

**Minimum Wage Increases and their Effects on Employment:  
Oregon and Nevada from 2002-2003**

Joshua Taj Bozeman

**Abstract**

The main purpose of this study is to investigate the effects of an increase in the minimum wage on teenaged unemployment. This study focuses on Oregon and Nevada, two neighboring states in the period from 2002 to 2003. Nevada's minimum wage was the same as the federal minimum wage of \$5.15 an hour from 2000-2005, whereas Oregon's minimum was in 2002 \$6.40 an hour with a jump to \$6.90 an hour in 2003. This study looks to see if that hike in minimum wage affected teen employment levels. The data came from the Current Population Survey and also included race and age. The results suggest that though Oregon faced a higher unemployment level among teens, the increase in minimum wage did not seem to have an impact on employment levels. The results also suggest that the probability of being unemployed is consistently higher for black residents of each state.

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## 1. Introduction

It is well known what basic economic theory tells us about what happens when a municipality, state, or the federal government raises the minimum wage. As the quantity of labor supplied goes up, the quantity of labor demanded decreases. When an artificial price floor is set by government, we will tend to see a negative impact, in that the price floor is often too low to clear the market, wages are too high for the particular skill of labor demanded, and we would historically tend to see unemployment. This is what basic theory says about price floors, but what does the history show of minimum wage hikes in the real world? Does an artificial price floor for wages distort the demand for labor and lead to increased unemployment, or does the reality not match what basic theory tells us about labor markets? This paper looks to find the answers to these fundamental questions, and it does so in a timely manner, as many politicians and labor leaders argue for a minimum wage as high as \$15 an hour. This is an issue that needs to be studied if only for the effects that it could possibly have on an already stagnate labor market in a country facing a slow recovery from one of the worst periods since the Great Depression itself.

Many studies have shown that an increase in the minimum wage has had precisely the effect assumed by basic economic theory—a drop in overall employment. Other studies in the 1980's, and most famously in the 1994 paper from David Card and Alan Krueger, suggest that small increases in the minimum wage do not have the assumed effect, and that the result is either positive employment gains or no discernible change in employment after minimum wage hikes (Card and Krueger). Other studies since then have gone both ways. Some suggesting that an

increase in the minimum wage has a deleterious effect on employment. Some studies find that a ten percent increase in the minimum leads generally to a one to three percent drop in employment in teenagers (Brown, Gilroy and Kohen 3). Other studies suggest that increases, if fairly small in scope, actually have no effect, and sometimes actually boost employment as many politicians claim will naturally result.

This paper looks at two bordering states in the period from 2002 and 2003. Oregon and Nevada are similar in geographic size, and though Oregon has a million more residents than Nevada, both states have large cities around the same size with around the same populations in each. Nevada's large cities are Las Vegas, Henderson, and Reno. These cities have a large gaming presence, but in this study we will limit the effects to those between the ages of 15 and 21. This might capture a small portion of the gaming industry, but it is unlikely to do so as those jobs would generally not pay minimum wage. These two states, however, had very different minimum wage levels throughout most of the 2000's. Oregon's minimum wage was consistently higher than that in Nevada (Nevada's minimum wage from 2000-2005 was the same as the federal level at \$5.15 an hour), and Oregon's wage was well over the federal minimum wage level this entire time (at \$6.50 an hour in 2000). In 2003, Oregon's minimum wage jumped from \$6.50 an hour to \$6.90 an hour, whereas Nevada stayed at the \$5.15 federal minimum wage level. This paper attempts to study the jump in minimum wage in Oregon to see if Nevada, with the lower wage and thus the lower cost of labor, had a more favorable employment outlook. This wage increase is quite significant, and this paper will look to this near natural experiment to see if basic economic theory holds up. Basic classical economics would tell us that the state of Oregon which saw a much larger increase in minimum wage should see a bleaker employment picture

than Nevada, as labor costs skyrocketed in comparison to its neighbor to the east. This paper will attempt to answer the question to see whether the basic theory is correct in the real world.

## **2. Background**

The first thing tends to stand out when looking at past research on the effects of various minimum wage laws is the lack of a clear conclusion. The gold standard of a randomized control experiment is very often impossible in dealing with the lives of average citizens, so sifting through the various reasons for employment changes is quite a challenging task for any researcher. When near experiments arise in real world situations, one has to deal with so many other circumstances different in each city, each state, each region of the country, that pinpointing the root cause of an increase or a decrease in employment is hard to do with any certainty. Research was often done for the mere purpose of debunking the conclusions of previous research(Lester 254), and that was very well true until the 1970's when a more sophisticated form of analysis came about, thanks in large part to the advent of powerful computers able to do complex regression analysis with large data sets in a timely manner. This allowed more complicated methods to be used to forecast possibilities only theorized before. There was, however, a whole area of research dedicated to the study of minimum wage effects well before the use of mathematical models, going all the way back to the first minimum wage laws in the country.

### **2.1 Overview of Available Research**

The first state minimum wages in the United States were enacted starting in 1912. The first federal minimum wage was enacted in 1933, only to be ruled unconstitutional by the US Supreme Court in 1935. In 1938 the federal minimum wage was re-established as part of the

National Labor Standards Act, and soon after economists were studying the effects of minimum wage laws around the country. One of the earliest papers was by George J. Stigler in 1946. In 1963, the issue was tackled by Richard Lester, taking previous research from the 1940's and arguing that much of the interpretations were flawed. The 1970's and 1980's saw the rise of an analytic, math-based approach in papers from Charles Brown, Curtis Gilroy, and others, mostly focusing on non-tipped wage quick-service (fast food) restaurant workers. In 1994, David Card and Alan B. Krueger wrote what is considered one of the most important studies on the effects of minimum wage laws when they looked to fast food workers in Pennsylvania and New Jersey using the contiguous counties method, studying only the counties in Pennsylvania that bordered the counties in New Jersey. Later studies, often dominated by David Neumark, revisit some of the old research using new data points. Card and Krueger, after some critics complained about their data, revisited their own 1994 study with new data points and drew the same conclusions that minimum wage increases tend to be either neutral or slightly positive. That is not to say that because the official unemployment level does not tend to rise that there is no loss of jobs in these studies. There is very often a loss of jobs in that many workers, most of them teenagers, will leave the labor force altogether (Brown, Gilroy and Kohen 17). They are, thus not picked up in the official unemployment levels as they are not technically considered "unemployed." This is consistent with many studies before the 1990's. Unemployment levels often remained level due to workers moving from the sectors covered by minimum wage laws to sectors that were not covered or by choosing to leave the labor force altogether. Recent studies have followed the same path and are focused almost exclusively on the unskilled and the young, as they make up the lion's share of people earning the legal minimum wage.

## **2.2 Early Research**

[**This section is cool, but intimidating. Perhaps chop into smaller paragraphs.**] Some of the very first studies of an impact of a minimum wage law concentrated almost exclusively on the question of poverty, and whether or not a minimum guaranteed wage rate would solve the issues of poverty or increase a family's total share of income at all (Stigler 362). That is, after all, the main purpose of the minimum wage in the minds of many in the political and pundit class. To improve the financial well-being of those on the lower end of the wage spectrum, often through redistribution of wages, at least in part, of those on the higher end of the spectrum. This very definition means a vast amount of research has been done for different reasons—some of it looking to see merely if the unemployment levels rise or fall with a change in a minimum wage, while others looking to see specifically if yearly income rises for a particular group of people after a change in the minimum wage.

This adds much to the confusion in terms of getting a concrete answer to the question, as so many researchers take a very different approach in terms of what equals success. The methodology has always been important as well. For example, earlier studies researched weekly minimum wages that were only in effect for women and not men, with corresponding work curfew laws (disallowing only women to work past a certain hour), and much of the data was compromised in a way, as those special circumstances of economic downturns and special laws forbidding women from working certain hours and certain jobs were thought to be the reason for a decrease in female employment rather than the new minimum wage laws (Lester 256).

George Stigler found that an introduction of a minimum wage would usually lead to a decrease in employment by ousting inefficient workers and keeping the more efficient to do more with less, or replacing labor with other previously unprofitable methods of production now made more profitable with the introduced minimum wage (Stigler 359). Much of the work from

Stigler and others in the early period was based almost exclusively on classical economic theory and basic math. After the 1970's, when computing power was finally at a place to allow for complex regression analysis, research was based much more on math and statistical analysis rather than only sales figures, wage levels, or employment numbers. Also, papers began to focus mostly on young people, especially teenagers in the labor market, as minimum wage laws, now fully in place at the federal and state levels, were the wages earned mostly by the young and unskilled.

### **2.3 Research in the 1980's**

The 1980's saw a number of papers on the topic, and they tended to find the same thing. When wage increases were small, there was little to no effect on the unemployment level yet some negative impact on the labor force participation rate. When those minimum wage increases grew, the actual unemployment level for minimum wage workers was lowered. Of the body of work on minimum wage effects, most of the research tends to center around non-tipped quick service restaurants. Tipped full-service restaurants tend to be a poor place to study, as tipped employees often make less than the true minimum wage, making up for the gap between what they bring home and the minimum wage in tips received for their service. The later research stayed in this very well studied area.

This period saw updates of previous research. Brown's data on teenage unemployment saw a decrease of one to three percent for every ten percent increase in minimum wage originally, but later research using updated methods, interaction variables, and some previously missing variables registered only a one percent drop in employment and no actual effect in teen "unemployment" levels (Wellington 28). In the 1980's, real wages decreased for the first time in many years, and this meant a natural experiment was opening up in order to more closely study

the phenomenon on a larger scale. Wellington, in 1991, took a look at these old studies with new data and new techniques and found that the estimates of one to three percent were in the high range, and that the decrease in employment was closer to .6 percent or perhaps even lower for all groups except non-whites where the decrease was only slightly higher(Wellington 44-45). Further research in the 1990's supported the idea that a small increase in the minimum wage lead to any large increase in teenaged employment. In fact, one study found that after a slight increase in the federal minimum wage, employers raised their wages for younger workers more than they needed to do so to comply with the increase, and there was no increase in the unemployment levels(Katz and Krueger 20).

However, other researchers found that a ten percent increase in the minimum wage between 1973 and 1989 actually did lead to an increase in unemployment in teens by around one to two percent(Neumark and Wascher, Employment Effects of Minimum and Subminimum Wages: Panel Data on State Minimum Wage Laws 78). This study as looked at the states that had a trial program allowing employers to pay a sub-minimum wage level to younger workers, and this wage, when utilized offset the increase in teen unemployment rates. In 1994, Card and Krueger's famous paper, studying bordering counties in Pennsylvania and New Jersey found no effect on teen unemployment levels when New Jersey's minimum wage jumped up and Pennsylvania's remained constant.

## **2.4Recent Research**

The early part of the new century saw many new studies that looked back to older studies to use new methods and updated data to see if the old research still held true. Neumark and Wascher updated their earlier research and found much what they did the first time, that generally speaking increases in the minimum wage have negative effects on teen unemployment

levels (Neumark and Wascher, State-Level Estimates of Minimum Wage Effects: New Evidence and Interpretations from Disequilibrium Methods 58). Neumark revisited the topic again in 2007, studying the question of whether long term exposure to minimum wage jobs leads to adverse effects later in time, perhaps because the person was under a minimum wage law that barred them from working more hours, gaining more skills, or learning tertiary jobs in the same establishment. He found that there is, in fact, an adverse effect in that those who are exposed to minimum wage jobs for a longer period of time make less later in life, and that allowing employers to work teens without such a limitation in wage might help them over the long run (Neumark and Nizalova, Minimum Wage Effects in the Longer Run 450-451).

Recently, studies have taken a different approach in precisely who is best for study. A 2014 paper, for example, took a look at tipped workers who can earn below the minimum wage and their employers must make up the difference between that and the actual minimum wage paid to others through wage credits. This study found that tipped workers who see a higher tipped minimum wage do see higher earnings, but there is also a drop in employment consistent with many of the earlier studies (Macpherson and Even 654). Neumark, once again, tackled the issue of minimum wage in a 2014 paper, and once again found that an increase generally leads to a decrease in teenaged employment, but he and his co-author argue that many of the studies on minimum wage are often not isolating the minimum wage as a factor as well as they need to, and that some of the methods used in attempting to answer the question are the wrong methods entirely:

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*The analysis we present here, however, provides compelling evidence that their methods are flawed and lead to incorrect conclusions. In particular, the methods they advocate do not isolate more reliable identifying information (i.e., a better*

*counterfactual). In one case—the issue of state- specific trends—we explicitly demonstrate the problem with their methods and show how more appropriate ways of controlling for unobserved trends that affect teen employment lead to evidence of disemployment effects similar to that reported in past studies. In the other case—identifying minimum wage effects from the variation within census divisions or, even more narrowly, within contiguous cross- border county pairs—we show that the exclusion of other regions or counties as potential controls is not supported by the data.(Salas, Wascher and Neumark 644)*

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There seems to be strong evidence that basic theory does hold up to some extent, but to what degree and in precisely what situations is up for debate. There is no consistent answer to the question of the effects of a minimum wage on employment levels, but even in the studies that suggest no drop in employment levels, even the data here points to some sort of drop in, at least, labor force participation rates amongst teens.

### **3. Data & Methodology**

#### **3.1 Data**

The data used in this study come from the Current Population Survey. This is a monthly survey that has been averaged out to cover the two years 2002 and 2003 when the big jump in minimum wage took place. There are a total of 666 observations when we limit the data to only those in the labor force and remove the observations where the information on labor force status was “not in the universe,” i.e. missing. The data points are comprised of those individuals in Oregon and Nevada in the labor force in the years 2002 and 2003, limiting the age range of the sample to 13-21 to control for those who tend to be in the workforce and earning at or close to the legal minimum wage, but also removing those in their early twenties who might be unemployed due to gaining an education and the hours required for attaining said education. \*(The data contained no observations of 13 or 14 year olds, so 15-21 is the de facto age range in this

research.) The sample includes an individual's race, sex, age, and whether or not they are employed. The characteristics of race, sex, and age have been used to determine if any of these have an effect on overall employment levels for workers under the age of 21. Past research has been mixed on the issue of effects in minimum wage changes in relation to sex and race, but it is clear that females and blacks, historically, tend to be closer to the minimum wage than males and whites. Many previous studies set two age groups, (1) teenagers- ages 13-19, and (2) young adults- ages 20-24. This paper has combined these two categories and sliced off 3 years from the upper end to attempt a clearer view of what's going on in this age range in general.

The data has been recoded as a series of dummy variables. The dummies are "black" (this is a 1 if the person is black and a 0 if they are non-black, used in order to see if any sort of racial differences can be found in the employment levels), "female" (this is a 1 if the person is female and a 0 if the person is non-female, used to see if the sex of the laborer has any effect on employment levels), "y2003" (this is a dummy that is a 1 if the observation is recorded in 2003 and a 0 if recorded in 2002), "Oregon" (this dummy records a 1 if the observation is from Oregon and a 0 if it was from Nevada), "unemployed" (this dummy is a 1 if the person is recorded as being unemployed and a 0 if they are considered employed). There is also a difference in difference measure used as an interaction to see the effects of the Oregon minimum wage increase in 2003. The difference in difference measure (labeled "didvar" in the data) takes the "Oregon" dummy and multiplies it by the "y2003" dummy. This allows us to see how much of the effect in employment is due to the increase in Oregon's 2003 minimum wage levels. In the "didvar," a 1 is recorded if the observation was from Oregon AND 2003, and it was recorded as a 0 if it did not meet both of these criteria.

Unemployed in the above variables is defined as a person who is in the labor force, and is actively seeking employment but is unable, for some reason, to gain employment. Employed above is defined as a person who is currently employed in any paying job and meets the criteria for CPS' measure of "employed." The data from the Current Population Survey denotes those who were employed but not at work in the past week, but for simplicity all of these people are still listed as being "employed" in the research.

### 3.2 Methodology

In this paper, a linear probability model is run using a number of dummy variables and an interaction term has been run. The data includes the 666 observations of only those in the labor force. The dummy variables mentioned in the data section above were used in the following regression:

$$Unemployed = \beta_0 + \beta_1 * Black + \beta_2 * Female + \beta_3 * Oregon + \beta_4 * Y2003 + \beta_5 * (Oregon * Y2003) + e$$

- "e" in the regression here indicates the basic error term or residual, any variation in the unemployment change that is not explained in the model.

After obtaining the linear probability model and obtaining the estimated coefficients, the following probabilities were calculated in order to find the probability of unemployment among people in both Oregon and Nevada in each year 2002 and 2003 from the ages of 13-21. The constant, or the baseline number is non-black males in Nevada in 2002, and everything else is built upon that foundation, so for the black dummy variable, this will tell us how much more or less likely than white males blacks in each state are to be unemployed. This is not the main point

of the research here, but it is, nonetheless, an interesting side note that could be studied with these numbers. The same for females—the data could be used to build out further to see if being female has an effect on employment based on the baseline of non-black males. Any number of combinations of race, sex, and observation year could be made, however the probabilities used in the results below are the four here, using the coefficients from the above regression.

*UNEMPLOYMENT PROBABILITIES:*

- (1) Nevada 2002 unemployment = .1338516
- (2) Nevada 2003 unemployment = .128316
- (3) Oregon 2002 unemployment = .3058865
- (4) Oregon 2003 unemployment = .2360487

Overall, the interaction term in our beta 5 is our most important measure, as it will test whether or not the increased minimum wage in Oregon is specifically to blame for any possible change in employment levels. The four probabilities will help us explore what the picture is in each state in each of the two years studied here.

## **4. Results**

### **4.1 Overview**

The results from the above regression are fairly inconclusive in that the variable that is the main focus, the interaction term, is not statistically significant at the 0.05 level of the 0.10 level. There seems to be no way to tell if the increase in minimum wage in Oregon in particular had any effect on whether a person was likely to become unemployed or not. However, the coefficient for the Oregon variable was statistically significant at the 0.05 level, as was the

“black” variable, suggesting that being black does have an effect on whether or not one is more or less likely to be unemployed. The result, though not a major focus of this research, shows that being black increases the probability of being unemployed by sixteen percent. The variables “female,” “y2003,” and “didvar” show no statistical significance at the 0.05 level. The Oregon coefficient suggests that a person in Oregon is 17 percentage points more likely to be unemployed than in Nevada. This matches conventional classical economic theory in that the state with the higher minimum wage level faces a higher unemployment level among teens who would be most likely to be exposed to that minimum wage when looking for work, employers, perhaps, not willing to pay that wage for skills they might deem too low to match that wage level.

This research supports basic economic theory that employers in a state facing a higher minimum wage for what is often lower skilled and less experience labor will face a bleaker economic outlook for teens who are likely to be in jobs that pay this wage. Taking a look at the overall probabilities, it is clear that Oregon teens faced a much more daunting prospect looking for work than teens in Nevada in this time frame. In Nevada in 2002, the probability of being unemployed from the ages of 15-21 were 13.39%, dropping down to 12.83% in 2003. In Oregon, the outlook was much more bleak, in 2002 the probability of being unemployed as a teen was 30.59%, dropping in 2003 to 23.60%. There is nothing in the data here that suggests why the drop in unemployment, especially the large drop in Oregon’s unemployment probability, but one would suspect that the rising housing market as well as the overall positive economic outlook leading up to the 2007 housing crash likely saw many states with lowering unemployment levels. There is also the rise out of the small recession 2001 as well as the quick economic come back from the 2001 terrorist attacks in New York City.

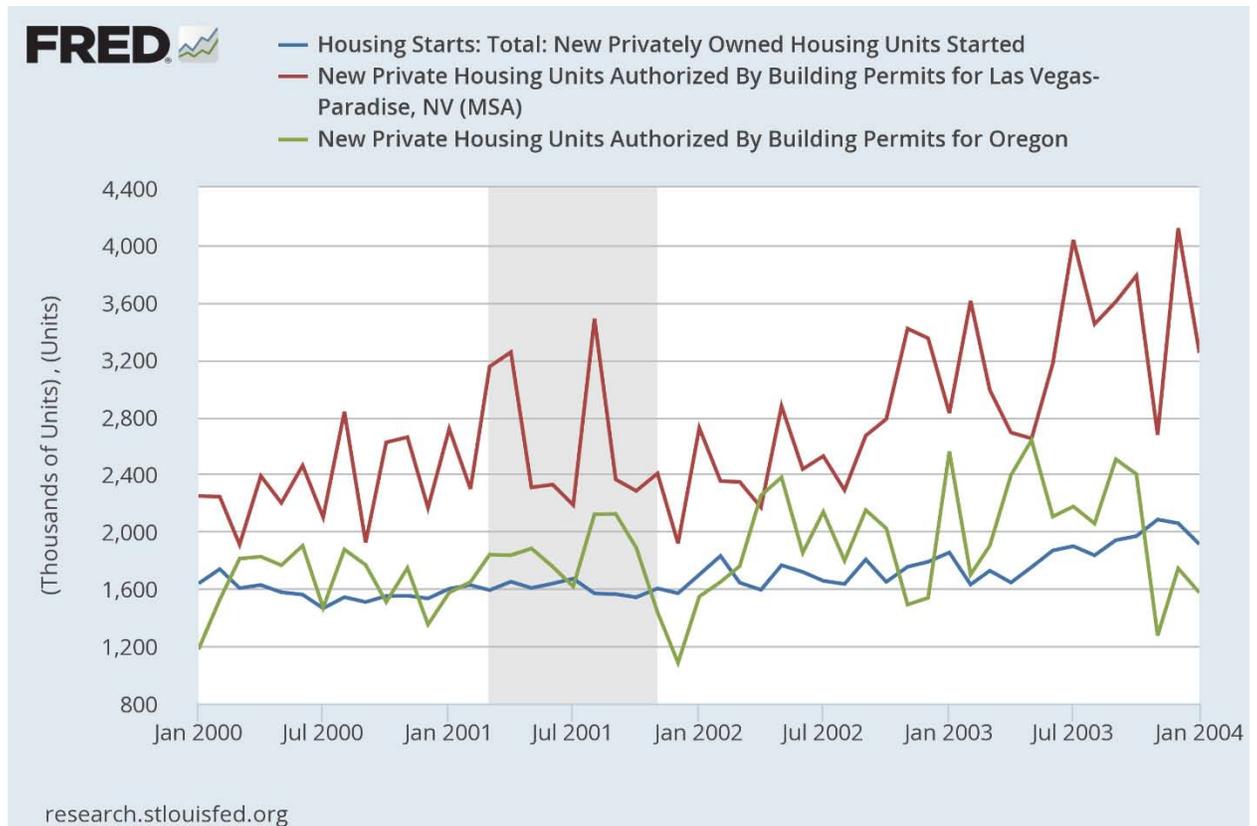
The results in general tend to confirm what is found many times in previous studies. States with higher minimum wages face unemployment effects that are negative compared to states that either raise their minimum wage as well but to a lower level or have a consistently lower minimum wage.

#### **4.2 Housing Starts as an Effect**

There is one thing that might be causing a lot of the issues in these two states, and that is new housing starts. 2002 and 2003 make up a unique period in history, as the middle of 2003 was the start of the housing boom that eventually led to a crash in 2007, a small part in the bigger crash that took place in 2008. Housing starts in Nevada's largest city, Las Vegas, was cranking up in 2003 when the entire state of Oregon was seeing a marked drop in new housing starts. Nevada is generally thought of as a prime area for new housing starts in the lead up to the housing boom and subsequent crash. A future study of a later period (post 2004), when the housing crash occurred, might show the opposite of what the research here suggests. Perhaps Nevada's economy would show the same strains in Oregon without a booming housing market.

A rise in new housing starts would likely directly help only the small portion of those under 21 years old working in the construction field, but also an indirect boost would be seen across the entire state. Some teens might be able to take on less hours due to an increase in wealth among their parents, and others in closely related industries might see an offer of more hours. The trickle-down effect of a boom in housing would also be seen in many industries across the board, even the fast food type of jobs that are typically the minimum wage jobs this study looks to focus on. This period of time with its historical housing boom might be one of the big reasons that there is such a large gap between the two states in probability of being unemployed as a teen. There is little doubt that such a housing boom would have positive effects

felt across many industries in the state, and it is likely that the boom has some power in explaining such a large gap.



#### 4.1 Policy Discussion

Though, there is a lack of true insight in terms of what one would hope to have been a natural experiment in 2003, as Oregon saw its minimum wage increase from an already high level compared to Nevada, the fact that the Oregon variable is significant suggests that being in the state leads to a much higher probability of being unemployed as a teen. The idea of a sub-minimum wage for teens only, a trial that has been used in the past and has seemed to lower the negative effects of wage increases, might be a good tool to try again today. With advances in statistical techniques, the widespread use of readily available and affordable statistical software packages, as well as the increasing ability of companies of all sizes to use large data sets to

forecast sales, costs, and labor costs in particular, businesses could more easily know what wage level is right for their particular labor force, especially for teen workers they might employ. The evidence suggests that even when there is no large effect in unemployment levels, the wage increases in previous studies have been quite low compared to the numbers being discussed by politicians lately, include minimum wages of up to fifteen dollars and hour. If a ten percent increase, in some research, leads to a one to three percent increase in teen unemployment, then a jump fifteen dollars and hour might be a disaster not only for young people making the minimum wage but especially for those older individuals who are stuck at that level as well.

Perhaps a natural experiment of sorts could be used in the United States to see if a lower minimum wage for lower skilled workers under the age of 21 might lead to positive job growth amongst that group, and perhaps the effects later in life that show up in some studies could be alleviated as well. If current workers who face exposure to minimum wage jobs for years do actually see long term negative consequences, a further bump in the federal minimum wage seems unlikely to resolve that problem, especially if companies face possible labor cost increases into the hundreds of millions or as Walmart recently saw with their voluntary increase to a minimum of \$9 per hour for their workers, a sudden increase of \$1.5 billion in new labor costs.

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