The Tipped Minimum Wage

Ishaana Talesara* Arthur Wickard†

August 2025

Abstract

We study the tipped minimum wage and the minimum wage using US tax data. Leveraging state policy changes, we show that the tipped minimum wage increases base wages of tipped workers, but decreases tips, at least fully offsetting any increase in earnings. By contrast, the minimum wage causes earnings of tipped workers to increase mostly through tips. Changes in tips are driven primarily by changes in the percentage of revenue tipped rather than changes in revenue per worker or tip pooling. Changes in tips are similar for workers throughout the firm wage distribution, suggesting firm-level policies matter for tip rates. We find negative effects of the tipped minimum wage on employment and revenue. A monopsony model where tips and wages are imperfect substitutes to the firm can rationalize these results.

*Department of Economics, Massachusetts Institute of Technology. talesara@mit.edu

†Department of Economics, Massachusetts Institute of Technology. wickard@mit.edu

We thank those we have worked with at the IRS, including Kelly Dauberman, Maria Orfanakis, Mark Stanton and others. We are grateful to Daron Acemoglu, Isaiah Andrews, Josh Angrist, David Autor, Amy Finkelstein, Nathan Hendren, Simon Jäger, Nathan Lazarus, Dean Li, Ashesh Rambachan, Nina Roussille, Anna Salomons, Ian Sapollnik, Bradley Setzler, Anna Stansbury, Iván Werning, Christian Wolf, and participants at the MIT Labor and Macro Lunches for comments at various stages of the project. We are very grateful to Ursina Schaede for pointing us to the call for proposals. This material is based upon work supported by the National Science Foundation Graduate Research Fellowship under Grant No. 1745302. Any opinion, findings, and conclusions or recommendations expressed in this material are those of the authors(s) and do not necessarily reflect the views of the National Science Foundation. The findings, interpretations and conclusions expressed in this paper are entirely those of the authors and do not necessarily reflect the views or the official positions of the U.S. Department of the Treasury or the Internal Revenue Service. All results have been reviewed to ensure that no confidential information is disclosed.

1 Introduction

The restaurant sector is a large part of the modern US economy and is a particularly important source of employment for low-wage workers. In 2024, restaurants and bars employed 8.5% of all private-sector workers and nearly one-fifth of workers in the bottom decile of the earnings distribution. Unlike most low-wage industries, restaurants finance a substantial share of labor costs through customer tips rather than wages. Understanding how this compensation structure interacts with wage-floor regulations is therefore central to the design of effective labor market policy.

In this paper, we use rich tax data to provide new insights into the effects of the tipped minimum wage and the minimum wage in the restaurant sector by leveraging state-level variation in the policies. Tip pay in the United States is governed by a two-tier wage floor. Employers may pay tipped employees a sub-minimum base wage so long as the sum of base pay and reported tips equals or exceeds the statutory minimum wage. Tipped worker pay is thus jointly constrained by the tipped minimum wage (TMW) and the standard minimum wage (MW). When the tipped minimum wage rises, restaurants must increase base wages for workers whose base pay would otherwise fall below the new threshold. However, if they can adjust tips, they can offset some or all of that cost by reducing tip income. Firms' ability to decrease tips will critically determine the effect of the policy. Whether higher tipped minimum wages raise total compensation or merely reallocate income between base wages and tips is therefore an empirical question.

Policy debate over the tipped minimum wage is ongoing and contentious. In Washington DC, Initiative 82, approved by nearly 74% of voters in November 2022, planned to eliminate the tip credit and raise the tipped minimum wage up to the standard wage by 2027. However, the policy's rollout caused pushback: the DC Council recently voted to slow down and ultimately cap the increases. Meanwhile, Massachusetts voters rejected a similar ballot measure in November 2024. Michigan has seen ongoing battles over the tipped minimum wage since 2018, with voters, the legislature, and the courts repeatedly overturning each other.

Proponents of increasing the tipped minimum wage argue that tip pay is not the same as base pay. Tips leave tipped workers vulnerable to harassment and wage theft (Schweitzer, 2021). It may also be undesirable for customers who dislike the pressure and opaque costs induced by American "tipping culture". Tips may increase earnings volatility, exposing workers to more risk. Additionally, some argue that raising the tipped minimum wage will increase earnings. One Fair Wage, a national advocacy organization campaigning to

eliminate the tip credit, uses the tagline "full minimum wage with tips on top."[1]

Opponents counter that restaurants may respond to higher base wages for tipped workers by adding services fees which are not tips,[2] pooling tips, raising prices, and cutting jobs. If restaurants are able to reduce tips to counteract the increase in base wages (by encouraging lower tips directly, adding service fees or sharing tips among more workers), earnings could fall, especially for those whose income is primarily tips. If they are unable to change tips, the tipped minimum wage may function like a minimum wage, albeit one that can affect workers with earnings above the standard minimum wage. Some restaurants claim the size of many proposed tipped minimum wage changes will increase their wage bills by an unsustainable amount, potentially causing them to close locations.

This paper brings new evidence and theory to the debate. A key question underlying the debate is whether firms can adjust tips in response to the policy. Some argue they cannot—in which case increasing the tipped minimum wage should increase earnings while decreasing the share of earnings that is in tips. The tipped minimum wage may then function similar to the minimum wage (while affecting different workers). We find the opposite: tips decline sharply by 4% in response to a 10% increase in the tipped minimum wage. Base wages of tipped workers increase (consistent with a binding policy change), so the net effect on reported earnings (tips and base wages) is null. If tips are under-reported relative to base wages, the effect on earnings is negative. Consistent with the view that tips can adjust in response to policies, we also find that the minimum wage increases the earnings of tipped workers entirely through tips. The two policies also have different distributional consequences. The tipped minimum wage tends to increase base wages for workers in the middle of the firm earnings distribution, whereas the minimum wage increases base wages for those at the bottom of the distribution.

In other words, we find that tips and, therefore, compensation structure respond strongly to the tipped minimum wage and the minimum wage. This produces the counterintuitive result that earnings can in fact *decrease* in response to the tipped minimum wage. This suggests that supporting the tipped minimum wage because it increases the earnings of tipped workers may be misguided. We also find that tips move similarly for workers across a firm regardless of their position in the firm earnings distribution. This suggests tips are changed at the firm level rather than at the individual level. How do firms change tips? Tips can change if the share of revenue that is tipped changes (the tip rate), if revenue per worker changes, or if the number of workers who split tips changes. We find that changes in

[1] Though advocates sometimes "double dip"—promising workers increased earnings while promising customers the end of mandatory tipping.

[2] Service fees generally do not go directly to workers. Some states require that service charges do go to workers, but allow administrative or house fees that designate that they will not go to workers.

average tips per worker are largely explained by changes in tips relative to revenue. This is consistent with restaurants implementing service fees, changing recommended tip rates, or shifting toward lower-tip output such as takeout.

Next, we turn to estimating employment results. It is not ex ante obvious what effect we should expect the tipped minimum wage to have on employment. Consistent with the fact that firms often pay both tips and base wages, tips and wages may not be perfect substitutes for restaurants. Tips and wages may be different in several ways. Tip compensation provides a form of performance pay. Tip pay may make high-revenue shifts (such as weekends and evenings), which are otherwise undesirable due to their timing and busyness, more desirable to workers (like busy baseball games as in Oettinger (1999)). Tips allow firms to share risk with workers. Finally, customers may be more sensitive to higher menu prices than to paying extra in tips (similar to tax-inclusive pricing in Chetty et al. (2009)). The strength of these forces may vary with the level of tips.

We find that the tipped minimum wage has a negative effect on employment while the minimum wage has a positive effect on employment. In line with our earnings and employment results, we find a positive effect of the minimum wage on total labor compensation at the firm and a (noisy) *negative* effect of the tipped minimum wage on total labor compensation. Adjusting for misreporting would likely imply an even larger gap between the two.

To rationalize our empirical findings, we develop a simple model in which monopsonistic firms choose both tips and wages. The effect of the tipped minimum wage depends critically on firms' ability to adjust tips. If tips cannot adjust, the tipped minimum wage works similar to the minimum wage. If tips can adjust, tips fall in response to a binding tipped minimum wage, offsetting at least some of the increase in wages. Near the unregulated base wage, tips do not fully offset base wages and total earnings and employment both rise. But for a sufficiently large increase in the tipped minimum wage, earnings and employment can *both* fall, which is consistent with our empirical results. Here, the mechanism is a movement along the labor supply curve. Firms find it optimal to decrease tips enough such that total earnings decreases and workers supply less labor. This stands in sharp contrast to the textbook monopsony model, where the minimum wage can only cause declines in employment accompanied by increases in earnings. We also show that given a binding tipped minimum wage, firms will raise earnings entirely through tips in response to an increase in the minimum wage.

We find strong evidence that tips do respond to the policies and compensation structure affects total compensation, and therefore employment. The tipped minimum wage likely has a negative effect on earnings *and* on employment. Importantly, workers may also have pref-

erences over compensation structure. Through the lens of our model, where disemployment comes through labor supply, the empirical results imply that—even if the worker prefers wages to tips—the overall package of lower tips, higher wages, and lower earnings makes the marginal worker worse off.

We contribute to the literature studying the tipped minimum wage by providing the first firm-level evidence of the effects of the tipped minimum wage. A few papers have studied the effects of the tipped minimum wage, generally finding positive effects on earnings and negative effects on employment (Wessels, 1993, 1997; Even and Macpherson, 2014; Neumark and Yen, 2023). Allegretto and Nadler (2015) argue that the negative employment effects are sensitive and find null effects on employment in their preferred specification. The closest paper to ours is Jones (2016) which uses tax data to study the effect of the tipped minimum wage on servers. This paper also finds no effect of the tipped minimum wage on reported earnings. The differences across papers may be due to higher rates of tip reporting in tax data or differences in design. These papers generally use what Dube and Lindner (2024) call "TWFE-log(MW)" designs, where the outcome is regressed on log(Minimum Wage) and log(Tipped Minimum Wage) with time and state (or city) fixed effects. To our knowledge, this is the first paper to study the tipped minimum wage using an event study design, allowing us to provide new estimates of the effect on earnings, wages, tips, and employment and discuss the dynamics of these effects. In some cases, these estimates differ from the prior literature. We are additionally able to study several new firm-level outcomes: income dispersion within the firm, tip pooling within the firm, the tip rate, firm wage bill, and revenue. These outcomes are important because many of the policy arguments depend critically on whether restaurants are able to adjust tips, how they adjust tips, whether tips can adjust independently for different types of workers, and how the policies affect the dispersion of earnings across workers. Our results speak to these policy questions. An additional contribution of ours is to discuss how the underreporting of tips affects estimates of the earnings effect. Across all studies of the tipped minimum wage, estimates of earnings effects are vulnerable to the underreporting of tips. By separately estimating effects on tips and base wages, we are able to calculate the implied effects of the policy on earnings under different possible reporting levels.

We also contribute to the literature studying the minimum wage by estimating the effect of the minimum wage on base wages and tips, using a design that controls for the tipped minimum wage, and estimating effects on wage dispersion within the firm. Restaurants have served as the canonical laboratory for studying the minimum wage, dating back to Card and Krueger (1994). Their prevalence in low-wage labor markets and consistent reliance on hourly workers have made restaurant-focused studies foundational to our understanding of

the minimum wage. Yet much of this literature has had little to say about tips, despite their central role in compensation for restaurant workers. When the minimum wage increases, firms can comply by raising the base wages or the tips of tipped workers, which can change the composition of earnings. The minimum wage can also affect the composition of earnings of workers not bound by the tipped minimum wage. Given the concern of many policy advocates about the prevalence of tip pay, policymakers may care about not only the effect of the minimum wage on earnings, but on the composition of earnings. Knowing the effect of the minimum wage on tips is also useful because many studies use measures of hourly earnings that include tips. If tips are underreported relative to base wages then the estimated change in earnings will be too low. We find a substantial increase in tips in response to the tipped minimum wage, suggesting that OWEs from the minimum wage be closer to zero than previously estimated in the restaurant industry. Additionally, estimates of the minimum wage on earnings, employment and revenue are useful to compare to the existing literature as we use a different design that allows us to control for the dynamic effects of the tipped minimum wage. Since the minimum wage and tipped minimum wage often move together, this can generate biases, potentially changing results substantially when the two policies move an outcome in opposite directions. Finally, our firm level data allow us to generate new estimates of the effect of the minimum wage on within firm wage dispersion and discuss how differences between tipped workers and non-tipped workers may explain the effects.

The rest of the paper proceeds as follows. Section 2 describes the setting and policy environment we study. Section 3 describes the data. Section 4 describes the empirical strategy. Sections 5, 6, 7, and 8 present the empirical results. Section 9 presents the model. Section 10 discusses. Section 11 concludes.

2 Setting

In 2024, restaurants and bars accounted for 8.5% of all private employment in the US. This employment is particularly concentrated near the bottom of the wage distribution. Figure 1 plots the share of workers employed in restaurants and bars for each decile of the (state level) income distribution using the 2023 ACS. In the bottom decile of the income distribution, 18% of workers' main industry is restaurants or bars. In the second decile, 13% work in restaurants or bars. Restaurant work is also most prevalent at the bottom of the education distribution, with 18% workers with less than a high school diploma and 7.5% of workers with a high school diploma without a bachelor's degree working in restaurants/bars.

Given this, it is no surprise that policymakers have focused on regulation intended to help workers in this industry. In addition to the prevalence of low wage workers in the

restaurant industry, restaurants differ from most other sectors in the U.S. economy because a substantial portion of workers' compensation comes directly from customer tips. At the average full-service restaurant in our data, in 2019, 45% of W-2s received any tips, and among these workers, on average, 50% of their income was in tips. At bars, 48% of W-2s received any tips, and tipped workers received 48% of their income in tips. Even in limited service restaurants, 22% of W-2s received any tips, and tipped workers still received 30% of their income in tips (see Table 1). These are likely lower bounds on the prevalence of tip compensation given underreporting in tips relative to base wages. This reliance on tip-based pay raises distinct concerns, such as increased vulnerability to harassment from customers, unpredictability in earnings, and potential difficulties enforcing wage laws. These issues underscore the importance of carefully understanding the costs and benefits of a tipping-based pay system and evaluating the policies that regulate it.

How is the pay of tipped employees regulated in the United States? In most states, employers of tipped workers are allowed to claim a tip credit and pay their employees a base wage which is beneath the minimum wage. The difference between the minimum wage and the maximum tip credit is the tipped minimum wage: the floor on base wage compensation for tipped employees.

Tipped workers are still covered by the minimum wage. The total of any employee's tip and base wage pay must average above the minimum wage across a given time period (often a week). If it falls short, the employer is legally required to make up the difference. For example, the federal tipped minimum wage in 2019 was $2.13 an hour and the federal minimum wage was $7.25 an hour. This would allow a restaurant to pay its waiters a $2.13 base wage so long as the waiters average over $5.12 an hour in tips each workweek. Notably, this means that individuals can be bound by the tipped minimum wage but make more than the minimum wage.

Increasing the minimum wage has an unambiguously positive effect on the hourly compensation of workers bound at the minimum wage. But raising the tipped minimum wage does not mechanically increase the pay of tipped workers. A higher tipped minimum wage would require some firms to increase the base pay of their tipped workers, but changes to tip pay could counteract—or fully flip—this boost to earnings.

In this paper, we leverage variation across states and over time in tipped minimum wages. The tipped minimum wage has its roots in the 1966 amendments to the Fair Labor Standards Acts, which introduced the idea of tip credit and formally allowed employers to pay tipped workers a lower base wage on the condition that tips would make up the difference to the regular minimum wage. The federal tipped minimum wage has remained at $2.13 per hour since 1991. While some states follow the federal standard, others have enacted higher tipped

minimum wages or eliminated the tip credit altogether. In 2019, out of 50 states and DC, 18 had tipped minimum wages at the federal level, 27 had tipped minimum wages between the federal level and their state minimum wage, and 6 had tipped minimum wages equal to their minimum wage. Figure 2 shows the ratio of the tipped minimum wage to the minimum wage in 2019.

3 Data

3.1 IRS tax data

Our primary data source comes from the US Internal Revenue Service. Our data on worker wages and tips comes from W-2s and our data on firm revenue comes from forms 1120-S, 1065, Schedule C, and 1120. We have two samples. Our primary sample is a sample of restaurants. The restaurant sample contains all firms that report NAICS 722511 (full service restaurants) or 722512 (limited service restaurants) at any point from 2012 to 2019 and all firms that report 722410 (bars) at any point from 2003 to 2019. For those firms, we have the firm tax forms and W-2s of *all* workers who report at least $5,000 in annual earnings associated with that firm for all years from 2003 to 2019. We restrict our analysis to firms with at least three workers in a year. This restaurant sample is our primary analysis sample. Our second sample is a firm 5% sample, where a 5% sample of all firms between 2000 and 2019 is drawn. For any firm drawn, we have the firm tax forms for all years from 2000 to 2019 and the W-2s for all workers who report at least $5,000 in annual earnings associated with that firm from 2000 to 2019. We use this sample for placebo tests. While one may worry about underreporting of tips to the IRS, Basker et al. (2024) show that tip reporting rates are several times higher in tax data than in survey data such as SIPP. We discuss throughout the paper how the underreporting of tips affects the interpretation of our estimates.

There are several desirable features of this data. First, it measures tips rather than just total earnings or just hourly base wages. This allows us to decompose earnings effects into tips and base wages and adjust for the possible underreporting of tips. Second, we have a firm panel linked to individual data. This allows us to study the effects of the policies at the firm level and to study effects across different types of workers (tipped and non-tipped, high earners and low earners, etc.).

Our wage and tips measures come from W-2s. Social security tips (box 7) include all reported tips as long as the total social security wages and tips are below the social security

cap.[3] Earnings come from box 1. We define base wages as earnings minus tips.[4] Note that, as in all studies using tax data, we observe annual earnings not hourly wages. This allows us to measure some important objects of interest, such as wagebill and share of income that is tips, well but makes it difficult to study hourly earnings. We restrict our earnings, base wages, and tips results to a sample of "full-year" workers (workers who were at the firm in the previous and the subsequent year, who are therefore unlikely to have been hired or separated in that year). This allows us to focus on earnings effects which are not due to changes in churn induced by the policies. However, we also report the effects on the sample of all workers in section 8.

We construct several variables. We construct earnings and base wages for tipped workers. Since we observe all W-2s for firms within our sample, we are able to construct the share of workers making tips as the number of W-2s with any reported tips over the total number of W-2s. We construct the share of earnings in tips as tips over total earnings. We define the compensation bill as total earnings summed across all W-2s at the firm(including tips), the wage bill as base wages summed up across W-2s at the firm, and the tip bill as tips summed up across W-2s at the firm. To study dispersion of earnings across workers within the firm, we generate wages, tips and earnings by quartile of firm-state-year earnings (for all firms with at least 4 full-year W-2s) as in Kline et al. (2019).

Our measure of revenue is the "gross receipts" line item on forms 1120-S, 1065, Schedule C, and 1120.[5] We also construct the ratio of total firm tips to firm revenue.[6] Table 1 provides summary statistics of firm-level variables for all bars, full-service restaurants, and limited-service restaurants in 2019. Tables 2 through 5 provide firm-state-level summary statistics for each regression sample and all outcomes.

3.2 State policy variation in TMW and MW

We construct our dataset of state tipped minimum wage and minimum wage laws using the historical tables on "Minimum Wages for Tipped Employees" available through the U.S. Department of Labor. Industry-specific regulations are especially common for the tipped minimum wage, with many states adjusting the allowed tip credit based on the tipping norms within a sector. We drop data on regulations for industries outside of our sample. For example, we remove the (tipped) minimum wage for "Chambermaids" in New York or

[3] In 2025, the social security cap was $176,100. This cap is quite high for the group of workers we are studying.

[4] We restrict to workers with non-negative earnings, base wages, and tips and trim the top and bottom 1% for all measures

[5] We restrict to firms with non-negative revenue and then trim the top and bottom 1%

[6] We additionally trim the top and bottom 1% of this value.

"All Other Employees" in Vermont (which specifies a different policy for restaurant workers and those who frequently receive tips).

States may also set tipped minimum wage or minimum wage levels which vary by other firm attributes—e.g. higher for larger firms or lower for firms which offer health insurance. We standardize these firm types across years within a state.

Due to these targeted regulations, our final dataset may contain multiple different levels of the (tipped) minimum wage within a state-year that could reasonably apply to firms in our sample of full service restaurants, limited service restaurants, or bars. We consider a state to have had a (tipped) minimum wage policy change if the (tipped) minimum wage was increased in any of these categories within that year.

4 Empirical strategy

We leverage state-level variation in the tipped minimum wage and minimum wage in an event study design similar to Cengiz et al. (2019). We consider events from 2003 to 2019 where the state (tipped) minimum wage increased by at least 5%. During this time period, the federal minimum wage was increased which induced a higher minimum wage in several states whose state minimum wage was equal to the federal minimum wage. In our primary specification, we consider these to be minimum wage events, but our results are robust to excluding these events caused by federal increase. Appendix Figure A1 shows the events we use in our main specification.

We estimate the following regression equation to study the effects of (tipped) minimum wage events on firm-state outcomes Y_{ist}:

$$Y_{ist} = \sum_{k=-3}^{4} \beta_k^{TMW} I_{st,k}^{TMW} + \sum_{k=-3}^{4} \beta_k^{MW} I_{st,k}^{MW} + \gamma_{is} + \delta_t + \Omega_{st} + \varepsilon_{ist} \tag{1}$$

where $I_{st,k}^{TMW}$ is an indicator which is 1 when state s had a tipped minimum wage event k years relative to time t and 0 otherwise and $I_{st,k}^{MW}$ is defined similar for the minimum wage events. γ_{is} is a fixed effect for firm-state is and δ_t is a time fixed effect. Ω_{st} denotes controls for small changes to the (tipped) minimum wage.[7]

By including event time dummies for both the minimum wage and the tipped minimum wage, our event study design can be thought of estimating the effect of the minimum wage

[7] Our events exclude small changes to the (tipped) minimum wage. We control for two sets of dummies of EARLY, PRE, and POST for small changes in the minimum wage and small changes in the tipped minimum wage. Each is defined as in Cengiz et al. (2019). EARLY = 1 if $-3 \leq k \leq -2$, PRE = 1 if $k = -1$, and POST = 1 if $0 \leq k \leq 4$

events controlling for the dynamic effects of changes to the tipped minimum wage—or vice versa. This is important because the two policies sometimes move together. This means we are studying the minimum wage using a different design than previous minimum wage papers, because we control for dynamics in the tipped minimum wage. We weight these regressions by firm-state employment and cluster standard errors at the state level. As in Cengiz et al. (2019), we are interested in $\beta_k^{MW} - \beta_{-1}^{MW}$ and $\beta_k^{TMW} - \beta_{-1}^{TMW}$ for $-3 \leq k \leq 4$ in our event window. Our event study figures plot these differences.[8]

Our main earnings and employment outcomes can all be constructed at the firm-state level. When studying outcomes that are firm-level (revenue, tip rate), we restrict to firms that had at least 80% of their W-2s in a single state in every year in our sample. Tables 2 and 3 compare firms in these samples to each other. As expected, single state firms are smaller, but they are very similar to the overall sample in terms of the share of workers tipped (about 60%), the share of income in tips (48%), and the ratio of tips to revenue (0.09). Though these firms may be different in unobservable ways, we find that our main results replicate in this sample.

To elucidate our empirical strategy, we estimate a state level version of Equation 1 where the outcome is log(minimum wage) or log(tipped minimum wage).

$$\log((\text{Tipped}) \text{ Minimum Wage})_{st} = \sum_{k=-3}^{4} \beta_k^{TMW} I_{st,k}^{TMW} + \sum_{k=-3}^{4} \beta_k^{MW} I_{st,k}^{MW} + \gamma_s + \delta_t + \Omega_{st} + \varepsilon_{st} \quad (2)$$

We weight by state employment in "Food Services and Drinking Places" (from Statistics of U.S. Businesses) and cluster standard errors at the state level. Figure 3 plots $\beta_k^{MW} - \beta_{-1}^{MW}$ and $\beta_k^{TMW} - \beta_{-1}^{TMW}$ for $-3 \leq k \leq 4$. Figure 3a shows the effect of the tipped minimum wage events on the minimum wage and the tipped minimum wage. As desired, the events increase the tipped minimum wage by around 10% and have no detectable effect on the minimum wage. Figure 3b shows the effect of the minimum wage events on the minimum wage and the tipped minimum wage. Analogously, these events increase the minimum wage by around 10% but not the tipped minimum wage. These plots are also useful to benchmark the effect sizes we find and construct elasticities, for example, of earnings with respect to the minimum wage.

Sometimes policy changes are phased in over the course of several years. In our main specification, any change above 5% is counted as a separate event. We can alternatively collapse consecutive increases into a single event marked by the first year of the changes. We

[8]Note that, in minimum wage designs, β_{-1} is generally not collinear with other coefficients due to repeated events.

show robustness to this alternative event specification in the appendix.

5 Earnings results

To understand the effect of the minimum wage and tipped minimum wage on the earnings of restaurant workers, we study these policies' impact on base wage and reported tip income and discuss how these results can be aggregated into an overall earnings effect.

5.1 Base wages and tips

We can make the average base wages for tipped and non-tipped workers at the firm-state level. First, we estimate the effect of the tipped minimum wage events on the base wages of tipped workers. Figure 4 shows that a 10% increase tipped minimum wage increases base wages by around 3.5% throughout the post period which is consistent with the tipped minimum wage, which regulates base wages, binding. Next, we estimate the effect of the tipped minimum wage on tips. The tipped minimum wage does not regulate total earnings, so if restaurants are able to reduce tips in response to an increase in the tipped minimum wage, earnings could stay the same, or even decrease in response to the tipped minimum wage. We find that reported tips decrease by about 4% in response to the tipped minimum wage.

In contrast, the minimum wage does not have a significant impact on the base wages of tipped workers, and a 10% increase in the minimum wage causes a large and persistent increase (about 5%) to the average tips reported by tipped workers. This is consistent with the fact that the minimum wage regulates the total compensation of tipped workers, but not the base wages.

Figure 4 further emphasizes the different effects of the tipped minimum wage and minimum wage on the composition of earnings by plotting the event study for the effect of these policies on the tip share of reported income for tipped workers and for all workers. As expected, the minimum wage caused tips to be a larger share of income whereas the tipped minimum wage decreased the tip share. Since the share of earnings that are tips can be calculated without the full-year restriction, this provides a useful complement to previous results.

These results answer one of the key questions posed by the policy debate and the model: firms *can* and *do* change tips in response to the tipped minimum wage and the minimum wage. This raises the question of *how* tips adjust in response to these policies. Changes in revenue per worker could pass through into tips, or firms could actively add service fees,

change tasks performed, or change the pool of workers sharing tips. We discuss and attempt to disentangle different mechanisms in section 7.

5.2 Earnings

What do these results say about the effect of the policies on total earnings? We can sum tip income and base wage income to estimate the effect of (tipped) minimum wage events on reported earnings. Figure 4 also demonstrates that the tipped minimum wage had no detectable effect on the reported earnings of tipped workers, while the minimum wage increased tipped worker reported earnings by around 1.5% in the post period. However, especially among tipped workers, reported earnings are not necessarily the same as true earnings. If workers underreport tips, this means that the effect on tip income is relatively more important for determining the effect on total earnings than we are measuring. To see this point, let true earnings equal base wages plus tips

$$E = B + T \tag{3}$$

Suppose that all of base wages are reported and a fraction $r \in (0, 1)$ of tips are reported. Let α be the fraction of true earnings that are tips before the policy.

$$E_{report} = B + rT = (1 - \alpha)E + r\alpha E \tag{4}$$

Now, suppose the policy changes tip income by t and base wages by b such that

$$T' = (1 + t)T, B' = (1 + b)B \tag{5}$$

Then, the percent change in true earnings is

$$\%\Delta E = b(1 - \alpha) + t\alpha \tag{6}$$

And the percent change in reported earnings is

$$\%\Delta E_{report} = b\frac{1 - \alpha}{(1 - \alpha) + r\alpha} + t\frac{r\alpha}{(1 - \alpha) + r\alpha} \tag{7}$$

That is, the effect on tips is down-weighted relative to the effect on base wages. Here, we are considering the effects of constant under-reporting and assuming r does not change in

response to the policy.[9] If not all tips are reported ($r < 1$), then the effect of the minimum wage on earnings is larger than its positive effect on reported earnings. Similarly, the effect of the tipped minimum wage on earnings would be lower than its effect on reported earnings. In fact, any amount of under-reporting tips (relative to base wages) would suggest a negative effect of the tipped minimum wage on earnings. The average firm in full service, limited service, and bars reports that tipped workers receive 46% percent of their total income in tips on average. If the true percent of their income coming from tips were any larger, then the total effect on earnings would be negative. This supports concerns among opponents of the tipped minimum wage that the policy may decrease earnings for some workers. The idea that tips would decline by more than wages increase is somewhat counterintuitive. It suggests that tips and wages are imperfect substitutes to the firm as a method of compensation. We formalize this idea and provide conditions under which it can happen in the model in section 9.

5.3 Effects by within-firm earnings quartile

Another important question for policymakers is *whose* earnings are being affected. The minimum wage targets those at the bottom of the wage distribution. However, the tipped minimum wage targets tipped workers. Tipped workers are often the subject of policy attention due to the concern that they are low earners. However, the tipped minimum wage can be binding for tipped workers who earn more than the minimum wage. In fact, the tipped minimum wage can be binding for high-earning tipped workers but not low earning tipped workers, for example, if high earning tipped workers are servers and low-earning tipped workers are bussers who receive a smaller share of earnings through tips through server tip outs. We separate workers in each firm-state-year with at least four full-year W-2s into quartiles based on annual reported earnings. This analysis is on all workers, not just tipped workers, since an important way that the minimum wage can increase earnings is by increasing the wages of non-tipped workers. Figure 5 shows the effects of the policies on base wages and earnings of full-year workers in each quartile of the firm-state annual earnings distribution. The minimum wage raises base wages primarily in the bottom quartile, and increases reporting earnings in the bottom two quartiles. The tipped minimum wage increases base wages in quartiles 2 and 3, suggesting that tipped workers bound by the tipped minimum wage are on average higher up in the firm earnings distribution than minimum wage workers. Figure 5 also shows the effects on tips in each quartile (for full-year tipped workers). We find that changes in tips are remarkably similar across quartiles. This suggests

[9] If reporting changes in response to the policy, that could have very different effects. The next section discusses why we do not think changes in r are driving our results.

tips are changed via firm-wide changes and not just for workers bound by the policies. In fact, the (noisy) point estimates suggest that the tipped minimum wage may even decrease earnings for quartile 1. This could be explained by quartile 1 having many minimum wage workers who make some tips (e.g. bussers). They would not be bound by the increase in the tipped minimum wage, but they would be affected by the establishment-wide decline in tips.

The common change in tips across quartiles also suggests that our results are not driven by compliance. While the IRS does not enforce minimum wage compliance, it is reasonable to ask if our results are driven by changing compliance motivations causing workers to report fewer tips following an increase in the tipped minimum wage (i.e. is r in Equation 4 changing in response to the policy?).[10] Specifically, if firms encouraged workers to report enough tip income to have their hourly pay reach the minimum wage, then increased base pay due to the tipped minimum might lead workers who were near this threshold to report less tip income. Similarly, firms could encourage workers to *report* more of their tips in response to the minimum wage. This force would be weaker for higher income workers who are more likely to already be reporting income well above the minimum wage. However, we see that the effect on tips is similar across the distribution of full-year earnings. This makes it unlikely that our results are driven by changing tip reporting to comply with the policy and instead suggests that the cause of the decline in tips is an establishment-level effect such as the introduction of service fees or changes to average restaurant traffic.

6 Employment

Now, we turn to asking what the effect of the tipped minimum wage and minimum wage is on restaurant employment. It is not obvious what effect we would expect the tipped minimum wage to have on employment, even given the effects on earnings. It depends on worker preferences over tips versus base wages and the firm's relative cost of paying the two types of compensation.

6.1 Number of W-2s

First, we look at the effects of the policies on log W-2 counts. Similar to the earnings results, this outcome is at the firm-state level. In Figure 6, we see that in response to the minimum wage, the number of W-2s increased by about 2%. In contrast, the number of W-2s fell

[10] Basker et al. (2024) show a bunching pattern of tips consistent with some reporting behavior being affected by compliance

substantially in response to the tipped minimum wage—reaching a 2.5% decline by the end of our event window.

While the W-2 count is often used as a measure of employment (Kline, Petkova, Williams, and Zidar, 2019; Lamadon, Mogstad, and Setzler, 2022), it measures the total number of workers who were employed by the firm at any point in the year which is different from most employment measures which count the number of employees at one snapshot in time. This means that the W-2 count is influenced by retention effects which can impact the number of workers who cycle through the firm throughout the year. Indeed, we show in Appendix Figure A2 that the minimum wage caused an increase to both hires and separations while the tipped minimum wage caused a decrease to both hires and separations[11]. This means that the W-2 count results may be at least partially driven by a negative churn effect for the minimum wage and a positive churn effect for the tipped minimum wage. However, the effects on total labor payments at the firm in Section 6.2 and the effect on revenue in Section 7.1 suggest an important role for (dis)employment effects.

6.2 Wage bill

Studying the effect on total earnings across all workers at the firm also helps us understand employment effects. This is often called the wage bill. We define the wage bill to include base wages only, the tip bill to include tip income only, and the compensation bill to include both forms of compensation. The effect on the compensation bill jointly summarizes the effect on earnings and employment, including effects on hours or retention. The minimum wage literature often asks how much of an earnings increase is counteracted by a decrease in employment (Dube and Lindner, 2024). If earnings increase, the compensation bill measures this object. Wage bill, tip bill, and compensation bill are calculated using all workers at the restaurant, without the full-year restriction, to fully capture effects driven by changes in retention, hours, employment, and hourly wages.

Figure 7 shows the effects of the policies on the wage bill, tip bill, and compensation bill. Since the wage bill and compensation bill include non-tipped workers, we include estimates of our main earnings regression on both tipped and non-tipped workers in Appendix Figure A3. Taking the point estimates, the TMW decreases the compensation bill by about 1.8%, though the estimates are somewhat noisy. That is, the TMW lowers total payments to workers. The fact that the compensation bill declines despite no effect on average earnings is consistent with a disemployment channel.[12] The MW increases the compensation bill by

[11] Importantly, we cannot tell whether separations are voluntary or involuntary, so interpreting these results as evidence of labor supply or labor demand changes is difficult.

[12] We do not think decreased churn explains these results since we estimate effects on average earnings

almost 3% while increasing average earnings by less than a percent, consistent with positive employment effects. Similarly, the TMW decreases the tip bill by 6% by the end of the post period and the MW increases the tip bill by around 7%. Much like in our average earnings results, if tips are consistently underreported relative to base wages, we will underestimate the decline in the compensation bill, since the tip bill decreases by more than the wage bill.

The employment and earnings results are consistent with a large tipped minimum wage increase causing firms to decrease tips by more than base wages change, decreasing total compensation, and causing the quantity of labor supplied to the firm to fall. We formalize this idea in section 9.

7 Unpacking changes in tips: revenue, tip rate, and tip pooling

Section 5 showed that reported tips decrease in response to increases in the tipped minimum wage and increase in response to increases in the minimum wage. These results raise the question of *how* tips adjust in response to these policies. There are several possibilities. First, firms may be able to change the average tip rate (tips as a percent of revenue). They may do this by implementing service fees, administration fees, or kitchen fees. These fees are not legally considered tips and are not required to be used for worker compensation.[13] However, they may decrease how much a customer tips. In Washington, DC, for example, these are sometimes listed as "I-82 fees," presumably to signal to consumers that the fee was caused by the initiative to equalize the tipped minimum wage with the minimum wage. Restaurants may also change recommended tips on receipts or electronic payment systems. Restaurants may shift towards or away from low-tip output like takeout. Restaurants often engage in some form of tip pooling, whereby servers share a portion of their tips with one another and may also "tip out" to non-serving staff such as bussers, food runners, and bartenders. They can change average tips per tipped worker by changing the number of workers in the tip pool. Tips may also move mechanically with revenue per worker. The price effects of the minimum wage are well-documented by the literature. If prices increases result in revenue per worker increases, this naturally passes through into tip income. Quantity can also affect tips through revenue per worker. If shifts become slower, revenue per worker may decrease, decreasing tips.

We attempt to disentangle these explanations here, by estimating the effect of the policy

using full-year workers.

[13] In a few states there is some regulation around these fees—such as requiring restaurants explicitly state the fees will not be going to employees

on revenue, tip rate ($\frac{\text{tips}}{\text{revenue}}$), and tip pooling. We find that, for both policies, changes in tips can mostly be explained by changes in the tip rate, suggesting that the service fee, recommended tips, and more/less tip-intensive output explanations are more important in explaining the changes in tips.

As described in section 4, since revenue is defined at the firm level (rather than firm-state), we restrict our analysis of revenue and tip rate to the sample of firms that had at least 80% of their W-2s in a single state in every year in our sample. In Appendix Figure A4, we show that our main earnings results replicate in this sample.

7.1 Revenue

We estimate the effect of the TMW and the MW on revenue at the firm. Figure 8a shows that the tipped minimum wage decreases revenue by about 2%. Our estimates of the minimum wage on revenue are similarly positive (point estimates of about 2%), but noisy. These results are broadly consistent with the disemployment effects of the tipped minimum wage and positive employment effects of the minimum wage. Consistent with the previous results, these results underscore the idea that the TMW affects restaurants very differently from the MW.

The effect of the policy on revenue *per worker* is most relevant for explaining the effect of the policies on average tips. Naively taking the estimates on the number of W-2s as estimates on employment would suggest that revenue per worker increases in response to the TMW and decreases in response to the MW, as the employment effects are larger than the revenue effects. In this case, the effects on revenue per worker cannot explain the effects on average tips.

However, as we have emphasized, the effects on W-2s likely include effects on churn as well and may thus overstate the employment effects. In which case, the effect of the TMW on revenue per worker could be negative and could contribute to lower tips. We continue this discussion below.

7.2 Tip rate

Next, we look at the effect of the (tipped) minimum wage on the tip rate: the sum of reported tips across all the firm's workers divided by revenue. This is useful because it allows us to understand whether quantity or price effects are driving our tip income results. If the same number of workers are serving more/less customers or getting tipped the same rate on higher/lower prices, then this will change their average tip received but will not impact the tip rate. In other words, changes in revenue per worker would change tips without changing

the tip rate. On the other hand, if restaurants impose service fees which cause patrons to tip less on a bill, the tip rate would decline. Figure 8b shows that the tip rate does fall in response to the tipped minimum wage and rise in response to minimum wage and that the magnitude of the changes is similar, but slightly smaller than the effects on average tips.

This suggests that changes in the tip rate play an important role in explaining the effect on tips. It is worth emphasizing that seemingly small changes in the *level* of the tip rate can explain these large changes in tips. If restaurants are able to change the amount tipped on a check from 10% to 11% of revenue, all else equal, tip income (and the tip rate) would increase by 10%.

7.3 Tip pooling

Finally, firms can change tips by changing how many workers tips are shared among. First, we look at the share of W-2s receiving *any tips*. For example, firms could share the same tips among more workers to decrease average tips per tipped worker. We find a small, noisy decrease in the share of workers receiving tips in response to the tipped minimum wage and a small, noisy increase in the share of workers receiving tips in response to the minimum wage. These effects go in the wrong direction to explain the effect on tips through tip pooling.

There are different possible explanations for this result. One possible explanation is that tipped workers are relatively cheaper as the share of their income that is tips increases. So in response to a TMW increase, restaurants demand fewer tipped workers relative to non-tipped workers. If this is happening alongside tip pooling, the effect of the policy on the share of workers making tips may not be informative. For example, the reduction in share of workers making tips could be evidence of larger disemployment effects for highly tipped employees (e.g. waiters) combined with tip pooling with additional workers (bussers).

Another test for tip pooling involves looking at the effect on tips by quartile as changes in tip pooling could show up as different effects on tips in different parts of the firm earnings distribution. For example, we would expect paying low wage bussers a small amount of tips from the pool to lower tips in the bottom quartile. But as shown in Figure 5 (see section 5.3), we find remarkably stable effects on tips across the firm earnings distribution. Taken together, this suggests a limited role for tip pooling in explaining the tip effects of the tipped minimum wage.

The fact we find limited evidence of tip pooling may be due to regulations dictating whether employers can form a tip pool and who they can include in it. The Fair Labor Standards Act states that if firms claim a tip credit, then they can only distribute tips among workers who regularly receive tips but if the firm pays all workers a base wage at least

$7.25 then they can implement a "nontraditional" tip pool which includes non-managerial back-of-house workers. But many states impose further restrictions—for example, stating that only voluntary tip pools are allowed or expressly forbidding back-of-house employees be included in the pool (regardless of whether the firm claims a tip credit).

7.4 Summary

Together, these results suggest that tips are mostly, but not entirely, explained by changes in the tip rate. Changes in revenue per worker may also contribute to changes in average tips. Tip pooling is unlikely to explain changes in tips. Combined with the previous evidence that the tip income effect is constant across worker income quartile, this suggests that the change in tipping behavior is largely driving by firm-level policies which impact the average tip rate such as service fees, recommended tips, or offering takeout versus sit down service.

8 Robustness

We show robustness to non-full-year workers, full service restaurants, and different event definitions as well as a placebo regression on a sample of all workers.

Our main earnings variables are all created using full-year workers, defined as those who had a W-2 from the same firm in the previous year and in the subsequent year. This is important because W-2s measures annual earnings which are affected by the number of days a worker works at a firm. Changes in average time a person spends at a firm (e.g. induced by hirings or separations) in response to the policies may change annual earnings/wages/tips even if hourly earnings/wages/tips do not change. In fact, we find that hires and separations decrease in response to the tipped minimum wage and hires and separations increase in response to the minimum wage (see Appendix Figure A2).

Re-estimating our main earnings results on all workers produces estimates consistent with the effects on churn. Appendix Figure A5 shows estimates including non-full-year workers. They are broadly consistent with the main results presented in Figure 4. However, the positive effect of the TMW on base wages (and earnings) is now larger, and the negative effect on tips is smaller. This is consistent with the bias one would expect from the TMW decreasing churn. Specifically, workers spending more of the year at the firm would magnify increases in hourly wages and mitigate decreases in hourly tips. Similarly, for the minimum wage the positive effect on tips and earnings is now smaller and the negative effect on base wages is larger. This is consistent with the MW increasing churn.

We estimate the main results on base wages, reported tips, and reported earnings re-

stricting to full-service restaurants. While limited-service restaurants still pay a substantial amount in tips, it is not clear how common it is for limited-service firms to claim the tip credit. The results are very similar. Appendix Figure A6 shows these results.

In our main specifications, we allow binding changes to the federal minimum wage to be counted as events (these will not affect all states, as some states will have minimum wages above the federal minimum wage). Since there are state-level changes in the tipped minimum wage in years where the federal minimum wage changes, including these allows us to control for effects that may be induced by the federal minimum wage change. We show robustness to excluding these events in Appendix Figure A7. When excluding federal changes from the set of events, we include controls for whether a federal event happened similar to how we control for small changes in the policies. We also show robustness to collapsing consecutive events into a single event in Appendix Figure A8.

Finally, we estimate the effect of the minimum wage and the tipped minimum wage on earnings in our 5% sample of all firms as a placebo test. Since minimum wage workers are a small share of the workforce, we do not expect to be able to estimate a precise effect of the policies on the 5% sample of firms in all industries. As expected, we find null effects on earnings. Appendix figure A9 shows these results.

9 Model

Next, we turn to theory to help us rationalize the empirical results. Why can the tipped minimum wage cause earnings and employment to both fall? Under what conditions can that occur? Why does the minimum wage raise earnings through tips? We write a simple model where monopsonistic firms pay workers in base wages and tips. Critically, we allow firms to adjust tips, since our empirical results suggest that firms *can* adjust tips. If firms cannot adjust tips, then the tipped minimum wage operates as in the textbook minimum wage model, strictly increasing the earnings firms must pay. In our model, we show that tips (weakly) fall in response to increases in the tipped minimum, earnings and employment *can* both fall in response to increases in the tipped minimum wage, and that in the presence of a binding tipped minimum wage, increasing the minimum wage will increase tips and have no effect on base wages.

The firm chooses wages and tips per worker to maximize profits π. Labor is a function of total earnings $w + T$. Revenue is linear in labor, with the price that firms can set being a function of the tips its workers receive.

$$\pi(w, T) = P(T)L(w + T) - wL(w + T) \tag{8}$$

This model nests many different ways that firms may adjust tips. For example, firms may change the recommended tips (to increase tips). Or alternatively, firms may add a service fee (to decrease tips), which they can claim directly as a revenue.

We assume that output is a continuously differentiable function of tips, $P'(T) \leq 0$ (inducing higher tips is costly), $P''(T) \leq 0$ (this cost is increasing), and $P'(0) = 0$ (around zero there is no cost to increasing tips).[14] Notably, for algebraic simplicity, we are assuming that revenue responds to tips per worker, rather than total tips at the firm or the average tip rate.[15] We assume $L'(w+T) > 0$ and $L''(w+T) < 0$: labor supply is upward sloping (monopsony) and workers become harder to recruit as L increases.

$P'(T) \leq 0$ captures the idea that it is not costless for workers to receive tips. Customers realize that the expectation they tip will impact their bill. Increasing T is costly because it decreases the price P the firm can charge, lowering revenue. Increasing w is costly because firms have to pay workers w out of revenue, lowering profits. In the unregulated equilibrium, firms choose wages and tips to equalize the costs. They will set $-P'(T) = 1$. Holding constant the firm's employment, the cost of paying a dollar of base wage pay (per worker) is 1 while the cost of a dollar of tip pay (per worker) is $-P'(T)$, the extent to which prices fall. Since $P'(T)$ does not always equal 1, this is the sense in which wages and tips are imperfect substitutes.

The idea that this cost is increasing ($P''(T) \leq 0$) could be due to several microfoundations. First, customers' distaste for tipping may be increasing in the level of the suggested tip. Additionally, it may be low-cost for firms to increase tips from lower initial tipping levels because it introduces a performance incentive. Tipped workers have an incentive to show up for the highest demand shifts and to provide high-quality service. These benefits might be particularly strong for the first few dollars of tips, justifying that $P''(T) \leq 0$. Lastly, we assume that the cost of adding tips (and how that cost is changing) is 0 when there are initially no tips. This is true if, for example, it is close to costless to allow customers who are very eager to tip to put a few dollars in a tip jar.

The proofs of the following propositions are in Appendix A2.

Proposition 1. *Tips (weakly) fall in response to increases in the (binding) tipped minimum wage*

When a firm's wage decision is bound by the tipped minimum wage, $\bar{w}$, they solve for

[14] You could alternatively replace 0 with a different lower bound for tips

[15] Since production is linear, this is inconsequential. In another model with nonlinear production, if tips are set as a share of revenue (rather than per worker), an additional force emerges, which is that hiring an additional worker reduces tips per worker for all employees. Wessels (1997) models tips as a fixed share of revenue rather than a choice and features this force.

the optimal amount of tips to offer. This leads to the following first order condition:

$$-P'(T)L(T+\bar{w}) = (P(T)-\bar{w})L'(T+\bar{w}) \tag{9}$$

Increasing tips is costly because it reduces revenue by $-P'(T)L(T+\bar{w})$. Increasing tips is beneficial because it increases the number of workers (where the firm profits $P(T)-\bar{w}$ on the marginal worker). Increasing $\bar{w}$, the tipped minimum wage, decreases the benefit of recruiting another worker by causing the markdowns to narrow and also reduces the number of workers the firm hires with an added dollar of tips, $L'(T+\bar{w})$. It also increases the marginal cost of paying tips, $-P'(T)L(T+\bar{w})$, since L is now higher. Since the cost of increasing tips is now higher and the benefit lower, the firm reduces tips to satisfy 9. (See Appendix A2 for more detail).

Proposition 2. *For a small increase in the tipped minimum wage above the unregulated equilibrium wage, total earnings and employment both rise*

For small increases in the tipped minimum wage (close to the unregulated base wage), the decline in tips will not fully offset the increase in base wages. This increase in compensation will increase employment, as in the textbook monopsony case. Note that the decline in tips will mute (though not reverse) the effect on earnings.

Proposition 3. *If $P''(0) = 0$, a sufficiently large increase in the tipped minimum wage will cause total earnings and employment both to fall*

Recall from proposition 1, that when the tipped minimum wage increases, firms reduce tips because the marginal cost of paying tips has gone up and the marginal benefit has gone down. Reducing tips causes the marginal cost to go down. However, since $P''(T) < 0$, when tips are low, the effect of reducing tips on the LHS of 9 is limited, so reducing the marginal cost requires a larger reduction of T.

To see the intuition, recall that the marginal cost of tips and wages are equal in unregulated equilibrium, $-P'(T) = 1$. The inframarginal cost of tips is always less than 1, and is smaller the lower tips are, whereas wages always cost 1. So if the tipped minimum wage increases, the firm reduces tips, giving up dollars of tip income that cost less than 1. The bigger the tipped minimum wage increase, the increasingly "cheap" inframarginal tip compensation the firm has to give up, so it requires larger declines in tips relative to the wage increase. Wages and tips are not perfect substitutes. At low levels of tips, tips are "cheap"—allowing generous customers to toss a buck in the tip jar as no effect on revenue—but wages never are. (The existence of some point at which tips fall by *more* than wages increase is not generically true. The condition, $P''(0) = 0$, captures the idea that the cost of

paying tips must be falling sufficiently fast near 0.)

This result is notably different than the firm response to the minimum wage. Here, employment has decreased not because the firm is off the labor supply curve—employment has fallen because the tipped minimum wage *reduced* total compensation, reducing the quantity supplied of labor. This case is consistent with our empirical results.

Proposition 4. *If the tipped minimum wage binds, then increasing the minimum wage will increase tips and have no effect on the base wage.*

If the tipped minimum wage binds, then we have $-P'(T) < 1$. This means that tips the per-worker cost of paying a dollar of tips, $-P'(T)$, is strictly less than the per-worker cost of paying a dollar of base wages, 1. When the minimum wage increases, the firm will choose to satisfy the higher compensation requirement with an increase to tips. At the point at which the minimum wage causes base wages to increase (in addition to tips), the tipped minimum wage must no longer bind.

10 Discussion

Reconciling empirical evidence and theory To summarize the results on the tipped minimum wage, we find that the tipped minimum wage increases base wages, but causes tips to decline. We estimate a null effect on reported earnings, which suggests that if tips are underreported total earnings likely fell. Additionally, we show that employment declines following increases to the tipped minimum wage. What can explain a decline in earnings and employment? Standard monopsony models of the minimum wage would predict that employment declines follow after an increase in earnings that is large enough to push the firm off the labor supply curve. But in the case of the tipped minimum wage, employment declines can be driven by the firm reducing total compensation, leading the worker to reduce labor supply. Increasing the required base wage affects the firm's incentive to pay the workers tips. Paying a higher base wage reduces the firm's markdown on its marginal worker, so the monopsonistic firm will cut tip pay, which pushes its margins back up. But as the firm adds service fees or reduces suggested tips to decrease tip pay, it gives up an increasingly cheap form of pay. This means that one dollar of a base wage raise will come at the cost of an increasingly large decline to tip pay—which, for a large enough tipped minimum wage increase, will net out to earnings falling.

What determines the benefit of reducing tips? As discussed in the model section, we model tips as decreasing revenue to capture the fact that customer demand responds negatively to paying tips. But the particular shape of $P(T)$, the marginal effect of changing tips

on revenue, captures many forces. First, tips operate as a form of performance pay, which may increase productivity. Second, firms value workers more during busy shifts (evenings, weekends, holidays), but these shifts are the most undesirable for workers under constant hourly pay. Tips make busy shifts desirable to workers (this could be thought of as another form of performance pay). Third, tips provide a form of risk-sharing. If one week is slow, workers make less money. While firms must make up pay up to the minimum wage on average, any workers making on average above the minimum wage (who may still be making the tipped minimum wage), can experience substantial volatility in earnings. Tips might provide a substantial source of wage flexibility in an economy with otherwise high levels of downward nominal wage rigidity. Fourth, customers may have different elasticities of demand with respect to tips compared to prices. We assume the marginal benefit of reducing tips for any of these reasons is smallest when tipping is close to zero: customers' preferences for paying tips may vary by the level—strongly disliking a suggested tip of 25% but hardly noticing tipping spare change, or firms may benefit most from the first few dollars of risk sharing or performance pay.

It is worth noting that an important difference between the two policies that we do not consider in the model is that the tipped minimum wage mostly affects the restaurant sector whereas the minimum wage affects all sectors employing low wage workers. This can generate different general equilibrium effects. Demand for a single sector's products is more price elastic than demand across many sectors. Firms may be able to increase prices with limited effects on quantity in response to the minimum wage but not in response to the tipped minimum wage.

Comparison to minimum wage literature The minimum wage literature often uses the own-wage elasticity (OWE) to compare estimates across studies. Dube and Lindner (2024) call any OWE less than -0.8 a "large negative OWE." It is large in the sense that an elasticity of -0.8 could be interpreted as 80% of the gains in earnings being erased by disemployment. If employment falls due to the worker reducing labor supply as total earnings falls, as we argue can explain the results in this paper, it is inappropriate to calculate an OWE. But we can use our estimates for the effect on the wage bill and the tip bill to compare the size of our effects to the literature. An OWE of -1 would correspond to 0 effect on the compensation bill—a very large negative effect where all earnings gains are erased by employment losses. We are unable to reject a null effect of the tipped minimum wage on the compensation bill and the point estimate is negative. Therefore, this is a more negative effect on the compensation bill than implied by 83% of the 70 published studies Dube and Lindner (2024) which estimate OWEs greater than -0.8. In contrast, our estimates of the minimum wage on

earnings and employment imply a large positive OWE of over 1. This estimate is near the top of the range presented in Dube and Lindner (2024) which may be due to the increase in employment being partially driven by churn and the fact that, unlike prior studies, we estimate our earnings effect controlling for changes in the tipped minimum wage (which frequently happen concurrently with changes in the minimum wage and would otherwise bias downwards the earnings and employment estimates).

Policy implications Workers may have preferences over compensation structure and not just earnings. Indeed, many policy advocates are specifically concerned that tips are an unjust form of pay. If workers prefer base wages to tips, the wage and tip bill results would fail to account for the fact that the compensation package improved even if earnings did not increase in response to the tipped minimum wage. Similarly, the increase in earnings in response to the minimum wage overstates the improvement in the compensation package. Even if it is true that workers prefer base wages to tips, our theory suggests that the negative employment effects of the tipped minimum wage are driven by labor supply, implying workers do not prefer the new compensation package.[16]

These results inform the policy debate by providing evidence that firms are able to change the tip rate in response to policy. Many in the policy debate assume that tips cannot be adjusted, implying potentially larger increases in earnings for workers and higher costs for restaurants. We find that tips do move in response to the policy and that they move primarily through changes in the tip rate. Importantly, economically small changes in the level of the tip rate can cause large changes in tip income. However, we find that the tip rate is a blunt tool—tips move similarly for tipped workers in all parts of the firm's income distribution. Our results suggest that it is unlikely, for example, that firms just increase tips for those making below the minimum wage when the minimum wage increases. Rather, tips increase throughout the distribution.

11 Conclusion

We find that the tipped minimum wage reduces earnings and employment. Importantly, this is because firms are able to change tips and choose to reduce tips by more than base wages increase. Our model suggests that the disemployment effects are driven by labor supply—implying that workers are worse off. This means that the tipped minimum wage is not an

[16]Through the lens of our model, it is difficult to explain our empirical results with the interpretation that workers prefer the new compensation package but the increased compensation causes "classic monopsony" negative employment effects. If firms were off their labor supply curve, they could reduce tips further.

effective policy to help tipped workers. The magnitude of the welfare consequences of the policy depends on worker preferences over compensation structure and the extent to which other industries are able to absorb these workers and at what wages. In contrast, we find that the minimum wage increases earnings in large part through tips, increasing the earnings of tipped workers without disemployment effects.

References

Allegretto, Sylvia and Carl Nadler (2015), "Tipped wage effects on earnings and employment in full-service restaurants." *Industrial Relations: A Journal of Economy and Society*, 54, 622–647.

Basker, Emek, Lucia Foster, and Martha Stinson (2024), "Tip of the iceberg: Tip reporting at us restaurants, 2005-2018." Technical report.

Card, David and Alan B. Krueger (1994), "Minimum wages and employment: A case study of the fast-food industry in new jersey and pennsylvania." *The American Economic Review*, 84, 772–793.

Cengiz, Doruk, Arindrajit Dube, Attila Lindner, and Ben Zipperer (2019), "The effect of minimum wages on low-wage jobs." *The Quarterly Journal of Economics*, 134, 1405–1454.

Chetty, Raj, Adam Looney, and Kory Kroft (2009), "Salience and taxation: Theory and evidence." *American economic review*, 99, 1145–1177.

Dube, Arindrajit and Attila Lindner (2024), "Minimum wages in the 21st century." *Handbook of Labor Economics*, 5, 261–383.

Even, William E and David A Macpherson (2014), "The effect of the tipped minimum wage on employees in the us restaurant industry." *Southern Economic Journal*, 80, 633–655.

Jones, Maggie R (2016), "Measuring the effects of the tipped minimum wage using w-2 data." *US Census Bureau, May*, 26.

Kline, Patrick, Neviana Petkova, Heidi Williams, and Owen Zidar (2019), "Who profits from patents? rent-sharing at innovative firms." *The quarterly journal of economics*, 134, 1343–1404.

Lamadon, Thibaut, Magne Mogstad, and Bradley Setzler (2022), "Imperfect competition, compensating differentials, and rent sharing in the us labor market." *American Economic Review*, 112, 169–212.

Neumark, David and Maysen Yen (2023), "The employment and redistributive effects of reducing or eliminating minimum wage tip credits." *Journal of Policy Analysis and Management*, 42, 1092–1116.

Oettinger, Gerald S (1999), "An empirical analysis of the daily labor supply of stadium vendors." *Journal of political Economy*, 107, 360–392.

Schweitzer, Justin (2021), "Ending the tipped minimum wage will reduce poverty and inequality." URL https://www.americanprogress.org/article/ending-tipped-minimum-wage-will-reduce-poverty-inequality/.

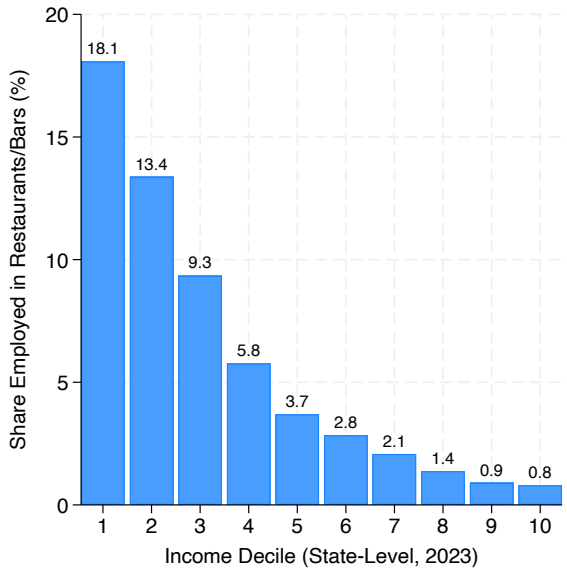
Wessels, Walter John (1993), "The minimum wage and tipped employees." *Journal of Labor Research*, 14, 213–226.

Wessels, Walter John (1997), "Minimum wages and tipped servers." *Economic Inquiry*, 35, 334–349.

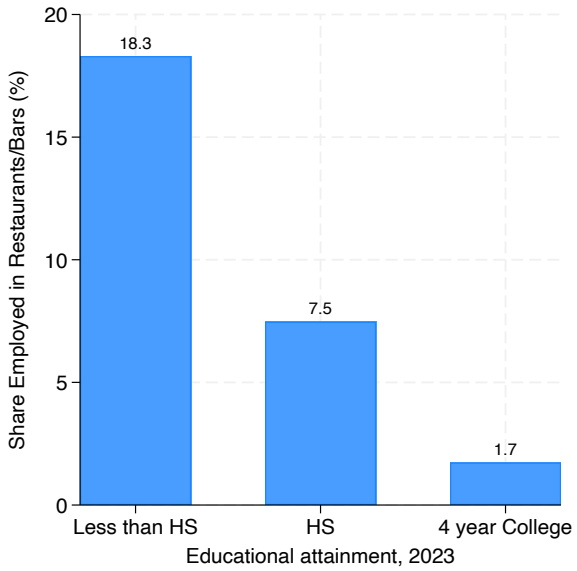
Figures

Figure 1: Prevalence of restaurant employment

(a) Restaurant employment by income decile

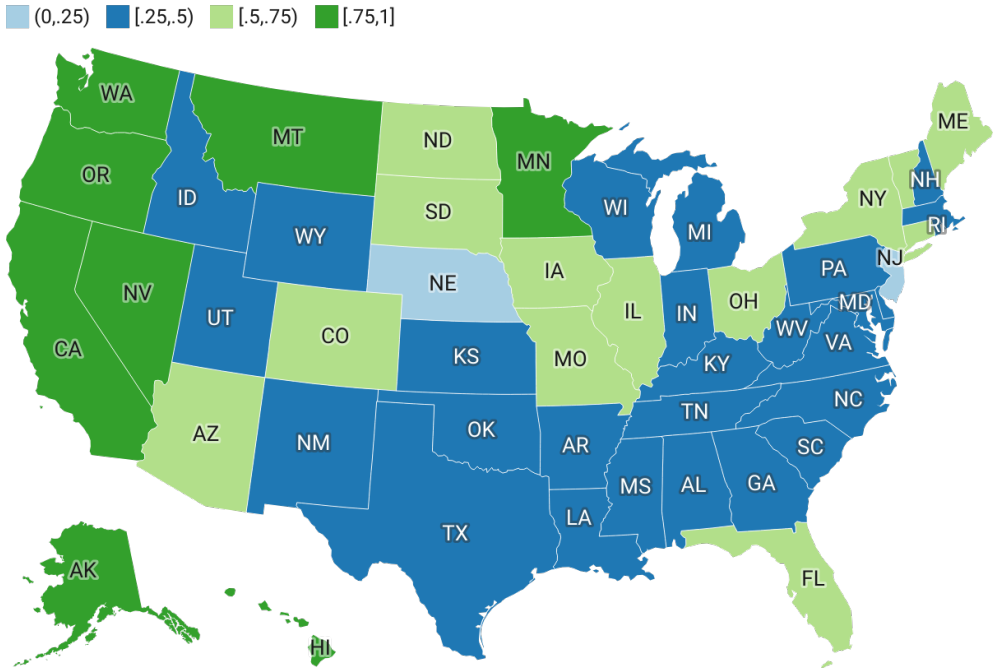


(b) Restaurant employment by educational attainment



Notes: Panel A plots the share of employed workers working in restaurants or bars in each decile of the income distribution. Deciles are defined at the state-year level. Panel B plots the share of employed workers working in restaurants or bars by educational attainment. These figures are made using the ACS (American Community Survey) 2023 1% sample. In the ACS, the reported industry is generally "the industry from which the person earned the most money."

Figure 2: 2019 $\frac{\text{Tipped Minimum Wage}}{\text{Minimum Wage}}$

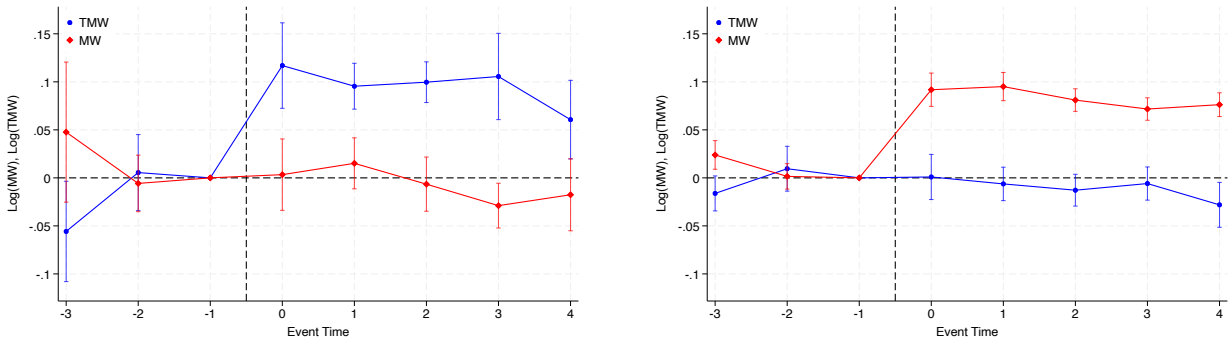


Notes: This maps the ratio of the tipped minimum wage to the minimum wage in 2019.

Figure 3: Effects of events on log(TMW) and log(MW)

(a) Tipped minimum wage change events

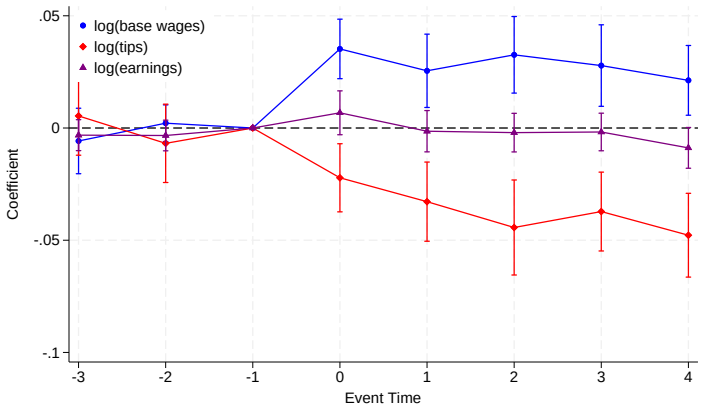
(b) Minimum wage change events



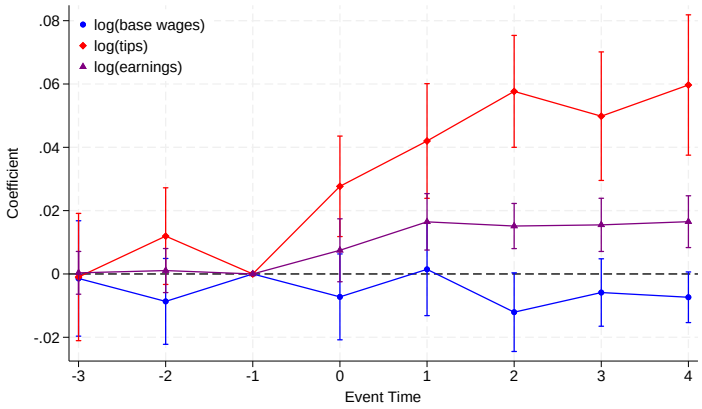
Note: These plots estimate the effect of tipped minimum wage increase events on the tipped minimum wage and the minimum wage and the effect of minimum wage increase events on both policies. They show estimates from equation 2. 95% confidence intervals are shown.

Figure 4: Effect of TMW and MW on composition of earnings

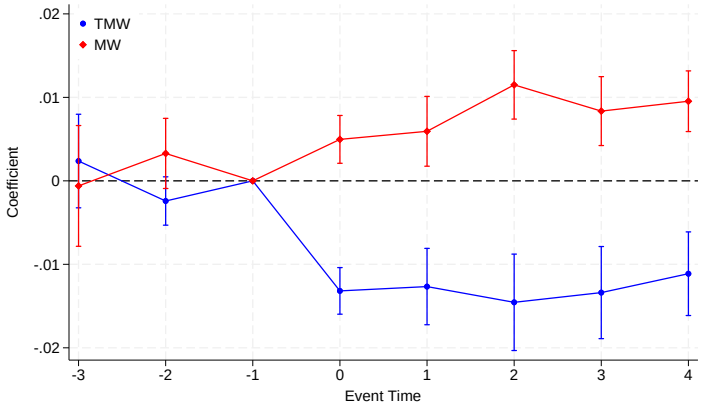
(a) Effect of TMW on types of earnings



(b) Effect of MW on types of earnings



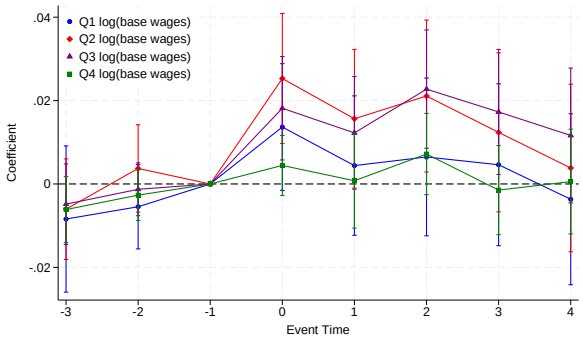
(c) Effect of policies on share of earnings in tips



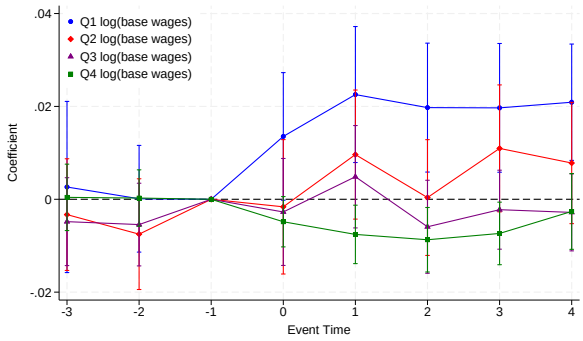
Note: Panels (a) and (b) estimate the effect of tipped minimum wage increases (TMW) and minimum wage increases (MW) on reported log(base wages), log(tips), and log(earnings) for tipped workers. The regressions are run at the firm-state level and are weighted by employment (see Equation 1). Panel (c) shows the effect of the two policies on the share of earnings that are tips, and does not limit to full-year workers, unlike panels (a) and (b). Earnings are always the sum of base wages and tips. Standard errors are clustered at the state level. 95% confidence intervals are shown.

Figure 5: Effect of TMW and MW on within-firm earnings dispersion

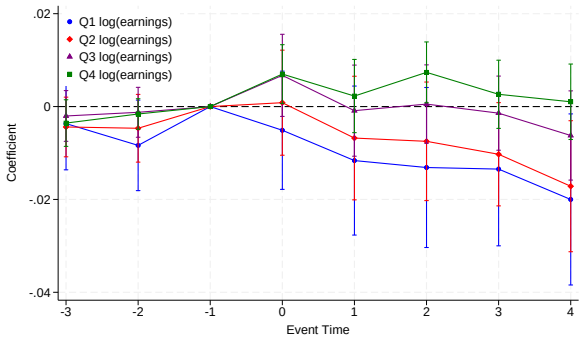
(a) Effect of TMW on base wages



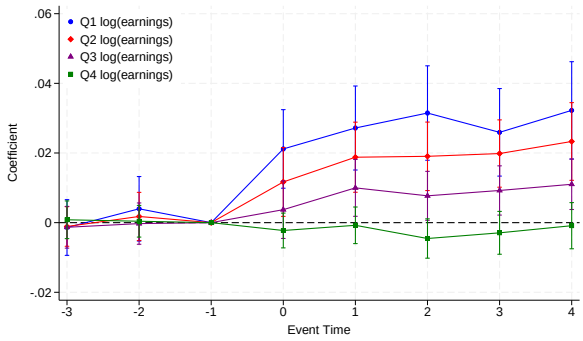
(b) Effect of MW on base wages



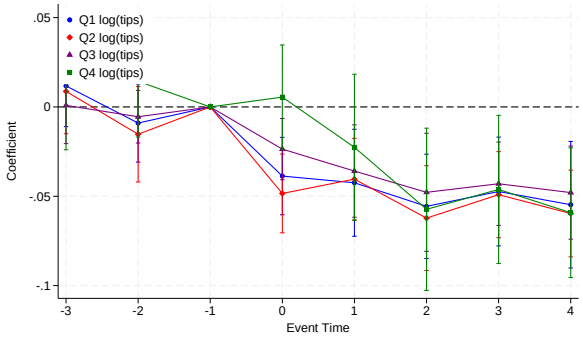
(c) Effect of TMW on reported earnings



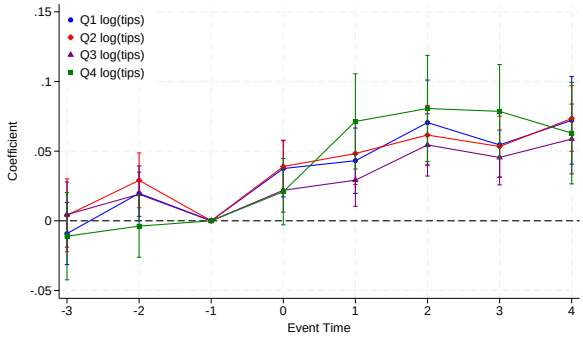
(d) Effect of MW on reported earnings



(e) Effect of TMW on reported tips

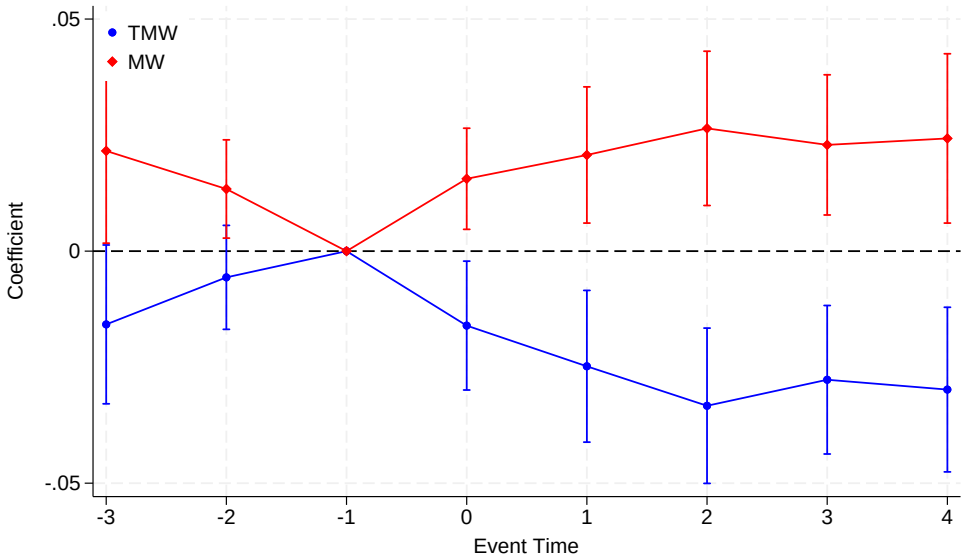


(f) Effect of MW on reported tips



Note: These plots estimate the effect of tipped minimum wage increases (TMW) and minimum wage increases (MW) on reported log(base wages), log(tips), and log(earnings) for workers in each quartile of their firm's earnings distribution. Regressions are run at the firm-state level and are weighted by employment (see Equation 1). Standard errors are clustered at the state level. 95% confidence intervals are shown. Quartiles are defined using all full-year workers (included non-tipped workers) for firms with at least 4 full-year W-2s.

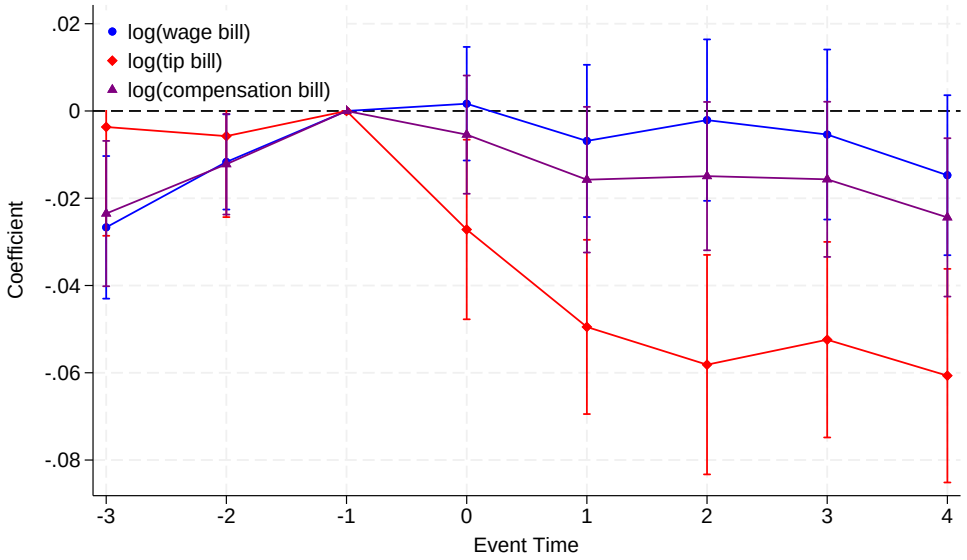
Figure 6: Effect of TMW and MW on employment, log(W-2 count)



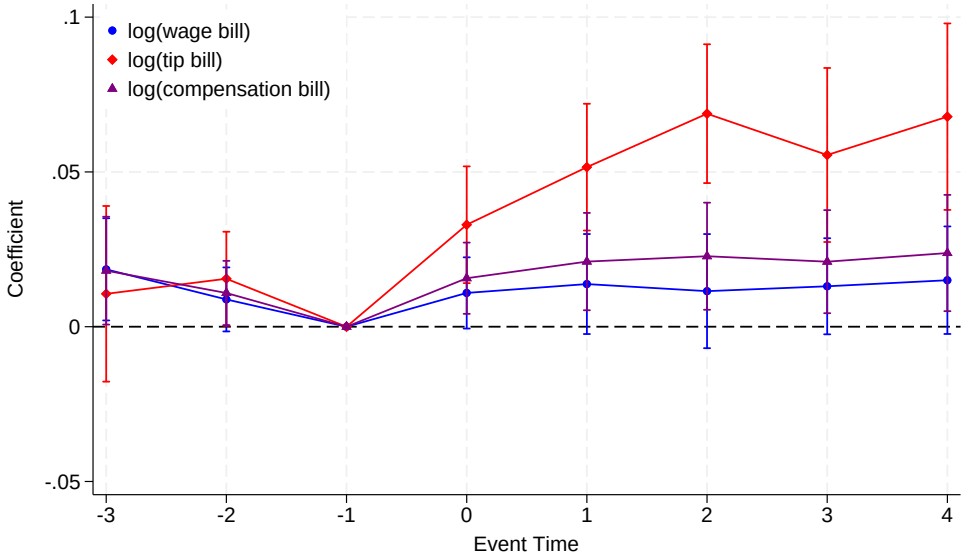
Note: This plot estimates the effect of tipped minimum wage increases (TMW) and minimum wage increases (MW) on the log(W-2 count). Regressions are run at the firm-state level and are weighted by employment (see Equation 1). Standard errors are clustered at the state level. 95% confidence intervals are shown.

Figure 7: Effect of TMW and MW on wage bill, tip bill, and compensation bill

(a) Tipped minimum wage change events



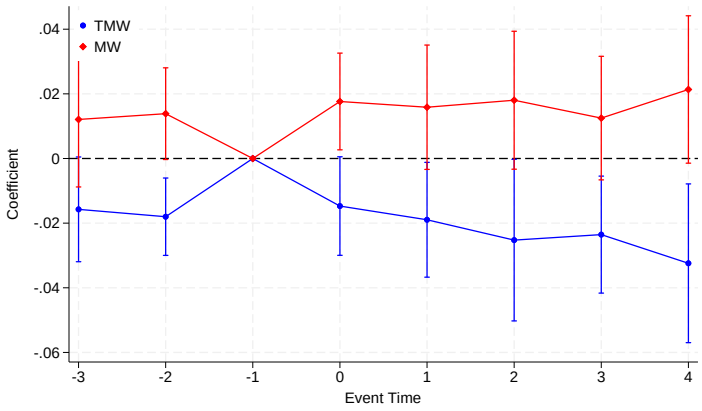
(b) Minimum wage change events



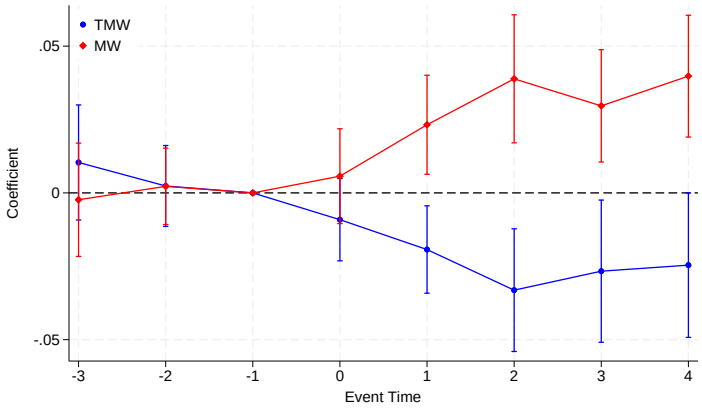
Note: These plots estimate the effect of tipped minimum wage increases (TMW) and minimum wage increases (MW) on log(wage bill), log(tip bill), and log(compensation bill). The wage bill is the sum of all base wages at the firm, the tip bill is the sum of all tips, and the compensation bill is the sum of both. There are no restrictions on whether workers earn tips or whether they are full-year workers. Regressions are run at the firm-state level and are weighted by employment (see Equation 1). Standard errors are clustered at the state level. 95% confidence intervals are shown.

Figure 8: Effect of TMW and MW on revenue, tip rate, and share making tips

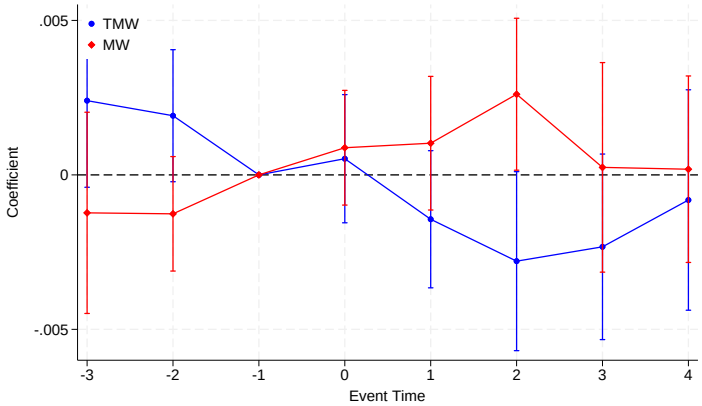
(a) Effect of TMW and MW on log(revenue)



(b) Effect of TMW and MW on log(tip rate)



(c) Effect of TMW and MW on share of workers making any tips



Note: This plot estimates the effect of tipped minimum wage increases (TMW) and minimum wage increases (MW) on the log(revenue), log(Tip Rate)—the ratio of tips to revenue, and the share of workers making any tips. Regressions are run at the firm-state level and are weighted by employment (see Equation 1). Standard errors are clustered at the state level. 95% confidence intervals are shown.

Tables

Table 1: Summary statistics for 2019 restaurants (mean and std. dev.)

	(1) Bars	(2) Full Service Restaurants	(3) Limited Service Restaurants	(4) Total
N	26,167	143,382	87,159	256,708
	(10.19%)	(55.85%)	(33.95%)	(100.00%)
W-2 Base Wages	8,931.25	9,871.83	10,257.36	9,906.85
	(5,572.36)	(5,395.94)	(5,883.82)	(5,596.52)
W-2 Earnings	11,677.42	12,611.89	10,914.43	11,940.31
	(6,578.47)	(6,207.89)	(6,077.83)	(6,252.55)
W-2 Tips	5,887.60	6,482.54	3,473.92	5,855.30
	(4,685.00)	(4,615.00)	(3,924.60)	(4,648.13)
Share Workers Tipped	0.48	0.45	0.22	0.37
	(0.37)	(0.30)	(0.34)	(0.34)
Tips/Earnings (if >0)	0.48	0.50	0.30	0.46
	(0.20)	(0.19)	(0.21)	(0.21)
Employment	17.64	39.31	43.90	38.66
	(25.41)	(131.43)	(231.00)	(166.99)
Revenue	742,723.34	1,287,558.39	1,078,083.82	1,161,235.39
	(909,838.08)	(1,358,083.51)	(1,465,498.78)	(1,368,150.31)
Tips/Revenue	0.06	0.07	0.02	0.05
	(0.06)	(0.06)	(0.03)	(0.06)
Labor Share	0.25	0.30	0.26	0.28
	(0.14)	(0.36)	(0.24)	(0.31)

Notes: Means are presented, and standard deviations are presented in parentheses. This table provides summary statistics for all bars, full service restaurants and limited service restaurants in 2019. Column (4) provides summary statistics for all firms. Observations are firms. Individual level variables are averaged at the firm-state level, then collapsed to the firm level, weighted by employment.

Table 2: Summary statistics for regression samples (mean and std. dev.)

	(1) Main	(2) Full Service	(3) Single State
N	484,156	366,683	364,312
Base Wages (full year)	13,687.60	13,575.23	13,713.06
	(5,004.78)	(4,770.99)	(4,841.54)
Earnings (full year)	19,210.36	19,621.14	19,384.63
	(6,399.79)	(6,354.02)	(6,429.25)
Tipped Worker Base Wages (full year)	9,524.06	8,967.83	9,596.59
	(5,155.75)	(4,871.93)	(5,047.16)
Tipped Worker Earnings (full year)	18,348.97	18,712.28	18,590.96
	(7,051.78)	(7,081.89)	(7,063.60)
Tips (full year)	8,824.91	9,744.45	8,994.37
	(5,353.01)	(5,114.81)	(5,356.50)
Tips/Earnings (if >0)	0.48	0.52	0.48
	(0.19)	(0.16)	(0.19)
Tips/Earnings	0.28	0.30	0.28
	(0.13)	(0.11)	(0.12)
Share Workers Tipped	0.61	0.60	0.62
	(0.19)	(0.17)	(0.18)
Employment (W2s)	85.96	83.44	63.53
	(236.89)	(237.76)	(81.64)
Revenue	2,503,883.01	2,617,974.59	2,248,359.41
	(3,806,238.83)	(3,934,781.85)	(2,698,197.16)
Tips/Revenue	0.09	0.10	0.09
	(0.04)	(0.04)	(0.04)
Tipped Worker Base Wages	6,139.65	5,824.43	6,191.34
	(3,506.93)	(3,301.82)	(3,365.08)
Tipped Worker Earnings	11,977.04	12,247.12	12,143.91
	(5,150.49)	(5,124.82)	(5,115.81)

Notes: Means are presented, and standard deviations are presented in parentheses. This table provides summary statistics for our regression samples. Observations span all years used and are at the firm-state level. Column (1) is our main sample, used for all main results and for the robustness checks using alternative event specifications. Column (2) is used for the robustness check on full service restaurants. Column (3) restricts to firms that had at least 80% of their W-2s in a single state in every year in our sample.

Table 3: Summary statistics for regression samples (mean and std. dev.)

	(1) Main	(2) Full Service	(3) Single State
N	484,156	366,683	364,312
Wage Bill	747,105.22	670,062.94	528,677.86
	(2,343,945.46)	(1,853,496.82)	(669,994.35)
Tip Bill	244,628.05	276,433.52	207,127.48
	(648,552.58)	(725,942.77)	(252,925.38)
Compensation Bill	991,733.27	946,496.46	735,805.34
	(2,836,484.99)	(2,529,486.99)	(878,374.82)
Tips	5,837.39	6,422.68	5,952.57
	(3,628.77)	(3,489.28)	(3,636.64)
Hires	37.20	36.35	27.36
	(104.37)	(106.17)	(40.54)
Separations	36.63	35.88	26.89
	(101.07)	(103.29)	(39.40)

Notes: Means are presented, and standard deviations are presented in parentheses. This table provides summary statistics for our regression samples. Observations span all years used and are at the firm-state level. Column (1) is our main sample, used for all main results and for the robustness checks using alternative event specifications. Column (2) is used for the robustness check on full service restaurants. Column (3) restricts to firms that had at least 80% of their W-2s in a single state in every year in our sample.

Table 4: Summary statistics for regression samples (mean and std. dev.)

	(1) Main	(2) Full Service	(3) Single State
N	484,156	366,683	364,312
Q1 Tipped Worker Base Wages (full year)	4,720.67	4,523.08	4,784.72
	(3,512.28)	(3,371.64)	(3,468.44)
Q2 Tipped Worker Base Wages (full year)	7,729.15	7,314.47	7,819.30
	(5,137.92)	(4,927.00)	(5,071.27)
Q3 Tipped Worker Base Wages (full year)	10,359.98	9,694.00	10,469.76
	(6,504.95)	(6,211.14)	(6,415.74)
Q4 Tipped Worker Base Wages (full year)	17,044.27	15,948.76	17,120.39
	(10,670.22)	(10,298.91)	(10,565.26)
Q1 Tipped Worker Earnings (full year)	8,966.50	9,153.97	9,095.82
	(5,114.05)	(5,143.96)	(5,132.96)
Q2 Tipped Worker Earnings (full year)	15,542.84	15,910.22	15,770.01
	(7,145.34)	(7,199.94)	(7,176.58)
Q3 Tipped Worker Earnings (full year)	21,401.60	21,888.72	21,726.08
	(8,598.44)	(8,643.80)	(8,632.06)
Q4 Tipped Worker Earnings (full year)	30,346.75	30,722.61	30,725.77
	(11,015.39)	(10,974.45)	(11,031.07)
Q1 Tips (full year)	4,245.83	4,630.89	4,311.10
	(3,404.07)	(3,410.33)	(3,399.01)
Q2 Tips (full year)	7,813.68	8,595.75	7,950.71
	(5,545.60)	(5,467.12)	(5,543.85)
Q3 Tips (full year)	11,041.62	12,194.72	11,256.31
	(7,183.27)	(6,947.46)	(7,201.83)
Q4 Tips (full year)	13,302.49	14,773.85	13,605.38
	(9,133.83)	(8,823.95)	(9,176.41)

Notes: Means are presented, and standard deviations are presented in parentheses. This table provides summary statistics for our regression samples. Observations span all years used and are at the firm-state level. Column (1) is our main sample, used for all main results and for the robustness checks using alternative event specifications. Column (2) is used for the robustness check on full service restaurants. Column (3) restricts to firms that had at least 80% of their W-2s in a single state in every year in our sample.

Table 5: Summary statistics for placebo regression samples (mean and std. dev.)

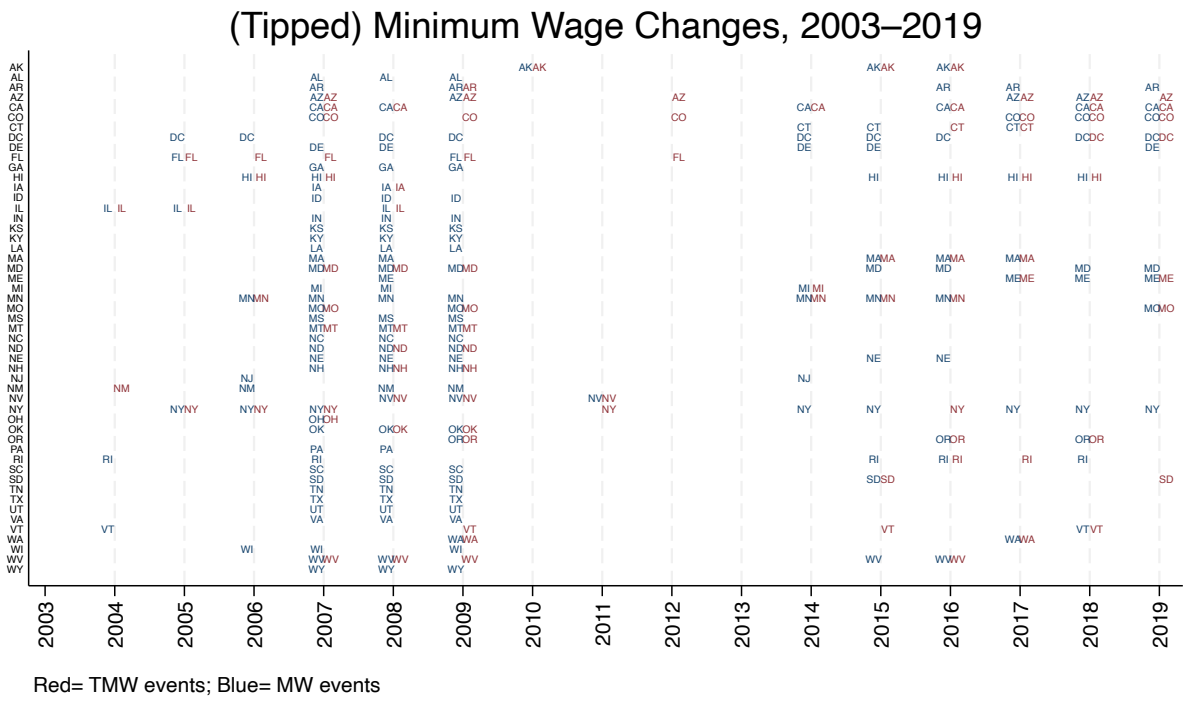
	(1) 5% sample of firms (all industries)
N	1,176,463
Base Wages (full year)	39,135.89 (26,405.93)
Earnings (full year)	39,528.37 (26,113.28)
Tips/Earnings	0.02 (0.09)
Employment (W2s)	54.43 (332.66)
Wage Bill	1,444,862.18 (18314358.89)
Tip Bill	13,420.61 (138,757.50)
Compensation Bill	1,458,282.79 (18317698.22)
Share Workers Tipped	0.06 (0.18)
Hires	20.97 (160.01)
Separations	19.97 (154.39)

Notes: Means are presented, and standard deviations are presented in parentheses. This table provides summary statistics for our final regression sample. Observations span all years used and are at the firm-state level. Column (1) is our placebo sample, using the 5% sample of firms from all industries rather than restaurants.

Appendix

A1 Additional Figures

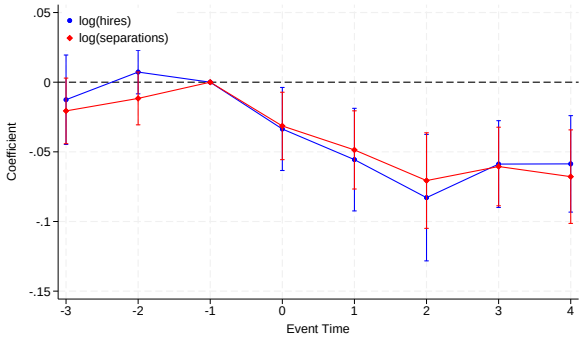
Figure A1: Events



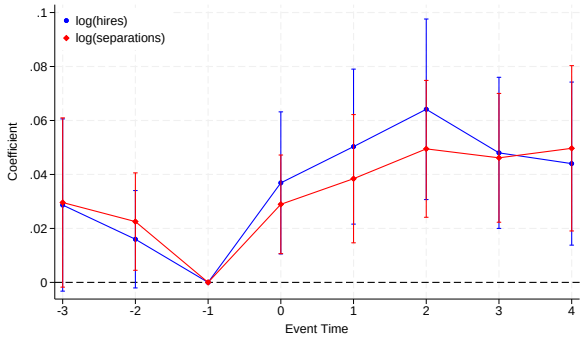
Note: This figure shows all events used in our main specification.

Figure A2: Effect of MW and TMW on hires and separations

(a) Effect of TMW on hires and separations



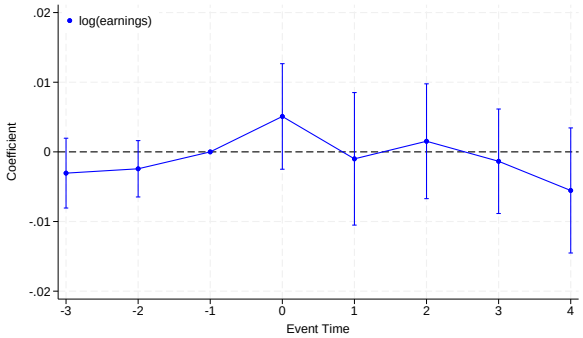
(b) Effect of MW on hires and separations



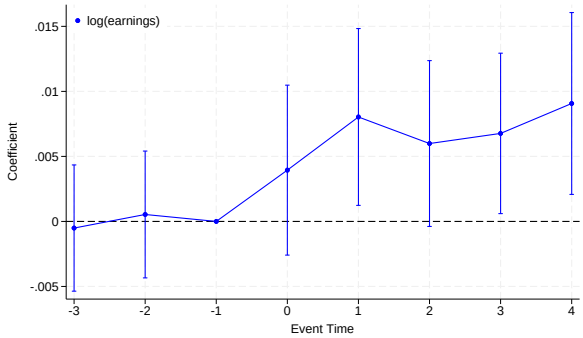
Note: This plot estimates the effect of tipped minimum wage increases (TMW) and minimum wage increases (MW) on the log(hires) and log(separations). Regressions are run at the firm-state level and are weighted by employment (see Equation 1). Standard errors are clustered at the state level. 95% confidence intervals are shown.

Figure A3: Effect of MW and TMW on earnings for all full-year workers (including non-tipped workers)

(a) Effect of TMW on earnings



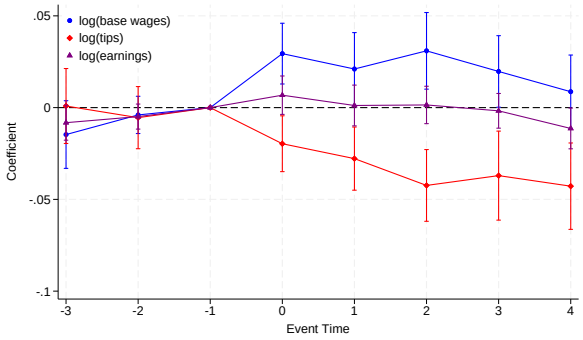
(b) Effect of MW on earnings



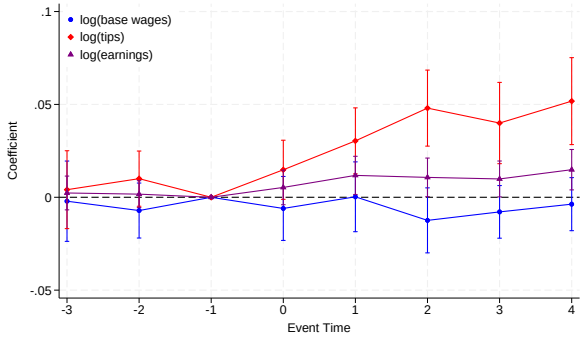
Note: This plot estimates the effect of tipped minimum wage increases (TMW) and minimum wage increases (MW) on the log(earnings), including non tipped workers. Regressions are run at the firm-state level and are weighted by employment (see Equation 1). Standard errors are clustered at the state level. 95% confidence intervals are shown.

Figure A4: Effect of MW and TMW on earnings for single state firms

(a) Effect of TMW on earnings



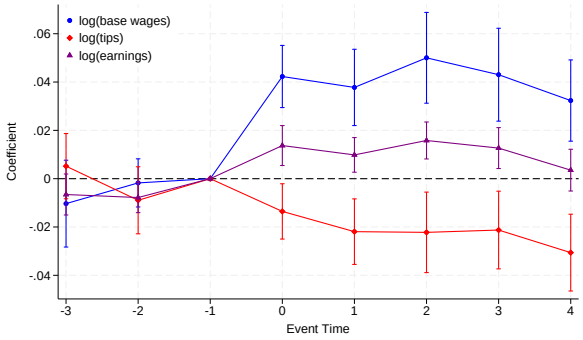
(b) Effect of MW on earnings



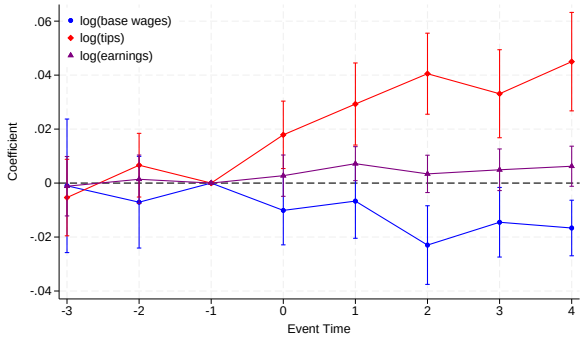
Note: This plot estimates the effect of tipped minimum wage increases (TMW) and minimum wage increases (MW) on the log(base wages), log(tips), and log(earnings) of tipped workers. These results are restricted to firms that had at least 80% of their W-2s in a single state in every year in our sample. Regressions are run at the firm-state level and are weighted by employment (see Equation 1). Standard errors are clustered at the state level. 95% confidence intervals are shown.

Figure A5: Effect of MW and TMW on earnings for all tipped workers (including non-full-year)

(a) Effect of TMW on earnings



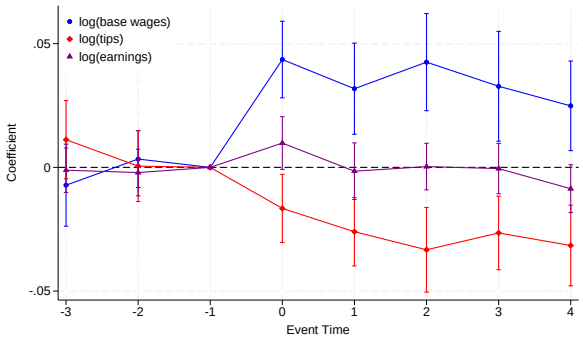
(b) Effect of MW on earnings



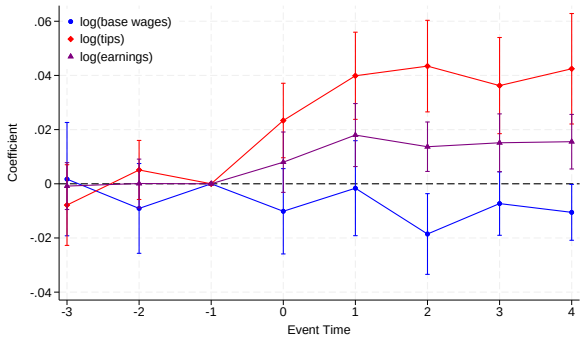
Note: This plot estimates the effect of tipped minimum wage increases (TMW) and minimum wage increases (MW) on the log(base wages), log(tips), and log(earnings) of tipped workers. These results include full-year and non-full-year workers. Regressions are run at the firm-state level and are weighted by employment (see Equation 1). Standard errors are clustered at the state level. 95% confidence intervals are shown.

Figure A6: Effect of MW and TMW on earnings for full-service restaurants

(a) Effect of TMW on earnings



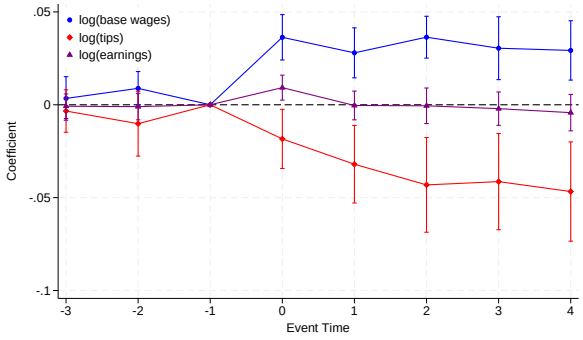
(b) Effect of MW on earnings



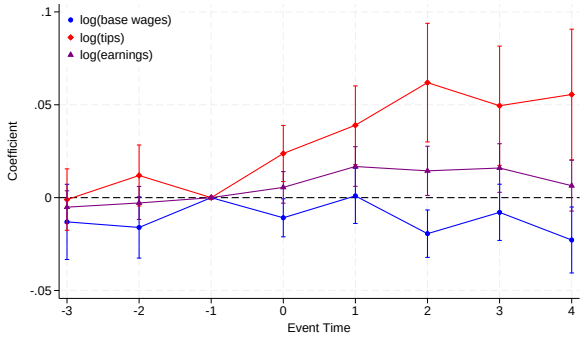
Note: This plot estimates the effect of tipped minimum wage increases (TMW) and minimum wage increases (MW) on the log(base wages), log(tips), and log(earnings) of tipped workers. These results are restricted to firms that are ever classified as full-service restaurants. Regressions are run at the firm-state level and are weighted by employment (see Equation 1). Standard errors are clustered at the state level. 95% confidence intervals are shown.

Figure A7: Effect of MW and TMW on earnings excluding federal events

(a) Effect of TMW on earnings



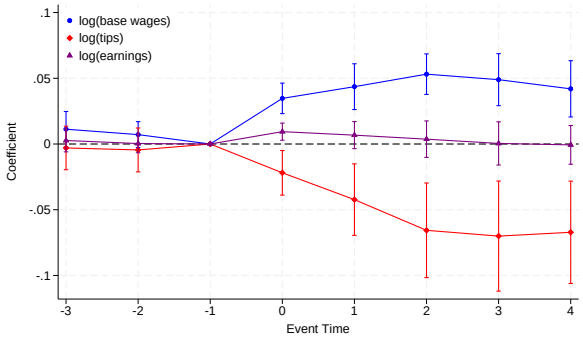
(b) Effect of MW on earnings



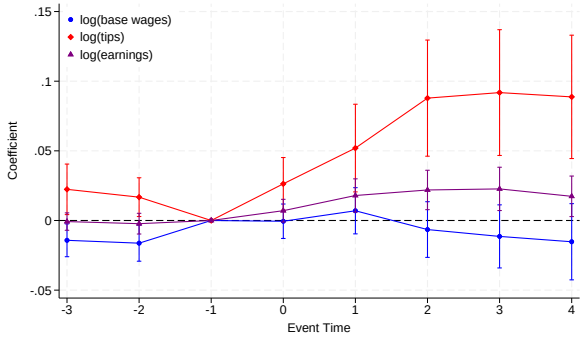
Note: This plot estimates the effect of tipped minimum wage increases (TMW) and minimum wage increases (MW) on the log(base wages), log(tips), and log(earnings) of tipped workers. These regressions exclude federal changes as events. Regressions are run at the firm-state level and are weighted by employment (see Equation 1). Standard errors are clustered at the state level. 95% confidence intervals are shown.

Figure A8: Effect of MW and TMW on earnings collapsing consecutive events

(a) Effect of TMW on earnings



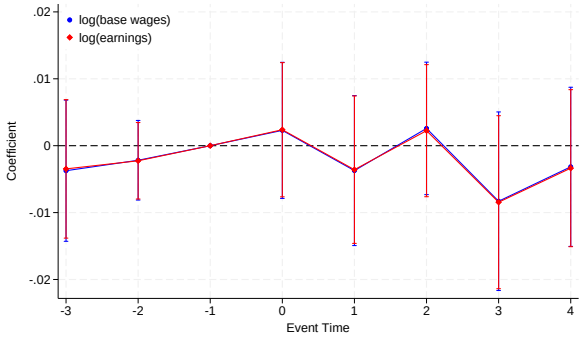
(b) Effect of MW on earnings



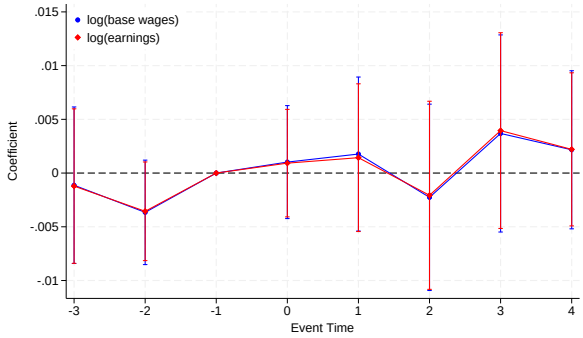
Note: This plot estimates the effect of tipped minimum wage increases (TMW) and minimum wage increases (MW) on the log(base wages), log(tips), and log(earnings) of tipped workers. These results use a definition of event where multi-year increases are collapsed to the first year. Regressions are run at the firm-state level and are weighted by employment (see Equation 1). Standard errors are clustered at the state level. 95% confidence intervals are shown.

Figure A9: Effect of MW and TMW on earnings for 5% sample of all firms (all industries)

(a) Effect of TMW on earnings



(b) Effect of MW on earnings



Note: This plot estimates the effect of tipped minimum wage increases (TMW) and minimum wage increases (MW) on the log(base wages), log(tips), and log(earnings) of tipped workers. These results use the 5% sample of all firms rather than the restaurant sample. Regressions are run at the firm-state level and are weighted by employment (see Equation 1). Standard errors are clustered at the state level. 95% confidence intervals are shown.

A2 Proofs

Proof of Proposition 1:

The firm's problem when subject to the tipped minimum wage $\bar{w}$ is:

$$\max_T P(T)L(\bar{w}+T) - \bar{w}L(\bar{w}+T)$$

First order condition:

$$-P'(T)L(T+\bar{w}) = (P(T)-\bar{w})L'(T+\bar{w})$$

Implicitly differentiating this expression [17]:

$$\begin{aligned} &-\left(P''(T)L + P'(T)L'\right)dT \;-\; P'(T)L'\,d\bar{w} \\ &= \;\left(P'(T)L' + (P(T)-\bar{w})L''\right)dT \;+\; \left(-L' + (P(T)-\bar{w})L''\right)d\bar{w} \end{aligned}$$

Rearranging:

$$\frac{dT}{d\bar{w}} = \frac{-P'(T)L' + L' + (P(T)-\bar{w})L''}{2P'(T)L' + (P(T)-\bar{w})L'' + P''(T)L}$$

Firms weakly profit on their workers so $P(T)-\bar{w} \geq 0$. This allows us to sign each term on the numerator as positive and each term on the denominator as negative.

Of course, tips cannot fall negative—so if tips are already zero then they cannot fall further. So tips weakly fall in response to increases in the binding tipped minimum wage.

Proof of Proposition 2:

To know whether total earnings increased or decreased, we want to know if $\frac{dT}{d\bar{w}}$ was above or below -1 (the point at which the positive base wage effect is fully cancelled out by a negative tip effect). For this proposition, we want to know the effect of a small increase to the tipped minimum wage above the unregulated wage. To answer this, we will now solve the unregulated problem.

$$\max_{T,w} P(T)L(w+T) - wL(w+T)$$

The wage FOC is $P(T)L' = L + wL'$. The tip FOC is $P'(T)L + P(T)L' = wL'$. Combining these two expressions, we have $-P'(T) = 1$. In the unregulated equilibrium, the firm trades off tip and base wage pay. Holding constant the firm's employment, the cost of paying a dollar of base wage pay (per worker) is 1 while the cost of a dollar of tip pay (per worker) is $-P'(T)$—the extent to which prices fall.

[17] Let $L(T+\bar{w})$, $L'(T+\bar{w})$, $L''(T+\bar{w})$ be denoted by L, L', L'' for simplicity

Plugging in the expression, $-P'(T) = 1$, which holds in the unregulated equilibrium to the expression for $\frac{dT}{d\bar{w}}$ from the previous proof, we have:

$$\frac{dT}{d\bar{w}}(\bar{w} = w_{unreg}) = \frac{(P(T) - \bar{w})L''}{-2L' + (P(T) - \bar{w})L'' + P''(T)L}$$

Since the denominator is larger in magnitude than the numerator, $\frac{dT}{d\bar{w}}(\bar{w} = w_{unreg}) > -1$.

Proof of Proposition 3:

Now, we ask whether it is possible for an increase to the tipped minimum wage to cause earnings to fall. We will show that around the value of $T = 0$, $\frac{dT}{d\bar{w}}(\bar{w}) < -1$ when $P(T)$ has low curvature for small tip values. This which suggests that there exists some threshold value of tipped minimum wage which causes a level of tips where $\frac{dT}{d\bar{w}}(\bar{w} = w_{cutoff}) = -1$.

First, note that there will be some value of the tipped minimum wage at which $T = 0$. If $\bar{w} = P(0)$, for example, the firm would lose money on each worker if they paid any tips.

From the proof of proposition X, we have $\frac{dT}{d\bar{w}} = \frac{-P'(T)L' + L' + (P(T) - \bar{w})L''}{2P'(T)L' + (P(T) - \bar{w})L'' + P''(T)L}$. This expression is less than -1 if:

$$(1 + P'(T))L' > -P''(T)L$$

Around $T = 0$, we have:

$$L' > -P''(0)L$$

If $P''(0)$ is sufficiently small, then this inequality holds and $\frac{dT}{d\bar{w}} < -1$. In particular, many reasonable function forms will have $P''(0) = 0$ which unambiguously satisfies the inequality.