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The Effects of a Raised Minimum Wage on Employment: Differences across States and Social Groups[1]

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The purpose of this project is to analyze the impact of a minimum wage increase on the probability of being employed in the fast food industry in selected states and to test the hypothesis that this impact may be different in different regions of the United States. Our study uses the Current Population Survey (CPS) and focuses on four states divided in two groups. The first group includes Vermont and New Hampshire, and the second includes Illinois and Indiana. The states were chosen so that each pair contains two similar states, one of which has experienced a recent minimum wage increase (Vermont in January 2006, and Illinois in January 2005), while the other has kept the minimum wage at its previous level. In each pair, the state which did not experience a minimum wage increase is used as a control group. Once we have separately modeled the effects of the minimum wage increase on employment for each pair of states, we proceed to compare the models and determine whether there are significant differences between them. Our models also include explanatory variables for age, education and race in order to control for individual level characteristics. While we find a reduction of employment in Vermont for workers under the age of 23 after the increase of the minimum wage, no similar reduction was found in Illinois.

A large number of studies have been conducted to try to assess the effect of an increase in the minimum wage on the unemployment rate. The neoclassical model dictates that an increase in the minimum wage should result in additional unemployment. However, the magnitude of this unemployment effect is not well established, and a series of empirical studies have reached controversial conclusions when studying this effect (Soest 1994). Card and Kruger (1995) have found that higher minimum wages increase the employment rate of low-income workers; while others, like Neumark and Washer (1995) have found results that confirm the negative employment effects of an increased minimum wage.

Having considered the results and models presented in the above studies, we decided to adopt the difference-in-differences methodology, presented by both Card and Krueger (2005), and Robinson and Wadsworth (2007), but conducting a different experiment by focusing on different states, time periods and dependent variables. We use two different pairs of states and two different dependent variables in an attempt to ensure that our findings are not compromised by flaws with any one particular model or by idiosyncrasies in one particular state. Thus, we begin by using a dependent variable that measures the total number of hours worked over the course of a year by food industry employees, then we check our results by using employment status as the dependent variable in the same model. We also control for age, education and race.

We believe that this technique ensures that we "control for all relevant factors in the economy that along with the minimum wage, might be determining employment outcomes"(Fox, 2006). Our aim is to contribute to the active debate on the effects of the minimum wage; along with that we believe that a comparison of the employment effects of minimum wage increases across different regions of the United

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States could help determine whether previous studies have taken the correct approach or whether they may have omitted certain important variables related to economic and social differences between states.

I. Theory

Standard neoclassical theory models the labor market using the same broad conceptual framework as in the case of most other markets, with an upward-sloping labor supply curve and downward-sloping labor demand curve. A minimum wage is a price floor in the labor market, and in our standard model it should act like any other price floor. If it is set below the equilibrium point, it will have no effect, since the equilibrium wage will be above the minimum wage level regardless of whether minimum wage legislation exists. On the other hand, if the minimum wage is set above the labor market equilibrium, then it will have the desired effect – it will prevent wages being driven down below a certain value by market pressures – at the expense of creating disequilibrium and leading to an excess of labor supply that cannot be met by demand (in other words, unemployment). Thus, in the absence of special conditions, neoclassical theory predicts that an effective minimum wage will cause some degree of unemployment. The precise *magnitude* of this negative effect on employment is of course a matter of debate, and is likely to vary depending on time, place, and the type of job under discussion. In terms of policy, it may or may not be considered an acceptable tradeoff for the beneficial effects of the minimum wage.

There are, however, certain special circumstances in which this tradeoff does not exist at all, because the nature of the market is different from the standard model in such a way that a minimum wage will not produce unemployment. The first example is monopsony: a labor market with only one employer. Under monopsony, the one employer will face an upward-sloping labor supply curve, and the marginal expense of hiring additional workers will also follow an upward-sloping curve, always above the labor supply (because the marginal expense of hiring an additional worker is higher than the wage). The profit-maximizing choice for the monopsonist is the point where the marginal expense of labor equals the marginal revenue product of labor, and this results in both a lower wage rate and lower employment than would result from perfect competition. Therefore, setting a minimum wage may actually increase both the income of workers *and* employment in this market, if the minimum wage is set above the wage paid by a profit-maximizing monopsonist but below the marginal expense of labor faced by the monopsonist at that point (Ehrenberg and Smith 2003).

A second case, in which a minimum wage may not reduce employment, is if the minimum wage has the secondary effect of shifting the labor demand curve to the right. In other words, this would be a situation where paying workers a wage above equilibrium will in some way cause firms to need more workers. That could happen if the minimum wage increases the demand for the firms' products, leading them to expand and hire additional employees. For example, if a firm's employees are also its main customers, increasing their wages (by setting a minimum wage, or by other means) may induce them to buy more from the firm. If this effect is large enough to offset the costs of the higher wages, employment will not decrease, and it may even increase.

II. Literature Review

The current minimum wage debate began with the findings of Card and Krueger (1995), which challenged the established neoclassical model. Card and Krueger used data from 1992, comparing New Jersey and Pennsylvania after New Jersey increased its minimum wage, and data from 1988, when the minimum wage in California was increased. In both cases they found evidence that the increase in the minimum wage led to an increase in pay, but did not result in the expected loss of jobs; on the contrary, they found a statistically significant *rise* in employment as a result of increases in the minimum wage.

The most active among the economists who argue that the minimum wage increase has an adverse effect on employment are Neumark and Wascher (1995, 2006), who have published a number of papers refuting the results of Card and Krueger (1995). Specifically, Neumark and Washer (1995) argue that higher minimum wages are correlated with a reduction in the proportion of teenagers pursuing their education and an increase in the proportion of teenagers who are neither employed nor in school. The methodology used in their study relies on panel data from the 50 states and the District of Columbia including such variables as Federal and State minimum wage rates, employment rates, and school enrollment rates.

Robinson and Wadsworth (2007) have studied the effects of the minimum wage on workers holding two jobs. Their study found that introduction of minimum wage encouraged such workers to work more hours in their primary job and reduce the hours worked in their secondary job if that job initially provided a wage below the new minimum. However, they found no evidence that the minimum wage resulted in a reduction in the rate of second job holding. The data set used by Robinson and Wadsworth (2007) consisted of a panel of individuals selected from Labor Force Surveys in Britain, and the methodology of the study is based on a difference-in-differences estimation. Thus, the Robinson and Wadsworth (2007) paper is methodologically similar to our own present study, despite the differences in subject matter. Fox (2006) suggest that even "if the negative findings of some researchers were to be accurate, minimum wage workers as a whole would be better off, as the temporary losses of the few would be far more than offset by the wage gains of the many." Fox (2006) also presents a lot of recent statistical data and results from newer findings, which support the hypothesis that an increase of the minimum wage does not cause an increase in unemployment.

III. Data Description

For the purpose of this study, we use pooled cross-sectional micro data obtained from the Current Population Survey (CPS) for the years 2005, 2006 and 2007 in the March annual supplement. The Current Population Survey interviews a random sample of individuals across the United States and gathers a wide variety of data that may be used in economic analysis. For our purposes, we selected only those observations taken from individuals who work in the fast food industry. Therefore, we considered only people working as "food preparation/server workers, bartenders, counter attendants, waiters/waitresses, food Servers" (CPS). The food industry was chosen due to the reasons listed by Card and Kruger (1995) – it is the leading employer of low wage earners, and it is an industry that in fact enforces the minimum wage.

We look at two different sets of states in the US for two different time periods. In both cases we compare the total number of hours worked by people employed in the fast-food industry in the period before and after the introduction of a minimum wage increase. The state that keeps its minimum wage at the old level serves as a control group, and the state that introduces a higher minimum wage is our treatment group. Each set of states is composed of two states that share a common border, have approximately the same geographical location and are expected to share similar cultures and economic backgrounds. The first pair of states we examine are New Hampshire and Vermont. In January 2006 Vermont increased its minimum wage from $7.00 to $7.25, while the minimum wage in New Hampshire remained at the level of $5.15, which had been the Federal minimum wage from 1997 to 2006. For this set of states, we used data from the CPS March Supplement for the years 2005 and 2006.

The second set of states in our study is composed of Illinois and Indiana. In January 2005, the minimum wage in Illinois was increased from $5.50 to $6.50, while the minimum wage in Indiana remained at the level of $5.15. For this set of states, we used data from the CPS March Supplement for the years 2004 and 2005. Table 1 below presents descriptive statistics of the dataset.

Table 1: Descriptive statistics for all continuous variables

Variable	Observations	Mean	Std. Dev.	Min	Max
TOTHRS	704	1101.389	779.776	8	4160
AGE	704	28.62642	13.69245	15	80
WSAL_VAL	704	10029.65	9952.146	45	84000

TOTHRS is the number of hours worked over the year by each individual. This is a variable that was not cited in the CPS. We constructed it as a product of the number of weeks the individual reported working multiplied by the number of hours he/she worked on average in a week over the past year. As we can see from Table 1 above, the total number of observations is 704. The minimum number of hours worked by an individual is 8, and the maximum is 4160. The mean number of hours worked is 1101.389, which is approximately half of what a full-time employed person should report (calculated as 50 weeks * 40 hours/week = 2000 hours). The relatively high standard deviation can be attributed to the large number of young people included in the sample, who are also attending college or high school, along with working part-time.

AGE is the self-reported age of the surveyed individuals. The median age is 28.62642, with standard deviation of 13.69245, which shows that we have a large number of young people in the sample.

WSAL_VAL is the individual's self-reported total wage and salary earnings amount over the past year. The mean is 10029.65, which is about the amount of money a person who is employed full-time would report if they were earning the Federal minimum wage ($5.15 per hour at the time in question). Such a person's yearly earnings would be approximately:

50 weeks * 40 hours/week * $5.15/hour = $10,300.

The next three tables give information about the data set, broken down into groups depending on the individuals' level of education, the state where they live and their race. The majority of people are white (88.49%), and 52.84% of them come from Illinois or Indiana.

Table 2: Observations from each state

State	Frequency	Percent
IL	249	35.37
IN	123	17.47
NH	188	26.7
VT	144	20.45
Total	**704**	**100**

Table 3: Racial distribution

Race	Observations	Percent
White	623	88.49
Others (non-white)	81	11.51
Total	**704**	**100**

As we can see from Table 4, most individuals (89.06%) did not have college education, and two thirds of them (66.05%) had only high-school education, or less. So our data confirms that people who are employed in the fast-food industry tend to earn around minimum wage, are typically young, and usually lack higher education. This means they have limited job opportunities and probably cannot afford to be selective when looking for employment.

Table 4: Educational level of surveyed individuals

Education level	Frequency	Percent
No high school	29	4.12
Some high school, no diploma	248	35.23
High school graduate, no college	188	26.70
Some college, no degree	162	23.01
College degree	75	10.65
Postgraduate degree	2	0.28
Total	**704**	**100**

Table 5 includes all variables used in the regression analysis presented further in the paper. TOTHRS and JOB are the dependent variables that we use to measure the effect of a minimum wage increase. As mentioned earlier, the TOTHRS variable is not directly reported, but we were able to construct it from reported data. We believe that TOTHRS is a better measurement of the effect of the changed minimum wage than JOB, as TOTHRS allows us to evaluate the magnitude of the effect. By contrast, since JOB only measures a person’s employment status, it does not account for the fact that a person may be actually working a different number of hours after the change of the minimum wage. The explanatory variables included in our model are used to assess to what extent the level of employment is affected by the socio-demographic characteristics of the surveyed people. We expect to find that younger people are more affected by a change in the minimum wage, and that the effect is negative, reducing the number of hours they work. We also expect that people who are part-time employed, and thus earning less than $12,000 a year, would also be more strongly affected by the minimum wage increase, as suggested by Robinson and Wadsworth (2007). Since the level of education tends to correlate positively with a person’s income, we expect that people with higher education would be affected less by a change in the minimum wage, since they are less likely to hold a minimum wage job. Finally, a variable for race is included to test for the possible presence of discrimination.

Table 5: Variables used in the model with their description

Variable name	Variable label
TOTHRS	The number of hours worked in a year by a fast-food industry employee
JOB	Employment status = 1 if the respondent was employed at the time of the survey; otherwise = 0
YEAR_DUM	Dummy variable = 1 for observations taken in the year after the minimum wage increase in each respective group; for observations taken the year before after the minimum wage increase = 0
STATE_DUM	Dummy variable = 1 for residents of the treatment state; for residents of the control state = 0
PROD_YS	YEAR_DUM x STATE_DUM (Interaction term)
AGE	Age of respondent
WHITE	Dummy variable = 1 if the respondent is white; otherwise = 0
HS_GRAD	Dummy variable = 1 if the respondent graduated high school; Otherwise = 0
COLLEGE	Dummy variable = 1 if the respondent has some college education; otherwise = 0
COL_GRAD	Dummy variable = 1 if the respondent graduated college; Otherwise = 0
WSAL_VAL	Total wage and salary earnings over the past year

IV. Empirical specification

Similarly to Card and Kruger (1995), we use the difference-in-differences methodology to determine the effect of the increase in the minimum wage in the treatment state compared to the control state. By using the difference-in-differences methodology we are able to compare the difference of the level of employment in the treatment state after the wage increase to the employment before the increase in the same state, as well as to the employment level in the control state. The use of control group is required so that we can account for any other changes in the economy that may have affected both the treatment and the control group simultaneously. The difference-in-differences methodology is used once for each of the two pairs of states. We also use two different dependent variables (TOTHRS and JOB), bringing the total number of initial regressions up to four.

Our first regression equation is as follows:

(1) $TOTHRS_i = \beta_0 + \beta_1 * YEAR\_DUM_i + \beta_2 * STATE\_DUM_i + \beta_3 * PROD\_YS_i + \beta_4 * AGE_i + \beta_5 * AGE_i^2 + \beta_6 * WHITE_i + \beta_7 * HS\_GRAD_i + \beta_8 * COLLEGE_i + \beta_9 * COL\_GRAD_i + e$

We use Equation 1 to run two different regressions in order to predict the total hours worked by food industry employees in the two sets of states. The first regression covers respondents from the Vermont/New Hampshire set, meaning that STATE_DUM is equal to 1 for residents of Vermont. The second regression covers respondents from the Illinois/Indiana set, meaning that STATE_DUM is equal to 1 for residents of Illinois.

Our second regression equation is as follows:

(2) $JOB_i = \alpha_0 + \alpha_1 * YEAR\_DUM_i + \alpha_2 * STATE\_DUM_i + \alpha_3 * PROD\_YS_i + \alpha_4 * AGE_i + \alpha_5 * AGE_i^2 + \alpha_6 * WHITE_i + \alpha_7 * HS\_GRAD_i + \alpha_8 * COLLEGE_i + \alpha_9 * COL\_GRAD_i + e$

We use Equation 2 in a similar manner as Equation 1, to run two different regressions in order to predict the total hours worked by food industry employees in the two sets of states. As before, the first regression covers respondents from the Vermont/New Hampshire set, while the second regression covers respondents from the Illinois/Indiana set.

A number of further restrictions were applied to all four regressions after we obtained the initial results; our notable findings are detailed below. The full results for all regressions are available in Appendix A and Appendix B, attached at the end of this paper. Appendix A details results for both groups of states using the TOTHRS model, while Appendix B details results using the JOB model.

V. Analysis of results for the Vermont/New Hampshire group

From Equation 1 above, we can observe the following:

β_0 represents the average number of hours worked by food industry employees in New Hampshire the year before the minimum wage increase.

$\beta_0 + \beta_2$ represents the average number of hours worked by food industry employees in New Hampshire the year after the minimum wage increase.

$\beta_0 + \beta_1$ represents the average number of hours worked by food industry employees in Vermont the year before the minimum wage increase.

$\beta_0 + \beta_1 + \beta_2 + \beta_3$ represents the average number of hours worked by food industry employees in Vermont the year after the minimum wage increase.

The change in hours worked in New Hampshire is equal to $(\beta_0 + \beta_2) - \beta_0 = \beta_2$

The change in hours worked in Vermont is equal to: $(\beta_0 + \beta_1 + \beta_2 + \beta_3) - (\beta_0 + \beta_1) = \beta_2 + \beta_3$

Finally, the difference in differences (change in VT minus change in NH) is:

$DID = (\beta_2 + \beta_3) - \beta_2 = \beta_3 = -77.69461$ (140.6272) [143.6487]

The number of hours worked increased in New Hampshire (the control state) while decreasing in Vermont (the treatment state). This suggests that the increase in the minimum wage may have had the negative impact on employment predicted by neoclassical theory. However, the regression analysis reveals that the p-value for β_3 is 0.589. With such a high uncertainty, the results are clearly not statistically significant. There is no evidence that the change in the minimum wage had an impact on employment measured in total hours worked.

We have attempted to improve on these results by restricting the model by age group. Previous studies have found that changes in the minimum wage affect young workers above all others. With this in mind, we ran a regression analysis on equation (1) restricted to observations from workers under the age of 23, since it has been argued that the young are disproportionately affected by the minimum wage laws. The age was chosen by trial and error to provide the best results:

$\beta_3 = -398.2248$ (144.9956) [141.4871]

Most importantly, the p-value for β_3 in this case is 0.005, making the result significant even at the 1% level. We therefore found evidence that the increase in the minimum wage was correlated with a reduction in total hours worked by employees under the age of 23 in Vermont. A similar regression analysis for employees over the age of 23 produces no significant results; likewise, no significant results were found when restricting by income rather than age (see Table 1).

We went through a similar process of analysis for equation (2), where the difference-in-differences is captured by the coefficient α_3. We found

$\alpha_3 = -.1445043$ (.0927642) [.094473]

However, this was again not significant, as the p-value was found to be 0.127. After applying the same age restriction as above, the revised difference-in-differences for workers under 23 was

$\alpha_3 = -.275875$ (.1457586) [.1476164]

with a p-value of 0.063, which would be significant at the 10% level. Thus we may have found additional evidence of a negative employment effect of the minimum wage on young workers in Vermont, though the evidence is weaker than that gathered from our previous model. As above, no significant results were found for workers over 23.

VI. Analysis of results for the Illinois/Indiana group

From equation (1) above, we can observe the following:

β_0 represents the average number of hours worked by food industry employees in Indiana the year before the minimum wage increase.

$\beta_0 + \beta_2$ represents the average number of hours worked by food industry employees in Indiana the year after the minimum wage increase.

$\beta_0 + \beta_1$ represents the average number of hours worked by food industry employees in Illinois the year before the minimum wage increase.

$\beta_0 + \beta_1 + \beta_2 + \beta_3$ represents the average number of hours worked by food industry employees in Illinois the year after the minimum wage increase.

The change in hours worked in Indiana is equal to $(\beta_0 + \beta_2) - \beta_0 = \beta_2$

The change in hours worked in Illinois is equal to $(\beta_0 + \beta_1 + \beta_2 + \beta_3) - (\beta_0 + \beta_1) = \beta_2 + \beta_3$

Finally, the difference in differences (change in IL minus change in IN) is:

DID = $(\beta_2 + \beta_3) - \beta_2 = \beta_3 = 96.56595$ (144.0324) [141.2109]

The number of hours worked declined more in Indiana (the control state) than in Illinois (the treatment state). This suggests that the increase in the minimum wage had a *positive* impact on hours worked in Illinois. However, the regression analysis reveals that the p-value for β_3 is 0.495. With such a high uncertainty, the results are clearly not statistically significant. There is no evidence that the change in the minimum wage had an impact on employment measured in total hours worked.

As in the first group of states we looked at, we have again attempted to improve on these results by restricting the model by age group. We ran a regression analysis on equation (1) restricted to observations from workers under the age of 24. Again the age was chosen by trial and error to provide the best results:

$\beta_3 = 82.9643$ (298.38) [163.838]

Unfortunately, the p-value for β_3 in this case is still unsatisfactory at 0.613, making the result statistically insignificant. Therefore, unlike in the case of Vermont, Illinois presents no evidence of an impact of the minimum wage on youth employment. A similar regression analysis for employees over the age of 24 likewise produces no significant results; likewise, no significant results were found when restricting by income rather than age (see Table 1).

We went through a similar process of analysis for equation (2), where the difference-in-differences is captured by the coefficient α_3. We found

$\alpha_3 = .0604448$ (.0841793) [.0805497]

However, this was again not significant, as the p-value was found to be 0.453. After applying the same age restriction as above, the revised difference-in-differences for workers under 24 was

$\alpha_3 = .0155518$ (.1337698) [.1382982]

with a p-value of 0.911, which is actually greater than the one in the unrestricted model, suggesting that the minimum wage increase was even less significant for the employment of young workers than for the employment of workers in general. In a similar test, no significant results were found for workers over 24, meaning that all of our tests failed to reveal any significant effect of the increased minimum wage on employment in Illinois.

VII. Robustness Checks

In the process of obtaining the results given above, we have repeatedly split our sample by age group and ran different regressions on the different age groups. A similar procedure was attempted for income groups, but it never yielded any significant results. In addition, when calculating p-values, we always used the robust (heteroskedasticity-adjusted) standard errors. It is important to justify all of these choices. We have therefore performed a series of Chow tests to show that different age and income groups do indeed require different regressions, and we have tested for heteroskedasticity in order to prove the need to use robust standard errors.

A. Chow Tests

We performed six Chow tests to determine if there are significant differences in the effects of the minimum wage increase across different groups defined by age and income. The first four tests are used to investigate the need for different regressions in the case of different age groups across the two separate pairs of states and the two regression models (TOTHRS and JOB) that we use for each pair of states. The last two tests are used to investigate the need for different regressions in the case of different income groups across the two separate pairs of states, using only the TOTHRS model. Dividing our sample by income group did not produce any significant results, so we felt no need to pursue that avenue further.

Note that the general procedure for doing a Chow test is as follows: First, observations are split in two groups in order to check if the groups are different enough to require separate regressions. Then, the two groups of observations are regressed independently and the SSR's yielded by the two regressions are summed in order to get SSR_{UR}. A third, "pooled" regression must then be estimated, using all observations from both groups. This third regression will provide SSR_R. Finally, the Chow statistic is computed using the following formula:

$$F_C = \frac{(SSR_R - SSR_{UR})/(k+1)}{SSR_{UR}/(n - 2(k+1))}$$

Where n is the total number of observations and k is the number of explanatory variables in the pooled regression. With the above procedure in mind, our results for the six Chow tests are displayed in Table 7:

Table 7. Chow tests results

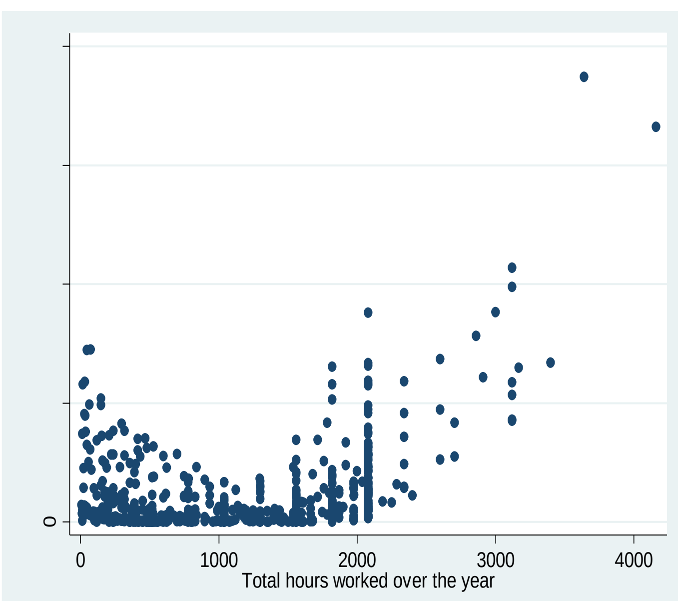
Chow tests	SSR (restricted)	SSR(ur-1)	SSR(ur-2)	SSR(ur)	k	n	n-2*(k+1)	F calculated	F critical
TOTHRS, VT/NH, restricetd model vs. AGE<23 and AGE >23	199384390	53973985.1	80678305	134652290	9	332	312	14.999	1.861
TOTHRS, IL/IN, restricetd model vs. AGE<24 and AGE >24	221812867	78632185.8	94559343	173191529	9	372	352	9.882	1.858
TOTHRS, VT/NH, restricetd model vs. income<12000 and income >12000	199384390	63357106.5	29263638	92620744.5	9	332	312	35.964	1.861
TOTHRS, IL/IN, restricetd model vs. income<12000 and income>12000	221812867	64964841.1	38228983	103193825	9	372	352	40.462	1.858
JOB, VT/NH, restricted model vs AGE<23 and AGE >23	61.238	41.495	15.073	56.568	9	332	312	2.576	1.861
JOB, IL/IN, restricted model vs. AGE<24 and AGE >24	55.570	35.810	17.814	53.624	9	372	352	1.278	1.858

The results above show that separate regressions are indeed required in five of the six cases we investigated. Only in the case of using the JOB model for IL/IN with an age restriction, we find that the two age groups are not sufficiently different for separate regressions to be justified.

B. Testing for Heteroskedasticity

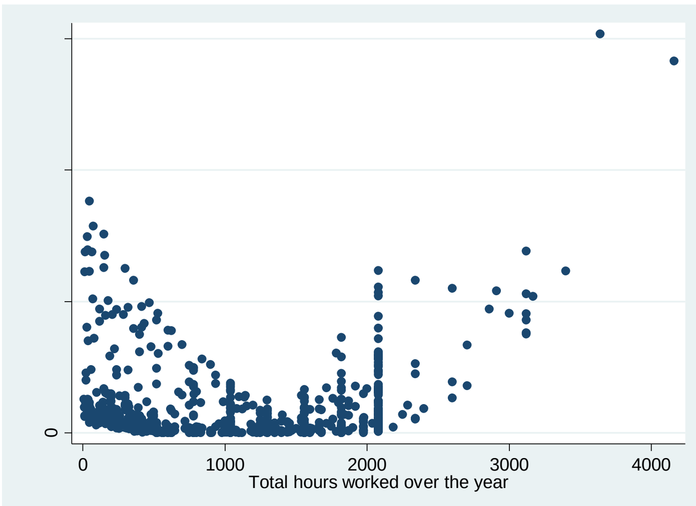
We check our sample for heteroskedasticity by performing White's General Test. More specifically, we perform two separate heteroskedasticity tests – one for each of the two pairs of states – the details of which can be found in the .do and .log files associated with this study. Our findings are as follows:

Figure 1: Heteroskedasticity in the VT/NH group



The test for heteroskedasticity for VT/NH produces the graph shown on Figure 1. The presence of heteroskeasticity can be clearly seen on the graph. So we continue by computing the F test, and we get $F_c(2, 701) = 10.21$, which is significant at the 5% level. Therefore, we conclude that in the case of VT/NH there is evidence for heteroskedasticity. Thus, we are justified in using the robust standard errors.

Figure 2: Heteroskedasticity in the IL/IN group



The test for heteroskedasticity for IL/IN produces the graph shown on Figure 2. The presence of heteroskeasticity can be clearly seen on this graph as well. So we continue by computing the F test, and we get $F_c(2, 701) = 21.68$, which is significant at the 5% level. Therefore, we conclude that there is evidence for heteroskedasticity in the case of IL/IN also. Thus, we are justified in using the robust standard errors.

VIII. Conclusion

There has always been debate over public policy surrounding the minimum wage, though at times the debate has been muted and out of the public spotlight. Recently, the issue once again came to the fore, as the federal minimum wage rate was increased in 2007 for the first time since 1997. Another increase followed in 2008, and a third one is scheduled for 2009. At the same time, the ongoing global recession is putting strains on the American economy and labor market, making questions of minimum wages and employment all that more acute. With large numbers of workers expected to lose their jobs, it is equally important to avoid policies that can decrease employment and to implement policies that bolster incomes (thus stimulating consumer spending). According to standard neoclassical theory, the minimum wage offers a tradeoff between those two policy goals, raising some incomes at the expense of creating unemployment. According to some of the literature on the subject, there is no tradeoff, and the minimum wage is unambiguously good. Given this disagreement, as well as the present economic climate, it is very useful to investigate whether the aforementioned tradeoff really exists, and whether it varies across geographical areas, age groups, or other variables. We believe the results of our study may shed some light on these questions.

Our study seems to confirm the validity of the neoclassical model only in very specific circumstances – for workers under the age of 23 in the state of Vermont – while finding no evidence in favor of that model in Illinois, or anywhere if workers from all age groups are considered. It is important to note that most of the tests we performed yielded statistically insignificant results, while the one test that showed a significant effect for youth in Vermont was significant even at the 1% level. Likewise, although insignificant, the results for Illinois and Indiana seemed to imply that the increased minimum wage could have had a positive effect on employment, and to our surprise we found that there was less evidence for an effect on young workers than for an effect on all workers in general.

It is difficult to find a single explanation for such widely diverging results. One possibility is that the minimum wage was below the equilibrium income for all workers in Illinois and for workers over the age of 23 in Vermont, and remained so even after its increase. Along those lines, Vermont currently has one of the highest minimum wage levels in the United States, while Illinois' minimum wage is still above the national average. If indeed only the wage in Vermont is above equilibrium, and only for young workers, that would lead us to expect that the minimum wage is below equilibrium for most groups of workers in most parts of the United States. Such a sweeping conclusion can in no way be supported by the limited data used in our study. It could just as easily be the case that the results for youth in Vermont are an aberration from the norm. We must therefore limit ourselves to drawing upon existing theories of the labor market to provide us with possible explanations for what we have observed.

It may be that the labor market in the fast food industry is monopsonistic, but this seems unlikely. There is clearly more than one employer. A monopsony could still exist if the various firms agreed to limit competition with each other, but there is no evidence for this (on the contrary, there appears to be vigorous competition). Nevertheless, the study of monopsony can provide a potential insight here. Ehrenberg and Smith (2003) point out that the key feature allowing a minimum wage to increase employment when dealing with a monopsony is the fact that the monopsonist faces an upward-sloping labor supply curve. Should competitive firms be faced with a similarly upward-sloping labor supply curve, the same result would apply to the minimum wage. Ehrenberg and Smith then go on to list certain factors that may cause competitive firms to be in this situation, including the existence of search costs, the need for large firms to pay higher premiums in order to compensate for their reduced ability to monitor workers, and discrimination.

Another possibility is the so-called "hungry teenager hypothesis" – essentially a special case of higher wages causing a rightward shift in the labor demand curve. The hypothesis is that paying higher wages to fast food employees (considered to be mainly teenagers) will lead them to spend more money on fast food, causing firms in this industry to expand and thus increase their demand for workers.

Although we do not know the reason for the statistical insignificance of most of our models, our results are important because they call into question the validity of the neoclassical view of the minimum wage. In the majority of cases, we found no evidence that an increase in the minimum wage has an effect on employment – negative or positive. As such, policymakers can feel free to increase the minimum wage (potentially as a form of economic stimulus), while remaining reasonably sure that its overall negative employment effects are likely to be negligible and concentrated on young workers. Perhaps such an increase in the minimum wage should be coupled with policy directed against youth unemployment, or in favor of greater opportunities in higher education. In that case, policymakers may also wish to take note of the differences between the effects on youth employment in Illinois and Vermont in our study.

Of course, it is always possible that a negative employment effect does indeed exist, but we failed to find evidence of it due to the interference of exogenous factors unrelated to the minimum wage. We cannot make pronouncements with the same level of certainty as if this were a laboratory experiment. Nevertheless, if a negative employment effect exists, our failure to find it suggests that it is likely to be small. Therefore, even in that case, the net effects of increasing the minimum wage are still likely to remain positive, and we maintain our policy recommendations.

IX. References

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X. Appendix A: Regression coefficients for the primary model, where the dependent variable measures total hours worked in a year

	Vermont / New Hampshire					Illinois / Indiana				
	Unconstrained	Constrained by age		Constrained by income		Unconstrained	Constrained by age		Constrained by income	
		Under 23	Over 23	Below $12,000	Over $12,000		Under 24	Over 24	Below $10,000	Over $10,000
State dummy	63.64106	269.3301	-243.2262	83.77365	-39.5064	-11.8953	-63.7468	-28.6120	-48.2955	24.57921
(treatment = 1)	(96.41932)	(99.31235)	(170.5181)	(88.0569)	(146.110)	(104.7101)	(125.163)	(161.949)	(109.378)	(116.9017)
	[106.1568]	[106.4845]	[188.4787]	[91.2277]	[183.306]	[113.9033]	[127.265]	[176.150]	[124.361]	[124.6594]
Year dummy	75.473	121.1822	-37.81001	97.48761	45.62396	-123.0677	-182.785	-58.9091	-182.144	-108.8154
(after = 1)	(92.9791)	(96.83751)	(161.3138)	(83.3640)	(146.031)	(117.6916)	(168.673)	(183.788)	(124.499)	(130.2015)
	[82.50511]	[86.63094]	[142.0992]	[71.5905]	[115.739]	[112.3935]	[127.746]	[175.008]	[118.418]	[125.7555]
Interaction term	**-77.69461**	**-398.2248**	**355.2449**	**-169.621**	**40.29214**	**96.56595**	**82.9643**	**125.574**	**10.4557**	**7.051241**
(state x year)	**(140.6272)**	**(144.9956)**	**(246.3659)**	**(127.009)**	**(219.765)**	**(144.0324)**	**(298.38)**	**(226.899)**	**(154.175)**	**(156.6995)**
	[143.6487]	**[141.4871]**	**[258.8086]**	**[132.258]**	**[236.543]**	**[141.2109]**	**[163.838]**	**[220.940]**	**[154.163]**	**[157.7438]**
Age	72.24489	-17.29722	10.07664	-4.93062	46.78649	100.9753	-382.591	65.4027	23.8461	64.34411

	(18.28609)	(370.6928)	(31.26629)	(17.6272)	(28.5123)	(12.86438)	(7.75073)	(26.5456)	(14.7842)	(15.26089)
	[22.16033]	[351.0736]	[28.05554]	[17.5279]	[30.5862]	[12.83421]	[271.474]	[22.3755]	[14.1891]	[16.14384]
Age^2	-.7489213	1.981963	-.1142085	.1170114	-.585466	-1.05508	14.3211	-.676667	-.221827	-.6672043
	(.241942)	(9.945663)	(.3716533)	(.228794)	(.371332)	(.1665954)	(117.227)	(.291086)	(.188273)	(.1911459)
	[.2814617]	[9.421566]	[.3352635]	[.225147]	[.389167]	[.1668741]	[7.09278]	[.234283]	[.180338]	[.2021793]
Race dummy	241.3346	-95.79413	490.9309	229.3231	116.6585	2.15093	-133.557	154.457	-14.8891	-47.58376
(white = 1)	(148.5161)	(175.6749)	(226.6401)	(132.616)	(242.835)	(92.74338)	(125.127)	(139.526)	(104.151)	(97.28934)
	[158.7883]	[176.6328]	[201.9799]	[90.0814]	[164.665]	[108.1195]	[166.303]	[134.297]	[125.764]	[85.22142]

Appendix A: (continued)

	Vermont / New Hampshire					Illinois / Indiana				
	Unconstrained	Constrained by age		Constrained by income		Unconstrained	Constrained by age		Constrained by income	
		Under 23	Over 23	Below $12,000	Over $12,000		Under 24	Over 24	Below $10,000	Over $10,000
High school dummy	435.756	638.7871	10.13995	392.3701	-303.5857	194.2254	221.1897	46.37042	217.6103	-115.7535
	(116.8329)	(145.8405)	(254.6525)	(115.281)	(205.779)	(87.59363)	(125.127)	(128.424)	(105.307)	(89.9103)
(finished high school = 1)	[136.7786]	[174.1174]	[319.0611]	[138.875]	[169.014]	[94.03971]	[133.012]	[134.050]	[119.226]	[89.8961]
College dummy	-174.3783	-520.1918	67.4381	-29.2946	140.6321	-126.9815	-405.9091	-129.3708	-148.137	-16.18299
(attended college = 1)	(103.3506)	(134.5267)	(162.2213)	(106.879)	(146.617)	(99.49627)	(123.075)	(166.105)	(114.699)	(102.152)
	[112.1096]	[162.5432]	[145.8542]	[128.500]	[129.909]	[101.6552]	[147.739]	[157.31]	[129.850]	[97.6974]
Graduation dummy (graduated college = 1)	330.4514	83.21012	148.869	399.6369	-78.38026	166.5833	-90.24735	211.7049	179.8539	-22.64658
	(119.4261)	(361.7313)	(168.6032)	(133.592)	(157.051)	(146.7564)	(290.195)	(205.598)	(207.870)	(132.740)

	[127.6451]	[639.75]	[155.3742]	[183.569]	[144.378]	[149.1989]	[368.373]	[191.646]	[309.004]	[125.589]
Constant	-821.5309	150.0015	785.3378	164.0382	1109.692	-716.276	3144.383	-24.30534	336.0044	690.1052
	(302.2008)	(3438.801)	(717.038)	(287.853)	(520.162)	(230.1152)	(2827.92)	(600.822)	(249.367)	(310.238)
	[348.501]	[3238.096]	[639.2472]	[271.072]	[523.909]	[228.3111]	[2565.66]	[497.056]	[246.625]	[321.752]
Number of observations	332	182	150	227	105	372	189	183	211	161
p-value for the interaction term (with robust se)	0.589	**0.005**	0.172	0.201	0.865	0.495	0.613	0.571	0.946	0.964

Appendix B: Regression coefficients for the secondary model, where the observed dependent variable records whether a person was employed (=1) or not (=0) at the time of the survey.

	Vermont / New Hampshire			Illinois / Indiana		
	Unconstrained	Constrained by age		Unconstrained	Constrained by age	
		Under 23	Over 23		Under 24	Over 24
State dummy (treatment = 1)	.0250717	.1411789	-.1224226	-.0825875	-.0082702	-.1152659
	(.0636026)	(.099835)	(.0725962)	(.0611975)	(.0992635)	(.070225)
	[.0658467]	[.0984574]	[.0820304]	[.0577671]	[.1035321]	[.0641207]
Year dummy (after = 1)	.0727426	.1029408	.0130668	-.0287804	.0127369	-.0642066
	(.0613333)	(.0973471)	(.0686776)	(.0687845)	(.1096583)	(.0796945)
	[.0580179]	[.0980995]	[.0527084]	[.062825]	[.1125115]	[.0624569]
Interaction term (state x year)	**-.1445043**	**-.275875**	**.0306616**	**.0604448**	**.0155518**	**.0894013**
	(.0927642)	**(.1457586)**	**(.1048876)**	**(.0841793)**	**(.1337698)**	**(.0983886)**
	[.094473]	**[.1476164]**	**[.1101037]**	**[.0805497]**	**[.1382982]**	**[.0844882]**
Age	.0181713	.0679099	-.0026264	.0098902	-.4208186	.0072104
	(.0120624)	(.3726436)	(.0133113)	(.0075185)	(.2366367)	(.0115108)
	[.0099868]	[.3896471]	[.0116835]	[.0070261]	[.198836]	[.0095981]
Age^2	-.0001747	-.0022963	.0000282	-.0000683	.011353	-.0000395
	(.0001596)	(.009998)	(.0001582)	(.0000974)	(.0061469)	(.0001262)
	[.0001296]	[.0104522]	[.0001372]	[.0000879]	[.005196]	[.0001023]
Race dummy (white = 1)	.0341244	.0107173	.0530972	.138049	.2517826	.0782601
	(.0979681)	(.1765994)	(.0964896)	(.0542036)	(.0929691)	(.0605018)
	[.1019191]	[.1753494]	[.1006612]	[.0609317]	[.1039459]	[.0661132]
High school (finished high school = 1)	.0107427	.1586925	-.1662223	.028707	.0747708	.0441816
	(.0770684)	(.146608)	(.1084156)	(.0511938)	(.0992351)	(.0556877)
	[.0714243]	[.1299865]	[.0609513]	[.0505374]	[.098831]	[.0611843]

College (attended college = 1)	-.0730533 (.0681748) [.0669432]	-.1776995 (.1352346) [.1229134]	.0298114 (.069064) [.0833609]	-.0615604 (.0581503) [.0587694]	-.1786887 (.0976076) [.0976106]	.061546 (.072027) [.0680176]
Graduation (graduated college = 1)	.2281765 (.078779) [.0535984]	.4108664 (.3636349) [.1384574]	.1380497 (.071781) [.0696658]	.0500178 (.0857714) [.0847586]	-.5750642 (.230146) [.2178674]	.037386 (.0891521) [.0777195]
Constant	.3574345 (.1993456) [.1948825]	.0927409 (3.456897) [3.598716]	1.026676 (.3052712) [.2611127]	.5290547 (.1344901) [.1294369]	4.396512 (2.242749) [1.872262]	.6314495 (.2605305) [.2312066]
Number of observations	332	182	150	372	189	183
p-value for the interaction term (robust se)	0.127	0.063	0.781	0.453	0.911	0.291