

Attachment 3

Estimated Impact of a Proposed Minimum Wage Law for the North Bay



OCTOBER 2018

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Overview

North Bay Jobs with Justice, the North Bay Labor Council and other labor, environmental, and community organizations will propose a \$15-an-hour citywide minimum wage by 2020 to the cities of Novato, Petaluma, Sonoma, Sebastopol, and Santa Rosa. This paper analyzes the prospective impact of that proposal in the four North Bay counties—Marin, Sonoma, Napa and Solano. The proposal would raise the minimum wage in these cities on a faster timetable than the state as a whole (see Table 1). Under the proposal, the minimum wage would be raised to \$12.75 on July 1, 2019, and to \$15.00 on July 1, 2020. In Section 1 of this report, we estimate the effects of the wage increase on workers and businesses, and place the proposal in context with other local minimum wage laws. In Section 2, we review the economic research literature on the effects of minimum wage increases on workers, employment, and business operations.

Table 1. Wage Schedule for the Proposed Minimum Wage Policy

Year	Nominal Dollars	Percentage Increase from Previous Year	Constant 2018 Dollars	Percentage Increase from Previous Year
2018	\$10.50	—	\$10.50	—
2019	\$12.75	21.4	\$12.53	19.3
2020	\$15.00	17.6	\$14.48	15.6

Source: Authors' analysis of OES data.

Note: Constant dollar values are calculated using the average annual change for the past ten years of the West Urban Regional Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W).

Section 1: Impact Estimates

Data and Methods

In the tables below we present estimates of the number of workers affected by the proposed law, the size of the wage gains for affected workers, and the demographic and job characteristics of affected workers. We use the current state minimum wage schedule (reaching \$15 by 2023) as the baseline, and estimate the effects of this proposal (reaching \$15 by 2020) over and above the current state policy. Our estimation method accounts for projected wage growth at the bottom of the wage distribution, interim increases in the state minimum wage, and projected employment growth. We use the 2015-2016 American Community Survey (ACS) to estimate the wage distribution and characteristics of covered individuals working in the counties of Marin, Napa, Solano, and Sonoma (the proposed minimum wage policy will not cover self-employed, state and federal workers). See our technical report for more detail on data and methods (Perry, Thomason, and Bernhardt 2016).

Impact Estimates

We estimate that about 192,000 workers—or about 36 percent of the North Bay’s workforce—would receive a pay raise by 2020 under the proposal (see Table 2). This estimate includes 152,000 workers who earn below the new minimum wage and would be directly affected by the increase, and another 40,000 who earn just above the new minimum wage and would receive wage increases due to a ripple effect.

Table 2. Cumulative Number of Workers Affected by the Proposed Minimum Wage Policy

Year	Number of Affected Workers (cumulative)	Number of Directly-Affected Workers (cumulative)	Number of Indirectly-Affected Workers (cumulative)	Percent of Covered Workforce (cumulative)
2019	149,000	117,000	32,000	28.2%
2020	192,000	152,000	40,000	35.7%

Source: Authors’ analysis of ACS, OES, and QCEW data.

Note: The proposed minimum wage policy will not cover self-employed, state, and federal workers. Directly-affected workers are those with wages below the proposed new minimum wage in each year. Indirectly-affected workers are those with wages slightly above the proposed new minimum wage, who will receive an increase via the ripple effect. The number of directly-affected workers and indirectly-affected workers may not sum to the total number of affected workers due to rounding.

Workers’ hourly wages and annual income would rise under the proposed law, resulting in a total increase in aggregate earnings of \$565 million (in 2018 dollars) by 2020. Wages of affected workers would rise by an average of \$1.74 per hour. Average annual earnings would increase by about \$2,900 per year (see Table 3). It is important to note that these pay increases would be in addition to the raises workers would receive under the current state minimum wage policy, which is set at \$11.00 in 2019, and \$12.00 in 2020.

Table 3. Cumulative Pay Increases for Workers Affected by the Proposed Minimum Wage Policy (in 2018 dollars)

	2019	2020
Average Cumulative Hourly Wage Increase	\$0.98	\$1.74
Average Cumulative Annual Earnings Increase	\$1,600	\$2,900
Average Cumulative Percent Annual Earnings Increase	10.1%	15.8%
Total Aggregate Cumulative Increase In Earnings (millions)	\$244	\$565

Source: Authors' analysis of ACS, OES, and QCEW data.

Note: Results are cumulative across the phase-in years

Contrary to common belief, only 6.4 percent of affected workers are teenagers, and more than half are in their thirties or older (see Table 4). Workers of color (Black, Latinx, Asian, and Other) constitute approximately 60 percent of the workers receiving raises. Affected workers have a wide range of educational backgrounds, with half having at least some college experience and 15 percent holding a bachelor's degree or higher. Median annual earnings of affected workers are only half of those of the overall North Bay workforce, yet affected workers bring home about half of their family's income.

Table 4. Demographic and Job Characteristics of Workers Affected by the Proposed Minimum Wage Policy by 2020 (all figures are percentages unless otherwise noted)

	Percent of Covered Workers	Percent of Covered Workers Getting a Raise	Percent of Group Getting a Raise
Gender			
Male	51.3	49.9	34.7
Female	48.7	50.1	36.7
Median Age			
	40	33	
Age			
16-19	3.1	6.4	
20-29	22.9	36.5	57.0
30-39	23.1	21.4	33.1
40-54	33.6	23.5	24.9
55-64	17.3	12.2	25.3
Race/Ethnicity			
White	53.1	40.2	27.1
Black	4.3	4.5	
Latinx	28.5	41.4	51.9
Asian	9.8	9.4	34.0
Other	4.2	4.5	37.5

table 4 continued

continued

Table 4. Demographic and Job Characteristics of Workers Affected by the Proposed Minimum Wage Policy by 2020 (all figures are percentages unless otherwise noted)

	Percent of Covered Workers	Percent of Covered Workers Getting a Raise	Percent of Group Getting a Raise
Education			
Less than High School	w12.0	20.8	61.7
High School or G.E.D.	19.5	28.8	52.7
Some College	26.6	27.6	37.1
Associate's Degree	9.3	8.2	31.5
Bachelor's Degree or Higher	32.6	14.6	16.0
Country of Birth			
U.S. Born	71.8	63.6	31.6
Foreign Born	28.2	36.4	46.2
Family Structure			
Married	48.6	34.7	25.5
Have Children	41.7	34.5	29.5
Family Income Relative to Poverty Level			
Less than 100% of Poverty Level	7.3	12.1	59.1
100% to 150% of Poverty Level	5.2	11.8	81.5
150% to 200% of Poverty Level	6.5	13.2	72.0
More than 200% of Poverty Level	81.0	63.0	27.7
Average Worker Share of Family Income	60.2	49.0	
Median Individual Annual Earnings (2017 Dollars)			
	\$39,400	\$19,900	
Full-Time / Part-Time Worker			
Full-Time (35 or More Hours per Week)	76.8	65.2	30.3
Part-Time (Fewer than 35 Hours per Week)	23.2	34.8	53.6
Full-Year / Part-Year Worker			
Full-Year (50-52 Weeks per Year)	82.1	76.7	33.3
Part-Year (Fewer than 50 Weeks per Year)	17.9	23.3	46.5
Health Insurance Provided by Employer			
Yes	72.9	56.5	27.7
No	27.1	43.5	57.4

Source: Authors' analysis of ACS, OES, and QCEW data.

Note: Only workers covered by the proposed minimum wage law are included in this table. See note for Table 2.

The industries where the most affected workers hold jobs are: retail trade (17.1 percent), food services (12.9 percent), and health services (8.4 percent). Most affected workers are employed in the private, for-profit sector; non-profit and public employees are less likely to be affected than the overall workforce (see Table 5).

Table 5. Impact Estimates for Major Industries by 2019

	Percent of Covered Workers	Percent of Covered Workers Getting a Raise	Percent of Industry Getting a Raise
All Sectors			
Agriculture, Forestry, Fishing, Hunting, and Mining	3.1	5.3	
Construction	6.2	4.6	26.4
Non-Durable Manufacturing	4.8	3.1	22.5
Durable Manufacturing	5.6	5.3	33.6
Wholesale Trade	3.1	2.6	
Retail Trade	12.0	17.1	51.1
Transportation, Warehousing, and Utilities	3.8	3.6	
Information	1.9	1.0	
Finance, Insurance, Real Estate, and Rental and Leasing	5.7	3.3	20.8
Professional, Scientific, and Management	4.9	2.5	18.3
Administrative and Waste Management Services	4.5	7.0	55.8
Educational Services	8.2	5.5	24.1
Health Services	12.3	8.4	24.4
Social Assistance	2.9	3.9	
Arts, Entertainment, Recreation, and Accommodation	4.3	5.9	48.7
Food Services	7.5	12.9	61.5
Other Services (except Public Administration)	4.4	6.0	47.9
Public Administration	4.8	2.1	15.3
Sector			
Private, For-Profit	76.8	85.5	39.7
Private, Non-Profit	8.8	6.9	27.8
Public	14.3	7.6	19.0

Source: Authors' analysis of ACS, OES, and QCEW data.

Note: Blank value for "Percent of Industry That is Getting a Raise" indicates insufficient sample size for that category. Only workers covered by the proposed minimum wage law are included in this table. See note for Table 2.

Table 6 shows an analysis of the proposed minimum wage policy's impact on business costs. For example, we estimate that payroll costs in the restaurant industry would rise by 6.7 percent by 2020. Since payroll costs constitute 31 percent of operating costs in the restaurant industry, operating costs would increase by 2.1 percent (compared to 0.4 percent for the retail industry and the overall economy by 2020). This would lead to a cumulative price increase of 1.8 percent in restaurants by 2020—but this increase would be spread over two years, a 0.9 percent increase in 2019, and a 1.0 percent increase in 2020. Price increases would be negligible for the retail industry and the rest of the economy. Once again, it is important to note that these increases would be in addition to the increases due to the current state minimum wage policy scheduled to reach \$11.00 per hour by 2019 and \$12.00 per hour by 2020.

Table 6. Cumulative Impact of the Proposed Minimum Wage Policy on Business Operating Costs and Prices for Select Industries and the Overall Economy

	2019	2020
Food Services		
% Change in Payroll Costs*	3.2	6.7
Labor Costs as % of Operating Costs	30.7	31.4
% Change in Operating Costs	1.0	2.1
Year over Year Price Change	0.9	1.0
Cumulative % Change in Prices	0.9	1.8
Retail Trade		
% Change in Payroll Costs*	1.5	3.4
Labor Costs as % of Operating Costs	10.8	10.9
% Change in Operating Costs	0.2	0.4
Year over Year Price Change	0.1	0.2
Cumulative % Change in Prices	0.1	0.3
Overall Economy		
% Change in Payroll Costs*	0.8	1.8
Labor Costs as % of Operating Costs	22.1	22.2
% Change in Operating Costs	0.2	0.4
Year over Year Price Change	0.2	0.2
Cumulative % Change in Prices	0.2	0.3

Source: Authors' analysis of ACS, OES, QCEW, Economic Census, U.S. Census Annual Retail Trade, Wholesale Trade, and Services Reports, and BEA data.

* "% Change in Payroll Costs" is net of savings from reduced turnover expenses, and includes additional payroll tax and workers' compensation expenses.

Section 2: Review of Economic Research Literature

Introduction

As cities and counties across the country increasingly debate whether to establish their own minimum wage laws, policymakers are understandably asking a host of questions. What do we know about the impact on workers and their families? What does research tell us about the effect of local wage mandates on employment? Do businesses move outside city or county borders in response to minimum wage increases?

In this section, we address these and related questions.¹ Economists agree that minimum wage laws have large positive effects on workers' pay and their families' living standards. Raising the minimum wage increases earnings for workers at the low end of the labor market, the majority of whom are adults. Women and workers of color benefit disproportionately. In addition, new research on the effect of minimum wage increases documents important reductions in family poverty rates. Moreover, low-wage workers and their families are often forced to rely on public assistance programs to meet their basic needs; new research on food stamps finds that raising the minimum wage reduces their reliance on this program.

We also review the economic research on the impact of minimum wage laws on businesses. The weight of the evidence suggests that moderate minimum wage increases have insignificant to non-existent negative effects on employment and work hours, reduce worker turnover and increase worker retention, and result in small, one-time price increases in heavily-affected industries, such as restaurants. We also explain how conflicting findings on the employment impact of the minimum wage can be traced to differences in the rigor of the research methods.

The Research Literature on Minimum Wage Effects

Below we summarize the empirical evidence on the effects of minimum wage laws on workers, families, and businesses. Where possible, we highlight research on local minimum wage laws. However, since most of the existing local laws have been in place a short time, the data that are needed for rigorous research on the recent laws are only now becoming available. Several new papers examine the effects of recent city minimum wage laws, though none have yet gone through a peer review process. Earlier economic impact studies on San Francisco and Santa Fe are also instructive.

We also draw upon the much larger body of research on the impacts of state and federal minimum wage increases. Recent studies that compare adjacent counties from different states with different minimum wages and studies that measure changes in the distribution of wage-earners before and after minimum wage increases are especially relevant. The findings from these studies speak directly to policymakers' concerns that businesses might reduce employment or relocate outside their city's borders in response to a local minimum wage law.

¹ This section draws on material presented in Reich, Jacobs and Bernhardt (2014) and Reich et al. (2015).

The Effects of Minimum Wage Laws on Workers and Families

The primary goal of raising the minimum wage is, of course, to raise the pay of low-wage workers. A broad consensus in the economic research literature agrees that minimum wage laws raise pay for workers on the bottom rungs of the labor market (for an extensive review, see Belman and Wolfson 2014). Researchers also consistently find that the affected workers are largely adults and disproportionately women and people of color. In addition, new research on the effect of minimum wage increases shows important reductions in family poverty rates. Finally, we review what is known about reliance on public assistance programs by low-wage workers and their families.

Impact on Low-Wage Workers' Earnings

In assessing the impact of a minimum wage increase on low-wage workers' earnings, it is important to keep two facts in mind. First, many low-paid workers earn wages somewhere above the old minimum wage level but below the new level. Consequently, not all workers who are directly affected by an increase will receive the full amount of that increase. Second, researchers have also documented a "ripple effect" from minimum wage increases in which employers give raises to workers who are earning above, but near, the new minimum wage (Wicks-Lim 2006; Autor, Manning and Smith 2016; Cengiz, Dube, Lindner, and Zipperer 2018). As a result, it is not completely straightforward to estimate either how many workers benefit from minimum wage increases or the policy's impact on their earnings.

Evidence from local minimum wage laws

Dube, Naidu and Reich (2007) assessed San Francisco's minimum wage law when it was first implemented in 2004, using a before-and-after survey of restaurant employers in San Francisco and in nearby parts of neighboring Alameda County. They found that the average wage of workers at surveyed restaurants rose from \$10.22 before to \$11.01 after the increase, with pay rising twice as much among fast-food restaurants compared to table-service restaurants. They also found evidence that the increase compressed the wage distribution among restaurant workers by raising the bottom of the distribution (not by hurting pay for higher-wage workers). Before the policy, 49.7 percent of restaurant workers earned less than \$8.50; afterward, only 5 percent did. The authors also tested whether compliance with minimum wage laws decreased after the law passed; they found no evidence of decreased compliance.

Jacobs and Reich (2014) recently conducted a longer-term assessment of San Francisco's minimum wage law. They estimate that 55,000 workers in the city (or about 14 percent of the private sector workforce) receive higher pay because of the ordinance, amounting to a cumulative increase of \$1.2 billion in wages in the ten years since the laws' inception. They also found additional evidence that the law had a significant impact on workers' earnings over time. The wages of San Francisco workers earning at the bottom of the distribution (the 10th percentile) jumped in 2004, when the law was implemented. This wage, when measured to take account of inflation, did not change even during the recession that began in December 2007 because the city's minimum wage standard is indexed

to inflation. By contrast, the 10th percentile wage in the surrounding counties, without an indexed minimum wage, declined over that same time period.

Schmitt and Rosnick (2011) studied the wage impacts of both the San Francisco and Santa Fe laws. These authors found that wages increased in a range of low-wage industries in both cities.² In San Francisco, for example, the average wage of fast-food workers increased 9 to 11 percent by the third year of the ordinance, and as much as 12 percent in low-wage industries overall. Pay for fast-food workers in Santa Fe increased by similar amounts, together with wage increases of 2 to 9 percent in the retail industry and 5 to 15 percent for low-wage industries overall. (See also Reynis, Segal and Bleeker (2005) for similar findings.)

Allegretto et al. (2018) examined the earnings effects of recent minimum wage laws in Chicago, Oakland, San Francisco, San Jose, Seattle, and the District of Columbia. The authors find that a 10 percent increase in the minimum wage increases earnings in the food services industry between 1.3 and 2.5 percent, depending on the model used. This study is the most comprehensive assessment to date of the earnings effects of city-level minimum wage increases.

Evidence from state and federal wage laws

Finally, a broader literature has looked at state and federal minimum wage increases and estimated their impact on workers' earnings. In their comprehensive review of existing research, Belman and Wolfson (2014) estimate that changes in the minimum wage typically affect about 10 to 20 percent of the labor force (and sometimes as much as 30 percent), counting both direct and indirect effects. Allegretto et al.'s (2017) review of 17 estimates from five recent studies of the minimum wage indicates that a one percent increase in the minimum wage increases average earnings between 0.19 and 0.21 percent. Research consistently finds that the pay of both adults and teens is affected by minimum wage increases (Allegretto, Dube and Reich 2011; Giuliano 2013).

We also note broad agreement among economists that raising the minimum wage reduces income inequality by pushing up the wage floor relative to the median wage (Lee 1999; Autor, Manning and Smith 2016).

Demographics of Affected Workers

Evidence on who benefits from minimum wage increases comes mainly from prospective studies (conducted when a minimum wage law is first being considered). In these studies, researchers analyze government survey data and estimate the number and characteristics of workers likely to be affected, given wage thresholds being considered by law makers.

Reich, Allegretto, and Montialoux (2017) evaluated the projected impact of California's statewide minimum wage increase from \$9 to \$15 an hour by 2023. They find that the minimum wage increase will affect 38 percent of California's labor force, resulting in a 25.4 percent increase in annual pay

² The authors also examined the impact of the 1993 minimum wage law in Washington DC, but found that the size of the increase was too small to raise wages in those industries (too few workers were affected). They conclude that the law therefore did not constitute a meaningful policy experiment.

increase for the average affected worker. Contrary to the common perception that minimum wage workers are mainly teens, 96 percent of affected workers in California are in their twenties or older and 58.2 percent are in their thirties or older. Workers of all education levels will benefit, with less educated workers benefiting the most (52.7 of affected workers have no college education). Over a third of affected workers have children (36.4 percent) and, on average, affected workers in California bring home 50.4 percent of their family's income, suggesting that they are primary breadwinners in their families and are not providing supplementary income. Finally, workers of color disproportionately benefit: 54.8 of eligible Latino/a workers and 36.2 percent of Black workers will get a raise under the California law. These findings on the demographics of affected workers are corroborated by prospective studies on the impact of proposed city minimum wage laws. Reich, Jacobs, Bernhardt and Perry (2014a-c, 2015) have consistently found that minimum wage increases mostly affect adult workers and disproportionately benefit workers of color.

At the national level, Cooper (2017) analyzed the likely effects of the Raise the Wage Act of 2017, a bill that would raise the federal minimum wage from \$7.25 to \$15 per hour by 2024. He found that the proposal would raise wages for 41.5 million workers (22.5 million directly, the remainder indirectly), or 29.2 percent of the U.S. workforce, generating \$144 billion in additional wages over the phase-in period. Cooper (2017) projects that 90 percent of workers who would receive a wage increase are 20 years old or older (the average age of affected workers is 36) and 63 percent work full-time (63 percent). The majority are women (55.6 percent), nearly half (46.6 percent) have some college experience, and more than a quarter (28 percent) have children. Of those workers who have children, the majority are the primary breadwinners, earning on average 63.8 percent of their family's total income. As in prospective studies of California, a federal minimum increase would disproportionately affect workers of color: 40.1 percent of black workers and 33.5 percent of Hispanic workers would receive an increase directly or indirectly.

Effects on Poverty and Use of Public Assistance Programs

Impact on poverty and income inequality

Compared to the large volume of research on the employment effects of minimum wage laws, few studies have examined the impact on poverty and income inequality.

Dube (2017) finds that higher minimum wages increase incomes at the bottom of the family income distribution, reduce the percent of individuals living below the poverty line, and, in particular, reduce extreme poverty (families with incomes less than one-half the poverty line). The reductions in poverty are somewhat larger for black and Latino individuals, for those with less education, and for children under 18.

Rinz and Voorheis (2018) use a unique dataset combining survey and administrative data to show that minimum wage increases generate long-term earnings growth for low-wage workers. They find that, for workers at the bottom of the income distribution, a ten percent increase in the minimum wage raises earnings growth by seven to eight percent, on average, over five years relative to workers who did not receive an increase. These results demonstrate that raising the minimum wage has durable, lasting effects for low-wage workers.

Impact on use of public assistance programs

Given that real wages have stagnated in recent decades, many low-wage workers depend on public assistance programs for basic survival. Jacobs, Perry and MacGillvary (2015) found that 56 percent of spending on food stamps, TANF cash assistance, Medicaid and CHIP, and the federal EITC is provided to members of working families, at an average cost of \$153 billion a year between 2009-2011 (Jacobs, Perry and MacGillvary 2015). Researchers further found that more than half (52 percent) of families of fast-food workers are enrolled in one or more public programs, at an annual cost of nearly \$7 billion. Again, low wages were the main predictor of public program enrollment (Allegretto, Doussard, Graham-Squire, et al. 2013).

Does raising the minimum wage reduce reliance on means-tested public assistance programs? The answer may seem obvious, but West and Reich (2014) point out that the research question is more complex. If, for example, raising the minimum wage causes increased unemployment, more workers and families would have to rely on programs such as food stamps. The authors analyze state and federal minimum wage increases from 1990-2012 and find that, on average, a 10 percent increase in the minimum wage reduces food stamp program enrollment by between 2.4 and 3.2 percent, and reduces program expenditures by 1.9 percent.³ They predict that an increase of the federal minimum wage to \$10.10 would reduce enrollment in the food stamp program by about 3.5 million people and reduce federal expenditures on food stamps by about \$4.2 billion per year. West and Reich (2014b) conducted a comparable study on the causal effects of minimum wage increases on Medicaid, with similar findings. Allegretto, Reich and West (2014) estimate that California would save \$1.5 billion if the state minimum wage were increased to \$13. Zipperer (2014) also examined the effects of minimum wages on these public programs and obtained similar results.

More generally, since eligibility for programs such as SNAP and Medicaid are tied to the federal poverty level, Dube's (2017) finding that higher minimum wages reduce the poverty rate suggests that we should also expect reductions in enrollments in public assistance programs.

Societal Effects of Minimum Wage Increases

A growing body of research suggests that minimum wage increases have significant downstream effects on social outcomes. Recent studies indicate that family income is a significant determinant of health outcomes (Hoynes, Miller, and Simon 2015) and school achievement for children (Dahl and Lochner 2012). Low wages are directly correlated with increased hypertension and obesity (Leigh and Du, 2012). Recent research finds direct positive effects of improving wages and incomes on

³ Several studies have examined the relationship between the minimum wage and the Earned Income Tax Credit, or EITC. Neumark and Wascher (2011) find that a higher minimum wage increases EITC benefits for families in deep poverty, while reducing EITC benefits for some subgroups. Lee and Saez (2012) argue that the minimum wage and EITC are complementary policies, not substitutes. The Congressional Budget Office (2014) argues that a minimum wage increase will not have a substantial effect on EITC spending, while Rothstein (2010) examines whether the positive effect of the EITC on female labor supply has lowered wages. While these studies are of interest, the EITC is quite different from programs such as food stamps. The EITC has a substantial phase-in period during which benefits increase and a long phase-out period, with eligibility ending completely at an annual income of about \$48,000 for a family of four—quite a bit above the reach of the minimum wage.

psychological well-being (Reeves, et al. 2017), children’s birthweights and infant mortality (Wehby, Dave, and Kaestner 2016; Komro et al. 2016) parental neglect (Raissan and Bullinger 2017), and crime (Akee et al. 2010; Agan and Makowsky 2018).

While this research program is in its initial stages, existing evidence suggests multiple causal pathways from income to social outcomes. Income affects access to safe housing, a healthy environment, healthy food, and health care services (American Public Health Association 2016). There is a growing body of research on the effects of stress on health and children’s development (Cooper and Stewart 2013). More research is needed to confirm the causal effects of minimum wage increases on social outcomes. Nevertheless, it is important to consider these long-term effects on families and communities when evaluating the impact of a minimum wage increase.

The Effects of Minimum Wage Laws on Businesses

The impact of the minimum wage on businesses—how many workers they hire, whom they hire, the prices they charge for their goods and services, their location decisions—is one of the most researched topics in economics, with hundreds of studies published over the decades. We do not attempt to summarize the full literature in this report; for recent reviews see Brown (1999), Neumark and Wascher (2006), Schmitt (2013), and Belman and Wolfson (2014).

Economists’ understanding of minimum wage effects has undergone significant changes over the past 20 years. This shift began with the groundbreaking work of Card and Krueger (1994), who analyzed employment in fast-food restaurants near the New Jersey and Pennsylvania border after New Jersey increased its state minimum wage. Card and Krueger found no measurable negative impact on employment.

Since then, economists have increasingly recognized that raising the minimum wage does not automatically mean that employment will fall. Increased labor costs can be absorbed through a variety of other channels. For example, if turnover declines, employers save on recruiting and training costs at the same time that they reap the benefits of more experienced workers who are more productive. When a cost increase affects all firms in an industry, firms can also raise their prices rather than reduce the number of employees. They may also experience lower profits. Modern economics therefore regards the employment effect of a minimum wage increase as a question that is not decided by theory, but by empirical testing.

In what follows we summarize the research that in our opinion is best suited to assessing the effects of minimum wage increases on businesses. We also give an intuitive explanation of the nature of the disagreements in the research literature about those effects.

Before proceeding, it is important to mention that existing research has only studied moderate increases in the minimum wage, of the size discussed in previous sections. These studies can only be suggestive of what might occur when minimum wages are increased significantly beyond past local, state, or federal mandates.

Impact on Employment and Hours

Evidence from local minimum wage laws

In this section, we review rigorous studies on the employment and hours impacts of existing city minimum wage laws.⁴ We highlight the findings of a comprehensive assessment of recent minimum wage increases in Chicago, Oakland, San Francisco, San Jose, Seattle, and the District of Columbia (Allegretto et al., 2018). Lastly, we shed light on serious methodological flaws contained in a recent study purporting to demonstrate significant employment losses due to Seattle minimum wage law.

Dube, Naidu and Reich (2007) studied the impact of San Francisco's minimum wage law after it increased from \$6.75 to \$8.50 an hour in 2004, using a unique quasi-experimental research design. They surveyed a sample of restaurants before the wage increase, and then re-surveyed the same businesses nine to ten months after. The sample included restaurants from San Francisco as well as neighboring East Bay cities that were not covered by the policy, allowing the researchers to compare outcomes at restaurants affected by the minimum wage mandate with those that were not. The study also was able to compare outcomes at fast-food restaurants with outcomes at full-service restaurants.

After controlling for a variety of potential confounding factors, the authors found no statistically significant negative effects on either employment or the proportion of full-time jobs as a result of the San Francisco law. This finding holds for both full-service and fast-food restaurants (one might expect more sensitivity to a higher minimum wage in the latter). A follow-up study (Dube, Naidu and Reich 2014) found that restaurant employment in San Francisco rose slightly faster than in surrounding counties after the minimum wage increase, and again after San Francisco implemented two additional policies (paid sick leave and a health spending requirement). Trends in overall employment in San Francisco closely matched those in the surrounding counties during the same time period, indicating that the differential trends in restaurant employment were not caused by differences in economic growth between the two areas. Restaurants closed in San Francisco at a 2.8 percent lower rate than in nearby areas not covered by the law. This difference, however, was not statistically significant.

Schmitt and Rosnick (2011) studied the impact of minimum wage increases in San Francisco and Santa Fe, comparing employment trends in these cities before and after their minimum wage increases

4 A few earlier studies are worth noting briefly. Potter (2006) studied the impact of Santa Fe's minimum wage law after it increased from \$5.15 to \$8.50 in 2004 using quasi-experimental methods. He found no statistically significant negative impact of Santa Fe's minimum wage increase on Santa Fe employment, both at an absolute level and relative to Albuquerque. Several additional studies of Santa Fe and San Francisco have been produced by the restaurant industry-backed Employment Policies Institute. In a study of Santa Fe, Yelowitz (2005a, 2005b) found an increase in the probability of unemployment for low-skilled workers and evidence of replacement of low-skilled adults by teens. In his study of San Francisco, Yelowitz (2012) found the opposite result: a decrease in teen work hours and no discernible effect on overall employment. Unfortunately, both Yelowitz studies suffer from serious methodological problems that make the results unreliable. Since higher wages are likely to increase the labor supply, unemployment rates can increase even as the number of people who are employed also increases. Pollin and Wicks-Lim (2005) replicate Yelowitz's (2005a) study but look at employment, rather than unemployment. They find no negative impact on employment. Furthermore, even if the reported results for each of the studies held, total compensation for teens and low-skilled workers would still have increased. Any employment or hours reductions would be more than offset by the increase in hourly earnings (Pollin and Wicks-Lim 2005; National Employment Law Project 2012).

to control groups of surrounding suburbs and nearby metropolitan areas.⁵ The authors found no discernible negative effects on employment, even three years after the respective ordinances were implemented. The authors focused on fast-food restaurants, food services, retail trade, and other low-wage industries.

Allegretto et al. (2018) examine the effects of recent minimum wage laws in Chicago, Oakland, San Francisco, San Jose, Seattle, and the District of Columbia, finding insignificant employment changes in the food service industry (an industry with high concentrations of low-wage workers). The authors derived these results using state-of-the-art econometric techniques (event studies and synthetic controls), providing the most comprehensive and rigorous assessment to date of the effects of local minimum wage laws. Many minimum wage studies lack credibility because they fail to identify a valid control group. The authors avoided this pitfall by running “falsification tests” to ensure selection of a valid comparison area for measuring the causal effects of the minimum wage policies. In particular, the authors tested whether employment and pay in the treated and comparison areas exhibited parallel trends during the years *before* the policy was implemented, and whether the outcomes of interest in the treated and comparison areas would have trended in parallel *if the policy had never been enacted*. These tests increased the likelihood that the estimated effects are indeed causal.

Using these techniques, Allegretto et al. (2018) estimated employment effects of a 10 percent increase in the minimum wage that range from a 0.3 percent decrease to a 1.1 percent increase, on average, resulting in no significant negative effect on employment. These results are supported by a variety of robustness checks, including a test of whether the authors’ methods detect earnings or employment effects in professional services, a high wage industry that should not be affected by the minimum wage.

While the above studies provide rigorous evidence that local minimum wage laws have little to no effect on employment, a recent study by researchers at the University of Washington, Jardim et al. (2017), received widespread news coverage for finding that Seattle’s minimum wage increases resulted in significant employment losses.⁶ Several methodological flaws cast doubt on the credibility of these findings. These flaws are outlined in a letter to the Seattle Mayor’s Office by Michael Reich (2017), who, together with other UC-Berkeley researchers, also analyzed the impact of Seattle’s minimum wage and found no negative effects on employment (Reich, Allegretto, and Godoey 2017). Two of the study’s primary flaws are described in detail below.

First, Jardim et al.’s statistical techniques do not control for the effects of Seattle’s booming economy during the years of the minimum wage increases. Instead, Jardim et al.’s results incorrectly imply that increasing Seattle’s minimum wage to \$13 an hour boosted employment in jobs paying \$19 an hour or more (Zipperer and Schmitt 2017). This finding is implausible on its face, which is why other empirical research on minimum wages rejects statistical techniques that find wage and employment effects far

5 The authors also examined the impact of the 1993 minimum wage law in Washington DC, but found that the size of the increase was too small to raise wages in those industries (too few workers were impacted). They conclude that the law therefore does not constitute a meaningful policy experiment.

6 Jardim et al. (2017) found that a 1 percent increase in the minimum wage resulted in a nearly 3 percent reduction in Seattle employment. This finding is far outside the bounds of most existing minimum wage research, which generally finds no negative effect on employment (Dube, Lester, and Reich 2016; Allegretto et al. 2017).

above the level of the minimum wage increase (Autor, Manning, and Smith 2016; Cengiz et al. 2017; Allegretto et al. Forthcoming). Jardim et al. mistakenly attributed losses in low-wage employment to increases in the minimum wage, when these losses are more likely due to the shifts in the Seattle labor market from low to higher wage jobs stemming from the city's economic boom (Zipperer and Schmitt 2017). Second, Jardim et al. exclude all employers with multiple locations in Washington state – accounting for nearly 40 percent of Seattle employment – from their analysis. Consequently, Jardim et al.'s methodology incorrectly codes as disemployed workers who moved from single-site employers to a multi-site employers (e.g. a chain restaurant or chain store) during the first two years of minimum wage increases. Both these flaws lead Jardim et al. to overestimate the negative employment effects of Seattle's minimum wage increases.

Evidence from state and federal minimum wage laws

If the findings of the small number of case studies discussed above are taken on their own, it would be difficult to draw broad conclusions about the impact of minimum wage laws. However, the results from studies of city and county minimum wage laws are corroborated by detailed research on state and federal minimum wage laws that provide a much larger sample of events to study.

Two innovative studies conducted by researchers from UC Berkeley, University of Massachusetts-Amherst, and UNC-Chapel Hill are especially relevant (Dube, Lester and Reich 2010, 2016; Allegretto, Dube, Reich and Zipperer 2017). The researchers looked at every state and federal minimum wage increase in the U.S. over several decades and identified several hundred pairs of adjacent counties that were located on different sides of a state border with a minimum wage difference.

This research design compares the employment trends of the most affected groups—teens and restaurant employees—across adjacent counties that were exposed to different minimum wage levels. It is therefore an excellent test of whether businesses relocate employment outside county borders to avoid being subject to a higher minimum wage. Using this research design, Dube, Lester and Reich (2010, 2016) and Allegretto, Dube, Reich and Zipperer (2017) find no statistically significant effects of minimum wage increases on either employment or hours in restaurants and other low-wage industries, controlling for a range of regional and local differences that previous research did not include.

Allegretto (2013) uses the same dataset to examine the effects of the subminimum wage for tipped workers (which has remained at \$2.13 an hour at the federal level for more than two decades, but varies significantly across states). Focusing on restaurants, she finds no statistically significant evidence of negative employment effects in states with higher (or no) subminimum wages for tipped workers.

Most recently, Cengiz, Dube, Lindner, and Zipperer (2018) pioneered a novel method – the “bunching estimator”—to measure the employment effects of minimum wage increases. The idea behind the method is to track over time how the minimum wage affects the distribution of workers at the bottom of the labor market. Following a minimum wage increase, the employment effect can be measured by taking the number of excess jobs at or above the new minimum wage and subtracting the number of missing jobs below that new minimum, controlling for other factors affecting the wage distribution. Cengiz et al. use this method to analyze the effects of 138 minimum wage increases between 1979

and 2016 and find no statistically significant effect on employment. They also find positive spillover effects for workers making above the minimum wage. About 40 percent of the overall wage gains from minimum wage increases went to workers making up to \$3 more than the minimum wage.

We highlight these studies because they combine state-of-the-art econometric methods with the most detailed datasets available, allowing researchers to control accurately for differences in local economic conditions that could confound the analysis. These studies also reflect a growing consensus among economists and policymakers: the employment effects of minimum wage increases range between very small and zero. Belman and Wolfson (2014) provide the most extensive summary of the minimum wage research since Card and Krueger (1995). They conclude that the employment effects of the minimum wage in the United States are “both vanishingly small and not statistically significant in even the most generous test” (p. 168). A separate review of minimum wage research by Schmitt (2013) similarly finds “the minimum wage has little or no discernible effect on the employment prospects of low-wage workers.”

Most of the broader studies that find negative effects, as reviewed in Neumark and Wascher (2008), fail a fundamental necessary condition for identifying statistically unbiased estimates of minimum wage effects. The key issue is that their research design assumes that states that increase minimum wages are otherwise not different from those that do not increase minimum wages. Dube, Lester and Reich (2010, 2016) and Allegretto, Dube, Reich and Zipperer (2017) have shown in detail that this assumption is incorrect. In the states that increased their minimum wages, employment among low-wage workers was already growing more slowly two years before the implementation of the minimum wage increases, compared to states that did not increase minimum wages. Existing differences in regional employment trends that are unrelated to minimum wage policy can explain the differences in outcomes after the increases. As Allegretto, Dube, Reich and Zipperer (2017) document, local comparisons make sense because nearby areas are much more similar than areas that are farther away. And when minimum wage effects are estimated using local comparisons—such as across adjacent counties on a state border—the negative effect on employment disappears.⁷ Totty (2017) corroborates this methodology by examining minimum wage effects without prior decisions on what control groups should be included. He finds that local controls should be included and that the minimum wage does not have significant effects on employment.

Other studies that find negative effects on employment fail to adequately control for macroeconomic changes affecting employment. For example, Clemens and Wither (2016) found that a federal minimum wage increase from \$5.15 to \$7.25 per hour occurring from 2007 to 2009 reduced the national employment-to-population ratio by 0.6 percentage points. However, Clemens and Wither fail to control for the effects of the Great Recession (Zipperer 2016). Once proper controls are included for regional and industry differences in the effects of the Great Recession, there is no evidence of job loss due to the federal minimum wage increase (Zipperer 2016).

⁷ A recent report by the Congressional Budget Office (2014) projects that a \$10.10 national minimum wage would raise wages for 16 million Americans, lift 900,000 out of poverty, and result in a reduction in jobs of 500,000. The report claims to synthesize recent research on teen employment, but it does so without making adjustments for research quality. The CBO’s estimated elasticity for adult employment is unsupported by the recent empirical research, including that of Neumark and Wascher (2008), which found no measurable employment impact for adults.

Some studies suggest that the employment effects of minimum wage increases are concentrated in reduced hours, rather than reduced jobs. For example, Jardim et al. (2017) report that Seattle's minimum wage increase to \$13 resulted in a 6.9% decline in hours worked by low-skilled workers. However, this study suffers from several methodological flaws described in the previous section. Cengiz et al. (2018) provide definitive findings with respect to hours worked. After analyzing the effects of 138 minimum wage increases between 1979 and 2016, Cengiz et al. find no statistically significant decline in the number of hours worked.

Lastly, Sorkin (2015) and Meer and West (2016) suggest that there are long-run employment effects of minimum wage increases, which have gotten undetected in previous short-run analyses. This claim lacks rigorous supporting evidence. Allegretto et al. (2017) do not find employment effects four years after various minimum wage increases. Cengiz et al. (2018) use administrative data on hours from Washington State which increased its minimum wage by 22 percent between 1999 and 2000 and indexed the wage rate to inflation starting in 2001. The authors find no measurable effect from Washington state's minimum wage increases on net employment in the state. While this is only a single case study, the results are consistent with their larger analysis of state-level minimum wage increases.

Impact on which workers are hired

In his review of minimum wage research, Schmitt (2013) considers several channels through which employers might adjust to increases in the minimum wage. One possible scenario is that employers will simply switch to hiring more skilled workers, thereby hurting the employment prospects of less educated workers and, in particular, black and Latino teens. Schmitt reviews several studies that have explicitly researched this question, some of which yield conflicting findings. Again, research design matters greatly here, and studies that thoroughly control for regional or local differences do not find evidence of labor substitution. For example, Allegretto, Dube and Reich (2011) examine the impact of the minimum wage on the employment of white, black, and Hispanic teens, covering the period from 1990 to 2009. After improving on previous research by controlling for regional differences, they find no statistically significant negative effects on employment or hours for teens, regardless of race or gender. In their contiguous counties dataset, Dube, Lester and Reich (2014) similarly find no evidence of such substitution by either age or gender.

Automation and substitution away from unskilled labor

It is often argued that a higher minimum wage will lead firms to reduce their use of workers. This reduction in labor demand can occur through two different channels: one involves substituting capital for labor, i.e., automation of jobs while keeping sales at the same level; the other involves needing fewer workers when sales fall as prices increase. We discuss here the automation channel and consider the effect on sales later in this section.

Mechanization does not necessarily lead to a net loss of jobs. As David Autor (2014a-b) points out, machines (including smart robots) do not just substitute for labor; they are also complements to existing jobs or lead to the creation of new jobs and industries. Indeed, previous rounds of automation and computerization have created more jobs than they destroyed. Moreover, automation does not

only involve the replacement of labor by machines. It also involves the replacement of old machines (think manual cash registers) with newer ones (think electronic cash registers and now iPads).

Aaronson and Phelan (2017) recently studied the short-run impact of minimum wages on the automation of different kinds of jobs in the restaurant industry. Just as Autor's job mechanization hypothesis predicts, Aaronson and Phelan find that minimum wage increases reduce cognitively routine jobs (such as cashiers) while increasing the number of manually-routine and non-routine jobs (such as food preparation). As it turns out, these changes offset each other almost equally, resulting in no net change in employment. Similarly, Autor, Dorn, and Hanson's (2015) detailed empirical analysis of the effects of computerization on local labor markets found no net decline in employment.

A recent study by Lordan and Neumark (2018) argues that increasing the minimum wage leads to a modest decrease in the share of automatable jobs held by low-skilled workers and an increase in higher skilled jobs. Unlike Aaronson and Phelan (2017), however, the authors do not report the effects of automation on net employment in low-wage industries. While minimum wage increases do lead to automation of some cognitively-routine, low-wage jobs, industries also experience concurrent increases in manually-routine and non-routine jobs. Based on the preponderance of evidence from existing studies, we conclude that the short-run effects of automation on net employment due to minimum wage increases are not significant.⁸

Reductions in paid hours relative to working hours

Some commentators assert that a higher minimum wage will lead employers to cheat them of a portion of their wages. It is important to recognize that such practices already exist; the question at hand is how much the minimum wage increase will increase their intensity and prevalence. Although it is difficult to measure changes in wage theft, we know that employee-reported increases in pay (to a census surveyor) after a minimum wage increase match up well to employer-reported increases in pay on administrative reports that determine payroll taxes (Dube, Lester and Reich 2010). These results suggest that most employers comply about as much after the increase as before.

Impact on retail businesses

Most of the studies cited above focused on employment in the restaurant industry. The retail industry is the second most intensive user of minimum wage and near-minimum wage workers. A few studies have examined the effects of minimum wages on the retail sector. In her research on the retail industry, Zeynep Ton (2012) finds that highly successful retail chains "not only invest heavily in store employees but also have the lowest prices in their industries, solid financial performance and better customer service than their competitors." Using *County Business Patterns* data and their border-county pair research design, Dube, Lester and Reich (2010) found no negative effects of minimum wages on retail employment. In a related study, Dube et al. (2006) compared the number of national retailers operating in San Francisco before and after the city minimum wage policy was implemented. They found that the number of top retailers grew, as did the number of stores. Overall retail employment

⁸ Long-run effects might be different. However, Dube, Lester and Reich (2010) do not detect any negative employment effects as long as four years after a minimum wage is implemented.

did not decline in San Francisco or Santa Fe, nor did employment in individual retail sectors, such as grocery stores, general merchandise stores, or clothing and accessories.⁹

Impact on Firms' Costs

The impact of minimum wages on the overall cost structure of a business varies significantly by industry. The impact of the minimum wage on a firm's operating costs will depend on the share of the workforce at or below the new minimum wage rate, their average wage before the increase, and the share of labor costs in total operating costs. Operating costs include not only labor, but also materials, rent, maintenance, supplies, taxes, utilities, and energy costs. An industry may have large numbers of low-wage workers, but if labor is a relatively small share of the total costs of the firm, the wage increase will have a correspondingly small impact on the overall cost structure of the firm.

In a prospective study of the San Francisco minimum wage, Reich and Laitinen (2003) carried out a representative survey of establishments. They estimated that a 25.9 percent increase in the minimum wage from \$6.75 to \$8.50 would result in a 1.1 percent increase in the overall wage bill. When viewed from the perspective of operating costs, a 26 percent increase would result in 82.0 percent of establishments experiencing an increase in operating costs of less than 1 percent or more, and 95.2 percent experiencing an increase in operating costs of less than 5 percent. Breaking down results by industry, they estimated that 17.9 percent of restaurants would experience an increase in operating costs of 5 percent or more, as would 8.6 percent of retail establishments. For manufacturing, entertainment, hotel, and personal service firms, the estimated increase in operating costs was close to zero.

Pollin (2004) similarly estimated that the average increase in firms' costs relative to sales under Santa Fe's 2003 minimum wage ordinance would be 1 percent; the average cost increase for hotels relative to sales would be 3 percent.

Benner and Jayaraman (2012) analyzed the impact of a proposed increase in the federal minimum wage from \$7.25 to \$10.10 (a 39 percent increase, not accounting for inflation during the phase-in) on the food industry. They estimated a maximum increase in operating costs for the food service and drinking establishment industry of 2.25 percent over three years, and 1 percent in the retail food industry.

Reich, Jacobs, Bernhardt and Perry (2015) estimated that increasing the minimum wage in Los Angeles to \$13.25 by 2017 would result in a 0.5 percent increase in operating costs across the economy by 2017. In the food services industry, they found that operating costs would rise by 3.9 percent by 2019, and in the retail industry costs would rise by 0.5 percent.

To put these results in context, consider the following hypothetical example of how a 10 percent increase in the minimum wage might affect costs in the restaurant industry. If one-third of restaurant workers were paid exactly the minimum wage or up to no more than 10 percent above the minimum wage (and if wages were evenly distributed), then these workers would receive a pay increase that would average half of the 10 percent increase in the statutory minimum. The increase in the wage bill would thus be one-third of 5 percent, or 1.67 percent.

⁹ However, data were not available for comparisons to areas not covered by the minimum wage policy.

Moreover, labor costs comprise about one-third of operating costs in the restaurant industry. A 10 percent increase in the minimum wage would therefore increase operating costs by one-third of 1.67 percent, or 0.56 percent. A larger minimum wage increase would imply a greater increase in costs. In the retail industry, the proportion of low-wage workers is lower than in restaurants; the proportion making exactly the minimum wage is also lower; and labor costs are only about 10 percent of operating costs. So the effect on costs in the retail industry would be even smaller than it is in the restaurant industry. The research results we summarized above are consistent with these hypothetical examples.

Impact on Prices

Since a higher minimum wage applies to all employers in the geographic region affected by the policy, a firm that serves the local market, like a restaurant, will be able to pass through a share of the higher costs without suffering a disadvantage relative to its competitors. Belman and Wolfson (2014) survey seven studies of price effects of the minimum wage, all of which found some impacts on prices in industries highly affected by the minimum wage, namely restaurants. Dube, Naidu and Reich (2007) found that restaurant prices in San Francisco rose 2.8 percent more than those in neighboring Alameda County, following the implementation of a 26 percent increase in the city's minimum wage law. Using a very small sample, Hirsch, Kaufman and Zelenska (2011) found that two-thirds of the cost increase for quick-serve restaurants in Georgia and Alabama were offset by increases in price. Aaronson (2001) found that a 10 percent increase in the minimum wage results in a 0.7 percent increase in restaurant prices. In a novel study analyzing prices from 884 Internet-based restaurant menus before and after San Jose implemented a 2013 minimum wage increase, Allegretto and Reich (2018) found that restaurants increased their prices by 1.45 percent, on average, in response to a 25 percent increase in the city's minimum wage.¹⁰ These results suggest that restaurants can absorb the costs of minimum wage increases through modest price increases and cost savings from reduced worker turnover (see Section E).

Recent research by Cooper, Luengo-Prado, and Parker (2017) examines aggregate effects on prices and consumption in localities. They find that a 10 percent increase in the minimum wage results in a modest 0.3 percentage point increase in aggregate city-level prices over time and a slightly higher 0.4 percentage point increase in the price of food away from home. Policymakers may be concerned that these price increases, though small, could result in lower consumption by low-wage workers, making them worse off. However, Cooper, Luengo-Prado, and Parker (2017) find that households *increased* the quantity of food they consumed at home and away from home following minimum wage increases (meaning that the income effect of higher wages outweighed the substitution effect from higher prices).

When these small price increases are considered in the context of who receives the wage increases, research shows a redistribution effect toward lower income families. Jacobs, Graham-Squire and Luce (2011) estimated the impact of a \$12 minimum wage for large retailers on employees and consumers.

¹⁰ Responding to concerns that competition outside the city would prevent restaurants in San Jose from raising prices to offset labor cost increases, Allegretto and Reich (2018) found that restaurants less than a mile apart near the city's border had different prices for similar items.

They found that if the entire cost were passed through to consumers, Walmart would increase prices 1.1 percent. The increased costs would be shared by consumers across the income spectrum, with 28.1 percent borne by shoppers in lower income households. By contrast, they found that the increase in workers' earnings would be large and concentrated, with 41.4 percent going to workers in families with incomes below 200 percent of the federal poverty line.

Impact on Profits

Previous prospective studies have made different assumptions on how much costs will affect prices—and therefore also profits. Card and Krueger (1995, ch. 10) provide an extensive discussion of this issue. As they point out, from the point of view of an individual employer in a perfectly competitive industry, profits would be unaffected only in the extreme case in which firms can costlessly replace low-wage labor with high-skill labor and/or capital, and without cutting output. Since such substitutions are costly, from this perspective a minimum wage increase would have to reduce profits. Firms do not envision a price increase as a solution, as they fear losing sales to their competitors.

A different result emerges when Card and Krueger consider the point of view of an industry as a whole. This perspective is necessary since the minimum wage increase applies to all the firms in an industry. Now, when individual firms respond to the prospect of reduced profits by raising their prices, they find that other firms are doing the same. Some of the price increases will stick and the industry will recapture some of the reduced profits. However, since demand for the industry's product is not fixed, this increase in price entails some reduction in product demand, implying that industry output (and therefore employment) will fall. In other words, the price increase will permit employers to recover only a portion of their reduced profits.

The above reasoning contains a key assumption: that firms' labor costs consist only of the wages they pay. As Card and Krueger and many other economists (such as Manning 2003, and Ashenfelter, Farber and Ransom 2010) emphasized, the presence of nonwage labor costs—such as the cost of replacing workers who leave—leads to different conclusions. In particular, minimum wage increases may reduce employee turnover costs. As a result, employment declines, price increases, and profit declines will all be moderated. Considerable evidence, moreover, suggests that turnover costs are an important feature of low-wage labor markets.

Aaronson (2001) and Aaronson, French and MacDonald (2008) both find complete pass-through of costs in the restaurant industry. However, their data come from a period of much higher inflation, are based on a handful of observations per metro area, and they do not correct their standard errors for clustering. In contrast, Allegretto and Reich (2014) collected a large sample of restaurant price data in and near San Jose, before and after a 25 percent minimum wage increase in 2013 (from \$8.00 to \$10.00). Their preliminary results indicate that most, but not all, of the costs are passed through to consumers in higher prices. Note that since sales fall, it is possible that profits will fall as well.

The evidence on whether profits do fall is extremely scant. The most important study remains Card and Krueger (1995), who obtain mixed results when examining the effects of minimum wage changes on shareholder returns for fast-food restaurant chains. Using British data, Draca et al. (2011) find a small negative effect on profits. However, one segment of this study uses data for firms in the British residential care industry. Firms in this industry were not permitted to increase prices, making the

results not very useful for other sectors. Harasztosi and Lindner (2015) examine a large (60 percent) increase in the Hungarian minimum wage, much of which was felt in manufacturing. These authors find that cost increases were entirely passed through, but employment did not change and profits did not fall. However, the relevance of the British and Hungarian studies for the U.S. is highly uncertain.

Impact on Employee Turnover

The correlation between low wages and high employee turnover is well documented (Cotton and Tuttle 1986). In 2011, 37 percent of food service workers and workers in hotels and accommodations voluntarily quit their jobs (Boushey and Glynn 2012). In an extensive study of minimum wage impacts on employment flows, Dube, Lester and Reich (2016) found that a 10 percent increase in the minimum wage results in a 2.1 percent reduction in turnover for restaurant workers and a 2.0 percent reduction in turnover for teens. Dube, Naidu and Reich (2007) found an increase in the average tenure of workers in limited-service restaurants of three and a half months. Brochu and Green (2011) obtained similar results with Canadian data.

Three studies analyzed the impact of living wage laws on employee turnover. A study of the Los Angeles Living Wage Ordinance (Fairris 2005) found a 35 percent reduction in turnover in firms that increased wages as a result of the law, with an average increase of 23 percent. Reich, Hall and Jacobs (2005) found an overall decrease in turnover at the San Francisco International Airport of 60 percent for firms that were highly impacted by mandated pay increases. Turnover of airport screeners fell by 80 percent following a 55 percent wage increase, from \$5.75 to \$10 per hour. Howes (2005) found a 17 percent decrease in turnover following a 13 percent wage increase for homecare workers in San Francisco. Putting the living wage studies together, Jacobs and Graham-Squire (2010) estimate that for every 1 percent increase in wages in low-wage service positions, turnover declines by an average of 1.45 percent. The impact may be smaller for broad minimum wage laws where all employers in a market increase their wages at the same time and the wage difference between firms remains the same (Manning 2011).

Employers incur significant costs from employee turnover. This includes both direct costs for recruitment, selection, and training of workers and the indirect costs associated with lost sales, poor customer relations, and lost productivity as new workers learn on the job. The cost of worker replacement varies based on compensation, firm size, and skill level of the job. Hinkin and Tracey (2000) conducted a detailed study of non-managerial staff at four hotels, two in Boston and two in Chicago. Taking into account both direct and indirect costs, they estimated replacement costs ranging from \$1,322 for room service wait staff and \$2,077 for a line cook to \$7,658 for an administrative assistant in sales and catering. A study of the cost of supermarket turnover by the Coca-Cola Research Council estimated the replacement cost for an \$8 an hour non-union worker at \$4,199 (Blake 2000). Boushey and Glynn (2012) find that the median cost of replacement for jobs paying \$30,000 a year or less is 16.1 percent of an employee's annual salary. A statistical analysis of California businesses by Dube, Freeman and Reich (2010) obtained similar results. Jacobs and Graham-Squire (2010) estimate that 18 percent of the costs of a wage increase for school cafeteria workers would be offset by lower turnover costs.

Impacts on Firms' Operations and Productivity

A higher minimum wage may reduce costs through additional channels that improve firm performance. In a small case study of quick-service restaurants in Georgia and Alabama, Hirsch, Kaufman and Zelenska (2011) suggest how firms adjust to higher wage mandates. These authors analyzed detailed payroll data and also surveyed managers and employees about human resource practices. The authors found no negative effect from the minimum wage increase on employment or hours worked. Managers reported they could offset 23 percent of the labor cost increase through operational efficiencies. Ninety percent of the employers reported they had or would increase performance standards, including requiring better attendance, requiring more proficient and faster performance of job duties, having workers take on additional tasks, and more quickly terminating workers who were not performing. Managers reported economizing on non-labor inputs, including water, electricity, and food wastage.

Reich, Hall and Jacobs (2005) surveyed employers and employees at the San Francisco International Airport following the implementation of higher mandated compensation standards. Employers reported improvements in overall work performance (35%), employee morale (47%), absenteeism (29%), reductions in grievances (45%), reductions in disciplinary issues (44%), improvements in equipment maintenance (29%), reductions in equipment damage (24%), and improvements in customer service (45%). Employees reported that more skills were required of them (50%), that they were working harder on the job (44%), that they were experiencing greater stress on the job (43%), and that the pace of work had increased (37%).

Reduced employee turnover means that workers will have more tenure with the same employer, which creates incentives for both employers and workers to increase training and therefore worker productivity. A large scholarly literature makes this point, and it has been emphasized recently by firms such as Walmart, TJ Maxx, and Gap as principal reasons underlying their announced policies to increase their minimum wages nationally to \$10.00. However, because of the lack of data on individual productivity, the literature does not provide a quantitative assessment of the importance of the effect on productivity.

Impact on Health Benefits and Pensions

If employers are required to increase their wages, they may compensate by reducing other benefits. For this reason, some of the local minimum wage laws count contributions towards health care towards meeting the minimum compensation requirement. Schmitt (2013) summarizes the empirical research, finding "small or no effects along these lines," either on the receipt of health insurance, on provision of family health insurance, or whether or not the employer paid the full premium. Dube, Naidu and Reich (2007) did not detect any decrease in the provision of health benefits in restaurants in San Francisco.¹¹ Belman and Wolfson's (2014) detailed survey of minimum wage research found that the evidence of impacts on benefits was "thin," and that any effect on health insurance provision was concentrated in smaller firms. They find no impact on employer-provided pensions, which

¹¹ Their surveys were carried out sufficiently prior to San Francisco's proposal to establish an employer minimum health spending requirement to avoid any contamination of the results.

is not surprising given that this benefit is rare among low-wage workers. Since the provision of employment-based health benefits is closely correlated with wages, effects could be larger at higher minimum wage rates.

The Effects of Minimum Wage Laws on the Local Economy

A common question is whether raising the minimum wage might act as an economic stimulus and engine of job growth, as low-wage workers spend their increased earnings in local communities. As discussed above, higher wages are absorbed by employers through a variety of channels, including lower turnover and increases in price. Higher prices will in turn reduce consumer demand for goods and services. At the same time, low-wage workers and their families are likely to spend a significant portion of their increased earnings from a minimum wage increase (Johnson, Parker and Soueles 2004), which increases demand for goods and services.

Researchers at the Federal Reserve Bank of Chicago analyzed how a future federal minimum wage increase would affect aggregate household spending (Aaronson and French 2013). The authors calculate that a \$1.75 increase in the federal minimum wage (from \$7.25 to \$9.00 an hour) would raise aggregate household spending by roughly \$48 billion in the short term, increasing GDP by 0.3 percent. In a similar vein, the Economic Policy Institute recently estimated that the Harkin/Miller bill would result in an additional \$35 billion in wages paid to affected workers by 2016. This projected rise in consumer spending would provide a net increase in GDP of \$22.1 billion, creating roughly 85,000 new jobs (Cooper 2013).

For local laws, the size of the locality and the proportion of workers who live and spend their income in the locality are also important. Reich, Jacobs, Bernhardt and Perry (2015) modeled the interaction between higher prices and higher wages on consumer demand in a prospective minimum wage study for the city of Los Angeles. They found that, on balance, the reduction in consumer demand from higher prices was offset by the increased purchasing power of low-wage workers receiving the pay increase. However, since not everyone employed within the city also lives within the city, some of the increased demand is spread to surrounding areas. As a result, they found the law would lead to a small net reduction in consumer demand and employment within the city of Los Angeles and a small net positive increase in employment in the county as a whole.

Since low-wage workers tend to live in lower-income neighborhoods, businesses in those neighborhoods will disproportionately benefit from the increase in worker spending.

Border Effects

Will higher local minimum wages lead to firms relocating outside the city? Most economic activity in the United States is concentrated in urban areas, where wages are higher. Despite higher wages—and much higher real estate prices—firms want to locate in cities. They seek the advantages of being near other firms in their industry, the market for their products, and sources of raw materials, transshipment points, and labor. The firms that locate in urban areas thus already are paying a premium. Of course, at the periphery of urban areas real estate prices are lower, creating an advantage that gets balanced against the benefits of being closer to customers and to other firms.

Previous research suggests that business relocations are determined more by real estate prices and access to consumer markets than by differences in labor costs (Kolko and Neumark 2007). Wages are also likely to rise just outside of a higher minimum wage city as businesses there will want to hold onto their workforce.

Jekanowski et al. (2001) find that convenience and accessibility are the prime determinants of fast-food restaurant location decisions. The best recent evidence comes from Colbion et al. (2015), who examined sales and price data for 31 identical products from hundreds of retail stores in 50 metro areas. These authors document substantial store-based differences in prices for the same exact product, even within the same metro area. The persistence in price differences, even among nearby stores, indicates the presence of geographic frictions in consumer markets. In other words, small price differences did not lead consumers to switch to lower-price stores.

On the other hand, the same study also found that consumers switch to low-price outlets when local unemployment rates increase, in part because the cost of time for unemployed shoppers is much lower than for shoppers as a whole. This evidence thus also indicates that spatial price differences, although not decisive for shoppers, are not completely irrelevant either. Not surprisingly, much depends on the size of the price differences. A number of studies have focused on the implied travel costs for consumers in deciding where to shop. Gopinath et al. (2011) estimate that such costs might be about \$1.70 per mile (round-trip) for retail. Thomadsen (2005) collected data on prices, locations, and attributes of every Burger King and McDonald's outlet in Santa Clara County and estimate a travel cost of \$3 per (round-trip) mile. Implied travel costs of this magnitude make it unlikely that fast-food restaurants would want to move away from their own customer base.

The UC Berkeley IRLE Minimum Wage Model

In 2015, the UC Berkeley Institute for Research on Labor and Employment (IRLE) minimum wage group developed a structural model to study the prospective impacts of a \$15 minimum wages in Los Angeles (Reich, et al 2015). Since then the model has been further developed to incorporate more of the direct and indirect effects of minimum wages on workers, businesses, and consumers, with more attention to possible automation and to the effects of higher wages on productivity growth.

Our structural model recognizes that higher minimum wages will affect labor supply and labor demand. Adjustments to labor supply include lower employee turnover and lower job vacancy rates. Adjustments to labor demand include possible substitutions of capital for labor and skilled labor for unskilled labor, greater worker productivity when wages rise, reductions in employment because higher prices reduce sales, and increases in employment because workers' spending out of their higher income will increase sales and employment. The net effect depends upon the magnitudes of the individual adjustments, again taking into account interactions among them.

The inspiration for the model derives from Marshall's Laws, a famous set of propositions about the labor market first developed by the great English economist Alfred Marshall in 1890.¹² These laws, which are featured in every labor economics textbook, examine how employer demand for workers

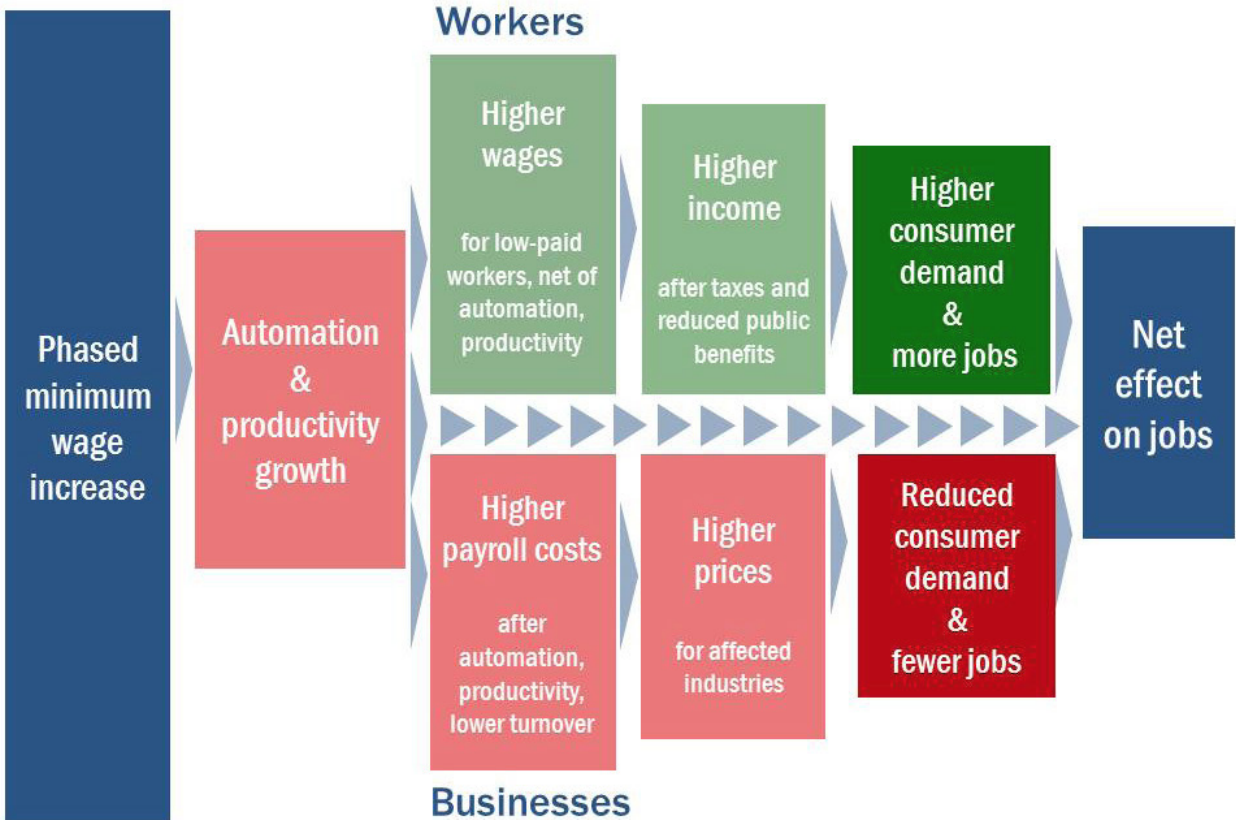
12 To recognize Hicks' 1932 formulation of these laws in mathematical form, they are also known today as the Hicks-Marshall laws of derived demand. See Cahuc et al. (2014), ch. 4.

will respond to an industry-wide wage increase. Marshall worked out the effects by examining “substitution” and “scale” effects in labor, capital, and goods markets. (For a formal version of this labor demand model, see Cahuc, Carcillo and Zylberg (2014), ch. 2). Since we are interested in the effects of an economy-wide minimum wage, we add an “income effect” to Marshall’s Laws. This effect accounts for Keynesian-style effects on the level of economic output obtained when pay increases lead to increased consumer demand.

Model Structure

Figure 3 summarizes our model qualitatively in a flow diagram. The green boxes refer to the effects on workers and the red boxes refer to the effects on businesses. The automation and productivity box is placed first to highlight how businesses will respond to a minimum wage. Automation here refers only to capital-labor substitution that is induced by the minimum wage, not to the much larger degree of automation that has taken place for decades. Productivity growth can come from automation, from workers working harder or smarter when pay is high, and from workers having more experience, as when minimum wages reduce employee turnover.

Figure 1. UC Berkeley IRLE Minimum Wage Model



Source: UC Berkeley IRLE Minimum Wage Research Group.

Examine next the effects on workers, shown in the green boxes and move from left to right. The first green box refers to the higher wages received by lower-paid workers. The next green box accounts for the net effect of taxes and reduced receipt of public benefit programs on workers' income. Workers will pay more in taxes as their wages increase and eligibility for public benefits will decline. The third box refers to how workers' increased spending power out of their higher net income translates into higher consumer demand and more jobs. We will refer to this mechanism as the income effect of minimum wages.

Examine now the effects on businesses and again move from left to right. The higher minimum wage will increase businesses' payroll costs, but some of these higher costs will be offset because employee turnover will fall, generating savings in recruitment and retention costs. Firms may also find that higher-paid and more experienced workers will be more productive, which could also offset payroll cost increases. In other words, one effect of a higher minimum wage is to induce more efficient management practices.

Higher payroll costs (net of turnover and productivity savings) will lead firms to increase prices, leading to reduced consumer demand. We will refer to this adjustment mechanism as the scale effect, as it identifies reductions in the scale of output that will reduce the demand for workers.

As we have already mentioned, businesses may also respond to higher minimum wages by increasing their investment in equipment. This substitution effect (think automation) also reduces their demand for workers.

The income effect has a positive effect on employment, while the scale and substitution effects each have negative effects on employment. The sum of the income, scale, and substitution effects determines the net employment effect of the minimum wage, as shown in the blue box on the right side of Figure 3.

Figure 3 is useful for understanding the basic structure of our model. But it leaves out some important details. First, the effects on businesses and workers in the red and green boxes of the model occur simultaneously, not sequentially. The effects in reality are therefore captured only by examining the net effects on the economy and employment. These net effects are symbolized by the blue box at the right of the diagram. Second, Figure 3 omits some feedback loops that would make the figure unwieldy, but which are included in our estimates when applying the model.

Model Calibration and Dynamics

The net effect of minimum wages on employment equals the sum of the income, scale, and substitution effects. The income effect will always be positive, while the scale and substitution effects will always be negative. Whether the net effect is positive, zero, or negative therefore depends upon the relative magnitudes of its three components.

These relative magnitudes in turn depend upon the quantitative responses of workers and businesses to a minimum wage increase. We refer to the model's parameters as the inputs that determine these multiple quantitative responses. Some of these parameters, such as the propensity to substitute capital for labor, may not vary with the magnitude of the minimum wage increase. Other parameters,

such as turnover cost savings, are likely to vary with the size of the increase. As with any economic model, we calibrate our model using the best data and research findings available.

The model's parameters and dynamics must be consistent with two conditions. First, the model must be consistent with the very small effects that researchers find for the smaller pre-2015 increases in federal and state minimum wages. Second, although labor demand in low-wage labor markets may be much less responsive to wages than is commonly thought, labor demand is not completely unresponsive. The model must therefore be consistent with growing negative effects if minimum wages were to reach extremely high levels, such as at \$25 or \$40 per hour. The big unknown, of course, is: At what level do the effects become visibly negative and how quickly do they become more negative?

Reich (2016) shows that our calibrated model predicts extremely small effects for minimum wage increases of up to 25 percent, to a minimum wage of \$10. At this minimum wage, the income, scale, and substitution effects are each very small. As the minimum wage reaches to higher levels, the (positive) income effect weakens since the propensity to consume of higher-paid workers is lower than that of lower paid workers. At the same time, the (negative) scale effect strengthens because turnover cost savings diminish and the price elasticity of consumer demand becomes higher for higher-priced goods.¹³ Our model is thus consistent with growing negative employment effects at higher minimum wage levels.

We have tested our model's calibration by undertaking a series of robustness tests. The tests show that this net effect changes by small amounts when we vary the model's parameters (Reich 2016).

Conclusion

In 1994 David Card and Alan Krueger published a groundbreaking study that changed how economists view the minimum wage. Card and Krueger looked at employment in fast-food restaurants across the New Jersey and Pennsylvania border after New Jersey increased its state minimum wage. They found no measurable negative impact on employment. In the twentieth-anniversary edition of their book, *Myth and Measurement*, Card and Krueger (2015) summarize the minimum wage research since their 1994 study, finding that the bulk of the literature confirms their original findings. As we reviewed above, a large body of research has since built upon their methodology. As a result, we have learned a great deal about how employers respond to increases in the minimum wage.

First, minimum wage increases lead to net gains in worker earnings and have no negative effect on employment. Second, turnover levels in low-wage jobs are high as workers leave jobs looking for better wages or because they are unable to stay in their jobs due to poverty-related problems such as difficulties with transportation, child care, or health. As a result, rather than eliminating jobs, raising the minimum wages can reduce turnover and increase job stability. Third, firms can absorb higher labor costs through other means as well. They can pass on some of the increased costs to consumers through higher prices or earn lower profits. In short, firms use a combination of strategies to adjust to higher minimum wages without cutting jobs or hours (Schmitt 2013).

13 The capital-labor substitution elasticity is not likely to be higher or lower at higher minimum wage rates.

Nonetheless, it is important to emphasize again that the existing research literature is necessarily limited to the range of minimum wage increases that have been actually been implemented. While these studies are suggestive, they cannot tell us what might occur when minimum wages are increased significantly beyond past local, state, or federal mandates. In the most comprehensive assessment to date, Allegretto et al. (2018) examine the effects of recent minimum wage laws in Chicago, Oakland, San Francisco, San Jose, Seattle, and the District of Columbia, finding that benefits to low-wage workers of the higher minimum wage laws outweigh any costs.

Finally, raising the minimum wage is not a cure-all, especially in the face of larger forces generating inequality that require national attention. Still, our assessment of the research evidence is that these policies have worked as intended in raising the incomes of low-wage workers and their families.

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Acknowledgments

The authors thank Michael Reich for his generous comments and feedback, and Sarah Lawton, Jenifer MacGillvary, and Sandy Olgeirson for their help in preparing the report.

This report was commissioned by North Bay Jobs with Justice, the North Bay Central Labor Council, and the Napa-Solano Central Labor Council.

Suggested Citation

Ian Perry, Garrett Strain and Ken Jacobs. Estimated Impact of a Proposed Minimum Wage Law for the North Bay. Center for Labor Research and Education, University of California, Berkeley. October 2018. <http://laborcenter.berkeley.edu/north-bay-minimum-wage/>.

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