	-.0042(.0018)*	-.0042(.0023)†
50/10	-.0035(.0013)**	.0050(.0024)*	.0035(.0023)	.0008(.0030)
MEN				
90/10	-.0170(.0027)**	-.0133(.0024)**	-.0042(.0034)	-.0033(.0041)
90/50	-.0061(.0018)**	-.0146(.0027)**	-.0083(.0029)**	-.0059(.0031)†
50/10	-.0108(.0014)**	.0013(.0024)	.0040(.0034)	.0026(.0035)
WOMEN				
90/10	-.0069(.0022)**	-.0071(.0026)**	-.0046(.0028)	-.0062(.0043)
90/50	-.0020(.0014)	-.0049(.0014)**	-.0048(.0018)**	-.0061(.0022)**
50/10	-.0049(.0015)**	-.0022(.0017)	.0002(.0021)	-.0002(.0030)
B. Average Establishment Size, Controlling for Population Size (ln) and Unemployment Rate				
ALL				
90/10	-.0112(.0022)**	-.0078(.0017)**	-.0002(.0026)	-.0020(.0039)
90/50	-.0086(.0015)**	-.0099(.0012)**	-.0034(.0018)†	-.0019(.0018)
50/10	-.0026(.0014)†	.0022(.0016)	.0033(.0023)	-.0002(.0032)
MEN				
90/10	-.0216(.0030)**	-.0145(.0022)**	-.0055(.0035)	-.0032(.0039)
90/50	-.0090(.0019)**	-.0132(.0025)**	-.0097(.0031)**	-.0053(.0029)†
50/10	-.0126(.0016)**	-.0013(.0021)	.0042(.0036)	.0021(.0037)
WOMEN				
90/10	-.0054(.0023)**	-.0103(.0017)**	-.0041(.0024)†	-.0041(.0041)
90/50	-.0006(.0012)	-.0064(.0012)**	-.0027(.0015)†	-.0018(.0015)
50/10	-.0048(.0020)**	-.0039(.0013)**	-.0014(.0019)	-.0023(.0032)
C. Average Establishment Size, Full Controls				
ALL				
90/10	-.0071(.0031)*	-.0078(.0024)**	-.0037(.0031)	-.0028(.0024)
90/50	-.0017(.0015)	-.0046(.0016)**	-.0005(.0018)	-.0004(.0013)
50/10	-.0054(.0027)†	-.0032(.0016)*	-.0032(.0022)	-.0025(.0017)

MODELS	1969	1979	1989	1999
MEN				
90/10	-.0061(.0028)*	-.0085(.0032)**	-.0053(.0043)	-.0029(.0024)
90/50	-.0007(.0018)	-.0032(.0030)	.0005(.0023)	.0007(.0018)
50/10	-.0054(.0022)**	-.0053(.0023)*	-.0059(.0032)†	-.0036(.0022)
WOMEN				
90/10	-.0066(.0035)†	-.0085(.0022)**	-.0037(.0027)	-.0022(.0028)
90/50	-.0027(.0023)	-.0048(.0012)**	-.0013(.0015)	-.0019(.0014)
50/10	-.0038(.0021)†	-.0037(.0015)**	-.0024(.0023)	-.0003(.0020)
D. Percent of Employment in Large Establishments (500+), Full Controls				
ALL				
90/10	-.0021 (.0013)	-.0029 (.0011)**	-.0010 (.0014)	-.0004(.0014)
90/50	-.0013 (.0006)*	-.0013 (.0007)†	-.0003 (.0008)	.0008(.0007)
50/10	-.0007 (.0011)	-.0016 (.0008)*	-.0008 (.0010)	-.0012(.0011)
MEN				
90/10	-.0030 (.0014)*	-.0028 (.0014)*	-.0003 (.0019)	-.0001(.0014)
90/50	-.0009 (.0007)	-.0004 (.0011)	.0010 (.0010)	.0016 (.0009)†
50/10	-.0021 (.0012)†	-.0024 (.0010)**	-.0013 (.0014)	-.0017(.0012)
WOMEN				
90/10	-.0017 (.0014)	-.0033 (.0011)**	-.0010 (.0012)	-.0001(.0016)
90/50	.0000 (.0010)	-.0010 (.0007)	.0003 (.0008)	.0003(.0009)
50/10	-.0017 (.0010)	-.0023 (.0009)**	-.0013 (.0010)	-.0004(.0012)
E. Percent of Establishments that are Large Establishments (500+), Full Controls				
ALL				
90/10	-.1112 (.0466)**	-.1477(.0468)**	-.0935 (.0683)	-.0318 (.0626)
90/50	-.0567 (.0249)*	-.0821(.0308)**	-.0352 (.0382)	.0177 (.0313)
50/10	-.0543 (.0390)	-.0657(.0332)*	-.0583 (.0499)	-.0495 (.0458)
MEN				
90/10	-.1635(.0515)**	-.1692(.0601)**	-.0992(.0959)	-.0307(.0618)
90/50	-.0414(.0281)	-.0666(.0533)	.0118(.0484)	.0414(.0409)
50/10	-.1222(.0436)**	-.1027(.0425)**	-.1110(.0714)	-.0721(.0518)
WOMEN				
90/10	-.0850(.0543)	-.1746(.0460)**	-.0890(.0590)	-.0150(.0691)
90/50	-.0073(.0367)	-.0740(.0263)**	-.0188(.0333)	-.0099(.0346)
50/10	-.0778(.0391)*	-.1005(.0340)**	-.0702(.0501)	-.0052(.0513)

MODELS	1969	1979	1989	1999
F. Percent of Establishments that are Large Establishments (1000+), Full Controls				
ALL				
90/10	N.A.	-.2935(.1262)*	-.0359(.1128)	-.0851(.1106)
90/50	N.A.	-.1673(.0750)*	.0217(.0686)	.0441(.0602)
50/10	N.A.	-.1262(.0799)	-.0576(.0944)	-.1292(.0769)†
MEN				
90/10	N.A.	-.3079(.1594)*	-.0153(.1592)	.0030(.1128)
90/50	N.A.	-.1132(.1078)	.1025(.0807)	.1212(.0799)
50/10	N.A.	-.1947(.1067)†	-.1178(.1261)	-.1242(.0940)
WOMEN				
90/10	N.A.	-.3167(.1054)**	-.0534(.1103)	-.1208(.1231)
90/50	N.A.	-.1381(.0587)*	.0234(.0852)	-.0436(.0653)
50/10	N.A.	-.1787(.0810)*	-.0769(.0930)	-.0773(.0894)
G. Percent of Employment in Small Establishments (1-20), Full Controls				
ALL				
90/10	.0074 (.0022)**	.0065 (.0019)**	.0024 (.0020)	.0027 (.0021)
90/50	.0034 (.0012)**	.0031 (.0013)**	.0002 (.0012)	.0003 (.0011)
50/10	.0041 (.0018)*	.0035 (.0013)**	.0022 (.0015)	.0024 (.0015)
MEN				
90/10	.0094 (.0022)**	.0074 (.0025)**	.0029 (.0028)	.0030 (.0021)
90/50	.0031 (.0014)*	.0021 (.0021)	-.0007 (.0014)	-.0006 (.0016)
50/10	.0063 (.0019)**	.0053 (.0017)**	.0036 (.0020)†	.0036 (.0018)*
WOMEN				
90/10	.0062 (.0029)*	.0073 (.0021)**	.0026 (.0017)	.0017 (.0022)
90/50	.0006 (.0018)	.0032 (.0011)**	.0009 (.0010)	.0014 (.0013)
50/10	.0056 (.0019)**	.0041 (.0014)**	.0017 (.0015)	.0003 (.0016)

Notes: All wage differentials are in natural logs. Each cell (line and column combination) represents a separate model for which N=115. Panel B models were also run with a measure of union coverage rates added and the results were largely similar. Controls added in full models are percents of immigrants, the college-educated, workers in trade-sensitive manufacturing industries, workers in high- technology manufacturing industries, and workers covered by a union contract (one estimate per city that does not change over time, estimated from 1980s and 1990s data). All measures related to establishment size do not include the retail sector.

†, $p <= .10$; *, $p <= .05$; **, $p <= .01$.

Sources: Wage differentials and control variables are calculated from the Public Use Microdata Samples of the Census of the Population for 1970, 1980, 1990, 2000, unless otherwise noted; measures of establishment size are calculated from County Business Patterns for 1969, 1979, 1989, 1999; population size is from the Regional Economic Information System (REIS) for 1969, 1979, 1989, 1999; union coverage rates are from Hirsch and McPherson (www.unionstats.com).

Table 4
The Effects of Establishment Size on Wage Differentials in 1979, with Full Controls
(WLS, robust standard errors in parentheses)

MODELS	ALL	MEN	WOMEN
A. 90/10			
Avg. Estab. Size	-.0078 (.0024)**	-.0085 (.0032)**	-.0085 (.0022)**
% Union Coverage	-.0033 (.0010)**	-.0040 (.0013)**	-.0036 (.0010)**
Ln(population)	.0110 (.0063)†	.0156 (.0083)†	.0113 (.0065)†
% Unemployed	.0134 (.0034)**	.0122 (.0045)**	.0186 (.0037)**
% in Trade-Sensitive Mfg.	.0056 (.0016)**	-.0007 (.0020)	.0061 (.0017)**
% in High-Tech. Mfg.	.0006 (.0016)	-.0022 (.0022)	-.0013 (.0015)
% Immigrant	.0023 (.0013)†	.0035 (.0017)*	.0037 (.0011)**
% College Educated	.0068 (.0018)**	.0082 (.0019)**	.0070 (.0015)**
Constant	1.3420 (.0720)**	1.2896 (.1038)**	1.1275 (.0721)**
B. 90/50			
Avg. Estab. Size	-.0046 (.0016)**	-.0032 (.0030)	-.0048 (.0012)**
% Union Coverage	-.0033 (.0008)**	-.0048 (.0012)**	-.0023 (.0007)**
Ln(population)	.0056 (.0046)	.0133 (.0089)	.0038 (.0039)
% Unemployed	.0062 (.0028)*	.0021 (.0042)	.0110 (.0024)**
% in Trade-Sensitive Mfg.	-.0058 (.0010)**	-.0086 (.0019)**	.0014 (.0010)
% in High-Tech. Mfg.	-.0023 (.0011)*	-.0063 (.0016)**	-.0015 (.0010)†
% Immigrant	.0023 (.0009)**	.0041 (.0011)**	.0028 (.0005)**
% College Educated	-.0001 (.0010)	.0000 (.0014)	-.0005 (.0009)
Constant	.8278 (.0539)**	.6535 (.1169)**	.7152 (.0462)**
C. 50/10			
Avg. Estab. Size	-.0032 (.0016)*	-.0053 (.0023)*	-.0037 (.0015)**
% Union Coverage	-.0000 (.0008)	.0008 (.0012)	-.0012 (.0007)†
Ln(population)	.0054 (.0045)	.0023 (.0074)	.0075 (.0044)†
% Unemployed	.0073 (.0027)**	.0102 (.0034)**	.0076 (.0029)**
% in Trade-Sensitive Mfg.	.0115 (.0012)**	.0079 (.0016)**	.0047 (.0013)**
% in High-Tech. Mfg.	.0028 (.0010)**	.0041 (.0014)**	.0002 (.0010)
% Immigrant	-.0000 (.0005)	-.0005 (.0010)	.0009 (.0007)
% College Educated	.0068 (.0011)**	.0082 (.0015)**	.0075 (.0009)**
Constant	.5142 (.0524)**	.6361 (.0906)**	.4123 (.0486)**

Notes: All wage differentials are in natural logs. In panels A-C, each *panel* and column combination represents a separate model for which N=115.

†, $p <= .10$; *, $p <= .05$; **, $p <= .01$.

Sources: Wage differentials and explanatory variables are calculated from the Public Use Microdata Samples of the Census of the Population for 1980, unless otherwise noted; measures of establishment size exclude the retail sector and are calculated from the County Business Patterns for 1979; employment is from the Regional Economic Information System (REIS) for 1979; union coverage rates are from Hirsch and McPherson (www.unionstats.com).

Table 5
The Effects of Establishment Size Changes on Changes in Wage Differentials Within 115 Cities: Fixed Effects Models for the 1980s
(WLS, robust standard errors in parentheses)

MODELS	ALL	MEN	WOMEN
A. 90/10			
Avg. Estab. Size	-.0098 (.0048)*	-.0077 (.0057)	-.0130 (.0041)**
Ln(employment)	-.0345 (.0383)	-.0834 (.0498)†	.0160 (.0352)
% Unemployed	.0112 (.0031)**	.0163 (.0052)**	.0105 (.0033)**
% in Trade-Sensitive Mfg.	-.0075 (.0026)**	-.0178 (.0039)**	-.0040 (.0032)
% in High-Tech. Mfg.	-.0112 (.0036)**	-.0115 (.0053)*	-.0134 (.0041)**
% Immigrant	-.0008 (.0015)	-.0007 (.0013)	-.0010 (.0014)
% College Educated	-.0045 (.0014)**	-.0051 (.0028)†	-.0042 (.0019)*
Year	.0496 (.0221)*	.1010 (.0278)**	-.0998 (.0206)**
City Dummies	YES	YES	YES
B. 90/50			
Avg. Estab. Size	-.0084 (.0028)**	-.0078 (.0048)	-.0074 (.0018)**
Ln(employment)	-.0326 (.0280)	-.0107 (.0497)	.0148 (.0224)
% Unemployed	.0035 (.0018)†	.0058 (.0030)†	.0036 (.0017)*
% in Trade-Sensitive Mfg.	-.0126 (.0018)**	-.0111 (.0033)**	-.0010 (.0018)
% in High-Tech. Mfg.	-.0046 (.0021)*	-.0024 (.0035)	-.0043 (.0016)**
% Immigrant	-.0009 (.0014)	.0006 (.0012)	-.0037 (.0004)**
% College Educated	-.0039 (.0012)**	-.0024 (.0020)	-.0032 (.0010)**
Year	-.0119 (.0144)	.0460 (.0218)*	.0312 (.0109)**
City Dummies	YES	YES	YES
C. 50/10			
Avg. Estab. Size	-.0014 (.0034)	.0001 (.0057)	-.0056 (.0033)†
Ln(employment)	-.0019 (.0322)	-.0726 (.0527)	.0012 (.0292)
% Unemployed	.0078 (.0027)**	.0105 (.0037)**	.0069 (.0029)**
% in Trade-Sensitive Mfg.	.0052 (.0021)**	-.0067 (.0033)*	-.0030 (.0028)
% in High-Tech. Mfg.	-.0067 (.0030)*	-.0091 (.0039)*	-.0091 (.0037)**
% Immigrant	.0001 (.0006)	-.0012 (.0008)	.0028 (.0012)*
% College Educated	-.0006 (.0015)	-.0027 (.0027)	-.0010 (.0022)
Year	.0615 (.0157)**	.0550 (.0240)*	.0686 (.0165)**
City Dummies	YES	YES	YES

MODELS	ALL	MEN	WOMEN
D. Models A-C replicated with Avg. Estab. Size substituted with % Employed in Large Estabs. (500+)			
90/10	-.0039 (.0018)*	-.0027 (.0024)	-.0059 (.0017)**
90/50	-.0028 (.0013)*	-.0039 (.0023)†	-.0028 (.0009)**
50/10	-.0010 (.0017)	.0012 (.0026)	-.0031 (.0015)*
E. Models A-C replicated with Avg. Estab. Size substituted with % Large Estabs. (500+)			
90/10	-.1868 (.0852)*	-.1514 (.1029)	-.3074 (.0774)**
90/50	-.1336 (.0511)**	-.2072 (.0938)*	-.1281 (.0357)**
50/10	-.0532 (.0710)	.0558 (.1106)	-.1793 (.0610)**
F. Models A-C replicated with Avg. Estab. Size substituted with % Large Estabs. (1000+)			
90/10	-.2298 (.1366)†	-.2398 (.1689)	-.1854 (.1340)
90/50	-.2634 (.0932)**	-.3699 (.1514)**	-.1272 (.0753)†
50/10	.0336 (.1008)	.1300 (.1643)	-.0582 (.1070)
G. Models A-C replicated with Avg. Estab. Size substituted with % Employed in Small Estabs. (1-20)			
90/10	.0122 (.0064)†	.0104 (.0070)	.0197 (.0052)**
90/50	.0066 (.0033)†	.0087 (.0046)†	.0082 (.0019)**
50/10	.0056 (.0044)	.0017 (.0062)	.0115 (.0043)**

Notes: All wage differentials are in natural logs. In panels A-C, each *panel* and column combination represents a separate model for which N=230. In panels D-G, each *line* and column combination represents a separate model for which N=230, and the full set of controls included in panels A-C are included as well (though only the establishment size variable is shown); the other coefficients are similar to those presented in panels A-C.

†, $p <= .10$; *, $p <= .05$; **, $p <= .01$.

Sources: Wage differentials and explanatory variables are calculated from the Public Use Microdata Samples of the Census of the Population for 1970, 1980, 1990, 2000, unless otherwise noted; measures of establishment size exclude the retail sector and are calculated from the County Business Patterns for 1969, 1979, 1989, 1999; employment is from the Regional Economic Information System (REIS) for 1969, 1979, 1989, 1999.

Appendix Table 1
Sample Characteristics for Calculation of Wage Differentials

A. Sample Selection Characteristics

(unweighted, but constant weights)

1970	all sample	within city	out of city	within city (%)	out of city (%)
Total	1219022	790380	428642	**65%**	**35%**
Male	743785	482005	261780	71%	35%
Female	475237	308375	166862	71%	35%
1980					
Total	4872040	3578294	1293746	**73%**	**27%**
Male	2653735	1947232	706503	73%	27%
Female	2218305	1631062	587243	74%	26%

(weighted)

1990	all sample	within city	out of city	within city (%)	out of city (%)
Total	112592405	83935636	28656769	**75%**	**25%**
Male	58512665	43614049	14898616	75%	25%
Female	54079740	40321587	13758153	75%	25%
2000					
Total	127336454	80252185	47084269	**63%**	**37%**
Male	65339904	41155638	24184266	63%	37%
Female	61996550	39096547	22900003	63%	37%

B. Wage Differentials In and Out of Sample (weighted)

IPUMS				
Within Sample	s.d.	90/10	90/50	50/10
ALL				
1969	0.666	1.554	0.716	0.838
1979	0.674	1.605	0.782	0.824
1989	0.666	1.686	0.808	0.877
1999	0.665	1.689	0.836	0.853
MALE				
1969	0.618	1.379	0.643	0.736
1979	0.671	1.586	0.670	0.916
1989	0.681	1.701	0.737	0.963
1999	0.672	1.717	0.814	0.903
FEMALE				
1969	0.656	1.518	0.745	0.772
1979	0.613	1.413	0.728	0.685
1989	0.619	1.557	0.758	0.799
1999	0.639	1.625	0.799	0.826

Out of Sample	s.d.	90/10	90/50	50/10
ALL				
1969	0.677	1.585	0.724	0.861

1979	0.659	1.551	0.793	0.759
1989	0.641	1.638	0.811	0.827
1999	0.637	1.616	0.804	0.813
MALE				
1969	0.623	1.412	0.620	0.792
1979	0.648	1.528	0.684	0.844
1989	0.644	1.610	0.719	0.891
1999	0.639	1.618	0.789	0.829
FEMALE				
1969	0.685	1.596	0.807	0.788
1979	0.604	1.393	0.733	0.660
1989	0.596	1.515	0.800	0.714
1999	0.612	1.530	0.808	0.722
National				
ALL				
1969	0.677	1.575	0.731	0.844
1979	0.673	1.592	0.803	0.789
1989	0.666	1.673	0.808	0.865
1999	0.658	1.664	0.829	0.836
MALE				
1969	0.628	1.433	0.649	0.784
1979	0.668	1.570	0.678	0.892
1989	0.676	1.706	0.765	0.941
1999	0.664	1.704	0.800	0.904
FEMALE				
1969	0.673	1.570	0.758	0.812
1979	0.615	1.415	0.736	0.679
1989	0.622	1.575	0.781	0.795
1999	0.636	1.613	0.805	0.808

Source: Public Use Microdata Samples of the Census of Population for 1970, 1980, 1990, and 2000.

Appendix Table 2
Industry Classifications

Trade-Impacted Manufacturing[a]
Glass
Iron and Steel
Nonferrous Metals
Engines and Turbines
Farm Equipment
Construction, Mining, and other Equipment
Household Appliances
Motor Vehicles and Parts
Ships and Boats

R&D Intensive Manufacturing[b]
Chemicals
Printing and Publishing
Petroleum Refining
Office, Accounting, Computing, and other Non-Electrical Machinery
Radio, TV, Communications and other Electrical Machinery
Aircraft, Aerospace, and Related Parts
Scientific, Medical, and Photographic Equipment

Sources: [a] Borjas and Ramey (1995). [b] Berman, Bound, and Griliches (1994) and Autor, Katz, and Krueger (1998).