Employment
Policies
INSTITUTE

Wage Growth Among Minimum Wage Workers

William E. Even, Miami University of Ohio
David A. Macpherson, Florida State University

June 2004

The Employment Policies Institute (EPI) is a nonprofit research organization dedicated to studying public policy issues surrounding employment growth. In particular, EPI research focuses on issues that affect entry-level employment. Among other issues, EPI research has quantified the impact of new labor costs on job creation, explored the connection between entry-level employment and welfare reform, and analyzed the demographic distribution of mandated benefits. EPI sponsors nonpartisan research that is conducted by independent economists at major universities around the country.

Dr. William E. Even is Professor of Economics at Miami University of Ohio and Associate Director of the Center for Pension and Retirement Research. His interests include pensions, minimum wage, employee benefits, and labor unions.

Dr. Even has authored several articles appearing in leading national economic journals, including *Applied Economics, Journal of Labor Economics,* and the *American Economic Review.* His work includes book publications in *Women and Work,* and he co-authored work in *Pension Coverage Issues for the 90s.* He completed his Ph.D. in Economics from the University of Iowa in 1984.

Dr. David A. Macpherson is Professor of Economics and Research Director of the Pepper Institute on Aging and Public Policy at Florida State University. His specialty is labor economics. His current research interests include pensions, discrimination, industry deregulation, labor unions, and the minimum wage.

Dr. Macpherson's research has appeared in the nation's most respected economics and industial relations journals, including the *Journal of Labor Economics*, *Industrial and Labor Relations Review*, and the *Journal of Human Resources*. He is a co-author of the undergraduate labor economics text *Contemporary Labor Economics* as well as the forthcoming book *Pensions and Productivity*. He received his Ph.D. from Pennsylvania State University in 1987.

Wage Growth Among Minimum Wage Workers

William E. Even, Miami University of Ohio and
David A. Macpherson, Florida State University

Executive Summary

Arguments in favor of increasing federal and state minimum wages often hinge on a belief that minimum wage employees are dependent on these government policies to receive a wage increase. Policymakers often believe that these employees receive raises only when the minimum wage is increased–implying a notion that these individuals are unable to increase their skill level and corresponding wages without the government's assistance. In this study, Drs. William Even and David Macpherson of Miami University of Ohio and Florida State University, respectively, show that wage growth among minimum wage employees is actually quite robust. Using over two decades of Current Population Survey (CPS) data, these authors dispel the notion that minimum wage employees are dependent on government policies to increase their wages. The authors also examine the factors that lead to wage growth and find that higher education and job training–along with a strong labor market–are significant contributing factors.

Between 1998 and 2002, median wage growth averaged 10.4 percent for minimum wage employees but only 1.7 percent for workers earning above the minimum—more than five times higher.

Wage Growth

As would be expected, minimum wage employment is a common entry point to the labor force. Individuals with few skills enter the workforce at this wage but quickly experience wage growth resulting from increased skill levels. This study finds that minimum wage employees are five times more likely than all employees to be new entrants to the labor force. Over the 23 years of data studied in the report, nearly two-thirds of minimum wage employees who continue employment are earning more than the minimum wage within 1-12 months.

The wage growth experienced by these employees is nontrivial and much larger than that of other employees. Over the past 23 years, the median annual growth in wages for minimum wage employees has been nearly six times that of employees earning more than the minimum wage. Employees at the top of the wage growth distribution experienced even larger wage growth. Over the entire sample period, minimum wage employ-

ees at the 75th percentile experienced wage growth that was 65 percent higher than their counterparts earnings more than the minimum wage; those at the 90th percentile experienced 40 percent higher wage growth.

Increased Wage Growth in Recent Years

While minimum wage employees have enjoyed significant wage growth over the past decades, this wage growth has been even higher since 1998. Between 1998 and 2002, median wage growth averaged 10.4 percent for minimum wage employees but only 1.7 percent for workers earning above the minimum—more than five times higher. Real wage growth at the 75th and 90th percentiles for the period averages 38.1 and 88.9 percent for employees at the minimum wage, and 20.6 and 63.0 percent, respectively, for employees starting above the minimum wage. Examining the trend over the entire data set reveals that the real wage growth of minimum wage employees has been rising relative to the rest of the labor force.

Minimum Wage Workforce

Over the last two decades, the percentage of employees earning the minimum wage peaked in 1980 at 5.3 percent and fell to 0.9 percent in 2003. The absolute number of employees fell sharply as well, from a peak of 4.4 million in 1980 to only 1.0 million in 2003.

The high number of minimum wage employees who are new entrants to the labor force, combined with the rapid wage growth enjoyed by these employees, leads to the minimum wage workforce being dominated by young employees. The percentage of employees earning the minimum wage drops sharply as individuals age. In addition, the percentage of employees at any age earning the minimum wage has dropped significantly over time. For any given age group, the percentage of employees earning the minimum wage in the 1996–2002 time period is one-third to one-fourth of what it was in the early 1980s.

Who Experiences Wage Growth?

The authors examined what factors make it more likely for an employee to experience significant wage growth. When the percentage of workers with job training in the occupation rises from 0 to 50 percent, the probability that employees in that occupation will rise above the minimum wage increases by 20.9 percentage points.

In addition to training, commitment to the workforce is a significant factor in determining wage growth. Compared with those working fewer than 10 hours per week, employees working 35 hours or more are nearly four times more likely to rise above the minimum wage. There are a number of factors potentially causing this, including greater commitment among full-time workers to acquiring the skills necessary to increase their wages.

Labor market conditions can also have a profound effect on the wage growth of minimum wage employees. While the overall unemployment rate has only a small effect on wage growth, the rate of the minimum wage relative to young high school graduates has a relatively large effect. Increasing the minimum wage by 10 percent relative to the median wage for young high school graduates would reduce the chance of rising above the minimum by 5.6 percentage points. Competition from these young and higher skilled employees affects the wage growth of current minimum wage employees.

After controlling for a host of factors, the authors found that the probability of rising above the minimum wage has drifted upward over time. The probability of wage growth within a year was 10 to 15 percentage points higher between 1998 and 2002 than it was in the early 1980s. A minimum wage employee in 2002 was over 2.5 times more likely to rise above the minimum wage than his counterpart in 1981.

Conclusions

This study disputes the notion that minimum wage employees are dependent on government policies to receive wage increases. Every day, minimum wage employees receive raises based on their hard work and increased skill levels. Nearly two-thirds receive a raise within a year of starting employment. These wage increases far outpace those of employees earning above the minimum. Furthermore, minimum wage employees over the last five years—a time period without a minimum wage hike—have experienced increasingly larger pay increases and higher exit rates from minimum wage employment.

Examining who rises above the minimum wage reveals that skill level is an important factor in determining wage rates. More educated and more dedicated employees are most likely to receive wage increases. In addition, increasing the minimum wage relative to the wages of young high school graduates (more skilled competitors for entry-level jobs) decreases the probability that minimum wage employees will receive wage increases.

Overall, the authors find that minimum wage employees depend on skill level and work effort—and not government assistance—to increase their wages.

Wage Growth Among Minimum Wage Workers

William E. Even, Miami University of Ohio, and
David A. Macpherson, Florida State University

1. Introduction

The most common argument in favor of increasing the minimum wage is that it would help lift workers at the bottom of the wage distribution out of poverty. However, economists have pointed out several shortcomings of this argument. First, if firms respond by cutting employment, a minimum wage hike could push some workers further into poverty. Numerous studies examine the effect of a minimum wage hike on employment, and there is considerable controversy over the size of the effects. Second, if minimum wage employment were generally an entry point for many workers that eventually leads to higher wages, a hike in the minimum wage would have little impact on lifetime poverty levels. Moreover, if a minimum wage hike reduces firm investments in training, an increase in the entry salary could be offset by reductions in subsequent earnings growth.

While many workers may begin their career at the minimum wage, approximately two-thirds realize sufficient wage growth to push them above the minimum wage within one year.

Several studies examine the extent of wage growth among minimum wage workers. Most recently, Even and Macpherson (2003) use Current Population Survey data for 1979 through 1999 and show that nearly two-thirds of minimum wage workers who continue employment receive a wage increase that pulls them above the minimum wage within one year. Several other studies find similar results.[1] Several conclusions can be drawn from the earlier work on this topic. First, wage growth among minimum wage workers is substantial, and a majority (60–70 percent) rise above the minimum wage within a year. Second, among minimum wage workers, wage growth is highest among the most educated, the young, those working full-time, and men.

This study extends our earlier work in a few ways. First, it adds several years of data to provide information on the recent wage growth performance of minimum wage workers. Second, it examines trends in the wage growth of minimum wage workers. Several findings are noteworthy. First, the wage growth of minimum wage workers has accelerated in recent years and has risen relative to wage growth of other workers. Second, minimum wage employment has become significantly less common over time. In recent years among workers over age 25, less than 1 percent are earning the minimum wage. Finally, while a hike in the minimum wage leads to an improvement in wage growth in the year of the hike for those who keep their jobs, it

could dampen subsequent wage growth for the targeted workers.

2. Data

The data for this study are drawn from 299 monthly CPS Outgoing Rotation Group (ORG) files between January 1979 and November 2003. The CPS is structured so that a given household will be sampled for four consecutive months, not interviewed for eight months, and then interviewed for another four consecutive months. When the household leaves the sample at the end of the first or last four-month period of interviews, it is part of an outgoing rotation group. The matched ORG files provide information on a person at the beginning and ending of a one-year period.[2] Given that our sample spans 1979 through 2003, there are 23 two-year panel data sets.[3]

For the data analysis, we first classify workers as to whether their hourly wage matches the minimum wage exactly or whether they earn more than the minimum wage. To determine a worker's minimum wage status, we use the federal minimum wage in effect during the month of the relevant survey unless the worker's state imposes a higher minimum wage, in which case the state minimum wage is used.

We construct four subsamples of data from the working population. The first-period (second-period) minimum wage sample is composed of workers who earn the minimum wage in the first year (second year) of a given two-year panel. A similar approach is used to create a first-period and second-period sample of workers earning above the minimum wage. The first-period samples of workers retain people who are no longer employed in the second period to allow for an analysis of exit from employment. The second-period worker samples retain people who were not employed in the first period to allow for an analysis of employment entry.

The wage rate used to classify workers is defined as the reported hourly wage for workers paid by the hour and usual weekly earnings divided by usual weekly hours for anyone not paid by the hour. First-period workers who are paid less than the minimum wage are excluded from the analysis since they may be exempt from coverage or may receive pay above and beyond the hourly wage rate (e.g., tips or commissions).[4]

3. Wage Growth

Table 1 contrasts several employment statistics illustrating the short-term nature of minimum wage employment. Using people who report employment in the second year of the panels, we calculate employment entry rates as the percentage of workers in the second year of the panels who reported that they were not employed in the first year of the panels. Over the 23 years of combined data, 39.5 percent of workers earning the minimum wage are entrants to the labor force, compared with only 8.5 percent of workers earning above the minimum wage. A minimum wage worker is nearly five times as likely to be a new entrant to the workforce versus those earning above the minimum wage.

The employment exit rate is measured as the percentage of workers who are employed in the first year of the panels but are no longer employed in the second year. Over the 23 years of data, 23.9 percent of workers earning the minimum wage in the

Table 1 Transition Rates for Minimum Wage Workers

	Entry Rate %		Exit Rate %		
First Year of Panel	At Minimum Wage	Above Minimum Wage	At Minimum Wage	Above Minimum Wage	Rise Above Minimum Wage, if Employed
1979	36.2	8.4	24.7	9.7	54.0
1980	35.8	8.5	25.7	9.4	52.7
1981	33.8	8.2	23.2	10.5	59.2
1982	38.3	9.3	24.3	9.6	58.0
1983	42.0	10.2	22.0	8.6	62.3
1984	45.6	9.0	24.4	8.8	67.0
1985	47.1	8.9	23.6	8.1	65.6
1986	43.7	9.3	25.3	8.5	65.2
1987	42.5	9.1	23.7	8.1	65.6
1988	42.2	8.5	24.4	8.0	68.8
1989	41.0	8.3	26.9	8.6	63.0
1990	36.1	7.5	25.9	9.3	50.4
1991	39.6	8.1	22.3	8.5	64.0
1992	41.6	8.3	22.3	8.3	68.9
1993	44.0	8.5	26.1	8.2	70.5
1994	40.8	9.3	21.5	8.2	67.6
1995	42.5	8.1	23.9	8.1	63.1
1996	40.4	8.0	23.5	7.6	63.7
1997	40.6	7.9	19.2	7.6	68.8
1998	42.1	7.8	22.9	7.7	75.7
1999	38.8	8.5	21.1	8.2	73.5
2000	35.5	7.8	24.2	8.7	70.8
2001	42.2	8.0	23.7	9.1	68.7
2002	36.0	8.2	24.6	8.8	66.0
All	**39.5**	**8.5**	**23.9**	**8.6**	**62.56**
Sample Size	34,044	1,249,941	35,809	1,242,417	27,238

first year of the panels exit employment by the second period. The exit rate is only 8.6 percent for workers earning above the minimum wage. Thus, minimum wage workers have much less attachment to the labor market and are more likely to exit employment.

Among workers earning the minimum wage in the first year of the panels and who continue employment into the second year, the majority receive a wage increase that is sufficient to push them above the minimum wage. Over the 23 years of combined data, an average of 62.6 percent of the minimum wage workers who continue employment are earning more than the minimum wage in the subsequent year. Not surprisingly, the percentage who rise above the minimum wage in a given year tends to be lower in years when there is an intervening hike in the federal minimum wage. These increases occurred in 1979, 1980, 1981, 1990, 1991, 1996, and 1997.

Table 2 compares the real wage growth of minimum wage workers with that of workers earning above the minimum wage. Real wages are calculated using CPI-U and reflect 2003 dollars. Real wage growth for each group is reported at several percentiles of the wage growth distribution (10, 25, 50, 75, and 90). Over the 23-year period, minimum wage workers experienced significantly higher real wage growth than workers earning above the minimum wage at all percentiles of the wage growth distribution. This is despite the fact that, in the absence of a minimum wage hike, inflation reduces the real value of the minimum wage from year to year. The percentage increase in real wages for the median minimum wage worker averaged 6.7 percent over the 23 years of panel data but only 1.2 percent for workers earning above the minimum wage.

For workers at the lower end of the wage growth distribution (the 10th and 25th percentile) who experience declines in real wages,

Table 2 Pecent Real Wage Growth Comparisons

		10th Percentile		25th Percentile		50th Percentile		75th Percentile		90th Percentile	
First Year of Panel	Inflation Rate	At Minimum Wage	Above Minimum Wage	At Minimum Wage	Above Minimum Wage	At Minimum Wage	Above Minimum Wage	At Minimum Wage	Above Minimum Wage	At Minimum Wage	Above Minimum Wage
1979	11.2	-7.0	-30.5	-3.9	-11.6	-1.5	-1.1	10.7	12.4	47.2	38.9
1980	9.5	-5.1	-31.9	-1.6	-11.4	0.7	-0.2	17.5	13.6	47.2	39.7
1981	6.1	-7.6	-30.7	-5.6	-10.2	-1.9	1.5	12.7	14.5	48.5	41.0
1982	4.2	-4.7	-31.3	-3.8	-9.9	0.2	1.3	15.0	15.6	52.0	47.1
1983	4.3	-4.4	-29.9	-4.1	-9.6	0.4	1.0	20.5	15.4	55.5	44.2
1984	3.6	-3.6	-29.9	-3.4	-8.9	3.6	1.7	25.1	15.9	72.7	49.9
1985	1.9	-1.5	-29.5	-1.3	-5.2	7.4	4.5	32.6	20.6	73.0	51.4
1986	3.6	-4.2	-30.7	-3.5	-8.6	3.0	0.8	27.6	15.6	72.6	44.5
1987	4.1	-4.1	-31.0	-3.8	-10.2	6.0	0.8	29.3	15.5	72.4	47.8
1988	4.8	-4.9	-38.4	-4.4	-12.4	7.2	0.1	32.3	15.1	75.0	47.7
1989	5.4	-5.0	-30.6	0.6	-10.2	10.7	-0.2	36.8	14.6	96.6	46.3
1990	4.2	-4.5	-32.5	6.6	-11.0	8.6	0.4	21.5	14.4	49.4	45.5
1991	3.0	-3.1	-31.8	-2.9	-10.4	2.8	0.8	14.2	14.0	43.9	45.4
1992	3.0	-3.1	-32.0	-2.7	-10.7	3.1	0.6	20.3	13.9	59.9	44.5
1993	2.6	-2.9	-36.6	-2.4	-11.5	8.5	0.9	23.1	15.8	60.7	50.1
1994	2.8	-3.1	-37.1	-2.8	-11.1	7.1	1.0	25.8	16.4	71.6	53.5
1995	3.0	-2.9	-33.5	4.1	-11.4	13.9	0.7	36.7	16.2	105.0	49.4
1996	2.3	-1.8	-34.8	8.5	-10.2	15.1	1.8	38.1	17.5	86.1	57.7
1997	1.6	-1.5	-35.1	6.6	-9.1	13.2	3.1	33.8	20.7	79.8	59.5
1998	2.2	-2.6	-35.8	-0.3	-11.4	9.9	2.3	32.5	19.4	89.2	57.7
1999	3.4	-3.5	-41.3	-2.7	-13.1	9.8	1.1	31.8	19.5	77.1	61.1
2000	2.8	-3.4	-37.9	0.9	-13.2	13.4	1.7	45.3	21.5	98.6	64.8
2001	1.6	-2.3	-38.7	0.6	-13.4	10.4	2.0	38.4	21.4	89.8	66.7
2002	2.3	-2.9	-38.5	-2.1	-13.9	8.5	1.3	42.7	21.4	90.0	64.7
All	**3.9**	**-3.7**	**-33.8**	**-1.0**	**-10.8**	**6.7**	**1.2**	**27.7**	**16.7**	**71.4**	**50.8**
1998 to 2002	2.5	-3.0	-38.5	-0.7	-13.0	10.4	1.7	38.1	20.6	88.9	63.0

Figure 1 Median Real Wage Growth and Change in Real Minimum Wage

the declines are substantially smaller for minimum wage workers than for people earning above the minimum wage. For example, over the entire sample period, wage growth at the 10th percentile averaged –3.7 percent for minimum wage workers and –33.8 percent for workers starting above the minimum wage. This is not surprising since the real wage for a minimum wage worker can drop only if the worker moves into employment that pays less than the minimum (perhaps because the job is exempt from minimum wage laws), or if the real value of the minimum falls because of inflation.

For workers at the top end of the wage growth distribution (the 75th and 90th percentiles), wage growth is higher for workers who start at the minimum wage. Over the entire sample period, the 75th percentile of real wage growth averaged 27.7 percent for minimum wage workers and 16.7 percent for workers starting above the minimum; the 90th percentile is 71.4 and 50.8 percent for the respective groups.

Despite the lack of any federal minimum wage hike since September 1997, median wage growth for minimum wage workers has been quite strong over the past several years. Between 1998 and 2002, median wage growth averaged 10.4 percent for minimum wage workers but only 1.7 percent for workers earning above the minimum. Real wage growth at the 75th and 90th percentiles for the 1998–2002 period averaged 38.1 and 88.9 percent for workers at the minimum wage and 20.6 and 63.0 percent for workers starting above the minimum wage. These growth rates exceed the average for the 23 combined years and suggest something has led to increased wage growth in recent years.

Figure 1 presents the median real wage growth of minimum wage workers and workers earning above the minimum wage. The comparison is striking. The real wage growth of minimum wage workers has been rising relative to the rest of the workforce over time.

Table 3 provides statistics on the extent of minimum wage employment since 1979. The nominal value of the federal minimum wage started at $2.90 in 1979 and increased to $5.15 in 2003. Measured in constant 2003 dollars, the real value of the minimum wage fell from $7.21 in 1979 to $5.15 in 2003.

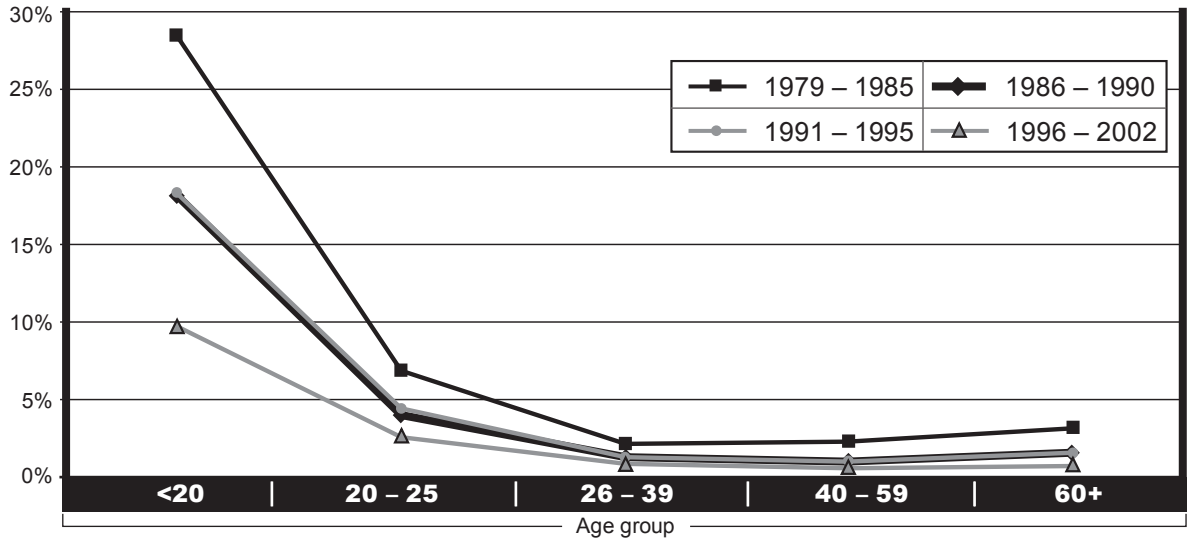
As the real value of the minimum wage fell over time, minimum wage employment should have become less common. Consistent with this hypothesis, the correlation coefficient between the percentage of workers earning the minimum wage and the real value of the minimum wage (both presented in Table 3) is 0.77. Also, the percentage of workers earning the minimum wage peaked in 1980 at 5.3 percent and fell to 0.9 percent in 2003. The number of workers earning the minimum wage fell sharply as well, from a peak of 4.4 million in 1980 to only 1.0 million in 2003.

Since a large share of minimum wage workers are entering minimum wage jobs and experience wage growth sufficient to push them above the minimum wage shortly thereafter, the fraction of workers earning the minimum wage should drop with worker age. Figure 2

Table 3 Means for Minimum Wage Workers

Year	Federal Minimum Wage	Real Federal Minimum Wage ($2003)	Percentage at Minimum Wage	Number at Minimum Wage	Date of Minimum Wage Hike
1979	$2.90	$7.21	4.5	3,766,487	01/01/1979
1980	$3.10	$6.93	5.3	4,415,779	01/01/1980
1981	$3.35	$6.84	4.8	4,044,222	01/01/1981
1982	$3.35	$6.45	4.7	3,919,222	
1983	$3.35	$6.19	4.8	4,059,431	
1984	$3.35	$5.93	4.4	3,936,452	
1985	$3.35	$5.73	4.1	3,742,774	
1986	$3.35	$5.62	3.6	3,318,283	
1987	$3.35	$5.43	3.2	3,067,549	
1988	$3.35	$5.21	2.8	2,717,052	
1989	$3.35	$4.97	2.2	2,216,382	
1990	$3.80	$5.35	1.5	1,540,500	04/01/1990
1991	$4.25	$5.74	2.9	2,837,583	04/01/1991
1992	$4.25	$5.57	2.8	2,803,424	
1993	$4.25	$5.41	2.5	2,519,684	
1994	$4.25	$5.28	2.0	2,097,101	
1995	$4.25	$5.13	1.8	1,935,317	
1996	$4.75	$5.57	1.7	1,832,520	10/01/1996
1997	$5.15	$5.90	1.9	2,070,152	09/01/1997
1998	$5.15	$5.81	1.8	1,996,780	
1999	$5.15	$5.69	1.5	1,723,351	
2000	$5.15	$5.50	1.3	1,467,243	
2001	$5.15	$5.35	0.9	1,089,664	
2002	$5.15	$5.27	1.0	1,125,973	
2003	$5.15	$5.15	0.9	1,004,415	

Figure 2 Percentage of Workers Earning Minimum Wage, by Age



presents data consistent with this hypothesis. It presents the fraction of workers earning the minimum wage for five different age groups (younger than 20, 20–25, 26–39, 40–59, and older than 59). The statistics are calculated for four different time periods to examine whether the aging effect on minimum wage employment has changed over time.

Figure 2 supports two conclusions. First, as expected, the percentage of workers earning the minimum wage drops sharply as workers age. Second, there has been a sharp decrease over time in the percentage of workers earning the minimum wage for all age groups. As some indication of the extent of how aging affects the share of workers earning the minimum wage, in the most recent time period (1996–2002), the percentage of workers earning the minimum wage drops from 9.7 percent for workers under age 20, to 2.6 percent for workers age 20–25, to less than one percent for workers in the three age groups over age 25. Minimum wage employment is a fairly rare occurrence for people beyond age 25.

The fraction of workers earning the minimum wage dropped dramatically for all age groups over the past 25 years. For any given age group, the percentage of workers earning the minimum wage in the 1996–2002 time period is approximately one-third to one-fourth of what it was in the early 1980s. For workers under age 20, the percentage earning the minimum wage was 28.4 percent in the 1979–1985 time period but fell to 9.7 percent in the 1996–2002 period. For workers age 20–25, the percentage earning the minimum wage fell from 6.8 to 2.6 percent over the same two time periods.

4. Regression Analysis

The rapid wage growth of minimum wage workers means that minimum wage employment will be fairly short-lived for most workers. This section uses regression methods to examine which factors affect the probability that a worker rises above the minimum wage within a year and the level of wage growth.

The regression models of real wage growth include controls for the worker's age, education, gender, race, and part-time status. Since access to job training is likely to affect wage growth, we also include two variables that measure the fraction of workers in the three-digit occupation that receive job training. Each ranges from 0 to 1 and indicates the percentage of workers in a three-digit occupation who receive training provided by the firm or other types of training.[5] The average minimum wage worker is in an occupation where 16.5 percent

Table 4 Means for Minimum Wage Workers

Variable	MPE	t-stat
Age (age 16 to 18 reference group):		
19 to 21	0.022	1.92
22 to 25	0.027	2.03
26 to 35	0.002	0.21
36 to 45	-0.002	-0.15
46 to 55	-0.017	-1.32
56 to 64	-0.083	-5.83
65 to 99	-0.194	-12.04
Education (less than 9th grade reference group):		
Less than High School	0.068	5.84
High School Graduate	0.109	9.88
Some College	0.111	8.59
College Graduate	0.143	6.88
Graduate Degree	0.172	3.93
Job Training:		
Provided by Firm	0.418	10.07
Other Types of Training	0.001	0.02
Female	-0.068	-10.40
Race/Ethnic Status (White, non-Hispanic reference group):		
Black	-0.025	-2.66
Other Race	0.008	0.40
Hispanic	-0.052	-4.60
Weekly Hours Worked (1 to 9 hours reference group):		
10 to 19	0.033	2.54
20 to 29	0.074	5.81
30 to 34	0.071	4.86
35 or more	0.130	10.09
Age 25 to 61 Unemployment Rate	-0.012	-6.96
Minimum Wage to Median Age 25 to 34 High School Graduate Wage	-0.563	-10.52
Percentage Increase in Real Minimum Wage	-0.739	-6.25
Lagged Percentage Increase in Real Minimum Wage	-0.349	-3.28

Continued ...

Table 4 Continued Means for Minimum Wage Workers

Variable	MPE	t-stat
Year (1979 reference group):		
1980	0.006	0.38
1981	0.044	3.05
1982	0.044	2.62
1983	0.092	5.76
1984	0.112	6.00
1985	0.095	3.84
1986	0.090	5.52
1987	0.076	4.47
1988	0.103	5.79
1989	0.083	4.02
1990	0.017	0.69
1991	0.123	6.90
1992	0.146	8.94
1993	0.155	8.80
1994	0.121	4.21
1995	0.122	3.70
1996	0.148	6.29
1997	0.210	9.87
1998	0.222	11.43
1999	0.174	8.40
2000	0.159	6.95
2001	0.158	6.14
2002	0.156	5.87
Sample Size 27,238 | Log-LikeliHood –17,168.099 | Psuedo R-Squared 0.0468		

of the workers receive firm training and 5.0 percent of the workers receive other training. The expectation is that workers in occupations with higher training levels will experience greater wage growth and be more likely to receive sufficient wage growth to rise above the minimum wage.

Since wage growth is likely to be affected by labor market conditions, we include two proxies for the state labor market conditions. For each worker, we merge quarterly labor market data for the worker's state of residence. The labor market data corresponds to the quarter of the first year in each panel data set.[6] The variables include the ratio of the minimum wage to the median wage of high school graduates (excluding those with some college) age 25–34 and the prime age (age 25 – 61) unemployment rate. Our expectation is wage growth will be enhanced by a lower unemployment rate or when the minimum wage is low relative to the wage earned by young high school graduates.

Table 4 provides the results of a probit model predicting the probability that a worker will receive sufficient wage growth to rise above the minimum wage. The coefficients are transformed to represent the effect of a one-unit change in the relevant explanatory variable on the probability of an exit. These marginal probability effects (MPEs) are evaluated for a worker with characteristics equal to the sample mean.[7]

The results are generally consistent with expectations. First, both formal education and job training improve the chance that a worker rises above the minimum wage. A high school graduate is 10.9 percentage points more likely to rise above the minimum wage within a year than a person with eight or fewer years of education. When the occupation-specific level of firm-provided training rises from 0 to 50 percent of workers, the probability of rising above the minimum increases by 20.9 percentage points.

Workers with the greatest level of commitment to the labor market are also the most likely to succeed in rising above the minimum wage. Compared with those working fewer than 10 hours per week, a person who is working 35 or more hours is 13.0 percentage points more likely to rise above the minimum wage. This might be because employers are more willing to invest in the training of a full-time worker. Alternatively, full-time workers may have a greater commitment to acquiring skills since there is a greater reward from any given increase in the hourly wage.

Labor market conditions can also have an important effect on the chance that a worker rises above the minimum wage. The effect of a 1 percentage point increase on the unemployment rate is statistically significant but would reduce the chance of rising above the minimum wage by only 1.2 percentage points. However, increasing the minimum wage by 10 percent relative to the median wage for young high school graduates would reduce the chance of rising above the minimum by 5.6 percentage points. When the minimum wage rises relative to the wage of high school graduates, wage growth is dampened.

An increase in the real minimum wage also reduces the chance that a worker rises above the minimum wage. Moreover, this effect carries over into at least one additional year. Increasing the minimum wage by 10 percent in a given year reduces the chance of rising above the minimum by 7.4 percentage points in the first year following the hike and by 3.5 percentage points in the subsequent year.

Even after controlling for all these worker characteristics and labor market conditions, the probability of rising above the minimum has drifted upward over time. Other things being the same, the probability of rising above the minimum wage within a year was 10 to 15 percentage points higher between 1998 and 2002 than it was in the early 1980s.

Since wage growth figures can have significant outliers, we use median regression methods to examine the determinants of real wage growth. Whereas ordinary least squares chooses coefficients to minimize the sum of squared errors, median regressions minimize the sum of absolute errors and thus place less weight on outliers in the data. To illustrate the interpretation of a median regression, consider the following specification describing real wage growth:

$$dw_i = X_i\beta + \varepsilon_i$$

where dw_i represents the percentage change in real wages for person i, X_i is a vector of characteristics describing person i, β is a vector of coefficients, and ε_i is an error term. If the above equation is estimated with median regression methods, the prediction represents the estimate of the median wage growth for a group of workers with observed characteristics described by X_i.

The same controls that were employed in the probit models explaining whether a work-

er rises above the minimum wage are employed. For the sake of comparison, we also estimate a median wage growth model for workers earning above the minimum wage. The results are in Table 5.

The pattern of results for the real wage growth equation is similar to the probit models explaining whether a worker rises above the minimum. Comparing the results for workers whose wage is at the minimum wage versus above the minimum wage leads to a few conclusions. First, job training has a much larger effect on the median wage growth of minimum wage workers. Compared with an

Table 5 Determinants of Real Wage Growth

Variable	At the Minimum Wage		Above the Minimum Wage	
	coefficient	t-stat	coefficient	t-stat
Age (age 16 to 18 reference group):				
19 to 21	0.012	3.14	0.008	1.74
22 to 25	0.042	10.01	0.003	0.65
26 to 35	0.012	3.36	-0.012	-3.16
36 to 45	0.013	3.25	-0.019	-5.19
46 to 55	0.005	1.14	-0.026	-6.95
56 to 64	-0.006	-1.40	-0.029	-7.53
65 to 99	-0.032	-6.38	-0.046	-9.33
Education (less than 9th grade reference group):				
Less than High School	0.012	3.22	0.010	3.01
High School Graduate	0.029	7.83	0.017	5.95
Some College	0.048	10.98	0.018	6.24
College Graduate	0.107	14.99	0.024	7.75
Graduate Degree	0.207	13.57	0.026	7.36
Job Training:				
Provided by Firm	0.155	11.84	0.004	0.92
Other Types of Training	0.092	5.12	0.001	0.13
Female	-0.032	-15.50	0.005	4.86
Race/Ethnic Status (White, non-Hispanic reference group):				
Black	0.002	0.71	-0.006	-3.04
Other Race	0.003	0.42	-0.006	-1.51
Hispanic	-0.022	-6.08	-0.003	-1.43
Weekly Hours Worked (1 to 9 hours reference group):				
10 to 19	0.005	1.21	0.031	5.92
20 to 29	0.018	4.31	0.039	7.93
30 to 34	0.020	4.10	0.042	8.04
35 or more	0.049	11.45	0.039	8.62
Age 25 to 61 Unemployment Rate	-0.004	-6.38	-0.002	-5.11
Minimum Wage to Median Age 25 to 34 High School Graduate Wage	-0.231	-13.40	-0.011	-1.22
Percentage Increase in Real Minimum Wage	0.723	18.92	0.065	4.32
Lagged Percentage Increase in Real Minimum Wage	-0.144	-4.23	0.026	1.69

Continued ...

Table 5 Continued Determinants of Real Wage Growth

Variable	At the Minimum Wage		Above the Minimum Wage	
	coefficient	t-stat	coefficient	t-stat
Year (1979 reference group):				
1980	0.003	0.70	0.009	2.70
1981	0.004	0.86	0.026	7.73
1982	0.013	2.40	0.030	8.20
1983	0.028	5.15	0.026	7.19
1984	0.032	4.99	0.031	7.26
1985	0.036	4.21	0.051	9.61
1986	0.027	4.81	0.019	5.50
1987	0.038	6.59	0.019	5.39
1988	0.041	6.81	0.010	2.78
1989	0.029	4.11	0.002	0.56
1990	0.015	1.86	0.006	1.55
1991	0.028	4.46	0.014	3.98
1992	0.043	7.45	0.016	4.60
1993	0.060	9.74	0.019	5.52
1994	0.058	5.88	0.021	4.61
1995	0.057	4.92	0.009	1.76
1996	0.062	7.38	0.019	4.78
1997	0.074	9.32	0.033	8.66
1998	0.077	10.79	0.030	8.52
1999	0.071	9.72	0.018	5.11
2000	0.090	11.26	0.024	7.01
2001	0.067	7.43	0.027	7.87
2002	0.075	7.92	0.023	5.75
Constant	**0.120**	**9.85**	**-0.035**	**-4.15**
Sample Size	27,238		113,724	
Pseudo R-Squared	0.0484		0.0029	

occupation with no job training, wage growth is 7.3 percentage points higher for the median worker employed in an occupation where 50 percent of workers report firm training. For a worker who starts above the minimum wage, the effect of this additional training is statistically insignificant.

Compared with workers earning above the minimum wage, the wage growth of minimum wage workers is more sensitive to minimum wage hikes and the value of the minimum wage relative to the average for high school graduates. A 10 percent increase in the minimum relative to the average for high school graduates would reduce wage growth at the median by 2.3 percentage points but would have a statistically insignificant effect on the wage growth of workers paid above the minimum. This reduced wage growth may be the result of firms cutting back on job training when the minimum wage becomes more binding. Alternatively, if firms offer deferred pay to workers, a higher minimum wage may mean that firms hold worker's wages flat for a longer period to make up for the higher starting wage rate.

Not surprisingly, if the minimum wage is increased at the same rate as the wages of high

school graduates, real wage growth of minimum wage workers is enhanced—at least temporarily. Our estimates indicate that a 10 percentage point increase in the minimum wage would increase median wage growth by 7.2 percentage points in the first year of the hike but reduce wage growth by 1.4 percentage points in the year after the hike. The effects of a contemporaneous minimum wage increase on the wage growth of workers who start above the minimum is statistically significant but quantitatively quite small. This may reflect a "ripple effect" of a minimum wage hike where workers who were paid slightly above the minimum

Table 6 Percentage Real Wage Growth Models, by Percentile

Variable	50th Percentile		75th Percentile		90th Percentile	
	coefficient	t-stat	coefficient	t-stat	coefficient	t-stat
Age (age 16 to 18 reference group):						
19 to 21	0.012	3.14	0.026	2.59	0.026	1.09
22 to 25	0.042	10.01	0.134	11.48	0.302	11.16
26 to 35	0.012	3.36	0.094	9.17	0.257	10.84
36 to 45	0.013	3.25	0.075	6.95	0.289	11.51
46 to 55	0.005	1.14	0.080	6.84	0.312	11.48
56 to 64	-0.006	-1.40	0.039	3.14	0.185	6.42
65 to 99	-0.032	-6.38	-0.010	-0.75	0.068	2.14
Education (less than 9th grade reference group):						
Less than High School	0.012	3.22	0.045	4.29	0.107	4.38
High School Graduate	0.029	7.83	0.093	9.31	0.224	9.68
Some College	0.048	10.98	0.179	15.04	0.407	14.75
College Graduate	0.107	14.99	0.467	24.00	1.017	22.44
Graduate Degree	0.207	13.57	0.825	19.77	1.914	19.53
Job Training:						
Provided by Firm	0.155	11.84	0.451	12.64	1.004	11.91
Other Types of Training	0.092	5.12	0.290	5.97	0.676	6.03
Female	-0.032	-15.50	-0.111	-18.91	-0.248	-17.61
Race/Ethnic Status (White, non-Hispanic reference group):						
Black	0.002	0.71	0.015	1.87	0.024	1.27
Other Race	0.003	0.42	-0.001	-0.06	0.018	0.42
Hispanic	-0.022	-6.08	-0.047	-4.68	-0.067	-2.82
Weekly Hours Worked (1 to 9 hours reference group):						
10 to 19	0.005	1.21	0.013	1.10	0.025	0.93
20 to 29	0.018	4.31	0.028	2.45	0.035	1.31
30 to 34	0.020	4.10	0.050	3.69	0.072	2.29
35 or more	0.049	11.45	0.125	10.59	0.180	6.58
Age 25 to 61 Unemployment Rate	-0.004	-6.38	-0.009	-5.82	-0.011	-3.01
Minimum Wage to Median Age 25 to 34 High School Graduate Wage	-0.231	-13.40	-0.710	-14.47	-1.216	-10.25
Percentage Increase in Real Minimum Wage	0.723	18.92	0.600	5.70	0.903	3.75
Lagged Percentage Increase in Real Minimum Wage	-0.144	-4.23	-0.163	-1.72	-0.382	-1.79

Continued ...

Table 6 Continued Percentage Real Wage Growth Models, by Percentile

Variable	50th Percentile		75th Percentile		90th Percentile	
	coefficient	t-stat	coefficient	t-stat	coefficient	t-stat
Year (1979 reference group):						
1980	0.003	0.70	0.009	0.68	0.004	0.14
1981	0.004	0.86	0.011	0.82	0.034	1.09
1982	0.013	2.40	0.019	1.26	0.026	0.73
1983	0.028	5.15	0.066	4.44	0.066	1.88
1984	0.032	4.99	0.084	4.77	0.107	2.62
1985	0.036	4.21	0.112	4.81	0.090	1.66
1986	0.027	4.81	0.068	4.42	0.154	4.34
1987	0.038	6.59	0.091	5.77	0.137	3.73
1988	0.041	6.81	0.092	5.53	0.152	3.92
1989	0.029	4.11	0.058	2.98	0.165	3.78
1990	0.015	1.86	-0.012	-0.54	-0.073	-1.38
1991	0.028	4.46	0.008	0.48	0.015	0.38
1992	0.043	7.45	0.052	3.28	0.077	2.11
1993	0.060	9.74	0.068	3.96	0.048	1.20
1994	0.058	5.88	0.102	3.75	0.061	0.98
1995	0.057	4.92	0.104	3.30	0.180	2.45
1996	0.062	7.38	0.128	5.60	0.128	2.42
1997	0.074	9.32	0.141	6.41	0.233	4.56
1998	0.077	10.79	0.156	7.83	0.237	5.15
1999	0.071	9.72	0.156	7.73	0.223	4.72
2000	0.090	11.26	0.202	9.13	0.230	4.46
2001	0.067	7.43	0.141	5.65	0.233	4.01
2002	0.075	7.92	0.222	8.44	0.278	4.54
Constant	**0.120**	**9.85**	**0.442**	**13.05**	**0.813**	**10.21**
Sample Size	27,238		27,238		27,238	
Psuedo R-Squared	0.0484		0.0796		0.1292	

would have wage growth enhanced if the minimum surpasses their old wage.

A final point worth noting from the wage growth equations is the trend toward greater wage growth in the minimum wage population, even after controlling for the changing composition of the minimum wage workforce and labor market conditions. Compared with the early 1980s, median wage growth between 1998 and 2002 has been approximately five to seven percentage points higher. This trend does not emerge for workers earning above the minimum wage. Median wage growth since 1998 has been virtually identical to that in the early 1980s.

It is well known in the labor literature that wage inequality rose during the 1980s, partly as the result of increasing returns to skill.[8] This rising wage inequality may also have contributed to greater inequality in wage growth as workers accumulated skills.

To examine the effect of rising returns to skill on the wage growth of minimum wage workers, we estimate quantile regressions of real wage growth at the 75th and 90th percentile. The results are presented, along

with the earlier median regression results, in Table 6.

A comparison of coefficients across quantiles reveals several striking results. First, the coefficients on the year dummy variables reveal how the distribution of wage growth has changed over time, holding other things constant. Comparing 2002 and 1980, the estimates suggest that wage growth is about 8 percentage points higher at the median, 22 points higher at the 75th percentile, and 28 points higher at the 90th percentile. The much higher wage growth in the upper percentiles is consistent with an increasing return to skill acquisition. It appears that increasing wage inequality has allowed the best workers to improve the size of their wage gains relative to others.

5. Summary

While many workers may begin their career at the minimum wage, approximately two-thirds realize sufficient wage growth to push them above the minimum wage within one year. As a result, the fraction of workers earning the minimum wage falls sharply with age. Between 1996 and 2002, approximately 10 percent of workers under age 20 earned the minimum wage, while less than 1 percent of workers over age 25 earned the minimum.

Over the past 25 years, there has been a dramatic decline in the fraction of workers earning the minimum wage. While 28 percent of workers under age 20 earned the minimum wage in the 1979–1985 period, less than 10 percent of workers under age 20 earned the minimum between 1996 and 2002.

Our empirical analysis illustrates that the wage growth of minimum wage workers has improved over time. The greater wage growth might reflect increasing returns to the skills acquired on the job, from training, or from greater levels of education.

The empirical analysis also illustrates that an increase in the minimum wage may improve wage growth for workers in the year of the hike, but could have a negative effect on subsequent wage growth. The negative effect on subsequent wage growth could be the result of firms cutting back on job training when the minimum wage is increased. Alternatively, firms may respond to the higher starting wage by flattening the wage profile for workers in subsequent years. Consequently, employers may eventually shift the cost of this minimum wage hike back to their workers by reducing the rate of wage growth.

References

Carrington, William, and Bruce Fallick (2001). "Do Some Workers Have Minimum Wage Careers?" *Monthly Labor Review* 124, 17–27.

Even, William E., and David A. Macpherson (1996). "The Consequences of Minimum Wage Indexing." *Contemporary Economic Policy* 14, 67–77.

—— (2003). "The Wage and Employment Dynamics of Minimum Wage Workers." *Southern Economic Journal* 69, 676–690.

Grossberg, Adam J., and Paul Sicilian (1999). "Minimum Wages, On-the-Job Training, and Wage Growth." *Southern Economic Journal* 65, 539–556.

Hirsch, Barry T., and David A. Macpherson (2003). *Union Membership and Earnings Data Book: Compilations from the Current Population Survey* (2003 Edition), Bureau of National Affairs, Washington, D.C.

Levy, Frank, and Richard Murnane (1992). "U.S. Earnings Levels and Earnings Inequality: A Review of Recent Trends and Proposed Explanations." *Journal of Economic Literature* 30, 1333–1381.

Long, James E. (1999). "Updated Estimates of the Wage Mobility of Minimum Wage Workers." *Journal of Labor Research* 20, 493–503.

Schiller, Bradley (1994). "Moving Up: The Training and Wage Gains of Minimum Wage Entrants." *Social Science Quarterly* 75, 622–636.

Smith, Ralph, and Bruce Vavrichek (1992). "The Wage Mobility of Minimum Wage Workers." *Industrial and Labor Relations Review* 46, 82–88.

Endnotes

1. For example, Smith and Vavrichek (1992) used the 1984 and 1985 panels of the Survey of Income and Program Participation (SIPP); Schiller (1994) uses data from the National Longitudinal Survey of Youth to examine workers entering the labor market in 1980; Grossberg and Sicilian (1999) use Employment Opportunities Pilot Project data from 1980–1982; Long (1999) uses the 1992 and 1993 Survey of Income and Program Participation panels; Carrington and Fallick (2001) use National Longitudinal Survey of Youth data to examine the factors that influence the fraction of a worker's career employed in jobs paying close to the minimum wage.
2. For more information about the matching procedure, see the data appendix for Even and Macpherson (2003).
3. The first two-year panel is for 1979–1980 and the last is for 2002–2003. The sample sizes are reduced to roughly half the normal size for the 1984/5 and 1994/5 panels and to one-quarter for 1985/6 and 1995/6 because of sample redesigns in those years that reduced the number of observations that could be matched between years.
4. The hourly wage measure is modified to account for workers with "top coded" earnings or variable hours. To estimate the mean earnings of top coded workers it is assumed that the upper tail of weekly earnings distribution follows a Pareto distribution. These estimated mean values for the CPS ORG files using this approach are presented in Hirsch and Macpherson (2003) by gender and year. To estimate usual weekly hours for workers who indicate their weekly hours are variable, we used the hours that the worker indicated that he or she worked in the week prior to the survey week.
5. The two measures of job training computed as the percentage of workers who report receiving such training in the worker's three-digit Census occupation. The data sources for this variable are the January 1983 and 1991 CPS. The variables were matched to the individual data using time-consistent three-digit Census occupation and industry codes. The 1970 codes were matched to 1980 codes using the mapping included in U.S. Bureau of the Census, "The Relationship Between 1970 and 1980 Industry and Occupation Classification Systems," Technical Paper 59, February 1989. The minor differences between the 1990 and 1980 codes were resolved based on a 1992 Census Bureau memorandum.
6. The state level variables are calculated from the 1979–2002 outgoing rotation groups of the CPS.
7. For dummy variables, MPEs are calculated as the change in the probability of an exit associated with switching the dummy variable from 0 to 1.
8. See, for example, Levy and Murnane (1992).

Selected Publications

The Cost of California's Health Insurance Act of 2003, by Dr. Aaron Yelowitz, University of Kentucky, October 2003.

Welfare Reform and Its Effects on the Dynamics of Welfare Receipt, Employment, and Earnings, by Dr. Peter Mueser and Dr. Kenneth R. Troske, The University of Missouri, September 2003.

Where the Jobs Aren't: Local Unemployment Spreads, by Employment Policies Institute, July 2003.

Who Would Benefit from a $6.65 Minimum Wage? A State-by-State Profile: 2003 Edition, by Employment Policies Institute, July 2003.

Indexing the Minimum Wage: A Vise on Entry-Level Wages by Employment Policies Institute, March 2003.

The Effects of the Proposed Santa Fe Minimum Wage Increase, by Dr. David A. Macpherson, Florida State University, February 2003.

Living Wage and Earned Income Tax Credit: A Comparative Analysis, by Mark D. Turner, Georgetown University/Optimal Solutions Group, and Burt S. Barnow, Johns Hopkins University, January 2003.

The Economic and Distributional Consequences of the Santa Monica Minimum Wage Ordinance, by Richard H. Sander, University of California at Los Angeles, and E. Douglass Williams, University of the South Joseph Doherty, Empirical Research Group at University of California Los Angeles, October 2002.

Measuring Poverty in America, by Employment Policies Institute, April 2002.

The Economic Well-Being of Low-Income Working Families, by John P. Formby and Hoseong Kim, University of Alabama, and Dr. John A. Bishop, East Carolina University, March 2002.

The Long-Term Effects of Youth Unemployment, by Thomas A. Mroz, University of North Carolina at Chapel Hill, and Timothy H. Savage, Welch Consulting Economists, October 2001.

The Case for a Targeted Living Wage Subsidy, by Employment Policies Institute, June 2001.

The Effect of Minimum Wages on the Labor Force Participation Rates of Teenagers, by Walter J. Wessels, North Carolina State University, June 2001.

Winners and Losers of Federal and State Minimum Wages, by Thomas MaCurdy and Frank McIntyre, Stanford University, June 2001.

Does the Minimum Wage Reduce Poverty? by Richard K. Vedder and Lowell E. Gallaway, Ohio University, June 2001.

State Flexibility: The Minimum Wage and Welfare Reform, by Employment Policies Institute, March 2001.

Evaluating the Effects of Medicaid on Welfare and Work: Evidence from the Past Decade, by Aaron S. Yelowitz, University of California at Los Angeles, December 2000.

Higher Minimum Wages Harm Minority and Inner-City Teens, by Mark Turner and Berna Demiralp, Johns Hopkins University, September 2000.

The Living Wage: Survey of Labor Economists, by The Survey Center, University of New Hampshire, August 2000.

Living Wage Policy: The Basics, by Employment Policies Institute, March 2000.

Rising Above the Minimum Wage, by William Even, Miami University of Ohio, and David Macpherson, Florida State University, January 2000.

Economic Analysis of a Living Wage Ordinance, by George Tolley, University of Chicago, Peter Bernstein, DePaul University, and Michael Lesage, RCF Economic & Financial Consulting, July 1999.

Effective Marginal Tax Rates on Low-Income Households, by Daniel N. Shaviro, New York University School of Law, February 1999.

An Analysis of the Baltimore Living Wage Study, by Employment Policies Institute, October 1998.

Targeted Jobs Tax Credits and Labor Market Experience, by Frederick J. Tannery, University of Pittsburgh, June 1998.

Work Ethic and Family Background, by Casey B. Mulligan, University of Chicago, May 1997.

From Welfare to Work: The Transition of an Illiterate Population, by Employment Policies Institute, February 1997.

Who Are The "Low-Wage" Workers? by Derek Neal, University of Chicago, July 1996.

Jobs Taken by Mothers Moving from Welfare to Work: And the Effects of Minimum Wages on This Transition, by Peter D. Brandon, Institute for Research on Poverty, University of Wisconsin–Madison, February 1995.

Minimum Wage Laws and the Distribution of Employment, by Kevin Lang, Boston University, January 1995.