Increased Concentration of Occupations, Outsourcing, and Growing Wage Inequality in the United States

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I. Introduction

Growing inequality of wages, particularly growing inequality in wages between employers, has been a key feature of the labor market in recent decades. Many changes in the labor market have been examined as potential sources of this inequality growth—including the decline of manufacturing, the role of technology in replacing employer demand for clerical work, and the increased potential for imports to replace domestic labor. This paper examines an additional source of growing wage inequality: the changing distribution of occupations between establishments as the boundaries of employers change, retaining certain types of work within the workplace, and outsourcing other work.

Much evidence shows that establishments play an important role in determining individual wages, beyond the role of individual characteristics (Groshen, 1991a, 1991b, Bronars and Famulari, 1997, Abowd, Kramarz, and Margolis, 1999, Lane, Salmon, and Spletzer, 2007, Card, Heining, and Kline, 2013). Several authors have used employer microdata to study growing variability in earnings in the U.S. from the mid-1970s to the early 2000s, and have found that the increasing variability is due more to variation between establishments than to variation within establishments (Davis and Haltiwanger, 1991; Dunne, Foster, Haltiwanger, and Troske, 2004; Barth, Bryson, Davis, and Freeman, 2014; Handwerker and Spletzer 2015; and Song, Price, Guvenen, and Bloom, 2015).[1] The results in this paper show that growth in outsourcing is a key explanation for the growth in the between establishment component of wage inequality: a growing trend of low-wage workers and high-wage workers employed at different employers, exacerbating differences in their pay.

The intersection of growing underlying wage inequality and the business environment in the United States can make it profitable for employers to focus on employing either low or high wage workers. This underlying wage inequality among workers arises from such sources as the changing composition of the workforce and changing returns to education and experience (Bound and Johnson, 1992, Katz and Murphy, 1992, Lemieux, 2006), the growing inequality within education and skill groups (Juhn, Murphy, and Pierce, 1993, Katz and Autor, 1999), and the differential impact of technology on differing portions of the worker skill distribution (Juhn, Murphy, and Pierce, 1993, Acemoglu, 2002, Autor, Katz, and Kearney 2006, 2008). As wages for different kinds of work become less equal, employers operate within the framework of regulations requiring nondiscrimination across employees in the coverage of pension plans, and sometimes also in the coverage of health insurance benefit plans (EBRI, 2009, Perun, 2010),[2] increasing incentives to contract out work that pays very different wages from the work of other employees. Moreover, social norms may make it more acceptable for employers to contract out work rather than pay very different wages to employees doing different kinds of work.

There are many potential reasons for businesses to outsource work, in addition to avoiding paying efficiency wages or rents when market wages are low for particular types of

[1] There is a large and growing literature on wage inequality growth in Europe, based on employee-employer linked data, most notably Card, Heining, and Kline (2013), who emphasize the role of increased worker sorting between employers in explaining wage inequality growth in Germany.

[2] Perun (2010) lists a variety of employment benefits which receive favorable tax treatment and are required to be available to low-wage as well as high-wage employees of each employer.

low-skill work—and there is no single straightforward measure of outsourcing, for any reason. Other motivations for businesses to outsource work identified by Abraham and Taylor(1996) include increased ability to smooth workload for regular work force employees, and 'the existence of scale economies accruing to specialized providers of particular services.' Dey, Houseman, and Polivka (2010) show a marked increase in various measures of outsourcing in recent years, but no clearly defined sector to which jobs are outsourced. The closest such industries are "employment services," "professional employer organizations," and "temporary help," and estimates from several sources show these industries roughly doubling in size from 1992 to 2002. However, not all outsourcing is the movement of jobs to these particular industries, or even to the more general "business services" sector.[3]

This paper uses the concentration of employment by occupation as an economy-wide measure of outsourcing, permitting the distinction between different types of outsourcing and an examination of the impacts of these different types of outsourcing on wage inequality. When businesses are outsourcing work to avoid monitoring, hiring, or other costs for occupations in which they have less expertise, we will observe less variety in the number of occupations they employ. However, when businesses are outsourcing work to narrow the wage distribution of their employees, we will observe increases in the fraction of their employees that do low wage work, or the fraction of their employees that do high wage work. The impact of these changes in occupation concentration are also compared with the impact of other changes in employer characteristics (industry, size, and location) on the overall distribution of wages.

This work has three major findings. First, wages are related to the occupational concentration of workers within establishments. Workers in establishments that are more concentrated in occupations (except those concentrated in typically high-wage occupations) are paid lower wages. This relationship holds even after controlling for workers' own occupations and the sizes and industries of their employers, and has been increasing somewhat during 2000-2013. Second, during this period, there has been an increase in the concentration of occupations within establishments, particularly in the fraction of workers who are employed in very highly occupationally concentrated establishments. This increase is consistent with an increase in outsourcing of particularly low and high wage occupations into separate establishments. Third, this increase in occupational concentration can explain a substantial amount of the increase in private-sector wage inequality observed in our data over the 2000-2013 time period. Including these measures of occupational concentration, we can explain as much as 48% of overall wage inequality growth (65% of wage inequality growth between employers), while changes in the distributions of occupations, industries, establishment sizes, and the geography of employers can explain no more than 34% of overall wage inequality growth (44% of wage inequality growth between employers).

[3] As examples, Dey, Houseman, and Polivka show large increases in the fractions of school bus drivers employed by bus services companies (rather than by schools) and truck drivers in transportation industries (rather than by other industries).

II. Occupational Concentration

Occupational concentration is the variety of occupations employed at a place of business. This is a description of the variety of tasks performed by the employer, separate from describing the tasks performed by individual employees (their occupations), the type of work done at the establishment (the industry) or its size. Much scholarship on outsourcing (for example Dey, Houseman, and Polivka, 2010; and Erickcek, Houseman, and Kalleberg, 2003) examines particular occupations and particular industries. In contrast, occupational concentration is intended as a measure of the variety of the type of work done in establishments throughout the economy.

IIa. Measuring Occupational Concentration

Type forms of occupational concentration within establishments are examined here—more general occupational concentration across all occupations, and the specific type of occupational concentration for particularly high and low-paid occupations. We measure general occupational concentration across all occupations with a Herfindahl index:

$$(1) \qquad H = \sum_{k=1}^{98} \left(\frac{Employment\ in\ Detailed\ Occupation_k}{Total\ Employment} \right)^2$$

This index uses all 98 minor occupational categories at the 3-digit level of the Standard Occupational Classification system.[4] It varies from 1/98 (equal representation of all occupations) to 1 (perfect concentration). Increased occupational concentration, as measured in this index, is a general indication that employers are becoming more specialized, and are outsourcing work to other employers.

Of particular interest is the outsourcing of work that pays particularly high or low wages. Thus, a specific type of occupational concentration, the fraction of workers with reported occupations that are typically high or low paid occupations can be measured for each establishment, as:

(2a) The fraction of workers who are classified in minor occupation categories (3-digit SOC levels) in which mean wages in 1999 were below the 30th percentile of the overall wage distribution. These 20 occupations are shown in Appendix A.

The 30th percentile of the overall wage distribution is selected to classify occupations as "typically low-wage" because classifications at the 25th percentile or lower select largely workers

[4] Handwerker and Spletzer (2015) studied this type of general occupational concentration with Herfindahl indices, using both the detailed 6-digit occupations of the Standard Occupational Classification System (829 categories) and the 2-digit major occupational categories of the Standard Occupational Classification System (22 categories), and found very similar time trends and relationships between occupational classification and wages with broad and detailed versions of this measure.

with occupations involving food and beverages, and this measure of low-wage workers is intended to apply to a broad group of industries.

(2b) The fraction of workers who are classified in minor occupational categories (3-digit SOC levels) in which mean wages in 1999 were above the 70th percentile of the overall wage distribution (chosen for symmetry with the 30th percentile cut-off above). These 38 minor occupational categories are shown in Appendix B.

This paper uses the microdata of the Occupational Employment Statistics (OES) Survey for the private sector in the United States, reweighted to match the detailed industry and employer size distribution of the Quarterly Census of Employment and Wages for the appropriate quarter. The OES survey is designed to measure occupational employment and wages in the United States by geography and industry, covering all establishments in the United States except for those in agriculture, private households, and unincorporated self-employed workers without employees. For a sample size of approximately 400,000 private and local government establishments per year, these microdata record the number of employees for each detailed occupation paid wages within specific wage intervals. More details about the survey and the reweighting procedure used can be found in the Data Appendix.

Figure 1 gives a comparison of trends in occupational concentration for two occupations used as examples of trends in outsourcing in both Abraham and Taylor (1996) and Dey, Houseman, and Polivka (2010). For accountants and janitors, outsourcing means that individuals are employed in the specialty industries of janitorial services or accounting services, rather than in other industries. Thus, Figure 1 compares trends in occupational concentration measures for accountants with the fraction of accountants employed in accounting agencies, and trends in occupational concentration measures for janitors with the fraction of janitors employed in janitorial services companies. For accountants, the low-wage and high-wage occupation percentage are correlated with time trends in accounting agency employment with p values less than .001, and the Herfindahl measure of occupational concentration is correlated with time trends in accounting agency employment with a p value of .0055. For janitors, the low-wage occupation percentage and Herfindahl measures of occupational concentration are correlated with time trends in janitorial services industry employment with p values less than 0.0001. These two example occupations show that the generalized occupational concentration measures defined in this section—designed to measure outsourcing across all occupations and industries—have similar time trends as specialty industry employment explored in occupation-specific case-studies of outsourcing.

IIb: Relationships between Occupational Concentration Measures and Wages

Measures of Occupational Concentration are strongly and significantly related to wages across all occupations. This is shown with the regression:

(1) $$Ln(wage) = \alpha OccupationalConcentration + \delta X + \varepsilon$$

where X includes the survey date, occupation fixed effects, industry fixed effects, state fixed effects, and establishment size (we use fixed effects for establishment size classes as well as a continuous measure of establishment size).

These relationships between wages and discretized measures of occupational concentration are shown graphically in Figure 2, in which each Occupational Concentration variable has been rounded to the nearest hundredth and the set of α coefficients for wages in each hundredth-group is plotted on the vertical axis. The top row of Figure 2 displays the raw data (with no controls for establishment characteristics X), and the bottom row displays wages for each hundredth-group after controlling for observable characteristics. Both rows clearly show that increasing Herfindahl indices of occupational concentration and increasing fractions of low wage workers in an establishment are associated with lower wages, while increasing fractions of high wage workers in an establishment are associated with higher wages. All of these relationships remain (although they are lessened) after controlling for observable characteristics.[5]

The relationships between wages and continuous measures of occupational concentration are shown with regression results in Table 1, using regressions of the form

$$(2) \qquad Ln(wage) = \alpha OccupationalConcentration + \beta OccupationalConcentration * Date + \delta X + \varepsilon$$

The first rows of Table 1 give estimates of the coefficients α from these regressions without any X variables. These estimates clearly show that increased occupational concentration is associated with lower wages (higher wages for increased concentration of typically high-wage occupations). Estimates of the coefficients β (shown here in decade units of time) show that all these relationships have quite significantly strengthened over time. Lower rows of Table 1give estimates with X variables added. These detailed controls ameliorates the strength of the relationship between occupational concentration and wages, but all of these relationships remain very significant, with unchanged signs.

The strength and direction of the relationships between occupational concentration and wages is not constant across the occupational distribution. Thus, changes in occupational concentration have different impacts on wages for different groups of workers. This is shown in the continuation of Table 1, in which workers are divided by occupation into those in typically high-wage occupations, those in typically low-wage occupations, and those in all other occupations, using the same divisions of occupations used in constructing measures of occupational concentration.

For workers in typically high-wage occupations, the relationship between wages and the fraction of the establishment in typically-high wage occupations is negative. Moreover, after controlling for occupation, the relationship between the wages for these workers and the fraction of coworkers in typically-low wage occupations is much stronger than it is for the full set of workers. However, the relationships between the other measures of occupational concentration

[5] It is possible that the particularly low and high values of occupational concentration are due to the absence of occupational heterogeneity in small establishments. However, the changes in slope at the extremes of the horizontal axis in Figure 2 remain when we drop small establishments from our estimating regressions.

and wages are much weaker for this group of workers. After including the full set of controls, there is a positive relationship between the Herfindahl index of occupational concentration and their wages for these workers.

For workers in middle-wage occupations, the raw (no occupation or employer controls) relationships between occupational concentration and wages have the same sign as in the overall results, but these results are weaker. After including the full set of occupation and employer controls, the relationships between wages and the concentration of coworkers in typically high and low wage occupations change sign for these workers.

The overall results appear to be driven by workers in typically low-wage occupations. For workers in typically low-wage occupations only, the estimates α of the relationships between wages and all measures of occupational concentration are particularly strong, both as raw relationships and as relationships after we include controls for occupations, industry, firm size, and state. However, for these workers, the estimates β have opposite sign from the estimates of α, indicating that all of these relationships have been weakening over time.

In combination, these results show very strong relationships between occupational concentration—by all measures—and wages. These relationships are only partially explained by occupation and employer characteristics, and they have been strengthening over time. Moreover, occupational concentration is a particularly important determinant of wages for low-wage workers.

IIc: Trends in Occupational Concentration Measures

Overall, the establishments in which workers work are becoming more occupationally concentrated over time, as shown in the top row of Figure 3. To explain this rise, the lower row of Figure 3 shows coefficients α from trend regressions of the form

(3) $$OccupationalConcentration_t = \delta X_t + \varepsilon .$$

After controlling for occupation, detailed industry, size class, and state, the average fraction of co-workers in higher-wage occupations has steadily risen over time, but other measures of occupational concentration have no clear time trend in mean values.

Continuous-time versions of this regression are shown in Table 2. These regressions take the form (4)

$$OccConcen = \alpha Survey\ date + \beta I(Maysurveydate) + \chi DetailedOcc + \delta Industry + \varepsilon SizeClass + \phi Size + \varphi State$$

, and the α coefficients are scaled to show change over a decade of time. These regressions show that occupations and employer characteristics explain the increase in Herfindahl indices of occupational concentration and the fraction of co-workers in typically low-wage occupations, but the increase in the fraction of co-workers in typically high-wage occupations remains quite strong, even after controlling for these observable characteristics.

The continuation of Table 2 breaks these trends apart for workers by occupational groupings. In the first column, occupational concentration measured with the Herfindahl index has grown most for workers in typically low-wage occupations. However, after adjusting for changes in occupations and employer characteristics, this type of occupational concentration has grown a small amount for workers in typically high-wage and in typically low-wage occupations, but not for workers in middle-wage occupations. In the second column, occupational concentration measured with the fraction of employees in typically low-wage occupations has grown most for workers in such low-wage occupations. After adjusting for changes in occupations and employer characteristics, this type of occupational concentration has barely shown any grown for any group of workers. The final column shows that occupational concentration measured with the fraction of employees in typically high-wage occupations has grown most for workers in such high-wage occupations—and this pattern remains even after controlling for changes in the composition of employment by occupation and employer characteristics.

Overall, this is evidence that occupational concentration of establishments has been increasing during the Fall 2000 – Spring 2014 time period. Without adjusting for changes in other characteristics, all three measures of occupational concentration are increasing over time. After adjusting for changes in the distribution of occupations, industries, state-level geography of employment, and employer sizes, establishment-level employment in typically high-wage occupations continues to display a strong increase over time, and Herfindahls of occupational concentration display a small increase over time for some groups of workers.

This set of trends—raw increases in the establishment-level fraction of employees in typically low-wage occupations, which can be explained by changing occupation and establishment characteristics, and raw increases in the establishment-level fraction of employees in typically high-wage occupations, which cannot be so explained—fit together. These are the trends we would observe if employers of high-wage occupations, in a variety of industries, are outsourcing typically low-wage work to specialty employers. For example, if employers in a variety of industries that employ higher-paid occupations increasingly outsource janitorial work to janitorial services companies, we would observe (1) an increase in the fraction of the (original) establishment in typically higher-paid occupations, which would not be explained by occupation or employer characteristics and (2) an increase in the overall fraction of the (janitorial) establishment in typically lower-paid occupations, which would be explained by being typical of the janitorial services industry.

IId: Variation in these results by state-level unionization rates

The OES does not collect information on unionization patterns by employer, but it includes location of each establishment, and unionization rates vary strongly by state. In results not shown, results are estimated separately for highly unionized states (those with 17-26% of employed workers unionized), middle, and low unionized states (those with 3-9.3% of employed workers unionized), based on published tables of unionization rates by state from the Current Population Survey. Although do not appear to be any differences in trends in occupational concentration levels between groups of states with high and low unionization rates, there are

differences among these groups of states in the relationship between occupational concentration and wages. Using equation (2) to calculate these relationships separately for different groups of states, states with lower unionization levels have stronger relationships α between Herfindahl measures of occupational concentration and wages, while states with higher unionization levels have stronger relationships α between the fraction of workers in establishments in typically high-wage or in typically low-wage occupations and wages. However, the time-varying coefficients β are stronger for the groups of states with lower α coefficients, which means that the relationships between occupational concentration and wages are converging over time between the different groups of states.

III. Occupational Concentration and Wage Inequality Growth

The combination of strong relationships between establishment-level occupational concentration and wages (particularly for workers in typically low-wage occupations) and growth in establishment-level occupational concentration over time suggests that changes in occupational concentration over time can explain some of the growth in wage inequality during this period. Using the method of DiNardo, Fortin, and Lemieux, 1996 (DFL)[6] it is straightforward to calculate counterfactual wage distributions based on the OES wage intervals, as if the distributions of observable characteristics in November 2013 matched their distributions in Fall 2000. Thus, portions of increased wage inequality growth from 2000 to 2013 can be attributed to changes in the distribution of occupations, employment by industry, state, employer size, occupational concentration, and combinations of all these factors.

Table 3 shows the results of DFL-type reweightings for the observable characteristics of detailed industry (at the 4-digit NAICS level), state, employer size, occupation (at the 3-digit SOC code level), and all three measures of occupational concentration. These reweightings are calculated for all possible sub-sets of these 7 variables—a total of 127 possible combinations. Row (1) of Table 3 gives the levels of overall, between-establishment, and within-establishment wage variance observed in November 2013 without any reweighting, rows (2) through (8) shows the results of reweightings for single characteristics, and rows (9) through (16) show the results of reweighting by selected combinations of observable characteristics. For each reweighting, Table 3 shows the percentage of the overall growth in ln wage variance explained by changes in the distribution of that observable characteristic, as well as the percentage of the growth in ln wage variance between and within establishments.

Examining the first rows of Table 3, row (5), occupation, at the 3-digit SOC level, and row (6), the fraction of employees in each establishment in typically high-wage occupations, are the single characteristics that explain the largest amount of overall wage variance growth from Fall 2000 to November 2013. Row (6) shows that reweighting observations in November 2013 to the Fall 2000 distribution of the fraction of employees in each establishment in typically high-

[6] The DiNardo, Fortin, and Lemieux (1996) methodology of creating counterfactual distributions for a later year if observable characteristics were held fixed at their distribution in an earlier year is to (1) combine the data for the earlier and later years and run a probit regression of the probability that an observation with a particular set of observable characteristics came from the earlier year and then (2) use the predicted values from this probit regression to create new weights for each observation in the later year.

wage occupations would reduce overall ln wage variance in 2013 from the measured variance of .4095 to .3940. This decrease represents 27% of all ln wage variance growth from Fall 2000 to November 2013. It represents 25% of ln wage variance growth between establishments, and 33% of ln wage variance growth within establishments. Similarly, reweighting observations in November 2013 to the Fall 2000 distribution of minor occupational categories (row 5) explains the greatest amount (31%) of the growth in overall ln wage variance and ln wage variance growth between establishments (42%) that can be explained by a single reweighting variable. Changes in the distributions of employment by detailed industries (row 2) and states (row 3) can also explain some of overall ln wage variance growth. Changes in the distributions of employment by size classes and by other measures of occupational concentration do not explain any of overall ln wage variance growth, although these other measures of occupational concentration do explain some of the growth of wage variance between establishments.

Further rows of Table 3 show reweightings for selected combinations of observable characteristics. The largest amount of overall wage variance growth explained (48%) can be explained by two different combinations of observable characteristics, (9) and (10). Both of these combinations contain the observable characteristics of industry, state, the fraction of establishments' employment in typically high-wage occupations, and the fraction of establishments' employment in typically low-wage occupations—they differ only in whether or not they include the Herfindahl index of occupational concentration within establishments. Reweighting (9), without this Herfindahl index, explains more of the growth in wage variance between establishments, while reweighting (10), including the Herfindahl index of occupational concentration, does a better job of explaining the growth in wage variance within establishments. Remarkably, neither of these "most-variance explained" reweightings includes occupation as a reweighting variables: although occupation alone is the best single-variable explanation for the growth in wage variance, the impact of changes in this variable on the overall variance of wages is completely captured by the combined impact of changes in the distribution of employment by state, industry, and occupational concentration.

Rows (12) and (13) of Table 3 give the combinations of characteristics that do the poorest job in explaining wage variance growth. Both combinations include reweighting employers in November 2013 to have the Fall 2000 distributions of employer size and fraction of employment in typically low-wage occupations, and differ only in whether or not they include the Herfindahl index of occupational concentration within establishments.

The largest amount of wage variance growth (67%) between establishments can be explained by the combination of observable characteristics labeled (14), while the least amount of wage variance growth between establishments can be explained by establishment size along, in row (4). The largest amount of wage variance growth (38%) within establishments can be explained by the combination of observable characteristics labeled (15). This combination includes only state, and the fraction of establishments' employment in typically high-wage occupations.

The combination of observable characteristics that best explains overall wage inequality growth without any occupational concentration measures is shown in row (11) of Table 3. This combination is state, and minor occupational category, which coincidentally are variables

available in household surveys such as the CPS. This combination explains 34% of overall wage variance growth—a difference of 14% from combinations (9) and (10). Adding industry to this combination yields the best explanation of between-establishment wage inequality growth without our measures of occupational concentration—45% of between-establishment wage variance growth—a difference of 22% from combination (14).

The discussion of reweighting results thus far has focused entirely on the impact of reweighting observable characteristics on overall and between-establishments wage variance. However, these reweightings show how changes observable characteristics impact the whole distribution of wages. Figure 4 plots the density of real wages by wage interval for Fall 2000, November 2013, and November 2013 after reweighting to one of the "best" combinations of observable characteristics—row (9) of Table 3. The upper panel of Figure 4 shows that wage variance increased between Fall 2000 and November 2013 because of increased employment in the very lowest wage interval and the top five wage intervals, with decreased employment in the lower-middle wage intervals. The lower panel shows that reweighting the 2013 data to reflect the 2000 distributions of industry, state, and occupational concentration variables reduces employment in the very lowest wage interval, increases employment in the lower-middle wage intervals, and reduces employment in the top six wage intervals.

Table 4 shows real wages in $2000 for selected percentiles[7] of the wage distribution in November 2013 and selected ratios of these percentiles, under the same reweightings as Table 3. At every percentile of the wage distribution shown, reweighting the 2013 data to the 2000 distribution of the fraction of establishments in typically high-wage occupations (row 6) would lower wages, while reweighting to the 2000 distribution of the fraction of establishments in typically low-wage occupations (row 7) or Herfindahls of occupation (row 8) would raise wages. Examining differential impacts for different parts of the wage distribution, the fraction of establishments in typically high-wage occupations (row 6) has a particularly strong impact on reducing the 50-10 wage ratio, as does the combination of characteristics shown in row (15), while occupation has a particularly strong impact on reducing the 90-50 wage ratio. The combination of reweighting characteristics in rows (9) and (10) have the greatest impact on both the 90-50 wage ratio and the 90-10 wage ratio.

IV: Occupational Concentration for Establishments or Firms?

Song, Price, Guvenen,& Bloom (2015) argue that the unit of importance for wage inequality should be the firm and not the establishment. In thinking about occupational concentration, some of the reasons for employers to outsource work to other establishments are also reasons to outsource work to other employers entirely. It may be more efficient for even multi-establishment employers to specialize in particular areas of work. Regulatory incentives for multi-establishment employers to specialize in employing workers in a particular part of the wage distribution are less clear. ERISA laws define employers as "controlled groups of corporations" and "entities under common control" in requiring common levels of pension and welfare benefits among most employees in exchange for favorable tax treatment (Perun, 2010),

[7] The OES survey collects employment by wage interval, not exact wages. Thus, these percentiles are calculated assuming a uniform distribution of wages within each interval.

and the Affordable Care Act of 2010 extended these provisions by requiring common levels of health care benefits among most employees of businesses with a common owner. However, as Perun notes, "Employers often invent new organizational structures and worker classifications designed to limit participation to favored employees… Regulatory authorities in turn develop complicated rules and regulations designed to prevent this."

This paper focuses on measures of occupational concentration at the establishment level because establishments are the sampling units of the OES, and the OES sampling design often includes some but not all establishments of multi-establishment companies, particularly when there are establishments in geographic areas with fewer establishments available to sample. However, the OES microdata can be linked with the EIN (tax-ID) numbers that these establishments submit to the unemployment insurance system, as compiled by the Quarterly Census of Employment and Wages. As discussed extensively in Handwerker and Mason (2013), very large firms may use multiple EINs in the unemployment insurance system, and there is no easy way to link together all of the establishments in these data for very large firms. Thus, while it is straightforward to recalculate measures of occupational concentration at the EIN level and repeat the analyses above, such EIN-level measures are not true firm-level measures.

Using EIN-level measures of occupational concentration instead of establishment-level measures has remarkably little impact on any of the main results in this paper. The relationship between EIN-level measures of occupational concentration and wages is very similar that shown for establishment-level measures in Table 1. The only difference is that in regressions $Ln(wage) = \alpha Occupational Concentration + \beta Occupational Concentration * Date + \delta X + \varepsilon$, for occupational concentration measured with either the fraction of the EIN-level employment in typically high-wage occupations or in typically low-wage occupations, when the full set of controls X are added, the coefficients α are roughly double the magnitudes of those shown in the last rows of Table 1. Trends in EIN-level measures of occupational concentration over time are very similar to those for establishment-level measures in Table 2, with and without the addition of other controls.

Reweighting the November 2013 data to the Fall 2000 distribution of EIN-level measures of occupational concentration yields nearly identical results to those shown in Tables 3 and 4. The largest difference is that reweighting by the fraction of typically high-wage occupations per EIN (rather than per establishment) would reduce the November 2013 ln wage variance to .3930, rather than the .3940 shown in row (6) of Table 3, explaining 29% of ln wage variance growth, rather than the 27% explained by the establishment-level version of this measure. Similarly, using EIN-level versions of the characteristics shown in row (10) of Table 3 can explain 50% of overall ln wage variance growth, rather than the 48% shown in Table 3, and EIN-level versions of the characteristics shown in row (14) of Table 3 can explain 68% of the growth in ln wage variance between establishments, rather than the 67% shown in Table 3.

V. Discussion and Conclusion—What do these results tell us about the role of outsourcing in increased wage inequality growth?

While many authors have studied the growth in wage inequality between employers and several have studied the impact of outsourcing on wages, this paper is the first to connect these literatures. This paper argues that occupational concentration is a measure of outsourcing, and uses this measure to examine the impact of outsourcing on wage inequality growth for the economy as a whole. Section II defines three measures of occupational concentration for every establishment—a Herfindahl index measuring occupational concentration across all occupations, and more specific measures of the concentration of typically low-wage workers and typically high-wage workers. All of these measures are strongly and significantly related to wages, especially for workers in typically low-wage occupations, even after controlling for the occupations of employees and various observable characteristics of their employers. These measures of occupational concentration show increased concentration over time, especially for workers in typically low-wage occupations. The pattern of time trends across measures of occupational concentration, with and without controlling for employer characteristics, is consistent with the idea that companies are "de-verticalizing" by outsourcing functions not integral to employers' missions, particularly if these outsourced tasks are done by workers paid lower wages than the "core workers" in the establishment. Increasing concentration of typically low-wage occupations over time can be explained by changes in the characteristics of establishments employing these occupations, but the increased concentration of typically high-wage occupations over time cannot be explained by these establishment characteristics. This is consistent with the movement of low-wage work to specialty low-wage employers.

The changing distribution of one measure of occupational concentration (the fraction of workers in each establishment in typically high-wage occupations) were responsible for more than a quarter of the increased wage variance growth measured in these data during the Fall 2000 – November 2013 time period. Combining measures of occupational concentration with industry and geographic information, it is possible to explain nearly half of measured increased wage variance growth, and captures all of the increased wage variation that could otherwise be explained by occupation. Combining measures of occupational concentration with industry, occupation, and geographic information, it is possible to explain two-thirds of nearly half of measured increased wage variance growth between occupations. In such reweightings, the fraction of workers in each establishment in typically high-wage occupations appears to be a key variable in explaining wage inequality growth, as it is present in all combinations of variables with the greatest power to explain wage inequality growth. This variable was designed to capture a particular form of outsourcing—the concentration of establishment-level employment in occupations in the upper part of the wage distribution. Its power in explaining wage inequality growth suggests that this particular form of outsourcing has a profound impact on wage inequality growth.

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Data Appendix

This paper uses Occupational Employment Statistics (OES) Survey microdata. The OES survey is designed to measure occupational employment and wages in the United States by geography and industry, and is the only such survey of its size and scope, covering all establishments in the United States except those in agriculture, private households, and unincorporated self-employed workers without employees. Every year, approximately 400,000 private and local government establishments are asked to report the number of employees in each occupation paid within specific wage intervals. This data collection occurred in October, November, and December, until 2001; since November 2002, data has been collected for about 200,000 establishments each November and another 200,000 each May.

An abridged version of an OES survey form is shown in Figure 1. This survey form is a matrix of detailed occupations and wage intervals. For large establishments, the survey form lists 50 to 225 detailed occupations; these occupations pre-printed on the survey form are selected based on the industry and the size of the establishment. Small establishments write descriptions of the work done by their employees, which are coded into occupations by staff in state labor agencies. Wage intervals on the OES survey form are given in both hourly and annual nominal dollars, with annual earnings that are 2080 times the hourly wage rates. To calculate average wages, the OES program obtains the mean of each wage interval every year from the National Compensation Survey (NCS). These mean wages are then assigned to all employees in that wage interval. The OES survey is not designed to produce time series statistics. Time series in this paper are produced using the methodology described in Abraham and Spletzer (2010) to reweight the data to November or May benchmarks of total employment by detailed industry and by broad industry and establishment size groups from the Quarterly Census of Employment and Wages (QCEW). The OES began collecting data using the Standard Occupational Classification System in 1999, and had a change of industry classification systems soon thereafter. Beginning with the 2002 OES survey, establishments were classified by 6 digit NAICS codes, and the OES staff recoded much of the 2000 and 2001 OES microdata to use NAICS as well. The analyses in this paper begin with the OES microdata from 2000 in order to be able to use consistent industry controls.

The OES *cannot* measure inequality in the top percentiles of the wage distribution. Earnings of individuals at the very top of the wage distribution are topcoded in the OES—the uppermost interval in the recent OES surveys is "$208,000 and over" (interval ranges vary by year). Averaged across all years, the uppermost interval contains roughly 1.3 percent of employment. Handwerker & Spletzer, 2014 compare wage data in the OES with wage data from the outgoing rotation groups of the CPS, and have two main findings. First, the interval nature of wage collection in the OES has almost no impact on overall wage variance trends. Second, reweighted OES data broadly replicate basic CPS wage distribution trends, beginning in 1998. Overall wage distributions in each year are similar, as well as overall variance trends, variance trends by sector, industry groups, and occupation groups. In both the OES and the CPS, industry groups alone explain 15-17% of wage variation, although industry groups explain slightly more of the variation in the (employer-reported) OES than in the (employee-reported) CPS. Occupational groups alone explain more of the variation in wages in the OES (about 40%) than

these same variables explain in the CPS (about 30%). The amount of wage variance explained by occupation is also growing more quickly in the OES than in the CPS.

Handwerker and Spletzer, 2015, examine the decomposition of total wage variance in the OES into its within-establishment and between establishment components at length. They find that over the period of 1998 through November 2011, 55% of wage variance is between establishments, while 74% of the growth in overall wage variance from Fall 1998 to November 2013 is between establishments, very similar to the findings of Barth, Bryson, Davis, and Freeman, with the Census Longitudinal Business Database. They also find that similar amounts of establishment-level wage variance in the OES can be explained by broad industry groups to the amount found by Barth, Bryson, Davis, and Freeman. However, more of the establishment-level wage variance can be explained by detailed industry in the OES data than in the Census data, echoing the findings comparing the OES and CPS data above.

Appendix A: "Typically low-wage Occupations"

3-digit SOC code	*Minor Occupational Category*
353	Food and Beverage Serving Workers
359	Other Food Preparation and Serving Related Workers
393	Entertainment Attendants and Related Workers
352	Cooks and Food Preparation Workers
412	Retail Sales Workers
372	Building Cleaning and Pest Control Workers
536	Other Transportation Workers
452	Agricultural Workers
399	Other Personal Care and Service Workers
311	Nursing, Psychiatric, and Home Health Aides
392	Animal Care and Service Workers
516	Textile, Apparel, and Furnishings Workers
395	Personal Appearance Workers
259	Other Education, Training, and Library Occupations
339	Other Protective Service Workers
373	Grounds Maintenance Workers
394	Funeral Service Workers
537	Material Moving Workers
513	Food Processing Workers
379	Other Building and Grounds Cleaning and Maintenance Occs

Appendix B: "Typically high-wage Occupations"

3-digit SOC code	*Minor Occupational Category*
231	Lawyers, Judges, and Related Workers
532	Air Transportation Workers
112	Advertising, Marketing, PR, and Sales Managers
111	Top Executives
172	Engineers
113	Operations Specialties Managers
291	Health Diagnosing and Treating Practitioners
151	Computer Specialists
152	Mathematical Science Occupations
192	Physical Scientists
159	Other Computer and Mathematical Occupations
119	Other Management Occupations
191	Life Scientists
153	Other Computer and Mathematical Occupations
193	Social Scientists and Related Workers
251	Postsecondary Teachers
331	First-line Supervisors/Managers, Protective Service Workers
131	Business Operations Specialists
471	Supervisors, Construction and Extraction Workers
414	Sales Representatives, Wholesale and Manufacturing
132	Financial Specialists
491	Supervisors of Installation, Maintenance, and Repair Workers
171	Architects, Surveyors, and Cartographers
413	Sales Representatives, Services
511	Supervisors, Production Workers
173	Drafters, Engineering, and Mapping Technicians
252	Primary, Secondary, and Special Education School Teachers
518	Plant and System Operators
531	Supervisors, Transportation and Material Moving Workers
431	Supervisors, Office and Administrative Support Workers
333	Law Enforcement Workers
273	Media and Communication Workers
451	Supervisors, Farming, Fishing, and Forestry Workers
272	Entertainers and Performers, Sports and Related Workers
194	Life, Physical, and Social Science Technicians
492	Electrical and Electronic Equipment Mechanics, Installers, and Repairers
239	Legal Occupations, Not Elsewhere Classified
232	Legal Support Workers

Exhibit 1: OES Survey Form (abridged)

OCCUPATIONAL TITLE AND DESCRIPTION OF DUTIES	NUMBER OF EMPLOYEES IN SELECTED WAGE RANGES (Report Part-time Workers According to an Hourly Rate)												
	A	B	C	D	E	F	G	H	I	J	K	L	T
Hourly (part-time or full-time)	under $7.50	$7.50–9.49	$9.50–11.99	$12.00–15.24	$15.25–19.24	$19.25–24.49	$24.50–30.99	$31.00–39.24	$39.25–49.74	$49.75–63.24	$63.25–79.99	$80.00 and over	Total Employment
Annual (full-time only)	under $15,600	$15,600–19,759	$19,760–24,959	$24,960–31,719	$31,720–40,039	$40,040–50,959	$50,960–64,479	$64,480–81,639	$81,640–103,479	$103,480–131,559	$131,560–166,399	$166,400 and over	
Architects, Except Landscape and Naval - Plan and design structures, such as private residences, office buildings, theaters, factories, and other structural property. **17-1011**	A	B	C	D	E	F	G	H	I	J	K	L	T
Landscape Architects - Plan and design land areas for such projects as parks and other recreational facilities, airports, highways, hospitals, schools, land subdivisions, and commercial, industrial, and residential sites. **17-1012**	A	B	C	D	E	F	G	H	I	J	K	L	T
Cartographers and Photogrammetrists - Collect, analyze, and interpret geographic information provided by geodetic surveys, aerial photographs, and satellite data. Research, study, and prepare maps and other spatial data in digital or graphic form. May work with Geographic Information Systems (GIS). **17-1021**	A	B	C	D	E	F	G	H	I	J	K	L	T
Surveyors - Make exact measurements and determine property boundaries Provide data relevant to the shape, contour, gravitation, location, elevation, or dimension of land or land features on or near the earth's surface. **17-1022**	A	B	C	D	E	F	G	H	I	J	K	L	T
Aerospace Engineers - Perform a variety of engineering work in designing, constructing, and testing aircraft, missiles, and spacecraft. **17-2011**	A	B	C	D	E	F	G	H	I	J	K	L	T
Agricultural Engineers - Apply knowledge of engineering technology and biological science to agricultural problems concerned with power and machinery, electrification, structures, soil and water conservation, and processing of agricultural products. **17-2021**	A	B	C	D	E	F	G	H	I	J	K	L	T
Biomedical Engineers - Apply knowledge of engineering, biology, and biomechanical principles to the design, development, and evaluation of biological and health systems and products, such as artificial organs and medical information systems. **17-2031**	A	B	C	D	E	F	G	H	I	J	K	L	T
Chemical Engineers - Design chemical plant equipment and devise processes for manufacturing chemicals and products by applying principles and technology of chemistry, physics, and engineering. **17-2041**	A	B	C	D	E	F	G	H	I	J	K	L	T

Figure 1: Comparisons of Time Trends in Occupational Concentration Measures for Janitors and Accountants with the fraction of employment in these occupations in Janitorial Services companies (NAICS code 561720) or Accounting Agencies (NAICS code 541211)

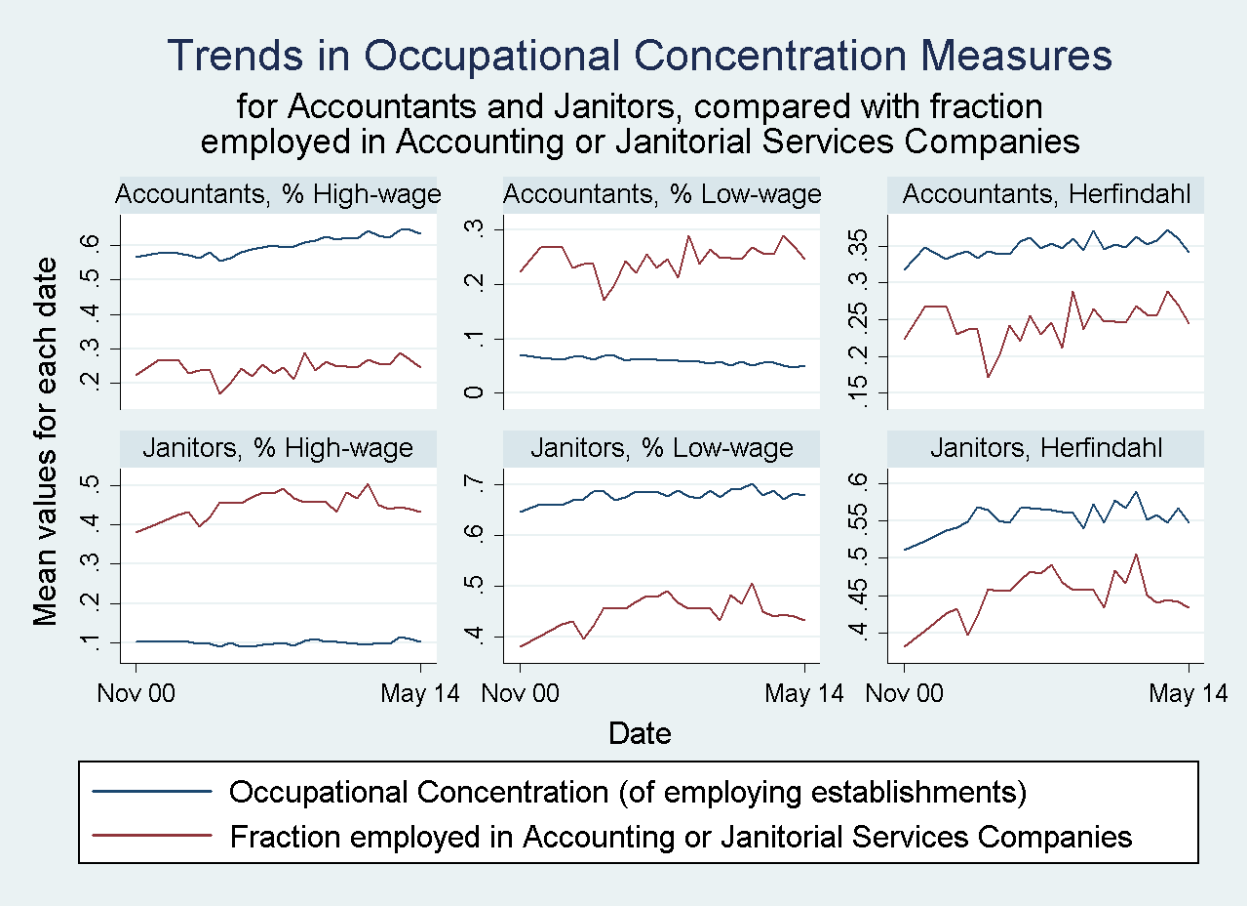
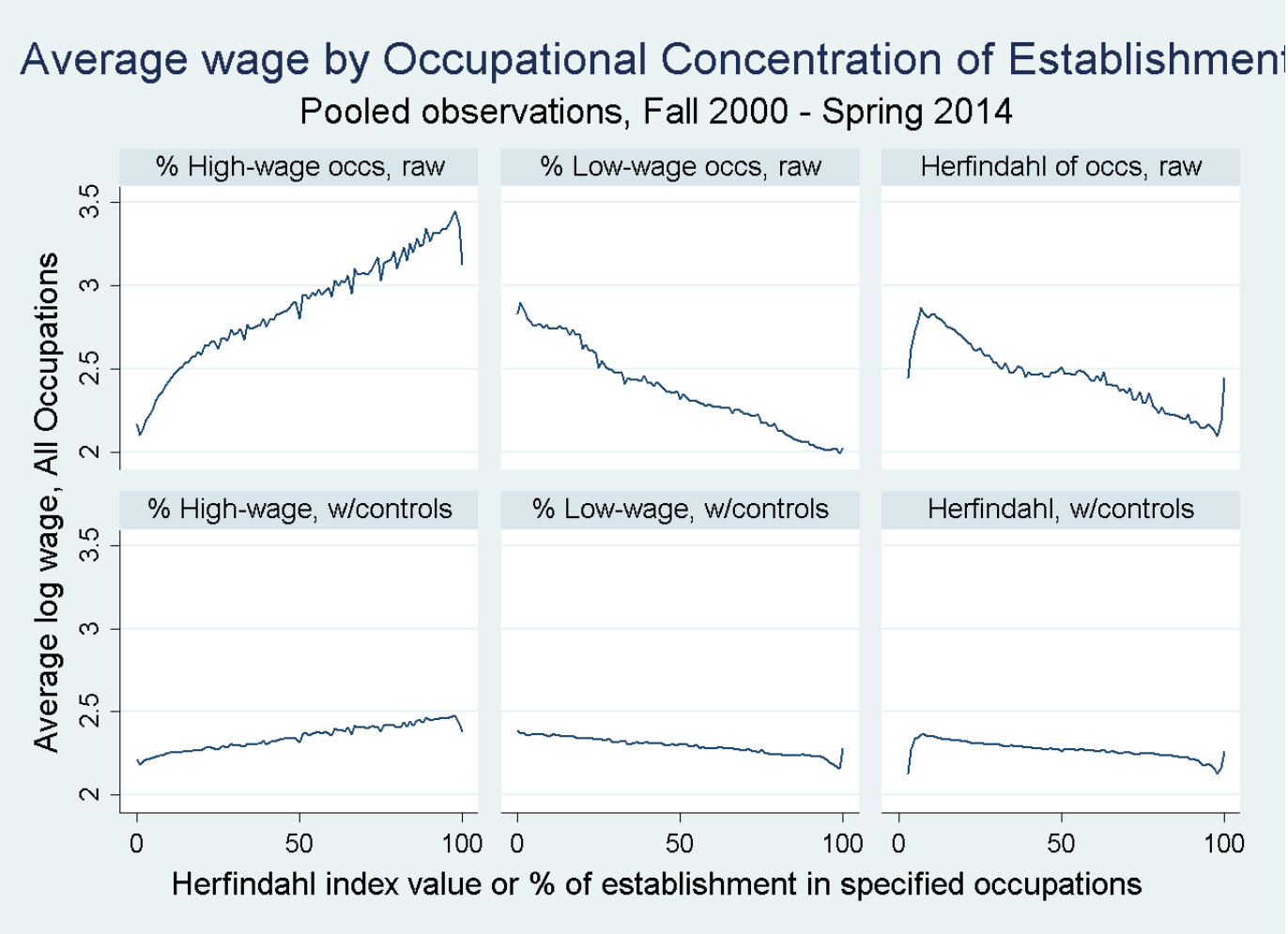
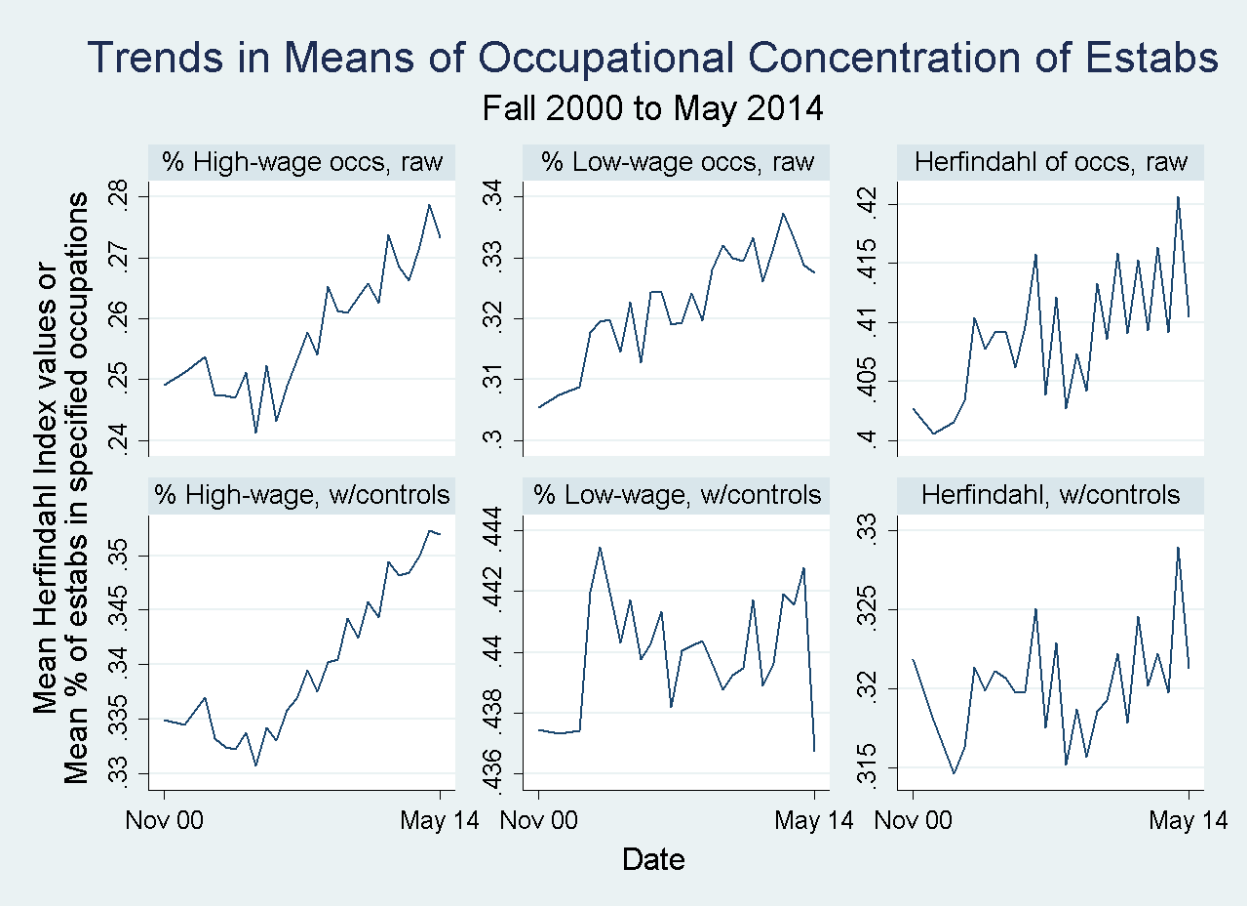


Figure 2: Relationships between Wages and Occupational Concentration



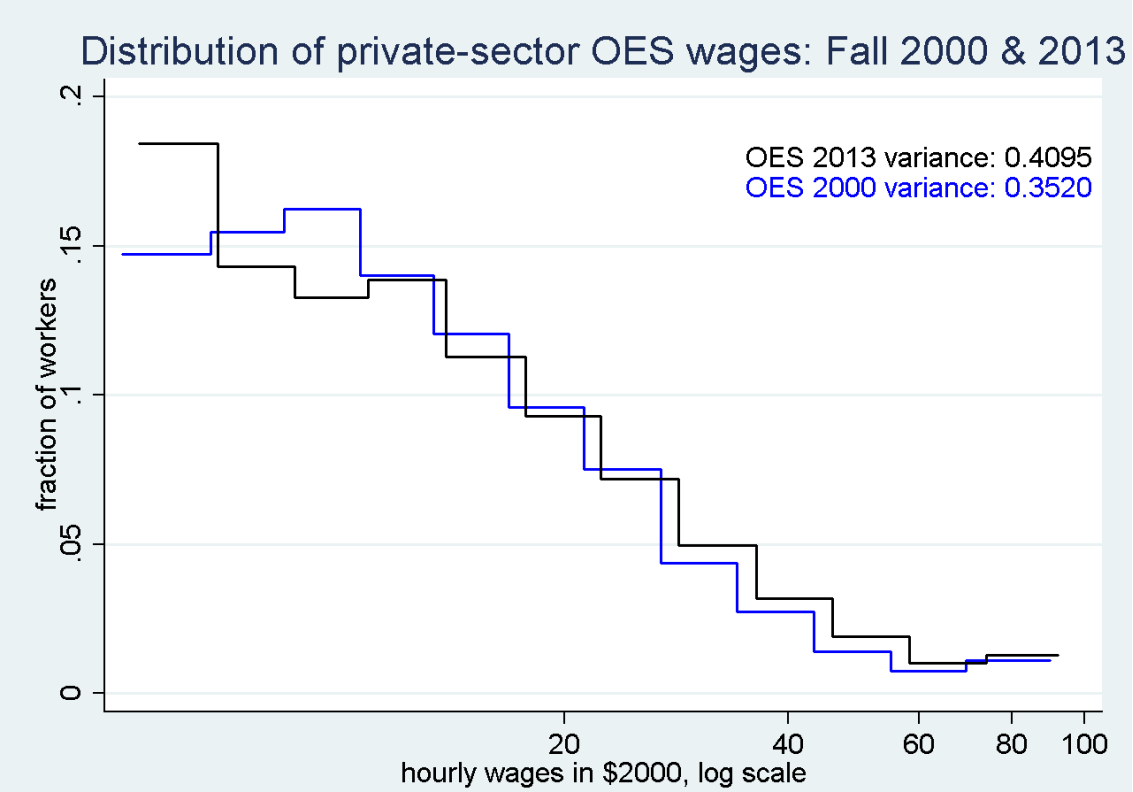
Notes: the "avgwage" coefficients plotted here are the set of α coefficients from regressions of the form $Ln(wage) = \alpha OccConcenGroup$ (top row), where Occupation Concentration Groups are formed by rounding each Occupation Concentration variable to the nearest hundredth, and $Ln(wage) = \alpha OccConcenGroup + \chi Survey\ date\ \ fixed\ \ effects\ + \delta X$ where X includes dummy variables for each detailed occupation in the OES, 4 digit employer NAICS codes, states, and employer size classes (bottom row).

Figure 3: Trends in Means of Occupational Concentration



Note: These are plots of coefficients α from regressions
$OccConcen = \alpha Survey\ date + \beta DetailedOcc + \chi Industry + \delta SizeClass + \varepsilon Size + \phi State$.

Figure 4: OES Wage distributions in Fall 2000, November 2013, and November 2013 with one of the "best" reweightings to Fall 2000 characteristics



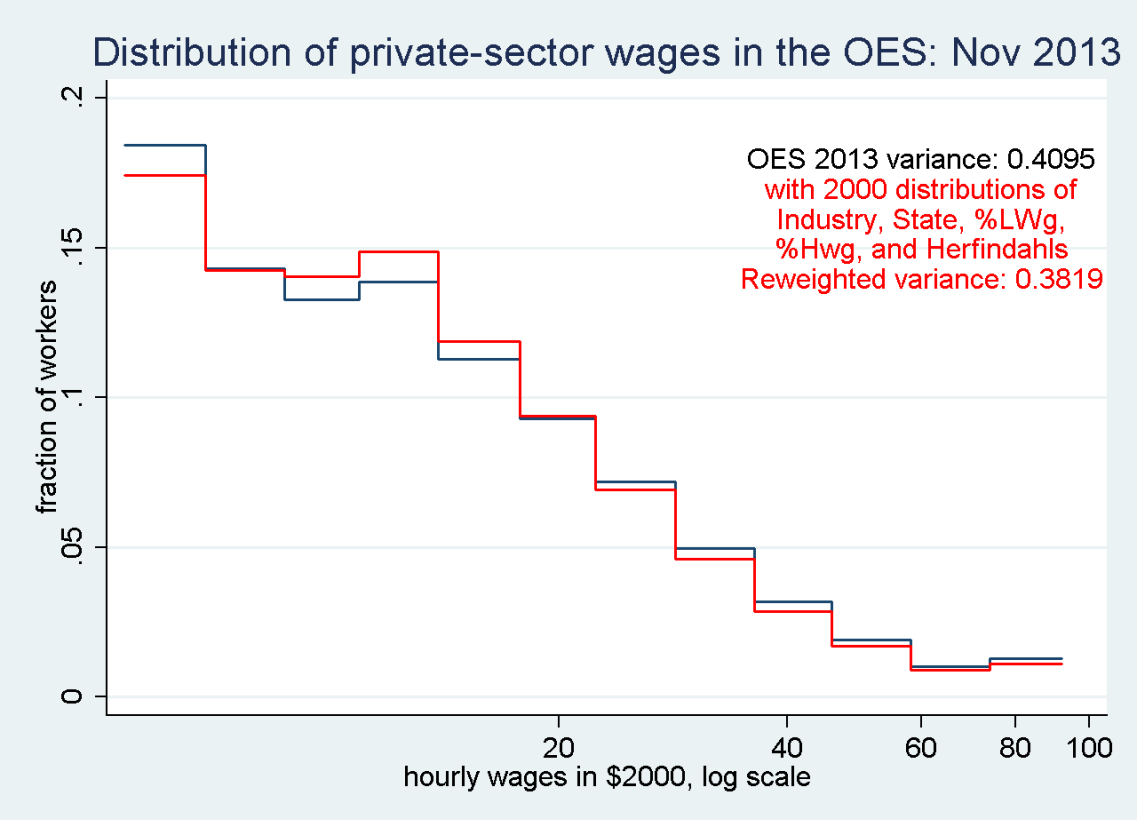


Table 1: Regressions of log wages on measures of Occupational Concentration

All unimputed OES private-sector data from Fall 2000-May 2014

Occupational Concentration Variable	Herfindahl of occupational concentration of the establishment	fraction of the establishment in typically low wage occupations	fraction of the establishment in typically high wage occupations
With survey-date fixed effects			
Coefficient on OccConcen	-0.298***	-0.616***	0.745***
(standard error)	(0.004)	(0.003)	(0.003)
Coefficient on OccConcen * Date	-0.048***	-0.054***	0.092***
(standard error)	(0.001)	(0.001)	(0.001)
With survey-date and 6-digit occupation fixed effects			
Coefficient on OccConcen	-0.176***	-0.278***	0.178***
(standard error)	(0.003)	(0.002)	(0.002)
Coefficient on OccConcen * Date	-0.008***	-0.001***	0.037***
(standard error)	(0.001)	(0.000)	(0.001)
With survey-date, 6-digit occupation, 5-digit NAICS, size class, & state fixed effects, and			
Coefficient on OccConcen	-0.048***	-0.075***	0.021***
(standard error)	(0.003)	(0.002)	(0.002)
Coefficient on OccConcen * Date	-0.012***	-0.009***	0.040***
(standard error)	(0.001)	(0.000)	(0.000)

Notes: These regressions are of the form $Ln(wage) = \alpha OccConcen + \beta OccConcen * Date + \chi Survey\ date\ \ fixed\ \ effects + \delta X$, where X includes occupation fixed effects at the 3-digit SOC level, industry fixed effects at the 4-digit NAICS level (NAICS codes are only available from 2000 forwards[8]), state fixed effects, and establishment size (using fixed effects for establishment size classes as well as a continuous measure of establishment size).

[8] Beginning with the 2002 OES survey, establishments were classified by 6 digit NAICS, and the OES staff converted much of the previous years' samples from SIC to 6 digit NAICS codes as well.

Table 1, continued. Regressions of log wages on measures of Occupational Concentration for subgroups

Occupational Concentration Variable	Herfindahl of occupational concentration of the establishment	fraction of the establishment in typically low wage occupations	fraction of the establishment in typically high wage occupations
Workers in typically high-wage ocupations only			
With survey-date fixed effects			
Coefficient on OccConcen	-0.456***	-0.362***	-0.444***
(standard error)	(0.007)	(0.009)	(0.006)
Coefficient on OccConcen * Date	0.031***	-0.022***	0.131***
(standard error)	(0.002)	(0.002)	(0.001)
With survey-date, 6-digit occupation, 5-digit NAICS, size class, & state fixed effects, and continuous size			
Coefficient on OccConcen	0.162***	-0.316***	-0.005
(standard error)	(0.006)	(0.007)	(0.005)
Coefficient on OccConcen * Date	-0.047***	0.024***	0.032***
(standard error)	(0.001)	(0.001)	(0.001)
Workers in neither typically high-wage nor typically low-wage occupations only			
With survey-date fixed effects			
Coefficient on OccConcen	-0.035***	-0.094***	0.055***
(standard error)	(0.005)	(0.005)	(0.006)
Coefficient on OccConcen * Date	-0.018***	-0.032***	0.075***
(standard error)	(0.001)	(0.001)	(0.001)
With survey-date, 6-digit occupation, 5-digit NAICS, size class, & state fixed effects, and continuous size			
Coefficient on OccConcen	-0.070***	0.078***	-0.037***
(standard error)	(0.004)	(0.004)	(0.004)
Coefficient on OccConcen * Date	-0.005***	-0.026***	0.059***
(standard error)	(0.001)	(0.001)	(0.001)
Workers in typically low-wage occupations only			
With survey-date fixed effects			
Coefficient on OccConcen	-0.336***	-0.752***	0.849***
(standard error)	(0.006)	0.006	(0.013)
Coefficient on OccConcen * Date	0.024***	0.067***	-0.024***
(standard error)	(0.001)	(0.001)	(0.003)
With survey-date, 6-digit occupation, 5-digit NAICS, size class, & state fixed effects, and continuous size			
Coefficient on OccConcen	-0.202***	-0.351***	0.337***
(standard error)	(0.005)	(0.005)	(0.011)
Coefficient on OccConcen * Date	0.013***	0.038***	0.000
(standard error)	(0.001)	(0.001)	(0.002)

Table 2: Changes in Occupational Concentration over time

All unimputed OES private-sector data from Fall 2000-May 2014

Occupational Concentration Variable	Herfindahl of occupational concentration of the establishment	fraction of the establishment in typically low wage occupations	fraction of the establishment in typically high wage occupations
Raw time trends in occupational concentration			
Coefficient (per decade)	0.086***	0.067***	0.054***
(standard error)	(0.00001)	(0.00002)	(0.00001)
Time trends, controlling for 6-digit occupation			
Coefficient (per decade)	0.008***	0.001***	0.016***
(standard error)	(0.00009)	(0.00007)	(0.00007)
Time trends, controlling for 6-digit occupation, 4-digit NAICS codes, size class, size, & state			
Coefficient (per decade)	0.003***	0.000	0.017***
(standard error)	(0.00007)	(0.00006)	(0.00006)

Note: These are coefficients α from regressions of the form

$$OccConcen = \alpha Survey\ date + \beta I(Maysurveydate) + \chi DetailedOcc + \delta Industry + \varepsilon SizeClass + \phi Size + \varphi State$$

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Table 2, continued: Changes in Occupational Concentration over time for subgroups

Occupational Concentration Variable	Herfindahl of occupational concentration of the establishment	fraction of the establishment in typically low wage occupations	fraction of the establishment in typically high wage occupations
High wage occupations only Fall 2000-May 2014			
Raw time trends in occupational concentration			
Coefficient (per decade)	0.072***	0.020***	0.119***
(standard error)	(0.00002)	(0.00001)	(0.00002)
Time trends, controlling for 6-digit occupation			
Coefficient (per decade)	0.008***	-0.003***	0.037***
(standard error)	(0.00014)	(0.00010)	(0.00015)
Time trends, controlling for 6-digit occupation, 4-digit NAICS codes, size class, size, & state			
Coefficient (per decade)	0.006***	-0.001***	0.030***
(standard error)	(0.00011)	(0.00007)	(0.00012)
Middle wage occupations only Fall 2000-May 2014			
Raw time trends in occupational concentration			
Coefficient (per decade)	0.083***	0.032***	0.044***
(standard error)	(0.00002)	(0.00002)	(0.00001)
Time trends, controlling for 6-digit occupation			
Coefficient (per decade)	0.005***	0.002***	0.016***
(standard error)	(0.00013)	(0.00011)	(0.00011)
Time trends, controlling for 6-digit occupation, 4-digit NAICS codes, size class, size, & state			
Coefficient (per decade)	0.000	0.001***	0.019***
(standard error)	(0.00010)	(0.00008)	(0.00008)
Low wage occupations only Fall 2000-May 2014			
Raw time trends in occupational concentration			
Coefficient (per decade)	0.101***	0.151***	0.016***
(standard error)	(0.00003)	(0.00003)	(0.00001)
Time trends, controlling for 6-digit occupation			
Coefficient (per decade)	0.010***	0.004***	0.000*
(standard error)	(0.00024)	(0.00021)	(0.00010)
Time trends, controlling for 6-digit occupation, 4-digit NAICS codes, size class, size, & state			
Coefficient (per decade)	0.005***	-0.002***	0.003***
(standard error)	(0.00019)	(0.00016)	(0.00008)

Table 3: Results for 2013 Variances of DFL-style reweightings, selected combinations of observable characteristics

2000 ln wage var:	0.3523	2000 Btw estab var:	0.1887	2000 Wthn estab var:	0.1636
2013 ln wage var:	0.4095	2013 Btw estab var:	0.2314	2013 Wthn estab var:	0.1781
Increase:	0.0571	Increase:	0.0427	Increase:	0.0144

	Combination of characteristics used in reweighting 2013 data to 2000 characteristics:							Overall		Between Estabs		Within Estabs	
	NAICS4	State	Size	Occup	%HWg	%LWg	herf3	Var	Explained	Var	Explained	Var	Explained
(1)								0.4095	0%	0.2314	0%	0.1781	0%
(2)	X							0.4006	15%	0.2221	22%	0.1785	-3%
(3)		X						0.4066	5%	0.2295	4%	0.1771	7%
(4)			X					0.4120	-4%	0.2319	-1%	0.1800	-13%
(5)				X				0.3919	31%	0.2136	42%	0.1784	-2%
(6)					X			0.3940	27%	0.2207	25%	0.1733	33%
(7)						X		0.4128	-6%	0.2309	1%	0.1819	-27%
(8)							X	0.4110	-3%	0.2280	8%	0.1830	-34%
(9)	X	X			X	X	X	0.3819	48%	0.2034	65%	0.1785	-3%
(10)	X	X			X	X		0.3822	48%	0.2072	57%	0.1749	22%
(11)		X		X				0.3902	34%	0.2127	44%	0.1775	4%
(12)			X			X	X	0.4146	-9%	0.2294	5%	0.1852	-49%
(13)			X			X		0.4146	-9%	0.2310	1%	0.1836	-38%
(14)		X		X	X		X	0.3844	44%	0.2027	67%	0.1818	-25%
(15)		X			X			0.3923	30%	0.2196	27%	0.1726	38%
(16)	X		X	X	X		X	0.3913	32%	0.2057	60%	0.1855	-52%

Table 4: Results for percentiles of the OES Wage Distribution in 2013 of DFL-style reweightings by selected combinations of observable characteristics

	Combination of characteristics used in reweighting 2013 data to 2000 characteristics:							Wage at selected percentiles of the wage distribution (assuming uniform distribution within intervals)					Ratios		
	NAICS4	State	Size	Occup	%HWg	%LWg	herf3	p10	p25	p50	p75	p90	90-50	50-10	90-10
(1)								6.34	7.82	11.83	19.16	30.65	2.59	1.87	4.83
(2)	X							6.39	7.96	12.01	19.15	30.52	2.54	1.88	4.78
(3)		X						6.33	7.79	11.78	19.02	30.38	2.58	1.86	4.80
(4)			X					6.35	7.87	11.95	19.41	31.00	2.59	1.88	4.88
(5)				X				6.38	7.92	11.82	18.58	29.68	2.51	1.85	4.65
(6)					X			6.29	7.66	11.41	18.22	29.11	2.55	1.81	4.63
(7)						X		6.40	8.01	12.21	19.72	31.39	2.57	1.91	4.90
(8)							X	6.37	7.90	12.01	19.43	31.00	2.58	1.89	4.87
(9)	X	X			X	X	X	6.38	7.94	11.83	18.50	29.13	2.46	1.85	4.57
(10)	X	X			X	X		6.37	7.91	11.79	18.43	29.04	2.46	1.85	4.56
(11)		X		X				6.37	7.90	11.80	18.52	29.51	2.50	1.85	4.63
(12)			X			X	X	6.42	8.06	12.31	19.93	31.66	2.57	1.92	4.93
(13)			X			X		6.41	8.05	12.29	19.90	31.63	2.57	1.92	4.93
(14)		X		X	X		X	6.37	7.90	11.77	18.42	29.15	2.48	1.85	4.58
(15)		X			X			6.29	7.64	11.38	18.15	28.94	2.54	1.81	4.60
(16)	X		X	X	X		X	6.40	7.97	11.90	18.70	29.83	2.51	1.86	4.66