The Costs to Fast-Food Restaurants of a Minimum Wage Increase to $10.50 per Hour

Jeannette Wicks-Lim and Robert Pollin

Political Economy Research Institute

University of Massachusetts, Amherst

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POLITICAL ECONOMY RESEARCH INSTITUTE
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INTRODUCTION

In response to a rise in political activity around proposals to raise the federal minimum wage, currently at $7.25 per hour, major media outlets have begun to focus on the specific question of how much a minimum wage increase would cost low-wage businesses, such as fast-food restaurants.[1] Whether business costs from a minimum wage hike are large or small is a critical issue. If these cost increases are large, employers may try to minimize the impact of the higher minimum wage on their wage bill by reducing their workforce. Low-wage workers may then lose their jobs or experience cutbacks in their work schedule sufficient to outweigh any earnings gains through their higher wage. Such outcomes could lead to worsening, instead of improving, the living standards of low-wage workers. On the other hand, if the cost increases are small, such negative unintended consequences are unlikely.

As part of this debate, we considered the potential impact of a proposal to raise the minimum wage to $10.50 put forth by Florida Congressman Alan Grayson in H.R. 1346. We concluded that such a minimum wage hike would meaningfully improve the living standards for low-wage workers and their households in part because the new minimum wage would impose only modest costs to businesses, including low-wage, fast-food restaurants. The $10.50 minimum wage would therefore boost earnings while avoiding the negative, unintended consequence of reducing employment.

We presented these findings in a petition supporting H.R. 1346 signed by over 100 professional economists.[2] In particular, we described how raising the minimum to $10.50 would impose a cost increase to the average fast-food restaurant equal to 2.7 percent of their sales revenue. In other words, assuming all else equal, the average fast-food restaurant could fully cover the costs of the $10.50 minimum wage by raising their prices 2.7 percent. This is equivalent to increasing the price of a $4.50 Big Mac to $4.60. This illustration caught the attention of writers at the *Daily Beast*, who then used our estimates to create its "McPoverty Calculator,"

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[1] See for example, "This Is What Would Happen If Fast-Food Workers Got Raises," by Venessa Wong, *Bloomberg BusinessWeek*, August 2, 2013 and "$12 Minimum Wage for Walmart Workers Would Cost the Average Shopper Just 46 Cents per Trip," by Caroline Fairchild, *The Huffington Post*, July 18, 2013.

[2] This July 2013 petition, "Economists in Support of a $10.50 U.S. Minimum Wage," can be viewed at: http://www.peri.umass.edu/fileadmin/pdf/resources/Minimum_Wage_petition_website.pdf .

an interactive website feature posted on 8/1/2013 that allowed readers to see how much fast-food workers' wages could rise given small increases in fast-food prices.[3]

Commentary by Ryan Chittum of the *Columbia Journalism Review* claims in his piece "*Daily Beast* Doubles Down on Big Mac Minimum Wage Nonsense," (8/16/13) that the *Daily Beast*'s estimates of the costs of a minimum wage increase, based on our research, are too low. He specifically calls into question our estimate that a $10.50 federal minimum wage would raise the costs of the average fast-food restaurant by an amount equal to 2.7 percent of their sales revenue. The main thrust of his critique is that our estimate is unreliable because it is extrapolated from past research as opposed to calculated directly from current industry data.

Chittum misunderstands the basis for our 2.7 percent estimate. As we explained in a technical appendix to the petition[4], we extrapolated our 2.7 percent figure from the findings of five empirical studies firmly grounded in industry-specific data. Each of these studies measures how the business costs of fast-food establishments increased in response to minimum wage hikes in the range of 10 percent to 65 percent. This allows us to observe the pattern of how costs increase for minimum wage hikes of various sizes, and predict well how costs will rise given a 44.8 percent minimum wage hike from $7.25 to $10.50. In other words, we effectively built our estimate from the industry data analyzed in all five studies. Moreover, Chittum makes assumptions about the basic pay structure in the fast-food industry that are at odds with the employment and wage data from the Labor Department. We demonstrate this in detail in this research brief.

In what follows, we provide a step-by-step illustration of how the minimum wage impacts the business costs of fast-food restaurants to explain: (1) why a 44.8 percent federal minimum wage hike from $7.25 to $10.50 would result in a modest cost increase equal to 2.7 percent of its sales revenue for the average fast-food establishment, consistent with past research findings; and (2) how Chittum's assumptions about the way a $10.50 minimum wage would impact the fast-food industry's payroll do not reflect available industry data.

ESTIMATING BUSINESS COST INCREASES FROM CURRENT INDUSTRY DATA

The crucial number challenged by Chittum is our estimate that the average fast-food business could cover the entire cost increase associated with a $10.50 minimum wage with 2.7 percent price increase. Where did we get this 2.7 percent figure? This figure is based on a key statistic—the cost-increase-to-sales ratio. Specifically, this is a ratio of a business's total cost increase, relative to its revenue, resulting through a minimum wage increase.

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[3] See the "The McPoverty Calculator," by Sam Schlinkert and Filipa Ioannou, *The Daily Beast*, August 1, 2013.

[4] This technical appendix can be found here: http://www.peri.umass.edu/fileadmin/pdf/resources/ minwage_notesjune19.pdf

As we noted above, we extrapolated our 2.7 percent figure from a set of five empirical studies that specifically measure how minimum wages affect the business costs of fast-food restaurants. To test the reliability of our extrapolation, we now also estimate the cost-increase-to-sales ratio directly using current industry data.

We begin with an estimate of the overall costs. Specifically we need to answer the following questions: (1) How many workers can expect to get raises? (2) How big are these raises? (3) What is their overall impact on the wage bill?

The wage, hours, and employment figures are based on 2012 standard labor market data published by the U.S. Labor Department. These include the Occupational Employment Statistics (OES), the Current Population Survey (CPS), the Quarterly Census of Employment and Wages (QCEW), and the Current Employment Statistics (CES).[5]

We include in our cost figure two categories of raises. The first is mandated raises— the raises that get all workers to the new $10.50 minimum. The second is ripple-effect raises. These are non-mandated raises that put near-minimum wage workers above the new minimum. Employers provide these ripple-effect raises in order to maintain a similar wage hierarchy before and after a minimum wage increase.

We assume that any limited-service restaurant workers earning between $7.25 and $10.50 will receive mandated raises that get them at least up to $10.50. Estimating which workers would get ripple-effect raises, as well as the size of these raises, is necessarily a more speculative exercise since such raises are not legally required.

We estimate the size and extent of ripple-effect raises using the results of a study by one of us.[6] That study looks at the impact of minimum wage hikes, from 1983 to 2002, on wages across the wage distribution. Its basic finding is that ripple-effect raises strongly compress wages at the low end. We apply the study's estimated minimum wage effects on wages across the wage distribution, and assume that the impact from a 44.8-percent minimum wage hike can be expected to extend up to workers earning $12.00 per hour. We present the figures for determining the costs of both mandated and ripple-effect raises in Table 1. (See Technical Appendix for details on estimating workers' characteristics.)

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[5] Except for the CPS, each of these sources provides data specific to the 6-digit NAICS industry (722211) called the "limited-service restaurant industry," which include fast-food restaurants. Here and throughout, we use fast-food restaurants and limited-service restaurants interchangeably. The CPS provides data specific to the 3-digit NAICS industry called "Restaurants and other food services." See Technical Appendix for details on how we used CPS data.

[6] See Chapter 11 in *A Measure of Fairness: The Economics of Living Wages and Minimum Wages in the United States* by Robert Pollin, Mark Brenner, Jeannette Wicks-Lim, and Stephanie Luce (2008, Cornell University Press).

Wage group	$7.25-$8.50	$8.50-$9.50	$9.50-$10.50	$10.50-$12.00	$12.00+
1. Number of workers	1.0 million	1.3 million	512,000	256,000	549,000
2. Average wage	$7.94	$9.05	$10.05	$11.43	$14.92
3. Average annual hours	999 hours (27 hrs/wk x 37 wks/yr)	1,271 hours (31 hrs/wk x 41 wks/yr)	1,485 hours (33 hrs/wk x 45 wks/yr)	1,620 hours (36 hrs/wk x 45 wks/yr)	1,800 hours (40 hrs/wk x 45 wks/yr)
4. Annual wage bill before $10.50 minimum	$8.1 billion	$15.9 billion	$7.6 billion	$4.7 billion	$14.7 billion
5. Average raise	32.2%	17.1%	7.5%	1.5%	0%
6. Average wage after $10.50 minimum	$10.50	$10.60	$10.80	$11.60	$14.92
7. Annual cost of raises	$2.6 billion	$2.7 billion	$570 million	$71 million	$0
8. Annual wage bill after $10.50 minimum	$10.8 billion	$18.6 billion	$8.2 billion	$4.8 billion	$14.7 billion

Source: Hours and wage data are from 2012 CPS; employment level for the limited-service restaurants comes from the 2010 Quarterly Census of Employment Wages and adjusted to 2012 using the employment growth rate between 2010 and 2012 for limited-service restaurants from the Current Employment Statistics.

Starting with the first column, we can see that about 1 million limited-service restaurant workers earn wages at the bottom of the wage scale—between $7.25 and $8.50. These workers can expect to get a raise that pushes them up to the new $10.50 minimum, up from their current average of nearly $8.00. This is an average raise of 32 percent.

The next group of workers in this industry earns between $8.50 and $9.50. We estimate that these approximately 1.3 million workers will, on average, receive raises that push their wages slightly higher than the new $10.50 minimum to $10.60 in order to preserve their position in the wage hierarchy just above the bottom rung. Their raises, however, are smaller than those of the lowest paid workers. The average wage increase is from $9.05 to $10.60, or 17 percent. These smaller raises result from the fact that they began at higher wages. In other words, minimum wage increases tend to compress, rather than simply shift, the wage distribution at the low end.

The third group of workers—earning $9.50 to $10.50—will similarly get raises that put them above the new minimum so that they retain their position in the wage hierarchy. Here again, these workers' raises are smaller in size than the other groups of workers. These 512,000 workers should get an average raise of 7.5 percent, from $10.05 to $10.80.

The fourth group of workers, earning between $10.50 and $12.00, make up the last group of workers we estimate would be affected by a minimum wage hike to $10.50.

These 256,000 workers receive ripple-effect raises only, bringing their average $11.43 wage up to $11.60, a 1.5 percent raise.

We assume that the final group of workers shown in column 5, who earn more than $12.00 an hour, do not experience any wage raises.

To calculate the total annual cost of these raises (shown in row 7), we simply multiply for each group of affected workers, i.e., those earning between $7.25 and $12.00, the number of workers (row 1) by their average annual hours (row 3) and their average raise (row 5).

Table 2 provides summary figures for all affected workers. We estimate that about 3.1 million fast-food workers out of a total workforce of 3.7 million, earn on average $9.20 in 2012. These workers can expect to receive an average raise of 16.4-percent to $10.72. Given that the average affected worker has an annual work schedule of 1,272 hours, these raises add up to a total of $6.0 billion.

TABLE 2: AVERAGE WAGE INCREASES DUE TO A $10.50 MINIMUM WAGE FOR ALL AFFECTED LIMITED-SERVICE RESTAURANTS WORKERS

Affected workers only	$7.25-$12.00
1. Number of workers	3.1 million
2. Average wage*	$9.20
3. Average annual hours	1,272 hours (31 hrs/42 wks/yr)
4. Annual wage bill before $10.50 minimum	$36.4 billion
5. Average raise*	16.4%
6. Average wage after $10.50 minimum	$10.72
7. Annual cost of raises	$6.0 billion
8. Annual wage bill after $10.50 minimum	$42.4 billion

Source: See Table 1 and notes to Table 1, page 4.
* Average wage and raise are per hour worked *not* per worker *in order to calculate the cost increase for the annual wage bill.*

To get the cost-increase-to-sales ratio, we take a few additional steps shown in Table 3. The additional economic data we use come from the 2007 U.S. Economic Census and the 2012 Labor Department's Employer Costs for Employee Compensation program.

First, we add another $458 million to the $5.98 billion increase to the wage bill to account for the higher level of taxes that these employers would owe due to their larger payroll. In sum, the total cost increase from a $10.50 minimum for fast-food employers comes to $6.44 billion.

Second, we need to estimate the 2012 overall sales level for this sector. Unfortunately, the U.S. Economic Census only provides an estimate of this figure every five

years; the most recent published figure is for 2007. We can update this figure to 2012, by looking at what the payroll-to-sales ratio has been in the recent past and then apply this ratio to the current total payroll implied by 2012 wage data described above.

Current payroll includes two basics parts: wage and non-wage pay. We estimate, as shown in row 4 of Table 1 (page 4), that the total wage bill before taking into account the $10.50 minimum adds up to about $51.0 billion, including the annual wage bill of all five groups of workers, not just those affected by the minimum wage. Non-wage pay includes other types of pay that employees get aside from the wages, such as health insurance benefits, some bonuses, and overtime pay. If we include these other types of pay, we estimate that total payroll would amount to about $60.7 billion.[7]

From 2002 and 2007, the payroll of employers in the limited-service restaurant industry as a share of overall sales declined from 26.1 percent in 2002 to 25.1 percent in 2007. Unfortunately, we do not have data on how this trend has proceeded between 2007 and 2012. We therefore simply assume that in 2012, payroll accounted for the same share of sales as in 2007, i.e., 25 percent. Based on this assumption, combined with an estimated total payroll of $60.7 billion, we calculate that total sales in 2012 would be on the order of $241.0 billion.[8]

We can now simply compare the total cost increase ($6.4 billion) to the total sales for this industry ($241.0 billion). As we see, the figure that results is 2.7 percent.

TABLE 3. TOTAL COST INCREASE RELATIVE TO SALES FOR LIMITED-SERVICE RESTAURANTS

Total cost increase from minimum wage increases	$6.4 billion
Total wage increases	$6.0 billion
+ Higher payroll taxes (7.65%)	$458 million
Estimated sales of limited-service restaurants	$241.0 billion
Total cost increase of limited-service restaurants	2.7% ($6.4 billion/ $241.0 billion)

Sources: See Table 1(page 4) and Table 2 (page 5). Sales data estimated from 2007 U.S. Economic Census.

This 2.7 percent cost-increase-to-sales ratio estimate is identical to the 2.7 percent estimate we presented in our technical appendix supporting our August 2013 petition in favor of a $10.50 federal minimum wage. This outcome is not a coincidence. As

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[7] As part of its Employer Costs of Employee Compensation program, the Labor Department publishes quarterly estimates of the share that wages and salaries make up of total compensation by major industry and some worker characteristics. For our calculation here, we averaged the quarterly figures for 2012 for part-time workers in the accommodations and food service industry—i.e., 84.2 percent. Therefore total payroll equals about $60.7 billion ($51.0 billion/84.2 percent = $60.7 billion). Note that we did not use a lower figure—80.2 percent—for the accommodations and food service overall since limited-service restaurant workers receive significantly less non-wage pay than the broader industry group. Using this lower figure would cause us to overestimate the overall sales figure and therefore *underestimate* the cost-increase-to-sales ratio.

[8] I.e., $60.7 billion/25 percent = $241.0 billion.

described in detail in both the Technical Appendix to the petition and this research brief, we extrapolated the 2.7 percent figure from the findings of five studies, three of which used the same basic methodology as that described in detail above.

More specifically, we extrapolated this 2.7 percent figure by doing the following. We first created a scatterplot graph relating, from each study, the size of the minimum wage hike examined to the estimated size of the cost-increase-to-sales ratio. We then identified the best fitting trend-line to these five data points, and used the function underlying this line to extrapolate the cost-increase-to-sales ratio for a 44.8 percent minimum wage hike. In other words, the 2.7 percent cost-increase-to-sales ratio is the number best predicted by the findings of five published studies.

In sum, whether we estimate the cost-increase-to-sales ratio directly from current industry data or extrapolate from past empirical studies, we produce the same number: a $10.50 minimum wage would cause business costs for limited-service restaurants to rise by an amount equal to 2.7 percent of sales.

WHAT EXPLAINS THE MODEST SIZE OF THE COST INCREASE?

From the above exercise, we can distill here the three features of the low-wage, fast-food industry that explain why a sizeable 44.8 percent minimum wage hike from $7.25 to $10.50 results in a modest cost increase equal to just under 3 percent of sales for fast-food restaurants.

First, the minimum wage hike will likely affect only 60.0 percent of the average fast-food restaurant's total payroll. We can see by comparing the total annual wage bill for affected workers just prior to the minimum wage hike of $36.4 billion (see Table 2, page 5) to our total payroll figure of $60.7 billion, or 60.0 percent. This may appear surprising given that the 3.1 million affected workers—earning between $7.25 and $12.00 per hour—make up 84 percent of the industry's 3.7 million total workforce (see Table 1, page 4 and Table 2, page 5). This is, in part, because the workers affected by the minimum wage also get paid the lowest wages. They also work the fewest hours per week and the fewest weeks per year. As a result, the portion of the wage bill going to these workers is smaller than their share of the total headcount of workers. The other factor, as we mentioned above, is that payroll includes both wage and non-wage pay.

Second, the average raise that these workers will receive is much smaller than the 44.8 percent required to increase a minimum wage worker's wage from $7.25 to $10.50. When it comes to assessing the impact of these raises on the overall wage bill, what matters is the average raise *per hour worked*. As we showed above, workers earning between $7.25 and $12.00 will likely get raises, either mandated and/or ripple-effect raises. However, the lowest-wage workers who get the largest raises from the minimum wage hike also work the fewest hours. Raises are much smaller for workers at higher wages, who work more average hours. Therefore, as we show in Table 2 (page 5), the estimated average raise *per hour worked* is 16.4 percent. Since

the average raise of 16.4 percent only applies to 60.0 percent of total payroll, total payroll can be expected to increase by 9.9 percent.

Finally, payroll in the fast-food industry represents 25 percent of the average restaurant's total sales revenue. As a result, any increase in payroll will represent a much smaller increase as a percent of sales. Specifically, a 9.9 percent increase in payroll represents a 2.5 percent of total sales (9.9 percent x 25.1 percent = 2.5 percent). Tacking on the employers' rise in payroll taxes (7.65 percent) raises this figure to 2.7 percent (2.7 percent x 1.0765 = 2.7 percent).

To review, three features of the fast-food restaurant industry's pay structure combine to reduce the impact of a 44.8 percent minimum wage increase to a cost increase that is less than 3 percent of sales:

1) The pay that goes to the lowest paid workers who would benefit from the minimum wage hike represent a much smaller share of an employer's total payroll than indicated by their share of the total workforce;

2) The average percentage raise workers get will be much less than the percentage increase in the minimum wage; and

3) These raises only increase labor costs and labor costs only represent 25 percent of their total sales.

In his August 16, 2013 critique, Chittum estimates that a $10.50 minimum wage would produce a cost increase of about 5.2 percent of sales. His figure is based on assumptions that are at odds with the basic features of the fast-food industry pay structure.

The errors in Chittum's own calculations are that he assumes an excessively low average wage for fast-food workers and that these workers' wages account for an excessively large proportion of total payroll. He specifically assumes that for the average McDonalds outlet, workers who account for 83 percent of total payroll earn an average wage of $8.50 per hour. His source for these assumptions is an income statement for an average McDonald's franchise in the U.S. But the income statement on which Chittum relies shows only that "crew" payroll amounts to 20 percent of sales, and "manager" payroll amounts to 4 percent of sales (see Table 4, page 9). This income statement provides no other details on payroll.

In contrast, as we showed in our detailed calculations above, based on 2012 Labor Department data, we find that the lowest paid workers, whose wages account for 60 percent of payroll, earn an average wage of $9.20. Recall this group of workers earn between $7.25 and $12.00 per hour. This implies that, according to Labor Department data, the earnings of workers averaging $8.50 per hour will make up a much smaller share of payroll—60 percent at most, about twenty percentage points lower than what Chittum assumes.

	Dollar Amount	% of Net Sales
Net Sales	**$2,700,000**	**100.0%**
Food Costs	$810,000	30.0%
Paper Costs	$108,000	4.0%
Total Cost of Sales	**$918,000**	**34.0%**
Gross Profits	**$1,782,000**	**66.0%**
Crew Payroll	$540,000	20.0%
Manager Payroll	$108,000	4.0%
Payroll Taxes	$54,000	2.0%
Advertising	$108,000	4.0%
Promotions	$13,500	0.5%
Outside Services	$27,000	1.0%
Linen	$5,400	0.2%
Operating Supplies	$27,000	1.0%
Maintenance & Repair	$40,500	1.5%
Utilities	$81,000	3.0%
Cash Over/Short	$2,700	0.1%
Miscellaneous	$13,500	0.5%
Controllable Expenses	**$1,020,600**	**37.8%**
Profit After Controllables	**$761,400**	**28.2%**
Rent & Fees	$391,500	14.5%
Legal & Accounting	$8,100	0.3%
Insurance	$54,000	2.0%
Taxes & Licenses	$27,000	1.0%
Miscellaneous Income/Expenses	$2,700	0.1%
Depreciation/Amortization	$94,500	3.5%
Interest Expense	$27,000	1.0%
Net Non-Product	$2,700	0.1%
Total Non-Controllable Expenses	**$607,500**	**22.5%**
Store-Level Operating Income	**$153,900**	**5.7%**

Source: Janney Capital Markets, cited by Ryan Chittum in "Daily Beast Doubles Down on Big Mac Minimum Wage Nonsense," Columbia Journalism Review, *August 16, 2013.*

In sum, we fully stand by our previous estimate of the cost increases for fast-food restaurants that we presented in the July 2013 petition in support of a $10.50 federal minimum. Extrapolating from past research, we estimated the average fast-food outlet would face a cost increase equal to less than 3 percent of their sales. We have now demonstrated in this brief the reliability of our estimate by deriving the same figure directly from current industry data. We additionally show that Chittum's own estimate overstates the cost increase for an average McDonald's from a $10.50 minimum by assuming an average wage too low for too many workers. Chittum's basic characterization of the pay structure of the typical fast-food restaurant does not square with the figures derived from more detailed labor market data, including data available from the Labor Department on the pay and hours of workers in the limited-service restaurant industry.

1. Estimating wages and employment levels of limited-service restaurant workers

The CPS does not distinguish limited-service restaurant workers from restaurant workers more generally. As a result, to estimate the wage, hours and employment characteristics of workers in this industry, we combine data on the limited-service restaurant industry wage structure from the May 2011 OES,[9] and data on restaurant workers the 2012 CPS. The OES provides the following measures of the limited-service restaurant industry's wage structure: the 10th, 25th, 50th (median), 75th, and 90th wage percentiles, as well as the mean.

TABLE A.1: 2011 WAGE DISTRIBUTION FOR LIMITED-SERVICE RESTAURANT WORKERS (2012$)

10th percentile	$7.90
25th percentile	$8.41
50th percentile	$9.05
75th percentile	$9.81
90th percentile	$12.98
Mean	$9.91

Source: May 2011 OES, adjusted for inflation using CPI-U.

We used these summary wage measures to first construct a wage distribution for the industry and then approximate the proportions of workers that are likely to receive raises from the $10.50 minimum wage proposal. Specifically, we approximated the following percentages of limited-service restaurant workers for each of the wage intervals that we analyze:

TABLE A.2: PERCENT OF LIMITED-SERVICE RESTAURANT WORKERS BY WAGE RANGE

Wage range	% of limited-service restaurant workers
$7.25 -$8.50	28%
$8.50 - $9.50	36%
$9.50 - $10.50	14%
$10.50-$12.00	7%
$12.00+	15%
Total	100%

Source: May 2011 OES, adjusted for inflation using CPI-U.

We then estimated the average wage, average weekly hours, and weeks worked using the 2012 CPS made publicly available by the Center for Economic and Policy Research (CEPR), restricting the sample of workers to those working in food services specifically, and using CEPR's hours (uhoursi) and wage (rw) measures from the Outgoing Rotation Group data files. Note that CEPR imputes usual weekly hours for

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[9] May 2012 OES implements a new set of NAICS codes that does *not* include 722211.

workers who report that their usual hours "vary." For more information about CEPRs adjustments to the hours and wage measures, see: http://ceprdata.org / wp-content/cps/CEPR_ORG_Wages.pdf . For the highest wage category of workers earning at least $12.00 per hour, we used as the maximum wage $19.40 since assigning this upper limit produces an overall wage distribution with a mean wage of $9.90, matching the mean wage for the limited-service restaurants industry from OES data. Without this limit, the maximum wage would be as high as $200.00, possibly overestimating the pay of the highest paid fast-food workers. This would, in turn, overestimate the size of payroll and ultimately, *underestimate* the cost-increase-to-sales-ratio.

We used the 2012 CPS ASEC file to estimate annual weeks worked for each wage interval. There are two issues to note about using this data file. We can construct an hourly wage from this data file by doing the following: (annual wage and salary income)/(number of weeks worked in the past year) x (number of hours worked per week). We can then use this hourly wage to identify workers within each of the wage groups listed in Table A.2 (again, using $19.40 as the maximum wage), and get their average weeks worked per year.

There is, however, a higher amount of reporting error in the CPS ASEC data file compared to the hourly wage measure in from the CPS ORG data file. This is because the hourly wage estimate from the CPS ASEC depends on information from respondents on their earnings and work schedule that they have to recall from over the entire past calendar year. The CPS ORG wage measure, in contrast, is based on respondents' reporting on their pay rate over the past two weeks. As a result, the CPS ASEC wage measure tends to have a problem of over-reporting hours at the low end of the wage distribution. This is because workers who overestimate the number of hours or weeks worked will tend to produce an underestimate of their hourly wage and incorrectly place themselves toward the low end of the wage distribution.

To take these errors into account, we adjust downward the weeks worked for the lowest wage workers ($7.25 - $8.50) by the following factor: the ratio of hours worked as reported in the CPS ORG file to the hours worked as reported in the CPS ASEC file, or 0.84. In other words, we multiply our unadjusted estimate of average weeks worked for the bottom wage interval (43 weeks) and multiply this by 0.84 to get an average of 37 weeks worked. This adjustment creates the familiar pattern of the lowest paid workers working the least and the highest paid workers working the most.

2. *Updating the 2007 Economic Census measure of overall sales in the limited-service restaurant industry*

As explained in the main text, we estimate the overall sales figure for 2012 by applying the payroll-to-sales ratio from the latest published data from the U.S. Economic Census (2007) for the limited-service restaurant industry to the overall payroll we estimated from the CPS. Calculating the sales figure by using a relative figure, the payroll-to-sales ratio from the Economic Census to the total payroll estimated from the CPS and QCEW, has the benefit of aligning the figures from the different data sources.

We can also estimate total sales in a different manner from that presented in the main text. We can use the fact that based on the 2007 Economic Census, the limited-service restaurant industry generated $49,500 in sales per employee (2012 dollars). We also know that these workers have become more productive since 2007, about 2.1 percent more productive according to the BLS' Labor Productivity and Costs database, which would increase the sales-per-employee to about $50,500. If we multiply this figure by the sector's 2012 employment level of 3.66 million workers, we would get an estimate of $184.9 billion in sales in 2012 ($50,500 sales/ employee x 3.66 million employees). However, this sales figure implies a payroll-to-sales ratio of 32.8 percent, i.e., $60.7 billion/$184.9 billion. This is much higher than in 2002 and 2007 and this suggests that combining figures from the CPS and the Economic Census data sources directly overstates the size of payroll relative to the sales. Even so, the cost-increase-to-sales ratio, assuming sales total to $184.9 billion, equals 3.46 percent. In other words, either method of estimating sales produces a cost-increase-to-sales ratio of roughly 3 percent.

3. Extrapolating an estimate of the increase in business costs due to minimum wage hikes

We extrapolate our estimate that business costs for fast-food restaurants would rise by an amount equal to 2.7 percent of sales revenue from the findings of five separate studies.

In Table A3 (page 13) we present these five studies, along with the size of the minimum wage hike analyzed, and the accompanying estimate of the business cost increase relative to sales revenue figure.

We use the numbers in Table A3 to produce a scatterplot (see Figure A1, page 14) with the size of the minimum wage increase on the x-axis, and the size of the business cost increase as a percent of sales on the y-axis. We find that the curve with the following equation best fits the data points (with an R^2 of 0.73):

$$y = 0.0454 \, x^{0.6363}$$

We use this equation to extrapolate that the business cost increase relative to sales figure given a 44.8-percent minimum wage hike would be 2.7 percent ($0.0454 \times 0.448^{0.6363} = 0.027$).

Study	Minimum wage hike analyzed	Estimate of business cost increase relative to sales for fast-food restaurants
Economic Analysis of the Florida Minimum Wage Proposal, by Robert Pollin, Mark Brenner and Jeannette Wicks-Lim (Amherst, MA and Washington, DC: Political Economy Research Institute and Center for American Progress, 2004).	Proposal to raise state minimum wage 19.4% from $5.15 to $6.15 in 2004	1.32% (see page 29)
Economic Analysis of the Arizona Minimum Wage Proposal, by Robert Pollin and Jeannette Wicks-Lim (Amherst, MA and Washington, DC: Political Economy Research Institute and Center for American Progress, 2006)	Proposal to raise state minimum wage 31.1% from $5.15 to $6.75 in 2006	1.73% (see page 26)
"Santa Fe Citywide Living Wage Ordinance," by Robert Pollin and Mark Brenner, Ch. 5 in *A Measure of Fairness: The Economics of Living Wages and Minimum Wages in the United States*, by Pollin et al. (Ithaca, NY and London: Cornell University Press, 2008)	Proposal to raise citywide minimum wage 65%, from $5.15 to $8.50	3.0% (see page 83)
"The Minimum Wage, Restaurant Prices, and Labor Market Structure," by Daniel Aaronson, Eric French, and James MacDonald, Federal Reserve Bank of Chicago Working Paper 2004-21 (revised August 3, 2007)	2-step federal minimum wage increase over 1996 to 1997, each step examined: from $4.25 to $4.75 (12%) and $4.75 to $5.15 (8.4%)	1.15% (see page 16)
"Minimum Wage Channels of Adjustment," by Barry T. Hirsch, Bruce E. Kaufman, and Tetyana Zelenska, W. J. Usery Workplace Research Group Paper Series Working Paper 2011-11-1, November, 2011	3-step federal minimum wage increase over 2007 to 2009, from $5.15 to $7.25 (40.8%)	4.0%* (see pages 22-23)

* Hirsch et al. (2011) estimate that mandated wage raises from the 40.8% minimum wage hike amount to 3.9% of business costs, and all labor cost increases that occurred over the 2007-2009 period (including ripple-effect raises and payroll tax increases, but also regular performance raises unrelated to the minimum wage hike) amount to 5.7% of business costs. They do not distinguish how much of the 5.7% can be attributed to minimum wage hikes alone. We therefore take the average between the two figures since the former (3.9%) represents an underestimate, and the latter (5.7%) represents an overestimate. This average of 4.8% is then adjusted downward to 4.0% since, as the authors' note (p. 23), the cost increases relative to sales will be smaller than when compared to business costs alone.
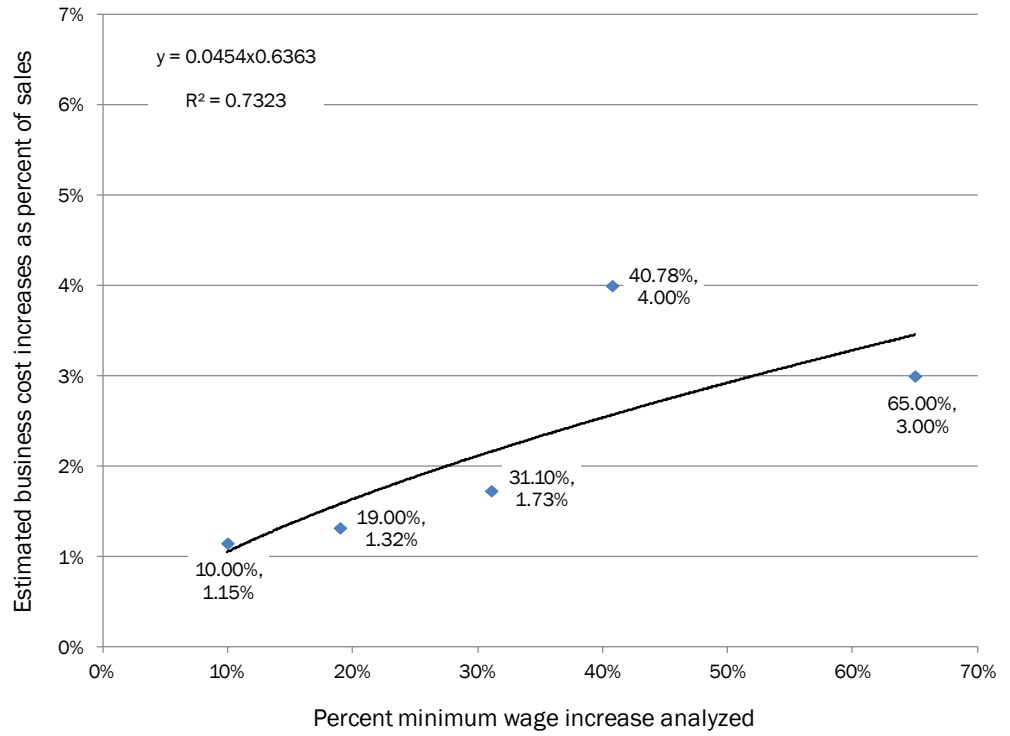
Source: See Table A3 (page 13). Note: For the minimum wage hike figure based on the Aaronson et al. study (2007), we used the average of the two minimum hikes studied (i.e., average of 12% and 8%) in the scatterplot.

ABOUT THE AUTHORS

Jeannette Wicks-Lim is an Assistant Research Professor at the Political Economy Research Institute at the University of Massachusetts, Amherst. Wicks-Lim specializes in labor economics, in particular conditions for low-wage workers in the U.S. economy. Her recent publications include *A Measure of Fairness: The Economics of Living Wages and Minimum Wages in the United States* (co-authored 2008), and the studies Pushing Working Families into Poverty: Assessing the New Haven Plan to Privatize the Public Schools' Custodial Services (2011), "Combining Minimum Wage and Earned Income Tax Credit Policies to Guarantee a Decent Living Standard to All U.S. Workers" (co-authored, 2010), "Creating Decent Jobs in the United States" (2009), and "Green Prosperity" (co-authored, 2009). She also writes a regular column for *Dollars & Sense* magazine.

Robert Pollin is Distinguished Professor of Economics and Co-Director of the Political Economy Research Institute at the University of Massachusetts, Amherst. His research centers on macroeconomics, conditions for low-wage workers, the analysis of financial markets, and the economics of building a clean-energy economy in the U.S. and globally. His books include *Back to Full Employment* (2012), *A Measure of Fairness: The Economics of Living Wages and Minimum Wages in the United States* (co-authored, 2008); *An Employment-Targeted Economic Program for Kenya* (co-authored, 2008); *An Employment-Targeted Economic Program for South Africa* (co-authored, 2007); and *Contours of Descent: U.S. Economic Fractures and the Landscape of Global Austerity* (2003).

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