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OCCUPATIONAL SEGREGATION OF WOMEN ON THE GREAT PLAINS

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ABSTRACT—Despite large increases in the participation of women in the paid labor force, occupational segregation by sex continues to be a significant characteristic of the labor market in the US. To better understand occupational segregation, we developed a new measure of occupational segregation that allows us to identify “female-dominated,” “male-dominated,” and “integrated” occupations. We use the new measure to examine differences in occupational segregation in the Great Plains states of North Dakota, South Dakota, Nebraska, and Kansas, compared with the US as a whole. Our results indicate that more women on the Great Plains are employed than expected, given male employment patterns in the US. However, women on the Great Plains are disproportionately represented in occupational categories that are traditionally “female-dominated.” To the extent that female-dominated occupations pay lower wages than male-dominated occupations, women in the Great Plains states suffer lower income levels than women elsewhere in the US.

Introduction

The increasing participation of women in the paid labor force has been one of the most outstanding changes of the economy in the 20th century (Goldin 1990). Whereas women constituted only one in five paid workers in 1900, today almost one half of all paid workers are women (Blau et al. 1998:80). Moreover, while the participation rate for women in the paid labor

force was 20% in 1900, by 1995 it had risen to 58.9% (Blau et al. 1998: 80). For women between the ages of 25 and 45, the participation rate in the paid labor force is currently almost 80% (US Bureau of the Census 1997: 403).

Despite vast increases in the participation of women in the paid labor market and substantial structural changes in the nature of work in the 20th century, job segregation by sex remains a dominant feature of the US economy (Blau et al. 1998). At least one study found evidence to support the hypothesis that much of the decline in occupational segregation that has occurred in the 20th century occurred before 1970 (Weeden 1998). However, the prevailing view is still that the degree to which women and men have been employed in essentially different jobs remained virtually unchanged from 1900 to 1970 (Goldin 1990). This pattern has begun to break down only in the past several decades (Bertaux 1991; Goldin 1990; Albelda 1986; King 1992; Cherry and Mobilia 1993). Moreover, although women continue to enter male-dominated occupations, some evidence suggests that the breakdown of occupational segregation slowed somewhat in the 1980s (King 1992).

The jobs that women tend to hold pay less on average than the jobs that men tend to hold (Goldin 1990). Thus, occupational segregation continues to have significant implications for disparities in income and status (US Bureau of Census 1987). Yet, despite the importance of occupational segregation, significant questions remain concerning the measurement of what we consider "women's work" and "men's work." That is, although we know that occupational segregation by sex is a dominant feature of the labor market, and that it helps explain disparities in income and status, little consensus exists on just what constitutes a "feminized" occupation versus a men-dominated occupation (Wooton 1997; Rosenfeld and Spenner 1992; and Beller 1982).

In addition, economists often ignore the spatial dimensions of labor markets. The tendency is to assume, either explicitly or implicitly, perfectly competitive, profit-maximizing firms facing a labor market characterized by perfect mobility and perfect information (Oppenheimer 1970). Variations in occupational segregation by city or by region are largely ignored, and explanations of variations in wages or income tend to focus on variations in human capital (Polachek 1979). The few studies that examine spatial dimensions of occupational segregation use geographic region as one of many independent variables to explain variations in occupational segregation, rather than examining differences in the character of occupational segregation within regions (Lorence 1992).

TABLE 1

PARTICIPATION RATES OF WOMEN
IN THE PAID LABOR FORCE, AND MEDIAN ANNUAL EARNINGS,
FOR THE GREAT PLAINS STATES IN 1990

State	Percent of Women in the Labor Force	State Rank: Women in the Labor Force	Median Annual Earnings	State Rank: Median Annual Earnings of Women
Kansas	63.4%	15	\$23,581	26
Nebraska	68.4%	2	\$20,577	45
North Dakota	64.9%	11	\$19,548	50
South Dakota	65.8%	7	\$21,063	42
United States	58.9%		\$24,909	

Full-Time, Year-Round Employed Women and Men

Occupational segregation by sex is particularly important to examine in the Great Plains states, since female labor participation rates are high and median annual earnings of women are relatively low. Nebraska, Kansas, South Dakota, and North Dakota all rank in the top fifteen states in the US in the percentage of full-time women in the paid labor force (Institute for Women's Policy Research 1999), with Nebraska ranking second in the nation (Table 1). Moreover, median annual earnings of full-time working women in these states—Nebraska, Kansas, South Dakota and North Dakota—fall in the bottom 50 % of all states in the US (Institute for Women's Policy Research 1999). Moreover, Nebraska and the Dakotas are in the bottom ten states in earnings (Table 1). Clearly, occupational segregation is important to examine in these states.

In this study, we propose an alternative way to measure the extent to which men and women are concentrated in occupations. Our measure is a "gender concentration quotient." These quotients can then be used to examine occupational segregation in more detail in the plains focusing on North

Dakota, South Dakota, Nebraska and Kansas, compared to the US as a whole.

Measuring Occupational Segregation

Several indices have been developed to measure occupational segregation by sex (Duncan and Duncan 1955; Charles and Grusky 1995, and Watts 1998). The most widely used measurement is the Duncan and Duncan index of dissimilarity (Duncan and Duncan 1955). This index of dissimilarity is:

$$DI = \frac{1}{2} (\sum |x_i - y_i|)$$

where “ x_i ” measures the percentage of women employed in occupation “ i ” and “ y_i ” measures the percentage of men employed in the same occupation “ i .” The Duncan and Duncan index measures the degree to which men and women are segregated into various job categories, and it indicates what percentage of women or men would need to change occupations for employment to be identical by sex in all occupations, given the representation of women in the labor market. Specifically, if women make up 46% of the total labor force, an index of zero would mean that women make up 46% of the employment in any given occupational category. Alternatively, an index of 100 would indicate total occupational segregation by sex; and, an index of 75 would mean that 75% of women or men would need to change occupations for there to be equal representation of women and men by occupation.

The Duncan’s index of dissimilarity has been used to examine factors that affect variations in occupational segregation by city or region. For example, Bertaux (1991) examined estimates for the index of dissimilarity from 1870 to 1900 to determine the effect of industrialization on occupational segregation by sex. According to Bertaux (1991), the index of dissimilarity declined substantially from 1870 to 1900, and it fell more rapidly in cities undergoing rapid industrialization. In another study, Lorence (1992) provided an interesting analysis of occupational segregation for the 130 largest metropolitan statistical areas, using 1980 US Census data. Lorence (1992) examined the influence of family responsibility, geographic region, educational attainment, age, unemployment, organizational size, and unionization on occupational segregation. Education and family responsibilities had no significant influence on occupational segregation. However, the evidence suggested that younger women were more likely than older women

to enter male-dominated fields. In addition, Lorence (1992) found little evidence to suggest that regional differences in occupational segregation. However, the evidence showed a greater similarity in occupations between men and women in larger cities than in smaller cities (Lorence 1992).

The index of dissimilarity is also used to examine changes in the nature of occupational segregation over time. A decline in occupational segregation can occur when women enter male-dominated jobs, or men enter female-dominated jobs, or as a result of growth in occupations in which employment is equally distributed between men and women. Examining the source of changes in occupational segregation from 1985 to 1995, Wootton (1997) attributed 65% of the decline in occupational segregation to changes in the gender composition within occupations; the remainder was attributed to changes in the occupational mix, along with an interaction effect between the two components. That is, 65% of the decline in occupational segregation was due to changes within job categories such as an increase in the share of employment of women in managerial occupations and of men in service occupations. The remainder of the decrease in occupational segregation was due to changes among jobs available such as an increase in employment in occupations that employ roughly equal numbers of men and women (Wootton 1997). Examining occupational segregation in the 1970s and 1980s, Bianchi and Rytina (1986) also found that a majority of the decline in occupational segregation by sex was the result of changes in the gender composition within occupations. Specifically, it was the result of women moving into male-dominated occupations, rather than men moving into female-dominated occupations (Bianchi and Rytina 1986; Beller 1982).

Such studies provide additional information beyond that which can be gained by examination of the index of dissimilarity alone. This reflects the fact that they analyze changes in the gender composition of specific occupations. These studies analyze occupations that are dominated by women and those that are dominated by men separately in an effort to determine changes in those occupations over time.

Identification of what constitutes a "male" versus a "female" occupation varies from study to study, and what constitutes an "integrated occupation" is often undefined. For example, Wootton (1997) identified as female-dominated those occupations in which 80% or more of the employment is female. Other studies have used 70% as the cutoff (Rosenfeld and Spenner 1992). Still other studies have argued that a male-dominated occupation is one in which men's share of employment is greater than their share of the labor force with a 5% allowance for random error (Beller 1982). For ex-

ample, Beller (1982) defined a male-dominated job as one in which men constitute 72.2% or more of total employment. This figure is obtained by adding 5 percentage points to the percentage of the labor force that was male, 67.2%, in 1960. An integrated occupation was one in which men represented 62.3% to 72.1% of the total employed (Beller 1982). The lower end estimate for an integrated occupation of 62.3% was derived by subtracting 5 percentage points for random error from the male share of employment.

An Alternative Measurement of Occupational Gender Concentration

Rather than simply examining the proportion of men or women employed in a given occupation, we constructed a measure we call a gender concentration quotient, to evaluate numerical pattern by subgroup. The gender concentration quotient is similar to a "location quotient" used by economic geographers and regional economists (Burt and Barber 1996). However, we use occupational groups, rather than regions, as the subgroups under examination. The gender concentration quotient (CQ) is:

$$CQ = W_i / W_i^*$$

$$W_i^* = (M_i / TM) \times TW$$

where " W_i " is the actual number of women employed in occupation "i" and " W_i^* " is the expected number of women employed in occupation "i" if women were employed in occupation "i" in the same proportion that men are employed in occupation "i". Thus, " W_i^* " is derived by taking the proportion of men employed in occupation "i" (M_i/TM) multiplied by the total number of women (TW) in the labor force.

The gender concentration quotient allows us to examine the actual number of women employed in an occupation, compared to the expected number of women who would be employed if women were distributed among occupations in the same proportions that men are distributed among occupations. As such, the gender concentration quotient utilizes what economic historians refer to as a counterfactual framework—a framework that compares actual female employment patterns with a hypothetical pattern that would exist if women were employed in jobs in the same proportions as men.

The gender concentration quotient can be interpreted in the following manner. If the concentration coefficient is greater than one, then more women work in that occupation than would be expected on the basis of male employment patterns. If the coefficient is equal to one, then the number of women that work in that occupation equals the number expected on the basis of male employment patterns. And, if the concentration coefficient is less than one, then fewer women work in that occupation than would be expected on the basis of male employment pattern. Thus, a concentration coefficient greater than one represents a female-dominated occupation, less than one represents a male-dominated occupation, and equal to one represents an occupation in which men and women are roughly equally represented given their overall participation in the labor force. The gender concentration quotient provides information about whether a particular occupation employs more women than would be expected, given the employment patterns of men.

The gender concentration quotient allows us to identify occupations which are male-dominated (those with a low concentration quotient), female-dominated (those with a high concentration quotient), or integrated (those in which the concentration quotient is equal to one). In addition to allowing us to identify these three categories of occupations, the gender concentration quotient has the advantage of providing a continuous measure of the degree of occupational segregation. Thus, it could be used in regression analysis to examine factors effecting occupational segregation.

Occupational Gender Concentration in the US

Gender concentration quotients were calculated for 507 occupational groupings using 1990 census data (Census of Population and Housing 1990, 1992). Also, we used a paired sample t-test to determine whether there is a statistically significant mean difference in gender concentration quotients between the Great Plains and the US. The distribution of the concentration quotients by occupation revealed that in 1990 women tend to be highly over-represented in a relatively small number of occupational categories in the US. For example, 22.8% of all women employed worked in only 4.5% of the 507 census occupational categories.

We examined the top ten occupations for women in the US to identify those occupations that were most highly female-dominated more explicitly. These occupations had more women employed than would be expected based upon male employment patterns (Fig. 1). We also examined the

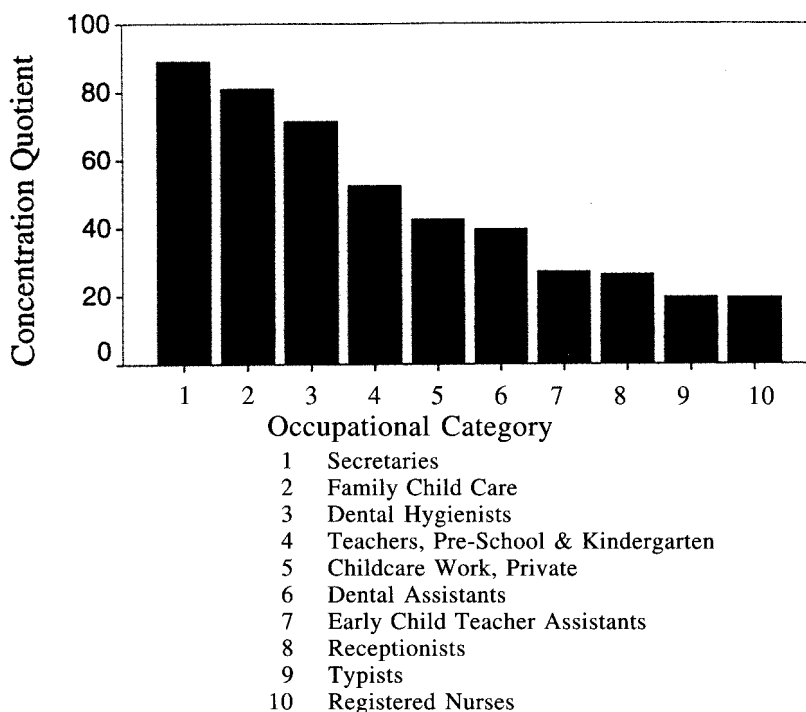


Figure 1. Top ten occupations for women in the United States in 1990 by Gender Concentration Quotient (observed compared to expected level of participation: see methods).

bottom ten, occupations in which fewer women were employed than would be expected based upon male employment patterns (Fig. 2). As can be seen, women were over-represented in clerical and service occupations and under-represented in precision production, craft, and repair occupations.

The gender concentration quotients were aggregated to form three groups of employment of women—female-dominated, male-dominated, and equally-dominated or integrated occupations. Because the distribution of gender concentration quotients is not symmetrical, we could not use traditional methods to obtain a confidence interval. However, because the probability that any occupation would have a gender concentration quotient exactly equal to one would be very small, we needed to identify a range of values that would allow us to categorize jobs as being female-dominated, male-dominated, or integrated. We examined the sample distribution of the

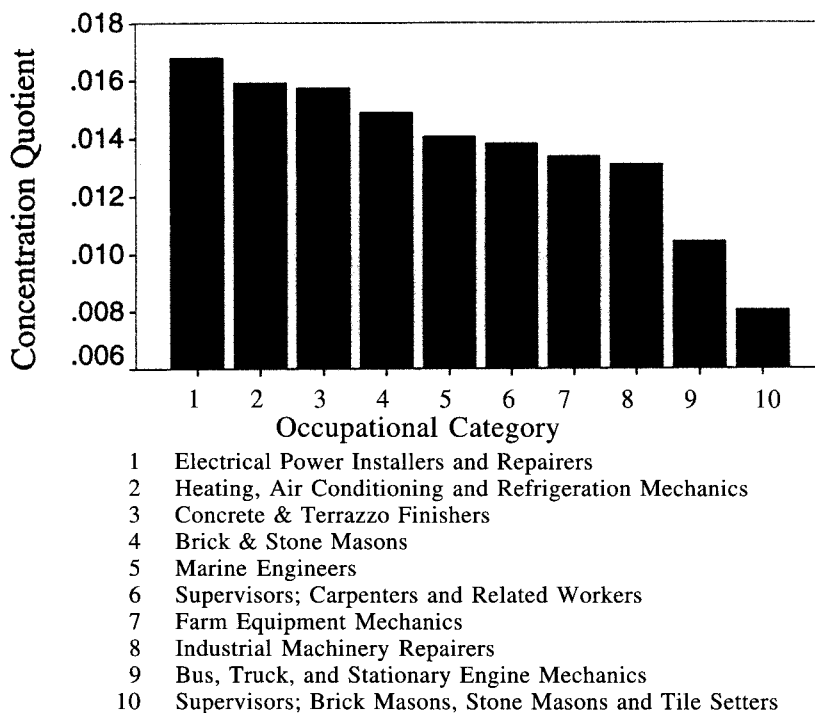


Figure 2. Bottom ten occupations for women in the United States in 1990, using the Lowest Gender Concentration Quotients.

measures and chose the following: female-dominated was any concentration quotient of 1.5 and above integrated was any measure between .5 and 1.49; and male-dominated was any measure of .5 or below.

Our analysis indicated that 64.3 % of women were employed in female-dominated occupations—occupations in which there are fewer women than expected, given male employment patterns, while 26.90% were employed in occupations in which there were roughly the number expected. And, 8.7 % of women were employed in male-dominated occupations—occupations in which the number of women employed was lower than expected, given male employment patterns (Table 2).

We compared this finding to the distribution of employment in male- and female-dominated occupations calculated simply as the percentage of men and women workers in a given occupation (Table 3). In this case, 53%

TABLE 2

PROPORTION OF WOMEN EMPLOYED IN PREDOMINATELY
FEMALE, INTEGRATED, AND MALE DOMINATED OCCUPATIONS
IN THE US, AND THE GENDER CONCENTRATION QUOTIENT,
FOR 1990

Category	Concentration Coefficient	Proportion Women
Female Dominated	> 1	64.3%
Integrated	= 1	26.9%
Male Dominated	< 1	8.7%

of women were in those occupations employing at least 70% women, and 37% were in occupations employing at least 80% women, and 17% were in highly female-dominated occupations, with at least 90% women (Table 3). Only 9% of women were employed in occupations that were at least 70% male-dominated, and only 2% of women were employed in occupations that were at least 90% male-dominated (Table 3). In contrast, 54% of men were in occupations employing at least 70% men; and, a relatively large 29% of all employed men were in highly male-dominated occupations, those with at least 90% men (Table 3). Few men were employed in occupations that were female-dominated: 7%, 3% and 0.6%, respectively for the 70%, 80% and 90% female-dominated job benchmarks (Table 3).

To summarize, we found that the majority of men and women work in occupations where they are the majority gender. Most men work in male-dominated occupations and most women work in female-dominated occupations. Moreover, a larger proportion of men work in highly segregated male-dominated occupations than do women who work in highly female-dominated occupations. And, finally, while few women work in highly male-dominated occupations, even fewer men work in highly female-dominated occupations.

The gender concentration quotient and the proportion of men and women by occupation measures both identify the same occupations as leading male and female-dominated occupations. And, the proportion of women employed in male-dominated occupations was roughly the same

TABLE 3

PROPORTION OF MEN AND WOMEN EMPLOYED IN MALE-DOMINATED, INTEGRATED, AND FEMALE-DOMINATED OCCUPATIONS IN THE US IN 1990, BY THE TRADITIONAL MEASURES (SEE TEXT)

Benchmark	Men		Women	
	Male-dominated	Female-dominated	Male-dominated	Female-dominated
70%	54%	7%	9%	53%
80%	43%	3%	5%	37%
90%	29%	0.6%	2%	17%

using both measures. However, the proportion of women employed in female-dominated occupations was higher using the gender concentration quotients.

Finally, previous discussions focused on identifying male-dominated and female-dominated occupations while ignoring those integrated by sex. If it is assumed that the lower boundary on what is considered to be a female- or male-dominated occupation is 70%, then implicitly it is assumed that occupations with concentrations of men or women between 30% and 69% might be considered integrated. Using proportional measures, the percentage of women working in occupations thus identified as integrated is 38%, while the gender concentration quotient measure shows that only 27% of women work in such occupations.

Occupational Segregation by Sex on the Great Plains

The gender concentration quotient can also be used to determine if there are differences in the degree of occupational segregation by region. Using data from large metropolitan areas, Lorence (1992) found no regional difference in occupational segregation. However, Lorence (1992) acknowledged that there might be regional differences when rural employment was taken into consideration.

TABLE 4

GENDER CONCENTRATION QUOTIENT INDICATING LEVEL OF
OCCUPATIONAL SEGREGATION ON THE GREAT PLAINS
AND THE US IN 1990.¹

	Great Plains	US	p<
Mean	2.82	2.30	0.01
Std. Deviation	9.77, S.E. 0.43	7.64, S.E. 0.34	

¹ Paired t-test of means: $t = 2.991$, $n = 507$, $df = 506$, sig (2-tail)

We tested regional differences in occupational segregation by evaluating the difference in means of the gender concentration quotients between the Great Plains and the rest of the US. This comparison showed that the mean value of the quotient for the Great Plains (2.82) was significantly larger than that the US (2.30) at the 0.01 level (Table 4). Thus, on average, the actual number of women employed in each occupation, relative to the expected employment of women based upon male employment patterns, was higher in the Great Plains than in the US as a whole.

This difference in the means however, reveals little about the types of occupations in which women were employed in the Great Plains. That is, it could be the case that women were employed in higher than expected numbers on the Great Plains in occupations that are male-dominated or female-dominated, or in integrated occupations. To determine the occupations in which the actual number of women employed exceeded the expected number on the Great Plains versus in the US, we examined the mean values of the gender concentration quotients for broad occupational categories provided by the census, using a paired sample test of means. The results indicated that the mean value of the quotient for those employed in "Executive, Administrative, and Managerial Occupations" was statistically significantly lower in the Great Plains than in the US as a whole (Table 5). That is, fewer women were employed than was expected in these occupations in the Great Plains versus in the US as a whole. Overall, this broad category

TABLE 5

OCCUPATIONAL SEGREGATION ON THE GREAT PLAINS AND THE
US IN 1990 BY BROAD OCCUPATIONAL CATEGORY

	% of women Great Plains	Great Plains Gender Concentration Quotient	% of women US	US Gender Concentration Quotient	t ¹	P
Executive, administrative, & managerial	9%	0.98	11%	1.05	-1.784	.042
Professional	17%	1.90	16%	1.97	-0.400	ns
Technicians & related support	3%	6.00	4%	5.47	0.373	ns
Sales	12%	1.47	13%	1.41	0.911	.186
Protective service	0%	0.39	1%	.50	-0.678	ns
Service, except protective & household	21%	10.31	16%	7.70	2.369	.012
Administrative support, including clerical	27%	7.23	27%	6.11	2.797	.004
Precision, craft, & repair	2%	0.58	2%	0.37	1.548	.062
Transportation & material moving	1%	0.12	1%	0.12	-0.006	ns
Handlers, equipment cleaners, helpers, & laborers	2%	0.41	2%	0.34	0.739	ns
Machine operators, assemblers & inspectors	5%	1.02	7%	0.82	1.626	.054
Farming, forestry, & fishing	2%	0.34	1%	0.50	-1.333	.099

¹Paired, one-tailed t-test statistic of H_0 : gender concentration coefficient for Great Plains was not higher than that for the US as a whole.

employed approximately 11% of all women in the US and 9% of women on the Great Plains, a major but not the largest category of employment for women (Table 5). Hence, the lower than expected number of managerial women was not enough to bring the mean gender concentration quotient for the Great Plains down below that of the US (Table 4). Occupations that make up the broad category of "Executive, Administrative, and Managerial Occupations" tend to be traditionally male occupations rather than traditionally female occupations. The occupations represented include legislator, chief executive and general administrators, accountants and auditors, personnel and labor relations, financial, marketing, advertising, public relations managers, and a variety of other management occupations.

Examination of employment in the "Service, Except Private Household and Protective," category shows that employment of women was significantly greater, on average, than expected in the Great Plains versus the US (Table 5). This category, which represented about 16% of employed women in the US and 20% of employed women on the Great Plains, consists of various food service, health service, personal service, and childcare occupations—occupations that are considered to be largely female-dominated (Table 5).

Finally, female concentration was, on average, much greater in "Administrative Support, Including Clerical" occupations in the Great Plains compared to the US (Table 5). This difference is important. This category of occupations employs many women, roughly 27% of all women workers in the US and on the Great Plains. The category consists of largely women-dominated occupations, such as officer supervisors, secretaries, office clerks, bank tellers, and communications workers. Hence, evaluation of the means of the gender concentration quotients by broad occupational category indicated that women are found, on average, in larger numbers than expected in the Great Plains over the US as a whole in the traditionally defined female occupations (Table 5).

Discussion

Causes

Explanations for gender occupational segregation take a variety of forms. Sociologists and psychologists focus on socialization and discrimination as explanations for why women are concentrated in certain jobs. The continued influence of the "Cult of True Womanhood" or the "Domestic

Code” causes women to be associated with home and men with work, and women to be viewed as nurturing by their very nature (England 1984). These presuppositions, it is said, result in women gravitating toward jobs in child care, teaching, domestic service and generally care-giving roles, and employers to hire women in these areas (Blumberg 1979). Alternatively, human capital theory explanations (Polachek 1987) propose that women choose employment in occupations in which the penalty for job interruption is less due to their greater child care and family responsibilities. However, such explanations do not seem to explain regional differences in gender occupational segregation. One of the few studies to examine regional differences based upon a sociological explanation was a study by Abrahamson and Sigelman (1987). They argued that Southerners were more likely to exhibit traditional sex norms than groups in other regions of the US; thus, occupational segregation would be greater in the South than in other regions. However, their evidence failed to support this hypothesis.

More promising are studies that look at demographic factors, such as female labor force participation rates (Abrahamson and Sigelman 1987), the supply of women relative to the supply of men (Blumberg 1979; Chafetz 1990), and the age structure of the population (Beller 1984). Additional factors such as cyclical downturns (Jones and Rosenfeld 1989), economic growth (Abrahamson and Sigelman 1987) are also implicated. For example, Abrahamson and Sigelman (1987) suggested that female participation rates decrease gender occupational segregation in metropolitan labor markets. Blumberg (1979) and Chafetz (1990) suppose that an abundance of male workers relative to female workers will result in an increase in gender occupational segregation and allow employers to hire men over women. Beller (1984) postulates that gender occupational segregation will be lower among younger cohorts. Also, the assertion that occupational segregation might decline during a prolonged economic downturn might be testable, given regional variations in economic conditions such as a farm industry slowdown. Studies such as Lonsdale and Archer’s (1995) might be helpful in examining the effects of national employment trends on local or regional labor markets.

Such studies offer alternative possible explanations for differences in gender occupational segregation. However, these studies have focused on national, aggregated data; and, they have not examined regional differences specifically. Because there is considerable reason to believe that labor markets are local, and perhaps regional more than they are national in scope, examination of these demographic differences on a regional basis would be

useful in light of our finding of regional differences in gender occupational segregation. The gender concentration quotient presented here provides an alternative mechanism for measuring occupational segregation in future studies.

Summary, and Policy Implications

Occupational segregation by sex continues to be a dominant feature of the labor market well into the 20th century, resulting in lower overall wages for women. While the index of dissimilarity is helpful in examining the degree of segregation at one point in time, or changes in the degree of occupational segregation over time, examination of changes in individual occupations or subgroups of occupations is necessary to better understand changes in female employment patterns.

The gender concentration quotients developed here provide an alternative mechanism for examining such changes and comparing the position of women in the labor market relative to men. The gender concentration quotient provides a continuous measure of occupational segregation. Thus, it can be used in regression analysis to test hypotheses concerning the factors that are important determinants of gender occupational segregation. It can also be used to identify categories of jobs that are female-dominated, male-dominated, or gender-integrated.

We compared the Great Plains region states of North Dakota, South Dakota, Nebraska, and Kansas to the US as a whole, using a difference of means test. Our analysis showed that, on average, women in these Great Plains states are employed in female-dominated occupations at a rate higher than was expected. These occupations were: food service, health service, and personal service occupations. Furthermore, our results indicated that women in these Great Plains states are employed at lower rates than expected relative to the US in executive, administrative, and managerial occupations.

To the degree that female-dominated occupations pay lower wages than male-dominated occupations, women in the Great Plains states will have lower income. The policy implications of this research are that programs aimed at training women in non-traditional occupations would be especially important in raising women's wages and in reducing the dependence of women on public assistance in the Great Plains states. However, other policies that may be helpful in improving the status of women on the Great Plains could include greater attention to affordable daycare, more

vigilant enforcement of affirmative action procedures, and adequate Equal Employment Opportunity Commission staff to address complaints. In addition, more discussion and recognition are needed of the ways in which employment patterns that affect the status of women might differ on the Great Plains from other regions of the US.

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