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UNION DENSITY EFFECTS IN THE SUPERMARKET INDUSTRY

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ABSTRACT

Higher union density (the percentage of employees in an area who belong to unions) is known to raise the wages of union members. We find that in the supermarket industry, higher density locally also leads to higher wages for non-union members. Despite this, workers who are not in unions lose ground relative to union members. For a 10% increase in local union densities in the supermarket industry it is estimated that the wages of union employees in that labor market will increase by 5.3% and by 1.2% for nonunion. Hence, the union wage premium will increase in regions with higher union densities.

At the time of the last national examination of the retail industry in 1977, union influence in the retail food industry was near its peak. Subsequently union membership and influence have declined. In 1993 a reported 25.7% of supermarket employees listed themselves as union members, a decline from 29.4% in 1984 (NBER, 1995). After conducting an extensive review of wage estimation literature, we focus on the structure of wages in the supermarket industry between 1984 and 1993.

The effect of union penetration in local markets on nonunion wages, or the "spill-over" effect, is an important focus of this study. While it is widely accepted that the higher the union percentage in local labor markets the higher the wages for those in the union, the corresponding effect has not been closely examined for the nonunion sector. To investigate this phenomenon we first replicate as closely as possible the results of a previous supermarket wage study (Belman and Voos, 1993). Following a baseline comparison of this initial estimation, we enlarge the data set to include individuals in rural areas and from additional years. By using a more sophisticated estimation technique we find that increasing union densities positively affect union and nonunion wages. The significant results for the nonunion sector is of particular importance, as this is the first confirmation of this effect to the best of our knowledge.

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UNION DENSITY EFFECTS IN THE SUPERMARKET INDUSTRY

I. INTRODUCTION

The US Department of Labor conducted a national examination of the structure of retail food industry wages in 1977. At that time union influence in the retail food industry was near its peak. Subsequently union membership and influence have declined nationwide. In 1993 a reported 25.7% of supermarket employees listed themselves as union members (United Food and Clerical Workers Union: UFCW), a decline from 29.4% in 1984 (Current Population Survey: National Bureau of Economic Research CD-ROM, 1995). This study reviews the current prevailing literature on wage determination and examines the structure of wages in the supermarket industry from 1984 to 1993. The "spill-over" effect of union penetration in local markets on nonunion wages is an important focus of this study. It is widely accepted that the higher the union percentage in local labor markets the higher the wages for those in the union (Freeman and Medoff, 1981; Lewis, 1986; Perloff and Sickles, 1987; Belman and Voos, 1993). The corresponding effect has not been closely examined for the nonunion sector, but union officials have hypothesized that this effect is also positive.

This paper estimates the effect of unionization on wages in the retail food industry (grocery) by using a full-information maximum likelihood estimation technique, which corrects for union endogeneity. That is to say that the impacts of wages on unionization and of unions on wages are accounted for in the results. We find that there is indeed a positive effect on wages of union and nonunion employees, the stronger the union influence is in a local labor market. For a given 10% increase in unionization coverage in a labor market the wages of union workers will increase by 5.3%; the wages of nonunion workers are 1.2% higher. We also find, therefore, that

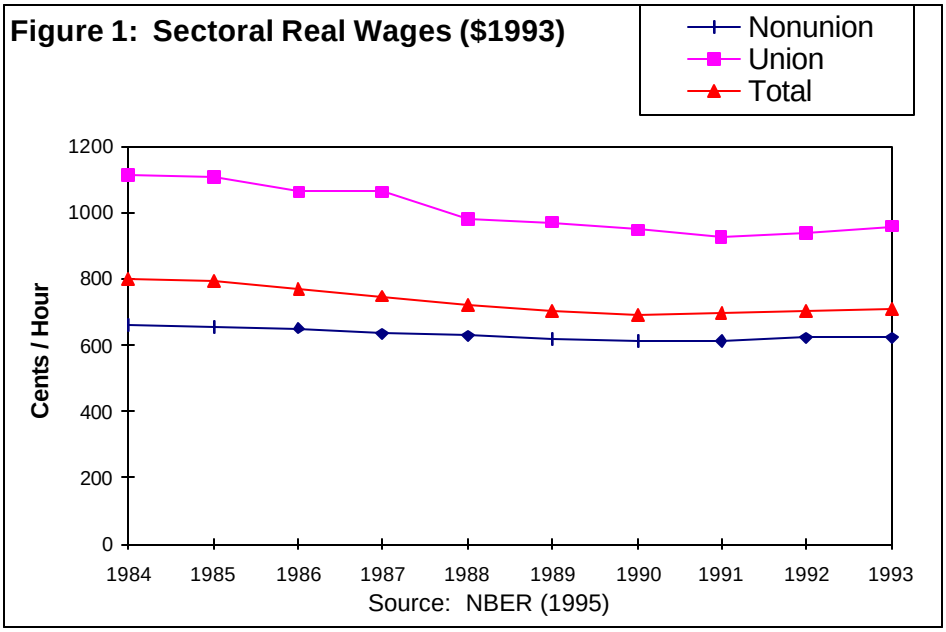
increasing union coverage leads not only to higher wages for both sectors, but also leads to an increase in the wage premium of union workers as compared to nonunion workers in the same labor market.

Section II outlines structural changes occurring in the US economy and in the supermarket industry over the past two decades. Section III explains the estimation methods used to determine the wage equations. It should be noted that several wage equations are estimated. First, using similar data and methods we replicate an earlier study (Belman and Voos, 1993) to establish a baseline comparison for our results. Following this we will develop both the estimation technique and data set to explore more fully the effects of union density on supermarket wages. Section IV briefly describes the data to be used in this paper. Section V discusses the results of the estimations and section VI concludes.

II. CHANGES IN THE SUPERMARKET INDUSTRY

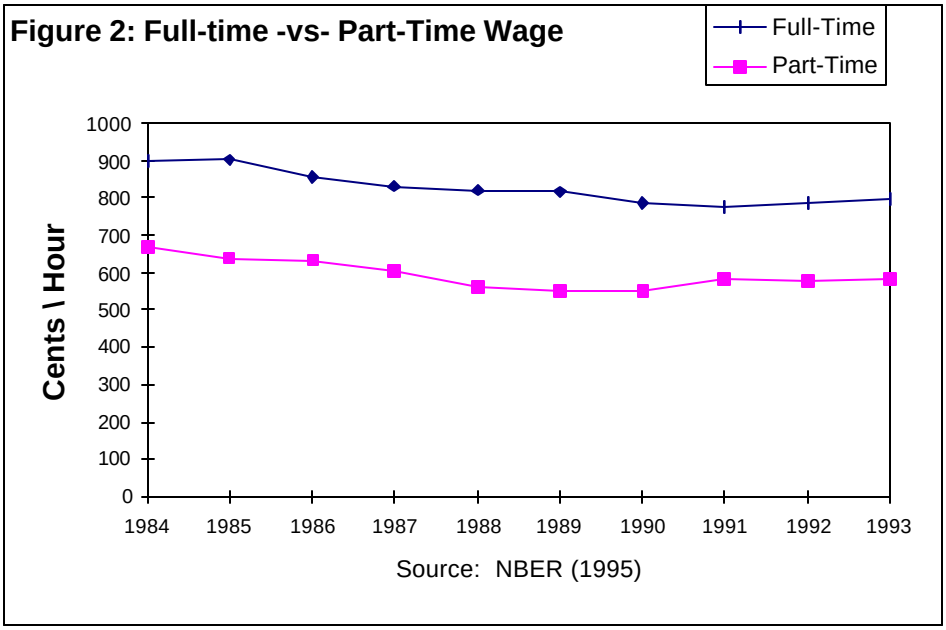
It is important to review the changes occurring in the supermarket industry to provide a theoretical basis for the wage determination. There have been vast structural changes in the organization of supermarkets and the services they offer. Already mentioned is the changing strength of the union sector over the last two decades. What one can deduce from these changes is essential in determining the correct model specification and in the verification of results; i.e. does the model yield results that are consistent with theoretical expectations?

If we examine the differences between wages in the union and nonunion sectors it is apparent that in both sectors there has been a downward trend in mean hourly wages (excluding non-wage benefits). However, it is interesting to note that over this time period the union wage premium has decreased and that wages in the nonunion sector have not decreased as substantially as those in the union sector (see Figure 1). This is not as one might expect, as unions are often credited for cushioning the effects of downturns in market cycles on their members' wages.

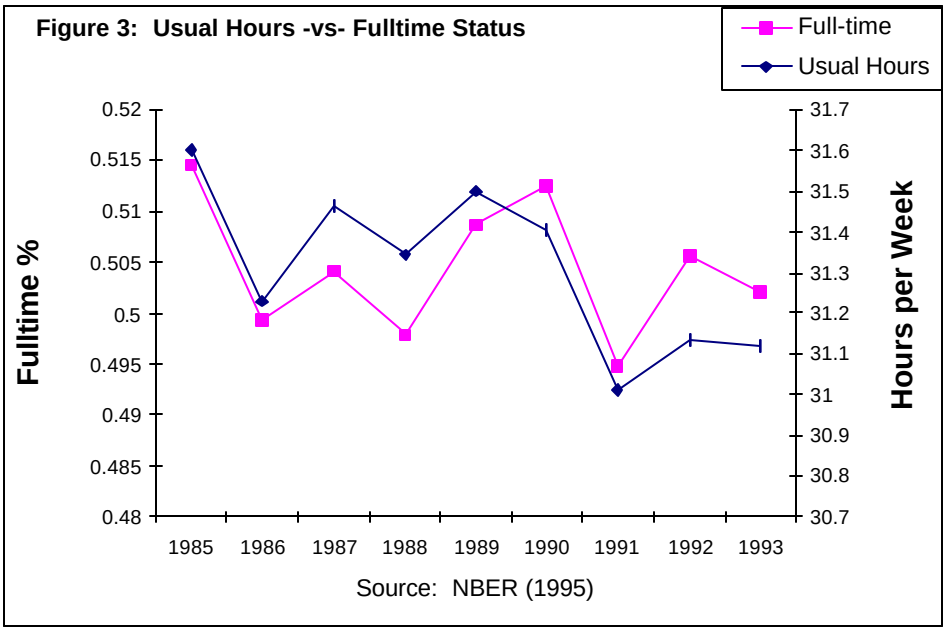


As expected, full-time employees do earn significantly more per hour than their part-time counter-parts (see Figure 2). However, part-time wages seem to rebound from the economic downswing in the eighties earlier than did full-time wages, probably due to the increase in the federal minimum wage in 1989 and 1990. This could help explain why the nonunion wages rebounded earlier than did the union wages, as a higher percentage of union employees work full-time compared to nonunion employees.

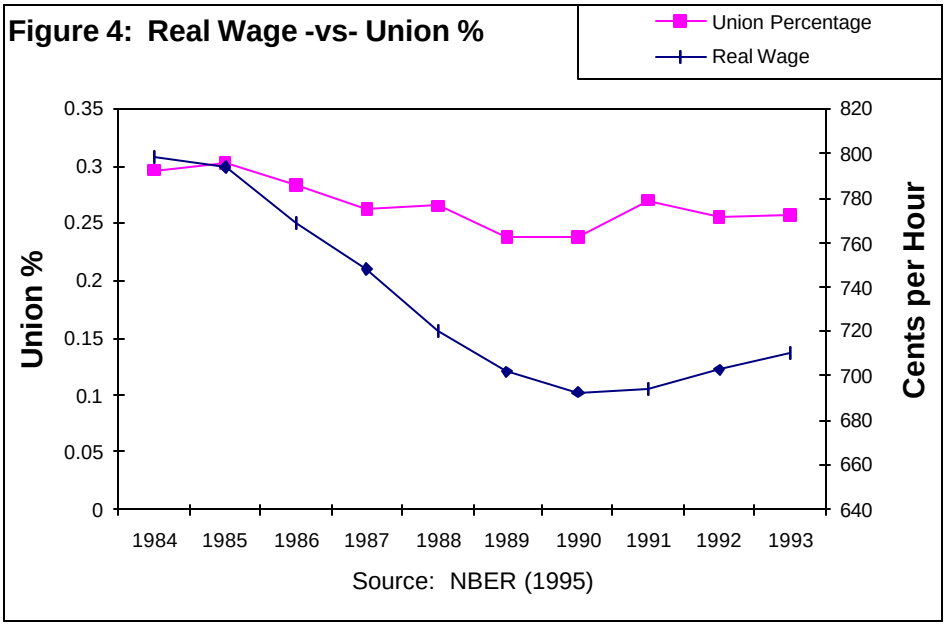
Figure 2: Full-time -vs- Part-Time Wage



There are many reasons for the downturn in wages over the last twenty years. As mentioned, changes in the proportion of full-time workers might help to explain falling wages and earnings (see Figure 3). Over the period from 1972 to 1993 average weekly hours worked fell from 33.0 to 29.8 for non-supervisory grocery workers. Part-time workers receive lower wages and non-income benefits in general than the full-time help coworkers. Minimum wage levels, which have not kept pace with inflation, may also explain falling real wages.



Finally, the proportion of an industry's workers belonging to unions may be an important determinant of income and income inequality. Currently 12% of workers are organized in the US (30% in 1970), compared to 40% in Germany. In the supermarket industry modest declines in union membership can be compared to rather substantial wage variability (see Figure 4).



What can be inferred from these descriptive statistics? Obviously from 1984 to 1993 there have been declines in wages (union and nonunion), declines in union membership, increases in the proportion of part-time employees, and declines in the average number of hours worked by supermarket employees. Several unanswered questions remain. Importantly, where have these changes happened geographically? Does the composition of a local labor market temper economic changes in the union and nonunion sector?

III. WAGE DETERMINATION

Determinants of wage levels include such variables as age, education, and labor union status. Deciphering the effects of endogenous variables such as union membership is complicated by self-selection bias. This refers to the phenomenon that some people choose to be in a union because of higher wage premiums. In reviewing the previous wage determination and union effect studies, one finds several methods used to address the union endogeneity issue and the resulting bias of regression coefficients and error terms.

Referring to statistical analysis, it is agreed that the traditional OLS wage regression, treating union membership as an exogenous variable, is consistent but biased. This is due to the correlation between union membership and the error term stemming from employee behavior or measurement error (Ashenfelter and Johnson, 1972; Schmidt and Strauss, 1975; Kahn, 1977; Belman and Voos, 1993; Budd and Na, 1994). More recently, union endogeneity in traditional wage analysis has taken on increasing importance. Observed union status has been regarded as resulting from an individual's choice, which is based on a comparison of probable earnings in the union and in the nonunion sector. Therefore, we estimate the effects of wage determinants on a worker's hourly pay using a full-information maximum likelihood estimation procedure. This technique corrects for union endogeneity in order to yield more accurate estimates of variable coefficients.

More specifically, this method involves estimating the wage equation in the second stage following a first stage probit estimation of the probability of union membership yielding consistent, asymptotically efficient coefficient estimates. First, we estimate the probability that a

worker decides to be a union member (or nonunion member) dependent upon age, age squared, education, race, sex, full-time / part-time status, and right-to-work legislation by state[1]. We assume that union (nonunion) membership for worker (i) is observed if the unobserved utility gain from being in that sector is greater than zero: $Z_{iu}\Gamma_u + u_{1ui} > 0$, where **Z** represents the aforementioned vector of demographic information for union worker (i), **G** represents the effects of marginal changes in **Z**, and u_{1ui} is the normally distributed error term for the union sector. The resulting coefficients yield the inverse Mills ratios (IMRs), which are necessary to estimate the wage determinants (Perloff and Sickles, 1987[2]; Budd and Na, 1994).

Equations (1) and (2) estimate the wages of union and nonunion workers respectively; **X** is a vector of explanatory variables (such as age, education, sex, race, etc.) for worker (i), **B** is a vector of the estimated changes in wage resulting from a marginal change in **X**, and u_{2ui} is the normally distributed error term for the union sector. In Equations (1) and (2), $\Phi(*)$ and $\phi(*)$ represent the cumulative distribution function and density function, respectively, of a standard normal variable.

$$\text{Equation (1):} \quad \ln W_{ui} = b_{u0} + b_{u1}X_{ui} + b_{u2}\left(-\frac{f(X_{ui} * \hat{\Gamma}_u)}{\Phi(X_{ui} * \hat{\Gamma}_u)}\right) + u_{2ui}$$

$$\text{Equation (2):} \quad \ln W_{ni} = b_{n0} + b_{n1}X_{ni} + b_{n2}\left(\frac{f(X_{ni} * \hat{\Gamma}_n)}{1-\Phi(X_{ni} * \hat{\Gamma}_n)}\right) + u_{2ni}.$$

[1] See Stata Reference Manual (1995): 438-445.

[2] They maintained that other consistent two-step estimators are unstable due to the collinearity between regressors (such as percentage unionized in a local labor market) and the instruments for the right-hand-side endogenous union dummy. To avoid this instability Perloff and Sickles employed a full-information maximum likelihood approach leading to larger sample mean wage union markups.

$\hat{\Gamma}_u$ and $\hat{\Gamma}_n$ are the estimates from the first stage probit. The IMR is given by $\phi(*) / \Phi(*)$; a numerical value of the value of the ratios found within the brackets from Equations (1) and (2). In the iterative maximization routine, IMRs are used as starting values for a numerical iteration to obtain the maximum-likelihood results. $\hat{b}_{u2}$ and $\hat{b}_{n2}$ are the covariances between the error terms in the probit and the wage equations. The null hypothesis in this procedure is that $\hat{b}_{u2}$ and $\hat{b}_{n2} = 0$. In other words, there is no difference in the determinants of union and nonunion wages. This null can be tested separately in the two sectors[3]. When they do not equal zero, we can assume that self-selection bias does exist and, therefore, the use of this technique is justified.

[3] See Heckman (1976) and Lee (1978) for a further discussion of the inverse Mills ratio technique to correct for endogeneity bias.

IV. DATA: THE CURRENT POPULATION SURVEY

The Current Population Survey (CPS) is a monthly household survey of employment and labor markets. The US Census Bureau on behalf of the US Bureau of Labor Statistics (BLS) conducts this survey annually. The survey data has been compiled on a NBER (National Bureau of Economic Research) CPS Labor Extracts: Annual Earnings File Extracts: 1979 - 1993 CD-ROM. The survey provides information on the labor status of non-military and non-institutionalized participants. Approximately 60,000 households are surveyed monthly, with a reference person from each household asked to report on his or her labor status and for those of other household members.

The sample is designed to yield accurate measures of labor force participation by state. For each monthly sample, eight representative sub-samples or rotation groups are included. Each household in a rotation group is interviewed a total of 8 times: four consecutive months of interviews, ignored for eight months, and then interviewed again for four months. If the occupants move they are not followed, rather the new occupants are interviewed. Since 1979 outgoing participants have been questioned with respect to usual weekly earnings and usual weekly hours. These participants in outgoing rotation groups (i.e. in interview month 4 and month 16) are used to compile the BLS Annual Earnings File (Merged Outgoing Rotation Groups File). The Annual Earnings File is used to produce the CPS Labor Extracts CD-ROM.

Of particular note are several new variables created from this survey and from outside data sources. The variable representing union density (*density*) was created using the local labor market densities for regions having at least 40 observations. For those individuals in cities with less than 40 observations the overall state union density was used (excluding the cities with 40 or more observations). Furthermore, these densities were calculated using a 3-year moving average

to smooth regional shocks to union coverage or data collection anomalies. The variable representing log wage (*lnpay*) is the ratio of "earnings per week" and "usual hours per week" from the CPS files. This variable was found to be superior[4] to the reported "earnings per hour". To supplement the effect of right-to-work legislation, an additional variable was created to supplement the *rtw* dummy. This variable, *rtow*, weights this effect by accounting for the year that the right-to-work legislation was passed in that state.

[4] A graphic of usual earnings per hour and the ratio of weekly earnings to usual weekly hours was generated to identify possible outlier observations. A 1:1 mapping was expected, but in several instances it was found that the usual earnings per hour was incorrectly reported. This determination was made by comparing these outlier values to the job classification and the wages earned by the majority of workers in that category. Hence, the ratio was chosen as a better representation of wages for this study.

V. RESULTS

The first set of estimations was conducted in an attempt to replicate an earlier supermarket industry wage study (Belman and Voos, 1993). This study included those individuals surveyed for the CPS in 1987 and 1989 in cities having at least 40 observations. The results from this replication can be seen below (Table 1) [5].

Table 1: Replication of Belman and Voos (1993)

Union Workers					**Nonunion Workers**			
LnPayU	**Coefficient**	**z**	**P>|z|**		**LnPayNU**	**Coefficient**	**z**	**P>|z|**
Density*	0.27426	2.682	0.007		**Density**	-0.01569	-0.272	0.786
Age*	0.0603	9.82	0		**Age***	0.044382	11.407	0
Age^2*	-0.00064	-8.403	0		**Age^2***	-0.00046	-9.406	0
Education*	0.016542	2.748	0.006		**Education***	0.034329	8.501	0
Male*	0.132009	5.702	0		**Male***	0.094661	5.279	0
White*	0.057826	1.92	0.055		**White***	0.132734	6.02	0
Full-time*	0.257051	11.005	0		**Full-time***	0.20753	11.06	0
Supervisor*	0.197013	2.332	0.02		**Supervisor***	0.405829	8.838	0
Professional*	0.159628	1.719	0.086		**Professional***	0.530189	6.461	0
Technician	-0.15707	-0.446	0.655		**Technician***	0.3956	2.65	0.008
Sales	0.038427	1.542	0.123		**Sales***	-0.14899	-7.535	0
Clerk*	0.065866	1.731	0.083		**Clerk**	0.004249	0.14	0.888
Service*	-0.28397	-3.627	0		**Service***	-0.19635	-5.432	0
Craft*	0.100537	3.046	0.002		**Craft***	0.076406	2.184	0.029
East	-0.00528	-0.117	0.907		**East***	0.053723	2.067	0.039
Midwest	-0.06457	-1.521	0.128		**Midwest**	-0.00848	-0.312	0.755
West*	0.100655	2.58	0.01		**West***	0.076618	2.859	0.004
Yr89*	-0.06084	-3.19	0.001		**Yr89**	-0.00152	-0.1	0.92
City1mil*	-0.0942	-2.789	0.005		**City1mil***	-0.08253	-3.422	0.001
City2.5*	-0.11259	-5.033	0		**City2.5***	-0.07311	-3.89	0
Constant*	0.537632	2.1	0.036		**Constant***	0.482831	6.272	0

NB: "*" indicates that the estimated effect is significant at the 0.90 confidence level.

[5] It should be noted for the Belman and Voos comparisons, coefficients represent the marginal effect all else equal, compared to a female, non-white, part-time supermarket laborer in the South during 1987. Probit results can be found in the Appendices. In addition, "z" statistics represent asymptotic t-statistics. P>|z| refers to the probability that the result is insignificant. In other words, the lower the P value the more confident we can be that the results are significantly accurate.

We felt this to be important as this recent study examined the effect of union coverage on union and nonunion sectors for the supermarket industry in selective cities. When we compare these results to those reported in Belman and Voos (1993), we note that with the exception of the city variables, the coefficients are all of similar sign and significance. This is to say that the density effect on union wages is significantly positive and is insignificantly negative for nonunion wages. This comparison provides a useful baseline for comparison and illustrates the benefits of increasing the data set and econometric sophistication.

If we utilize the full-information, maximum likelihood iterative estimation using the Belman and Voos (1993) data set we note that the density effects are slightly different, but not to any significant degree (see Appendix A). Following this estimation the data set used in this study was expanded to include the years 1984 through 1993 and individuals in smaller labor markets[6]. The results for the final estimation can be seen in Table 2. We find by adding observations from additional years, by including individuals not in large urban centers, and by using a fully iterative estimation procedure the density effect on the nonunion sector is significantly positive. We should note here that there existed significant correlation between the error terms in the aforementioned (section III) union membership estimation and wage estimation to justify this econometric method to correct for self-selection bias.

Table 2: Full Data Set FIML								
Union Workers					Nonunion Workers			
LnPayU	Coefficient	z	P>|z|		LnPayNU	Coefficient	z	P>|z|
Density*	0.529214	13.621	0		Density*	0.156784	8.041	0
Age*	0.062941	24.53	0		Age*	0.032847	28.943	0
Age^2*	-0.00069	-20.728	0		Age^2*	-0.00034	-23.663	0
Education*	0.020011	6.717	0		Education*	0.029779	20.835	0
Male*	0.171507	15.19	0		Male*	0.192022	33.271	0
White*	0.052097	3.367	0.001		White*	0.055459	6.852	0
Full-time*	0.239066	21.104	0		Full-time*	0.210206	35.271	0
Manager*	0.12563	1.977	0.048		Manager*	0.530882	27.46	0
Professional*	0.133347	2.491	0.013		Professional*	0.522258	17.491	0
Technician	0.156845	1.573	0.116		Technician*	0.515064	10.28	0
Sales*	0.095644	7.991	0		Sales*	0.080245	11.402	0
Clerk*	0.067405	3.386	0.001		Clerk*	0.20424	17.404	0
Service*	-0.14284	-5.691	0		Service*	-0.03069	-2.553	0.011
Craft*	0.131217	7.221	0		Craft*	0.20093	15.927	0
East	-0.02362	-1.313	0.189		East*	0.095433	11.922	0
Midwest*	-0.07561	-4.272	0		Midwest*	-0.01288	-1.791	0.073
West*	0.063011	3.679	0		West*	0.059882	7.004	0
Constant*	0.179984	2.16	0.031		Constant*	0.480399	19.835	0

NB: "*" indicates that the estimated effect is significant at the 0.90 confidence level.

As mentioned in the introduction, this positive density affect on union and nonunion sectors has another important implication: the union wage premium will become greater in markets with higher unionization rates. Premiums for the union and nonunion sectors were calculated using these coefficients and mean values (see Table 3). We can see that at the average union density for the supermarket industry that the union premium is approximately $0.51 or 6% above nonunion wages. For cities with lower densities there is very little union premium and for those regions with high union densities the union premium is pronounced. As noted earlier from

[6] As reported earlier a mapping of earnings per hour and the ratio of earnings per week and usual hours per week was conducted. This mapping allowed incorrectly reported observations to be removed from the sample set. There were 4 observations removed from a sample set of 21,680 leaving the final data set of 21,676 individuals.

Figure 2, nonunion wages had not declined to the same extent that union wages had over the study period. This decrease in union wage premium can now be partially explained by the decrease in union densities during this period.

Table 3: Wage Premiums as a Function of Supermarket Union Density

Union Density*	Union Wage	Nonunion Wage	Union Premium
0			
10 - 20	**$8.42 - $8.88**	**$8.39 - $8.52**	**$.03 - $.36**
Mean Density = 24.5%	**$9.09**	**$8.58**	**$.51**
30 - 40	**$9.36 - $9.87**	**$8.66 - $8.80**	**$.70 - $1.07**
40 - 50	**$9.87 - $10.40**	**$8.80 - $8.93**	**$1.07 - $1.47**
50 - 60	**$10.40 - $10.97**	**$8.93 - $9.08**	**$1.47 - $1.89**
60 - 70	**$10.97 - $11.57**	**$9.08 - $9.22**	**$1.89 - $2.35**

* This refers to the supermarket unionization rate in the local labor market as a percentage.

Examination of the other coefficients in Table 2 reveals a wealth of information regarding employee wages in this industry and also about the economy as a whole (in so far as the supermarket industry is a major component of the economy as a whole). For example, note that there are the largest positive affects from being white, a male, and a technician living in the West if you are in a union. However, if you are a nonunion supermarket employee the largest positive affects are if you are white, a male, and a manager living in the East. It can also be seen that being a union employee mutes the effects of race, sex, and increased education. Not being in a union mutes the effects of age and the premium for working full-time.

Additionally, as one might expect, the movement towards technology to increase productivity would result in the premium for skilled labor. This may be one reason explaining decreased wages over this period. Evidence supporting this hypothesis can be found by examining the *occupation* variables (e.g., *manager, professional, technician, sales, clerk,* etc.) which reflect positive wage premiums for all positions (with the exception of *service*) as compared to general supermarket labor. It should be noted that managers, professionals, and technicians all receive much higher wage premiums in the nonunion sector as compared to the union sector.

If we use the Oaxaca decomposition technique[7] it is possible to isolate the union wage premium, conditional on sample means and union density. By using sample means for the explanatory variables we find that there exists on average for the industry a union wage premium of 28.3%. When we include the significant union density effect (at the average unionization rate) we find that this premium increases to 31.5%.

[7] The Oaxaca (1973) decomposition technique is based on estimation results using sample means as a means to separate out the differences between union and nonunion wages.

VI. SUMMARY AND CONCLUSIONS

After conducting an extensive review of wage estimation literature, we have focused on the structure of wages in the supermarket industry between 1984 and 1993. We replicate as closely as possible the results of a previous supermarket wage study. Following a baseline comparison of this initial estimation, we enlarge the data set to include individuals in rural areas and from additional years. By using a more sophisticated estimation technique we find that increasing union densities positively affect union and nonunion wages. The significant results for the nonunion sector is of particular importance, as this is the first confirmation of this effect to the best of our knowledge. Furthermore, the effect of increasing union densities in local labor markets will additionally increase the premium enjoyed by union workers.

It should be noted that this examination of supermarket wages relies on the self-reported usual earnings as collected in the CPS. This may introduce measurement bias[8]. In addition, the estimations of wage used for this study omit the non-wage benefits as part of the estimation procedure, which over the ten-year sample period could mask many employer/employee relations, especially when examining the union effects on wage. As reported by the FMI in 1995, an average store pays its employees about 25 cents in fringe benefits out of every dollar spent on salary. Despite technological and structural changes in supermarkets, food-marketing remains highly labor intensive as compared to other national industries[9]. Not surprisingly, the union effect on fringe benefits has been found to be much larger than the union wage effect

[8] Other studies that have used the Current Population Survey as a data source for calculating similar estimates of wage determinants have reported the estimated percentage gains in wages due to collective bargaining to be lower than estimates obtained using other sources of data (see Freeman and Medoff, 1984, pg.46).

[9] In 1994 the average gross margin of supermarkets was between 23.4% and 25.8% (gross margin is the difference between the buy and sell price of merchandise). Of that percentage roughly fifty percent is spent on store labor costs (FMI: *Operations Review*, 1994).

(Freeman & Medoff, 1984). An example of this would be the importance that union-negotiated pension funds have become in capital markets. Also not examined as a determinant of wages are the hidden employer effects, which could cause omitted variable biases. Freeman and Medoff (1984) cite informally that when questioned about treatment of union and nonunion employees in a firm, some firms admit that they change the pay of their nonunion workers at different times to disguise the union influence (Freeman and Medoff, 1984).

During this period it is evident both that the number of employees in the supermarket industry increased and also that the percentage of those workers in the UFCW decreased. These two factors could have affected the other regression coefficients longitudinally. Therefore, it is important to further study the longitudinal effects on the coefficient values in the various models used to analyze the wage data to have a more complete picture of what is actually happening. This effect could be described as a longitudinal disturbance, which left undetected, could cause bias in the estimation methods and corresponding coefficients.

However, based on nationwide wage data from 1984-1993 in the supermarket industry, this study found that the average union wage premium for these years was 28.3%. In addition this study found a positive influence of increasing union density on both union and nonunion sectors. For a 10% increase in union density in the retail food industry for a local labor market it is estimated that the wages of union employees will increase by 5.3% and by 1.2% for nonunion employees in that market. Hence, the union wage premium will increase in regions with higher union densities. If this is considered when calculating union effects on wage the wage premium enjoyed by union employees in the supermarket industry increases to 31.5%.

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Appendix A: Comparison to Belman and Voos (1993) Summary Statistics (3691 Observations)

Variable	Definition	Mean	Std. Dev.	Min	Max
Age	Years of age	30.91547	13.02045	16	76
Age^2	Age squared	1125.253	983.5776	256	5776
Education	Years of schooling	12.36115	1.901617	0	18
Male	0=female, 1=male	0.520184	0.49966	0	1
White	0=non-white, 1=white	0.863181	0.343703	0	1
Full-time	0=part-time, 1=full-time	0.587104	0.492421	0	1
Supervisor	Supervisor	0.024384	0.154258	0	1
Professional	Professional	0.009754	0.09829	0	1
Technician	Technician	0.001897	0.043514	0	1
Sales	Sales	0.356814	0.479124	0	1
Service	Service	0.037388	0.189737	0	1
Craft	Craftsperson	0.075589	0.264376	0	1
Labor	General Labor	0.263072	0.440361	0	1
Clerk	Clerk	0.080737	0.272468	0	1
yr89	0=1987, 1=1989	0.506909	0.50002	0	1
city1mil	In City of 1 Million	0.131672	0.338179	0	1
city2.5	In city of 2.5 Million	0.311027	0.462977	0	1
East	Region=East	0.299377	0.458047	0	1
Midwest	Region= Midwest	0.20699	0.405203	0	1
South	Region=South	0.271742	0.444918	0	1
West	Region=West	0.221891	0.415575	0	1
Uhourse	Usual Hours per Week	33.97724	12.14031	0	99
Earnwke	Usual Earnings / Week	276.3403	207.7751	5	1923
Pay	Ratio: earnwke/uhourse	9.336233	10.32628	0.848005	553.5282
Lnpay	Log of Pay	2.089994	0.501704	-0.16487	6.316313
Lnpayu	Log of Pay for Union	2.281727	0.467708	-0.16487	3.949236
Lnpaynu	Log of Pay Nonunion	1.975187	0.486143	0.258359	6.316313
Density	Local Union Density	0.374424	0.206464	0	0.677419
Union	0=nonunion, 1=union	0.374424	0.48404	0	1
Right-to-Work	0=not in a rtw state 1= living in a rtw state	0.281225	0.449658	0	1

Appendix B
Full Data Set: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Age	21676	30.43864	13.00361	16	90
Age^2	21676	1095.597	988.0103	256	8100
Education	21676	12.22506	1.828592	0	18
White	21676	0.885542	0.318375	0	1
Male	21676	0.478271	0.499539	0	1
Full-time	21676	0.557437	0.496702	0	1
Manager	21676	0.016701	0.12815	0	1
Professional	21676	0.007843	0.088214	0	1
Technician	21676	0.002537	0.05031	0	1
Sales	21676	0.521591	0.499545	0	1
Clerk	21676	0.068601	0.252781	0	1
Service	21676	0.054161	0.226341	0	1
Craft	21676	0.062327	0.241754	0	1
Labor	21676	0.266239	0.442001	0	1
East	21676	0.230947	0.421448	0	1
Midwest	21676	0.244833	0.429998	0	1
South	21676	0.317217	0.465404	0	1
West	21676	0.207003	0.405167	0	1
Pay	21676	7.718098	4.261058	1.165323	56.02288
Uhourse	21676	33.02625	11.98504	1	99
Earnwke	21676	240.2649	192.4188	7	1923
Logpay	21676	1.928182	0.455745	0.152998	4.02576
Lnpayu	5221	2.171114	0.467127	0.152998	3.973137
Lnpaynu	16455	1.851102	0.423929	0.152998	4.02576
Density	21676	0.245202	0.181977	0	0.804878
Union	21676	0.240866	0.427619	0	1
Rtw	21676	0.383742	0.486308	0	1
Rtow	21676	0.263584	0.390545	0	1

Summary Statistics

Union Sample

Variable	Obs	Mean	Std. Dev.
Age	5221	31.66137	12.39741
Age^2	5221	1156.108	925.9995
Education	5221	12.33212	1.662875
White	5221	0.891017	0.311648
Male	5221	0.50565	0.500016
Full-time	5221	0.572113	0.49482
Manager	5221	0.005746	0.075592
Professional	5221	0.008236	0.090386
Technician	5221	0.002298	0.047891
Sales	5221	0.450872	0.497628
Clerk	5221	0.073932	0.261686
Service	5221	0.040988	0.198282
Craft	5221	0.095001	0.293244
Labor	5221	0.322927	0.46764
Density	5221	0.383113	0.157647
Lnpayu	5221	2.171114	0.467127
Rtw	5221	0.128519	0.334699
Rtow	5221	0.077026	0.233487
East	5221	0.278874	0.448488
Midwest	5221	0.263743	0.440704
South	5221	0.141161	0.348221
West	5221	0.316223	0.465046

Nonunion Sample

Variable	Obs	Mean	Std. Dev.
Age	16455	30.05068	13.16679
Age^2	16455	1076.397	1006.155
Education	16455	12.1911	1.876891
White	16455	0.883804	0.320469
Male	16455	0.469584	0.499089
Full-time	16455	0.55278	0.497222
Manager	16455	0.020176	0.140607
Professional	16455	0.007718	0.087515
Technician	16455	0.002613	0.051054
Sales	16455	0.544029	0.498073
Clerk	16455	0.06691	0.249873
Service	16455	0.058341	0.234394
Craft	16455	0.05196	0.221953
Labor	16455	0.248253	0.432012
Density	16455	0.201444	0.166701
Lnpaynu	16455	1.851102	0.423929
Rtw	16455	0.464722	0.498769
Rtow	16455	0.322777	0.411194
East	16455	0.21574	0.411347
Midwest	16455	0.238833	0.426384
South	16455	0.373078	0.483637
West	16455	0.172349	0.377695