THE WAGE AND EMPLOYMENT

DYNAMICS OF MINIMUM WAGE WORKERS*

March 2002

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*We are grateful to the referees for several useful comments that helped improve the paper.

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Abstract

This study uses 20 years of short panel data sets on minimum wage workers to examine the wage and employment dynamics of minimum wage workers. Compared to workers earning above the minimum wage, minimum wage workers differ substantially in several ways. First, minimum wage workers are much more likely to be new entrants and much more likely to exit the labor market. Second, changes in industry and occupation and access to job training are particularly important to improving the wages of minimum wage workers. Finally, we find evidence that many minimum wage workers are earning less than their potential wage temporarily because of other non-work circumstances that make higher paying jobs less attractive.

I. INTRODUCTION

An important issue in the policy debate over the merits of increasing the minimum wage is the duration of minimum wage employment. At one extreme, if minimum wage workers are entry level workers who quickly accumulate skills that push their wages above the minimum, a minimum wage hike would have a relatively short term effect on any given worker's income. On the other extreme, if all minimum wage workers find themselves in "dead end" jobs which provide no opportunities for wage growth, a hike in the minimum wage could have long term effects on the incomes of workers.

There are several studies that provide insights into the wage growth of minimum wage workers. Using 1984-1985 data from the Survey of Income and Program Participation (SIPP), Smith and Vavrichek (1992) show that over 60 percent of workers earning the minimum wage in 1984 were earning more than the minimum wage one year later. For those with wage gains, the typical wage increase was approximately 20 percent. Long (1999) finds similar results using the 1992-1993 SIPP. Using National Longitudinal Survey data from the early 1980s, Schiller (1994) finds that, after entering a minimum wage job, only 15 percent of continuing workers were still earning the minimum wage after three years.

While most minimum wage workers realize sufficient wage growth to rise above the minimum wage relatively quickly, a significant minority do not. The existing literature provides some insight into which workers are most likely to be "stuck" at the minimum. A fairly consistent finding is that less educated workers and part-time workers are less likely to rise above the minimum. However, the understanding of the processes at work in determining the extent of wage growth is limited.

Perhaps the most-studied determinant of wage growth for minimum wage workers is the extent of on-the-job training. Hashimoto (1982) argues that a hike in the minimum wage could reduce the amount of training workers receive and thereby reduce their subsequent wage growth. More recently, however, Acemoglu and Pischke (1999) argue that, in non-competitive labor markets, a minimum wage hike could actually increase employer-provided training. Empirical evidence on the effects of a minimum wage hike on training are mixed.[1]

This study uses 20 years of short panel data sets on minimum wage workers to improve the understanding of the wage and employment dynamics of minimum wage workers in several respects. First, it examines the degree of labor market attachment of minimum wage workers by computing transition rates into and out of minimum wage employment. The transitions could be the result of entry or exit from the labor market, or from wage increases or decreases. The evidence reveals that minimum wage employment is short-lived for many workers. Second, among minimum wage workers that continue employment, we explore alternative explanations for wage growth. Our study examines the importance of job training, job switching, and changes in non-work conditions that might lead workers to accept jobs that are not the best match for their skills. We find that that switching jobs is vital to significant wage growth among minimum wage workers, particularly for young workers who find themselves in "low training" occupations. We also demonstrate that finishing school improves wage growth, partly by increasing the change that a worker makes a job change. Re-enrolling in school has the opposite effect.

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[1] For example, Lazear and Miller (1981) and Grossberg and Sicilian (1999) find mixed effects of a minimum wage hike on training. Neumark and Wascher (2001) find that higher minimum wages reduce the level of employer-provided training.

2. DATA

The monthly Current Population Survey (CPS) Outgoing Rotation Group (ORG) files from January 1979 through December 1999 allow construction of a series of twenty separate two-year panel data sets on minimum wage workers. The CPS is structured so that a given household is sampled 4 consecutive months, not interviewed for 8 months, and then interviewed for another 4 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 ORG. The matched ORG files provide information on a person at the beginning and ending of a one year period.[2]

We construct two samples of minimum wage workers from the CPS-ORG files.[3] The first includes all workers who earned the minimum wage in the reference week of the first year of the two year panels, regardless of their earnings or employment status in the second year. This sample provides information on the wage growth, job change, and employment behavior of minimum wage workers. The second data set includes all workers that earned the minimum wage in the second year of the two-year panels, regardless of their earnings or employment status in the first year. This data allows us to investigate the path into minimum wage employment. In addition to the minimum wage samples, we create a comparison sample that includes workers earning above the minimum wage in the first year of the panels.

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[2] Additional details on the data set are provided in the data appendix.

[3] The minimum wage is defined for each month and state in the sample. When a state has a minimum wage that exceeds the federal minimum, the state minimum wage is used. The wage rate is defined as the hourly wage rate for those that report being paid by the hour. For those that are not paid by the hour, we impute the hourly wage by dividing weekly earnings by weekly hours. Details on the frequency of imputations are included in the data appendix.

Table 1 provides sample means for some key demographic characteristics for working earning the minimum wage in the first year of the panels. The first period minimum wage sample has 33,520 workers and the comparison sample has 923,752 workers earning above the minimum wage.

Compared to workers earning above the minimum wage, workers in minimum wage jobs are younger, less educated, and work fewer hours. Relative to workers earning above the minimum, minimum wage workers are eight times more likely to be under age 21, nearly four times as likely to have no high school degree and 6 times more likely to work less than 20 hours per week.

3. TRANSITIONS TO AND FROM MINIMUM WAGE EMPLOYMENT

In this section, we examine transitions into and out of minimum wage employment. In table 2, the frequency of the four transition rates into minimum wage employment are listed. The transitions into minimum wage employment are from non-employment, or from employment that paid a wage at, above, or below the minimum wage. These transition rates are respectively labeled ENTER, STAY, FALL, and RISE.

Minimum wage jobs are often thought of as "entry level" jobs. The evidence in our data supports this view. Among the workers earning the minimum wage in the second year of our panels, 39.4 percent were not employed in the prior year. Among the comparison sample of people earning above the minimum wage in the second period of the sample, only 8.5 percent reported no employment in the prior year. Hence, minimum wage workers are approximately five times more likely to be entrants from a spell of non-employment than those earning above the minimum. Among the minimum wage workers who were not employed in the prior year, the

most common reasons reported for non-employment were that they were enrolled in school (44%), were unemployed (24%), or doing housework (16%).

While a large share of minimum wage workers are beginning a new spell of employment, the majority (about 60 percent) are not. Approximately one quarter (22.6 percent) were minimum wage employees in the prior year, and another one quarter (27.8 percent) were earning above the minimum wage. Among people working in both periods, this implies that the chance of earning above the minimum wage in the prior year is nearly one-half. Hence, while several studies emphasize that the majority of minimum wage workers rise above the minimum in a short period of time, it is also true that a substantial share of minimum wage workers previously earned above the minimum wage.

Approximately 10 percent of the workers earning the minimum wage in the second year of the panels were earning less than minimum in the prior year. One explanation for workers earning less than the minimum wage is that minimum wage laws do not apply to all employees. Under current legislation, workers under the age of 20 can be paid a "sub-minimum" wage for their first 90 days of employment. There are also exemptions for disabled workers, full-time students, and students enrolled in vocational education programs. Workers who receive tip income (e.g. waiters and waitresses) can currently be paid as little as $2.13 an hour if their reported tip income is sufficient to bring their total hourly income to $5.15. Consistent with these exemptions is the fact that, among workers earning the minimum wage in the second year of the panels, the waiter and waitress occupation had the greatest fraction of workers being paid below the minimum in the prior year.[4] Also, minimum wage workers under the age of 21 are more likely to have been paid less than the minimum in the prior year.

[4] The occupation category with the second largest fraction of workers being paid below the minimum wage is the "food counter, fountain, and related occupations".

Among continuing workers that earned the minimum wage in the second year of the panels, approximately one-half were earning above the minimum in the first year. The likelihood that a given minimum wage worker was previously paid above the minimum wage generally rises with characteristics that enhance wage potential. For example, the percentage of minimum wage workers that previously earned above the minimum wage rises with education, age, and hours worked per week.

Not surprisingly, the chance that a minimum wage worker is a new entrant is greatest among young workers. Among minimum wage workers aged 18 or less, 58.1 percent are entrants from non-employment. This is in stark contrast to the 19.8 percent entry rate for minimum wage workers aged 65 or more. Entry rates for minimum wage workers are also higher among less educated workers and those who work fewer hours per week.

The chance that a worker remains in minimum wage employment between years varies relatively little by education and hours worked. However, the chance of staying at the minimum wage increases fairly sharply with age. Minimum wage workers aged 65 and over are approximately 2.5 times as likely to stay at the minimum wage as workers aged 18 or less (39.5 percent versus 16.3 percent).

A description of the transition rates from minimum wage employment is provided in table 3. Using data on workers earning the minimum wage in the first year of the two-year panels, four transition rates are calculated. The transitions are from minimum wage employment to no employment, and from minimum wage employment to employment paying at, above, or below the minimum wage. These transitions are respectively labeled RISE, STAY, FALL, and LEAVE. The transition rates are presented for the minimum wage sample as a whole and by demographic characteristics.

The transition rates reveal that minimum wage employment is short-lived for the vast majority of workers. Only 21.6 percent of minimum wage workers are still earning the minimum by the end of the year. Nearly one-half (47.2 percent) of the first year minimum wage workers report rising above the minimum wage by the end of the year. A small percentage (7.3 percent) remain employed but earn a wage below the minimum in the second year. Approximately one-fourth (23.9 percent) leave employment by the second year. The fraction of workers leaving employment by the second year is only one-third as high (8.6 percent) among the comparison sample of workers earning above the minimum wage in the first period.

The chance that a minimum wage worker leaves employment tends to be higher for workers that have characteristics associated with greater earnings potential. For example, the percentage of minimum wage workers leaving employment falls with education and hours worked. The exit rate also drops with age until workers reach their mid-50's.

The statistics on the fraction of workers that stay at the minimum wage from one year to the next reveal relatively modest variation across demographic characteristics. The reason is that, generally speaking, characteristics that increase the chance of rising above the minimum wage tend to decrease the chance that the worker leaves employment. An exception to this pattern is the effect of age. The older the minimum wage worker is, the greater is the chance that the worker will stay at the minimum wage. For example, the chance of staying at the minimum wage is nearly twice as high among workers aged 65 or more compared to that for workers aged 22-25 (33.1 percent versus 17.3 percent).

4. DETERMINANTS OF WAGE GROWTH

In this section, we examine the distribution of wage growth for people who are earning the minimum wage in the first year of the CPS-ORG panels. While the earlier analysis reveals that the majority of workers continuing employment from one year to the next will rise above the minimum wage, we show in this section that the extent of wage growth varies dramatically across minimum wage workers, the type of job they start in, and their propensity to change employers, occupation and industry. We also compare the wage growth of minimum wage workers with a comparison sample of workers earning above the minimum wage in the first year of the panels.

Table 4 provides a comparison of real wage growth of minimum wage workers with the comparison sample of people earning above the minimum wage.[5] Median real wage growth for the comparison sample of workers earning above the minimum wage in the first year of the panels is 1.3 percent over the 1980-1999 sample period. This is substantially below the 3.5 percent median wage growth for workers earning the minimum wage in the first year of the panels.[6] Among minimum wage workers who rise above the minimum by the second year of the panels, median wage growth is 14.8 percent. Reflecting the decline in the real value of the minimum wage over the sample period, workers who earned the minimum wage in both years of the panels experienced a median reduction in real wages of 3.6 percent.[7]

There are at least three distinct ways that on-the-job experience could lead to wage growth for minimum wage workers. First, workers may receive job specific skills making them more productive in their jobs with their current employer. Second, the minimum wage job may

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[5] Since the CPS data is monthly, real wages are calculated using the monthly series for the consumer price index for urban consumers.

[6] If workers with imputed wages in the second year of the panels (9.0 percent of the sample) are dropped from the analysis, median wage growth drops to 3.0 percent. Workers who switched from hourly to non-hourly jobs experience much higher wage growth (31.0 percent).

[7] If workers with imputed wages in the first year of the panels are dropped from the sample, the median reduction in real wages is reduced to 4.1 percent.

provide general skills that allow the worker to move into jobs with greater earnings potential. However, it is conceivable that a switch of employers could be necessary to obtain a match that rewards these newly acquired skills. Third, it is possible that wage growth occurs because a worker is in a minimum wage job only because temporary circumstances preclude accepting a job with greater earnings potential. When circumstances change, the workers moves to an employer that can make better use of his skills (i.e. a better match) and receives an increase in pay as a result. For example, a person enrolled in school may be capable of acquiring a job with greater skill requirements and higher pay, but chooses the minimum wage job because of greater flexibility in hours or a shorter commute. Upon leaving school, she switches to a job that has higher skill requirements and pays more.

Depending on the source of wage growth, changing employers will have differential effects on wage growth. If the source of wage growth is the accumulation of employer-specific skills, a switch of employers will retard wage growth. If the accumulation of general skills is the source, employer switching would have a positive effect if it leads to a better match. Alternatively, if switching employers improves the match between skills and job requirements, employer switching will improve wage growth.

In an investigation of the determinants of wage growth, Gottschalk (2001) finds that switching employers enhances wage growth, particularly for less educated workers. We extend this line of reasoning by examining the importance of switching employers to the wage growth of minimum wage workers. We also examine the importance of other personal and job attributes that might impact the extent of wage growth, as well as the importance of employer switching to wage growth.

A change of employer in the CPS data can be measured two ways. Our first measure is based on the subset of panels that contain information on employee tenure.[8] If a person who reports work in both years of the panel indicates she has less than a year of tenure, we assume that she switched employers.[9] Among workers earning the minimum wage in the first year of the panels, we estimate that 30.7 percent switch employers by the second year.[10] The rate of job switching among workers earning above the minimum wage is less than one-third as high (9.5 percent).

As a second measure of job switching, we compare the three-digit occupation and industry reported in the two years of the panels. This measure of job switching has an important advantage in that all the panel data sets contain industry and occupation information, allowing for a much larger sample for data analysis. A shortcoming of the industry/occupation based measure is that there is measurement error in the classification methods.[11]

Changes in industry and occupation provide a different kind of information than the tenure based measure. The tenure-based measure reflects a change in employers, regardless of whether there is a significant change in job duties. Job switches based on changes in both industry and occupation reflect a change in both employer and job type. Among workers that report employment in both years of the panels, we estimate that 34.9 percent of those earning the minimum in the first year of the panel change both industry and occupation. In the comparison

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[8] The panels were matched CPS supplements that contained data on employee tenure. The analysis includes the following months: January 1983, May 1983, January 1987, May 1988, January 1991, April 1993, February 1996, February 1998, and February 2000.

[9] Unfortunately, it appears that this classification method has some error. In the January and February surveys, workers with less than 3 years of tenure are asked to provide tenure in months. Apparently workers round their answers because there is significant heaping in the data at 12, 24, and 36 months.

[10] For this part of the analysis, workers earning below the minimum wage in either period are eliminated because the reasons for earning below the minimum vary between non-coverage, potential measurement error in the earnings variable, and tip credits that allow covered workers to be paid less than the minimum. The qualitative nature of the results is not changed by this exclusion.

[11] See, for example, Mellow and Sider (1983) and Macpherson and Hirsch (1995).

sample of workers earning above the minimum wage in the first year and continuing employment into the second year, only 18.8 percent report a change in both occupation and industry. Minimum wage workers are almost twice as likely as other workers to change occupation and industry.

The effect of employer switching on wage growth is illustrated for minimum wage workers and the comparison sample in Table 5. The estimates imply that changing employers or occupation and industry is associated with significantly higher wage growth for minimum wage workers, but slightly lower wage growth for workers earning above the minimum wage. A switch of employers improves wage growth by 3.6 percentage points for minimum wage workers, but worsens wage growth by 1.6 percentage points for workers in the comparison sample. A switch of both occupation and industry enhances wage growth by 10.8 percentage points for minimum wage workers, but reduces wage growth by 0.1 percentage points for workers in the comparison sample. Employer switching, especially when combined with a change in occupation and industry is particularly important to the wage growth of minimum wage workers. This suggests that the accumulation of general skills or improvement in match quality are more important than the accumulation of firm specific skills. More evidence on this point is provided below.

Another potential source of unusual wage growth are changes in non-work circumstances that improve the chance of accepting employment that is a better match to the worker's skills. One example would be when a worker either finishes or starts a spell of school enrollment. To examine this, we restrict the sample to observations with enrollment information -- workers aged 24 or less in surveys from 1984 forward. We then divide workers into four groups depending

upon their enrollment status at the beginning and end of the panels and compute median wage growth.

Information on the importance of school enrollment for minimum wage workers is given in table 5. School enrollment is common for many minimum wage workers. For workers under age 24 earning the minimum wage in the first year of the panels, 43.0 percent report being enrolled in school in both years; 15.6 percent report being enrolled in the first year, but not the second; and 4.7 percent report no enrollment in the first, but enrollment in the second. Workers who stay enrolled or start enrollment have lower wage growth than those who either finished a spell of school enrollment or were not enrolled in either period. This pattern holds for minimum wage workers and those earning above the minimum wage, and the size of the enrollment effects are similar. It thus appears that school enrollment restricts a worker's earnings potential and completion of an enrollment spell leads to above average wage growth.

Changes in work hours might also account for large changes in wages for workers. Unfortunately, we cannot determine whether observed changes in hours are voluntary. However, we expect that a willingness to increase from part-time to full-time work would increase access to higher paying jobs. In the reverse direction, a desire to cut hours may reduce access to high paying jobs. To investigate the validity of this hypothesis, we divided workers into five groups depending upon the change in hours worked per week between the first and second year of the panels. Wage growth is substantially higher for those who start at the minimum wage and increase work hours. For example, median wage growth for those who increase work hours by 20 or more hours per week is 20.6 percent. This compares to median growth of 4.4 percent for those who changed hours worked by fewer than 10 hours per week. The relationship between changes in hours and wage growth is much weaker in the comparison sample. Moreover, the

relationship between wage growth and either sharp increases or decreases in hours work is the opposite of that found for minimum wage workers.

Given that many of the factors affecting wage growth will be correlated with worker characteristics, multivariate analysis is necessary to sort out the separate effects of each factor. We use median regression methods to further investigate the determinants of wage growth for minimum wage workers.[12] Particular attention is paid to the variation in wage growth in the different types of minimum wage jobs, the importance of training, and the extent to which job changes, changes in school enrollment, and changes in hours worked affect wage growth.

Table 6 presents the results of median regressions estimating the determinants of the percentage change in real wages for the minimum wage and comparison sample. The sample is restricted to workers who are employed in both years of the two-year panels. In addition to variables describing the worker and the job, year dummies are included to control for macroeconomic conditions and changes in the level of the federal minimum wage. State dummies are included to control for state-specific effects.

The regression estimates reveal that for both the minimum wage and comparison sample, wage growth rises with education. However, the effect of education is much sharper in the minimum wage sample. Compared to workers with a high school degree, wage growth among workers with a college degree is 9.2 percentage points higher for workers in the minimum wage sample, but only 1.0 percentage points higher for workers in the comparison sample. In both samples, wage growth rises then falls with age and is greater for full-time than part-time workers.

The 16 occupation dummies included in the model were formed by selecting the fifteen three-digit occupation groupings that employ the largest number of minimum wage workers. The

[12] Median regression methods were chosen to reduce the effect of exteme outliers in the data and the fact that wage growth is truncated from below given the requirement of a minimum wage.

sixteenth occupation grouping (listed as "other") includes all other occupations. The largest minimum wage occupation (cashiers) is the reference group in the regression. There is statistically significant variation in wage growth across the occupations. Comparing the minimum wage occupations with the highest and lowest wage growth reveals a difference of 12.4 percentage points in the minimum wage sample and a difference of 6.5 percentage points in the comparison sample. The ranking of wage growth across occupations is very similar in the minimum wage and comparison sample.[13]

To provide further insight into why wage growth differs across workers and occupations, we estimate several additional specifications of the wage growth equation. Our first objective is to determine the importance of job training and job switching in determining wage growth. The job training measures reflect the percentage of workers in a given 3-digit occupation reporting that they received training for their job through their employer ("firm training") or by someone other than the employer ("outside training").[14] The measure of “job change” indicates whether the worker switches industry and occupation.

The frequency of job training varies substantially across occupation. Table 7 provides a representative list of occupations with high, medium, or low levels of training. The occupations were classified according to whether the percentage of workers in a given occupation was in the top, middle, or bottom third of the distribution of occupation specific training levels. Among the

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[13] The Spearman rank correlation coefficient of the coefficients on the occupation dummies is .71 with a p-value of .003.

[14] The occupation specific training measures were created from the January 1983 and 1991 Current Population Survey. The firm training variable represents the percentage of workers within a given three digit occupation that report participation in either formal or informal company training with the current employer. The other training measure represents the percentage of workers receiving training from someone other than the employer while on the current job. The variables were matched to the individual data using time-consistent 3-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 (1989). The minor differences between the 1990 and 1980 codes were resolved based on a 1992 Census Bureau memorandum.

firms within a given training category (e.g. the top one-third), the ten occupations with the largest number of employees are listed. To provide some idea of where occupations with large numbers of minimum wage workers fit into this distribution, the 15 occupations with the largest number of minimum wage employees are listed in the table as “minimum wage occupations”.

Minimum wage occupations are predominantly low training jobs. Of the 15 minimum wage occupations, 13 are in the bottom one-third of both the firm training and outside training distribution. The two minimum wage occupations that are not in the bottom one-third are nurses, orderlies, and attendants; and secretaries. These two occupations fit into the middle one-third of the training distributions.

To discern the effect of job training and job switching on wage growth, variations of the median wage growth equation presented earlier are estimated for the minimum wage and comparison sample. In the first specification, we add controls for job switching and training. A potential concern with this specification is that training or job changes could be endogenous in the wage growth equation. For example, Neumark and Wascher (2001) cite evidence that firms may select the workers with higher levels of ability for training. If ability is not adequately controlled for, this could lead to an upward bias in the estimated effect of training on wage growth. A similar problem would emerge if those with greater wage growth potential are more likely to change industry and occupation. For example, if workers who have skills that are not fully utilized in their current job are more likely to switch industry and occupation, our estimate of the job switching effect could partly reflect this. Since the available data do not allow us to properly address these potential endogeneity problems, the results must be interpreted with some caution.

With the above caveats in mind, the estimates in specification 1 imply that, other things being the same, median real wage growth is 5.8 percent higher for workers that change industry and occupation. This is in stark contrast to workers earning above the minimum wage in the first period where a change in industry and occupation has a slightly negative but statistically insignificant effect. One might interpret this difference as an indication that a disproportionate share of minimum wage workers are in jobs that are a poor match to their skills and can thus benefit substantially from a change in industry and occupation.

Firm provided job training has a larger positive effect on wage growth for minimum wage workers than for workers earning above the minimum wage. Job training provided outside of the firm has a positive effect on the wage growth of minimum wage workers, but a statistically insignificant negative effect on the wage growth of workers earning above the minimum wage. Given evidence that minimum wage increases reduce access to training for minimum wage workers, it's clear that a minimum wage hike could have adverse effects on workers' long term wage prospects.[15]

According to job-matching theories of wage growth, job switching early in a worker's career is particularly important to wage growth.[16] When a worker first begins employment, he continues switching employers until an acceptable match is made. With each switch, the quality of the match (and the corresponding wage rate) improves. Eventually, a good match is found and the returns to job switching diminishes.

To determine whether the effect of job matching on wage growth diminishes with age, the wage growth models are estimated with the addition of interactions between the job switch

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[15] Neumark and Wascher (2001) suggests that a 10 percent increase in the minimum wage would reduce the incidence of formal training by 18 percent (1.8 percentage points) among 20-24 year olds.
[16] See, for example, Altonji and Shakotko (1987) or Topel (1991).

variable and dummies representing the worker's age. The estimates indicate that, for minimum wage workers, changes in occupation and industry enhance wage growth for workers in all age categories. However, the effect of job changes rises until the worker is in his mid-20s and then begins to fall. Whereas a job change enhances wage growth by 13.2% for a worker between the ages of 22 and 25, its effect is only 0.9% among workers aged 65 or more. Switching occupation and industry has much smaller effects on wage growth in the comparison sample of workers earning above the minimum wage and there is no consistent pattern across age groups.

The effect of a job change on wage growth should vary depending on the type of training and skills that a worker acquires on the initial job. If training provides skills that are firm specific, a job change may worsen wage growth. Alternatively, if the first job is not a good match to the worker's skills, a job change could have a positive effect on wage growth. To examine whether training improves or worsens the returns to a job change, the third specification in table 8 adds interactions between the job training and job change variables. The results for minimum wage workers reveal that a job change has a greater positive effect on wage growth when workers leave an occupation that had low training levels. In occupations where there is no firm or other training, median wage growth is 8.2 percent higher for workers who switch industry and occupation. On the other hand, at the maximum value of firm and other training observed in the minimum wage sample (.722 and .638, respectively), estimated wage growth is slightly higher for workers who do not change industry and occupation. For the comparison sample of workers earning above the minimum wage, a similar pattern emerges. Training enhances wage growth most for workers who stay within the same industry and occupation and a job change enhances wage growth most for workers who were in occupations with low training levels. However, the size of the effects are generally smaller in the comparison sample. A job change

from an occupation with no training enhances wage growth by 8.2 percent in the minimum wage sample, but only 1.3 percent in the comparison sample.

Since there is evidence that the effects of job training and employer switching differ by sex, we also estimated wage regressions by sex.[17] For the sake of brevity, we did not include all of the additional results in the tables since the pattern is easy to summarize. For both men and women, the basic patterns found in the pooled sample still hold up. Namely, both training and a switch in employer and occupation enhance wage growth. Also, the interaction effect between training and a switch of employers is negative for both sexes. The major difference between men and women is that the effects of firm provided training, job changes and the interaction effects are nearly twice as large for men. However, training done by someone outside the firm has nearly twice the effect for women as men.

To determine whether changes in school enrollment have an important effect on wage growth, we estimate a fourth specification with the sample restricted to workers with enrollment information and include dummy variables indicating whether the person continues, stops, or starts an enrollment spell over the two-year panel. The reference group includes people who are not enrolled in either year of the panel. The estimates reveal that minimum wage workers who complete a spell of school enrollment have 5 percent higher median wage growth than the reference group, and the effect is approximately the same among workers earning above the minimum wage in the first year of the panels. The estimates also imply that staying in school or returning to school reduces wage growth for both minimum wage workers and workers in the comparison sample.

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[17] See, for example, Olsen and Sexton (1996) and Loprest (1992).

For some people, increasing work hours could have a large effect on their ability to acquire a job that pays above the minimum wage. For others, the minimum wage may be the most they can earn regardless of whether they work full or part-time. We expect that a person's earning opportunities would be improved if they are willing to take a full-time job, and that the effect would be especially large for those with higher levels of education. The hypothesis is that part-time employment would impose a larger wage penalty on more educated workers. To investigate these hypotheses, we estimate a wage growth regression with interactions between the education dummies and the change in hours between the two periods. For minimum wage workers, the effect of a 20 hour increase in work hours on median wage growth ranges from a low of 2 percent among workers with 8 or fewer years of education to a high of 32 percent for those with more than 16 years of education. For workers earning above the minimum wage, the picture is quite different. In 5 of the 6 education groups, increases in work hours are associated with lower wage growth and the negative effect is greatest among the most educated workers. The negative effect observed in the most educated workers could reflect the endogeneity of work hours. Namely, if a worker experiences a decrease in wages, they may respond by increasing work hours.

A possible concern with our analysis is that wage growth is observed only for those workers that continue employment. Consequently, the wage regressions could contain a sample selection bias.[18] There are well known techniques for correcting sample selection bias in a linear regression model. A shortcoming, however, is that the corrected estimates are typically sensitive

[18] If, for example, workers with greater potential for wage growth are more likely to continue employment, wage growth in the sample of continuing workers would overstate potential wage growth for all workers. The sample selection could also bias the estimated effects of explanatory variables.

to distributional and identifying assumptions, and the statistical properties of the sample correction methods in a median regression model are not yet developed.[19]

With the aforementioned caveats in mind, we examined the importance of sample selection in the minimum wage sample using the two-step procedure popularized by Heckman (1976).[20] We failed to reject the null hypothesis of no sample selection bias in 4 of the 6 wage growth specifications estimated above. In the two cases where there was evidence of sample selection, it pointed towards negative selection bias suggesting that the workers with unobservables leading to below average wage growth are more likely to continue employment. However, we are not confident in the corrected estimates since the sign of the sample selection bias was not robust to alternative specifications of the wage equation and statistically insignificant in the at the .10 level in 4 of the 6 specifications. It is important to note, however, that correcting for sample selection bias had virtually no impact on the estimates that were the focus in this paper. For the minimum wage sample, correcting for sample selection had a small effect on the estimated coefficients presented in table 8 and our empirical results are robust to corrections for sample selection.[21]

6. SUMMARY AND CONCLUSIONS

This study examined the wage and employment dynamics of minimum wage workers. It shows that most workers earning the minimum wage in a given year will either earn more than

[19] Vella (1998) provides a recent review of the methodology for correcting sample selection biases and the shortcomings of the various approaches.

[20] In the first step, a probit model of the decision to continue employment is estimated. The control variables include all those in the wage regression specified in table 6 plus controls for the number of children in the household in various age categories, the type of living quarters, and whether the worker is either the household head or the spouse of the household head. The probit estimates are used to generate a correction factor (the inverse Mills' ratio) that is added to the wage regression model as an additional explanatory variable to correct for sample.

[21] Correcting for sample selection changed 24 of the 25 coefficient estimates presented in table 8 by less than .01. The largest change was for the coefficient on the "stop enrollment" variable which dropped from .057 to .043 upon correcting for sample selection.

the minimum wage in the following year or exit employment. While the majority of minimum wage workers will not be earning the minimum wage a year later, almost 25 percent of workers earning the minimum wage in a given year were earning above the minimum wage in the previous year.

The factors that influence the level of wage growth among minimum wage workers were the major focus of this study. Our analysis finds evidence that improved matches through job switching are particularly important to the wage growth of some minimum wage workers. Compared to workers earning above the minimum wage, minimum wage workers reap especially large benefits from a change in industry and occupation, though the effects diminish sharply after age 45.

The importance of a change in industry and occupation to wage growth depends upon the type of occupation that a worker starts in. While job training is relatively uncommon in occupations with large numbers of minimum wage worker, it has especially large effects on the wage growth of minimum wage workers. If a minimum wage worker finds himself in an occupation with a low training level, a job change is especially important to wage growth. However, if there is a very high level of training in the original occupation, a switch of occupation and industry could adversely affect wage growth. This result emphasizes the importance of understanding how minimum wage hikes affect training levels. While a hike in the minimum wage may benefit workers in the short run, it could hurt their prospects for future wage growth if firms cut back on training levels.

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Table 1. Sample Means for Workers in the Current Population Survey by Minimum Wage Status[1]

Variable	Workers Above Minimum	Workers at Minimum
Education		
Less Than High School Degree	12.8%	47.6%
High School Degree	38.7%	33.6%
Some College	23.5%	16.3%
College Degree	17.1%	2.2%
Graduate Degree	7.8%	0.3%
Age		
16-18	2.5%	34.2%
19-21	4.1%	15.6%
22-25	7.6%	8.7%
26-35	27.7%	13.1%
36-45	27.2%	9.7%
46-55	19.7%	7.4%
56-64	9.4%	6.4%
65-99	1.9%	4.9%
Mean Age	39.2	30.7
Weekly Hours Worked:		
1-9	1.2%	7.6%
10-19	3.3%	23.6%
20-29	6.3%	26.1%
30-34	11.1%	9.6%
35 or more	78.1%	33.0%
Gender:		
Female	46.4%	63.4%
Race/Ethnic:		
White	87.8%	82.3%
Black	8.7%	14.2%
Other Nonwhite	3.5%	2.3%
Hispanic	5.2%	8.5%
Training:		
% of occupation receiving firm provided training	28.1%	16.5%
% of occupation receiving other training	13.50%	5.1%
Sample Size	923,752	33,520

[1] The sample means are for workers in the first year of the two-year panels of the outgoing rotation groups in the 1979 through 1999 Current Population Survey. A worker's wage rate in the first year of panel data sets is used to classify them according to whether their wage was at or above the minimum wage.

Table 2. Transition Rates for Workers Earning Minimum Wage in Second Year of CPS-ORG Panels.

	RISE	STAY	FALL	ENTER	Sample Size
Entire Sample	10.2%	22.6%	27.8%	39.4%	32,166
Education:					
Less Than High School Degree	11.6%	21.5%	20.5%	46.5%	14,566
High School Degree	9.5%	24.3%	32.8%	33.4%	10,904
Some College	8.9%	22.6%	34.8%	33.7%	5,768
College Degree	6.4%	18.2%	41.0%	34.4%	780
Graduate Degree	7.1%	22.4%	43.9%	26.5%	98
Age:					
16-18	12.5%	16.3%	13.1%	58.1%	10,638
19-21	9.4%	22.7%	27.2%	40.6%	4,272
22-25	8.3%	21.8%	36.9%	33.0%	4,290
26-35	8.3%	22.4%	36.7%	32.7%	4,072
36-45	9.4%	25.0%	38.8%	26.8%	3,009
46-55	8.7%	28.7%	40.6%	22.0%	2,438
56-64	10.7%	34.2%	36.5%	18.5%	1,891
65-99	10.6%	39.5%	30.1%	19.8%	1,506
Weekly Hours Worked:					
1-9	9.9%	18.2%	17.5%	54.3%	2,300
10-19	10.6%	20.1%	18.9%	50.3%	7,624
20-29	10.4%	23.3%	24.3%	42.0%	8,784
30-34	10.7%	24.7%	28.9%	35.6%	3,038
35 or more	9.7%	24.1%	39.3%	26.9%	10,370
Gender:					
Male	9.4%	19.8%	28.8%	42.0%	11,861
Female	10.7%	24.2%	27.3%	37.8%	20,255
Race and Ethnic Group:					
White	9.0%	24.7%	28.4%	37.8%	4,581
Black	9.1%	19.9%	29.1%	41.9%	1,082
Other Nonwhite	10.5%	22.3%	27.7%	39.6%	26,453

Table 3. Transition Rates for Workers Earning Minimum Wage in First Year of CPS-ORG Panels.

	RISE	STAY	FALL	LEAVE	Sample Size
Entire Sample	47.2%	21.6%	7.3%	23.9%	33,520
Education:					
Less Than High School Degree	41.2%	23.7%	7.8%	27.3%	15,947
High School Degree	51.8%	20.9%	6.8%	20.6%	11,262
Some College	53.0%	17.9%	6.7%	22.4%	5,471
College Degree	59.5%	15.7%	7.9%	16.9%	726
Graduate Degree	64.0%	20.2%	5.3%	10.5%	114
Age:					
16-18	43.2%	20.1%	7.8%	29.0%	11,458
19-21	51.6%	18.2%	6.9%	23.2%	3,951
22-25	53.9%	17.3%	5.8%	23.1%	4,205
26-35	51.3%	20.2%	6.8%	21.7%	4,386
36-45	51.9%	23.1%	7.3%	17.7%	3,253
46-55	49.7%	27.1%	7.3%	15.9%	2,483
56-64	41.2%	29.8%	7.4%	21.5%	2,152
65-99	30.8%	33.1%	9.5%	26.7%	1,632
Weekly Hours Worked:					
1-9	34.2%	20.9%	8.7%	36.2%	2,561
10-19	41.7%	22.1%	7.8%	28.4%	7,908
20-29	46.9%	22.0%	7.1%	24.0%	8,765
30-34	49.2%	22.4%	8.6%	19.8%	3,226
35 or more	53.7%	20.8%	6.4%	19.1%	11,060
Gender:					
Male	49.7%	19.1%	6.4%	24.8%	12,262
Female	45.7%	23.0%	7.8%	23.5%	21,258
Race and Ethnic Group:	47.2%	21.6%	7.3%	23.9%	33,520
White					4,581
Black	41.2%	23.7%	7.8%	27.3%	15,947
Other Nonwhite	51.8%	20.9%	6.8%	20.6%	11,262

Table 4. Median Real Wage Growth of Minimum Wage Workers by Type of Transition.[1]

Group	Median Real Wage Growth
All workers earning above minimum wage in first year	1.3%
Minimum wage workers in first year of panels.	
All minimum wage workers in first year	3.5%
Workers that rise above minimum in second year.	14.8%
Workers that are at minimum in second year.	-3.6%
Workers that are below minimum in second year.	-11.0%

[1] The data are drawn from the CPS ORG panels for the year 1979 through 1999.

Table 5. Wage Growth by Minimum Wage Status.[1]

	Above Min Wage		At Minimum Wage	
	Median Wage Growth	Sample Size	Median Wage Growth	Sample Size
All	0.9%	923,752	3.5%	25,494
Sub-Groups of Workers.				
Same employer in both years	1.8%	24,286	4.7%	474
Change in employer between years	0.2%	2,653	8.3%	210
t-statistic for equality	4.85		2.25	
Same industry or occupation in both years	0.9%	750,441	3.3%	15,015
Change industry and occupation between years	0.8%	173,312	14.1%	8,042
t-statistic for equality	-2.6		72.56	
Start school enrollment in second year	1.3%	3,434	9.6%	289
Enrolled in school both years	2.1%	13,352	7.4%	2,620
Not enrolled in school either year	3.9%	35,499	13.9%	2,229
Stop enrollment in second year	8.67	6,387	15.4%	948
Change in hours worked per week between years.				
Decrease 20 or more	2.0%	18,277	5.2%	510
Decrease 10 to 19	6.5%	45,065	4.9%	1,365
Between decrease of 9 and increase of 9	0.8%	806,522	4.4%	16,062
Increase 10 to 19	-1.6%	39,467	9.4%	3,002
Increase 20 or more	-2.0%	14,422	20.6%	2,118

[1]All data are from two year panels created from outgoing rotation groups in the Current Population Surveys between the years 1979 through 1999. The wage rate for the first year of the panel is used to classify workers as earning at or above the minimum wage.

Table 6. Determinants of Median Real Wage Growth[1]

	Workers Earning Above Minimum Wage in First Year		Workers Earning Minimum Wage in First Year	
	Coeff	t-statistic	Coeff	t-statistic
Constant	-0.038	-5.35	-0.028	-4.08
Education (elementary school reference group):				
High School School Dropout	0.005	1.83	0.001	2.53
High School Degree	0.010	4.63	0.028	6.78
Some College	0.014	6.17	0.049	9.92
College Degree	0.020	8.50	0.120	15.02
Graduate Degree	0.021	8.02	0.184	10.77
Age (16-18 reference group):				
19-21	0.002	0.66	0.010	2.51
22-25	0.003	0.82	0.026	5.32
26-35	-0.013	-3.94	0.010	2.08
36-45	-0.023	-6.84	0.004	0.71
46-55	-0.030	-8.87	-0.004	-0.69
56-64	-0.034	-9.78	-0.013	-2.2
65-99	-0.043	-10.07	-0.034	-5
Female	0.006	6.91	-0.028	-10.85
Hours Worked (1-9 reference group):				
10-19	0.031	7.18	0.007	1.45
20-29	0.042	10.25	0.020	4.2
30-34	0.038	9.45	0.026	4.72
35+	0.049	12.57	0.055	11.43
Public sector employee	0.003	2.50	-0.013	-3.56
Occupation:				
Waiters and Waitresses	-0.058	-8.38	-0.046	-8.02
Cooks	-0.009	-1.90	-0.011	-1.89
Sales Workers, other Commodities	-0.001	-0.13	-0.002	-0.34
Janitors and Cleaners	-0.016	-3.48	-0.003	-0.47
Misc. Food Preparation Occupations	-0.010	-1.39	-0.012	-1.84
Stock Handlers and Baggers	0.001	0.15	-0.004	-0.68
Textile Sewing Machine Operators	-0.028	-4.35	-0.036	-5.02
Food Counter, Fountain and Related Occupations	-0.001	-0.06	-0.004	-0.54
Nursing Aides, Orderlies, and Attendants	-0.005	-1.03	0.007	0.89
Waiters'/Waitresses' Assistants	-0.022	-2.28	-0.019	-2.45
Maids and Housemen	-0.015	-2.37	-0.009	-1.13
Sales Workers, Apparel	0.007	0.90	0.004	0.52
Farm Workers	-0.034	-4.88	-0.044	-4.56

Table 6. Determinants of Median Real Wage Growth (Continued)[1]

	Workers Earning Above Minimum Wage in First Year		Workers Earning Minimum Wage in First Year	
	Coeff	t-statistic	Coeff	t-statistic
Secretaries	-0.007	-1.88	0.078	8.61
All other occupations	-0.016	-5.01	0.009	2.19
Race and Ethnicity (white,Non-Hispanic reference group):				
Black	-0.009	-5.71	-0.006	-1.6
Other Nonwhite	-0.006	-1.85	0.009	1.13
Hispanic	-0.008	-3.79	-0.018	-3.84
Marital Status (never married reference group):				
Married, Spouse Present	0.001	0.80	0.012	3.07
Ever Married, No Spouse Present	0.001	0.46	0.005	0.95
Sample size	184,729		25,494	

[1]The data is from the 1979-1999 ORG CPS panels. The regressions also include year and state of residence dummies.

Table 7. Training Levels for Selected Occupations.[1]

Occupations ranked by percentage of workers receiving company provided training.
("minimum wage occupations" in bold)

Bottom one-third (less than 17.7 percent receive training)

truck drivers; **cashiers**; **janitors and cleaners**; elementary school teachers; secondary school teachers; **cooks**; **sales workers, other commodities**; non-construction laborers; **stock handlers and baggers**; **textile sewing machine operators**; **misc. food preparation workers**; **waiters and waitresses**; **maids**; **food counter and fountain workers; waiters'/waitresses' assistants; sales workers, apparel; farm workers.**

Middle one-third (17.7 to 34.3 percent receive training)

Secretaries; supervisors and proprietors in sales occupations; bookkeepers, accounting and auditing clerks; **nursing aides**, **orderlies and attendants;** accountants and auditors; assemblers; misc. machine operators; administrative support occupations; typists; general office clerks.

Top one-third (more than 34.3 percent receive training)

Managers and administrators; registered nurses; supervisors in production occupations; sales representatives in mining, manufacturing and wholesale; automobile mechanics; computer operators; administrators and officials, public administration; misc. financial officers; social workers; investigators and adjusters, except insurance.

Occupations ranked by percentage of workers receiving training outside company.
("minimum wage occupations" in bold)

Bottom one-third (less than 4.5 percent receiving training outside firm)

Truck drivers; **cashiers**; **janitors and cleaners**; **cooks**; **sales workers, other commodities**; nonconstuction laborers; assemblers; misc. machine operators; **stock handlers and baggers; textile sewing machine operators; waiters and waitresses**; **misc. food preparation workers; food counter and fountain workers; waiters'/waitresses' assistants; maids; sales workers, apparel; farm workers.**

Middle one-third (4.5 to 15.3 percent receive training)

Secretaries; supervisors and proprietors in sales occupations; bookkeepers, accounting and auditing clerks; supervisors in production occupations; **nursing aides**, **orderlies, and attendants**; sales representatives in mining, manufacturing, and wholesale trade; misc. administrative support occupations; carpenters; typists; receptionists.

Top one-third (more than 15.3 percent receive training)

Misc. managers and administrators; elementary school teachers; registered nurses; secondary school teachers; accountants and auditors; electricians; administrators and officals in public administration; administrators in education and related fields; misc. financial officers; social workers.

[1] The 3 digit occupations listed reflect the 10 occupations with the largest level of employment within each training group, and the 15 occupations with the largest number of minimum wage employees (referred to as minimum wage occupations).

Table 8. Expanded Models of Median Real Wage Growth.[1]

	Workers Earning Above Minimum Wage		Workers Earning Minimum Wage	
	coefficient	t-statistic	coefficient	t-statistic
Specification 1.				
change industry and occupation	-0.001	-1.23	0.058	28.15
% of occupation receiving firm provided training	0.006	1.97	0.123	9.52
% of occupation receiving other training	-0.006	-1.40	0.094	5.24
Sample size	184,729		25,494	
Specification 2.				
Job switching effects by age group				
16-18	-0.012	-2.35	0.027	8.58
19-21	0.000	0.08	0.097	21.16
22-25	0.008	2.39	0.132	21.24
26-35	0.000	0.19	0.129	24.02
36-45	-0.002	-1.12	0.111	16.08
46-54	0.001	0.53	0.037	4.69
56-64	-0.009	-2.27	0.021	2.13
>64	-0.019	-2.28	0.009	0.70
Sample size	184,729		25,494	
Specification 3				
a. change industry and occupation	0.013	5.10	0.082	18.14
b. % of occupation receiving firm provided training	0.011	3.15	0.164	10.48
c.% of occupation receiving other training	0.001	0.14	0.102	4.78
a*b	-0.021	-2.44	-0.153	5.80
a*c	-0.087	-7.75	0.001	0.04
Sample Size	184,729		25,494	

Table 8. Expanded Models of Median Real Wage Growth (continued).[1]

	Workers Earning Above Minimum Wage		Workers Earning Minimum Wage	
Specification 4 (effect of change in enrollment status)	coefficient	t-statistic	coefficient	t-statistic
Stop Enrollment	0.046	6.09	0.057	6.70
Stay Enrolled	-0.020	-2.81	-0.023	-3.17
Start Enrollment	-0.040	-4.31	-0.011	-0.89
Sample Size	11,592		6,646	
Specification 5 (effect of change in hours by education):				
Elementary School	-0.0003	-1.13	0.001	4.12
High School School Dropout	0.0003	1.65	0.003	18.54
High School Degree	-0.0007	-7.37	0.004	23.55
Some College	-0.0008	-7.57	0.006	27.70
College Degree	-0.0074	-56.63	0.012	24.21
Graduate Degree	-0.0130	-74.05	0.018	14.34
	184,618		25,479	

[1] All specifications also include the controls listed in table 6. Specifications 2, 4, and 5 also include the job switching and job training measures.

DATA APPENDIX

The data for this study is drawn from the 252 monthly Outgoing Rotation Group (ORG) Current Population Survey (CPS) files from January 1979 to December 1999. In the CPS, eight panels are used to rotate the sample each month. A sample unit is interviewed for four consecutive months, and then, after an 8-month rest period, for the same four months a year later. Each month a new panel of addresses, or one-eighth of the total sample, is introduced.

The outgoing rotation groups (ORGs) include the people that are in either rotation group 4 or 8 (i.e. the subsamples that will be leaving for the 8 month rest period or permanently). Since 1979, the people in the ORGs were asked questions from an earnings supplement providing information on union status, weekly earnings, hourly earnings, and hours worked. Individuals potentially can be identified for the same month in consecutive years; that is, individuals in rotation group 4 in year 1 can be matched to individuals in rotation group 8 in year 2.

Matching people across years in the CPS was accomplished as follows: From the ORGs, data files were created for pairs of years (e.g. rotation 4 in January 1992 and rotation 8 in January 1993). Within each file, individuals were sorted on the basis of household ID, year, gender, and age. To be considered an acceptable match, a rotation 8 individual in year 2 had to be matched with a rotation 4 individual in year 1, with identical sex, household ID, survey month, and an age difference between 0 and 2.[22] If more than one person in year 1 can be matched to a given individual in year 2, additional variables (e.g. marital status, education) are used to find the correct match. If it is impossible to find a unique match in year 1 for an individual in year 2, the

[22] Since surveys can occur on different days of the month, age change need not equal 1.

observation is deleted. Starting in 1994, the CPS included reliable individual identifiers that simplified matching individuals across time.[23]

Two minimum wage samples are used in the analysis. The first includes wage and salary workers earning exactly the minimum wage in the first year of the two year panels.[24] The second includes wage and salary workers earning exactly the minimum wage in the second year of the two year panels. The minimum wage is defined as the greater of the federal or state minimum wage and was computed for each month over the sample period. The wage rate is defined as the reported hourly wage for workers paid by the hour. For workers not paid by the hour, the hourly wage rate is imputed by dividing usual weekly earnings divided by usual weekly hours. Only 0.6% of workers earning the minimum wage in the first year of the two year panels have imputed earnings. Because of frequent job switching by minimum wage workers, however, 9.0 percent of continuing workers have imputed wages (i.e. are not paid by the hour) in the second year.[25] While imputations create the potential for measurement error, workers with imputed wages are included in the analysis to avoid dropping those workers that rise above the minimum wage (or fall to the minimum) by switching between jobs that pay by the hour and salaried positions. As noted in the text, these workers have higher than average wage changes.

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[23] There are several reasons why matches might not be found for a given individual. The most important reasons for a match failure include: (i) a household moves; (ii) an individual moves out of the household, or (iii) the Census is unable to reinterview a household or obtain information on the individual. Perrachi and Welch (1995) analyze the attrition rates in matched March CPS files and find that the match rate is lowest among those in their early twenties Sample sizes are reduced further due to partial panels in 1984-85, 1985-1986, 1994-95, and 1995-96 due to changes in Census location identifiers during 1985 and 1995.

[24] The data source for the federal and state minimum wages is the *Monthly Labor Review.*

[25] Among workers earning the minimum wage in the second year, .6 percent have imputed wages in the second year and 10.4 percent had imputed wages in the first year of the panel.