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SURVIVAL OF THE FITTEST:
THE IMPACT OF THE MINIMUM WAGE ON FIRM EXIT

Dara Lee Luca
Michael Luca

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Survival of the Fittest: The Impact of the Minimum Wage on Firm Exit
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ABSTRACT

We study the impact of the minimum wage on firm exit in the restaurant industry, exploiting recent changes in the minimum wage at the city level. We find that the impact of the minimum wage depends on whether a restaurant was already close to the margin of exit. Restaurants with lower ratings are closer to the margin of exit on average, and are disproportionately driven out of business by increases to the minimum wage. Our point estimates suggest that a one dollar increase in the minimum wage leads to a 10 percent increase in the likelihood of exit for a 3.5-star restaurant (which is the median rating on Yelp), but has no discernible impact for a 5-star restaurant (on a 1 to 5 star scale). We expand the analysis to look at prices using data from delivery orders, and find that lower rated restaurants also increase prices in response to minimum wage increases. Our analysis also highlights how digital data can be used to shed new light on labor policy and the economy.

Dara Lee Luca
Mathematica Policy Research
955 Massachusetts Ave
Cambridge, MA 02139
dleeluca@mathematica-mpr.com

Michael Luca
Harvard Business School
Soldiers Field
Boston, MA 02163
and NBER
mluca@hbs.edu

I. Introduction

The minimum wage has recently re-entered the forefront of policy discourse as federal proposals range from leaving it as is at $7.25, increasing it to $10.10 or raising it to as high as $15 per hour.[1] While the federal minimum wage has remained stagnant since 2009, states – and more recently, cities – have increasingly set local minimum wages above the federal mandate.

Theory dating back to Stigler (1946) has highlighted the potential for the minimum wage to distort markets. At the firm level, increasing the minimum wage creates a shock to the costs incurred by a business. One important way in which businesses can adjust is by exiting the market altogether. The basic argument is that firms will choose to stay in the market as long as it is profitable. Increases to the minimum wage reduce firm value and the profitability of operating (Bell and Machin, 2018; Draca, Machin, and Van Reenen, 2011), and hence have the potential to cause businesses that were already close to the margin to exit the market. Seminal theory from Williamson (1968) suggests that higher minimum wages can help larger or more productive firms, and lead to fewer small or less productive firms.

In this paper, we empirically investigate the impact of the minimum wage on firm closures in the restaurant industry. As theory would suggest, we find robust evidence that the impact of the minimum wage depends on how close a restaurant is to the margin of exit, proxied by its rating. Looking at city-level minimum wage changes in the San Francisco Bay Area (the "Bay Area"), we present two main findings. First, at all observed minimum wage levels,

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[1] While his exact stance on the minimum wage is not clear, President Trump has intimated that he would prefer to eliminate the federal minimum wage and let states determine their own minimum wages (http://www.politico.com/blogs/2016-presidential-debate-fact-check/2016/10/trump-kaine-minimum-wage-229149). Bernie Sanders proposed a $15 federal minimum wage as part of his presidential campaign in 2016 (https://berniesanders.com/issues/a-living-wage/).

restaurants with lower ratings are more likely to exit, suggesting that they are less efficient in the economic sense. Moreover, lower rated restaurants are disproportionately affected by minimum wage increases. In other words, the impact of the minimum wage on exit is most pronounced among restaurants that are closer to the margin of exit.

The restaurant industry in the Bay Area makes a compelling setting to investigate the impact of the minimum wage on small businesses. First, the restaurant industry is the most intensive employer of minimum wage workers (U.S. Bureau of Labor Statistics, 2016b). Second, there is high turnover within the restaurant industry. In our sample – which covers restaurants in the Bay Area from 2008 through 2016 – roughly 5 percent of restaurants go out of business each year. The exit margin is hence economically meaningful. Additionally, there is no tip credit in California, meaning that tips do not count toward the official wage and wait staff are covered by the same minimum wage as other employees, so the minimum wage is more likely to be binding. Finally, there have been many recent minimum wage increases in the area, with a number of cities implementing minimum wages upwards of $12.

Our analysis proceeds in two stages. First, we provide evidence that lower rated businesses are, on average, closer to the margin of exit and fail at higher rates than higher rated restaurants, irrespective of the minimum wage level. Empirically, there is significant and predictable variation in how close to the margin of exit firms are. A one-star increase in rating is associated with more than a 50% decrease in the likelihood of going out of business. We then exploit the multiple city-level minimum wage changes in recent years across the Bay Area to implement a difference-in-differences design to investigate the effects of the minimum wage. We do not find robust evidence that higher minimum wages lead to overall increases in restaurant exit rates. While the estimates are uniformly positive, they are imprecisely estimated. However, this masks important heterogeneity – we find a clear and significant relationship between the impact of the minimum wage on restaurant exit and the rating of the restaurant.

We find that the impact of the minimum wage on the likelihood of exit decreases as the restaurant's rating increases. Our results suggest that a \$1 increase in the minimum wage leads to a 10 percent increase in the likelihood of exit for the median 3.5-star restaurant, but no impact for five-star restaurants (the point estimate is in fact negative, suggesting that the likelihood of exit might even decrease for five-star restaurants, but the estimate is not statistically different from zero). These effects are robust to a number of different specifications, including controlling for time-varying county characteristics that may influence both minimum wage policies and restaurant demand, city-specific time trends to account for preexisting trends, as well as county-year fixed effects to control for spatial heterogeneity in exit trends.

Businesses might also adjust to minimum wage increases by raising their prices (Aaronson, 2001; Aaronson, French, and MacDonald, 2008; Allegretto and Reich, 2016). In our context, it is *a priori* unclear whether we should expect higher or lower rated restaurants to pass higher wages on to customers through price increases. If survival is driven by the ability to pass on higher labor costs to consumers through higher prices among stronger businesses, then we would expect to see higher rated restaurants raise prices more. On the other hand, if exit is driven by the fact that lower rated businesses generally have lower profit margins and are more affected by the minimum wage, then we might see lower rated restaurants increase prices by a greater degree.

To explore, we use data on orders placed through the online delivery platform Eat24, which has a partnership with Yelp. We find that the average cost of an order among higher rated restaurants rose less in response to higher minimum wages relative to lower rated restaurants, suggesting that minimum wage increases may have been more binding for lower rated restaurants, and that they raise their prices as a way to offset higher labor costs.

Overall, our findings shed light on the economic impact of the minimum wage. Basic theory predicts that the minimum wage will cause firms that cannot adjust in other ways to cover their increased costs to exit the market. We find that lower rated firms (which are already closer to the margin of exit) are disproportionately impacted by the minimum wage. After a minimum wage increase, they are more likely to exit the market altogether and more likely to raise their prices. Our work also relates to a large literature on labor effects of the minimum wage. While some studies find no detrimental effects on employment (Card and Krueger, 1994, 2000; Dube, Lester and Reich, 2010; Katz and Krueger, 1992), others show that higher minimum wage reduces employment, especially among low-skilled workers (see Neumark and Wascher, 2007 for a review). Horton (2017) highlights that firms can also adjust employment at the intensive margin.

In addition, our analysis also highlights how data from online platforms can be used to better understand labor policy and the economy. Historically, datasets from the US Census Bureau and the Bureau of Labor Statistics (BLS) have formed the backbone of analyses looking to estimate the impact of the minimum wage in the US (e.g. Dube, Lester and Reich, 2010, Aaronson et al., forthcoming). Other analyses consist mainly of researcher-administered surveys (e.g. Katz and Krueger, 1992; Card and Krueger, 1994). While administrative datasets are critical to our understanding of the minimum wage and the economy more generally, the effects we identify in this paper would have been difficult to observe using standard datasets.

The growth of online review platforms such as Yelp allow for unique insights into this issue. First, we can use each restaurant's rating as a proxy for its reputation, a measure that is not captured by conventional datasets. This lets us to evaluate whether the minimum wage differentially impacts businesses of lower reputation. Second, we are able to use exit data in close to real time, whereas BLS and Census data only become publicly available after a lag. This allows researchers and policymakers to more quickly understand the impacts of different economic policies. Third, we are able to observe granular data on businesses, whereas the public versions of the Census and BLS data are aggregated to coarser geographic levels, such as by county (depending on the variable the researcher is interested in). In principle, researchers can access restricted business-level data via an extensive application process, but the current waiting period for access even among approved applications is estimated to be two years. For example, a researcher trying to understand the impact of a policy change in 2017 would not be able to examine firm-level microdata from the Census until at least 2020. By using data from online platforms, researchers can measure the impacts in close to real time. While there are important limitations to data from online platforms as well, our analysis suggests that they are a valuable complement to more traditional data sources.

The rest of the paper proceeds as follows. We discuss the landscape of minimum wages across the United States in recent years in Section II. Section III discusses the data and empirical strategy, and presents some graphical evidence. Section IV reports the main results. Section V examines the impact on prices, aggregate entry, exit, and survival. Section VI presents several robustness checks, and Section VII concludes.

II. The minimum wage in recent years

The current federal minimum wage of $7.25 is binding for roughly 2.6 million hourly workers (U.S. Bureau of Labor Statistics, 2016a), with the restaurant industry having the highest percent of employees at the minimum (U.S. Bureau of Labor Statistics, 2016b). In addition to the

$7.25 federal minimum wage rate, 29 states and 41 cities have introduced higher than federal minimum wage. For example, San Francisco is set to increase its minimum wage to $15 in July 2018 from its current wage of $ 13 (since July 1, 2016).

We focus our analysis on the Bay Area, a region comprising of 101 cities surrounding the San Francisco Bay ("Bay Area"). The Bay Area is home to more than 7.5 million people, and includes the major cities and metropolitan areas of San Jose, San Francisco, and Oakland. Among the 41 cities and counties that have changed their minimum wage ordinances at the local level since 2012, 15 were in the Bay Area.[2] We document 21 total local changes during our sample period from 2008 through 2016, with four additional cities set to increase their minimum beginning in 2017. Beyond the wide variation in minimum wage, focusing on a single region potentially allows us to better control for macroeconomic trends and attitudes towards labor standards.

Figure 1 depicts the changes for the state of California and 11 cities in the Bay Area that have increased their minimum wage independently and above the state mandate since 2008.[3] In cities with separate minimum wages for large (usually defined as over 500 employees) and small companies, we use the minimum wage for small companies, as the majority of full-service and limited-service restaurants have fewer than 500 employees (U.S. Census Bureau, 2014). At the state level, the minimum wage was set at $8 in the beginning of the sample, increased to $9 in 2014, and then to $10 in 2016. However, a subset of cities raised their minimum wages above the

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[2] See http://laborcenter.berkeley.edu/minimum-wage-living-wage-resources/inventory-of-us-city-and-county-minimum-wage-ordinances/
[3] Four additional cities (San Leandro, Cupertino, Los Altos, San Mateo) are slated to increase their minimum wage above the state level in 2017.

state minimum wage, creating variation at different times and across cities within the Bay Area. This leads to minimum wage changes of different magnitude and beginning at different dates for different cities. For example, Berkeley had the same minimum wage as the state until 2014 when they increased their minimum wage to $10 – $1 higher than the state mandate. They further raised their minimum wage to $11 in 2015, while the state mandate remained at $9. California increased the state-wide minimum wage to $10 in 2016, whereas Berkeley left their minimum wage at $11 until later that year when they increased it to $12.53. Oakland did not increase their minimum wage more than the state mandate until 2015, when they raised the minimum wage to $12.25, more than three dollars above the state mandate (which stayed at $9) , and then increased it again to $12.55 in 2016, when California increased the state minimum wage to $10. Our difference-in-difference framework hence leverages the variation in both the timing and different levels of minimum wages implemented by cities across the Bay Area.

III. Data and empirical strategy

A. Restaurant data

Our underlying restaurant data are obtained from the online review platform Yelp. Yelp was founded in 2004 in San Francisco and is now a dominant review platform in the US. On Yelp, users can leave text reviews and ratings (from 1 to 5) for individual businesses, ranging from dry cleaners to dentists.

We start with the universe of all Yelp reviews for the Bay Area since 2008, and limit the dataset to only reviews for full-service and limited-service restaurants. Based on the review-level data, we form an unbalanced panel dataset at the restaurant-month level, where a restaurant enters the panel when it becomes active on Yelp (either by the owner registering the business, a reviewer registering the business, or receiving the first review), and leaves the panel after it has been marked as having been closed on Yelp.

The indicator for restaurant exit is crowdsourced. On each restaurant's Yelp page, users have the option of updating the restaurant's business details, including tagging it as having closed or moved. Any suggested changes are then verified by Yelp moderators before being marked as such on the restaurant's profile page. In practice, timing of exit through Yelp may also be more accurate than official administrative data, which contains nontrivial reporting lags and errors. We exclude filtered reviews, which are deemed by Yelp's algorithm as more likely to be fake or untrustworthy (Luca and Zervas, 2016). The dataset contains basic information about the restaurant, including the type of cuisine (e.g., "New American", "Chinese"), the price range of a typical meal of the restaurant (denoted by dollar signs ranging from $ to $$$$, with four dollar signs being the most expensive)[4], the exact location, and also time-varying characteristics such as the running average rating, the number of reviews, and exit status.[5]

Yelp coverage of restaurants is close to universal in the Bay Area. Comparing Yelp data to administrative data obtained for the city of San Francisco,[6] the number of restaurants active at the end of 2016 is 6,087 and 5,558 based on the San Francisco administrative and Yelp data, respectively. Exit statistics generated from the two datasets are similar and consistent with previous research. For example, a common statistic that the restaurant industry focuses on is the

[4] The price range category is a crowd sourced element that is time-invariant. Upon reviewing a restaurant, users are able to designate dollar signs indicating the cost of an approximate cost per person for a meal including one drink, tax and tip based on the following criteria: *$= under $10, $$=$11–$30, $$$=$31–$60, $$$$= over $61*.

[5] We constructed these variables such that they capture the measure at the end of the month, for example, the running average of the restaurant at the end of the month, or the displayed rating at the end of the month.

[6] SF OpenData is the central clearinghouse for data published by the City and County of San Francisco, and includes a database of registered businesses that pay taxes, including their date of entry and exit. We restricted to the NAICS code of 722 (full-service restaurants and limited-service restaurants).

rate of closure within one year of entry. Based on the administrative data, 19.8 percent of restaurants exit within one year of entry, whereas Yelp data indicates 20.9 percent. Other research on the restaurant industry has demonstrated similar numbers ranging from 23 percent in Dallas, Texas (Cline Group, 2003) to around 26 percent in Columbus, Ohio (Parsa, Self, Njite, and King, 2005).

We present two descriptive statistics of the data. The first set of statistics provides a snapshot of the restaurants' last appearance in the panel, i.e., at the end of 2016 or at the time of exit (Table 1 Panel A). There are 35,227 unique restaurants in our dataset, with a mean number of 184 reviews per restaurant and an average rating of 3.56.[7] Among the entire universe of restaurants, around 30 percent have closed. Restaurants remain in the panel for an average of 77 months[8] and have an average price sign of 1.6 "dollar signs". The second set of statistics shows a summary at the monthly panel level (Table 1 Panel B). A restaurant receives on average 2.5 new reviews each month with an average rating of 3.5. The likelihood of exit in any month is 0.4 percent.

B. Delivery orders data

We use orders data from the online delivery platform Eat24 to investigate whether restaurants respond to higher minimum wages by increasing prices. Table 2 presents the same set of characteristics as Table 1. Eat24, an online delivery platform, was acquired by Yelp and incorporated with the Yelp interface in 2013. We hence have data on delivery orders from March

[7] While Yelp displays ratings rounded to the nearest 0.5 on their website, we use unrounded version in the main analysis. Whether we use the rounded or unrounded version of ratings does not affect the conclusions of our analysis.

[8] Note that this statistic may not accurately represent average lifespan of a restaurant since when the restaurant becomes active on Yelp may not necessarily be the same as when the restaurant began operations.

2013 onward. There are 4,046 restaurants on Eat24, which represents slightly over 10 percent of the restaurants in our main sample. Restaurants on Eat24 on average have a rating of 3.53 and are similarly priced at 1.6 dollar signs, and are around the same age. However, restaurants on Eat24 are concentrated among larger cities.

Using data from Eat24 to measure prices has important advantages and challenges. One major advantage is that it allows us to observe a proxy for prices in real time at the restaurant level. This also allows us to implicitly weight prices by popularity of different menu items (which would be difficult if we based the analysis only on menu data without orders). However, while the restaurants that are delivering via Eat24 are generally similar in observable characteristics to other restaurants, they represent a nonrandom sample of businesses and may differ from other businesses, which may affect the magnitude of the results on prices.

C. Graphical evidence

We first present graphical evidence of the relationship between a restaurant's operational status and its rating. Figure 2a depicts a snapshot of the overall distribution of restaurant ratings when last observed in the dataset. The modal rating is 3.5, and ratings are generally more positive than negative; there are fewer than 5 percent of restaurants with ratings 2 and below, whereas 40 percent of restaurants have an average rating of 4 or above. Figure 2b overlays the distribution by whether the restaurant has closed. The mass of ratings for closed restaurants is concentrated towards lower ratings relative to operating restaurants, suggesting that a restaurant's rating is correlated with closure.

We further explore this by plotting the simple means of the monthly likelihood of exit by displayed rating (which is the average rating rounded to the nearest 0.5). Figure 3 depicts a clear negative relationship between the likelihood of exit and rating, again implying that restaurants with lower ratings are closer to the margin of exit.

Figure 4 examines the mean likelihood of exit by restaurant rating and minimum wage. To account for the fact that larger or wealthier cities are more likely to increase the minimum wage, and that exit rates could be systematically different (higher) in those cities as well, we obtain the residuals from regressing the likelihood of exit on city dummies, and plot the mean residuals against rating, for when the minimum wage in the city equals to the state mandate, versus when the minimum wage in the city is at least 20 percent higher than the state mandate. The figure synthesizes our empirical strategy and our main result: at any rating level, the average likelihood of exit is higher when the minimum wage is higher. However, the increase in the likelihood of exit is greater for lower rated restaurants, and there does not appear to be any penalty for the highest rated restaurants. We confirm this finding using a regression framework in Section IV.

D. Empirical strategy

The graphical evidence presented in Section 3.B suggests several things. First, restaurants with lower ratings are more likely to exit. Second, higher minimum wages are correlated with higher probabilities of exit for lower rated restaurants. We use a difference-in-difference framework to empirically analyze the impact of the minimum wage on restaurant exit decisions, in which exploit the temporal and spatial variation in minimum wage increases at the city level across the Bay Area. The basic regression model, estimated as a linear probability model, is as follow:

$$Exit_{ijt} = \alpha_i + \phi'_t\lambda + \beta MW_{jt} + X'_{ijt}\delta + Z'_{jt}\rho + \varepsilon_{ijt} \qquad (1)$$

where $Exit_{ijt}$ is a binary variable denoting whether restaurant *i* in city *j* has exited by time *t*. MW_{jt} is the minimum wage (measured in dollars) in that city, ϕ'_t is a vector of time controls to capture variation in macroeconomic conditions and variation in restaurant demand, α_i are restaurant fixed effects, which we include in some specifications to control for unobservable underlying restaurant characteristics that could affect both ratings and the likelihood of exit, such as the owner's management ability or style. Other restaurant characteristics that are constant over time, including the price range, location, type of cuisine, are also controlled implicitly by restaurant fixed effects. In specifications where we do not include restaurant fixed effects and compare across restaurants, we control for city and price range fixed effects. Z'_{jt} includes a host of county-level time-varying characteristics that may influence both restaurant demand and minimum wage policies, including the percent of young workers between ages 15 to 24, percent black, percent under the poverty line, the unemployment rate, and logged per capita income. X'_{ijt} are time-varying restaurant measures, such as the number of ratings and lagged running average rating.[9] ε_{ijt} is the usual error term.

As Figure 1 shows, cities that raised their minimum wages above the state mandate tend to be larger and more populous cities. We address these differences in several ways. First, we control for time-varying city and county level characteristics in Z'_{jt} to capture potential differences between cities that may both affect minimum wage legislation and business conditions. Second, the key identifying assumption of the difference-in-difference framework is that exit trends in treatment cities would have exhibited parallel trends to comparison cities

[9] Restaurant characteristics that are constant over time, such as the dollar range, location, type of cuisine, are controlled implicitly by restaurant fixed effects.

absent of minimum wage hikes. While we cannot test for this directly, Figure 2 demonstrates similar trends in exit rates between cities that raised their minimum wage (excluding San Francisco since they raised their minimum wage earlier) and those that did not before 2014, which was when most cities began raising their minimum wage. The trends are generally similar across the two sets of restaurants. In both sets, observed exit increases over time – potentially because of improved measurement of exit on Yelp over time. Although pre-existing trends appear to be similar, we include city-specific time trends as a robustness check in certain specifications. We also include county-year fixed effects in certain specifications to control for spatial heterogeneity in exit trends that are unrelated to minimum wage policies. The estimated impact of a $1 increase in the minimum wage is then given by $\hat{\beta}$. Standard errors are clustered by city to allow for serial correlation within locale.

We then estimate the heterogeneous effects of the minimum wage by including an interaction term of the minimum wage with the restaurant's rating. More specifically, our estimating equation becomes:

$$Exit_{ijt} = \alpha_i + \phi'_t\lambda + \beta MW_{jt} + \gamma Rating_{ijt} + \theta MW_{jt} * Rating_{ijt} + X'_{ijt}\delta + Z'_{jt}\rho + \varepsilon_{ijt} \quad (2)$$

where $\hat{\theta}$ would provide an estimate of how the minimum wage affects exit by the restaurant's quality, as measured by its rating.

IV. Main results

A. Restaurant rating and exit

As in our graphical evidence, we first examine the relationship between a restaurant's likelihood of exit and its Yelp rating (Table 3). Cross-sectionally, a one-star increase in rating is associated with a 0.09-0.1 percentage point decrease in the likelihood of exit in any given month (Columns 1 and 2), which is consistent with Figure 3. After controlling for restaurant and time fixed effects, the coefficient increases to approximately -0.29 percentage point (Column 3). The relationship remains stable when we include city-specific time trends and county-year fixed effects (Columns 4 and 5). Our results imply a one-star increase in rating is associated with a decline in the likelihood of exit of around 70 percent.

The negative relationship observed between restaurant rating and exit is not necessarily causal – it is certainly possible that poor quality restaurants are both more likely to exit and receive worse ratings. It could also be that lower ratings directly contribute to restaurants exiting; as Luca (2011) shows, a one-star increase in Yelp rating leads to a 5 to 9 percent increase in restaurant revenue. We do not attempt to provide a particular interpretation to ratings in this paper; our objective is to test whether restaurants with lower ratings tend to be closer to the margin of exit.

B. Minimum wage and restaurant exit

The evidence that higher minimum wages increases the overall likelihood of exit is weak. (Table 4). Across all restaurants, a one-dollar increase in the minimum wage is associated with a 0.09 percentage point increase in the probability of exit, which represents a 22 percent increase (Column 1). Within cities, however, the relationship between the minimum wage and exit becomes less precisely estimated, suggesting that minimum wages tend to be higher in cities with higher exit rates (Column 2), and does not reach statistical significance in most of the specifications. When we include restaurant fixed effects to account for potential unobserved firm heterogeneity, the coefficient on the minimum wage is positive but imprecisely estimated, again indicating that the overall likelihood of exit for a restaurant is not significantly impacted by a minimum wage hike. The estimate remains imprecise when we include time-varying county characteristics that may influence both minimum wage policy and restaurant demand, city-specific time trends, and county-year fixed effects (Columns 4 and 5)

Overall impacts could mask underlying heterogeneous effects if the minimum wage differentially affects restaurants of varying quality. To examine this, we include the interaction effect between a restaurant's rating and the minimum wage, as specified in Equation (2). Table 5 reports the main results of our paper: the minimum wage increases the likelihood of exit, but the impact falls for higher-rated restaurants. In all specifications – with or without restaurant fixed effects – the negative sign on the interaction term indicates that the impact of the minimum wage increases for lower rated restaurants. When we include city and price category fixed effects, the estimates suggest that the likelihood of exit of the median 3.5-star restaurant is approximately 0.04 percentage points (=0.11-3.5*0.02), or 10 percent higher after the minimum wage increases by $1 ($p$-value < 0.05). For a 5-star restaurant, the impact falls to close to approximately zero (0.01 percentage points) and not statistically different from zero. The magnitude of the coefficients increases when we include restaurant fixed effects.

Based on the estimates in Column 5, the results would suggest that the impact of a $1 rise in the minimum wage would increase the likelihood of exit for the median restaurant by around 0.04 percentage points, which is approximately 10 percent (from a mean likelihood of exit of 0.4) and statistically significant at the 10 percent level. For a 5-star restaurant, this impact is in fact negative (-0.03 percentage points), suggesting the likelihood of exit *decreases* as the minimum wage increases for high rated restaurants, although the estimate is not statistically distinguishable from zero.

Our average effects results are directionally consistent (though a smaller magnitude) than Aaronson et al. (2018), who find that a 10 percent raise in the minimum wage increases firm exit by approximately 25 percent from a base of 5.7 percent for limited service restaurants, using QCEW data and a border discontinuity design. However, our results show that lower quality businesses are much more sensitive than the average business.

V. Further investigation

A. Are results driven by restaurant prices?

If ratings are systematically correlated with prices – e.g., if cheap restaurants tend to receive low ratings, and expensive restaurants high ratings – then the effects of restaurant prices and ratings could be confounded. Further, it could be minimum wages are less binding for higher end full service restaurants, i.e., more expensive restaurants already pay wages above the minimum, and hence are less affected by minimum wage hikes. Are the heterogeneous effects we observe driven by how expensive the restaurant is rather than its rating?

We address this issue in several ways. First, it can be seen that the coefficient on the interaction term between rating and minimum wage remains negative in Table 5 Column 2, where we include city and price category dummies. Restaurants with lower ratings are more likely to exit after a minimum wage increase even within the same price range, suggesting that the results are not being confounded by the cost of the restaurant. That is, the negative relationship between rating and exit holds even within cheaper, limited service restaurants where the minimum wage can be expected to be more binding, as well among higher end full service restaurants, where the minimum wage is presumably less binding.

Second, we provide a brief analysis of examine the relationship between a restaurant's price range and its likelihood of exit (Table 6). Interestingly, a restaurant is *more* likely to exit if it belongs to a higher price category. This is consistent with existing evidence that full-service restaurants with average diner checks of over $25 tend to have the lowest profit margins because of higher overhead and staffing costs (Aaronson, French, and Macdonald, 2008; National Restaurant Association, 2010).

We next examine the impact of the minimum wage by price range. *A priori*, one may expect restaurants in the lower end of the market, such as fast food restaurants, to be affected the minimum wage more because they are more likely to pay at the minimum wage (Card and Krueger, 1994). In our data, most fast food or limited service restaurants, such as MacDonald's, Subway, and Burger King, fall in the one dollar sign category. When we add the interaction term of the restaurant's price range and the minimum wage $MW_{jt} * Price\ Range_i$ to Equation 2 (excluding restaurant fixed effects), the estimates in Table 6 (Columns 2 and 3) indicate that consistent with the existing literature, higher minimum wages affect lower priced restaurants more, holding rating constant. For example, for a 3.5-star one-dollar sign restaurant, a $1 increase in the minimum wage increases the likelihood of exit by 0.06 percentage points (0.157-0.036-3.5*0.018 = 0.06), or 15 percent (Column 3). In contrast, the impact of falls to 0.02 percentage points (0.157-2*0.036-3.5*0.018 = 0.02), or 5 percent, for a more expensive $2 dollar sign restaurant at the same rating. Further, consistent with our main results, the coefficient on $MW_{jt} * Rating_{ijt}$ remains negative and statistically significant, providing evidence that the heterogeneous effects observed in Section IV are driven by rating rather than by the cost of the restaurant. For example, holding the cost of the restaurant at one dollar sign, a $1 raise in the minimum wage increases the likelihood of exit for a 3.5-star restaurant by 0.06 percentage points, or 15 percent, but the effect drops to 0.03 percentage points (0.157-0.036-5*0.018 = 0.03), or approximately 8 percent for a higher rated 5-star restaurant in the same price category of one-dollar sign (Column 3).

When we include restaurant fixed effects, the negative interaction effect between the price range category and the minimum wage diminishes, suggesting there are unobserved restaurant characteristics that affect both the price range (or type) of the restaurant and likelihood of exit (Columns 4 to 6). Nonetheless, the interaction effect of minimum wage and rating remains statistically significant and negative, even when controlling for the interaction effect of minimum wage and price range.

B. Impact on the cost of food orders

One potential channel through which restaurants may absorb higher minimum wages is by increasing prices. The impact on prices by restaurant quality may depend on mechanism for exit effect. If exit is driven by the ability to pass on higher labor costs through to consumers for thriving businesses, then we may observe higher rated restaurants raise prices more. On the other hand, if exit is driven by the fact that lower rated businesses are relatively more affected by minimum wage (perhaps because higher rated restaurants already pay more than the minimum wage), then we might see lower rated restaurants raise prices more.

We conduct an exploratory analysis of the impact of the minimum wage on prices using orders data from the food ordering platform Eat24. We find limited evidence that the average cost of a delivery or pick-up order increased from minimum wage hikes (Table 7 Panel A). Most studies examining the impact of the minimum wage on price pass-through has found that a 10 percent increase in the minimum wage leads to roughly an increase in prices of 0.5 percent (MacDonald 2016). Our estimates suggest that the average order total increases from 0.1 percent to 0.9 percent depending on the specification, but the estimates are mostly imprecisely estimated.

When we examine the impact by restaurant rating, we find that the average cost of a food order at higher rated restaurants rose less than their lower rated counterparts (Table 7 Panel B).

The results suggest that higher rated restaurants increased their menu prices less than lower related restaurants.[10] This holds true even when we include price range fixed effects, meaning for both expensive and cheaper limited service types restaurants, higher rated restaurants raise their prices less. One possible explanation is that restaurants with higher ratings are already paying above the minimum wage and hence are not affected by increases in city-level mandates. It is also feasible that higher rated restaurants have healthier profit margins to absorb higher labor costs without needing to increase prices.

C. Impact on entry

A natural follow-up question to our results on exit is the impact of the minimum wage on entry. Dates on restaurant entry only became regularly recorded by Yelp at the end of 2009, so we restrict our entry analysis to the post-2010 period. Another issue is that new restaurants may not show up in Yelp as quickly. To examine entry, we generate a city-level panel dataset based on our restaurant-level dataset and estimate the analogous version of Equation (1) using the entry rate as the dependent variable, weighted by the number of restaurants on Yelp in that city.

Table 8 reports the results of this exercise. First, consistent with our restaurant-level analysis, we find no overall impacts of the minimum wage on exit (Columns 1 to 3). Next, we find that the entry rate in fact declines with minimum wage increases – depending on the specification, the entry rate declines by 0.026 to 0.039 percentage points from a base of 0.6 percent from a $1 increase in the minimum wage, corresponding to an approximate 4 to 6

[10] It is possible those higher minimum wages increases purchasing power of consumers, and hence result in higher order totals. If this were the case, orders should increase by rating, which means the estimate on the interaction term is upward biased. Further, we do not see an increase in the number of orders (results available by request), suggesting that the results are not driven by increased consumption.

percent reduction. The number of restaurants per capita falls as expected, but the estimates are not statistically significant (Columns 7 to 9).

Our results suggest that higher minimum wages deter entry. One interpretation would be that an increase in the minimum wage reduces overall firm profits, lessening the incentive to enter the industry. Previous empirical research on entry has produced mixed findings. Using a border discontinuity approach and data from Dun and Bradstreet Marketplace files, Rohlin (2011) finds that minimum wages hikes implemented between 2003 and 2006 discouraged firm entry – a $1 increase in the minimum wage decreased the share of new establishments in an area relative to its comparison area by approximately 6 percent. Draca and Machin (2011) find some suggestive evidence that net entry rates decline after the imposition of a national minimum wage in the United Kingdom. In contrast, Aaronson et al. (forthcoming) finds that a 10 percent increase in the minimum wage increases the entry rate by roughly 14 percent from a mean of 8.7 percent using a similar border discontinuity approach and QCEW data. Card and Krueger (1994) compared the numbers of operating restaurants and the numbers of newly opened McDonald's stores in different states over the 1986-1991 period using a difference-in-differences framework, and they found little evidence that higher minimum wages impacted the rate of new openings or net number of stores.

D. Impact on survival

In addition to the overall monthly likelihood of exit, we examine the effect of the minimum wage on restaurant time to exit. Since this relies on accurate coding of entry dates, we also restrict the analysis to after 2010. We estimate a survival model where the dependent variable is time to exit in months using a Weibull distribution (Table 9). The coefficients indicate that overall, the minimum wage increases the hazard rate, but the estimates are not statistically significant (Column 1). However, when we interact the minimum wage with the restaurant's rating, we can see that the coefficient on the interaction term is negative and statistically significant, suggesting that the speed to exit is accelerated for poorly rated restaurants (Column 2).

VI. Robustness checks

A. Specifying rating non-linearly

In this section, we present results from several exercises to test the robustness of our results. First, we relax the assumption of the constant marginal effect of rating. To examine this, we present results where we specify rating to be (1) as a binary variable indicating whether it is above the median rating in the city and (2) as categorical values. When we consider using the above/below median delineation, the results are consistent: the minimum wage increases the likelihood of exit for restaurants with below median ratings, but the effect largely diminishes for restaurants with above median ratings (Table 10 Panel A). When we enter rating as categorical dummies, with ratings less than 2.5 as the base, the results are also consistent, with the likelihood of exit decreasing as rating goes up (Panel B). Finally, we enter the minimum wage as a binary variable, which equals to 1 if the city's variable is higher than the state mandate (Panel C), interacted with the above median dummy, which also yields consistent results.

B. Specifying price range non-linearly

Similarly, we provide results where the price range is specified as categorical dummies rather than a linear variable (Table 11). The results are consistent with those in Table 6. Overall, more expensive restaurants are more likely to go out of business at any point in time. However, the minimum wage disproportionately affects cheaper restaurants. At the same time, higher rated restaurants are more shielded from minimum wage shocks. This holds true whether we specify use city or restaurant fixed effects.

C. Using a static snapshot of rating

In our main model, rating is time-varying, meaning that a restaurant's rating may change over time. One question that may arise, however, is how much of the effect we observe is driven by the restaurant's rating changing over time, versus the change in the minimum wage. In other words, are restaurants with worse ratings pushed to exit because of the minimum wage, or do higher labor costs exert downward pressures on a restaurant's quality and ratings as well, leading it to decline in reputation and exit? To shed light on this question, we use a static snapshot of rating, captured at the midpoint of the restaurant's life-cycle (calculated as halfway between the first and last review; we use the midpoint value to allow the restaurant time to gain a foothold in the market, but not too close to the end of the panel). By using a static snapshot of a restaurant's rating, the results help isolate the variation in minimum wage. The results are qualitatively consistent, but smaller in magnitude (Table 12), suggesting one mechanism through which minimum wages increase exit is perhaps by depressing service or food quality.

VII. Discussion

We find considerable and predictable heterogeneity in the effects of the minimum wage, and that the impact on exit is concentrated among lower quality restaurants, which are already closer to the margin of exit. We also provide suggestive evidence that the minimum wage drives lower rated restaurants to increase prices. Here, we provide a back-of-the-envelope exercise to interpret our findings in the context of restaurant industry statistics. Approximately one-third of a restaurant's expenses are on payroll (National Restaurant Association, 2010). Assuming that half of a restaurant's payroll will be affected by the minimum wage, so that one-sixth of restaurant costs are spent on the wages of minimum wage workers. If the minimum wage increases by 10 percent, then profits will fall by close to 2 percent. The average profit margin of a restaurant ranges from 2 to 5 percent, and will be presumably closer to the low end for low rated restaurants. This provides further support for our interpretation, highlighting that recent minimum wage increases lead to economically meaningful cost shocks for restaurants. Theory models that allow for firms with heterogeneous productivity should suggest that a minimum wage increase would act to truncate firms from the lower end of the distribution (Butcher, Dickens, and Manning 2012; Card et al.2016; Draca et al. 2011; Eckstein and Wolpin 1990).

Our findings suggest directions for future research. First, because most minimum wage changes in our sample are relatively new, our results may be capturing short-run effects. Second, it is unclear what happens to employees after a business closes. For example, they could move to higher rated restaurants, switch industries, or become unemployed. For example, higher rated restaurants may hire some of the employees from the lower rated businesses exiting the market. Third, our results raise the possibility that higher rated restaurants may adjust to higher minimum wages through other channels. Our analysis using delivery order data provide suggestive evidence that poorly rated restaurants may respond to minimum wage hikes by increasing prices. Other potential responses may include substituting toward higher productivity workers (Horton, 2017), especially if higher quality restaurants are able to assortatively match with more productive workers (Eeckhout and Kircher, 2011; Epstein and Wolpin, 1990; Mendes et al., 2010).

A large literature has now documented that firms exhibit considerable variation in productivity and management practices. Moreover, there is growing evidence that management practices can be improved through interventions ranging from connecting businesses with each other (Cai and Szeidl 2018) to professional consulting (Bloom et al 2013). Our results find that lower rated businesses are much more likely to exit, and are much more sensitive to the cost shocks associated with a minimum wage increase. This raises policy questions about whether these firms are optimizing, given outside options, or whether there is scope to help improve the practices of low-performing businesses.

Lastly, our results also demonstrate the potential for digital exhaust from online platforms to complement standard data sources to provide unique insight in policy evaluations. The strength of data from online platforms is that they might provide dependent variables that are more granular and closer to real time, as well as independent variables that provide insight into dimensions of markets that were previously unobservable (Glaeser et al., forthcoming). Our analysis provides a case study in this, showing how digital data from Yelp can further our understanding of the impacts of the minimum wage. However, questions remain about how representative of such data and how selection may bias results. Further research is needed to understand the representativeness of data from digital platforms and the implications of using such data for policy analysis.

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Figure 1. Minimum wage increases in the San Francisco Bay Area

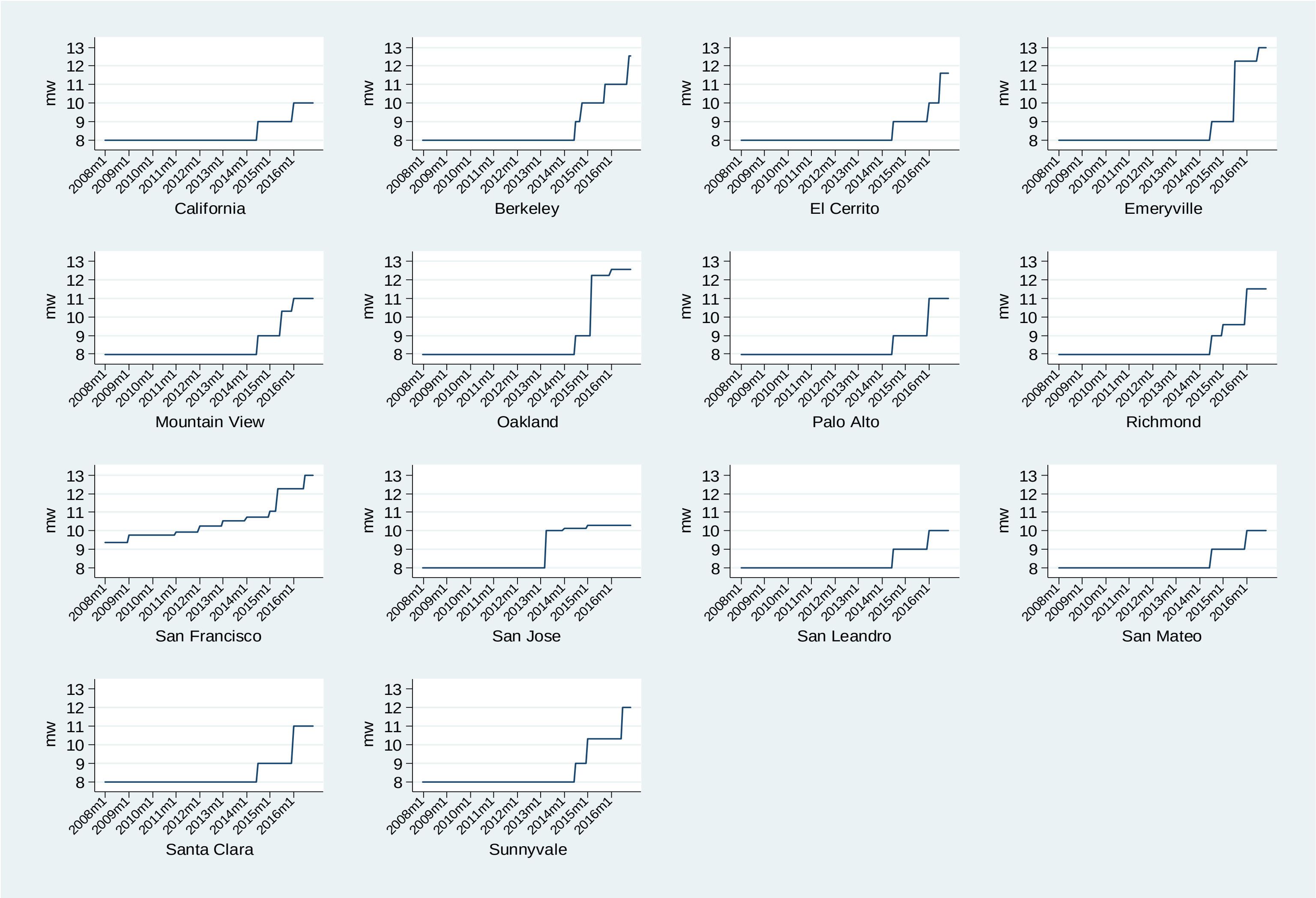
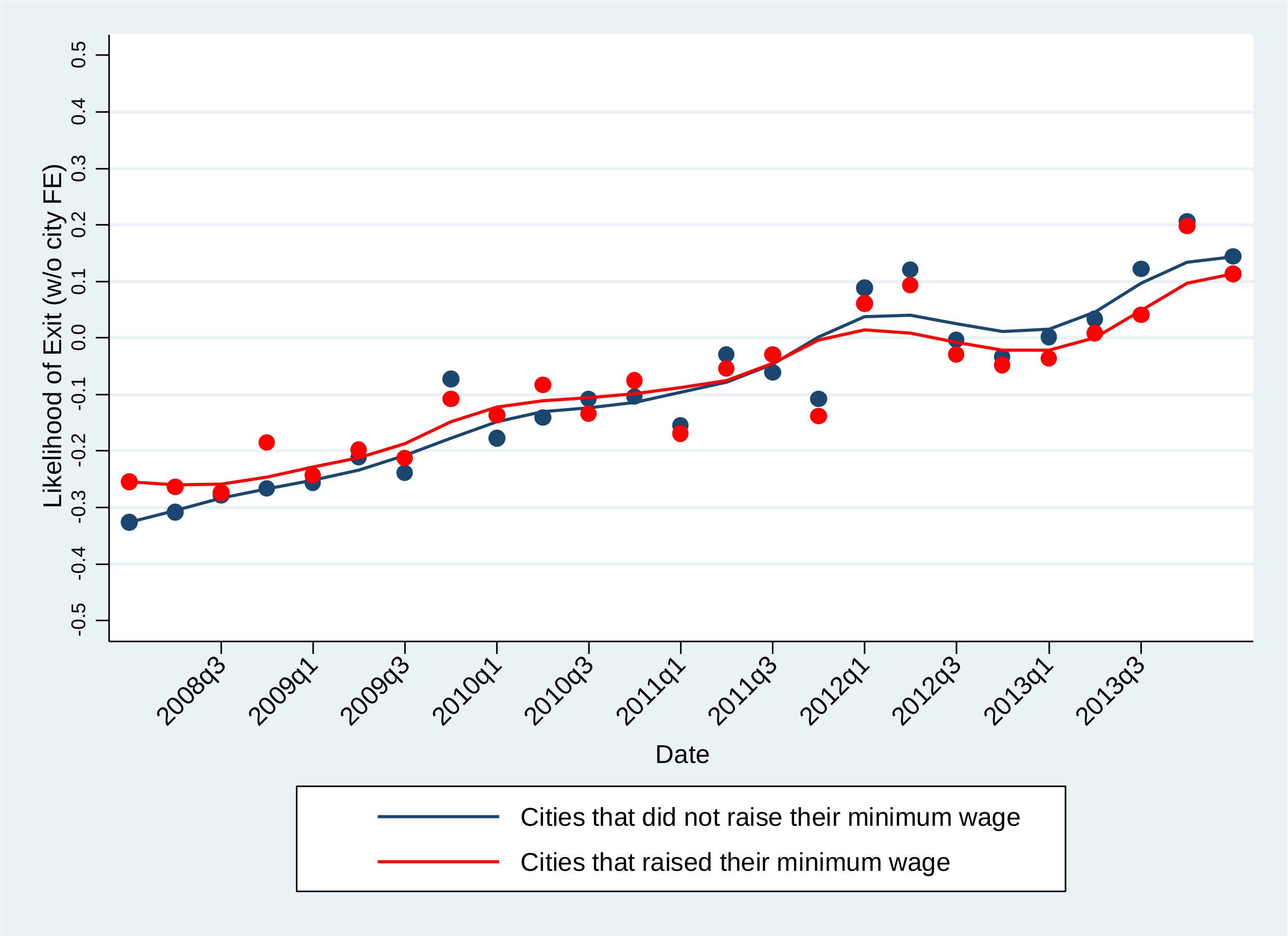


Figure 2. Pre-trend analysis: Comparing exit trends prior to minimum wage changes



Note: This graph compares the exit trends in cities in the Bay Area (excluding San Francisco) that raised their minimum to those that did not in the years leading to 2014, when multiple cities began raising local minimum wages.

Figure 2a. Overall distribution of Yelp ratings

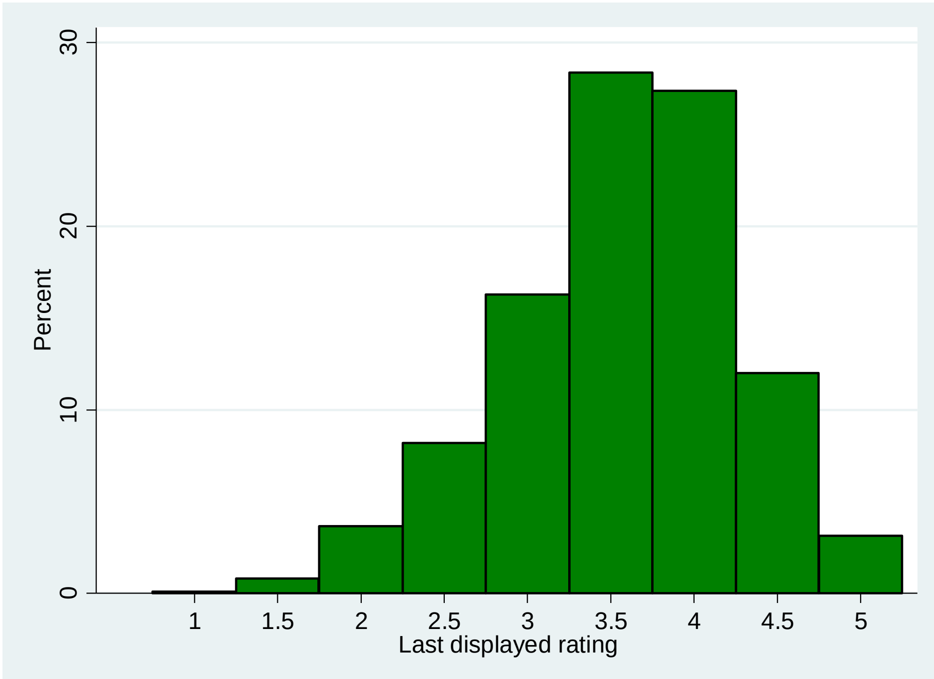


Figure 2b. Closed restaurants have lower ratings

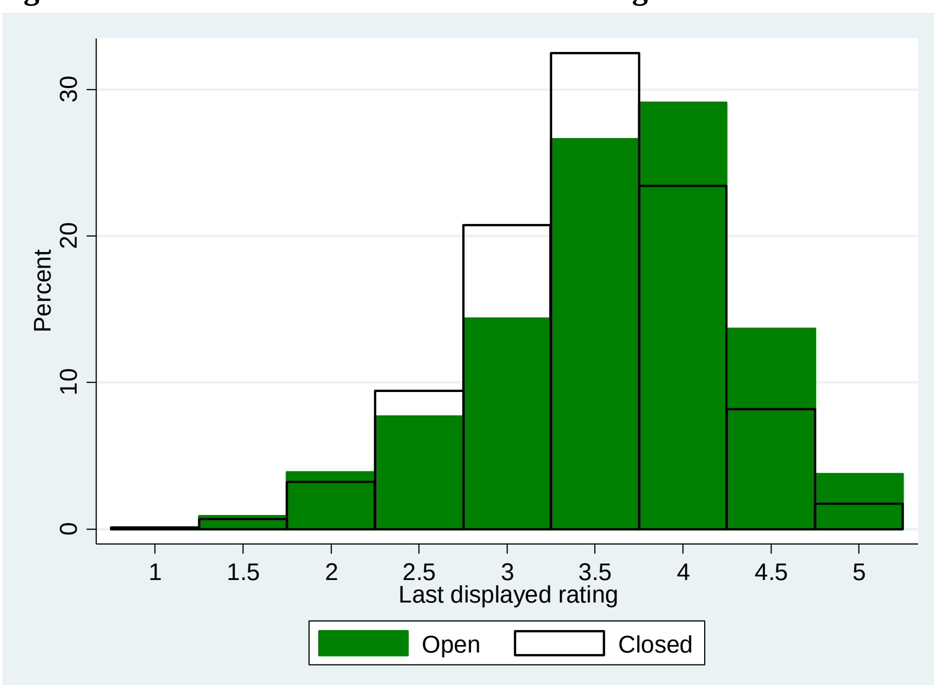
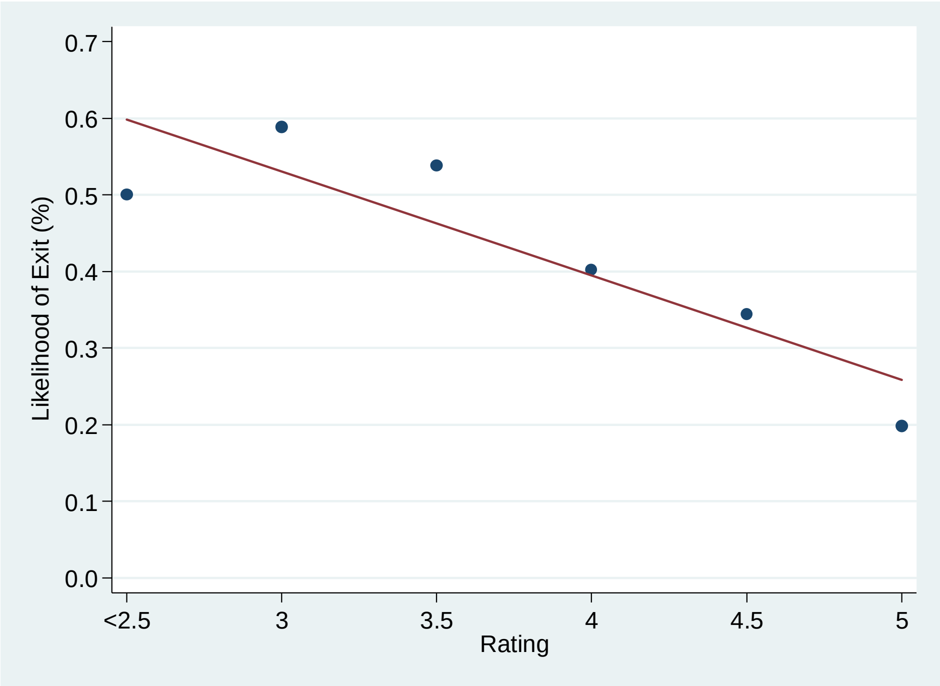
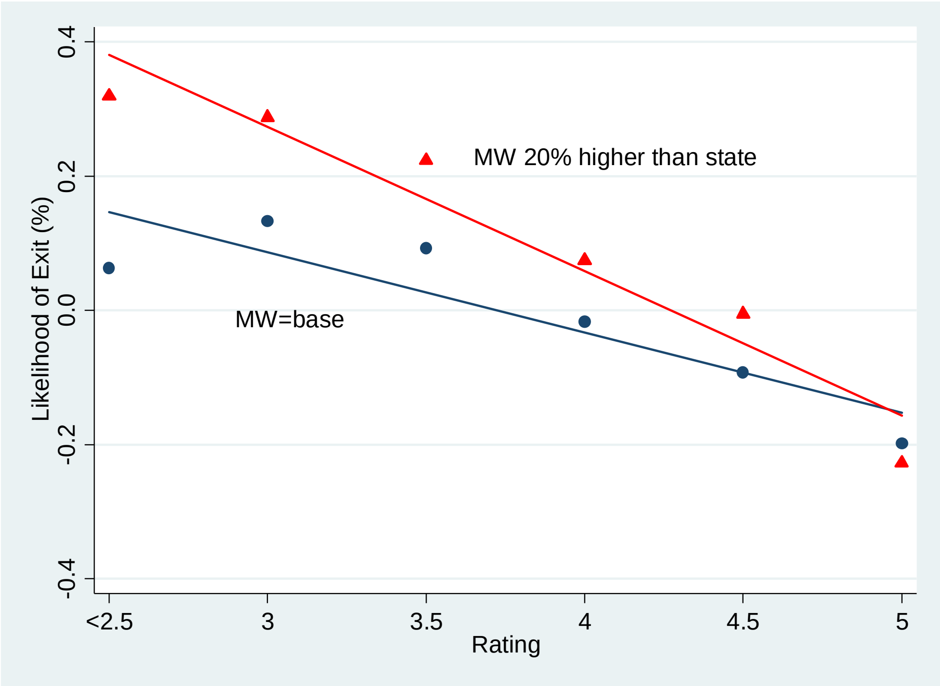


Figure 3. Lower rated restaurants are more likely to exit



Note: This figure plots the monthly likelihood of exit at each rating.

Figure 4. Minimum wage increases exit, but more so for worse restaurants



Note: This figure plots the simple means of the residuals from regressing the likelihood of exit on city dummies at each rating, when the minimum wage equal to the state mandate ("MW=base"), compared to when the minimum wage is equal or exceeds 20 percent above the state mandate ("MW 20% higher than state").

Table 1. Descriptive statistics of restaurant data

Number of restaurants	35,227
Number of ratings	6,563,627
Number of observations	2,356,677

Panel A: Summary statistics at the restaurant level (at time of last appearance in panel)

Variable	**Mean**	**Std Dev**	**Min**	**Max**
Total number of ratings	184.4	327.1	10	9781
Rating	3.564	0.691	1	5
Closed	0.301	0.459	0	1
Price category[a]	1.588	0.603	1	4
Age of restaurants (months)	77.16	42.85	0	145
Minimum wage ($)	10.52	1.532	8	13
Percent higher than state mw (%)	9.895	12.84	0	36

Panel B: Summary statistics at the restaurant-month level

Variable	**Mean**	**Std Dev**	**Min**	**Max**
New ratings	3.540	1.105	1	5
Number of new ratings	2.475	4.845	0	690
Running average of rating	3.574	0.707	1	5
Exited (%)	0.429	6.535	0	100
Minimum wage ($)	9.041	1.291	8	13
Percent higher than state mw (%)	7.397	11.80	0	36.1

[a] The price category ranges from one “dollar sign” to four “dollar signs” indicating how expensive the restaurant based on the approximate cost per person for a meal including one drink, tax and tip using the following criteria: $= under $10, $$=$11–$30, $$$=$31–$60, $$$$= over $61.

Table 2. Descriptive statistics of delivery order data

Number of restaurants	4,046
Number of orders	1,806,175

Panel A: Summary statistics at the restaurant level (at time of last appearance in panel)

Variable	Mean	Std Dev	Min	Max
Total number of ratings	260.2	371.4	10	7658
Rating	3.535	0.561	1	5
Closed	0.140	0.347	0	1
Price category	1.635	0.503	1	4
Age of restaurants (months)	76.97	45.25	3	146
Minimum wage ($)	11.14	1.391	8	13
Percent higher than state mw (%)	13.01	13.55	0	36

Panel B: Summary statistics at the restaurant-month level

Variable	Mean	Std Dev	Min	Max
New ratings	3.488	1.063	1	5
Number of new ratings	4.259	5.326	0	130
Running average of rating	3.569	0.514	1	5
Exited (%)	0.030	1.745	0	100
Minimum wage ($)	10.44	1.430	8	13
Percent higher than state mw (%)	12.60	13.82	0	36.1

Table 3. Are lower rated restaurants more likely to exit?

	Likelihood of Exit (%) (Mean = 0.4)				
	(1)	(2)	(3)	(4)	(5)
Rating	-0.094***	-0.099***	-0.293***	-0.293***	-0.288***
	(0.012)	(0.015)	(0.028)	(0.028)	(0.028)
Restaurant FE			x	x	x
City FE		x			
Month-by-year FE		x	x	x	x
Time-varying county characteristics		x	x	x	x
Dollar range FE		x			
City-specific time trend				x	
County-year FE					x

Standard errors are clustered at the city level. FE = fixed effects.

Number of observations = 2,356,677

Table 4. Overall minimum wage effects on exit

	Likelihood of Exit (%) (Mean = 0.4)				
	(1)	(2)	(3)	(4)	(5)
Minimum Wage ($)	0.093***	0.012	0.032	0.010	0.037
	(0.008)	(0.017)	(0.026)	(0.019)	(0.024)
Restaurant FE			x	x	x
City FE		x			
Month-by-year FE		x	x	x	x
Time-varying county characteristics		x	x	x	x
Price category FE		x			
City-specific time trend				x	
County-year FE					x

Standard errors are clustered at the city level. FE = fixed effects.

Number of observations = 2,356,677

Table 5. Heterogeneous effects of the minimum wage on exit

	Likelihood of Exit (%) (Mean = 0.4)				
	(1)	(2)	(3)	(4)	(5)
Minimum wage	0.164***	0.108***	0.229***	0.198***	0.226***
	(0.021)	(0.040)	(0.071)	(0.071)	(0.072)
Rating	0.065	0.078	0.173	0.149	0.153
	(0.055)	(0.064)	(0.134)	(0.140)	(0.140)
Minimum wage * Rating	-0.019***	-0.020***	-0.055***	-0.052***	-0.052***
	(0.006)	(0.008)	(0.016)	(0.017)	(0.017)
Restaurant FE			x	x	x
City FE		x			
Month-by-year FE		x	x	x	x
Time-varying county characteristics		x	x	x	x
Price category FE		x			
City-specific time trend				x	
County-year FE					x

Standard errors are clustered at the city level. FE=fixed effects.
Number of observations = 2,356,677

Table 6. Are results driven by restaurant prices?

	Likelihood of Exit (%) (Mean = 0.4)					
	(1)	(2)	(3)	(4)	(5)	(6)
Price range	0.053***	0.091***	0.384***			
	(0.019)	(0.022)	(0.049)			
Minimum wage		0.390***	0.157***	0.215***	0.185**	0.211***
		(0.048)	(0.043)	(0.078)	(0.078)	(0.080)
Minimum wage * Price range		-0.037***	-0.036***	0.005	0.004	0.006
		(0.005)	(0.005)	(0.010)	(0.010)	(0.011)
Rating			0.065	0.165	0.143	0.149
			(0.067)	(0.138)	(0.143)	(0.143)
Minimum wage * Rating			-0.018**	-0.054***	-0.051***	-0.052***
			(0.008)	(0.017)	(0.018)	(0.018)
Restaurant FE				x	x	x
City FE	x	x	x			
Month-by-year FE	x	x	x	x	x	x
Time-varying county characteristics	x	x	x	x	x	x
City-specific time trend					x	
County-year FE		x	x			x

Standard errors are clustered at the city level. FE = fixed effects

Price range indicates the cost of an average meal at the restaurant, with 1 being the lowest and 4 being the highest.

Number of observations = 2,356,677

Table 7. Minimum wage effects on delivery orders

	Ln (Order Total) (Mean =$35)				
	(1)	(2)	(3)	(4)	(5)
Panel A:					
Minimum Wage	-0.053***	0.008	0.004	0.009**	0.001
	(0.006)	(0.006)	(0.003)	(0.004)	(0.003)
Panel B:					
Minimum wage	0.034	0.078***	0.037***	0.044***	0.033***
	(0.042)	(0.027)	(0.008)	(0.009)	(0.008)
Rating	0.172	0.108	0.125***	0.135***	0.121***
	(0.115)	(0.084)	(0.027)	(0.029)	(0.028)
Minimum wage * Rating	-0.024**	-0.019**	-0.009***	-0.010***	-0.009***
	(0.011)	(0.008)	(0.002)	(0.002)	(0.002)
Restaurant FE			x	x	x
City FE		x			
Month-by-year FE		x	x	x	x
Time-varying county characteristics		x	x	x	x
Price category FE		x			
City-specific time trend				x	
County-year FE					x

Standard errors are clustered at the city level. FE = fixed effects

Number of observations = 75,621

Table 8. Minimum wage effects on exit, entry, and number of restaurants

	Likelihood of Exit (%) (Mean = 0.4)			Likelihood of Entry (Mean = 0.6)			Restaurants per 10,000 pop (Mean = 45.3)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Minimum Wage	0.0023	-0.0008	0.0169	-0.0387***	-0.0266*	-0.0380**	-0.2283	-0.1185	-0.1720
	(0.0118)	(0.0128)	(0.0140)	(0.0132)	(0.0142)	(0.0176)	(0.1556)	(0.1169)	(0.1609)
Restaurant FE	x	x	x	x	x	x	x	x	x
Month-by-year FE	x	x	x	x	x	x	x	x	x
Time-varying county characteristics	x	x	x	x	x	x	x	x	x
City-specific time trend		x			x			x	
County-year FE			x			x			x

Each cell represents a different regression. Regressions are weighted by the number of restaurants at the city level
Standard errors are clustered at the city level
Number of observations = 8,134

Table 9. Minimum wage effects on restaurant survival

	Hazard Rate (Failure = Exit)	
	(1)	(2)
Minimum wage	0.0333	0.4197***
	(0.0429)	(0.0854)
Minimum wage * Rating		-0.1027***
		(0.0199)
Rating		0.8606***
		(0.1707)

Standard errors are clustered at the city level. Coefficients are reported.
Number of observations = 18,631
The survival model includes controls the total number of ratings at exit or end of panel, time-varying county level characteristics, price category of the restaurant, and dummies for year of entry.

Table 10. Robustness check: specifying rating non-linearly

	Likelihood of Exit (Mean = 0.4)			
	(1)	(2)	(3)	(4)
Panel A				
Minimum wage (MW)	0.026*	0.062**	0.043**	0.069***
	(0.015)	(0.026)	(0.020)	(0.024)
Above median rating	0.035	0.287**	0.309***	0.303***
	(0.068)	(0.113)	(0.109)	(0.111)
MW * Above median rating	-0.022***	-0.060***	-0.061***	-0.061***
	(0.008)	(0.012)	(0.012)	(0.012)
Panel B				
MW	0.030	0.073*	0.051	0.079**
	(0.025)	(0.040)	(0.035)	(0.039)
MW* (Rating = 3)	0.008	0.035*	0.032*	0.035*
	(0.018)	(0.019)	(0.019)	(0.019)
MW * (Rating = 3.5)	-0.015	-0.027	-0.031	-0.026
	(0.018)	(0.024)	(0.024)	(0.024)
MW * (Rating = 4)	-0.030	-0.078***	-0.078***	-0.076***
	(0.019)	(0.023)	(0.024)	(0.024)
MW* (Rating = 4.5)	-0.019	-0.086**	-0.081**	-0.081**
	(0.020)	(0.034)	(0.035)	(0.035)
MW* (Rating = 5)	-0.025	-0.129***	-0.120***	-0.120**
	(0.027)	(0.045)	(0.045)	(0.046)
Panel C				
Higher than state	0.080**	0.105**	0.108**	0.115**
	(0.034)	(0.043)	(0.047)	(0.055)
Above median rating	-0.139***	-0.207***	-0.197***	-0.197***
	(0.012)	(0.021)	(0.020)	(0.020)
Higher than state * Above median rating	-0.069***	-0.154***	-0.150***	-0.148***
	(0.018)	(0.035)	(0.036)	(0.035)
Restaurant FE		x	x	x
City FE	x			
Month-by-year FE	x	x	x	x
Time-varying county characteristics	x	x	x	x
Price category FE	x			
City-specific time trend			x	
County-year FE				x

Standard errors are clustered at the city level. FE = fixed effects.
Number of observations = 2,356,677

Table 11. Robustness check: specifying price range of restaurant non-linearly

	Likelihood of Exit (%) (Mean = 0.4)			
	(1)	(2)	(3)	(4)
Minimum wage	0.102***	0.217***	0.186**	0.213***
	(0.036)	(0.074)	(0.074)	(0.030)
Dollar range = 2	0.423***			
	(0.062)			
Dollar range = 3	0.840***			
	(0.127)			
Dollar range = 4	0.344			
	(0.300)			
Minimum wage * (Dollar = 2)	-0.040***	0.018*	0.018	0.019*
	(0.007)	(0.011)	(0.011)	(0.011)
Minimum wage * (Dollar = 3)	-0.078***	-0.031	-0.034	-0.029
	(0.012)	(0.023)	(0.024)	(0.027)
Minimum wage * (Dollar = 4)	-0.028	-0.010	-0.005	-0.005
	(0.030)	(0.075)	(0.072)	(0.071)
Rating	0.068	0.166	0.144	0.149**
	(0.064)	(0.138)	(0.142)	(0.066)
Minimum wage * Rating	-0.019**	-0.054***	-0.052***	-0.052***
	(0.008)	(0.017)	(0.018)	(0.007)
Restaurant FE		x	x	x
City FE	x			
Month-by-year FE	x	x	x	x
Time-varying county characteristics	x	x	x	x
City-specific time trend				x
County-year FE				

Standard errors in parentheses. FE = fixed effects.
Number of observations = 2,356,677

Table 12. Robustness check: using a static snapshot of rating

	Likelihood of Exit (%) (Mean = 0.4)			
	(1)	(2)	(3)	(4)
Minimum wage	0.037***	0.079***	0.070*	0.079***
	(0.014)	(0.028)	(0.042)	(0.023)
Mid-point rating	0.053			
	(0.041)			
Minimum wage * Mid-point rating	-0.008**	-0.017***	-0.018**	-0.019***
	(0.003)	(0.006)	(0.008)	(0.006)
Restaurant FE		x	x	x
City FE	x			
Month-by-year FE	x	x	x	x
Time-varying county characteristics	x	x	x	x
Price category FE	x			
City-specific time trend			x	
County-year FE				x

Standard errors are clustered at the city level. FE = fixed effects.
Number of observations = 2,356,677