Legislation and anticipation: Consequences for the measurement of the minimum wage employment effect

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When Congress or a state legislature passes a minimum wage increase, there is often a period of several months between the passage of the increase and its implementation. During this period, employers know the level of the current binding minimum wage, but they also know the level of the minimum wage at a defined future date. Although this "future wage," as I call it, is not yet binding, employers may take action to decrease their employment in anticipation of the coming increase. Using monthly CPS data from California, Oregon and Washington in the years 1994-2014, I estimate the effect of both the current minimum wage and the future wage, when it exists, on the teen employment-population ratio. I divide the observations into two regimes: a "limbo" period during which there is a future wage, and a "normal" period during which there is not. I find that while a strong correlation exists between the minimum wage and teen employment in the normal regime, this correlation disappears in the limbo regime when a future wage exists. This indicates that although employers make employment decisions based on the current wage when no future wage exists, it is not clear whether they continue to do so when a future wage is present.

Keywords: minimum wage, legislation, employment, lead effects, teenagers

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1. INTRODUCTION

A long-standing debate in economics surrounds the relationship between the minimum wage and the employment of low-wage workers. (For a more detailed history of this debate and review of the corresponding literature, see for example Neumark and Wascher, 2006). In the early 1900s before a minimum wage was established in the United States, this debate was conducted between two main theoretical schools: the neoclassical and the progressive. Proponents of the neoclassical view thought that labor demand was fully determined by labor productivity, and therefore that a minimum wage would reduce demand for low-skilled (and now overvalued) workers. Although the higher wage would increase the quantity supplied of such workers, the decrease in quantity demanded would lead to a decrease in employment, because the wage could not decrease to eliminate the surplus of labor supply.

The progressives, in contrast, thought that low-wage workers were, in the absence of a minimum wage, actually underpaid due to higher bargaining power wielded by employers, and therefore that a minimum wage would reduce such exploitation while boosting workers' efforts and productivity. This in turn, they believed, would increase product demand through those workers' increased purchasing power, producing if anything a positive effect on employment. This argument assumes that any decrease in employers' purchasing power because of loss of profits is offset by the increase in workers' purchasing power.

After the federal minimum wage was established in 1938, the debate was renewed as the potential for empirical evidence appeared on the horizon. It was still primarily a theoretical debate, with figures such as Stigler (1946) arguing the neoclassical perspective (also known as marginalism) while opponents such as Lester (1947) took the progressive or institutionalist view.

It was not until the mid 1970s that a large body of empirical evidence began to emerge. The greater portion of this evidence supported the neoclassical view, showing a significant negative effect on the employment of low-skilled workers due to increases in the minimum wage. Much of this empirical research involved the employment of teenagers. By the 1980s, there existed a broad consensus in support of this finding. In 1982, Brown, Gilroy and Kohen published an exhaustive review of the literature in which they concluded that the existing research seemed to show an employment effect on the order of a 1-3% decrease in

teen employment for every 10% increase in the minimum wage.

New research in the 1990s challenged this consensus. An increase in state-level variation in minimum wages allowed new types of comparative studies. Although some of these new studies such as that of Neumark and Wascher (1992) found similar results to earlier research, others such as Card (1992) found little to no effect of the minimum wage on employment.

A possible explanation for these differences in empirical measures of the employment effect is the presence of lead effects. Although a few papers have considered the possibility of anticipatory effects of a minimum wage change (see for example Alegretto et al., 2011; Meer and West, 2013), none appears to have explored the idea in depth. In this paper I attempt to contribute to a resolution of the current debate by estimating the magnitude of the lead effects of the minimum wage on employment. Specifically, I divide the data into two groups: the "limbo" regime, which includes observations in which a future minimum wage has been legislated but not yet implemented, and the "normal" regime, which includes observations in which no future minimum wage is known. I then compare the estimates of the effect of the current minimum wage on employment in each regime, as well as an estimate of the effect of the legislated "future wage" on employment, where it exists.

When Congress, a state legislature, or any other entity passes a minimum wage increase, there is often a gap of several months or sometimes years between the passage of the increase and its implementation. During this period, employers know that the minimum wage is going to increase, and what the new minimum wage will be, but the increase is not yet binding. Employers may take action to decrease their employment in anticipation of the upcoming increase, for instance by declining to fill vacancies or expand their workforce. Employers often face hiring and firing costs that may cause them to choose to operate with fewer workers before the minimum wage increases, rather than to hire workers for a short period and then let them go when the wage increases. If this is the case, estimates of the employment effect that focus only on the change in employment after the minimum wage increase is implemented will not measure the decrease in employment that took place before the change was implemented, but after it was announced.

In this paper, I present estimates based on monthly data from the Current Population Survey on the states of California, Oregon, and Washington in the period from January 1994 through March 2014. These data are easily accessible through the Census Bureau and cover

a time period with a total of 42 minimum wage changes - five federal changes, seven state-level changes in California, fourteen in Oregon, and sixteen in Washington. Both Oregon and Washington index their minimum wage to inflation in the form of a national Consumer Price Index; this is discussed in detail in section 3.

In the proceeding sections of this paper, I first explain the theory behind my hypothesis and the equation I estimate. Second, I describe the data I use for each variable in the equation. Third, I present my estimation results. Finally, I offer some additional thoughts on hours of work and on the particulars of minimum wage law in these three states in terms of coverage and the effect of municipal living wage ordinances.

2. THEORY

In neoclassical economic theory, employment and wages are determined by the equilibrium point created by the intersection of the labor demand and labor supply curves. When a minimum wage is introduced, it creates a wage floor. If this floor is above the equilibrium wage for the group of workers covered by the legislation, or for a distinct subset of covered workers (e.g. low-skill workers, whose labor market may be considered separately from that of high-skill workers), the result is that the new prevailing wage is the minimum wage. At this wage, the quantity demanded of labor is less than in equilibrium, while the quantity supplied is greater. Employment decreases, and a labor surplus may lead to unemployment (See Figure 1).

This view leads to a prediction of reduced employment when the minimum wage increases. This view assumes that the labor market is competitive, and that the market equilibrium wage, in the absence of a minimum wage, is the going wage for each firm. That is, while the market labor supply curve is upward sloping, each individual employer faces a supply curve that is horizontal at the equilibrium wage. Employers, seeing this wage, then choose how many workers to employ. If employers maximize profits, the optimal employment level for each employer will be that at which the workers' marginal labor productivity is equal to the going wage.

The progressive view suggests that the labor market, at least for low-skilled workers, has monopsonistic characteristics. That is, the labor supply curve is upward sloping not just for

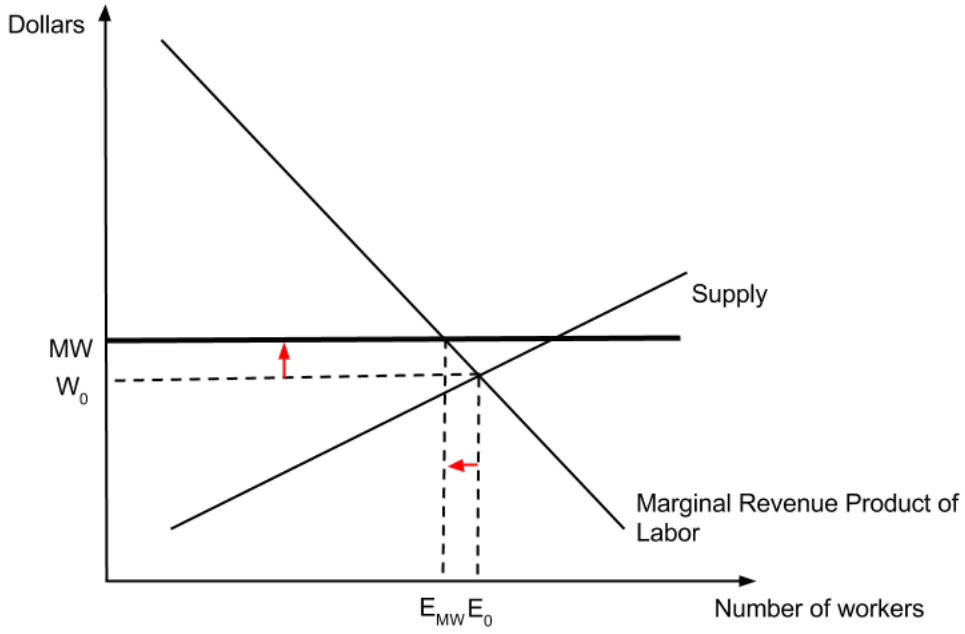

FIG. 1. The neoclassical view

the market but for an individual employer. If this is the case, employers do not optimize employment given the going wage, but they choose a wage to offer, knowing how many employees they will attract at that wage. In this situation, the marginal expense of each additional worker is higher than her wage, because the employer pays all workers the higher wage required to employ another worker.

In the monopsonistic case, each employer will offer a wage such that employment settles at the point at which the workers' marginal productivity is equal to their marginal cost - because their marginal cost is greater than their wage, they will be paid less than their productivity (see Figure 2).

When a minimum wage is introduced in a monopsonistic setting, it does not necessarily decrease employment, and in fact it may increase it. This is because, for the region in which the minimum wage is higher than the labor supply curve, marginal expense becomes constant. If the marginal worker will work for the minimum wage, her marginal expense is simply equal to her wage, because all other employees are already earning the minimum, so their wage need not rise. When the employer chooses the wage such that marginal revenue

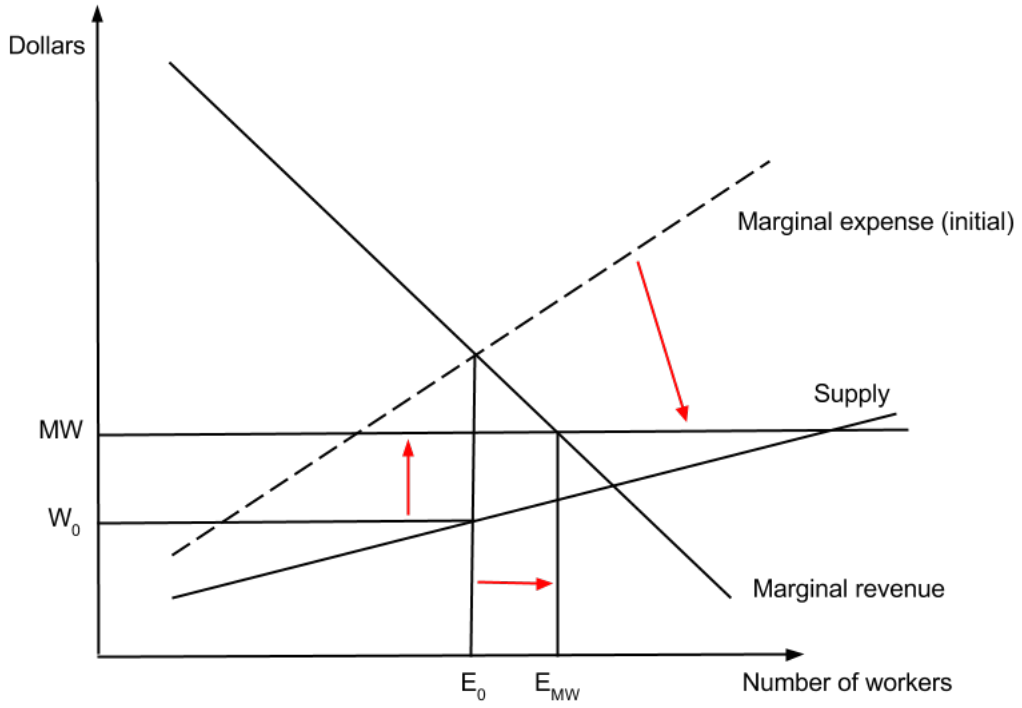

FIG. 2. The progressive view

is equal to marginal expense, the resulting employment level may actually be higher than without the minimum wage, because marginal expense is lower.

In summary, the theoretical effect of the minimum wage on employment depends on a number of factors. These include the degree to which monopsonistic characteristics exist in the labor market, where the minimum wage falls with respect to the labor supply, marginal revenue and marginal expense curves, and the elasticities of said curves.

My estimation method is as follows. First, I estimate a conventional measure of the employment effect:

$$lgEPR_{st} = \beta_0 + \beta_1 lgC_{st} + \beta_3 X_{st} + \epsilon_{st} \tag{1}$$

The dependent variable, $lgEPR_{st}$, is the logarithm of the employment-population ratio of teenagers in state s in month t. By measuring teen employment in comparison to the entire population of teens rather than the labor force, I am able to isolate any decrease in employment associated with a decrease in the quantity of teenage labor demanded, without confounding it with the increase in unemployment caused by an increase in quantity of labor

supplied as a result of a minimum wage increase. ϵ_{st} is a stochastic error term.

As one can see in Figure 3, there is a clear downward trend in the teen employment-population ratio over time in all three states. There is not such an obvious trend in the real minimum wage, at least for the latter half of the period (see Figure 5), so it is likely that the negative trend in the teen employment-population ratio is caused by omitted variables that may introduce bias into the estimations if said variables are correlated with the minimum wage. To combat this issue, I include a linear time trend in some of my specifications in Section 4.

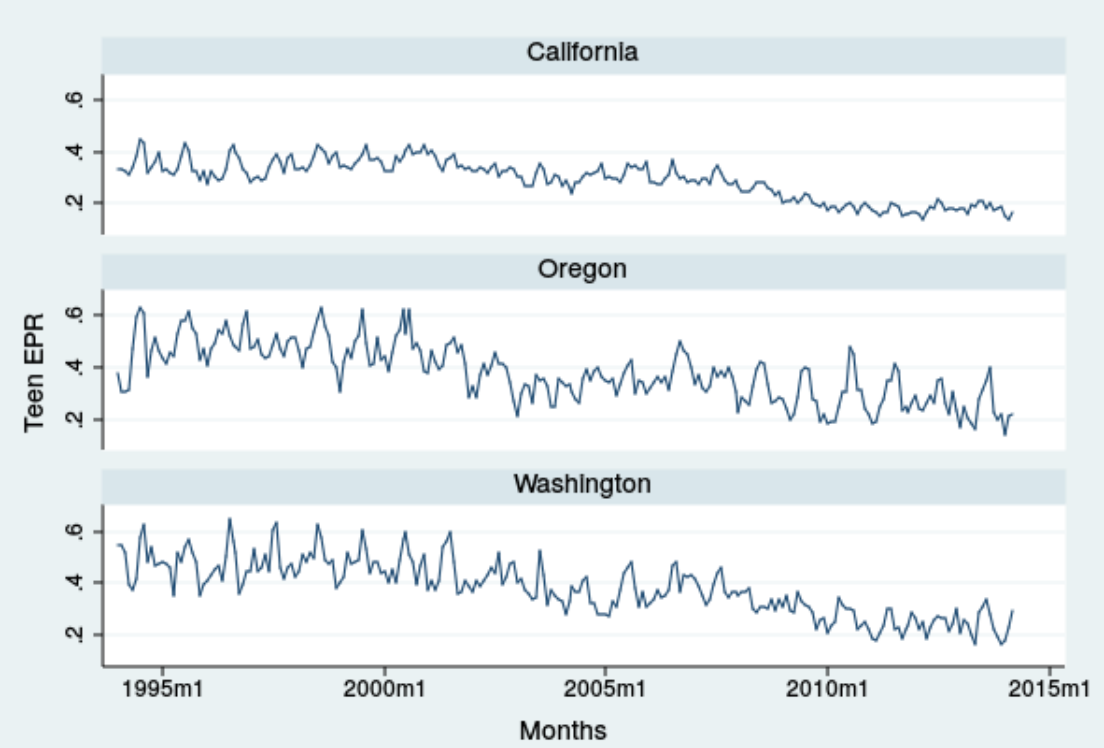

FIG. 3. Teen employment-population ratio over time

The independent variable of interest, lgC_{st}, is the logarithm of the effective current minimum wage in state s during month t. The nominal minimum wage I take to be the higher of the state and federal minimum wages (see Figure 4). I then deflate this nominal wage by the national manufacturing PPI in period t, as a representation of output prices employers face (see Figure 5). The manufacturing PPI is the best candidate for a deflator because it is available over the entire period, whereas most other PPIs, including those of any service industry, are not available until the early to mid-2000s. The coefficient β_1 represents the

effect in percent change on EPR of a 1% increase in the minimum wage. While there is a clear upward trend in the nominal minimum wage in each state (Figure 4), the real minimum wage in Figure 5 trends upward in each state in the late 1990s, but is stagnant beginning in the early 2000s. Looking at the simple scatter of C vs EPR, an obvious pattern does not immediately emerge (see Figure 6).

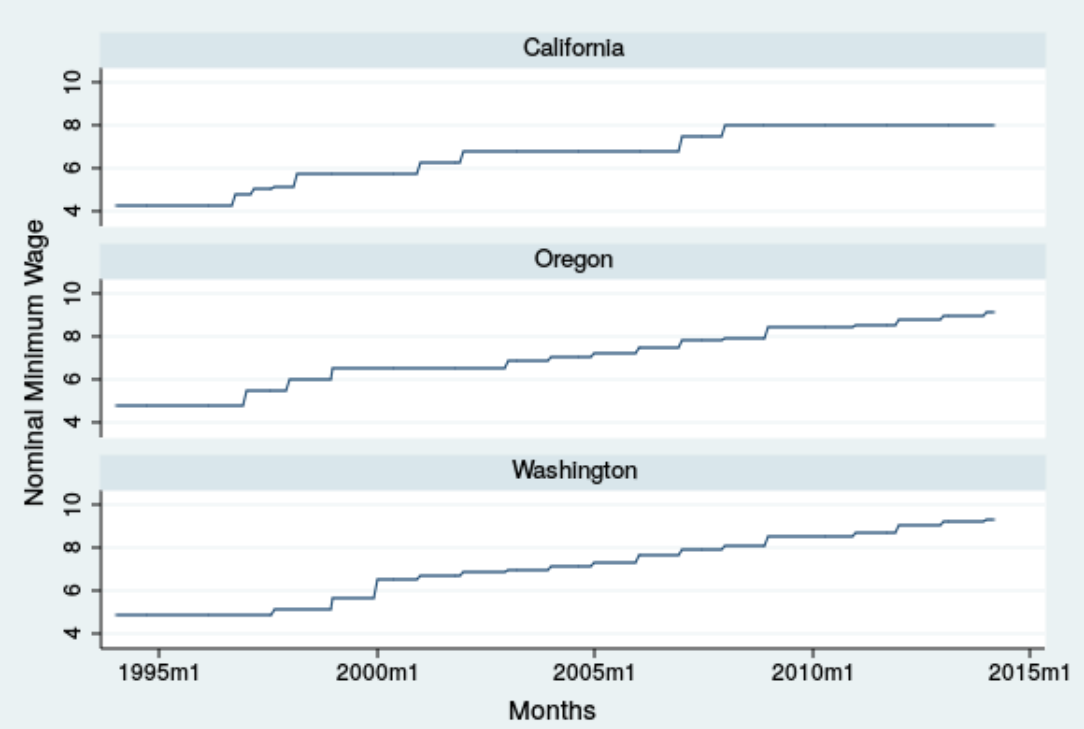

FIG. 4. Nominal minimum wage over time

The remaining variable X_t is a vector of controls. The controls include the national PPI for machinery manufacturing, to control for the effects of changes in the price of capital; the unemployment rate for prime-age males, to control for cyclical movements in teen employment; average adult male earnings to control for labor substitution; and monthly indicator variables to remove seasonal variation in teen employment. In some specifications, I also include state fixed effects and a linear trend. More information on the selection of these variables can be found in the following section.

Second, I divide the observations into two regimes. In the "Normal" regime, there is no future wage. I estimate the employment effect in this regime using equation (1). In the "Limbo" regime, there is a future wage that is higher than the current minimum wage. I

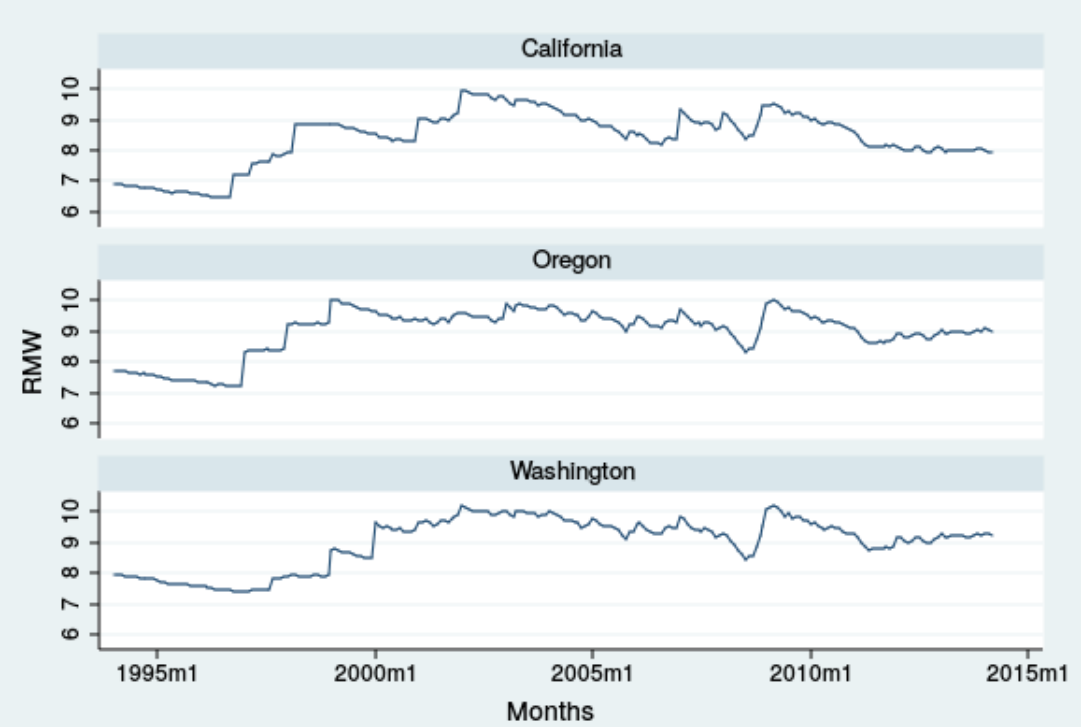

FIG. 5. Real minimum wage over time

estimate two employment effects in this regime. First, I estimate the employment effect of the current minimum wage using equation (1). Second, I estimate the employment effect of the future wage as follows:

$$lgEPR_{st} = \gamma_0 + \gamma_1 lgF_{st} + \gamma_3 X_{st} + \mu_{st} \tag{2}$$

The dependent variable, $lgEPR_{st}$, and the vector of controls, X_{st}, are the same as in equation (1). μ_{st} is a stochastic error term. The independent variable, lgF_{st}, is defined as the logarithm of the real value of the highest minimum wage that has been legislated and whose implementation date is known. If the effective minimum wage is the federal minimum, it is considered legislated beginning in the month in which the relevant law was signed by the President, or in the next month if the law was signed during the second half of the month. If the effective minimum is the state minimum and was passed through the state legislature, it is considered legislated beginning in the month the law was signed by the governor (or, similarly, the next month). If the minimum was passed via referendum, it is legislated beginning in the month the referendum was voted on.

There is some variation in how long a future wage exists before it becomes the current

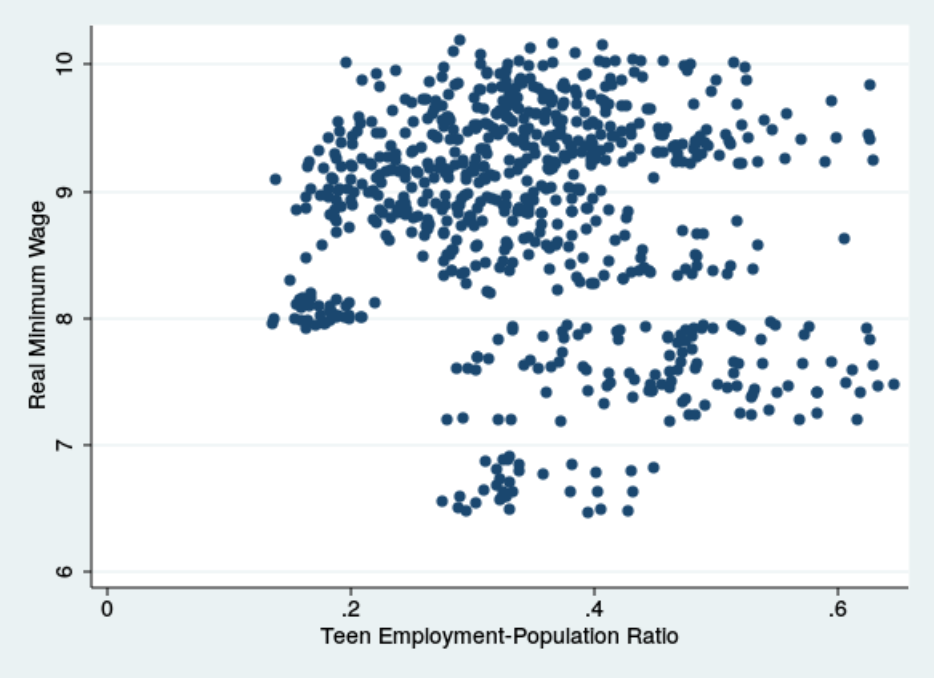

FIG. 6. Teen employment-population ratio vs real MW

wage. For example, in Oregon and Washington during periods where the minimum wage is indexed to inflation, a future wage exists for three months each year before it becomes the current wage. In periods and states without indexation, two or three future wages are sometimes legislated at once, such that the higher future wage exists for a year or more before being implemented. Examining the relationship between this span of time and the employment effect would be an interesting topic for future research.

The coefficient γ_1 represents the effect of the future wage on teen employment - that is, the effect of the knowledge that the minimum wage will increase, although the increase has not yet been implemented.

Oregon and Washington are interesting cases as far as minimum wage legislation goes because each indexes its minimum wage to inflation, as determined by a national Consumer Price Index. Oregon uses the US City Average CPI for All Urban Consumers for All Items, while Washington uses the CPI for Urban Wage Earners and Clerical Workers, resulting in slightly different minimum wage calculations for each state. Oregon's first indexed minimum wage was implemented in 2004, and Washington's in 2001. Both states implement indexed increases each January 1st and announce each year's increase in the prior September. For

these states, therefore, after indexing is implemented the value of lgF changes every October (See figures 7, 8, and 9).

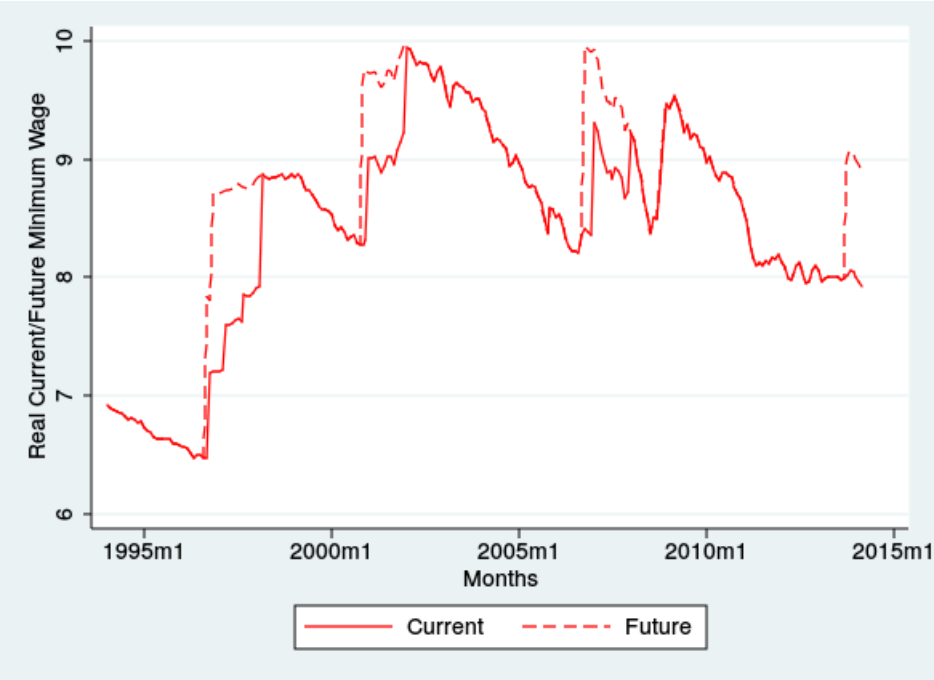

FIG. 7. Real minimum wage in California, current and future

Proponents of the neoclassical view expect that β_1 will be negative in the normal regime, and also in the limbo regime if hiring and firing costs are low. In this case, it is rational for employers to employ the equilibrium number of workers for the current wage for the entire period until the higher future wage is implemented, and then change employment to the new equilibrium, which in the neoclassical theory is lower. If employers in the Limbo regime make decisions based on the future wage instead of or in addition to the current minimum wage, perhaps because hiring and firing costs are high, then the neoclassical theory predicts γ_1 will be negative in the Limbo regime, while the sign of β_1 becomes unclear because of the presence of a future wage.

3. DATA

I choose the period January 1994-March 2014 because CPS data are readily available during this period and are comparable. March 2014 is the most recent month for which data

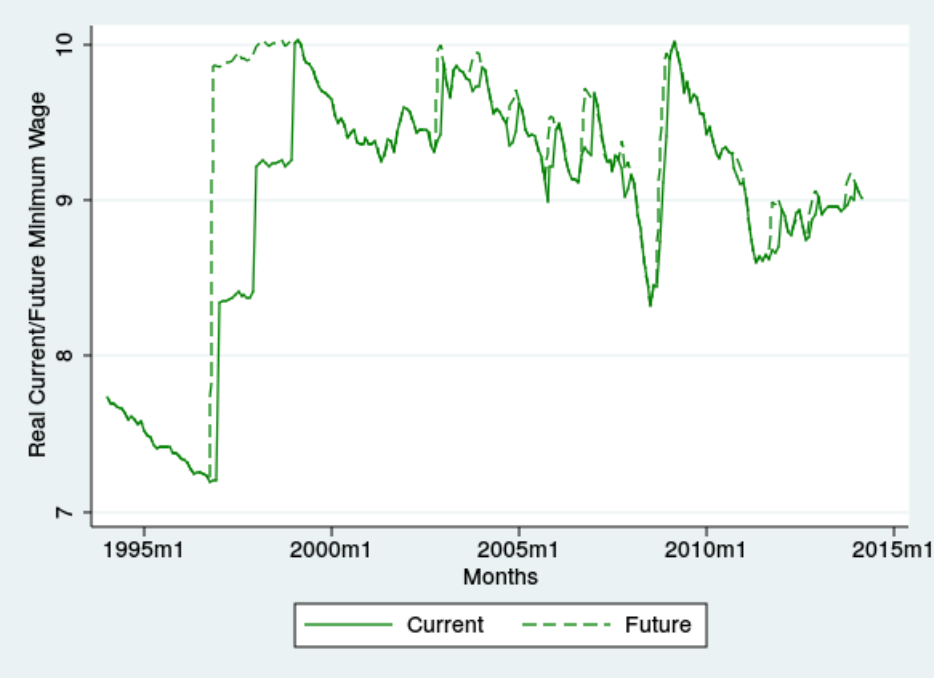

FIG. 8. Real minimum wage in Oregon, current and future

have been published. The Census Bureau makes CPS data available in an easily manageable form through its web-based application, DataFerrett, beginning in 1989. However, beginning with the January 1994 survey, the CPS underwent a major revamping, in which the entire questionnaire was overhauled and some labor force variables were redefined. Including data both before and after 1994, although possible, would require significant data readjustment that is beyond the scope of this work.

I initially chose California as a starting point for my research because it is populous and raises its minimum wage fairly frequently. I then expanded my data set to include Oregon and Washington because they are geographically proximate, relatively populous and also raise their minimum wages frequently due to indexing. It is entirely possible and for the most part straightforward to include data on the other 47 states for this time period, as well as the District of Columbia. I have not done so because of time constraints. This expansion would make a good project for the future.

I obtain the date of implementation of each minimum wage change from data collected by Meer and West (2013), which they have generously made publicly available. The dates of passage of the corresponding minimum wage laws I obtained via federal bills and state

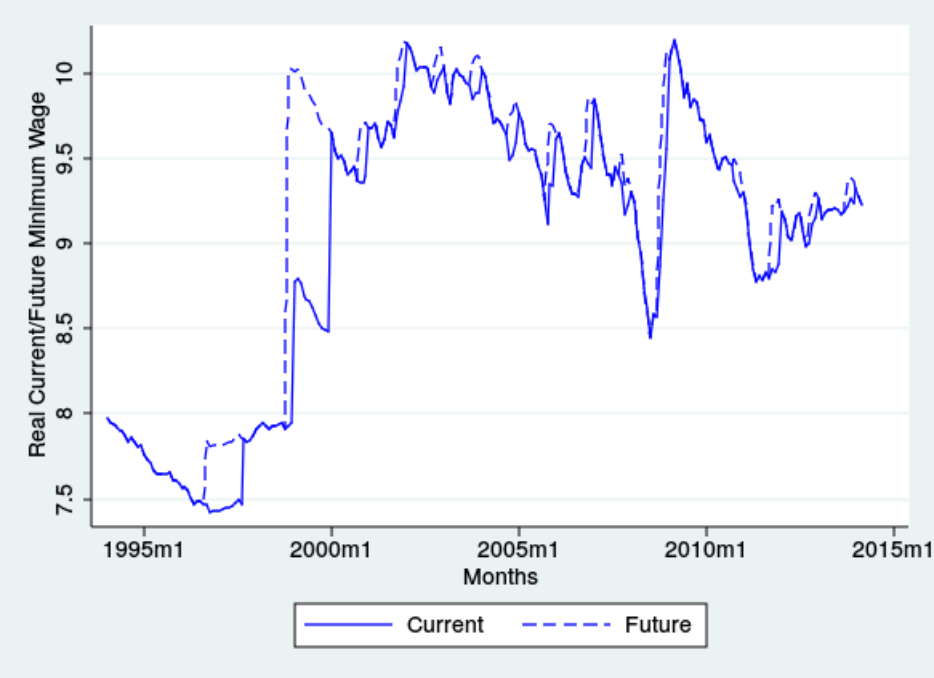

FIG. 9. Real minimum wage in Washington, current and future

session laws.

It is interesting to note the variety of political processes behind the minimum wage changes present in these data. One minimum wage law was passed at the federal level in 1996. It contained two changes, one from $4.25 to $4.75 on October 1, 1996 and the other to $5.15 on September 1, 1997. Neither increase changed the effective minimum wage in Oregon, whose minimum wage was already $4.75 in 1996 and $5.50 beginning in 1997. Both increases changed the effective minimum in California, however, and the second changed that of Washington. A second federal law was passed in 2007 implementing increases in 2007, 2008 and 2009, but all three states had minimum wages well above the federal level by this time.

California passed two minimum wage changes via popular vote in the form of a ballot initiative during the election cycle of 1996. These changes took effect in 1997 and 1998. The state's next two increases in 2001 and 2002 were mandated by its Industrial Welfare Commission in the form of wage orders. This process was ended, and subsequent increases were passed conventionally through the state legislature.

Oregon saw two ballot measures in relation to the minimum wage during this time period.

The first, in 1996, passed three increases that took effect from 1997 to 1999. The second, in 2002, passed a 2003 increase and also indexed the minimum wage to price inflation beginning in 2004. Washington is the nation's pioneer of the indexed minimum wage: it passed a referendum in 1998 that raised the minimum twice before indexing it beginning in 2001. Neither state allows for the minimum wage to decrease if the CPI drops; in this case, the minimum wage stays the same, as happened in both states in 2010 and in Oregon in 2012.

Indexed minimum wages add an extra layer of complexity to employers' ability to anticipate a change. Employers know as an established fact that the minimum wage will increase by some amount each year, but they do not know until a few months in advance exactly what that amount will be. For the sake of clarity, in this paper I consider a minimum wage change to be legislated when it is fully determined - that is, when its amount is announced. However, it is possible that employers do not so much change their thinking every year when the next increase is announced, but rather work with the ongoing assumption that the minimum wage will increase, without caring much about the exact amount. In further research, it would be useful to include more data from states with and without indexed minimum wages, and compare the two groups.

For the teen employment-population ratio, I use monthly CPS data from each state, from January 1994 through March 2014. The data are from the basic survey. I define "teens" as people aged 16-19. The CPS does not collect labor force data on people under 16.

I include the unemployment rate of prime-age males as an indicator of the economic climate, which is likely to affect teen employment and is also likely to be correlated with the real minimum wage. As Reich (2009) indicates, minimum wage increases tend to be both legislated and implemented in periods when the economy is strong. Failing to account for this would create an upward bias in the estimation of the employment effect. These data are also available monthly at the state level through the CPS.

The cost of capital also has an effect on employment. Whether this effect is positive or negative depends on whether teen labor is a complement or a substitute for capital. Generally, low-skill labor is assumed to be a substitute for capital, but either way the cost of capital is an important control. Again, the cost of capital is an economic condition that may affect businesses' level of opposition to a minimum wage change, as well as politicians' willingness to implement one. To represent the cost of capital, I use the national PPI for the

manufacture of machinery. This is the most appropriate PPI for which data are available for the entire period. I deflate the machinery manufacturing PPI analogously to the minimum wage, by dividing it by the general manufacturing PPI.

I also control for average real earnings of adult males. When adult wages are high, demand for adult labor decreases. If teen labor is a substitute for adult labor, this would lead to an increase in demand for teen labor and therefore in teen employment. Conversely, if teen labor is a complement to adult labor, increased adult wages would lead to a decrease in teen employment. Earnings may also be correlated with the minimum wage in either direction: on the one hand, raising the minimum wage raises wages for adults that work at or near the minimum wage, although it is generally expected to impact adults less than teenagers. On the other hand, it is possible that when wages for adults (who are more likely to be the primary breadwinners in their families and thus are the more likely focus of policy) are rising of their own accord, there may be less pressure to raise the minimum wage than when wages are stagnant or declining in comparison with prices. For these reasons, many estimations of the employment effect have included the average adult male wage, either as a control or as a deflator for the minimum wage term. My estimate of the employment effect is very sensitive to the inclusion of this control, which I discuss further in Section 4.

Unfortunately, correct monthly data on hourly wages at the state or national level are not available through the Census Bureau prior to 2002. Instead, I use CPS data offered at the national level through the Bureau of Labor Statistics. The BLS offers data on average weekly earnings for all males aged 25 and over, annually for 1994-1999 and quarterly beginning in 2000. These data are in nominal dollars, so I deflate them by the same manufacturing PPI I use to deflate the minimum wage. A potential concern is that these data are not a good proxy for hourly wage data if weekly hours change significantly over the period.

When using national data, as I do for the machinery PPI that I include as a control and the general manufacturing PPI that I use to deflate the minimum wage and earnings data, as well as for adult male earnings, one must consider the consequences of applying national controls to an otherwise state-level estimation. The wages of adults and the output prices and costs of capital faced by employers of teens can be expected to vary across the country, and these variations may affect the labor demand for teens in different areas. It is also possible that these differences in conditions for employers would have an impact on

the political process and, therefore, on the minimum wage. Unfortunately, I am not able to solve this problem due to the unavailability of state-level data for these factors, but it is important to keep in mind the potential bias present. For instance, if employers in California face on average higher product prices than those of the nation as a whole, and this makes them both more inclined to hire teens and less inclined to oppose a minimum wage increase, then controlling for this using the national PPI (which would be low compared to that of California) would not fully correct for the positive bias present in the estimation of the employment effect.

The data available for teen employment are not seasonally adjusted, so I include monthly dummy variables. Monthly indicators are especially important for teens because of the large upswing in employment that teens experience during the summer months. Since several minimum wage increases also take place during the summer (for instance, California often raises its minimum in July), it is crucial to control for this variation.

Additionally, in some specifications I include fixed effects for each state. One must use caution when including state and year effects because they indiscriminately remove a lot of variation. In this case, I include state effects in some estimations to show how sensitive the results are to these effects. The results' sensitivity suggests that the political and economic climates within each state have significant effects on the relationship between the minimum wage and employment that should be accounted for. I discuss this further in Section 4.

Finally, there is a clear downward trend in teen employment over time (see Figure 3), even in periods when the real minimum wage is relatively stationary. For this reason, in some specifications I include a linear time trend. In other specifications I use year effects in place of a linear time trend; the advantages and disadvantages of these tools are discussed in Section 4.

4. ESTIMATION RESULTS

I begin with a conventional equation to estimate the employment effect of the current minimum wage, without yet adding the future wage. As can be seen in Table II, most estimates show the estimated employment effect to be positive. When W is excluded as a control in column (1), the estimated β_1 is negative, however one cannot reject the null

N		729	
Variable description	Variable name	Mean	Standard deviation
Log of teen employment-population ratio	$lgEPR$	-1.10	0.324
Nominal current minimum wage	-	6.85	1.38
Log of real current minimum wage (2014 dollars)	lgC	2.17	0.104
Nominal future wage	-	6.97	1.35
Log of real future wage	lgF	2.19	0.105
Machinery manufacturing PPI, deflated by total manufacturing PPI	K	1.04	.0929
Average real weekly earnings of prime-age males	W	975	51.8
Prime-age male unemployment rate	U	0.0591	.0247

TABLE I. Descriptive statistics

hypothesis that β_1 is zero or positive. Furthermore, although the correlations between adult wages and teen employment and between adult wages and the minimum wage are ambiguous as discussed in section 2, there is likely some omitted variable bias when this control is not included.

When W is introduced as a control in column (2), the estimate of β_1 becomes positive, and one can reject the null hypothesis that it is negative at a 5% significance level. Including state effects in column (3) reduces the estimate of β_1 from 1.41 to just .0284, and one cannot reject the hypothesis that β_1 is negative. Because the magnitude and significance of β_1 are so sensitive to the inclusion of state effects, it would be useful to have data on more states, especially those that are geographically, economically and/or politically quite different from the West Coast states included. In subsequent estimates, I include state effects.

In column (4), I include a linear time trend. As discussed in section 2, the apparent presence of a downward trend in the teen employment-population ratio and the lack of such a trend in the real minimum wage suggests this may be helpful. The estimated β_1 increases to .269 and is significant at the 5% level. In column (5), I include year effects instead of a linear time trend. The estimated β_1 remains positive, decreasing to .178, but is no longer significant at the 5% level. Including year effects has the advantage that the correlation

between year and teen employment is not constrained to be linear over time, but in this case a linear trend is more appropriate because year effects remove a large amount of variation in the minimum wage. (For an example of the dramatic effects the inclusion of year effects can have on estimations of the employment effect, and an argument against their inclusion, see Burkhauser (2000).)

Specification	(1)	(2)	(3)	(4)	(5)
R-squared	.669	0.736	.817	.821	.842
lgC	-.0025	1.41*	.0284	.269*	.178
	(.0656)	(.106)	(.108)	(.120)	(.126)
K	2.08*	3.47*	2.48*	1.12*	.880
	(.0889)	(.130)	(.113)	(.277)	(.577)
U	-3.68*	-2.41*	-2.80*	-2.86*	-1.28*
	(.332)	(.331)	(.281)	(.277)	(.444)
W	-	-.0038*	.0011*	.0005	-.0009
		(.0002)	(.00026)	(.0003)	(.0005)
State effects	No	No	Yes	Yes	Yes
Linear trend	No	No	No	Yes	No
Year effects	No	No	No	No	Yes
* = significant at the 5% level					

TABLE II. Conventional employment effect estimation

For control variables, I measure significance using a two-tailed hypothesis, with the null hypothesis being that the coefficient is zero. One may note that the coefficient on U is significant and negative for all specifications, indicating a strong cyclical effect on teen employment. Additionally, the coefficient on K is positive and significant unless year effects are included, so the real cost of capital also seems to influence teen employment. It appears that teen labor is a substitute for capital, such that when capital is more expensive, teen employment increases.

It is apparent that these results do not support the neoclassical theory. One possible

N		554	
Variable description	Variable name	Mean	Standard deviation
Log of teen employment-population ratio	EPR	-1.11	0.328
Nominal current minimum wage	-	6.91	1.40
Log of real current minimum wage (2014 dollars)	C	2.17	0.108
Machinery manufacturing PPI,	K	1.03	.0928
deflated by total manufacturing PPI			
Average real weekly earnings of prime-age males	W	975	53.4
Prime-age male unemployment rate	U	0.0618	.0259

TABLE III. Descriptive statistics, Normal regime

explanation is that, in some periods, a future wage is present that employers may have in mind when making employment decisions, in addition to or instead of the current minimum wage. To test this hypothesis, I next estimate the same equation, but divide the observations into two regimes. The "Normal" regime consists of the periods in which there is no future wage. In these periods, lgF is equal to lgC. The "Limbo" regime consists of the periods in which there is a future wage. In these periods, lgF is greater than lgC and there is a possibility that employers will make employment decisions based on the future wage in addition to or instead of the current minimum. The Normal regime contains 554 observations, or about 75% of the total observations. The Limbo regime contains 175 observations, or 25%. Thus, in 75% of observations, lgC and lgF are the same; among the sample of 729 observations, they have a high correlation coefficient of 0.9068.

The results can be seen in Table V. In column (1), the conventional estimation with both regimes is reprinted for reference. As explained above, I have chosen to proceed with the inclusion of state effects and a linear time trend, so column (1) of Table V is identical to column (4) of Table II. In column (2) of Table V, I estimate the conventional equation using observations only from the Normal regime. The coefficient on lgC, β_1, is similar to that of the combined regimes, and is significant at the 5% level. By contrast, estimating the equation for only observations from the Limbo regime, as I do in column (3), produces an estimate of β_1 that is smaller and not significant at the 5% level. However, the hypothesis

N		175	
Variable description	Variable name	Mean	Standard deviation
Log of teen employment-population ratio	EPR	-1.05	0.307
Nominal current minimum wage	-	6.65	1.30
Log of real current minimum wage (2014 dollars)	C	2.16	0.0876
Nominal future wage	-	7.16	1.17
Log of real future wage	F	2.24	0.0688
Machinery manufacturing PPI,	K	1.05	.0917
deflated by total manufacturing PPI			
Average real weekly earnings of prime-age males	W	975	46.3
Prime-age male unemployment rate	U	0.0506	.0180

TABLE IV. Descriptive statistics, Limbo regime

that β_1 for the Normal regime is equal to β_1 for the Limbo regime cannot be rejected at the 5% significance level.

A possible explanation for the change in the coefficient on lgC from the Normal to the Limbo regime is that, in the Limbo regime, employers are basing employment decisions on the legislated minimum wage instead of the minimum wage currently in effect. To test this hypothesis, in column (4) I estimate the regression using lgF as the independent variable of interest, rather than lgC. The estimated coefficient on lgF, γ_1, is larger than the estimated β_1 for the Limbo regime, but still is not significant at the 5% level. Additionally, the hypothesis that $\gamma_1 = \beta_1$ in the Limbo regime cannot be rejected at the 5% level.

The significant negative correlation between teen employment and adult male unemployment remains in both regimes, but the positive correlation between the cost of capital and teen employment is not significantly present in the limbo regime. It may be that the presence of a future wage influences employers' employment decisions enough to remove any clear relationship between teen employment and the cost of capital.

Although the data do not clearly indicate whether teen employment is correlated with either the current or the legislated minimum wage in periods where they differ, it is interesting to note that the significant correlation between the current minimum wage and employment

Specification	(1)	(2)	(3)	(4)
Regime	Both	Normal	Limbo	Limbo
N	729	554	175	175
R-squared	.8311	.8340	.8343	.8344
lgC	.269*	.268*	.182	-
	(.120)	(.139)	(.358)	-
lgF	-	-	-	.340
				(.294)
K	1.12*	1.20*	.216	-.262
	(.350)	(.394)	(.942)	(1.04)
U	-2.86*	-2.88*	-2.79*	-2.75*
	(.277)	(.319)	(.697)	(.696)
W	-.00046	-.00055	.00047	.00067
	(.00030)	(.00034)	(.00094)	(.00069)

TABLE V. Employment effect by regime

that exists in the Normal regime disappears in the Limbo regime. It is entirely possible that further research could reveal a correlation between $lgEPR$ and lgF in the Limbo regime, or at least shed more light onto the reason why the two regimes differ in this regard.

5. ADDITIONAL THOUGHTS

A. Hours of work

Although my research thus far has focused solely on employment, it is important to acknowledge that the minimum wage may also affect labor demand in the form of hours of work. Rather than or in addition to decreasing or increasing the number of workers they employ, firms may also change the hours of work demanded from each worker. Thus, measuring the effect of the minimum wage on the employment-population ratio of teens may not capture the total effect of the minimum wage on demand for teen labor.

Couch and Wittenberg (2001) estimate the effect of the minimum wage on hours of work

per worker for teenagers. Their findings are consistent with the neoclassical theory (unlike my results). Additionally, they find that when the minimum wage rises, hours of work decrease *more* than employment, suggesting that estimates of the effect of the minimum wage on labor demand that focus only on employment underestimate said effect. A potentially insightful avenue for future research, therefore, would be to include data on hours of work.

B. Coverage

Not all workers are covered by minimum wage laws. Depending on the number and type of workers who are not covered, this could potentially affect the estimation of the employment effect. For example, the federal minimum wage does not apply to workers at businesses that have sales of less than $500,000 per year. Additionally, many state minimum wage laws have a lower minimum for workers who earn tips, or for minors.

Fortunately for the accuracy of my results, Califiornia, Oregon and Washington all make relatively few exceptions to their minimum wage coverage. None of the three states has a lower tipped wage. None excepts small businesses or minors, although Oregon and Washington make an exception for student workers who are employed part-time as part of a certified professional job training program; they may be employed for no less than 75% of the minimum wage. Additionally, in California and Washington, workers in training may be paid as little as 85% of the minimum wage for their first 160 hours of work, provided they are new to the occupation in which they are working. All three states allow employers to pay a submimimum wage to disabled workers, provided they obtain a special permit. There are a variety of other minor exceptions including for camp counselors, some agricultural workers, and babysitters; these vary across states.

Although some of these exceptions, particularly that for disabled workers, may be important or controversial for other reasons, none of them is likely to have significant effects on estimations of the employment effect because of the small number of workers excepted. If this research were extended to states with broader exceptions such as tipped minimums, coverage might become more of a concern.

C. Living Wage Ordinances

Throughout the history of the minimum wage in the US, there have been periods of high levels of legislation of state minimum wages, usually coinciding with periods of stagnation in the federal minimum. Beginning in the mid 1990s, even state-level growth in the minimum wage has not been enough for some local governments, who have begun instituting their own minimum wages at the city or county level, usually known as "living wage" laws.

Of the more than 125 municipalities across the country that have passed living wage laws, 33 are in California. Oregon has four locations with living wage laws, while Washington has three.

These laws have not received much research attention because, with a few notable exceptions, they apply only to government workers, employees of contractors who contract with the local government, or employees of businesses who receive financial assistance from the government through economic development initiatives.

Such research that does exist has been done on the three cities with blanket city-wide living wages: San Francisco, Santa Fe, and Washington, DC. This research has generally found positive effects on wages without significant negative effects on employment (cf Reich et al., 2007).

6. CONCLUSION

This research finds no evidence for a negative effect of the minimum wage on employment. This finding is significant in itself, as it rejects the neoclassical theory that firms operate in a competitive labor market and reduce employment when the wage floor increases. It is possible that firms in these states and in the employment sectors where teens primarily work are monopsonistic. Another explanation is that the going wage in the relevant labor markets is higher than the minimum, such that the wage floor is not relevant. Testing this is not straightforward, because it is a question of what the going wage would be, hypothetically, in the absence of a minimum wage.

These results also indicate that employers may behave differently with regard to teen employment decisions when there is a future wage. The positive employment effect that is significant in the combined observations and in the Normal regime is not significant in the

Limbo regime. However, more data are needed to clarify this relationship. In addition, these findings cannot contribute to explaining the discrepancy in the current research between work that finds a negative employment effect and work that finds none, because it does not give any explanation for the negative employment effect findings.

Possible next steps include expanding the data set to include all 50 states, expanding the timespan of the study to include earlier periods, and examining the differences between states with indexed minimum wages and those without. Another possibility for exploration is the potential relationship between the employment effect of the future wage and the length of time remaining before the future wage becomes the current wage.

REFERENCES

[1] Allegretto, Sylvia A., Arindrajit Dube and Michael Reich. 2011. "Do Minimum Wages Really Reduce Teen Employment? Accounting for Heterogeneity and Selectivity in State Panel Data." *Industrial Relations,* Vol. 50, No. 2 (April), pp. 205-240.

[2] Brown, Charles, Curtis Gilroy and Andrew Kohen. 1982. "The Effect of the Minimum Wage on Employment and Unemployment." *Industrial and Labor Relations Review*, Vol. 20, No. 2 (June), pp. 487-528.

[3] Burkhauser, Richard V., Kenneth A. Couch and David C. Wittenburg. 2000. "A Reassessment of the New Economics of the Minimum Wage Literature with Monthly Data from the Current Population Survey." *Journal of Labor Economics*, Vol. 18, No. 4, pp. 653-680.

[4] Card, David. 1992. "Using Regional Variation in Wages to Measure the Effects of the Federal Minimum Wage." *Industrial and Labor Relations Review* Vol. 46, No. 1 (October), pp. 38-54.

[5] Couch, Kenneth A. and David C. Wittenburg. 2001. "The Response of Hours of Work to Increases in the Minimum Wage." *Southern Economic Journal*, Vol. 68, No. 1, pp. 171-177.

[6] Lester, Richard A. 1947. "Marginalism, Minimum Wages, and Labor Markets." *American Economic Review*, Vol. 37, No. 1, pp. 135-148.

[7] Meer, Jonathan and Jeremy West. 2013. "Effects of the Minimum Wage on Employment Dynamics." *National Bureau of Economic Research*, working paper, August.

[8] Neumark, David and William Wascher. 1992. "Employment Effects of Minimum and Subminimum Wages: Panel Data on State Minimum Wage Laws." *Industrial and Labor Relations Review,* Vol. 46, No. 1 (October), pp. 55-81.

[9] Neumark, David and William Wascher. 2006. "Minimum Wages and Employment: A Review of Evidence from the New Minimum Wage Research." *National Bureau of Economic Research*, working paper, November.

[10] Reich, Michael, Arindrajit Dube and Suresh Naidu. 2007. "The Economic Effects of a Citywide Minimum Wage," *Industrial and Labor Relations Review*, Vol. 60, No. 4 (July), pp. 522-43.

[11] Reich, Michael. 2009. "Minimum Wages in the United States: Politics, Economics, and Econo-

metrics." In *Labor in the Era of Globalization,* Brown, Eichengreen, and Reich, eds. Cambridge, UK: Cambridge University Press, pp. 353-74.

[12] Stigler, George J. 1946. "The Economics of Minimum Wage Legislation." *American Economic Review,* Vol. 36, No. 3 (June), pp. 29-50.

Other source material

Minimum wage legislation information: Heinonline.org; Govtrack.us.

Coverage and living wage information: National Employment Law project: nelp.org; Washington Administrative Code; Oregon Wage and Hour Division.