THE EMPLOYMENT EFFECTS OF THE OREGON 1997-99 MINIMUM WAGE INCREASES: ESTIMATION THROUGH GEOGRAPHICAL WAGE VARIATION

by

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This paper evaluates the employment effects of the 1996 initiative to raise minimum wages in Oregon. It exploits geographical wage variation at the county and MSA levels in order to estimate the relationship between the proportion "low paid" in a given area and the change in both the employment rate and total employment after the 1997-99 minimum wage increases. No evidence is found to indicate that the minimum wage increases produced adverse employment effects.

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I. INTRODUCTION

Background

Minimum wage provisions were first introduced by the Fair Labor Standards Act (FLSA) of 1938. Since its passage, advocates have "argued that minimum wage laws enhance social welfare by guaranteeing that all workers receive a 'fair' wage for their labor," while opponents maintain that a minimum wage "only guarantees excessively low employment among the relatively unskilled."[1] Economists have generated a large body of literature analyzing these arguments, but have not yet found definitive answers.

In November of 1996 Oregon voters passed a three-step increase in the state minimum wage. On January 1, 1997 the minimum wage was increased from $4.75 to $5.50, and was subsequently increased on January 1, 1998 and 1999 to $6.00 and $6.50 respectively. Singell and Terborg (2001) note that the Oregon case offers a particularly good area of study, as "the minimum wage increase is relatively large in magnitude (a 37 percent increase) and over a longer duration…than prior studies of the minimum wage."

This study will evaluate, through empirical analysis, the employment effects of the 1997-99 minimum wage increases in Oregon. The effects will be estimated by exploiting geographical wage variation at the county and metropolitan statistical area (MSA) levels. This paper will test the prediction of the standard economic model: increases in the minimum wage will have greater adverse effects on employment in areas in which there is a relatively large percentage of industries that pay "low wages" (as these are the areas in which the minimum wage will have the largest effect on wages).

[1] Linneman, P. (1982). 'The economic impacts of minimum wage laws: a new look at an old question' *Journal of Political Economy,* Vol. 90, p. 444.

Ultimately, this study does not find any evidence in support of the hypothesis. The welfare effects of the minimum wage increases will not be addressed in this paper.

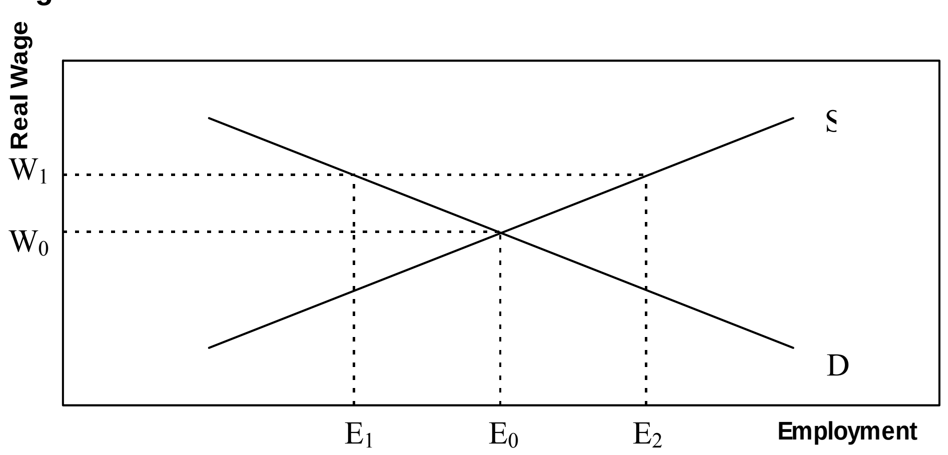
The remainder of this section is devoted to economic theory on minimum wage legislation (for those unfamiliar) and prior research done on the employment effects of minimum wage legislation. The methodology and equations estimated in this study are discussed in section II. Section III presents the estimates of the equations and discusses the implications of the results. In section IV I offer my opinion on the validity of economic theory given the results of this study. Section V contains a summary.

Theory

Standard Economic Model

The standard economic model (Figure 1.1) predicts that minimum wages cause unemployment.

Figure 1.1



This model assumes: (1) a competitive labor market, (2) complete coverage (all workers are affected by the law), and (3) homogenous labor (workers are similar in all wage-determining respects). The labor supply curve (S) gives the amount of workers who are willing to work at any given wage level (W) and the labor demand curve (D) gives the total number of workers that firms in the market demand at any given wage level. We begin with a market in equilibrium (labor supply (S) = labor demand (D)). The equilibrium wage is W_0 and the equilibrium level of employment is E_0. W_0 will be the prevailing wage because at any other wage level there will be either upward or downward pressures on the wage: a wage lower than W_0 will lead to more jobs than there are workers willing to work, and a wage above W_0 will lead to more workers willing to work than there are jobs. Thus, there is no unemployment in a competitive labor market that is in long-run equilibrium. At the market equilibrium wage (W_0) the number of persons who want to work is equal to the number of workers firms want to hire.

Now suppose that the government imposes a minimum wage (W_1) that is binding ($W_1 > W_0$)[2]. Firms will move up the labor demand curve to W_1 (because they cannot pay less) and employment falls to E_1 (firms demand less workers as the price of labor increases). Some workers (E_1-E_0) have lost their jobs and are unemployed. Additionally, because of the increased wage, more persons are now willing to work (E_2-E_0) but cannot find jobs. In total, the minimum wage has created unemployment of E_2-E_1. Therefore, a minimum wage creates unemployment both because previously employed workers lose their jobs and because the higher wage has attracted additional workers into the labor market who also cannot find work.

Monopsony Model

There is, however, a situation in which a skillfully set minimum wage may raise employment. This situation can occur in a monopsonistic labor market (Figure 1.2), in

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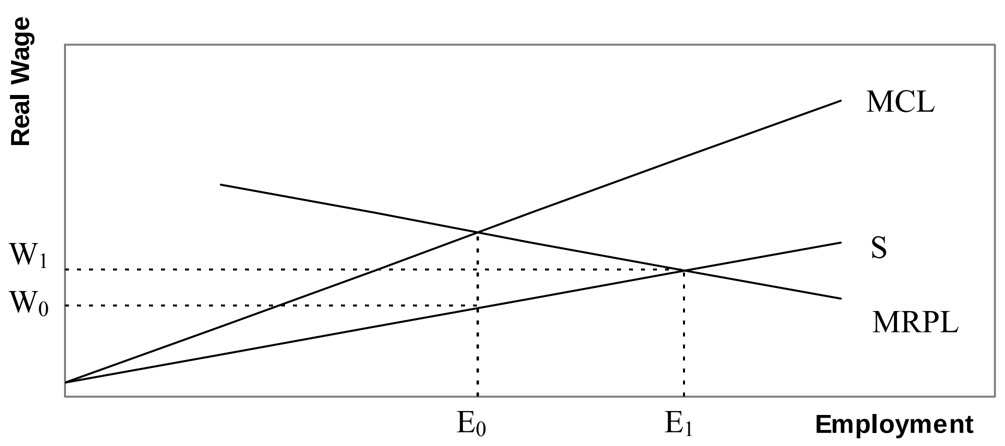
[2] A nonbinding minimum wage ($W_1 < W_0$) does not require firms to raise workers' wages; thus, nonbinding minimum wages have no effect on employment.

which there is a single buyer of labor (the "competitive labor market" assumption above is relaxed).

Figure 1.2



In this model the sole employer can choose what wage to pay; the higher the wage that the employer offers, the higher the supply of workers. The profit-maximizing firm will choose the level of employment where the value of the product produced by the last worker hired[3] is equal to the cost of that worker (marginal revenue product of labor (MRPL) = marginal cost of labor (MCL)). Note that the cost of the last worker hired is greater than the wage, as raising the wage to attract the last worker also requires the firm to raise the wages of all the previously hired workers. The result of this feature is that each worker is paid less than the value that they create. It is because of this gap that the minimum wage can raise the wage of workers without forcing them into unemployment.

We can see this possibility in Figure 1.2. Before the imposition of a minimum wage, the monopsony firm hires workers until the marginal cost of labor (MCL) is equal to the marginal revenue product of labor (MRPL). The equilibrium level of employment

[3] The value of the product produced by the last worker hired is less than that of the previous worker hired, as additional workers are less productive when they are added to a fixed amount of capital (the law of diminishing returns). Hence, the slope of the marginal revenue product of labor (MRPL) schedule is negative.

(E_0) and labor supply (S) determine the equilibrium wage (W_0). Now suppose that a binding minimum wage (W_1) is introduced. The marginal cost of labor collapses to the minimum wage (because the firm cannot pay less) until it intersects the labor supply curve (after which the firm will need to pay above the minimum wage in order to attract more workers). Now that the firm does not have the option of paying workers less than the minimum wage, it might as well hire as many workers as it can get at the minimum wage level (E_1). Thus, employment increases by E_1-E_0.

It is important to note that the highest level to which the minimum wage can be raised without decreasing employment again is the wage level that would have prevailed under a competitive labor market (at the intersection of (S) and (MRPL)). Therefore, the level to which the minimum wage can be increased before employment starts to fall depends on the elasticity (slope)[4] of both the labor supply schedule (S) and labor demand schedule (MRPL). Notice that if the slope of labor supply (S) was close to flat, the window in which a minimum wage increase could cause positive employment effects is extremely small (flattening MRPL widens the window). This attribute greatly reduces the monopsony model's validity: the general consensus is that "the typical minimum-wage employer is not a mining company in an isolated company town but a retail trade or service employer in a labor market with many such employers," and so one would expect that "the elasticity of labor supply to any one such employer should…be 'close' to

[4] Elasticity is the percentage change in the dependent variable caused by a 1 percent increase in the independent variable, or ($\Delta W/ \Delta E$), or the slope of the line. Economists typically use elasticity to describe how sensitive the demand/supply for a particular good is to changes in the price. If demand/supply varies greatly with price, then demand/supply for the good is said to be elastic. If not, then demand/supply for the good is said to be inelastic.

infinite [very flat]."[5] Thus, many economists feel that, in reality, the opening for a skillfully set minimum wage is negligible.[6]

However, Dolado et al. (1995) argue that "the important features of monopsony will be reproduced in any situation where firms have some discretion over the wages they pay." Intuition and common experience tell us that this case is quite common, as the average firm will find it easier to recruit and retain workers if it offers a higher wage. The perfect competition model says that firms have no control over the wages that they pay, and so the implication is that if an employer cuts wages by even a fraction of a penny, all of its workers will immediately leave. This assumption is just as extreme as those of the pure monopsony model, and so "the important question is the *extent* of monopsony power."[7] If this is the case then economic theory does not make an unambiguous prediction on the employment effects of the minimum wage. We can then only hope to answer the question through empirical research.[8]

Other Models

Recall that the monopsony model relaxes the "competitive labor market" assumption of the standard economic model. Additional models are needed when the other two basic assumptions of the standard model are relaxed. For a detailed discussion of these models [as well as alternative versions of the monopsony model and a discussion of cases in which employers cut job package costs (fringe benefits, training, etc.) instead of employees] see Brown (1999), pp. 2003-2111.

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[5] Brown C. (1999). 'Minimum wages, employment and the distribution of income', in Ashenfelter, O. and Card, D. (eds), *Handbook of Labor Economics,* Vol. 3, Elsevier, Amsterdam, 2108.
[6] Ibid., 2108-9.
[7] Dolado, J., Kramarz, F., Machin, S., and Manning, A., Margolis, D. and Teulings, C. (1995). 'The economic impact of minimum wages in Europe', *Economic Policy,* Vol. 23, p. 330.
[8] Ibid., 330.

Methodology

Generally, economists use two different approaches in order to analyze empirical evidence on the effects of a minimum wage. The first method is to look at the correlation between employment changes and minimum wage changes, while controlling for other relevant factors. This approach takes advantage of variation in minimum wages over time and/or across industries and regions.[9]

The second method is to examine instances in which minimum wages are raised and treat them as a "natural experiment". This approach compares a group that is directly affected by new minimum wage legislation to an unaffected (or varyingly affected) "control" group. The control group might be a nearby state or region, or a high-wage group (which is not addressed by minimum wage legislation). High-wage groups are typically identified by region, firm, individual, industry, occupation, or demographic (age, education, etc.).[10]

Empirical Research

Research Done Prior to 1982

Early research primarily gathered time-series data on the variation in minimum wages and employment. Time-series analysis examines variables over time. The standard statistical model for the time-series literature is

$$E_t = \alpha * X_t + \beta * MW_t + \varepsilon_t$$

where E_t is the employment/population ratio, X_t controls for relevant variables such as time trends (business cycles), MW_t is the level of the minimum wage, usually relative to the average wage, ε_t is the error term, and the subscript t denotes the time at which each

[9] Ibid., 330-31.
[10] Ibid., 331.

data point was taken.[11] Resultantly, β is the estimate of the relationship between minimum wage levels and employment over time.

Most of these studies focused on teenagers because teenagers are generally considered a "low-wage" group. This characteristic means that the proportion of teenagers directly affected by the minimum wage is larger than that of the whole population, and so the anticipated effect on teenage employment is likely to be larger.[12] Brown et al. (1982) noted that the studies available at that time, taken as a whole, revealed a teenage employment elasticity (β) between -0.1 and -0.3. This means that a 10% increase in the minimum wage typically resulted in a reduction in teenage employment of 1 to 3%. These results were generally statistically significant.[13]

Recent Research

More recent research relies more on the aforementioned "natural experiment" approach than the time-series approach, and has provided mixed evidence on the employment effects of minimum wage legislation. Perhaps the most famous and controversial study using this methodology is by Card and Krueger (1994). Card and Krueger use New Jersey's 1992 minimum wage increase in order to conduct two employment outcome comparisons: (1) fast-food industry employment growth in New Jersey versus that of nearby Pennsylvania (the control), and (2) within New Jersey, the employment changes at fast-food restaurants initially paying high wages (the control) versus those initially paying low wages. In both cases Card and Krueger find evidence that the increase in the

[11] Brown C. (1999). 'Minimum wages, employment and the distribution of income', in Ashenfelter, O. and Card, D. (eds), *Handbook of Labor Economics,* Vol. 3, Elsevier, Amsterdam, 2113-4.
[12] Ibid., 2107.
[13] Ibid., 2115.

minimum wage *increased* employment. This finding directly contradicts the predictions of the standard economic model.

Though the Card and Krueger (1992) study has not gone unchallenged (Neumark and Wascher, 2000) or unrevised (Card and Krueger, 2000), it continues to be an important part of a growing body of literature that has cast significant doubt on traditional theory. The findings of this body of literature are largely in keeping with Card and Kruger (2000), who argue that

> because of friction in the labor market, a minimum wage increase can be expected to cause some firms to reduce employment and others to raise employment, with these two effects potentially canceling out if the rise in the minimum wage is modest.

Dolado et al. (1995) review 30 years of minimum wage legislation in Europe and offer this conclusion:

> The importance of minimum wages has probably been exaggerated…. The evidence on the employment effects of minimum wage legislation is very mixed. We have found evidence that higher minimum wages reduced employment in some cases…and raised it in others…. We should emphasize that none of our results suggests that the effects (good or bad) on the economy of current levels of minimum wages are particularly large.

For additional studies that find similar results see Card (1992), Katz and Krueger (1992), and Stewart (2003) and (2004).

This is not to suggest, however, that the new consensus is that minimum wages have no effect on employment. Burkhauser et al. (2000) estimate that the elasticity of teenage employment is between -.2 and -.6 and argue that the macroeconomic controls used in studies such as Card and Krueger (1995) eliminate all variation in the minimum wage variable, which thereby reduces "the likelihood of obtaining a precise estimate of the impact of the [minimum wage] policy being examined." Deere et al. (1995) compare the changes in employment rates of high- and low-wage workers and find that after the 1990-91 U.S. national minimum wage increases, subgroups with more low-wage workers experienced larger declines in employment. In particular, they find that teenagers bore a significant portion of the job losses. In Oregon, Singell and Terborg (2001) conduct three natural experiment analyses on the employment effects of the 1997-99 minimum wage increases, in the restaurant industry, and find data that are consistent with neoclassical economic theory. Other studies that find the more standard effect include Neumark and Wascher (1992) and (2000), and Neumark (2001).

Taken as a whole, the findings of research on the employment effects of the minimum wage are inconclusive. It is probable that the minimum wage question will remain a contentious one for sometime to come.

II. METHODOLOGY

This study is in keeping with "natural experiment" studies that compare changes in employment measures between groups with high and low percentages of low-wage workers. One of the first such studies was conducted by Linneman (1982), who compares individuals above and below the national minimum wage established by the 1974 FLSA amendment (prior to its enactment) in order to parameterize the disemployment effects of the amendment on the subminimum population. Rather than comparing individuals, Card and Krueger (1994) compare high- and low-wage companies, and several other studies alternatively compare high- and low-wage geographical areas (Card, 1992; Deere et al., 1995).

The method of this study also involves exploiting geographical wage variation, and most closely follows the model set by Stewart (2003). Stewart begins by dividing the UK into 140 "local areas". In each area Stewart relates the change in the employment rate, in a period straddling the minimum wage introduction in 1999, with the proportion of individuals who are "low paid" (earning less than the minimum wage prior to the minimum wage introduction). Any minimum wage will take a larger "bite" into an area's wage distribution if a greater proportion of its population is initially earning a wage that is lower than the new minimum, and so one would expect that in such areas the employment effects will be more negative (if the standard economic model is to be supported).

This study analyzes geographical wage variation in Oregon at the county and metropolitan statistical area (MSA) levels. County level data are used when available, and Benton, Lane, and Jackson counties have been substituted with Corvallis MSA, Eugene-Springfield MSA, and Medford-Ashland MSA, respectively. Due to a lack of available data, Gilliam and Wheeler counties are not included in the analysis. Only two industries were surveyed in Gilliam County (with a total annual average weekly employment of five persons in 1996) and only three industries were surveyed in Wheeler (with a total annual average weekly employment of two persons in 1996). In total, 34 geographical areas are examined.

The impact of the of the three-step increase in the Oregon minimum wage on employment is estimated by two very similar statistical models. The first model takes the form:

$$\Delta E_{g,s\text{-}e} = \alpha_0 + \beta P_{g,s} + \varepsilon_{g,s} \quad (1)$$

where $\Delta E_{g,s\text{-}e}$ is the change in the employment rate between time interval $s\text{-}e$ in area g, $P_{g,s}$ is the proportion of industries in area g who are "low paid" at time s, and $\varepsilon_{g,s}$ is the error term. The proportion "low paid" in a given area is determined by the percentage of 3-digit NAICS[14] industries, within that area, which pay an average weekly wage that is at least one standard deviation below the average weekly wage paid by all 3-digit NAICS industries in the state of Oregon. In the fourth quarter of 1996, the state average weekly wage for all 3-digit NAICS industries was $496.82 with a standard deviation of $240.95, which defined "low pay" industries as those paying an average weekly wage of less than $255.87 ($496.82 - $240.95). This definition is markedly different from that of Stewart (2003), who uses individual level data rather than industry level data, and is able to define the proportion "low paid" as the proportion of individuals within a given area who earn less than the minimum wage prior to the minimum wage introduction. Ideally, this

[14] North American Industry Classification System – for example, NAICS 445 identifies "Food and Beverage Stores".

study would also employ Stewart's definition, which addresses the minimum wage question more directly, but individual level data in Oregon is not readily available. Consequently, the alternative method of identifying "low pay" areas has been used.

Equation (1) is estimated using data over four different time intervals. The first dataset specifies *s* as the fourth quarter of 1996 and *e* as the fourth quarter of 2000. Recall that the three minimum wage increases occurred between January 1, 1997 and January 1, 1999. Thus, this specification allows the proportion "low paid" in the quarter immediately preceding the first minimum wage increase (Q4 96) to predict the change in the employment rate in a given area across an interval that spans all three minimum wage increases [Q4 96 - Q4 00]. The next two regressions use the intervals [Q4 96 - Q4 01] and [Q4 96 - Q4 02]. Note that these time intervals allow for the possibility that the impact of a minimum wage introduction will occur with a lag (see Burkhauser et al., 2000; Neumark, 2001). The fourth regression is a control regression, which estimates the equation over the interval [Q4 92 - Q4 96], where the proportion "low paid" in Q4 92[15] is the predictor. The minimum wage was not increased during this time interval, which is why it has been identified as a suitable control.

The second model takes the form:

$$\Delta T_{g,s\text{-}e} = \alpha_0 + \beta P_{g,s} + \varepsilon_{g,s} \quad (2)$$

where all of the variables are identical to those of equation (1), except the independent variable is now $\Delta T_{g,s\text{-}e}$, which represents the change in total employment between time

[15] The Q4 92 state average weekly wage for all 3-digit NAICS industries was $445.77 with a standard deviation of $214.47, which defined "low pay" industries as those paying an average weekly wage of less than $231.30.

interval *s-e* in area *g*. The four time intervals used in equation (1) are also used in equation (2).

Equations (1) and (2) will both test the hypothesis that $\beta < 0$. This simply means that one would expect (given the standard economic theory) that the greater the percentage of "low wage" industries within a particular area, the greater the negative employment effects will be as a result of the introduction of the minimum wage.

The data on wages are from the 1992, 1996, and 2000-02 Quarterly Census of Employment and Wages (QCEW). The employment rate and total employment data are from the Oregon Employment Department (OED). The only data that required any transformations were the fourth quarter estimates of employment rates and total employment. These data were only available in monthly figures, and so quarterly figures were created by taking the average of the October, November, and December figures.

III. RESULTS AND ANALYSIS

TABLE 1
Estimates of the minimum wage impact on employment rates

Time Interval (s-e)	*Proportion "low paid" at time s: slope coefficient (absolute t-ratio)*	*Constant (absolute t-ratio)*	R^2
Q4 96 - Q4 00	5.560 (1.744)*	.840 (1.302)	.087
Q4 96 - Q4 01	8.452 (1.883)*	-1.876 (2.066)	.100
Q4 96 - Q4 02	16.295 (3.822)*	-2.723 (3.158)	.313
Control: Q4 92 - Q4 96	3.000 (.649)	.109 (.126)	.013

*Denotes statistical significance at the 10% level.

The estimates based on the employment rate data are presented in Table 1. Taken as a whole, the results conflict with the predictions of the standard economic model. The slope coefficient (β) over the [Q4 96 - Q4 00] interval is 5.560, meaning that a 10% (0.10) increase in the proportion "low paid" in a particular area corresponds with a .556% (5.560*0.10) increase in that area's employment rate from 1996 to 2000. The absolute *t*-ratio[16] of 1.744 indicates that we can be approximately 95% confident that we can reject the hypothesis $\beta = 0$ (which means that β is positive and different from zero). Recall that economic theory predicts $\beta < 0$. As the time interval is expanded to [Q4 96 - Q4 01] and [Q4 96 - Q4 02] the estimate of β becomes more positive and statistically more significant.

[16] The t-ratio is a measure of how statistically significant the estimate is, which is typically defined as how confident we can be that the estimate is not random, given that we expect no relationship between the two variables ($\beta = 0$). The higher the t-ratio, the more confident we can be that the real value of β is not zero.

TABLE 2 *Estimates of the minimum wage impact on total employment*			
Time Interval (s-e)	*Proportion "low paid" at time s: slope coefficient (absolute t-ratio)*	*Constant (absolute t-ratio)*	R^2
Q4 96 - Q4 00	-53632.038 (4.060)*	13270.007 (4.967)	.340
Q4 96 - Q4 01	-28483.141 (2.469)*	7086.824 (3.038)	.160
Q4 96 - Q4 02	-34251.040 (2.645)*	8972.864 (3.426)	.179
Control: Q4 92 - Q4 96	-65271.250 (3.806)*	16493.350 (5.133)	.312

*Denotes statistical significance at the 10% level.

The estimate of β over the control interval [Q4 92 – Q4 96] is 3.000 with a *t*-ratio of 0.649. This estimate is not statistically significant, which is expected given that it was taken over the interval in which there were no changes in the minimum wage. The general trends over the four time intervals are visible in the area-level scatter plots of the change in the employment rate and the proportion in the area that were "low paid" (see Appendix: Figures 2.1, 2.2, 2.3, and 2.4). The first three graphs show a stronger and stronger positive relationship between the proportion "low paid" and the change in the employment rate. The fourth graph, which illustrates the control, shows that there is no relationship between the two variables.

The estimates based on the total employment data, presented in Table 2, are consistent with standard economic theory, but the estimates taken over the affected intervals are not significantly different from the estimate taken over the control interval. The estimate of β over the interval [Q4 96 - Q4 00] is -53632.038 with a *t*-ratio of 4.060, which is both negative and significant. However, the estimate of β over the control interval [Q4 92 – Q4 96] is -65271.250 with a *t*-ratio of 3.806, which is similarly negative and similarly significant. This indicates that the declines in total employment in relatively “low wage” areas were *independent* of minimum wage legislation. This trend is clearly visible in the area-level scatter plots (see Appendix: Figures 3.1, 3.2, 3.3, 3.4). The first three graphs, the “affected intervals”, and the last graph, the control interval, all show an inverse relationship between the proportion “low paid” and the change in total employment.

What do the estimates of equations (1) and (2) tell us collectively? We can be fairly certain that total employment increased more in relatively “high wage” areas between 1996 and 2002. We can also be fairly certain that changes in employment rates between 1996 and 2002 were more favorable in relatively “low wage” areas. Several possible scenarios can be inferred from these results.

First, we know from the control that total employment in “high wage” areas was growing before the minimum wage increases, and continued to grow after the minimum wage increases. That “high wage” areas were able to attract more workers makes intuitive sense. So why did employment rates generally decrease in these areas? One possibility is that there was relatively more in-migration into “high wage” areas than into “low wage” areas, and that the rate of employment for those that migrated to “high wage” areas was lower than the rate of employment in the area (in Q4 1996) to which they migrated. This combination would both lower the rate of employment and increase total employment in a particular “high wage” area. That there was relatively more in-migration into “high-wage” areas can be seen in the data (see Appendix: Table A1). The three counties with the lowest proportion “low paid” - Multnomah, Washington, and Clackamas counties - grew by 21,805, 50,153, and 17,200 people respectively between 1996 and 2000. On the other hand, the four counties with the highest proportion “low

TABLE 3
Industry Analysis

County	*NAICS Industry*	*96-00 %Δ Average Weekly Employment*	*00-02 %Δ Average Weekly Employment*
Clackamas	5112	53%	-18%
Multnomah	5112	66%	-10%
Washington	5112	61%	-30%
Clackamas	518	-9%	28%
Multnomah	518	27%	-16%
Washington	518	33%	-16%

paid" - Crook, Curry, Harney and Union counties - grew by 2,112, 94, 411, and -382 people respectively between 1996 and 2000.

A possible role that the minimum wage increases could have played in this scenario is the following: many of those that migrated to "high wage" areas came from "low wage" areas in Oregon, and those "low wage" migrants were forced out of their jobs because of the minimum wage. This is, of course, highly speculative.

The results of the regressions also indicate that, relative to 2000, employment rates worsened substantially in "high wage" areas in 2001 and 2002. It is very likely that what we are seeing here is the effects of the recession that began in February 2001, as the "high wage" high-tech sectors were among the hardest hit by the recession. The data also indicate this (see Table 3). I have again examined the three counties with the lowest proportion "low paid": Multnomah, Washington, and Clackamas counties. Now, if we look at the average weekly employment in two high-tech industries, "Software publishers" (NAICS 5112) and "ISPs, search portals, and data processing" (NAICS 518), we can see the trend that I am addressing. In almost every case there was dramatic growth in these industries from 1996 to 2000, and then dramatic decline from 2000 to 2002. The only case that doesn't follow suit is NAICS 518 in Clackamas County, and I believe that this is because the industry is so small (157 average weekly employment in 1996, compare with 1,732 in Multnomah County) that only tiny, insignificant changes produced the observed fluctuations.

Note that the effects of the recession do not account for the relative declines in employment rates in "high wage" areas between 1996 and 2000 (as the recession began in 2001). I suggest that perhaps features of the monopsony model are at work here. It is plausible that, in the very small counties, employers behave more like a "mining company in an isolated company town" (i.e. the only purchaser of labor) than do employers in larger counties. Also, recall the argument of Dolado et al. (1995), that "the important question is the *extent* of monopsony power." If employers in small counties have relatively more monopsony power, then theory predicts that the minimum wage increases (if skillfully set) may actually raise employment in those counties rather than reduce it.

Whether or not there truly is monopsony power among minimum wage employers, we still must ask: is there evidence that the minimum wage increases caused the employment of low wage workers to *increase*, given the results of equation (1) over the [Q4 96 - Q4 00] interval? Taken alone, the hypothesis $\beta > 0$ seems plausible. However, given the results of equation (2), I am reluctant to adopt this view. Alternatively, I am confident that, in this particular case, the minimum wage had no adverse effect on employment, as there is no evidence to support the hypothesis $\beta < 0$. This is the same conclusion that was reached by Stewart (2003), the model for this paper, and the aforementioned body of research conducted by Card and Krueger (1992, 1994, 1995, 2000).

IV. IS THEORY WRONG?

Given that the results of this paper are in keeping with the "controversial" body of research on the employment effects of minimum wage legislation, I will review the validity of the standard economic model. It is important to note that just because economists are frequently unable to *measure* negative employment effects does not mean that the standard economic model offers an invalid method of thinking about and examining minimum wage legislation. The power of the standard model is in its simplicity and intuitiveness. It should make sense to anyone that as the price of a commodity or production input increases, demand for it will decrease. If the price of Coke rises, some Coke consumers will switch to Pepsi. If the price of labor increases, producers will attempt to get more effort out of fewer workers, or they will switch to more capital-intensive modes of production (as capital has become relatively cheaper).

So if the theory is essentially correct, the problem must be with the capabilities of the measurement techniques currently employed by economists. I agree with the position of Deere et al. (1995), who also find some "seemingly anomalous results":

> We do not view our…findings as refutation of the *law of demand;* instead we take them as a warning that minimum wages are not everything that affects employment and that other things must be considered before we can correctly assess the employment effects of minimum wages.

Similarly, Singell and Terborg (2001) warn that data selection is crucial: "aggregation over different types of workers and firms may be inappropriate and can understate the employment effect of the minimum wage."

The low values of R^2 in all of the regression relationships presented in this study confirm this view (the values of R^2 in the eight equations estimated ranged from 0.013

and 0.340).[17] Had the data used for this study been at the individual level rather than at the industry level, the results may have confirmed economic theory (at the very least, they would have been more instructive). Singell and Terborg (2001) analyze the employment effects of the same minimum wage increases in Oregon, in a specific industry (the restaurant industry), at the more disaggregated firm level, and find evidence in support of the standard economic model. In the future, the method of this study could be made to produce more useful results if the data are gathered from unemployment insurance records, which offer an extremely large sample of detailed individual level data. Time constraints forbade the use of such data in this study.

Economists may also encounter problems in measuring the predicted negative employment effects because the economy is a hugely complex and vast system, and minimum wage laws may only create a small undetectable, or barely detectable, ripple. However, Card and Krueger (1995) note that even though their "empirical evidence suggests that the standard model is incomplete," they also "suspect that, at sufficiently high levels of the minimum wage, the predicted employment losses of the standard model will be borne out." I am fairly certain that if the minimum wage in Oregon was raised to $20 or $30, there would be no problems in measuring the resultant negative employment effects, even at high aggregation levels. At extremely high levels, say $75, not only would we see negative employment effects, we may find doctors driving taxicabs.

[17] R^2 is a measure of the predictive power of a model, a.k.a. a "goodness of fit" measure, defined by the percentage of the variation of the dependent variable that is explained by the regression; the higher R^2, the closer the estimated regression equation fits the sample data; all values of R^2 must lie between 0 and 1.

V. SUMMARY

This paper evaluates the employment effects of the 1997-99 increases in the Oregon minimum wage. The employment effects were estimated by exploiting geographic wage variation at the county and MSA levels. Two similar equations were estimated: the first used the proportion “low paid” in a particular area to predict the change in employment rates in that area, and the second used the same predictor to estimate total employment changes. Both equations were estimated over four different time intervals; three of the time intervals were across the “affected” years and one interval was used as a control. The prediction tested is that of the standard economic model: the proportion “low paid” should be inversely related to the changes in area level employment rates and total employment after the minimum wage increases ($\beta < 0$).

The results are mixed. The results of the employment rate equations contradict the standard economic theory: the higher the proportion “low paid”, the more positive was the change in the employment rate ($\beta > 0$). These results were also statistically significant. On the other hand, the results of the total employment equations are consistent with theory: the higher the proportion “low paid”, the more negative was the change in total employment ($\beta < 0$). However, the estimate of β over the “affected” interval was not significantly different from the estimate of β over the control interval, which indicates that the changes in area level total employment were not affected by the minimum wage legislation. In summary, no evidence was found in support of the standard economic model.

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APPENDIX

Figure 2.1

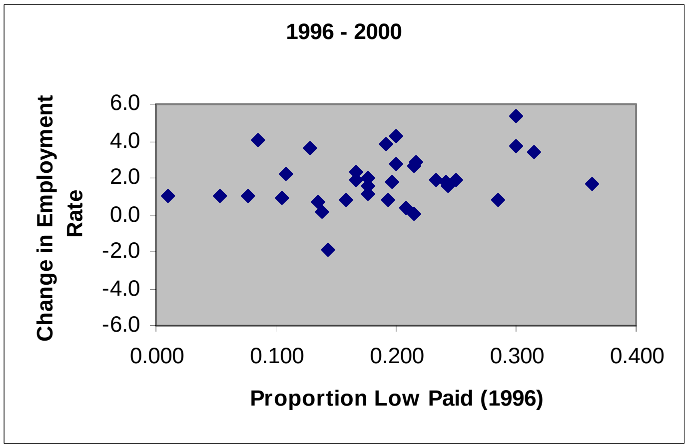
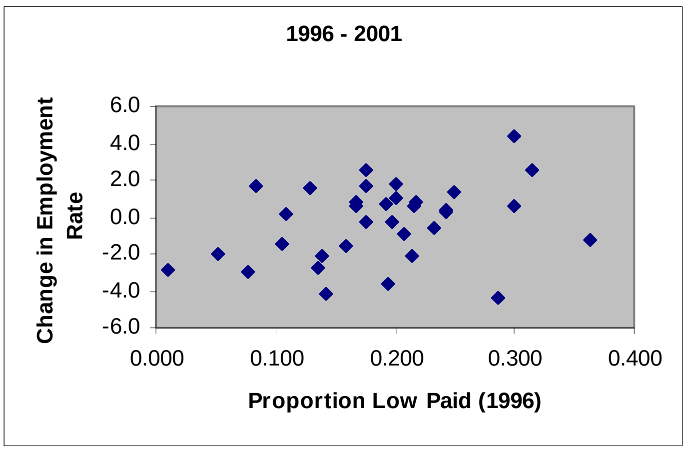


Figure 2.2



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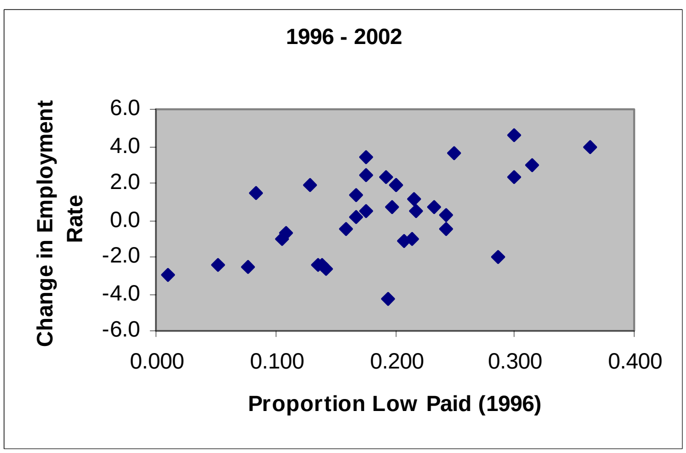


Figure 2.4

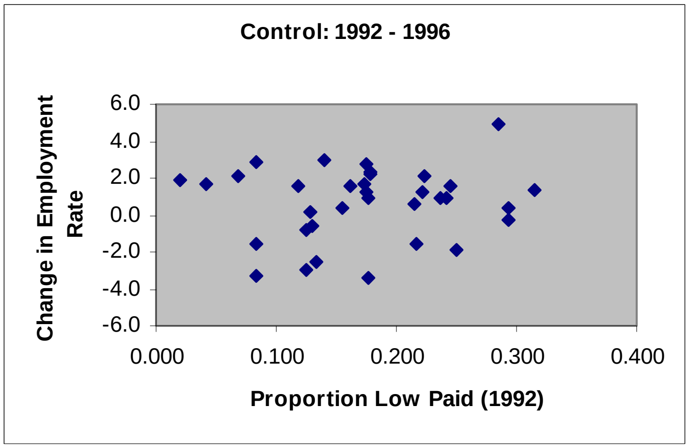
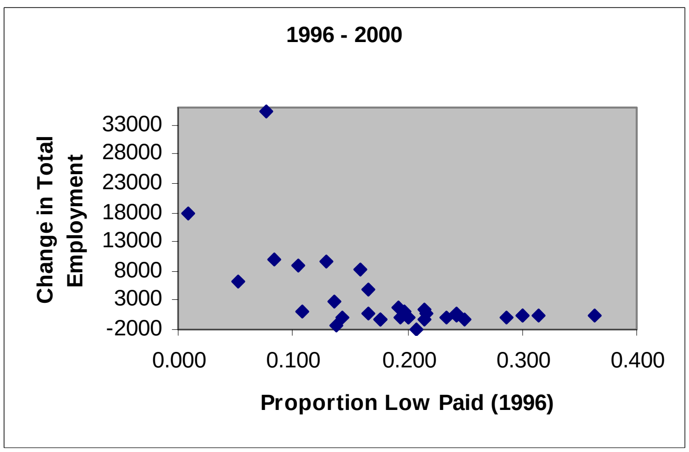


Figure 3.1



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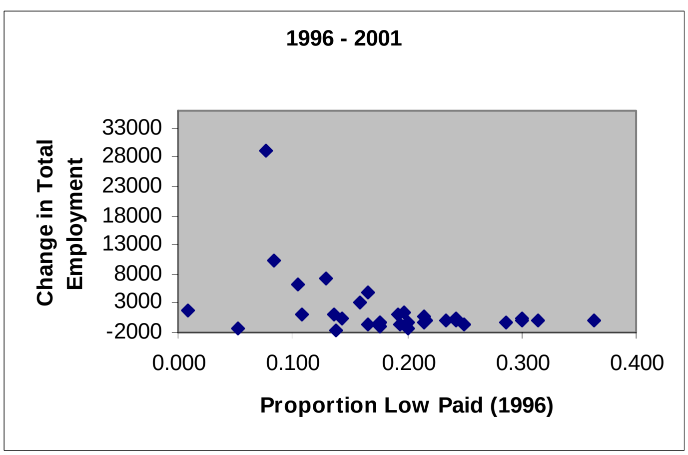

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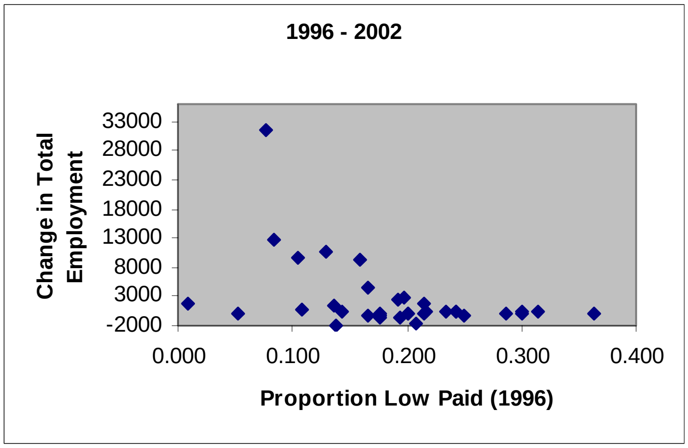

Figure 3.4

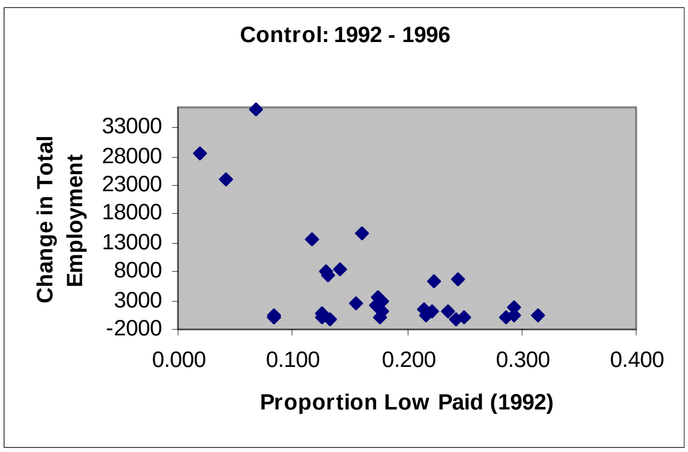

TABLE A1

Population growth by county

County	*Proportion "Low Paid" Q4 96*	*1996 Pop.*	*2000 Pop.*	Δ Pop. *96-00*	*2001 Pop.*	*2002 Pop.*	Δ Pop. *00-02*
Baker	20.00%	16652	16727	75	16654	16492	-235
Benton	18.52%	77776	78159	383	78346	78874	715
Clackamas	5.26%	322376	339576	17200	345276	352427	12851
Clatsop	21.74%	35444	35592	148	35574	35645	53
Columbia	19.35%	41454	43670	2216	44310	45449	1779
Coos	20.00%	63505	62686	-819	62377	62618	-68
Crook	30.00%	17227	19339	2112	19918	20172	833
Curry	30.00%	21023	21117	94	21127	21480	363
Deschutes	8.45%	99362	116594	17232	120750	125566	8972
Douglas	19.70%	99802	100465	663	100307	101142	677
Grant	17.65%	8079	7898	-181	7524	7437	-461
Harney	36.36%	7201	7612	411	7418	7326	-286
Hood River	24.24%	19339	20477	1138	20455	20645	168
Jackson	12.99%	170715	181840	11125	183851	186650	4810
Jefferson	16.67%	17307	19109	1802	19459	19592	483
Josephine	19.23%	72310	75876	3566	76526	77820	1944
Klamath	17.65%	62061	63927	1866	64212	64307	380
Lake	25.00%	7476	7411	-65	7474	7421	10
Lane	10.59%	311004	323413	12409	324674	327327	3914
Lincoln	21.57%	44720	44337	-383	44057	44494	157
Linn	13.85%	100582	103019	2437	103786	104898	1879
Malheur	24.32%	30211	31538	1327	31453	31271	-267
Marion	10.47%	266490	285581	19091	288690	293463	7882
Morrow	14.29%	9336	11062	1726	11259	11605	543
Multnomah	0.95%	639587	661392	21805	668969	675438	14046
Polk	21.43%	57967	62649	4682	63715	64743	2094
Sherman	28.57%	1933	1924	-9	1862	1788	-136
Tillamook	23.33%	23994	24259	265	24447	24494	235
Umatilla	16.67%	66240	70682	4442	70621	71413	731
Union	31.43%	24934	24552	-382	24318	24435	-117
Wallowa	17.65%	7507	7219	-288	7176	7081	-138
Wasco	10.81%	23170	23822	652	23714	23579	-243
Washington	7.69%	398289	448442	50153	462543	471962	23520
Yamhill	13.56%	78538	85284	6746	86392	87913	2629

Source: Bureau of Economic Analysis