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ABSTRACT

The desirability of raising the minimum wage long revolved around just one question: the effect of higher minimum wages on the overall level of employment. An even more critical effect of the minimum wage rests on the composition of employment--who gets the minimum wage job. An examination of employment in eating and drinking establishments (including fast food, table service restaurants and cafeterias) shows that the effect of higher minimum wages in the late 1980s was to displace adults employed in food service in favor of younger workers. The analysis exploited the differences in state-level minimum wages that arose in the late 1980s, a period in which many states raised their minimums while the federal minimum remained constant. When the federal minimum wage rose in 1990-91, its effect on wages was stronger in states that had lower wages. This disparity in minimum wage effects made it possible to estimate interstate differences in employment composition: the displacement effect on older workers from the federal increase was greater in lower-wage states. The greater the effect the minimum wage increase had on wages, the larger was the resulting displacement of older workers. (An appendix includes information on how minimum wage changes can lead to worker displacement.) (YLB)

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MINIMUM WAGE LAWS AND THE DISTRIBUTION OF EMPLOYMENT

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This paper has grown out of work co-authored with William Dickens. I am grateful to him for
ful conversations and to Mukesh Chawla for his research assistance. The usual caveat applies.

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EXECUTIVE SUMMARY

The desirability of raising the minimum wage has long revolved around just one question: the effect of higher minimum wages on the overall *level* of employment. This report adds an important new dimension to that debate by showing that an even more critical effect of the minimum wage rests on the *composition* of employment—who gets the minimum wage job.

Kevin Lang's paper focuses on employment in eating and drinking establishments, a Bureau of Labor Statistics classification including fast food (the focus of numerous recent minimum wage studies) and table service restaurants, as well as cafeterias. The report shows that the effect of higher minimum wages in the late 1980s was to displace adults employed in food service in favor of younger workers.

Consistent with this shift towards younger workers, the study reports that the higher minimum wage increased the share of employment that was on a part-time rather than full-time basis.

Two forces in the labor market work to exclude adult workers after a minimum wage increase. Higher wages swells the pool of job applicants by making these jobs attractive to a larger portion of the population. Many of these new workforce entrants are students and teens electing to enter the workforce. This expanded pool of applicants allows employers to be more selective in the workers they hire. At the same time, the labor costs associated with the higher wage require employers to be more selective in their hiring practices; the costs of an incorrect hiring decision become much higher. Many employers making hiring decisions simply conclude that younger workers are more desirable as workers than adults whose *only* employment option is at the minimum wage.

Dr. Lang's analysis exploits the differences in state-level minimum wages that arose in the late 1980s, a period in which many states raised their minimums while the federal minimum remained constant. When the federal minimum wage rose to $4.25 in 1990-91, its effect on wages was stronger in states which had lower wages. This disparity in minimum wage effects made it possible to estimate inter-state differences in employment composition: the displacement effect on older workers from the federal increase to $4.25 was greater in lower-wage states. After the federal increase, a state where *average* food service wages were already $4.50 showed approximately 9 percentage points greater adult employment gains than did a state where average wages were $1 lower. The greater the effect the minimum wage increase had on wages, the larger was the resulting displacement of older workers.

Some economists have concluded that higher minimum wages can increase the flow and quality of applicants for entry-level jobs. However, this report shows that the increased competition from better workers hurts the most disadvantaged applicants.

Ironically, the effect of higher minimum wages may be to undercut the welfare-to-work transitions that are at the core of efforts to reduce welfare dependency. Many welfare recipients simply don't have the education or skills to compete with the more qualified workers who may be attracted to entry-level positions after a minimum wage hike. For these welfare recipients, increasing the minimum wage closes off economic opportunities at the very time that public policy stands poised to require greater work effort on their part.

These findings quantify and confirm a feature frequently reported on in the popular press: the adverse effects employers feel from a higher minimum wage are somewhat offset by the fact that they are able to select from a higher quality of job applicants. More and better workers do respond to higher wages, and they do get jobs. The losers are those former workers whose skills do not allow them to compete successfully.

The analysis controls for the changing size of the workforce, changes in its educational characteristics, as well as changes in the national economic climate over the sample period. Data source for the estimation were the National Bureau of Economic Research Current Population Survey extracts for the years 1987 to 1991.

Carlos Bonilla
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Introduction

The textbook analysis of minimum wage laws is clear. At higher wages, firms employ fewer workers. Therefore a minimum wage law reduces employment. The lost employment is a cost society imposes on itself when it creates a minimum wage. At best, according to this view, minimum wage laws are an inefficient means for helping low-wage workers. At worst, they actually hurt low-wage workers if the employment losses outweigh the wage gains.

Some recent research has called into question this textbook analysis. Studies of the fast-food industry by Lawrence Katz and Alan Krueger (1992) and by David Card and Krueger (1993) suggest that, if anything, minimum wage laws increase employment in these industries. Similarly, studies of California's experience with a minimum wage above the federal minimum (Card, 1992a) and comparing the effect of increasing the federal minimum wage in low- and high-wage states suggest that minimum wage laws do not reduce employment among teenagers, the group most likely to be affected. Card's results have been the subject of a heated exchange between David Neumark and William Wascher (1992) and Card, Katz and Krueger (1993). In the face of this ongoing controversy, it is safe to say that the evidence that minimum wage laws significantly reduce teenage and fast-food employment has been questioned.

. . . low-wage employers may be substituting workers they prefer for more disadvantaged workers. If so, minimum wage laws are a very undesirable anti-poverty measure.

One response to these findings has been the assertion that minimum wage laws must be desirable. Indeed, Sylvia Nasar writing in the *New York Times* concludes that these studies make "the case for modest increases in the minimum wage as an ingredient in future anti-poverty measures." Strikingly, Card, Katz and Krueger have all been much more cautious in their assessment of the policy implications of their findings. Without a theory which can explain their results, we need to be extremely careful about drawing strong conclusions.

There is cause for concern in Nasar's own discussion of why minimum wage laws do not reduce employment. She quotes one employer as saying, "Paying that extra 50 cents helped us recruit. We're getting better kids." This suggests that minimum wage laws not only affect the number of low-wage jobs but also who gets them. If the experience of the employer just quoted is typical, low-wage employers may be substituting workers they prefer for more disadvantaged workers. If so, minimum wage laws are a very undesirable anti-poverty measure.

The distributional effect of minimum wage laws has been a long-standing concern among economists studying the topic. The textbook model of minimum wage laws is clearly too simple to address this concern. It assumes that all workers are identical. Therefore, when minimum wage laws create job scarcity, all workers are equally likely to share in the unemployment.

In reality, the situation is quite different. Highly paid professionals are, of course, unlikely to be significantly affected by a minimum wage set substantially below their usual earnings. On the other hand, employers are likely to respond by laying off or not hiring the least productive workers. Even in an economy where all workers are equally productive, employers may distinguish among them on the basis of other factors such as sex or race.

Modifying the textbook analysis to account for such differences among workers reminds us of the importance of considering who gets jobs as well as the number of jobs available. However, by itself, taking account of differences among workers does not explain why some empirical studies do not show that minimum wage laws reduce employment.

To understand where the textbook model goes wrong, we must not only take differences among workers into account. We must also recognize that wages do not adjust smoothly, so that even in the absence of a minimum wage law there would be unemployment. In particular, job openings and workers looking for those openings do not find each other effortlessly. On the contrary, some jobs stand vacant for weeks or even months while others receive an abundance of qualified applicants.

Minimum wage laws can increase the flow and quality of applicants for low-wage jobs and may therefore increase employment in these jobs. However, the increased competition from better workers hurts the most disadvantaged workers.

When we take account of the fact that unemployed workers search for jobs while employers with job vacancies search for workers, a very different picture of the labor market arises. Minimum wage laws can increase the flow and quality of applicants for low-wage jobs and may therefore increase employment in these jobs. However, the increased competition from better workers hurts the most disadvantaged workers. Indeed, it is possible for a minimum wage law to increase overall employment while hurting disadvantaged workers it was designed to help and not helping advantaged workers. A full description of labor market operations consistent with this employment model is presented in the appendix to this paper.

In the research described below, I present evidence that suggests that minimum wage laws do affect who gets low-wage jobs. Therefore, any assessment of the impact of minimum wage laws must take account of their impact on the distribution of employment.

Time-Series Evidence on Minimum Wage Effects

While the federal minimum wage was constant at $3.35 per hour from 1981 to 1990, towards the end of this period there were dramatic changes in minimum wage laws at the state level. The first significant change occurred when the minimum wage in California was raised to $4.25 on July 1, 1988. Due to legal challenges (see Card, 1992a), implementation of the law was delayed, but the law was clearly in place by the beginning of the following year. A number of smaller states also raised their minimum wages above the federal level in 1988 and 1989. In 1987 only Alaska and the District of Columbia had minimum wages exceeding 110% of the federal minimum. By 1989, Alaska, California Connecticut, the District of Columbia, Hawaii, Massachusetts, Maine, Minnesota, Pennsylvania, Rhode Island and Washington, all had statutory minima in excess of this level (Neumark and Wascher, 1992). The federal minimum was raised to $3.80 per hour on April 1, 1990 and raised again to $4.25 on April 1, 1991.

This section of this report examines employment in low-wage occupations in the food-service industry to examine who gets low-wage jobs. The data are drawn from the National Bureau of Economic Research (NBER) Current Population Surveys (CPS) extracts. These extracts are available for 1979-1991. For each year, they combine data from all the outgoing rotation groups for that year. By combining the data from all twelve monthly surveys, we are able to generate very large data sets which, in turn, make it possible to study a small industry. By limiting the sample to the out-going rotation groups, we avoid the danger of counting an individual twice in a single year. On the other hand, the NBER extracts do not provide information about the month in which the individual was interviewed. Hence, approximately one-quarter of the sample in each of 1990 and 1991 will have been interviewed prior to that year's increase in the federal minimum wage.

Our sample consists of all individuals who reported themselves as employed in eating and drinking establishments and working in occupations food-service occupations.

Our initial approach is straightforward. We begin by examining the trends in the composition of employment in food-service occupations from 1987 to 1991. Our sample consists of all individuals who reported themselves as employed in industry 641 (eating and drinking establishments) and working in occupations 433-443 (food-service occupations). The sample size for each year is 6,616 - 6,087 - 6,335 - 6,509 and 6,480 for 1987-1991, respectively, giving a total sample of 32,027.

Table 1

Hourly Wages of Employees in Food-Service Occupations (1987)

Wage	All Workers
<$3.35	23%
$3.35	19%
>$3.35-<$3.80	19%
≥ $3.80- <$4.25	22%
≥ $4.25	17%

Note: Based on unweighted sample characteristics.

Of the individuals employed in these occupations and for whom wage or salary information was available in 1987 (6,388 observations), fully 91% were paid on an hourly basis. Table 1 gives the distribution of wages for these workers. Fully 23% claimed to be paid less than the federal minimum wage of $3.35 per hour.[1] Another 19% were paid exactly the minimum wage. The same percentage (19%) earned between $3.35 and $3.80 per hour and would therefore be directly affected by an increase in the minimum wage to $3.80. A further 22% earned at least $3.80 but less than $4.25 and would therefore be affected by an increase to that level. The remaining 17% earned at least $4.25 per hour. Salaried workers were generally better paid. Using earnings per week divided by usual weekly hours as the measure of the hourly wage, only 12% claimed to earn less than the minimum wage and almost three-quarters earned at least $4.25 per hour.

Wages of hourly workers in food-service occupations are considerably below those for hourly workers as a whole. The mean wage in food-service occupations was $3.88 in 1987 compared with $7.50 for all hourly workers.

Whether the federal minimum wage amendments increased the minimum wage in food-service occupations is actually a complex question. Formally, the federal minimum wage applies fully only to workers who do not receive tips. Employers may count tip income towards a certain fraction of the minimum wage. For most of the 1980s, this percentage was 40% but rose to 45% on April 1, 1990

Table 2

Characteristics of Employees in U.S. and in Food-Service Occupations

	Food-Service Occupations 1987-1991	All Occupations 1987	All Occupations 1991
Sex			
Male	37.65%	54.20%	53.45%
Education			
≤8	6.39	5.05	4.41
9-11	28.67	11.14	9.73
12	40.59	40.05	39.11
13-15	19.07	20.91	22.06
16+	5.27	22.84	24.68
Student			
Full-Time	20.37	4.10	3.76
Part-Time	1.97	0.76	0.72
Age			
16-19	27.87	6.02	4.91
20-24	21.35	11.43	10.08
25-29	14.30	14.24	12.85
>30	36.49	68.31	72.16
Race			
White	85.84	87.89	87.40
Black	8.09	8.81	8.50

Note: Based on unweighted sample characteristics.

1 Note that wages less than the federal minimum are not necessarily indications of non-compliance with the law. Tipped employees can, in most states, be paid less than the federal minimum (with the balance accounted for by tips.)

and to 50% on April 1, 1991. Thus, for an employee receiving significant tip income, the nominal federal minimum wage rose from $2.01 to $2.09 on April 1, 1990 and to $2.12 the following year. Thus the real (constant dollar) federal minimum wage was actually lower for these workers than it had been in the mid- to late 1980s. However, provisions of state minimum wage laws frequently override the tip exemption in the federal law. For these states, the amendments to the federal minimum would have effectively increased the statutory minimum.

In fact, the minimum wage increases of the late 1980s and early 1990s appear to have raised wages for those who would otherwise have been below the new minimum in food-service occupations. If wages in food-service occupations had increased by only the average increase experienced by all hourly employees, we would have expected, based on the 1987 distribution of wages, 61% of workers to be earning less than $4.25 per hour in 1991. In fact, only 34% earned less than $4.25 per hour in 1991.[2] Since the minimum wage increases did have an effect on wages in the industry, it is possible to estimate the effect of those increases on the labor market.

Consistent with common perceptions, it is evident . . . that workers in these occupations tend to be younger than other employees.

Table 2 provides a comparison of the socio-demographic characteristics for food-service occupations with those of all employees in the U.S. Consistent with common perceptions, it is evident from the table that workers in these occupations tend to be younger than other employees. Consistent with their youth, they are more likely to be enrolled in school and are less educated, on average, than is the typical American worker. They are also more likely to be female. Workers in food-service occupations may be slightly less likely to be white than are workers as a whole, but the difference is not large.

Table 3
Employment in Food-Service Occupations Compared with Total Employment

	Food Service Sample Size	% of Total Employment
1987	6,616	3.13%
1988	6,087	3.04
1989	6,335	3.11
1990	6,509	3.09
1991	6,480	3.10

Note: Based on unweighted sample characteristics.

With the exception of race, the food-service occupations draw their employees disproportionately from socio-demographic categories associated with low wages. This, combined with the fact that wages are generally low in these occupations, suggests that food-service occupations are a good area for investigating the effect of minimum wage laws on the distribution of employment.

Table 3 gives the fraction of workers in the CPS who are reported as being employed in food-service occupations in eating and drinking establishments. The table reveals no tendency for employment in these occupations to fall as the minimum wage rises. We examine the age, sex, race, education, enrollment status, marital status and full-time/part-time employment status of these individuals and determine whether there has been a shift towards the sorts of individuals who typically earn higher wages, particularly men, whites, mature workers as well as those who are not enrolled in school. Table 4 gives the results of this procedure.

2 Recall that for one-quarter of the year, the minimum was was $3.80 which makes this finding particularly striking.

Table 4

Distribution of Jobs in Food-Service (1987-91)

	1987	1988	1989	1990	1991
Sex					
Male	37.79%	39.36%	40.43%	40.47%	41.74%
Education					
<12	35.97	36.51	36.00	35.75	33.44
12	40.65	38.72	40.34	40.32	40.58
>12	23.37	24.77	23.67	23.93	25.98
Student					
Full-Time	20.53	21.25	20.69	19.25	18.97
Part-Time	2.21	2.47	1.96	2.19	2.01
Age					
16-19	28.65	28.96	27.88	26.43	24.45
20-24	23.00	22.99	22.17	20.55	23.97
25-29	14.80	15.08	14.67	14.99	14.67
≥30	33.55	32.97	35.28	38.02	36.91
Race					
White	84.82	85.54	84.42	84.17	84.30
Black	10.42	9.13	10.07	10.14	10.24
Married, Spouse Present	29.72	27.95	29.07	31.48	28.54
Full-Time Worker	47.76	48.03	49.66	49.76	46.17

The results fall into three groups. One group—broken down by sex, enrollment and age—shows shifts which precede the increases in the federal minimum wage. Employment of enrolled students and teenagers declines beginning in 1989. There is a sharp decline in the teen-age share of employment over the period and a corresponding increase in the share of jobs held by individuals over age 30. The fraction of workers who were in their twenties remained essentially constant. Similarly, the fraction of workers who were full-time students fell by more than 2 percentage points between 1988 and 1991. The results show that beginning in 1988, there was a sharp shift in the distribution of employment in food-service occupations towards men, going from 38% to 42%. Unless the increases in the early years are attributable to changes in the state laws, these trends cannot be attributed to changing minimum wages.

A second group—broken down by race and marital status—shows no real change following the increases in the minimum wage which the United States experienced in the late 1980s and early 1990s. Employment of blacks remained more or less constant in the vicinity of 10% throughout the period. The fraction of workers who are married varies over the years but shows no consistent pattern.

It is certainly plausible that employers in the food-service industry conclude that students involved in part-time employment are superior to adults whose best full-time employment option is in food-service occupations.

Finally, a third group—defined by full time employment status and education—shows sharp shifts between 1990 and 1991. The fraction of workers without a high school degree drops by 2 percentage points while the fraction with at least some college education increases by the same amount. There is some evidence that the shift away from workers who had not completed high school started prior to 1990-91. The pattern for full-time workers is clearest. It rises steadily from 1987 to 1990 and then drops sharply.

There are two conclusions to be drawn from these results. First, the strongest case for attributing a shift in the employment pattern to the minimum wage is the shift away from full-time workers. Unfortunately, it is not clear whether this represents a shift towards higher or lower productivity workers. It is certainly plausible that employers in the food-service industry conclude that students involved in part-time employment are superior to adults whose best full-time employment option is in food-service occupations. Such an interpretation would be consistent with Sylvia Nasar's observations.

The second point is that if we refer back to table 2, we see that some of the same trends we observe in food-service occupations can be discerned for the economy as a whole. Between 1987 and 1991, the employed work force became more educated, older and less likely to be enrolled in school. Thus, trends in the economy may be obscuring the countervailing impact of changes in the minimum wage.

Consequently, in the next section we take advantage of variation across states in the level of prevailing wages to cast further light on the relation between minimum wage laws and the composition of employment in low-wage occupations.

Time-Series Cross-Section Evidence

We follow the approach employed by Card (1992a) and use prevailing wage levels to proxy the importance of the minimum wage increase. The higher the average wage is among food-service workers in a state, the less impact we would expect to find on average wages, and hence on employment, among workers in that state. However, as discussed above, in the case of food-service occupations, there is an additional complication generated by the presence of tip income. The federal minimum increased very little for workers receiving tip income. However, many states have supplementary minimum wage laws which, in effect, require payment of the full minimum even to workers who receive tips. To capture the importance of variations in this provision and possibly in enforcement, we also examine the fraction of workers who earned less than the minimum wage in the state.

Because Alaska has much higher wages than other states and had almost no workers reporting wages below the minimum in 1987, there is reason to be concerned that the results may be unduly influenced by that state. We therefore use a bounded influence regression technique.[3] In no case do the results in this section change substantially if the estimates are based on Ordinary Least Squares (OLS) or on OLS omitting Alaska.

Table 5 presents the results of regressing the change between 1988 and 1991 in the (log-odds) fraction of workers employed in food-service occupations on the average wage in the state for workers in these occupations in 1987 (shown in column 1), as well as a second regression of this variable together with the percentage earning less than the minimum wage (shown in column 2).

Note that the dependent variable in these regressions is the change in the log-odds fraction of workers employed in the food service industry which share a particular characteristic. It is defined as the change between 1988 and 1991 in log(x/(100-x)), where x is the percentage of food-service workers in the state with a particular characteristic. If, in a given year, 10 percent of workers share a particular trait then the log-odds value for that year is log(10/(100-10) = log(10/90).

We can put the results in units which are more familiar by finding the effects of a $1.00 difference in the average wage on the change in the percentage of employees in a category—adults, for example—in the following way: Multiply the coefficient reported in table 5 by x * (100-x)/100 where "x" is the percent of the population sharing the trait in question (from table 2). In practice, multiplying by 20 will generally give a good approximation.

The first specification, the ratio of food service to total employment (equation "A" in table 5), fails to find evidence that differences in employment growth across states can be explained by varying susceptibility to the minimum wage. Both the simple and multiple regressions fall far short of significance at conventional levels.

3 The technique used is the rreg routine in Stata (see Stata Corporation, 1993, Vol. III, 126-31).

Table 5 also gives the results of regressing the change in each of several socio-demographic groups (specifications B-G) of hourly workers in food-service occupations on the average wage received by food-service workers in the state and the percentage earning less than the minimum wage in 1987. In each case, the dependent variable is the change in the log-odds ratio of the demographic variable.

Table 5
The Effect of Minimum Wage Laws on Employment in Food-Service Occupations

Dependent Variable, the log-odds of	Independent Variable	1	2	P-Value
A. Food Service Employment/Total Employment				.872
	Average Wage	.02	.07	
		(.05)	(.07)	
	% Below Minimum Wage	—	.07	
			(.33)	
B. Adult				.000
	Average Wage	.45	.57	
		(.10)	(.11)	
	% Below Minimum Wage		1.05	
			(.52)	
C. Student				.061
	Average Wage	-.41	-.38	
		(.17)	(.21)	
	% Below Minimum Wage	—	.27	
			(1.00)	
D. High School Grad				.624
	Average Wage	.08	.09	
		(.08)	(.11)	
	% Below Minimum Wage	—	.10	
			(.51)	
E. Male				.158
	Average Wage	-.13	-.03	
		(.10)	(.13)	
	% Below Minimum Wage	—	.87	
			(.61)	
F. Full-Time Worker				.389
	Average Wage	.08	.18	
		(.11)	(.14)	
	% Below Minimum Wage	—	.86	
			(.68)	
G. Married				.285
	Average Wage	.08	-.05	
		(.11)	(.15)	
	% Below Minimum Wage	—	-1.00	
			(.68)	

Note: The dependent variable is the change in log(x/(100-x)) from 1988 to 1991 where x is the percentage of food-service workers in the state with the charactenstics. All coefficients have been multiplied by 100.

The results suggest strongly that the increased minimum wage induced a shift away from adults and towards teenagers. The fraction of workers who are adults grew more in states with high wages than in states with low wages—a minimum wage increase has less of an impact in a state where wages are relatively high. Using the approximation described above, the results indicate that, on average, the fraction of adult employees grew by about 9 percentage points more in states with an average wage of $4.50 than in states with an average wage of $3.50.[4] States where the increase in the minimum had less of an effect saw greater gains in adult food service employment. Conversely, those states where the minimum had more of an effect in actually raising wage levels experienced greater gains in teenage employment.

In addition, the fraction of adult workers grew more rapidly in states with more workers paid less than the minimum wage, a rough proxy for the tip credit allowed against the minimum wage—in the presence of a tip credit, a minimum wage increase has less of an impact on wage costs and therefore has

4 From Table 2, 27.87 percent of food service workers were teens, making adults 72.13 percent. Using the estimated coefficient for adults from regression 1 in Table 5 yields .45*72.13*(100-72.13)/100=9.04.

fewer labor market effects. Thus, both results suggest that where the minimum wage increase had more impact—states with lower average wages or which did not allow a tip credit to be claimed—teenage employment grew faster (or declined less rapidly).

There is also evidence of a shift towards students where the minimum wage was more binding. States with lower wages—and where the minimum wage increase had more of an impact—were more inclined to increase student employment in these occupations in the aftermath of minimum wage increases. On the other hand, there is no evidence that the ability to pay less than the minimum had much effect on students.

. . . those states where the minimum had more of an effect in actually raising wage levels experienced greater gains in teenage employment.

One possible explanation for the shift towards students is that it may be easier to take advantage of the training sub-minimum wage. However, the evidence suggests that very little use is made of the sub-minimum wage (Katz and Krueger, 1992; Card, Katz and Krueger, 1993). Furthermore, there is absolutely no evidence of a spike in the data at the sub-minimum.[5] Therefore, the sub-minimum wage is unlikely to account for this shift.

There is little evidence from the state data that minimum wage laws induced a shift in other demographic characteristics of food-service employees. There is some weak evidence of a shift towards male workers in the simple regression, but this must be treated with caution since it is not confirmed in the second regression. Indeed the results regarding payment below the minimum wage suggest the opposite.

It appears from the results in this section that the minimum wage increases induced a shift towards teenagers and students and away from nonstudents and adults who may have been more female as a group in this industry. It is plausible that the higher minimum wage attracted more student workers to food-service occupations. Many of these may have been talented workers who compared favorably with unskilled adult workers.

[in] states . . . which did not allow a tip credit to be claimed—teenage employment grew faster (or declined less rapidly).

In the light of the literature discussed in the introduction and the results presented above, this author can find little effect on employment levels from changes in the minimum. Nevertheless, minimum wages may have important effects on who gets low-wage jobs and cause a displacement of less-skilled workers which is not captured in an analysis which focuses solely on the *level* of employment.

Summary and Conclusion

Theoretical analysis suggests that it is important to consider the effects of minimum wage laws not only on wages and employment but also on the composition of employment. It is possible for a minimum wage to make workers worse off (in an ex ante sense) even if it increases employment and raises wages for low-wage jobs. The reason for this seemingly unlikely outcome is that workers who would not otherwise apply for low-wage jobs may be attracted to them when the wage is raised. Since the higher quality workers were previously unattracted to lower-wage jobs, the fact that the jobs have been made more attractive to them is of only minor consequence for them. However, the competition from higher quality workers makes low-skill workers worse off.

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5 For the first three months of 1991, the sub-minimum was $3.35. The number of observations with a wage of $3.35 in 1991 was 41, only slightly more than the number earning $3.25 (37) and fewer than the number earning $3.50 (80). For the last eight months of 1991, the sub-minimum wage was $3.62. Not a single member of the sample earned $3.62. The sub-minimum provisions expired in 1993.

The model is clearly stylized and cannot capture all of the important elements of the workings of a minimum wage law. Given the evidence that the minimum wage shifts employment towards teenagers and students, minimum wage laws could encourage relatively productive workers to get less education or to pursue their studies less intensively.

. . . minimum wages may have important effects on who gets low-wage jobs and cause a displacement of less-skilled workers which is not captured in an analysis which focuses solely on the level of employment.

As a consequence, any policy analysis of the effects of minimum wage laws must account for their impact on who gets the minimum-wage jobs. Looking only at the wage and total employment effects may give very misleading answers.

APPENDIX

How Minimum Wage Changes Can Lead to Worker Displacement

In their courses on economic principles, economists explain that prices will adjust until supply equals demand. They use the metaphor of an auctioneer calling out prices until the quantity of goods people want to buy is just equal to the quantity that other people want to sell. When asked how prices adjust in reality, economists typically reply that, faced with an abundance of buyers, firms will raise prices. Faced with a surplus of goods, firms lower their prices.

For many purposes, this may be a useful way of modelling firm behavior, but it is clearly a poor description of reality. Moreover, in the case of the labor market, it is difficult to understand how job vacancies and unemployment can exist simultaneously. The reality is that in most product markets (and in the market for unskilled workers) prices and wages are set before a worker or consumer appears up at the firm. There is also a maximum quantity that the firm will sell at that price or hire at that wage.

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When economists discuss goods which vary in quality, they point out that if consumers can tell which goods are better, the better goods will sell at a higher price. For some products this analysis is informative. Faster computers or those with more memory or more disk space are generally more expensive than comparable computers that are slower, have less memory or less disk space. On the other hand, anyone who has gone through a fruit bin picking out the ripe fruit and rejecting pieces that are bruised, knows that there can be considerable variation in the quality of goods that are sold at the same price. When variation in quality is sufficiently small and when there is no easy way to measure quality, a firm may simply set a single price for all comparable items.

A similar phenomenon arises in the labor market. For many jobs, firms just set a single wage regardless of who fills it. The wage may depend on seniority and, in some cases, on education and experience. However, the wage in such cases does not depend on the outcome of individual negotiations. Of course, there are many jobs, particularly in professional labor markets, where such negotiation does take place, but individualized payments are atypical in low-wage labor markets.

The final important feature of the labor market for our analysis is that workers do not apply for all jobs. Applying for a job is costly. At a minimum, the individual could use the time for other activities, including applying for a different job. Consequently, workers must weigh the cost of applying for a given job against the potential benefits. Everything else equal, they will prefer to apply where their prospects of employment are highest.

These four features — wages set in advance, wages set independently of most worker qualifications, limits on the number of workers which a firm will hire at the set wage, and workers caring about the probability that they will get a job for which they apply — imply that low-wage labor markets work very differently from the perfectly competitive labor market described in textbooks. Moreover, as we shall see, they result in very different predictions about the effect of a minimum wage law.

The most immediate implication of these features is that applicants care about the other candidates against whom they will be competing. Since firms set the wage in advance and cannot offer different wages to workers with different abilities, they will prefer to hire the best workers who apply for the job. Moreover, since the number of openings is limited, if enough higher quality workers apply lower quality

workers will not be hired. Workers will not want to apply where they expect many better candidates to apply. There is no point in applying for a job which you know you will not get. This phenomenon is familiar to college applicants; not everyone who would like to go to Harvard actually applies.

If workers prefer to apply for jobs where they expect to compete against the least number of better qualified applicants, making the job less desirable can actually increase the expected number of applicants. As college administrators know, the number of applicants and quality of admitted students are not necessarily positively related. A low-wage firm might find that by increasing the wage it offers, it increases the quality of the applicants but at the cost of getting fewer applicants. As the increased wage makes the job more attractive to better applicants, less qualified applicants will prefer to apply to other firms that have maintained their low-wage policy.

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In this situation, raising the wage may be undesirable from the firm's perspective. It pays higher wages and has a greater risk of vacancies. These negative effects are unlikely to be offset by a small increase in average worker quality.

Of course, it is also possible for higher wages to attract more workers. This will be true in the case of a job which is already attracting high quality workers. At a higher wage, more high quality workers will compete for the job. Here the firm will trade off the benefits of a reduced risk of vacancies against the higher cost of the increased wage.

Strikingly, this can generate significant differences from the standard model even when the productivity differences between workers are small. In the following paragraphs, I sketch a simple model designed to show the impact of taking into account the features of the labor market discussed above. Readers who are interested in the details are referred to Lang (1993).

To capture the idea that workers vary in quality, suppose that there are two types of workers, high and low quality. We maintain the usual assumption that there are many workers of both types. (Anyone concerned with the realism of assuming only two types of workers should recall that in the standard textbook model there is only **one** type of worker.) Let us further assume that each firm must rent some equipment before announcing a vacancy.

The market outcome in the standard textbook model is simple. High-quality workers are paid more than are low-quality workers. There are no vacancies and no unemployment.

When we modify the example to take account of key features of the labor market, the results are quite different. To capture the idea that it is costly to apply to a job, assume that each worker can only apply for a single job. To capture the limits on hiring at each firm, assume that each firm hires at most one worker. Finally, for simplicity we assume that workers maximize their expected earnings (the probability of getting the job multiplied by the wage associated with the job).

The results are dramatically different. Because workers only apply to one firm and firms only hire one worker, there is a risk of mismatching. Some firms receive more than one applicant, and thus some workers fail to obtain employment. Some firms receive no applicants, and their jobs remain vacant. The wage each firm sets is determined by a trade-off between the cost of raising the wage against the benefit of a reduced risk of a vacancy.

It can be shown that in this case, if the productivities of the high and low quality workers are not too different, some firms will offer a high wage and some will offer a low wage. The high-wage firms will attract only high-quality workers while the low-wage firm will attract only low-quality workers. Because they are better workers, high-quality workers would beat out the low-quality workers for the low-wage jobs. However, the wage differential is (just) sufficient to make it worth risking unemployment and applying for a high-wage job. The low-quality workers, on the other hand, have a much better shot

at getting a low-wage job in competition with other low-quality workers than they do of getting a high-wage job in competition with high-quality workers. Therefore, they choose to apply to low-wage jobs.

Similarly, firms offering a high wage benefit from the higher quality workers they attract. Low-wage firms benefit from the reduced wage payments they make. In addition, vacancy rates may differ between the two types of jobs. Whether vacancy rates are higher or lower in high-wage jobs depends on how much more productive high-quality workers are. Similarly, low-quality workers can have higher or lower unemployment rates than high-quality workers. It is certainly possible to construct examples in which high-quality workers have lower unemployment rates and high-wage firms have lower vacancy rates.

Note that low-quality workers would prefer employment in a high-wage job. Moreover, in general, high-wage firms would be willing to hire low-quality workers. However, because firms prefer high-quality workers, low-quality workers are only hired when no high-quality workers apply, and therefore they are better off applying for low-wage jobs.

The critical point is that low-quality workers strongly prefer to avoid competition with high-quality workers. This means that if a low-wage firm were to raise its wage to the point of being at least somewhat attractive to high-quality workers, it would actually reduce its expected number of applicants. In general, two features—that high-quality workers are (almost) indifferent to applying to the two types of jobs and low-quality workers prefer low-wage jobs—apply to any example in which the productivities of the two types of workers do not differ too much. The reason that the equilibrium takes this form is that firms catering to high-quality workers simply choose the wage which gives the right trade-off between wages and vacancies. In the absence of high-quality workers, firms catering to low-quality workers would choose a slightly lower wage than is chosen by high-wage firms. However, the desire to exclude high-quality applicants in order to encourage more overall applicants causes them to choose a wage just sufficiently low to deter high-quality applicants from applying.

These results are striking evidence of the dangers of drawing strong conclusions about the desirability of minimum-wage laws on the basis of their effect on employment.

We are now in a position to consider the effect of a minimum wage law. When the minimum wage is set above the level which would be offered by low-wage firms in the absence of legislation, low-wage jobs become attractive to some high-quality workers inducing some of them to apply for these jobs. If the minimum wage is not too high, the employment rate for these high-quality workers applying for minimum-wage jobs will be quite high. If only one high-quality worker applied for the job affected by the minimum wage increase, his employment rate would be 100%. Conversely, if that worker had continued to apply only for high-wage jobs, his employment rate would be substantially lower. Thus the employment rate of high-quality workers is increased by the minimum wage.

This does not mean that high-quality workers are necessarily better off, since some of them have accepted employment at a rate lower than they would have previously. (It should be remembered that in this exposition high-quality workers are essentially indifferent between applying for high-wage and low-wage jobs.) On the other hand, low-quality workers are clearly worse-off as a result of the increased competition from high-quality workers.

The entry of high-quality applicants into the minimum-wage sector is attractive to firms and induces entry. However, this may be insufficient to offset the damage to low-quality workers. The employment rate for low-quality workers will generally fall, as may their expected wage. Nevertheless, it can be shown that both low-wage employment and overall employment increase as a result of the minimum wage.

These results are striking evidence of the dangers of drawing strong conclusions about the desirability of minimum-wage laws on the basis of their effect on employment. In the simple model, employ-

ment rises. However, high-quality workers are no better off as a result of the minimum wage and low-quality workers may be strictly worse off.

As always, going from a simple model to the real world requires some care. The simple model just described assumes that there are just two skill levels and neglects the possibility that workers may affect their quality by choosing how much education to get. Nevertheless, these findings suggest that it is essential to consider the effects of the law on the distribution of employment when assessing the desirability of a statutory minimum.

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