Unintended Consequences of a Minimum Wage Hike that Never Happened

(PRELIMINARY AND INCOMPLETE)

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Abstract

Recent theoretical and empirical evidence suggesting that the effects of a minimum wage raise might be small in the short run, but sizable in the long run. I use high-frequency data from online betting markets and financial markets to study the long-term impact of minimum wage legislation on firm profits and employment. While this approach only allows me to study the impact on big firms, quoted on the stock market, it has the advantage of not relying on employment data, which is often noizy and difficult to find. Preliminary reduced-form results suggest that a 10 percentage-point increase in the odds of a minimum wage increase are associated with a 1 percentage-point decrease in the returns to stock of companies in the limited-service restaurant industry.

1 Introduction and Background

In this project I plan to study the long-term impact of minimum wage legislation on firm profits and employment. The effect of price floors on the labor market has a long and controversial history in economics. While standard models would predict that a binding minimum wage induces firms to substitute away from low-skill labor toward other inputs of production, empirical studies have often found little or no effect on the employment of low-skill workers. Recent papers, such as Sorkin (2015) and Aaronson et al. (2018), have proposed a reconciliation of theory and evidence. If firms face high adjustment costs, they will find it hard to change the number of employees they hire; in the long run, however, as new firms enter the market and old firms leave, the new firms will take into account the higher cost of hiring workers and will set up their operations in a way that uses less low-skill labor. While the effect of a minimum wage hike is very small in the short-run, these models generate sizable long-run responses. Because minimum wage hikes tend to be nominal in nature, and get eroded by inflation as time goes on, this explanation is also consistent with empirical studies that find no significant responses in the long term. By the time that new firms would have adjusted to the new steady state, the *real* minimum wage is back to its original level, and so we never get to observe its full brunt.

My project sets out to investigate the long-term consequences of the minimum wage by looking at how the stock market prices of companies affected by the minimum wage change when there is a change in the expectations about future minimum wage hikes. There are two major parameters of interest in determining both the stock price response and the long-term employment response: the substitutability of inputs and the elasticity of demand for output. First, if firms can substitute low-skill labor more easily with other inputs, this will magnify the response of employment, and reduce the effect on firm value. Second, if consumers in industries where the minimum wage bites are relatively inelastic to price increases, this means that increases in the minimum wage will translate more easily in increases of the price of output in these industries. This implies that if consumers are very inelastic to price increases, firms will be able to keep producing about the same amount as before, using about the same amount of labor, and making about the same amount of

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profits.

Given one of these parameters and the stock price response, we will therefore be able to infer the other parameter, and thus the implied employment response. For example, if we suppose that firms cannot substitute low-skill labor for other inputs, then observing the stock market response will allow us to infer how elastic the demand for output is, and therefore what the employment response will be. Conversely, if we knew that customers are perfectly elastic to output price, then observing the stock market response will tell us the degree to which they will substitute away from low-skill labor. The purpose of this study is to measure the stock market response, and to show what it implies for the long-term employment response depending on what we assume about each of these two parameters, and the structure of labor markets.

Stock markets are known for the way they aggregate all information that is publicly available. While the aggregate employment of low-skill workers might take a long time to respond, stock markets will react immediately to a change in expectations about the future minimum wage. I plan to measure these expectations with a source of variation that was previously unused in this literature: odds from bets on minimum wage hikes. PredictIt.org is an online platform that offers its users the possibility to exchange futures contracts about political and policy-related events. For example, PredictIt offered its users the possibility to exchange contracts that would pay \$1 if there was a federal minimum wage hike in 2015. I plan to use the price at which these contracts were traded, as well as the price of similar contracts for 2016 and 2017, to proxy for the public's belief about a future minimum wage hike.

My approach presents one small drawback, but many advantages. The drawback is that most firms employing workers at the minimum wage are too small to be quoted on the stock market. While this might impact the external validity of our results, the big firms included in the study (e.g. McDonald's, Chipotle, or Walmart) hire many more workers at the minimum wage than other small enterprises, and so the question of how big companies react is interesting in and of itself. Furthermore, my approach presents many advantages over the previous literature. Compared to studies that look directly at employment, looking at stock market responses is useful for two reasons. First, employment is typically measured through surveys of establishments, which can be noisy and unreliable, and are only observed over long periods of time, typically a quarter or a full year. In contrast, the stock market offers clear, clean data at a very high frequency. Second, while employment might take a long time to adjust to its new levels, stock market prices will adjust immediately to a shock in expectations.

While I am not the first to think about how stock market prices are affected by the minimum wage, I will be using a totally novel setting to infer something about the long-run employment response. Previous studies that looked at stock market responses, as do Card and Krueger (1995) in a chapter of their book, focused on specific events that raised the expectations of the future minimum wage – e.g., President Bush's decision in 1989 to publicly support a higher minimum wage. Similar approaches have been used by Bell and Machin (2018) on a surprising shift on minimum wage policy by the UK's conservative party, or by Lee and Mas (2012) in the context of labor unionization. They use event-study methodologies to infer how these occurrences affected the stock market price of firms. My approach presents two advantages over these studies. First, event studies about financial variables are inherently plagued by the problem of what time-window to consider. To the extent that an event was already expected by the public, it will already be priced into the stock market, and so we will observe little or no change when the event actually realizes. This leaves researchers with the arduous task of deciding when an event actually surprised the public, how anticipated it was, and what window of time should be considered. My approach is completely free from these concerns. Since stock market prices and contract prices are based on the same information set – namely, all publicly available information – the changes in one will be contemporaneous to changes in the other. Second, my approach allows us to somehow quantify the change in expectations. Previous studies that looked at specific events could not quantify how these events altered expectations. While I cannot directly observe the expected minimum wage in every period, using a proxy for the probability of a hike gives us a clear numerical value that is much easier to interpret.

2 Empirical Methodology and Preliminary Results

My research design is based on so-called difference-in-difference designs. Instead of the classic, pre-post and treated-control distinction, I plan to take a more continuous route. The final objective is to compare how firms' stock market valuations react to changes in the probability of a hike depending on how exposed they are to the minimum wage. To do this, I plan to first estimate a model of the stock market in the spirit of Fama and French (1993) on a period *preceding* the bets on minimum wage, to get a sense of how each company's stock moves with the rest of the financial market. In their three-factor model the stock market returns of company i in period t, R_{it}, depends on the returns to a market portfolio, R_t^m, the persistent effects of book-to-market equity, a High-Minus-Low portfolio (HML_t), and the persistent effects of firm size as measured by its market capitalization, a Small-Minus-Big portfolio (SMB_t):

$$R_{it} = \beta_i^m R_t^m + \beta_i^{HML} HML_t + \beta_i^{SMB} SMB_t + u_{it}.$$

The estimates $(\hat{\beta}_i^m, \hat{\beta}_i^{HML}, \hat{\beta}_i^{SMB})$ will then allow us to construct expected returns during our sample period of interest, namely the years in which we have data on the betting odds of a minimum wage hike. I will use these expected returns to construct "abnormal returns" for each company in every period, AR_{it}:

$$AR_{it} \equiv R_{it} - \hat{\beta}_i^m R_t^m - \hat{\beta}_i^{HML} HML_t - \hat{\beta}_i^{SMB} SMB_t.$$

Once we have abnormal returns for every company in the sample, I plan to see how changes in the unexpected, abnormal returns vary with changes in the odds of a minimum wage hike. If $\Delta P_t = P_t - P_{t-1}$ is the innovation in the odds of a minimum wage increase, T_i is a measure of how exposed firm i is to minimum wage increases, and $\mathbf{X_{it}}$ is a vector of controls, then our regression of interest is:

$$AR_{it} = \beta_0 + \beta_1 T_i + \beta_2 \Delta P_t + \beta_3 T_i \Delta P_t + \gamma' \mathbf{X_{it}} + \varepsilon_{it}. \tag{1}$$

In particular, we will be interested in estimates of β_3, which will measure how unexpected returns vary with changes in expectations about the minimum wage as firms are more exposed to minimum wage labor.

In preliminary regressions I have used a rudimentary measure of T_i. I focused on the restaurant industry[1], and coded $T_i = 1$ for firms in the limited-service restaurant industry[2], and $T_i = 0$ for firms in other sub-industries. Limited-service restaurants, i.e. restaurants that do not serve customers at the table, have historically been a focus in studies on the minimum wage due to their high exposure to minimum wage labor. These preliminary regressions, whose results are reported in table 1, show that a 10 percentage-point increase in the odds of a minimum wage increase are associated with a 1 percentage-point decrease in the returns to stock of companies in the limited-service restaurant industry, relative to other firms in the restaurant industry.

2.1 Data Concerns and How to Address Them

The road ahead is still long, but these preliminary results give us confidence that the data support our intuition of how stock market prices would move with changes in expectations about the minimum wage. However, a lot of work is still needed to build a dynamic model and think carefully about what I am measuring in my empirical work and how it relates to the model. Another important feature of the project that will require a lot of attention is how to build a better measure of firm exposure to the minimum wage. In the absence of company-level data on this matter, I will need to construct indices by region or by industry, somewhat along the lines of what Clemens and Wither (2019) do for individuals. The basic idea of this approach is to use county-level data on minimum wage exposure by the working population, and link that to industry-level shares of county GDP, to construct an index of exposure to minimum wage by industry at the national level.

An alternative and more novel approach to measure exposure to minimum wage, following a trend in papers on policy uncertainty such as Baker et al. (2016), would be to use textual analysis. One version of

[1] NAICS 3-digit code 722
[2] NAICS 6-digit code 722513

	1	2	3	4
$T * \Delta P$	-0.070	-0.070	-0.090	- 0.090
	(0.042)	(0.040)	(0.040)	(0.038)
T	0.227	0.230	0.025	0.031
	(0.381)	(0.364)	(0.382)	(0.362)
ΔP	-0.018		-0.004	
	(0.012)		(0.011)	
Time FE		X		X
Weigh by volume			X	X
N	2738	2738	2687	2687

Table 1: Estimates of equation 1. All specifications are based on weekly data for December 2014 to December 2015. Odds are calculated as the average price at which the PredictIt contract "will the federal minimum wage increase in 2015?" traded in a given week. Specifications 1 and 2 are unweighted, while specifications 3 and 4 are weighted by the volume of contracts traded in that week. Naturally, controlling for time fixed-effects also controls for the historical series of ΔP_t, so our preferred specification here is in column number 4. Standard errors (in parentheses) are calculated as if abnormal returns came straight from the population, while eventually I will need to design a bootstrapping procedure to calculate them. Abnormal returns are calculated using data from the Center for Research in Security Prices (CRSP) and Kenneth French's website for aggregate indicators. A CAPM model is estimated on a two-year window ending six months prior to the start of the bet. Model estimates for each firm are then used to compute abnormal returns for December 2014 to December 2015.

this exercise could be to look at company financial statements and count how many times they mention the words "minimum wage". Unfortunately, it appears that even companies like McDonald's or Walmart do not mention the minimum wage in their yearly financial statements, which could be due to the highly public nature of financial statements. Nonetheless, some hope remains for this approach. Hassan et al. (2017), for instance, use transcripts of conference calls held in conjunction with an earnings release to measure firms' exposure to political risk; if earnings calls are perceived to be less public than financial statements, there might be some hope for investors and board members to speak more openly. More work is needed to determine whether I will be able to access these transcripts.

A second concern is to think about how to deal with the time-dimension of the bets I'm considering. The terms of these bets have a built-in expiration date, because they ask about minimum wage increases by the end of a calendar year. As a result, there should be a natural down-ward trend in the odds of a successful hike: by the time we reach year-end, it should be clear whether the hike has happened or not. Indeed, even if every day there was an independent draw that resulted in a hike with probability $p \in (0,1)$, the probability on date $t = 0, 1, ..., T$ that a minimum wage occurs by date T is:

$$\begin{aligned} \mathbb{P}[\text{Hike by date } T|t] &= 1 - \mathbb{P}[\text{No hike by date } T|t] \\ &= 1 - \prod_{s=t}^{T} \mathbb{P}[\text{No hike on date } s] \\ &= 1 - (1-p)^{T-t}, \end{aligned} \tag{2}$$

which can be easily verified to be decreasing in t. This trend can also be easily recognized in the data, as one can see in figure 1. A more sophisticated version of my preliminary results should therefore account for this trend, rather than interpreting it as an actual shock in expectations about the future minimum wage. This can be done by estimating a model such as the one in equation 2 on the betting data, and then using the predicted probabilities to de-trend the series of betting odds. A good robustness check could be performed by focusing only on the biggest jumps in the prices of betting contracts, which one could suppose to be linked to big shifts in expectations rather than due to a generic downward trend.

3 Conclusion

In conclusion, this project proposes to use a novel measure of beliefs about the minimum wage, namely bets on whether there would be a federal minimum wage increase. I use the high frequency of these data to

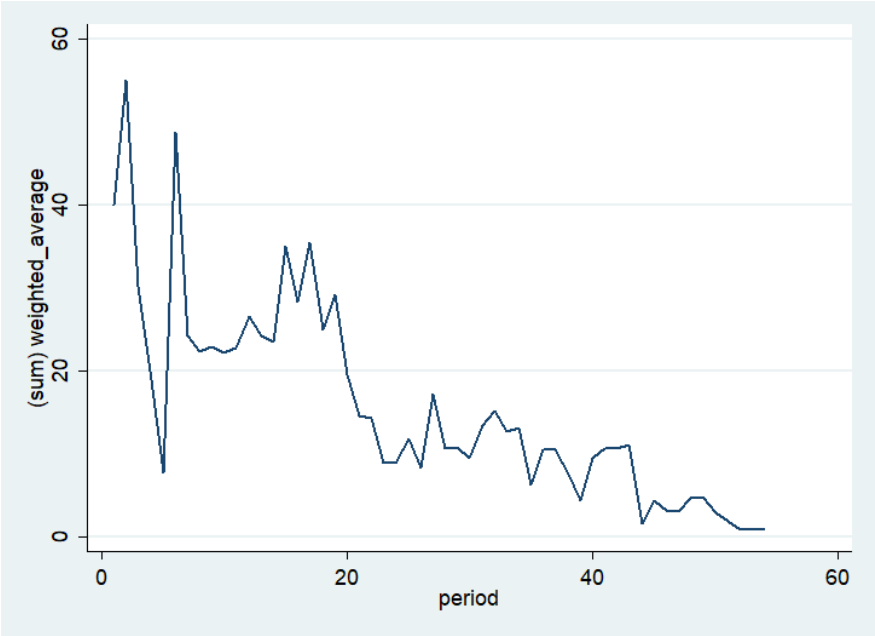

Figure 1: Average weekly prices for the PredictIt contract "will the federal minimum wage increase in 2015?" between the second week of December 2014 and the last week of December 2015. Prices are expressed in cents.

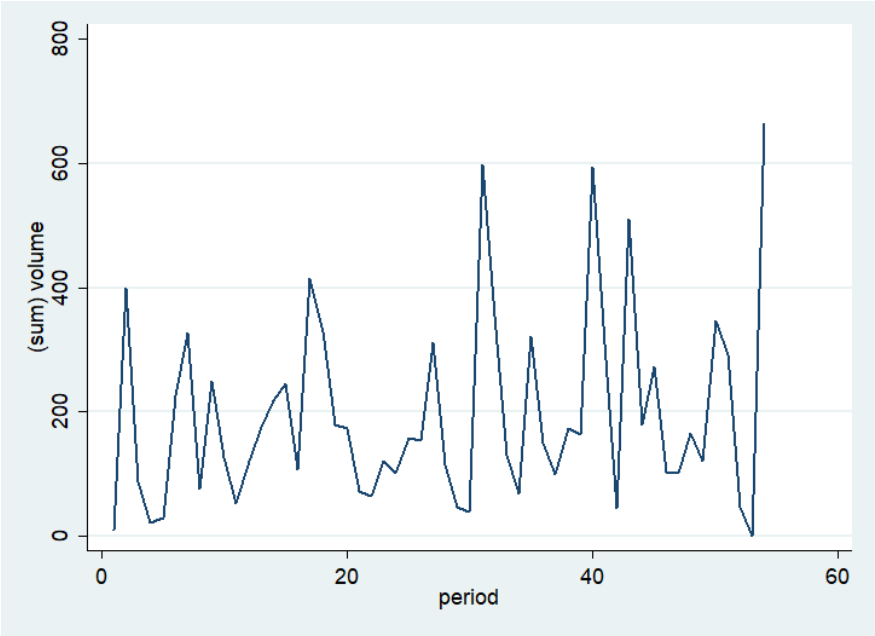

Figure 2: Total number of contracts traded each week for the PredictIt contract "will the federal minimum wage increase in 2015?" between the second week of December 2014 and the last week of December 2015.

infer how beliefs about future minimum wage hikes affect the value of firms that hire labor at the minimum wage. This presents significant improvements over existing event studies, both because the betting market and the stock market contemporaneously react to new information, and because the quantitative nature of my measure of beliefs allows us to give clearer interpretation of the results.

Further, I plan to establish a theoretical link between these empirical results and the behavioral responses they imply. Thanks to the forward-looking nature of the stock market, my model will be able to speak about long-term steady states, rather than simply short-run responses.

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