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The Effects of a $15 Minimum Wage by 2019 in San Jose and Santa Clara County

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CONTENTS

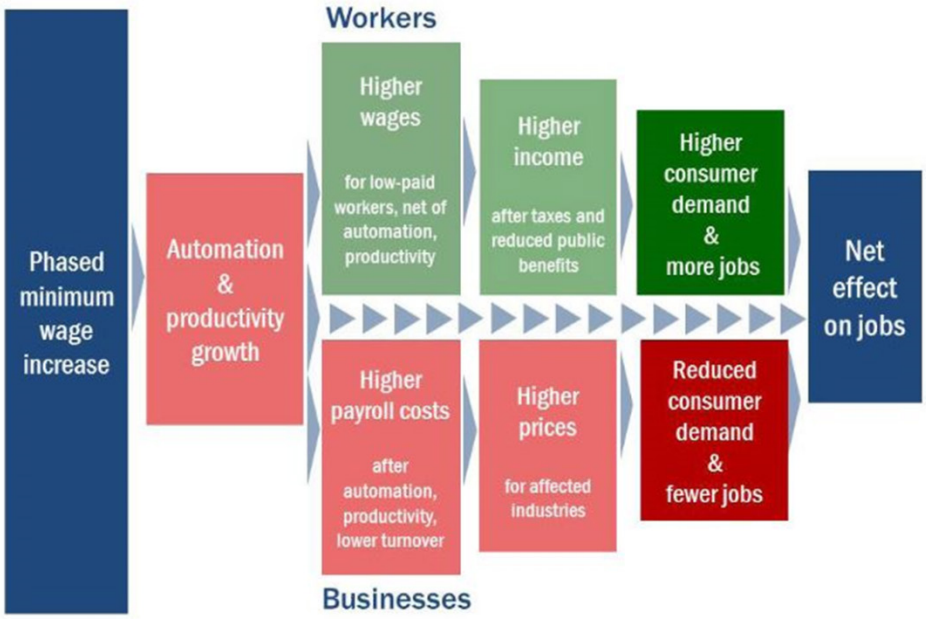
KEY FINDINGS

We present here, at the request of the City of San Jose, an analysis of the impact of minimum wage increases for both San Jose and all of Santa Clara County. Both scenarios begin on January 1, 2017 and increase to $15 by January 1, 2019.[1]

Critics of minimum wage increases often cite factors that will reduce employment, such as automation or reduced sales, as firms raise prices to recoup their increased costs. Advocates often argue that better-paid workers are less likely to quit and will be more productive, and that a minimum wage increase positively affects jobs and economic output as workers can increase their consumer spending. Here we take into account all of these often competing factors to assess the net effects of the policy.

Our analysis applies a new structural labor market model that we created specifically to analyze the effects of a $15 minimum wage. We take into account how workers, businesses, and consumers are affected and respond to such a policy and we integrate these responses in a unified manner. In doing so, we draw upon modern economic analyses of labor and product markets. As we explain in the report, the main effects of minimum wages are made up of substitution, scale, and income effects. The figure below provides a guide to the structure of our model.

Figure 1. UC Berkeley IRLE minimum wage model



Source: UC Berkeley IRLE Minimum Wage Research Group

Our data are drawn from the Census Bureau's American Community Survey and from other Census and U.S. Bureau of Labor Statistics datasets. We also make use of the extensive research conducted by economists—including ourselves—in recent years on minimum wages, and upon research on related economic topics.

Our estimates of the effects of a $15 minimum wage are also based upon existing research on labor markets, business operations, and consumer markets. Our estimates compare employment numbers if the policy were to be adopted to employment numbers if the policy is not adopted. Other factors that may affect employment by 2019 are therefore outside the scope of our analysis. We have successfully tested our model with a set of robustness exercises.

Our analysis does not incorporate the recent state minimum wage law passed in April 2016. Since the San Jose and Santa Clara County scenarios are on a faster timeline, the number and demographics of workers affected would be similar if we had included the scheduled statewide increases. However, the size of the average wage increase and the effect on firms compared to the new baseline established by the state would be somewhat smaller.

SCENARIO A: KEY FINDINGS FOR A $15 MINIMUM WAGE INCREASE IN SAN JOSE – BY 2019

Economic context

- When accounting for inflation, median earnings in San Jose were 10.5 percent lower in 2014 compared to their 2007 pre-recession level. Median annual earnings in San Jose are 20.9 percent higher than the state as a whole, but 17.3 percent less than median earnings in Santa Clara County.

- Unemployment rates have declined significantly for the state and San Jose. The April 2016 unemployment rate for California was 5.3 percent, down to its 2007 pre-recession rate. Annual unemployment in San Jose had was 4.5 percent in 2015, lower than its pre-recession rate (5.2 percent in 2007).[2]

Effects on workers – by the end of 2019

- Increasing the minimum wage to $15 would increase earnings for 115,000 workers, or 31.1 percent of the city's workforce.

- Among those getting raises in San Jose, annual pay would increase 17.8 percent, or about $3,000 (in 2014 dollars) on average. These estimates include a ripple effect: some workers who already earn $15 will also receive an increase.

- 96 percent of workers who would get increases are over 20 and 56 percent are over 30—with a median age of 32.

- The proposed minimum wage increase would disproportionately benefit Latinos, who represent 53 percent of affected workers.

- Workers who would get pay increases are less-educated than the overall workforce, but almost half (48 percent) have some college experience or higher.

- The median annual earnings of workers who would get raises ($18,100 in 2014 dollars) are 36 percent of median earnings for all workers in San Jose ($50,507). Workers getting increases are disproportionately employed in part-time jobs, and are also less likely to have health insurance through their employer.

- Workers who would get pay increases disproportionately live in low-income families; on average, they earn close to half of their family's income.

- The research literature suggests downstream benefits from the proposed wage increase, such as improved health outcomes for both workers and their children, and increases in children's school achievement and cognitive and behavioral outcomes.

Effects on businesses and consumers – by the end of 2019

- Three industries account for over half of the private sector workers getting increases in San Jose: restaurants (21.0 percent), retail trade (19.1 percent), and administrative and waste management services (14.7 percent).

- 77.8 percent of workers in the restaurant industry in the private sector would receive a wage increase, compared to 11.5 percent in manufacturing.

- Total wages would increase by 10.1 percent for restaurants and 1.3 percent across all employers. This increase is much smaller than the minimum wage increase because many businesses already pay over $15 and many workers who would get pay increases are already paid more than the current minimum wage. In addition, the workers who would receive pay increases are the lowest paid workers in San Jose and their wages represent only 8.3 percent of total wages.

- Employee turnover reductions, automation, and increases in worker productivity would offset some of these payroll cost increases.

- Businesses could absorb the remaining payroll cost increases by increasing prices slightly—by 0.3 percent through 2019. This price increase is well below annual inflation of 2.5 percent over the past five years. Price increases in restaurants would be higher, 3.1 percent.

- Price increases would be much smaller than labor cost increases because labor costs average about 22 percent of operating costs; compared to 31 percent for restaurants and 11 percent for retail.

- The consumers who would pay these increased prices range across the entire income distribution.

Net effect on employment in San Jose, Santa Clara County and nine nearby counties – by the end of 2019

- Our estimate projects slightly slower employment growth during the phase-in period than without the minimum wage increase: cumulatively, 960 fewer jobs by the end of 2019 in San Jose, which corresponds to 0.3 percent of projected 2019 employment. In comparison, employment in the state is projected to grow 1.32 percent annually in the same time period.

- Most of the reduction in job growth in San Jose reflects leakage of the increased spending by workers getting increases into the rest of the region. A substantial share of San Jose workers who would get pay increases live and spend their increased income in neighboring areas. Taking into account the increased spending in surrounding areas, we estimate there would be 80 fewer jobs over the larger regional area than without the wage increase. This area includes the following counties: Santa Clara, Alameda, San Mateo, San Francisco, Santa Cruz, Monterey, and San Benito.

SCENARIO B: KEY FINDINGS FOR A $15 MINIMUM WAGE INCREASE IN ALL OF SANTA CLARA COUNTY – BY 2019

Economic context

- After accounting for inflation, the earnings of typical workers in the county declined by 8.3 percent between their pre-recession level in 2007 and 2014. Median annual earnings in Santa Clara County are 49.6 percent higher than in the state as a whole.
- Santa Clara County has experienced rapid employment growth in the recovery from the recession. Over 62 percent of Santa Clara County's working age residents are employed, compared to 57 percent in the state as a whole.
- The unemployment rate in Santa Clara County was 4.2 percent in 2015, significantly below the pre-recession rate and falling.

Effects on workers – by the end of 2019

- Increasing the minimum wage to $15 would increase earnings for about 250,000 workers in Santa Clara County, or 25.3 percent of the county's workforce.
- Among those getting raises in Santa Clara County, annual pay would increase 19.4 percent, or $3,200 (in 2014 dollars) on average. These estimates include a ripple effect in which some workers who already earn $15 will also receive an increase.
- The demographics of the affected workers in Santa Clara County mirror those in San Jose: 95.5 percent are over the age of 20, with a median age of 32; 37.0 percent are married; 33.9 percent have children; nearly half are Latino.
- The median annual earnings of affected workers ($17,821 in 2014 dollars) are about one-third of the median for all workers in Santa Clara County ($57,956).

Effects on businesses and consumers – by the end of 2019

- Three industries account for nearly half of the private sector workers getting increases in Santa Clara County: food services (20.2 percent), retail trade (16.1 percent), and administrative and waste management services (11.9 percent).
- 71 percent of workers in the restaurant industry in the private sector would receive a wage increase, compared to 11.2 percent in manufacturing.

- Total wages would increase by 9.5 percent for restaurants and one percent across all employers. This increase is much smaller than the minimum wage increase because many businesses already pay over $15 and many workers who will get pay increases are already paid over the current minimum wage. In addition, the workers who would receive pay increases are the lowest paid workers in Santa Clara County and their wages represent only 6.1 percent of total wages.

- Employee turnover reductions, automation, and increases in worker productivity would offset some of these payroll cost increases.

- Businesses would absorb the remaining payroll cost increases by increasing prices slightly—by 0.2 percent through 2019. This price increase is well below annual inflation of nearly 2.5 percent over the past five years. Price increases in restaurants would be higher at 2.9 percent.

- Price increases would be much smaller than labor cost increases because labor costs average about 22 percent of operating costs; compared to 31 percent for restaurants and 11 percent for retail.

- The consumers who would pay these increased prices range across the entire income distribution.

Net effect on employment in Santa Clara County and nine nearby counties – by 2019

- Our estimate projects slower employment growth over the phase-in period than without the minimum wage increase: cumulatively, 1,350 fewer jobs by the end of 2019 in Santa Clara County, which corresponds to 0.1 percent of projected 2019 employment. In comparison, employment in the state is projected to grow 1.32 percent annually in the same time period.

- Based upon regional commuting and spending patterns, we estimate a net gain of less than one hundred jobs over the larger region that includes the counties of Santa Clara, Alameda, San Mateo, San Francisco, Santa Cruz, Monterey, and San Benito. The employment gains generated by a $15 minimum wage within Santa Clara County are spread over nearby counties.

LIMITS TO OUR STUDY

- Any prospective impact study involves an inherent level of uncertainty. Actual effects may differ from our estimates if future economic conditions vary from current forecasts.
- We estimate the net effects on jobs in the city, county and region. The effects will vary for particular industries.
- We do not take into account the effects of higher wages on worker health and on worker training, which are likely to be positive. Also, although higher parental earnings have well-documented effects on children's health, educational outcomes, and future earnings, these long-run effects are beyond the time scope of our study.
- These results cannot be generalized to minimum wages higher than $15. Our model predicts additional negative effects would occur at some higher minimum wage.

CONCLUSION

- Like all forecasts, our results may differ if other economic conditions change.
- A $15 countywide minimum wage by 2019 would generate a significant increase in earnings for about 115,000 workers in San Jose and 250,000 workers in Santa Clara County. The improvement in living standards would outweigh the small effect on employment.
- How can such a major improvement in living standards occur without adverse employment effects? While a higher minimum wage induces some automation, as well as increased worker productivity and slightly higher prices, it simultaneously increases worker purchasing power. These positive and negative effects on employment largely offset each other. In the end, the impacts of the minimum wage will be employee turnover reductions, productivity increases and modest price increases.

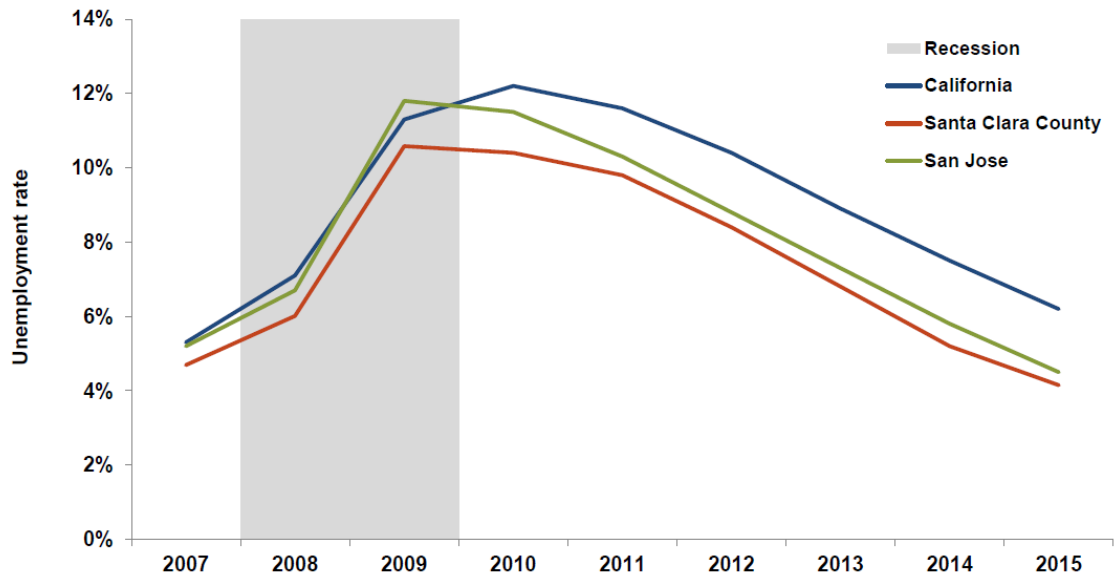
PART 1. THE POLICY CONTEXT

1. THE ECONOMIC CONTEXT

We review here the current economic conditions in Santa Clara County, the City of San Jose and, for context, California. We focus on four economic indicators over the Great Recession and recovery: unemployment rates, job growth, employment rates, and earnings. Each provides a somewhat different perspective on the nature of the current recovery.

The Great Recession started near the end of 2007 and officially lasted until June 2009. California was hit hard by the recession as state unemployment rates soared into double digits as did the rates for San Jose and Santa Clara County (Figure 2). Unemployment rates started to decline as the economy improved. The April 2016 unemployment rate for California was 5.3 percent, down to its 2007 pre-recession rate. The 2015 annual unemployment in San Jose was 4.5 percent, lower than its pre-recession rate (5.2 percent in 2007).

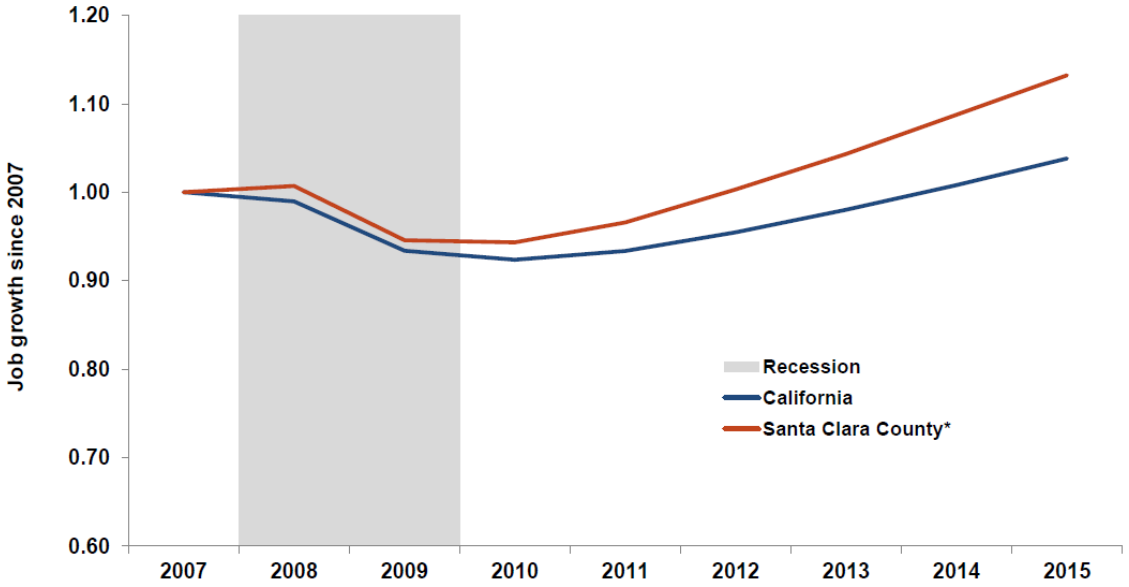
Figure 2. Annual unemployment rates, 2007-2015



Source: Annual unemployment rates are from the California Employment Development Department.

Unemployment rates improved as job growth strengthened over the last several years. Figure 3 shows the sizable job losses in Santa Clara County and California during the recession. Job growth returned in 2011—at a faster pace in Santa Clara County than in California—and that higher pace of job growth in Santa Clara County has increased even as job growth in the state steadily improved.

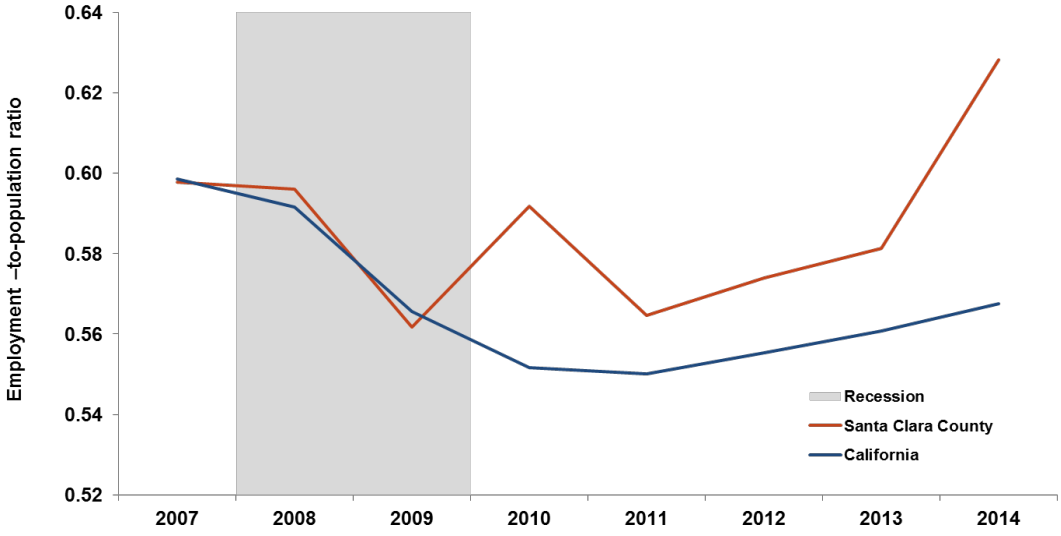
Figure 3. Job growth, California and Santa Clara County, 2007-2015



Source: Authors' calculation of growth in total nonfarm payrolls (annual averages) from Current Employment Statistics.

Note: *Data for Santa Clara County refers to the San Jose–Sunnyvale–Santa Clara MSA

Figure 4. The employment rate (EPOPS), 2007-2014

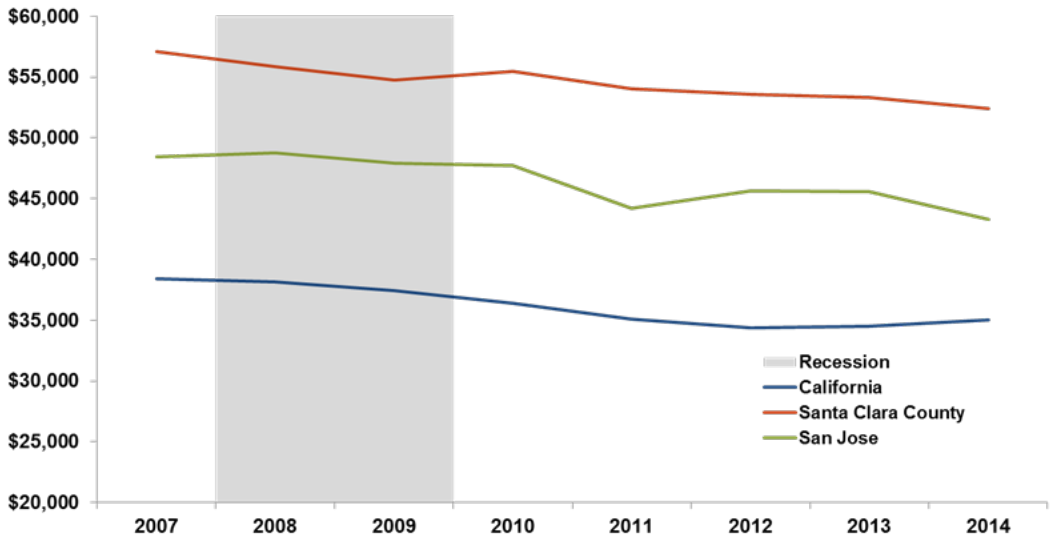


Sources: California state employment-to-population ratios are calculated using annual employment data from the CPS and annual population data from the U.S. Census. Santa Clara County ratios are calculated using annual employment data from EDD and annual population data from the U.S. Census.

Figure 4 depicts trends in the employment rate - the share of the working age population that is employed. This indicator is a companion to the unemployment rate as it counts workers who stopped looking for work and those who want more hours of work. Santa Clara County has experienced rapid employment growth over the recovery. Over 62 percent of Santa Clara County residents are employed compared to 57 percent for the state as a whole. Figure 4 shows that the earnings of typical workers in Santa Clara County far outpace earnings for workers in San Jose and the state overall. Median annual earnings in Santa Clara County are $52,377 (in 2014 dollars) which is 49.6 percent higher than the state as a whole. Annual earnings in San Jose are $43,313 (in 2014 dollars), which is 20.9 percent higher than the state as a whole, but 17.3 percent less than median earnings in Santa Clara County.

However, pay in both the county and the state is lower than it was in 2007. In Santa Clara County, after accounting for inflation, earnings of typical workers have declined by 8.3 percent, compared to pre-recession levels. The pay of typical workers in the City of San Jose is 10.5 percent lower compared to the 2007 per-recession level. These patterns suggest that inequality has continued to increase even during economic expansions.[3]

Figure 5. Real median earnings, 2007-2014



Source: American Community Surveys 2007-2014.
Note: Median annual earnings for workplace geography in real 2014 inflation-adjusted dollars for workers 16 years and over with earnings.

In summary, unemployment and employment trends show that California's economic recovery has strengthened substantially in recent years—and even more so in Santa Clara County and San Jose. Median annual earnings are considerably higher in Santa Clara County and San Jose than in the state as a whole. However, the earnings of typical workers have declined despite the economy recovery.

2. THE MINIMUM WAGE INCREASE SCHEDULES

Both of the scenarios considered in this report would phase in minimum wage increases over three years, starting with $12 an hour in 2017 and reaching $15 an hour in 2019. In Scenario A, this minimum wage schedule is adopted in San Jose. In Scenario B, this minimum wage schedule is adopte throughout Santa Clara County, including San Jose. Tables 1 and 2 compare these two minimum wage scenarios to the "baseline" schedules currently in effect (as of March 1, 2016). In the impact analyses that follow, our logic will be to estimate the effects of Scenario A and B, relative to their respective baseline schedules. (Our analysis does not take into account the recent state minimum wage increase signed into law in April 2016).

Table 1. San Jose Minimum Wage Schedule: Scenario A

	2017	2018	2019
Baseline schedule*	$10.53	$10.76	$11.00
Scenario schedule	$12.00	$13.50	$15.00

* Based on San Jose's minimum wage schedule as of March 1, 2016. It does not take into account the state minimum wage increase enacted on April 4, 2016. San Jose's minimum wage was indexed to the U.S. All Cities CPI-W. We estimate each year's minimum wage using the average annual increase in the CPI-W over the past 10 years.

Table 2. Santa Clara County Minimum Wage Schedule: Scenario B

	2015 workforce	2017	2018	2019
Baseline schedules				
San Jose & Sunnyvale	431,000	$10.53*	$10.76*	$11.00*
Palo Alto & Santa Clara City	211,000	$11.25*	$11.50*	$11.75*
Mountain View	84,000	$13.00	$15.00	$15.37*
Rest of Santa Clara County (state schedule)	180,000	$10.00	$10.00	$10.00
Scenario schedule				
Santa Clara County (except Mountain View)	906,000	$12.00	$13.50	$15.00

Note: The baselines for these schedules were in effect as of March 1, 2016. Proposals being considered by individual cities were not used. We do not take into account the state minimum wage increase enacted on April 4, 2016.

* Where minimum wages are scheduled to increase according to CPI, we estimate the increase using the average annual CPI increase over the past 10 years. Mountain View's minimum wage is indexed to the San Francisco CMSA CPI-W. All other cities are indexed to the U.S. All Cities CPI-W.

PART 2. EMPLOYMENT IMPACT ANALYSIS IN SAN JOSE AND SANTA CLARA COUNTY

1. PREVIOUS MINIMUM WAGE RESEARCH

In the past two decades, economists have conducted numerous econometric studies of the effects of minimum wages. The overwhelming majority have focused on the employment effects (Belman and Wolfson 2014; Belman and Wolfson 2015; Schmitt 2015). Typically these studies make use of panel data on workers or firms from standard government sources such as the Current Population Survey or the Quarterly Census on Employment and Wages.

Most extant research on minimum wages does not detect significant effects on workers age 20 and over. Some observers attribute the lack of visible effects to the relatively small proportion of adults who were affected by past minimum wage increases in the U.S.[4] These observers argue that minimum wage effects should be detectible by examining groups that are more affected, notably teens and restaurant workers (Brown 1999).

Economists have therefore focused on these two groups. After two decades of methodological controversy among researchers, the literature has produced some areas of agreement. In particular, recent studies of the effects on restaurant workers by researchers with opposing methodological views have arrived at a consensus: the employment effects are either extremely small or non-existent.[5] The effects of minimum wages on teen employment remain somewhat controversial. Some researchers find significant but not large negative effects (Neumark, Salas, and Wascher 2014) while others find effects that are much smaller, close to zero (Allegretto et al. 2015).

The remaining controversy over effects on teens has become less relevant than it once was. While teens once represented one-fourth of all workers affected by minimum wages nationwide, their importance has fallen to less than half that level today. We find that teens represent only 4.5 percent of the workers who would be affected by the proposed $15 Santa Clara County minimum wage. Moreover, compared to teens, the rest of the low-wage workforce is older and has more work experience and schooling than was the case in previous decades. Results that are specific to teens are therefore not as informative for the effects on the workforce as a whole.

This minimum wage research uses quasi-experimental methods, exploiting time and state variation between 1979 and 2012 in federal and state minimum wages to identify causal effects. The most credible of the studies use state of the art statistical methods to ensure that the causal comparisons are apples to apples. However, the minimum wage changes in these past experiences, which peak at about $10, generated increases for at most 8-10 percent of the workforce. In contrast, approximately 31 percent of all workers would receive a wage increase in the $15 San Jose scenario and 25 percent in the $15 Santa Clara County scenario, far higher than is the case in the minimum wage research literature to date. As a result, this previous research is at best only suggestive of the effects we consider here.

Moreover, this quasi-experimental econometric approach does not tell us whether employment effects are the result of automation, or price increases, or other possible mechanisms. Instead, it incorporates the results of all these mechanisms without identifying which are at work.

Since the quasi-experimental econometric approach is not appropriate for our study, we draw here upon the other major empirical method used by economists—building and calibrating a structural model. Thus, in order to better understand the impacts of a larger minimum wage increase, we model how the minimum wage policy works its way through the San Jose and Santa Clara County economy, examining workers, businesses, and consumers. We incorporate outcomes from economists' best research on labor markets, business practices, and consumer spending to construct a structural, multi-iterative model to estimate the effects of the scenarios for San Jose and Santa Clara County.

2. 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 wage in Los Angeles.[6] This model was further enhanced to study the effects of a $15 minimum wage in New York State (Reich et al. 2016). The current report, which uses that model, contains two components:

- A wage simulation model that predicts the number of workers that will be affected by (i.e., receive) minimum wage increases. The results of this model are described in the first part of this report, and the model itself is described in detail in the appendix.

- An economic impact model that predicts the effect of minimum wage increases, given the structure of the workforce affected, on consumer demand. We focus on the latter in this section.

We also adapt the model to apply to San Jose and Santa Clara County in particular. Our estimates draw on standard government data sources, the large body of economic research on the minimum wage, other research studies, and a standard regional economic model (IMPLAN). These data sources and models are fully documented in the text, accompanying endnotes, and in the appendix.

Our economic impact 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.

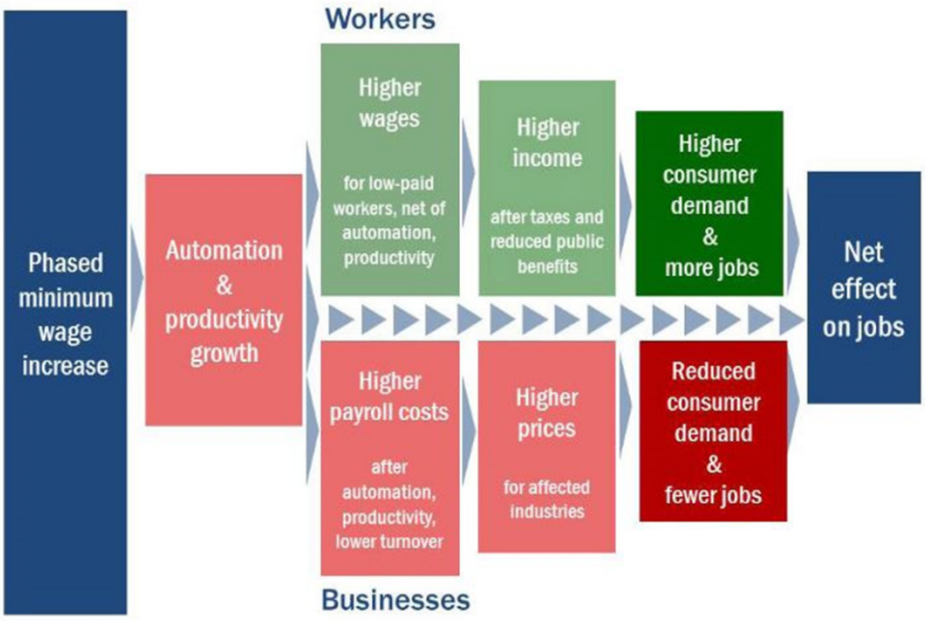
The labor demand model draws from standard labor economic textbook analyses. For industry labor demand, these analyses incorporate "substitution" and "scale" effects in labor, capital, and goods markets. For a formal version of this labor demand model, see Cahuc, Carcillo and Zylberg (2014). Since our concern here is on the effects of an economy-wide minimum wage, we add an "income effect." The income effect accounts for changes in the level of economic output when wage increases lead to increased consumer demand.

Model Structure

Figure 6 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 6. 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 6.

Figure 6 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 6 omits some feedback loops that would make the figure unwieldy, but which are included in our calculations.

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 details are presented in Section 5 below and in Appendix A2.

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?

In a forthcoming paper, Reich et al. (2016) show 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 higher levels, the (positive) income effect weakens since the increase in the proportion of workers getting pay increases slows down, and because 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.[7] 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 et al. 2016). In the next sections, we discuss how we quantify the effects in each of the boxes in Figure 6.

3. EFFECTS ON WORKERS

We begin by analyzing the effects of the Scenario A (San Jose) and Scenario B (Santa Clara County) minimum wage increases on workers. To estimate these effects, we use publicly-available government datasets to model (a) the number of workers who would receive pay increases under the two minimum wage scenarios and (b) the size of those wage increases. We exclude federal and state government employees, local school district employees, In Home Supportive Services (IHSS) workers, and self-employed workers from our analysis, since those groups of workers would not be eligible for local minimum wage laws.

Specifically, for each scenario, our model produces two different simulations of the future wage distribution. First, we conduct a baseline simulation, in which we assume that the minimum wage will increase each year according to minimum wage laws that are already in effect (see Tables 1 and 2 above). For Scenario B (Santa Clara County), we assume that cities that do not have their own minimum wage law will follow the state minimum wage schedule in effect as of January 1, 2016 (again, this analysis does not take into account the new state minimum wage law signed in April 2016). Second, we conduct a simulation that models the future wage distribution under each of the two minimum wage increase scenarios.

We then compare the baseline and scenario simulations and estimate, for each yearly phase-in step, the number of workers that would be affected by the scenario and the additional wages they would receive as a result, above and beyond any currently scheduled minimum wage increases. In constructing these estimates, our model adjusts for expected growth in employment, wages and inflation over time. Our estimates also take into account what is often referred to as a "ripple" or "compression" effect: workers who make slightly more that the scenario minimum wage are also likely to receive wage increases. More information on our methodology is available in Appendix A1.

3.1 Workforce Impacts

Table 3 shows the estimated number and percentage of eligible workers affected under Scenario A (San Jose) and Scenario B (Santa Clara County). Under Scenario A, we estimate that 115,000 workers in San Jose will receive a pay raise by 2019, or about 31.1 percent of the eligible workforce. Of these, 92,000 are directly affected workers (earning less than $15 per hour when the scenario would be fully implemented in 2019) and 23,000 are indirectly affected (earning slightly more than $15 per hour when the scenario would be fully implemented in 2019).

Under Scenario B, 250,000 workers, or about 25.3 percent of the eligible workforce in Santa Clara County, would receive a pay raise by 2019. Of these, 198,000 are directly affected workers and 52,000 are indirectly affected workers. Estimates for Santa Clara County include San Jose.

Table 3. Estimated cumulative impacts on workers by 2019

Cumulative workforce impacts	Scenario A: San Jose	Scenario B: Santa Clara County
Percent of eligible workforce receiving pay increases	31.1%	25.3%
Total number of workers receiving increases	115,000	250,000
Number of workers affected directly	92,000	198,000
Number of workers affected indirectly	23,000	52,000
Average hourly wage increase (2014 dollars)	$1.81	$1.92
Average annual earnings increase for workers receiving increases (2014 dollars)	$3,000	$3,200
Average percent annual earnings increase for workers receiving increases	17.8%	19.4%
Total aggregate increase in wages (2014 dollars)	$345 million	$796 million

Source: Authors' analysis of ACS, OES, and QCEW data. See Appendix A1 for details.

Note: Santa Clara County impacts include those for the entire county, including San Jose. Eligible workers are those that work in the city/county where the new minimum wage policy is implemented. Directly affected workers earned between 50% of the old minimum wage and 100% of the new minimum wage. Indirectly affected workers earned between 100% and 115% of the new minimum wage. Average annual earnings is per worker, not per job.

We also estimate the additional earnings that affected workers would receive under each scenario, relative to their earnings under current minimum wage schedules. Table 3 shows the estimated cumulative increase in affected workers' hourly wages, annual earnings, and percentage increase in annual earnings, as well as the cumulative total earnings increase for all affected workers. By full implementation in 2019, we estimate that the wages of affected workers will have risen by about $1.92 per hour in Santa Clara County and $1.81 per hour in San Jose. That amounts to an estimated additional $3,000 in earnings per year for impacted workers in San Jose and $3,200 for impacted workers in Santa Clara County. In total, we estimate that affected workers will earn an additional $796 million by 2019 in Santa Clara County. In San Jose, we estimate that affected workers will earn an additional $345 million by 2019. All estimates are listed in 2014 dollars.[8]

3.2 Impact on Benefits Eligibility and Poverty

Some policymakers have expressed concern that affected workers and their families could ultimately be worse off after minimum wage increases if they are no longer eligible for means-tested social assistance programs. However, research suggests that most workers will come out well ahead financially, because the benefits from most social assistance programs phase out as recipients' income rises. This means that as the earnings of affected workers rise, the benefits they receive will gradually decline instead of being eliminated all at once.[9] In fact, the Congressional Budget Office (Congressional Budget Office 2012) has estimated that the average marginal tax rate for low-and moderate-income workers is 34.8 percent, meaning that affected workers will keep 65.2 cents of each additional dollar they earn. So while taxes and reductions in social assistance benefits will erode some of the additional earnings for affected workers, most

families will still see significant gains in income under the scenario minimum wage increases. Finally, Arin Dube has estimated that for each percentage increase in the minimum wage, household poverty is reduced by -0.24 percent (2013). Applying this measure of the elasticity of poverty with respect to the minimum wage, we estimate that an increase to $15 would reduce the number of households in poverty by 8.5 percent in San Jose and 8.2 percent in Santa Clara County.

3.3 Demographics of Affected Workers

Next, we analyze the demographic and job characteristics of the workers who would be affected by the two minimum wage scenarios (including both directly and indirectly affected workers). Table 4 profiles workers affected by Scenario A in San Jose. In the first column, we display the characteristics of all eligible workers. For example, 58.3 percent of San Jose workers are men and 41.7 percent are women. In the second column, we show the *distribution of affected workers* by 2019. For example, we estimate that 51.4 percent of affected workers are men and 48.6 percent are women. In the third column, we present the *share of each demographic group that will receive a wage increase*. For example, we estimate that 27.4 percent of male workers and 36.2 percent of female workers eligible for the proposed increase will receive a raise.

Contrary to the common perception that minimum wage workers are mainly teens, we estimate that 95.6 percent of affected workers in San Jose are in their twenties or older and 56.3 percent are in their thirties or older. The scenario will be particularly beneficial to Latino/a workers in San Jose, as half of these workers (50.8 percent) will receive a raise. Workers of all education levels would benefit from the scenario, with less educated workers benefitting the most. About half of affected workers have no college education (51.2 percent)

We estimate that over a third of affected workers in San Jose have children (33.9 percent) and 37.1 percent are married. Affected workers in San Jose disproportionately live in low-income families, with 40.3 percent at or below 200 percent of the federal poverty level. Fully 91.8 percent of workers in poor families will receive a pay increase. On average, affected workers in San Jose bring home 48.5 percent of their family's income, suggesting that they are primary breadwinners in their families and are not providing supplementary income.

We estimate that the median annual earnings of affected workers ($18,100 in 2014 dollars) is less than half (35.8 percent) of the median earnings for all workers in San Jose. Affected workers are disproportionately employed in part-time or part-year jobs, and are much less likely to have health insurance provided by their employer than the overall San Jose workforce.[10]

Table 4. Demographic and job characteristics of affected workers in Scenario A - San Jose

	Percent of eligible workers	Percent of eligible workers getting a raise	Percent of group getting a raise
Gender			
Male	58.3	51.4	27.4
Female	41.7	48.6	36.2
Median Age	39	32	
Age			
16-19	1.6	4.4	86.6
20-29	22.4	39.3	54.4
30-39	27.2	22.8	26.1
40-54	35.6	23.7	20.7
55-64	13.3	9.8	22.9
Race/Ethnicity			
White (Non-Latino)	33.8	20.9	19.2
Black (Non-Latino)	2.6	3.1	37.5
Latino/a	29.9	50.8	52.8
Asian (Non-Latino)	31.0	22.7	22.7
Other	2.6	2.4	28.7
Education			
Less than High School	11.1	23.9	66.7
High School or G.E.D.	16.5	27.3	51.4
Some College	20.2	26.7	41.0
Associate's Degree	7.1	7.7	33.4
Bachelor's Degree or Higher	45.0	14.4	9.9
Country of Birth			
U.S. Born	51.8	48.0	28.8
Foreign Born	48.2	52.0	33.5
Family Structure			
Married	55.0	37.1	20.9
Has Children	44.2	33.9	23.8
Family Income Relative to Poverty Level (FPL)			
Less than 100% of FPL	3.8	11.4	91.8
100% to 150% of FPL	5.1	14.3	86.6
150% to 200% of FPL	6.0	14.7	75.8
200% to 300% of FPL	13.0	24.2	57.7
Greater than 300% of FPL	72.1	35.5	15.3
Average Worker Share of Family Income	62.9	48.5	
Median Individual Annual Earnings (2014 Dollars)	$50,507	$18,100	
Full-Time / Part-Time Worker			
Full-Time (35 or More Hours per Week)	82.8	64.6	24.2
Part-Time (Fewer than 35 Hours per Week)	17.2	35.4	64.0
Full-Year / Part-Year Worker			
Full-Year (50-52 Weeks per Year)	87.1	80.2	28.6
Part-Year (Fewer than 50 Weeks per Year)	12.9	19.8	47.7
Health Insurance Provided by Employer			
Yes	77.1	52.0	20.9
No	22.9	48.0	65.1

Source: Authors' analysis of ACS, OES, and QCEW data. See Appendix A1 for details.

In Table 5, we show the demographic and job characteristics of the affected workers under Scenario B in Santa Clara County. Affected workers in Santa Clara County as a whole share many of the same characteristics as affected workers in San Jose. Nearly half of Latino/a workers would receive a raise as a result of the proposed law. Over half are in their thirties or older (56.6 percent) and most are in their twenties or older (95.5 percent). About a third have children (33.9 percent).

As in San Jose, a disproportionate number of affected workers in Santa Clara County live in families at or below 200 percent of the federal poverty level (39.9 percent), and most workers living in families below the poverty line will receive a pay increase (91.1 percent). On average, affected workers bring home almost half of their family's income (48.0 percent).

The earnings gap between affected workers and the overall workforce is higher for Santa Clara County than for San Jose. We estimate that the median annual earnings of affected workers ($17,821 in 2014 dollars) is less than one third (30.7 percent) of the median earnings for all workers in Santa Clara County. As in San Jose, affected workers in Santa Clara County are disproportionately employed in part-time or part-year jobs, and are much less likely to have health insurance provided by their employer than the overall Santa Clara County workforce.[11]

Table 5. Demographic and job characteristics of affected workers in Scenario B - Santa Clara County

	Percent of eligible workers	Percent of eligible workers getting a raise	Percent of group getting a raise
Gender			
Male	57.3	49.2	24.4
Female	42.7	50.8	33.3
Median Age	39	32	
Age			
16-19	1.4	4.5	86.7
20-29	21.6	38.9	50.6
30-39	28.0	22.7	23.3
40-54	35.9	24.1	18.9
55-64	13.2	9.8	20.6
Race/Ethnicity			
White (Non-Latino)	34.9	21.1	17.3
Black (Non-Latino)	2.5	3.2	35.6
Latino/a	26.2	49.3	50.8
Asian (Non-Latino)	33.6	23.9	20.6
Other	2.8	2.5	25.8
Education			
Less than High School	9.3	22.9	66.0
High School or G.E.D.	14.2	26.5	50.0
Some College	18.8	26.8	39.0
Associate's Degree	7.0	8.0	31.3
Bachelor's Degree or Higher	50.7	15.9	9.2
Country of Birth			
U.S. Born	51.5	48.2	26.3
Foreign Born	48.5	51.8	30.2
Family Structure			
Married	56.2	37.0	18.7
Has Children	44.8	33.9	21.4
Family Income Relative to Poverty Level (FPL)			
Less than 100% of FPL	3.3	11.2	91.1
100% to 150% of FPL	4.4	14.2	86.4
150% to 200% of FPL	5.2	14.5	75.2
200% to 300% of FPL	11.7	24.0	55.3
Greater than 300% of FPL	75.4	36.1	13.7
Average Worker Share of Family Income	63.9	48.0	
Median Individual Annual Earnings (2014 Dollars)	$57,956	$17,821	
Full-Time / Part-Time Worker			
Full-Time (35 or More Hours per Week)	84.1	64.7	21.9
Part-Time (Fewer than 35 Hours per Week)	15.9	35.3	60.3
Full-Year / Part-Year Worker			
Full-Year (50-52 Weeks per Year)	87.4	79.7	25.8
Part-Year (Fewer than 50 Weeks per Year)	12.6	20.3	44.8
Health Insurance Provided by Employer			
Yes	79.8	53.2	19.0
No	20.2	46.8	62.7

Source: Authors' analysis of ACS, OES, and QCEW data. See Appendix Section A1 for details.

3.5 Downstream effects

The increases in earnings shown in Tables 4 and 5 would be substantial and would have an immediate impact on the lives of low-wage workers and their families in San Jose and Santa Clara County. But it is important to recognize that there are longer-term effects of minimum wage increases as well.

Low wages have been shown to affect workers negatively in a variety of ways, but the health impacts are most pronounced. All else being equal, low wages (and in turn poverty) result in increased rates of high blood pressure and high levels of stress, as well as shorter life expectancy (Leigh and Du 2012). A recent study from the United Kingdom found that by reducing the financial strain on low-wage workers, an increase in the minimum wage improves mental health at a level comparable to the effect of antidepressants on depression (Reeves et al. 2016). In another study, additional income led to fewer arrests for parents and increases in parental supervision of their children (Akee et al. 2010). Similarly, increases in Earned Income Tax Credit (EITC) program payments led to improvements in the mental health of mothers (Evans and Garthwaite 2010; Congressional Budget Office 2012).

Multiple rigorous studies also establish a causal negative effect of low incomes on outcomes for children. A recent review of peer-reviewed articles found that 29 of 34 studies established a negative effect of poverty on children's outcomes (K. Cooper and Stewart 2013). Using data from a randomized control trial of the Minnesota Family Investment Program, researchers found positive, significant effects on children's social behavior and school engagement due to increases in income (Morris and Gennetian 2003). Other researchers analyzed data from ten such studies and found significant effects of increased income on school achievement (Rodgers 2004).

Generally, these studies show that additional income has a positive effect on the outcomes of children in households of all income levels. However, multiple studies also suggest that additional income has a larger effect in very-low-income households compared to middle-income households (Dahl and Lochner 2012); (Akee et al. 2010); (Costello et al. 2003). Some evidence indicates that additional income early in life is important to cognitive outcomes, whereas additional income in later childhood may be more important in terms of behavioral outcomes (K. Cooper and Stewart 2013).

4. EFFECTS ON BUSINESSES

How a higher minimum wage affects a firm depends on how much the firm's operating costs change and on how the firm responds to those changes. In this section, we first identify the industries that will be highly affected by the two minimum wage increase scenarios. We then estimate the impact of the minimum wage increases on firms' operating costs across the entire economy and for highly affected industries, taking into account savings from reduced turnover. We describe the effects on businesses separately for Scenario A (San Jose) and Scenario B (Santa Clara County).

4.1 Scenario A: San Jose

Minimum wage increases do not affect all industries equally. We therefore begin with an analysis of the impact of Scenario A at the industry level. Table 6 shows the estimated distribution of affected workers across San Jose's industries by 2019. In the first column, we show the percentage of the overall eligible San Jose workforce in each industry. The second column displays our estimate of *the distribution across industries* of workers getting a raise under the scenario. The third column presents our estimate of the percentage of workers getting a raise *within each industry*.

Over half of affected workers are employed in just three service sector industries: food services (21.0 percent), retail (19.1 percent), and administrative and waste management services (14.7 percent), which is comprised mainly of building services contractors and employment agencies. The service sector also dominates the list of industries that have high rates of low-wage work—that is, industries where we estimate a high share of workers will get a raise (for example, 77.8 percent in food services and 50.7 percent in administrative and waste management services).

We also examine the sectoral distribution of affected workers in Table 6. Our estimates show that affected workers are largely employed in the private, for-profit sector. Nonprofit and public sector workers are less likely to be affected than the overall San Jose workforce.

Table 6. Cumulative impact estimates for major industries in San Jose by 2019

	Percent of eligible workers	Percent of eligible workers getting a raise	Percent of industry getting a raise
All Sectors			
Agriculture, Forestry, Fishing, Hunting, and Mining	0.2	0.3	
Construction	6.0	6.5	33.3
Manufacturing	16.5	6.1	11.5
Wholesale Trade	4.6	3.2	21.2
Retail Trade	12.7	19.1	46.8
Transportation, Warehousing, and Utilities	2.8	2.8	31.0
Information	3.1	0.9	9.5
Finance, Insurance, Real Estate, and Rental and Leasing	4.8	3.1	20.1
Professional, Scientific, and Management	11.9	2.7	7.2
Administrative and Waste Management Services	9.0	14.7	50.7
Educational Services	1.9	1.6	25.9
Health Services	8.5	5.5	20.4
Social Assistance	1.7	2.4	45.4
Arts, Entertainment, Recreation, and Accommodation	2.8	4.5	49.2
Food Services	8.4	21.0	77.8
Other Services	3.1	4.7	47.9
Public Administration	2.0	0.7	10.7
Total	100.0	100.0	
By Sector			
Private, For-Profit	90.0	93.8	32.4
Private, Non-Profit	6.0	4.6	23.6
Public	4.0	1.6	12.6
Total	100.0	100.0	

Source: Authors' analysis of ACS, OES, and QCEW data. See Appendix A2 part B for details.

Note: Blank value for "Percent of Industry That is Getting a Raise" indicates insufficient sample size for that category.

Changes in a firm's operating costs due to a minimum wage increase are determined by the following factors: the share of workers receiving wage increases, the average size of the wage increases, and the labor share of operating costs within the firm. As we saw in Table 6, in most industries only a minority of workers in San Jose will receive a wage increase under Scenario A. Furthermore, among workers that do receive an increase, not everyone will receive the full increase (because many of the affected workers already earn more than the current minimum). Specifically, we estimate that the total wages of all affected workers will increase by 15.3 percent in San Jose. However, affected workers' wages represent only 8.3 percent of all workers' wages in San Jose. As a result, total wages in San Jose will increase by 1.3 percent.

Economic research suggests that some of the increased labor costs that businesses face as a result of a higher minimum wage can be offset through lower turnover. In our calculations below,

we take the midpoint of those estimates and assume that 17.5 percent of increased labor costs are absorbed via turnover savings in the first year.[12] These savings are likely to accrue at smaller rates as wage levels go higher; we therefore assume that by 2019 the marginal increase in earnings relative to 2017 no longer yields any additional turnover savings. As a result, we estimate that the total savings from turnover at a $15 minimum wage in 2019 would be 11.3 percent of increased labor costs.[13]

Table 7 shows our estimates of the increase in business operating costs (net of savings from reduced turnover) in retail and restaurants, the two industries with the largest number of workers receiving a raise under Scenario A. By 2019, we estimate that businesses in the restaurant industry would see their payroll costs rise by 10.2 percent and businesses in the retail industry would see their payroll costs rise by 2.2 percent; these cost estimates include payroll taxes and workers' compensation insurance expenses.[14] Across the entire San Jose economy, we estimate that payroll costs would rise by 1.2 percent by 2019.

However, operating costs will rise by a much smaller amount, because labor costs only make up a portion of the total costs that businesses face. We estimate that labor costs excluding health benefits currently account for 30.7 percent of restaurant operating costs, 10.8 percent of retail operating costs, and 22.1 percent for the overall economy (these percentages will increase over time as labor costs rise faster than other costs due to the proposed minimum wage increase). We therefore estimate that by 2019, total operating costs would rise by 3.1 percent for restaurants, 0.2 percent for retail, and 0.3 percent for the overall economy. (See Appendix A2.2 for more detail on how we estimate the labor share of operating costs by industry.)

Table 7. Cost impacts for businesses in San Jose by 2019

	Percent change in payroll costs	Labor costs as percent of operating costs	Percent change in operating costs and prices
All	1.2	22.1	0.3
Restaurants	10.2	30.7	3.1
Retail	2.2	10.8	0.2

Source: US Census Annual Wholesale Trade Report and authors' analysis of ACS, OES, and QCEW data. See Appendix A2 Part B for details.

4.2 Scenario B: Santa Clara County

Table 8 shows the estimated distribution of affected workers across industries in Santa Clara County under Scenario B. As in Scenario A, over half of affected workers are employed in three service sector industries: food services (20.2 percent), retail (16.1 percent), and administrative and waste management services (11.9 percent). These same industries have a high proportion of low-wage workers who would get a raise in the scenario (for example, 71.0 percent in food services and 47.6 percent in administrative and waste management services).

Affected workers in Santa Clara County are also mostly employed in the private, for-profit sector. Nonprofit and public sector workers are less likely to be affected than the overall Santa Clara County workforce.

Table 8. Cumulative impact estimates for major industries in Santa Clara County by 2019

	Percent of eligible workers	Percent of eligible workers getting a raise	Percent of industry getting a raise
All Sectors			
Agriculture, Forestry, Fishing, Hunting, and Mining	0.3	0.9	67.8
Construction	4.4	5.5	31.9
Manufacturing	16.6	7.4	11.2
Wholesale Trade	3.8	3.0	20.1
Retail Trade	9.2	16.1	44.4
Transportation, Warehousing, and Utilities	1.9	2.2	28.7
Information	7.5	1.4	4.6
Finance, Insurance, Real Estate, and Rental and Leasing	3.7	2.7	18.9
Professional, Scientific, and Management	16.0	4.1	6.5
Administrative and Waste Management Services	6.4	11.9	47.6
Educational Services	3.8	3.8	25.2
Health Services	10.2	7.7	19.1
Social Assistance	2.0	3.3	43.0
Arts, Entertainment, Recreation, and Accommodation	2.3	4.2	46.2
Food Services	7.2	20.2	71.0
Other Services	2.7	4.8	45.4
Public Administration	2.0	0.7	9.4
Total	100.0	100.0	
By Sector			
Private, For-Profit	88.7	92.3	26.4
Private, Non-Profit	7.3	5.9	20.4
Public	4.0	1.8	11.3
Total	100.0	100.0	

Source: Authors' analysis of ACS, OES, and QCEW data. See Appendix A2 Part B for details.

Note: Blank value for "Percent of Industry That is Getting a Raise" indicates insufficient sample size for that category.

We estimate that the total wages of all affected workers in Santa Clara County will increase by 16.4 percent. But again, because affected workers' wages represent only 6.1 percent of all workers' wages in Santa Clara County, total wages in the county will increase by 1.0 percent.

Table 9 shows our estimates of the increase in business operating costs for Santa Clara County for retail and restaurants, the two industries with the largest number of workers receiving a raise under the proposed minimum wage law, as well as for businesses across all industries. After accounting for reductions in turnover we estimate that businesses in the restaurant industry will see their payroll costs rise by 9.5 percent and businesses in the retail industry will see their

payroll costs rise by 2.1 percent.[15] Across the entire Santa Clara County economy, we estimate that payroll costs will rise by 1.0 percent by 2019.

We therefore estimate that by 2019, total operating costs will rise by 2.9 percent for restaurants, 0.2 percent for retail, and 0.2 percent for the overall economy.

Table 9. Cost impacts for businesses in Santa Clara County by 2019

	Percent change in payroll costs	Labor costs as percent of operating costs	Percent change in operating costs and prices
All	1.0	22.1	0.2
Restaurants	9.5	30.7	2.9
Retail	2.1	10.8	0.2

Source: US Census Annual Wholesale Trade Report and authors' analysis of ACS, OES, and QCEW data. See Appendix A2 Part B for details.

5. EFFECTS ON EMPLOYMENT

A principal goal of the proposed minimum wage policy for San Jose (Santa Clara County) is to raise the earnings of low-wage workers, while minimizing the tradeoffs in economic costs. In previous sections, we have assessed the benefits to low-wage workers as well as the impact on businesses' operating costs in particular industries. In this section we consider whether the proposed policy would generate net gains or losses to the city's (county's) economy.

In Section 5.1, the key issues concern how much employers will substitute equipment or skilled labor for unskilled labor and how much of their cost increases employers will pass on in the form of higher prices. In Section 5.2, we discuss who might pay the costs of the higher minimum wage. Higher prices reduce consumption demand, which translates into reductions in employment and economic activity.

Section 5.3 examines the increased spending that derives from the higher income of low-wage workers. We take into account the effects of taxes and reduction in public benefits on the affected workers' take-home pay and the rate at which their households spend income compared to others. Greater spending from consumers increases economic demand, which translates into increases in employment and economic activity.

The net effects on the economy will then depend upon the sum of the effects estimated in each of these three sections. Section 5.4 estimates these net impacts on economic activity and employment.

5.1 Automation, productivity 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 or mechanization of jobs while keeping sales at the same level; the other involves lower demand for workers when prices increase and sales fall. We discuss here the automation channel and consider the effect on sales in the following section.

Automation: economic theory and measurement

Mechanization does not necessarily lead to a net loss of jobs. As David Autor (2014a; 2014b) points out, machines (including smart robots) do not just substitute for labor; they are also complements to existing jobs and they can 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 involve only 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 electronic screens like iPads).

In general, the effect of automation on employment depends upon the elasticity of substitution of capital for labor (sigma)—the change in the relative prices of capital and labor—and the share of profits in revenue. The lower is sigma, the more difficult it is to substitute capital for labor. Robert Chirinko, the leading economist specializing in estimates of sigma, finds an economy-wide sigma of about 0.4 (Chirinko and Mallick 2016). While the estimates in this study are identified across all economic sectors, most of the variation occurs among manufacturing industries. Lawrence (Lawrence 2015) also finds that the economy-wide sigma is less than 1 and that it is lower still in low-wage manufacturing industries than in high-wage manufacturing industries.

Alvarez-Cuadrado, Van Long and Poschke (2015) estimate substitution elasticities separately for manufacturing and services using data on 16 countries. They find that service sector elasticities are considerably lower than in manufacturing. However, their study does not examine low-wage services separately. The results in these papers nonetheless suggest, as Autor et al. conjectured, that automation possibilities are lower in low-service jobs.

Aaronson and Phelan (Aaronson and Phelan 2015) have carefully studied the short-run impact of minimum wages on the automation of different kinds of low-wage jobs. Their study is the first to examine automation within low-wage industry contexts. Aaronson and Phelan find that minimum wage increases do reduce routinized low-wage jobs (such as cashiers) and increase the number of less-routinized low-wage jobs (such as food preparation). As it turns out, the changes offset each other almost equally, resulting in no net change in employment. Thus, Aaronson and Phelan (2015) find that sigma is essentially zero in low-wage occupations.

We use a sigma of 0.2 in our calculations, half-way between Chirinko and Mallick and Aaronson and Phelan. This conservative assumption may therefore result in an over-estimate of the magnitude of the automation effect.

Aaronson and Phelan's findings also suggest very little substitution of highly skilled workers for lower skilled workers. Dube, Lester and Reich (2016) obtained a similar result. Consequently, we do not include any effect of skilled labor being substituted for unskilled labor in our model.

Automation in practice

Machines that process automated transactions—at airports and in airplanes, banks, self-checkout stations in retail stores, parking garages, and gasoline stations—have become particularly widespread over the past 30 years. During this period, the price of computer-related machines has rapidly declined. Labor-saving automation will occur even when wages do not rise, insofar as the technological change continues to push down the price of equipment, making investments in new equipment and software profitable.

The effects of a rising minimum wage on actual automation depend in part upon whether new labor-saving technology that has not yet been adopted continues to become available. We suggest that much of existing labor-saving technological change has already been embodied in low-wage industries, in equipment and software such as smart electronic cash registers, remote

reservations, and ordering systems. An increase in the minimum wage is likely only to generate small increases in the adoption of more automated systems.

Equally important, the rate of adoption of technical change depends on changes in the relative prices of capital and labor, not just on the price of low-wage labor. Although the prices of computer-related equipment and software have fallen dramatically, by approximately a factor of ten in the past several decades, the decline in the past five years is much smaller. Meanwhile, median wages have stagnated and real minimum wages remain lower than they were in the early 1970s.

The declining cost of capital is also reflected in declines in long-term interest rates in recent decades. Five-year and ten-year inflation-protected interest rates have also fallen dramatically. These changes in relative prices have been the main impetus to increased automation. Even a doubling of the minimum wage policy, which would imply (according to (Allegretto et al. 2015) an average wage increase of about 22 percent, would have very little impact in comparison. However, interest rates are unlikely to fall further. It is therefore likely that actual automation in low-wage industries is slowing.

To summarize, empirical estimates of the elasticity of substitution of capital for labor that include low-wage industries in their sample range between 0 and 0.4. We use 0.2, the midpoint of this range. Since Aaronson and Phelan find a much smaller elasticity, our use of 0.2 is conservative.

Reductions in paid hours relative to working hours

Some commentators assert that a higher minimum wage will lead employers to cheat workers of a portion of their wages. However, such practices already exist; the question at hand is how much the minimum wage increase will increase their prevalence and intensity. 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.

Employee turnover and employer recruitment and retention costs

The correlation between low wages and high employee turnover is well known (Cotton and Tuttle 1986).[16] Over the last decade, annual employee turnover in accommodation and food service averaged 70 percent a year, compared to 41.4 percent in other services, 30.5 percent in health care and social assistance, and 32 percent in non-durable manufacturing (Statistics 2014).[17] Quits are higher in low-wage occupations because workers leave to find higher-wage jobs or because they are unable to stay in their jobs due to problems such as difficulties with transportation, child care, or health.

Recent labor market research has gone beyond establishing a correlation between pay and turnover. We now know minimum wage increases have well-identified causal impacts that reduce worker turnover. Dube, Naidu and Reich (2007) found that worker tenure increased substantially

in San Francisco restaurants after the 2003 minimum wage law, especially in limited service restaurants. 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 for teens. Jacobs and Graham-Squire (2010) reviewed studies of the impact of living wage laws on employment separations and found that a 1 percent increase in wages is associated with a decline in separations of 1.45 percent.

Turnover creates financial costs for employers (Blake 2000; Dube, Freeman, and Reich 2010; Hinkin and Tracey 2000). These costs include both direct costs for administrative activities associated with departure, recruitment, selection, orientation, and training of workers, and the indirect costs associated with lost sales and lower productivity as new workers learn on the job. Hinkin and Tracey (2000) estimate the average turnover cost for hotel front desk employees at $5,864. A study of the cost of supermarket turnover by the Coca Cola Research Council estimates the replacement cost for an $8 an hour non-union worker at $4,199 (Blake 2000). Boushey and Glynn (2012) estimate that the median replacement cost for jobs paying $30,000 or less equals 16 percent of an employee's annual salary.

Pollin and Wicks-Lim (2015) estimate that 20 percent of the increased costs from a minimum wage increase are offset by reductions in turnover. Similar estimates can be found in Fairris (2005) and Jacobs and Graham-Squire (2010). In a small case study of quick service restaurants in Georgia and Alabama (Hirsch, Kaufman, and Zelenska 2011), managers reported they offset 23 percent of the labor cost increases through operational efficiencies.

For our calculations below, we assume that 17.5 percent of the increase in payroll costs is absorbed through lower turnover in the early years of the proposed minimum wage increase.[18] However, these turnover savings do not continue to grow at higher wage levels. Dube, Lester and Reich (2016) find that most of the reduction in turnover occurs among workers with less than three months of job tenure.

This result suggests that the effect of higher wages on increasing tenure dissipates as wage levels increase. We therefore assume that the increases in wages after 2018 no longer result in turnover reductions, yielding an overall lower rate of savings from turnover of 13.4 percent in 2019.

Impact of higher wages on worker performance

Paying workers more can also affect worker performance, morale, absenteeism, the number of grievances, customer service, and work effort, among other metrics (Hirsch, Kaufman, and Zelenska 2011; Reich, Jacobs, and Dietz 2014; Ton 2012; Wolfers and Zilinsky 2015).

Efficiency wage models of the labor market argue that wage increases elicit higher worker productivity, either because when employers pay workers more, workers are more willing to be more productive, or because they remain with the firm longer and thereby gain valuable experience, or because higher pay tends to reduce idleness on the job. This theoretical result

holds whether one company raises its wage above the market-clearing level, or whether all do (Akerlof and Yellen 1986).

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 The Gap as principal reasons underlying their announced policies to increase their minimum wages nationally to $10. However, because of the lack individual- or firm-level productivity data, the earlier efficiency wage literature does not provide a reliable quantitative assessment of the importance of the effect on worker productivity among low-wage workers.

A new paper by Burda, Gedanek and Hamermesh (2016) does just that. Using microdata for 2003- 2012 from the American Time Use Study, Burda et al. find that working time while on the job increases when wages are higher. Their results imply that an increase in hourly pay from $10 to $15 increases the level of productivity by 0.05 percent.

Burda et al.'s estimate may be too high, given the difficulty of disentangling cause from effect in their loafing data. On the other hand, they do not have measures of worker engagement while working, which could make the actual worker productivity improvement potentially twice as large. To capture this range of productivity effects in our model, we use the Burda et al. estimate of 0.05 percent.[19]

Another relevant new paper (Card et al. 2016) appeared after the analysis for this report was completed. This paper uses firm-based data on value added per worker and pay to examine how much the rise of wage inequality derives from increases in firm-based productivity differences. The results in this paper (Card, personal communication) imply that a one percent wage increase leads to a 0.04 percent increase in log of productivity, which translates into a productivity increase of 0.1 percent. Consequently, our productivity estimate may be too low, which offsets our automation estimates, which may be too high.

A recent study by John Abowd et al. (Abowd et al. 2012) demonstrates the substantial room for productivity and wage growth in low-wage industries in the U.S. Using longitudinally linked employer-employee data, Abowd et al. disentangle wage differentials among industries that are attributable to individual heterogeneity (such as the demographic, educational, and work experience characteristics of workers in the industry), which they label person effects, from the characteristics of the product market and bargaining power of firms in the industry, which they label industry effects.

Abowd et al. can observe wage changes when individual workers move from one employer to another. They find very strong industry average firm effects, particularly for industries that have high average pay and low average pay. Among restaurants, for example, they find that 70 percent of the relatively low wages in the industry are attributable to firm effects, and only 30 percent to

person effects. These findings suggest that a change in an industry's environment can have large effects on worker pay.

Effects on prices

As we have seen, previous prospective studies have made different assumptions on how much costs will affect prices—and therefore also profits. Card and Krueger (1995) 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 it fears losing sales to its 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. Card and Krueger do not, however, take into account the income effect that will increase sales when a minimum wage applies to an entire economy, not just a single industry.

The evidence on whether profits do fall is extremely scant. The most important study remains the one in Card and Krueger (1995). These authors obtained 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) and persistent increase in the Hungarian minimum wage, which affected much of manufacturing. These authors find that cost increases were entirely passed through, but employment did not change and profits did not fall. Of course, the relevance of the British and Hungarian studies for the U.S. is highly uncertain.

In our model, employers pass all of the increase in operating costs stemming from a minimum wage increase onto prices, after accounting for the above-mentioned turnover savings, automation, and productivity growth. Studies of price effects of minimum wages are consistent with this model. These studies generally examine data on restaurants. Aaronson (2001) and Aaronson, French and MacDonald (2008) both find complete pass through of costs. 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 (2015) 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 results indicate that most of the costs are passed through to consumers in higher prices. Using scanner data from supermarkets, Montialoux et al. (forthcoming) find a similar effect for retail prices.

Effects on profits and rent

Some economists have argued that many firms have captured above-normal profits in recent decades. An increase in the minimum wage could therefore reduce such economic rents. We attempted to include such an effect in our model, but were stymied by limited data on the proportion of reduced profits that would be borne within the study area.

Our simulations did confirm that insofar as payroll cost increases are partly absorbed by profits, then the scale effect is smaller. The reduced profits have much less effect on the income effect because propensities to spend are low among shareholders and managers, and because much of the profit decline affects capital owners outside of the study area. As a consequence, including a fall in profits in our model would have led to more positive effects on employment.

Minimum wage increases will likely affect the composition of businesses within and among industries. Aaronson, French and Sorkin (2015) find that minimum wage increases raise both exit and entry rates among restaurants, suggesting that entering firms arrive with a business model that is more oriented to the higher wage minimums. These higher-wage firms could be instituting business methods that improve productivity or improve product quality, or both. It is not possible for us to quantify these secondary effects, as they require more data on such adjustment mechanisms than are available.

Franchisee-franchiser relationships and commercial rental leases could also be altered by minimum wage increases. Franchises are particularly important among restaurants. In principle, franchisees could pass their increased costs to franchisers, either through a relaxation of fees or land rent. However, data on such changes are not available, to our knowledge. Effects on commercial rents are also difficult to detect, in part because of the lack of data and in part because such leases are typically of longer duration.

5.2 Scale effects of increased prices on reduced sales of consumer goods

Economists use the term price elasticity of consumer demand to refer to the effect of an increase in prices on reducing consumer demand. Taylor and Houthakker (2010) report price elasticities for six categories of goods and services that together cover all of consumption. We adjust their health care elasticity to -0.20, to take into account changes in the structure of health care provision since the 1990s, and then compute a weighted average elasticity across the six categories using personal consumption expenditure shares from the U.S. Consumer Expenditure Survey (McCully 2011). The result is a price elasticity of consumer demand of -0.72.[20]

This estimate is compatible with, but somewhat larger than, price elasticities estimated from aggregate panel data. Hall (2009), for example, obtains a price elasticity of -0.50. On the other hand, our estimate is very close to that of Blundell et al. (1993).

5.3 Income effects

We consider here the increased spending that derives from the higher income of low-wage workers. Our model takes into account the effects of taxes and reduction in public benefits on the affected workers' take-home pay and the rate at which their households spend (as opposed to save) income compared to others. Greater spending by consumers increases economic demand, which translates into increases in employment and economic activity.

We do not expect all of the increases in household incomes to translate into increased consumption demand. A substantial portion of minimum wage earners come from households in the middle of the household wage distribution. These households will save some of their increased income. The amount of such savings will depend on their current savings rates and on the extent to which they view the increase in income as permanent, rather than a short-term windfall.

Economic research has found that changes in permanent income generate much higher consumption effects than changes that are, or are perceived as, transitory. Low wage-earners who are young and have more education may regard their low-wage status as transitory. These earners may regard a minimum wage increase as transitory.

However, recent research has found that an increasing proportion of minimum wage workers are stuck in minimum wage careers (Boushey 2005; Casselman 2015). These results suggest that the proportion of workers who regard a minimum wage increase as constituting a one-time increase will be small. Moreover, economic theory and evidence suggests strongly that the distinction between permanent and transitory income does not apply to workers who are credit-constrained and whose households have accumulated very little in assets (Achdou et al. 2014). The majority of minimum wage workers fit this description.

The IMPLAN model does not account for savings that come from transitory income. The considerations above indicate that any such effects are likely to be small. This is nonetheless a topic for future research.

5.4 Model calculations and net effects on employment for scenario A: a $15 minimum wage increase in San Jose

Table 10 displays the results of our model for 2019. Note that the estimates in this table are *cumulative*. They are estimated relative to the city's minimum wage in each year, and therefore capture the full effect of increases in the suggested city minimum wage in previous years.

Table 10. Scenario A: Cumulative net changes in employment in San Jose

	Impacts in San Jose	Additional impact in the rest of Santa Clara County & nine nearby counties	Total impact of a $15 MW increase in San Jose, the rest of Santa Clara County and nine nearby counties
A. Cumulative reduction in wage bill due to capital-labor substitution and productivity gains			
Reduction in number of jobs from substitution effects and productivity gains	-1,190	n.a.	-1,190
B. Scale effect: Cumulative reduction in consumer spending			
Reduction in consumer spending from price increase (millions)	-$107	n.a.	n.a.
Reduction in number of jobs due to the scale effect	-580	n.a.	n.a.
Reduction in GDP due to the scale effect (millions)	-$64	n.a.	n.a.
C. Income effect: Cumulative increase in consumer demand			
Aggregate increase in consumer spending (millions)	$204	+$101	$305
Increase in number of jobs due to the income effect	800	+890	1,690
Increase in GDP due to the income effect	$92	+$105	$197
D. Cumulative net change in employment			
Net change in employment	-960	+880	-80
Net change in employment, as a percent of total employment	-0.3%	+0.3%	0.0%
Net change in GDP (millions)	$25	+$105	$130
Net change in GDP, as a percent of total GDP	0.0%	+0.1%	0.1%

Source: Authors' calculations using the regional economic impact model IMPLAN.

Note: The nine nearby counties taken into account are: Alameda, San Mateo, San Francisco, Santa Cruz, Monterey, San Benito, Contra Costa, San Joaquin, and Merced. All estimates are in 2019 dollars.

Panel A: Reduction in employment due to capital-labor substitution and productivity gains

Panel A in Table 10 shows our estimates for the reduction in the number of jobs due to both capital-labor substitution effects and productivity gains. With an assumed capital-labor substitution elasticity of 0.2 and a productivity effect of 0.005, we find a negative employment effect of about 1,190 jobs.

Panel B: Scale effects due to reduced consumer spending

Panel B in Table 10 presents our estimates of the reductions in consumer spending from the higher payroll costs that are generated by the suggested minimum wage increase in 2019, in both (1) San Jose and (2) in San Jose, the rest of Santa Clara County and 9 nearby counties (Alameda, San Mateo, San Francisco, Santa Cruz, Monterey, San Benito, Contra Costa, San Joaquin, and Merced). Row 3 restates the total net percentage increase in payroll costs from the proposed policy, accounting for savings from reduced turnover costs. This number comes from the top line of Table 6, using the same assumption that expected savings from reduced turnover will be 17.5 percent in 2017, 17.5 percent in 2018 and 11.30 in 2019. Similarly, Row 4 in Table 8 restates the percentage change in prices from Table 6. Percentage changes in prices are equal to the percentage change in operating costs (after accounting for savings from turnover).

Row 5 presents our estimate of the reduction in consumer spending in San Jose from the price increase. As previously discussed, we estimate that each 1 percent increase in consumer prices results in a -0.72 percent decline in consumer spending. We apply this price elasticity of demand to the percentage increase in prices and then multiply by annual consumer spending in San Jose.[21]

The result is an estimate of $64 million cumulative reduction in consumer spending by 2019. We then use IMPLAN to estimate the total reduction in consumer demand, including multiplier effects.[22] Row 6 then translates these results into numbers of jobs.

Panel C: Income effect-- cumulative increases in wages from proposed minimum wage increase

Panel C of Table 10 presents the estimated income effect: increases in consumer demand deriving from increased incomes of low-paid workers. The income effects are presented first for San Jose (column 1), and then detailed for a broader region (column 3). The additional increase in income effects coming from the broader region is detail in column 2. We estimate that only 65 percent of workers are affected by scenario A work and live in San Jose. As a consequence, the income effect presented in column 1 captures only the positive effects of a boosted consumption for 65 percent of affected workers. Column 3 presents a more complete picture of these income effects: 99 percent of affected San Jose workers live in Santa Clara County and nine nearby counties.

Row 7 shows the total wage increase from the proposed law for all affected workers. These estimates are taken from Table 4, converted to nominal dollars in 2019. Row 8 adjusts the total wage increase for an estimated loss of 14.75 percent due to reduced eligibility for public assistance programs, as well as lost worker income due to reductions in consumer spending from

Panel A.[23] The result is an estimated net income increase of $204 million by 2019 in San Jose, and $305 million in Santa Clara County and nine nearby counties. We then use IMPLAN to estimate the increase in employment for San Jose resulting from the increased household spending triggered by the income increase, accounting for multiplier effects and spending leakage outside the city (respectively outside Santa Clara County and nine nearby counties).[24] Row 9 shows the employment change associated with this increase in income in San Jose (column 1), and in Santa Clara County and nine nearby counties (column 3).

Panel D: Net effect

As we have previously mentioned, the substitution productivity, scale, and income effects in Parts A to C occur simultaneously, not sequentially. It is thus not correct to infer that the employment changes in Parts A to C actually occur. Net employment changes occur only to the extent that is registered after we add Parts A to C together to obtain the net effects.

Panels A to C do tell us that the net effects will likely differ by job wage rates. In particular, the automation and productivity effects in Part A will occur entirely among low-wage jobs. The scale and income effects of Parts B and C, however, will affect jobs throughout the state's consumer demand industries and among a much broader wage distribution. We have not been able to quantify these differences, as they depend on the relative concentration of scale and income effects in low-wage industries.

In Panel D of Table 10, we present our estimate of the net change in employment from scenario A.

- For San Jose only (column 1), we estimate a cumulative net loss in employment, due to the policy, of 960 jobs by 2019, or -0.3 percent of total employment. To put this estimate in context, we project, based on past QCEW data on employment that San Jose will grow annually by 1.32 percent from 2014 to 2019. (For more details see Appendix A2.)

- For Santa Clara County as a whole and nine nearby counties (column 3), we estimate a cumulative net loss in employment, due to the policy, of 80 jobs by 2019, or -0.0 percent of total employment. We've also assumed that this broader region will grow annually by 1.32 percent from 2014 to 2019, at the same pace as San Jose. (For more details see Appendix A2.)

We emphasize again that our cumulative estimate will be spread over the preceding years of the minimum wage increase—the 2019 estimate includes effects in 2016, 2017, 2018 and 2019.

The key point in Table 10 is that a $15 minimum wage has negligible effect on net on employment when examining the region as a whole.

5.5 Model calculations and net effects on employment for scenario B: a $15 minimum wage increase in Santa Clara County

We conduct a similar analysis as in section 5.3 for a $15 minimum wage increase in Santa Clara County. In Table 11 we present our results for Santa Clara County in column 1 and for Santa Clara County and nine nearby counties. We estimate that 84 percent of Santa Clara County affected workers are also living in Santa Clara County and therefore spend their additional income in this county. We also estimate that 99 percent of Santa Clara County affected workers live in Santa Clara County and nine surrounding counties.

Panel A: Reduction in employment due to capital-labor substitution and productivity gains

Panel A in Table 11 shows our estimates for the reduction in the number of jobs due to both capital-labor substitution effects and productivity gains. With an assumed capital-labor substitution elasticity of 0.2 and a productivity effect of 0.005, we find a negative employment effect of about 2,700 jobs.

Panel B: Scale effects due to reduced consumer spending

Panel B in Table 11 presents our estimates of the reductions in consumer spending from the higher payroll costs that are generated by the proposed minimum wage law in 2019.

We estimate that scenario B would lead to a $214 million cumulative reduction in consumer spending by 2019. We then use IMPLAN to estimate the total reduction in consumer demand, including multiplier effects. Row 6 then translates these results into numbers of jobs.

Panel C: Income effect--cumulative increases in wages from proposed minimum wage increase

Panel C of Table 11 presents the estimated income effect: increases in consumer demand deriving from increased incomes of low-paid workers.

We estimate that scenario B could trigger a net income increase of $602 million by 2019 in Santa Clara County, and $706 million in Santa Clara County and nine nearby counties (column 3), i.e. an additional $104 million (column 2). We then use IMPLAN to estimate the increase in employment for Santa Clara County resulting from the increased household spending triggered by the income increase, accounting for multiplier effects and spending leakage outside the city (respectively outside Santa Clara County and nine nearby counties).[25] Row 9 shows the employment change associated with this increase in income in Santa Clara County (column 1), and in Santa Clara County and nine nearby counties (column 3).

Panel D: Net effect

Panel D of Table 11 presents our estimate of the net change in employment in scenario B.

- For Santa Clara County only (column 1), we estimate a cumulative net loss in employment, due to the policy, of 1,350 jobs by 2019, or -0.1 percent of total employment.

- For Santa Clara County and nine nearby counties (column 3), we estimate a cumulative net gain in employment, due to the policy, of 60 jobs by 2019, or 0.0 percent of total employment.

Scenario B, as scenario A would lead to negligible effect on net employment by 2019 if the benefits of the income effect are fully taken into account. The job losses are greater if the area of study is smaller.

Table 11. Scenario A: Cumulative net changes in employment in Santa Clara County

	Impacts in Santa Clara County only	Additional impact in nine nearby counties	Total impact of a $15 MW increase in Santa Clara County and nine nearby counties
A. Cumulative reduction in wage bill due to capital-labor substitution and productivity gains			
Reduction in number of jobs from substitution effects and productivity gains	-2,700	n.a.	-2,700
B. Scale effect: Cumulative reduction in consumer spending			
Reduction in consumer spending from price increase (billions)	-$214	n.a.	n.a.
Reduction in number of jobs due to the scale effect	-1,120	n.a.	n.a.
Reduction in GDP due to the scale effect (millions)	-$130	n.a.	n.a.
C. Income effect: Cumulative increase in consumer demand			
Aggregate increase in consumer spending (millions)	$602	+$104	$706
Increase in number of jobs due to the income effect	2,480	+1,410	3,890
Increase in GDP due to the income effect (millions)	$285	+$170	$455
D. Cumulative net change in employment			
Net change in employment	-1,350	+1,410	60
Net change in employment, as a percent of total employment	-0.1%	+0.1%	0.0%
Net change in GDP (in millions)	$160	+$170	$330
Net change in GDP, as a percent of total GDP	0.1%	+0.0%	0.1%

Source: Authors' calculations using the regional economic impact model IMPLAN.

Note: The nine nearby counties taken into account are: Alameda, San Mateo, San Francisco, Santa Cruz, Monterey, San Benito, Contra Costa, San Joaquin, and Merced. All estimates are in 2019 dollars.

PART 3. POLICY ISSUES

IMPACTS ON SPECIFIC SUBPOPULATIONS

Young Adults and Learners

California regulation allows for "learner" employees to be paid 85 percent of the minimum wage during their first 160 hours of employment in occupations in which the employee has no previous similar or related experience (California Department of Industrial Relations 2013).

Local minimum wage laws typically incorporate state definitions of which employees are covered by state labor law. Of the 18 local minimum wage laws in California:

- 11 have no other special provisions for teens or learners
- 4 exempt youth training programs operated by a non-profit corporation or government agency (Sacramento, Richmond, Berkeley, San Diego).
- 1 exempts publicly subsidized job-training and apprenticeship programs for teens (San Francisco)
- 2 extend the state learner provision to 480 hours or 6 months (Santa Monica, Long Beach)
- 2 restrict the learner provision to youth under the age of 18 (Los Angles, Pasadena)

The goal behind exempting young workers from minimum wage requirements is to avoid creating disincentives for hiring such workers. In theory, higher minimum wages could reduce the incentive for employers to hire less skilled workers, thus disadvantaging teens. On the other hand, higher minimum wages might draw more teen workers into the labor market, leading to an increase in teen employment.

Teens make up a shrinking share of the workforce. We estimate that teens will constitute 4 percent of workers affected by the proposed increase (see Table 4). A large body of research suggests that the effect of minimum wage laws on teen employment is either negligible or very small, and may run in either direction (Manning 2016). Giuliano (2013) finds a small increase in relative employment of teens after a minimum wage increase using personnel data from a large U.S. retail firm. Neumark and Wascher (1992) find a modest negative impact on teen employment through cross-state comparisons. Allegretto, Dube and Reich (2011) follow Neumark and Wascher's methods, but control for regional differences and find no measurable impact on teen employment.[26]

On the downside, subminimum or training wages for teens may create an incentive to hire middle-class teenagers over low-wage adult workers in high-turnover industries such as food-fast restaurants. When state or federal law has included a subminimum wage for teens, very few employers made use of it (Card and Krueger 1995).[27]

To summarize, it appears that differential treatment for teens beyond what is already permissible in California law is not necessary.

Transitional Jobs Programs

Transitional jobs programs provide short-term, subsidized employment and supportive services through a non-profit organization to help participants overcome barriers to employment. This may include programs for the formerly incarcerated, youth from disadvantaged backgrounds, adults with mental health challenges and the homeless. The programs typically provide a mix of services to their client employees including vocational training, legal services, counseling, etc.

Most minimum wage laws treat transitional jobs programs the same as other non-profit organizations. To the degree the programs are funded by public contracts and philanthropy, the considerations for these programs may not be significantly different from other non-profit health and human service agencies. In Los Angeles and Santa Monica, participants in transitional jobs programs that meet specified criteria are exempted from the higher minimum wage for a maximum of 18 months.

Other Exemptions

General exemptions under state law

As discussed above, local minimum wage laws generally incorporate the definition of who is an eligible employee from state law. Under California law the following employees are exempt from the state minimum wage:

- A parent, child or spouse of the employer.
- A person under the age of 18 employed as a babysitter for a minor child of the employer in the employer's home.
- Persons employed by the federal government.
- "Outside salespersons" who spend more than half of their time away from their employer's place of business.

People employed in "executive, administrative or professional capacities" are exempt from most state wage orders (overtime, meal breaks, etc.). In order to be an exempt employee in California, the employee must earn a salary equal to twice the state minimum wage.

Subminimum wages for workers with severe mental or physical disabilities

Workers with severe mental or physical disabilities may be paid a sub-minimum wage if an employer has received a special license from the state labor commissioner. Wages are set based on the individuals' productivity and the prevailing wage for similar work. There is no legal wage floor for these programs.

This practice, which dates back to the passage of the Fair Labor Standards Act in 1938 has become more controversial in recent years. Opponents include the National Disability Rights Network and the National Federation for the Blind ("Groups Supporting the Repeal of Section 14(c) of the Fair Labor Standards Act" 2016). They argue that this allows for exploitation of disabled individuals. Proponents, such as Goodwill Industries, argue that it provides opportunities

to work for people who otherwise would not be employable due to their lower productivity. Maryland abolished the subminimum wage for people with disabilities earlier this year (Marans 2016).

Nonprofit organizations

Nonprofits comprise a wide range of organizations. Some are large institutions (universities, hospitals, large services providers) that have sizeable annual budgets with varied funding streams and that are therefore able to absorb minimum wage increases. Such institutions account for a significant portion of the nonprofit sector. At the same time, other nonprofits may face real constraints on their ability to adjust to minimum wage. These are typically smaller nonprofits dependent on a few public funding streams that are fixed over the short or even medium term, and over which they have little leverage.

A local minimum wage policy offers an opportunity to address the problem of low-wage work in certain nonprofit service-providing sectors—a problem that impacts the well-being of both workers and program clients through the quality of care provided. Raising wages in human services and early care and education has benefits for clients as well as workers.

There is a well-documented link between quality jobs, worker turnover and quality care in human services and early care and education.

Larson et al. (2004) found that, in the field of developmental disability services, high vacancies are associated with lower consumer and family satisfaction. Furthermore, families reported increased stress, greater financial challenges, and more job losses due to reduction in services that were at least in part connected to high turnover and vacancies. Wage increases have been shown to reduce turnover and vacancies. For example, after Wyoming legislation increased wages for developmental disability industry workers, turnover rates fell from 52 percent to 32 percent in just two years (Harmuth and Dyson 2005). Similarly, turnover decreased 17 percent among home care workers in San Francisco after an increase in wages (Howes 2002).

Other studies have directly linked wages and quality care. The National Childcare Staffing Study (Whitebook, Howes, and Phillips 1989) found that staff wages provided the strongest predictor of child care quality. Observations in child care centers in Wisconsin revealed an increase in the quality of care after a wage increase (Center on Wisconsin Strategy (COWS) 2002). Child care quality in turn has long-term impacts on children's learning, health and development (Whitebook, Howes, and Phillips 2014). Larson et al.'s 2004 study similarly found a link between lower wages in developmental disabilities services and lower quality of life assessments for consumers (Larson et al. 2004).

A higher minimum wage would help to reduce turnover in lower paid occupations within the nonprofit sector and improve quality outcomes for consumers. Exempting groups of nonprofit organizations from a minimum wage increase, conversely, could have negative effects on the quality of care by increasing employee turnover. If certain nonprofits pay lower wages than the

rest of the market, it will make it harder for them to attract and retain workers. But requiring higher wages without addressing the need to increase funding streams, or without providing sufficient phase-in time, is likely to result in cuts to services.

Ultimately, the solution is to increase public funding for the services provided by these nonprofits. San Jose and Santa Clara County could choose to fund the higher wages in certain sectors. San Francisco's C-Wages program, for example, provides County wage subsidies to child care centers and family child care providers that meet certain quality measures and enroll at least 25 percent of their children from low-income families. Funding for this program was increased to assist providers in meeting the higher minimum wage in 2015. San Jose could also engage with private philanthropy to help support nonprofit agencies through the transition. This should include both financial aid and technical assistance and management support in adjusting to the higher wage rate.

A number of city minimum wage laws have provided for slower phase-ins for nonprofit organizations to provide more time to adjust to the higher minimum wage. In San Francisco's 2003 law, implementation was delayed by one year for nonprofits; however, its recent 2014 law had no such phase-in. Berkeley's 2014 law exempts nonprofits for one year, at which point they are required to pay the same minimum wage as for-profit firms. Los Angeles allows nonprofit organizations to seek a one year deferral provided that either the chief executive officer earns a salary that is less than five times the lowest paid employee; it is a transitional employer as discussed above; it serves as a child care provider; or it is primarily funded by public grants or reimbursements. The new California minimum wage law treats nonprofits the same as all employers.

Small Businesses

The California State minimum wage law and a number of the city laws that reach $15 an hour have provided slower phase-ins for small businesses. The State of California, Los Angeles, Los Angeles County, Long Beach and Santa Monica all delay the raises by one year for businesses with 25 or fewer employees. Emeryville has a slower phase-in for businesses with 55 or fewer employees (combined with a one year 60 percent increase in the minimum wage for larger firms). San Francisco, Sunnyvale, Mountain View and El Cerrito treat all firms equally, regardless of size.

In all of these cases the wages ultimately converge between large and small firms. This is important to reduce any perverse incentives created by permanently different wage structures for different business sizes. The State of California and Los Angeles area policies all begin indexing the year after the small firms reach the final mandated wage level, leaving the wage for larger firms at $15 for two consecutive years. Emeryville increased the wage for large firms to $14.44 in one step in 2015 and began indexing the following year. Wages for small firms reach $15 in 2018 and are increased to match the rate for larger businesses the following year (estimated at $16 an hour).

If San Jose or other cities in Santa Clara County choose to go this route, another important consideration is the definition of what counts as a business for the purpose of counting employees. Large firms often operate via multiple small establishments (i.e., retail clothing stores or bank branches); therefore, a small business definition based on establishment size will erroneously include large national or multinational firms. We would therefore recommend a definition based on firm, rather than establishment size. The same principle holds in the case of franchises—i.e., all franchises or other businesses owned by a given owner or group of owners should be counted toward firm size.[29]

Whether or not the City institutes a longer phase-in period for certain small businesses, the Cities may want to seek ways to assist small businesses through the transition, including providing access to small business loans and technical assistance and training.

WAGE LEVEL

Economists often look at two summary statistics when assessing a proposed minimum wage increase schedule. The first measures the ratio of the minimum wage to the median full-time wage, a common metric used both in the U.S. and in other countries (Organization for Economic Co-operation and Development (OECD) 2013). The second estimates the percentage of the workforce directly or indirectly affected by the minimum wage increase. Both metrics provide a measure of scale of impact and therefore give us insight into the ability of an economy to absorb higher minimum wage levels (the two metrics are related but do not necessarily move in strict tandem). Table 11 shows our estimates of these metrics for the San Jose and Santa Clara County minimum wage scenarios at $15 in 2019.

We begin with the ratio of the minimum wage to the median full-time wage (minimum-to-median ratio for short). Historically, this ratio reached a high of 55 percent in 1968 at the federal level (Dube 2014). The average for OECD countries is 49 percent; five, including France and New Zealand, have minimum-to-median ratios of 60 percent or more (2013). The United Kingdom recently pegged the minimum wage to a ratio of 60 percent (O'Connor 2016).

Table 11 shows that $15 an hour in 2019 would result in a minimum to median ratio of 41 percent in San Jose and Santa Clara County, well within the historical range in the United States. Even at $20, the minimum to median ratio in San Jose or Santa Clara County would be below 55 percent. This compares to 62 percent for $15 in California when full phased in in 2023. New York City is projected to reach 57 percent, Los Angeles 62 percent, Seattle 53 percent and San Francisco 46 percent at the point of full implementation in each of those cities.

It is important not to place too much weight on the minimum to median wage measure. While the minimum to median ratio provides a simple tool of thumb for comparisons across geographical areas, it can be misleading on its own, especially for small geographic areas, and is best used in combination with other measures.

Table 11. Minimum wage to median ratio, bite and average percent increase per year

	Minimum Wage to Median Full-Time Ratio	Share of workers getting pay increases (Percent)	Average Percent Earnings Increase (Percent)
San Jose ($15)	0.41	31	18
Santa Clara County ($15)	0.41	25	19
San Jose ($20)	0.55	NA	NA
Santa Clara County ($20)	0.54	NA	NA
California	0.62	39	24
New York City	0.57	35	28
Los Angeles City	0.62	39	29
Seattle	0.53	29	NA
San Francisco	0.46	23	16

Sources: UC Berkeley-IRLE calculations using ACS data and Cooper (2016) for New York State; Reich et al. (2015) for a $15.25 minimum wage in Los Angeles and in Seattle; Reich et al. (2014) for a $15 minimum wage by 2018 in San Francisco.

Notes: The figures are provided for the end point of the minimum wage increase. The end point for California is 2023. It is 2019 for New York City and Los Angeles and 2018 for Seattle and San Francisco. The Share of workers getting pay increases for Seattle is the percent of employees who earn $15 or under and live and work in Seattle.

Our second metric shows that that the percentage of workers directly and indirectly affected under the proposed law. The share of affected workers in San Jose (31 percent) and Santa Clara County (25 percent), are below each of the other $15 minimum wage laws, with the exception of San Francisco (23 percent). Similarly, the average projected increase per worker in San Jose (18 percent) and Santa Clara County (19 percent) are well below the other policies, again with the exception of San Francisco (16 percent). In contrast, state and federal minimum wage increases between 1979 and 2012 have generally affected 10 percent or less of the workforce (D. H. Autor, Manning, and Smith 2016).

Effects of a $20 Minimum Wage

Setting a higher minimum wage (such as $20) can be expected to amplify each of the effects discussed in the minimum wage model, but not to the same degree. The higher wage level is likely to increase the negative consumption effects caused by higher prices, and negative employment effects from automation and increased productivity. Since more of the individuals receiving wage increases would have higher income levels, either as a result of the wage increase or because the increases are reaching farther up into the wage distribution, a greater portion of the increased wages is likely to be saved rather than spent. This means that the positive consumption effects from higher wages will decline as the size of the increase goes up. As a result, a $20 minimum wage in 2019 is likely to generate larger negative net employment effects. To understand the size of those effects would require further research. Any projections at wage levels much higher than previously studied necessarily entail greater uncertainty.

Raising the minimum wage steeply over a short period of time is also likely to generate greater disruption of existing firms (Aaronson and Phelan 2015). While by some of the indicators discussed above San Jose and Santa Clara County may well be able to absorb a higher minimum wage than $15 an hour, if the City and County were to pursue such an option, a longer phase in time should be considered and assistance provided to non-profit human service agencies and small businesses as they make the transition to higher wages.

CONCLUSION

The proposal to increase the minimum wage to $15 by 2019 will generate benefits and costs for workers and businesses in Santa Clara County and San Jose. Like all forecasts, our estimates of the benefits and costs are subject to some uncertainty. First, economic conditions, such as employment and wage growth in the absence of the policy, may differ in future years from the standard forecasts that we rely upon in this report. For example, in a recession employment would fall and wages would not grow as quickly. Our cost estimates might then be somewhat larger, but then so would our benefit estimates. Our estimates of the net effects are therefore likely to change, but not by a large amount. Second, our estimates rely on parameters that are themselves estimated with some uncertainty. We have tested the sensitivity or our calculations to these parameters. The results were encouraging, but require further research.

The proposed policy would result in substantial benefits to low-wage workers and their families. The policy will raise wages for 115,000 workers in San Jose and 250,000 in Santa Clara County by 2019. On average, for workers getting increases, their annual earnings will increase by 17.8 percent or $3,000, in San Jose and $3,200 or 19.4 percent in Santa Clara County by 2019.

These large increases in pay will raise overall wages in for-profit businesses by only 1.3 percent in San Jose and one percent in Santa Clara County. This amount is surprisingly small because many businesses already pay more than $15, because many of the workers who are now paid below $15 are already paid above the current minimum wage, and because the pay of low-wage workers makes up a smaller share of total payroll costs.

Businesses will absorb the additional payroll costs partly through savings on employee turnover costs, higher worker productivity gains, and some automation (the substitution effect). Most of the increase in costs will likely be passed on to consumers via increased prices. Since labor costs make up only about one-fourth of operating costs, consumer prices will increase only slightly—about 0.3 percent in San Jose and 0.2 percent in Santa Clara County over the entire phase-in period. Prices will be most affected in the restaurant industry, where they will increase by 3.1 percent in San Jose and 2.9 percent in Santa Clara County.

These higher prices by themselves would reduce consumer sales and reduce the demand for labor (the scale effect). But simultaneous positive effects on increased consumer spending from workers receiving wage increases will offset the scale and substitution effects.

After taking into account all of these factors, we estimate that the proposed minimum wage policy would result in slower employment growth, reducing overall net employment (as a percent of total employment) in San Jose by 0.3 percent and in Santa Clara County by 0.1 percent by 2019, over the baseline. This estimate is cumulative (and so will be spread over several the phase-in period). In comparison, employment in the state is projected to grow 1.32 percent annually in the same time period. Most of the job declines reflect leakage of the increased spending into the rest of the region. When taking into account the surrounding counties, the net effect on jobs is close to zero.

In sum, it is possible to effect a substantial improvement in living standards for a quarter of the workforce in San Jose and nearly a third of the workforce in Santa Clara County without generating a significant net adverse employment effect. It can do so through induced efficiencies (more automation, productivity gains, and turnover savings) and slight price increases borne by all consumers. Based on our analysis, we conclude that the proposed minimum wage will have its intended effects in improving incomes for low-wage workers. Any effects on employment and overall economic growth are likely to be small. The net impact of the policy will therefore be positive.

APPENDIX: DATA AND METHODS

In this appendix, we document the data and methods we use in this study. Section A1 details how the Census' American Community Survey was used both to estimate pay increases for affected workers and the median full-time wages in San Jose and Santa Clara County. Section A2 describes the data and methods we use to calibrate the UC Berkeley IRLE minimum wage model.

A1. THE WAGE SIMULATION MODEL

In this section, we describe our simulation model for estimating the number of workers that would be affected by the Scenario A and Scenario B minimum wage increases. We provide a general overview of our methodology here. For full documentation of the model and data we use, see Perry, Thomason and Bernhardt (Forthcoming).

The logic of our method is to simulate the future San Jose and Santa Clara County wage distributions with and without the scenario minimum wage increases. First, we use our model to run a "baseline" simulation of the wage distribution through 2019 assuming existing minimum wage schedules (see Table 2 and Table 3). We then use our model to run a "scenario" simulation of the wage distribution through 2019 assuming the minimum wage increases specified in the two scenarios.

We then compare the baseline and scenario simulated wage distributions to identify the impact of the minimum wage increase scenarios above and beyond currently scheduled minimum wage increases. With this comparison, we are able to estimate (a) the number of workers affected by each scenario, and (b) the additional wages earned as a result of the increase. In our estimate of affected workers, we include those workers who earn just above the new minimum wage but who also receive an increase via the ripple effect (see below). Our estimates are adjusted for projected wage and employment growth.

Dataset

We combine the 2013 and 2014 IPUMS American Community Survey (ACS) (https://usa.ipums.org/usa/) in order to attain sufficient sample size for our analysis (Ruggles et al. 2015). The American Community Survey is the largest annual survey conducted by the U.S. Census Bureau, and interviews more than 2.3 million households throughout the United States. The ACS is better suited than the Current Population Survey (CPS) for conducting labor market analyses at the state or sub-state level for two main reasons: first, the ACS sample size is much larger than the CPS; and second, the ACS contains place of work data, while the CPS data are limited to place of residence. This allows us to disaggregate wage and employment data for sub-state geographical units.

Sample definition

We make the following adjustments to our ACS sample:

1. We restrict the sample to individuals age 16 to 64 who had positive wage and salary income in the previous 12 months, who worked in the previous 12 months, and who were not self-employed or unpaid family workers.

2. We exclude the following workers from our sample who would not be eligible for a municipal or county minimum wage law:

    a. Federal and state government workers would not be eligible for the minimum wage increases in Scenario A and Scenario B because local governments do not have jurisdiction over federal or state employees.

    b. Public education employees are excluded from our sample because local school districts are state entities and are exempt from local minimum wage laws.

    c. In-Home Supportive Service (IHSS) workers are also excluded because IHSS programs are administered at the county level and are exempt from local minimum wage laws.

Wage measure

Because the ACS only records workers' annual earnings, it is necessary to estimate an hourly wage variable in order to perform simulations of the effects of minimum wage increases. The hourly wage is estimated for all workers in the sample using their reported annual earnings, usual hours of work per week, and weeks worked in the previous year. The annual earnings measure includes wages, salaries, commissions, cash bonuses, and tips from all jobs, before deductions for taxes. The "number of weeks worked in the previous year" variable is a categorical variable of intervals of weeks worked (such as 14–26 weeks or 50–52 weeks). This variable is converted to a discrete variable using the mid-point of each interval. The hourly wage variable is then estimated as annual earnings divided by the product of the number of weeks worked in the previous year and usual hours worked per week. Workers in occupations that receive tips as the majority of their earnings are coded with hourly wage values equal to state minimum wage, since we only want to measure wages paid by their employer in this study.

Geography

The smallest geographic unit for the ACS place-of-work variable is the county. In order to estimate the impact of the minimum wage scenarios for cities within Santa Clara County, we conduct our simulation as described above using county-level data, and then estimate the number of affected workers in the city by applying the percentage of affected workers to city-level employment estimates from the Quarterly Census of Employment and Wages (QCEW). This step introduces additional assumptions; namely, that the wage distribution of those who work in the city (not all of whom live in the city) is the same as the wage distribution of those who work in the county, and that future wage and employment growth trends in the city will mirror those at the county level. We therefore make two adjustments to our county-level ACS data to better approximate the city-level wage distribution:

1. We use data from the California Employment Development Department to adjust the industry and sector distribution of the county-level ACS data to match the city's distribution.

2. We adjust wages for two high-impact industries where QCEW data show a significant difference in wages in San Jose and Santa Clara County.

Our model for Santa Clara County takes into account the different local minimum wage laws in effect within the county (see Table 3).

Identifying affected workers

Our model estimates the impact of minimum wage increases on three groups of affected workers: minimum wage workers, subminimum wage workers, and those who are indirectly affected (via spill-over effects). The spill-over effect means that workers who make slightly more than the new proposed minimum wage level are also likely to receive wage increases.

The main group of affected workers – minimum wage workers – consists of those who earn between the old minimum wage and the new minimum wage. Given measurement error, we include in this group workers who earn somewhat below the old minimum wage (down to 90 percent of the old minimum wage). Subminimum wage workers include those earning between 50 percent to 89 percent of the old minimum wage. Indirectly affected workers are those earning between 100 and 115 percent of the new minimum wage.[30]

We then estimate the additional wages earned by affected workers as a result of the minimum wage increase scenario, as summarized in Table A1. Minimum wage workers simply receive the new minimum wage. Subminimum wage workers receive a percentage wage increase of the same size as the percentage change in the statutory minimum wage. Indirectly affected workers receive a quarter of the difference between their current wage and the upper bound of the spill-over band (115 percent of the new minimum wage).

This model is used to simulate the scenario minimum increases for each of the phase-in years from 2017 to 2019, but also to simulate baseline minimum wage increases between 2013 and 2019 (i.e. minimum wage increases that have already occurred or are planned under existing law). We model overall regional wage growth over time using the average annual growth rate of the San Francisco CMSA CPI-W Urban Wage Earners & Clerical Workers between 2005 and 2014 (2.45 percent).

A2. CALIBRATING THE UC BERKELEY IRLE MINIMUM WAGE MODEL

A2.1 Structure of the model, and calculations step by step

Table A1 summarizes the structure of our model. The table has four components. The top part describes the number of workers in the state who will receive pay increases by 2021. Part A describes the effects of automation and worker productivity gains. Part B describes how much consumer prices will increase and how much those increases will reduce consumer demand and employment. Part C describes how we calculate the income effect: how pay increases will increase consumer spending and employment. Part D describes how we calculate the net effect on employment. In this section we document in detail the data and methods that we use in each part of Table A1. In section A2.2, we document the source of the key parameters used to calibrate our model.

Top part: Workers affected and wage increase

Lines [1] to [3] in Table A1 use our estimates (described in detail in the first section of the appendix) on how the labor force will grow and how the proposed minimum wage increase would affect the wage distribution of workers in San Jose (respectively Santa Clara County). The wage estimates include the number of workers directly and indirectly affected by the two scenarios, and their nominal wages with and without the policy. We also use our estimate of the total wage bill by 2019: it will be $31.1 billion in San Jose with minimum wage increase (as described in scenario A) and $30.7 billion without the minimum wage increase. In Santa Clara County, we estimate that the total wage bill will be 90.0 billion with the minimum wage increase (as described in scenario B) and 89.1 billion without the minimum wage increase.

Part A: Impact of capital-labor substitution and productivity gains

Part A calculates the impact of capital-labor substitution and productivity gains on employment and the total wage bill. Our estimates are calculated as follows:

The reduction in number of jobs from substitution effects (line [5] in Table A2) is calculated by multiplying four components: (i) the capital-labor substitution elasticity (see section A2.2) (ii) the average wage increase of workers getting increases, that we estimate to be 18 percent based in San Jose (respectively 19 percent in Santa Clara County), (iii) the profit share of revenues (see section A2.2), and (iv) the total number of affected workers.

The reduction in number of jobs from productivity gains ([6]) is calculated by multiplying two components: (i) the productivity gains (see section A2.2 for a description of the values we use to calibrate the model) and (ii) the total number of affected workers (that we estimate to be 115,000 in San Jose and 250,000 million in Santa Clara County according to our wage simulation model).

The reduction in wage bill due to substitution effects and productivity gains ([7]) is calculated by multiplying the reduction in number of jobs due to capital-labor substitution and productivity gains ([8]) by the nominal average annual earnings of workers who would otherwise remained employed ([9]).

Table A1. Structure of the UC Berkeley IRLE minimum wage model for the case of San Jose

A. Workers affected and wage increases	
Total employment	[1]
Total number of affected (directly and indirectly) workers in San Jose in 2019	[2]
Working age population growth from 2014 to 2019	[3]
B. Impact of K-L substitution and productivity gains on number of jobs and wage bill	
Reduction in # of jobs from substitution effects and productivity gains	[4]=[5]+[6]
Reduction in # of jobs from substitution effects in 2019	[5]
Reduction in # of jobs from productivity gains in 2019	[6]
Reduction in wage bill due to substitution effects and productivity gains job loss (in millions)	[7]=[8]*[9]/1e6
Reduction in # of jobs from substitution effects and productivity gains	[8]=[4]
Nominal average annual earnings of directly and indirectly affected workers without the policy	[9]
C. Scale effects: increase in consumer prices and reduction in consumer demand	
Percentage increase in consumer prices	[10]=[11]
Percentage increase in operating costs	[11]=[12]*[13]
Payroll share of operating costs	[12]
Net percentage payroll increase, accounting for savings from reduced turnover and productivity gains	[13]
Annual reduction in consumer demand from price increase (in millions)	[14]=[15]*[16]
Percentage reduction in demand from price increase	[15]
Annual aggregate consumer spending in San Jose (in millions)	[16]
Reduction in # of jobs from consumer spending reduction in San Jose	[17]
Reduction in # of jobs, as a percentage of total employment	[18]
D. Income effects: effects of pay increases on consumer spending and employment	
Net change in compensation for workers in San Jose (in millions)	[19]=[20]-[21]
Total wage increase for state workers in San Jose from proposed minimum wage increase (in millions)	[20]
SNAP and ACA benefit reduction	[21]
Increase in # of jobs from wage increase in San Jose (respectively in SC county and nine counties)	[22]
Increase in # of jobs, as a percentage of total employment	[23]
E. Net effects	
Cumulative net change in # of jobs in San Jose	[24]
Cumulative net change in # of jobs, as a percent of total employment	[25]=[24]/[1]
Annual net change in # of jobs in San Jose	[26]=[24]/5
Annual net change in # of jobs, as a percent of total employment	[27]=[25]/5

Source: UC Berkeley minimum wage model.

Part B: Scale effects: increase in consumer prices and reduction in consumer demand

Part B of Table A1 estimates the percentage increase in consumer prices due to an increase in operating costs for firms and the annual reduction in consumer demand from price increase. We use the 2014 IMPLAN model to calculate the impact of this reduction in consumer spending on employment. Our estimates are calculated as follows:

- The percentage increase in consumer prices ([10]) is assumed to be equal to the percentage increase in operating costs ([11]), following the widely-used Dixit-Stiglitz model of monopolistic competition (Dixit and Stiglitz 1977).
- The percentage increase in operating costs ([11]) is obtained by multiplying the net percentage payroll increase ([13]) by the labor share of operating costs ([12]).
- The net percentage payroll increase ([13]) includes savings from reduced turnover and the reduction in wage bill due to substitution effects and productivity gains. We estimate the total wage bill increase to be $389 million in San Jose by 2019 (respectively $899 million in Santa Clara County). We subtract the reduction in total wage bill due to substitution effects and productivity gains ([1]). We also account for the increase in payroll costs that corresponds to Medicare, Social Security, and Workers' Compensation costs. This share equals 10.36 percent in 2019 (see section A2.2 for the source). To compute the net percentage increase in payroll costs, we apply a partial offset for turnover cost savings (see section A2.2 for the source).
- The labor share of operating costs ([12]): we estimate the economy-wide labor share of operating costs to be 22.1 percent in 2016 (see section A2.2 for the source).
- The reduction in consumer demand from price increase ([14]) is obtained by multiplying the percentage reduction in demand from price increase ([15]) by the annual aggregate consumer spending in San Jose (respectively Santa Clara County) ([16]). The estimated reduction in consumer demand due to higher prices equals $107 million in San Jose (respectively $214 million in Santa Clara County). The key components of this calculation are:
    - The percentage reduction in consumer demand from price increase ([14]). It depends on two parameters: (i) the percentage increase in consumer prices as calculated in line [10], and (ii) the price elasticity of demand (see section A2.2 for the source). The bigger the price elasticity of demand is, the more sensitive the consumers are to a price change and the greater the percentage reduction in demand from price increase is.
    - Annual aggregate consumer spending ([16]) is obtained by multiplying the projected annual GDP for San Jose and Santa Clara County in 2019 by an overall estimated share of consumer spending in GDP. We estimate San Jose GDP and

Santa Clara County GDP so that it is consistent with the underlying value of the GDP in IMPLAN in 2019 (see section A2.2), and we estimate that the share of consumer spending in GDP is 58.8 percent (see section A2.2). We estimate that the annual aggregate consumer spending is $57.9 billion in 2019 in San Jose and 146.5 billion in Santa Clara County.

- The annual reduction in jobs resulting from price increases is estimated using the 2014 IMPLAN model (see (Day 2013) for documentation on this software). We adjust those estimates by working age population growth from 2014 to 2019, estimated to be 6.79 percent for the overall period in both San Jose and Santa Clara County (see section A2.2).

Part C: Income effects

Part C of Table A1 estimates the income effects resulting from pay increases for low-wage workers, the resultant increase in consumer demand, and its impact on employment. Our estimates are calculated as follows:

- The net change in compensation for affected workers ([19]) is calculated as the total wage bill increase for affected workers ([20]) minus the wage bill reduction from a reduction in the Supplemental Nutrition Assistance Program (SNAP) and in premium tax credits under the Affordable Care Act benefit reduction ([21]).

- The offset from SNAP and premium tax credits ([21]) under the ACA is estimated to be 14.75 percent of the total wage increase (see Appendix A2) and is applied to the total wage bill increase for all households, as there is no easy way to separate this out by income brackets.

- The annual increase in jobs resulting from higher consumer demand is estimated using the 2014 IMPLAN model. We adjust those estimates by the working age population growth from 2014 to 2019, estimated to be 6.79 percent for the overall period in both San Jose and Santa Clara County (see section A2.2 for the source).

Part D: Net effects

Part D of Table A1 estimates the cumulative net effect on employment ([24]), simply by subtracting the reduction in employment due to substitution effects, productivity gains ([4]), and scale effects ([17]) from ([the employment gains due to income effects 22]). We compute the annual estimates by dividing the cumulative effects on employment by five, to account for the number of years needed for the policy to be fully phased in. These numbers are therefore approximate annual averages.

A2.2 Key parameters and assumptions used in the model

Our key parameters are drawn from the best available evidence. We vary some of them in our robustness tests. We explain and document below the range of those parameters and the

sources we used. The values of the key parameters used in the model are summarized in table A2.

Table A2. Key parameters of the model

	In San Jose	In Santa Clara County
A. Workers affected and wage increases		
Working age population growth from Dec 31 2012 to July 1 2021	6.79%	6.79%
B. Impact of K-L substitution and productivity gains on number of jobs and wage bill		
Capital-Labor substitution	0.2	0.2
Profit share (taking into account the share going to intermediate inputs and materials) of revenues	0.15	0.15
Productivity gains - in levels	0.005	0.005
C. Scale effects: increase in consumer prices and reduction in consumer demand		
Labor percent of operating costs	22.1%	22.1%
Percent of wage costs for Medicare, Social Security, and worker compensation	10.36%	10.36%
Turnover reduction (as share of payroll increase)	0.11	0.11
Price elasticity of demand	-0.72	-0.72
Annual GDP in 2019 (in millions)	$98,420	$249,225
Share of consumer spending in GDP	0.588	0.588
D. Income effects: effects of pay increases on consumer spending and employment and employment		
Percentage offset from reduced SNAP benefits and lower premium tax credits	14.75%	14.75%
Offset from reduced EITC	0.60%	0.60%
Offset from reduced SNAP benefits	4.20%	4.20%
Offset from lower premium tax credits under the ACA	2.30%	2.30%
Offset from reduced payroll taxes	7.65%	7.65%
E. Net effects		
No key parameters used in this section		

Source: UC Berkeley minimum wage model.

Future Employment Growth

Our estimate of future employment growth in San Jose and Santa Clara County comes from data supplied by the California Employment Development Department (EDD) (2015).

Capital-labor substitution

For a discussion about capital-labor substitution and the sources we used, see section 4.2 in the main report.

Profit share of revenues

We use Table 1.14. "Gross Value Added of Domestic Corporate Business in Current Dollars and Gross Value Added of Nonfinancial Domestic Corporate Business in Current and Chained Dollars" of the National Income and Product Accounts Tables (NIPA) published by the Bureau of Economic Analysis to estimate the labor and capital share of national income. Using the 2014 data, we estimate that the labor share of national income is 62 percent and the capital share of national

income (including capital depreciation) is 38 percent. Knowing that the labor share of operating costs is 22.1 percent in 2016, we apply the growth rate of payroll costs to estimate the labor share of operating costs in 2019 and estimate that the profit share of revenues is therefore estimated to be 0.15 in 2021. The remainder of businesses revenues is composed of materials, intermediate inputs and rent.

Productivity gains

For a discussion of productivity gains and the sources we used, see section 5.1 in the main report.

Labor share of operating costs

Net payroll cost increases for businesses are a function of three factors: (1) the total wage bill increase, after reduction due to substitution effects and productivity gains; (2) Medicare, Social Security, and Workers' Compensation increases, and (3) turnover costs savings. The payroll costs increase as total compensation increases and decrease with turnover costs savings.

- The total wage bill increase from 2016 to 2019 is estimated with our wage simulation model based on micro data. For each year, we calculate the reduction in wage bill due to job losses from substitution effects and productivity gains, assuming that capital-labor substitution and productivity gains are constant over the years. We assume in our calculations that capital-labor substitution is equal to 20 percent every year, and that productivity gains are equal to 5 percent every year.

- Employers' costs for Medicare, Social Security, and Workers' Compensation will equal 10.36 percent of wages from 2016 to 2019. We estimate the three components—Medicare (1.45 percent), Social Security (6.2 percent), and Workers' Compensation costs—separately. Since we are estimating only the effects of a minimum wage increase, we assume the Medicare and Social Security rates will not change between 2016 and 2019. For Workers' Compensation costs, we draw from a report of the National Academy of Social Insurance {Citation}(2013). Table 14 (p. 37) of this report indicates that Workers' Compensation employer costs in 2013 amounted to $1.50 per $100 of eligible wages. These costs increased $0.11 cent increase a year over 2011–2013, slightly more than the 2009–2011 change. To account for these cost increases, we adjust the 2013 cost by $0.34. Consequently, we estimate that Workers' Compensation costs will equal 1.84 percent of wages in San Jose and Santa Clara County from 2016 to 2019.

- Turnover costs savings are based on the estimates of Pollin and Wicks-Lim (2015), Fairris (2005), Dube, Freeman and Reich (2010), Dube, Lester and Reich (2016), Boushey and Glynn (2012), and Jacobs and Graham-Squire (2010). See section 5.1 in the main report.

The labor share of operating costs by industry

For each industry, we estimate labor costs as the sum of the annual wage costs, payroll taxes and employer paid insurance premiums (except health insurance), and other benefits (other than contributions to pension plans). The labor share is estimated using 2012 Census Bureau surveys—the most recent year available. We use these surveys only for select individual industries: retail trade; food services; wholesale trade; manufacturing; administrative and waste management services; health care and social assistance (including ambulatory care, hospitals, and long-term care); and other services. We document here our sources and methods for these individual industries as well as for our estimates of the labor share of operating costs in the overall economy.

- Retail trade (including grocery stores): The 2012 U.S. Census Annual Retail Trade Reports provides data on retail sales, payroll costs, merchandise purchased for resale, and detailed operating expenses. We add operating expenses and purchases together to determine total operating costs. We add the costs of payroll taxes, employer paid insurance premiums, and employer benefits (excluding health insurance and retirement benefits) to annual payroll to estimate total labor costs. Health and retirement benefits are excluded since, unlike payroll taxes and Workers' Compensation insurance, the costs of the benefits will not change if wages are increased. Dividing labor costs by operating costs gives us the labor share in retail trade.

- Food services industry: Industry data on gross operating surplus are available from the Bureau of Economic Analysis Input-Output Account Data, before Redefinitions, Producer Value. We subtract gross operating surplus from sales to obtain total restaurant operating costs, and then proceed as we did for retail to obtain labor cost data.

- Wholesale trade: Data are from the U.S. Census Annual Wholesale Trade Report. We follow the same methods as with retail trade.

- Manufacturing: Data are from the 2012 Economic Census (Table EC1231I1). To determine operating expenses we add together payroll costs and benefits, total cost of materials, total capital expenditures, depreciation, rental or lease payments, and all other operating expenses. To determine labor costs we add together payroll costs and payroll taxes, employer paid insurance premiums, and employer benefits (excluding health insurance and retirement benefits).

- Administrative and waste management services, health care and social assistance (including ambulatory care, hospitals, and long-term care), and other services: Data are from the U.S. Census Annual Services Report, which provides data on payroll and operating expenses. Total operating expenses are reported directly in the data. To determine labor costs we add together payroll costs and payroll taxes, employer paid insurance premiums, and employer benefits (excluding health insurance and retirement benefits).

- Overall economy: We sum the total labor and operating costs across all industries with available data and then divide the aggregate labor costs by the aggregate operating costs. In addition to the industries listed above, we are able to use the Annual Services Report to gather data on the following industries: utilities; transportation and warehousing; information; finance and insurance; real estate and rental and leasing; professional, scientific, and technical services; educational services; and arts, entertainment, and recreation. We are missing data for the following industries, and as a result they are not included in our calculation: agriculture, forestry, fishing, and hunting; mining, quarrying, and oil and gas extraction; construction; accommodation; and public administration. Overall, we estimate that the labor share of operating costs is 22.1 percent in 2012, and assume it is constant between 2012 and 2016.

Share of payroll costs for Medicare, Social Security and Workers' compensation

The share of Medicare, Social Security, and Workers' Compensation is assumed to continue to be 10.36 percent from 2016 to 2019. We estimate the Medicare, Social Security, and Workers' Compensation costs separately. Employers are liable for 6.2 percent Social Security taxes and 1.45 percent Medicare taxes. We estimate that the Workers' Compensation employer cost is 2.71 percent of wages in California. The estimate of 2.71 comes from Workers' Compensation Insurance Rating Bureau of California (2014), Chart 6 for "all industries": http://www.wcirb.com/sites/default/files/documents/state_of_the_wc_system_report_140815.pdf.

Turnover reduction

For a discussion on savings generated by turnover reduction and the sources we used, see section 5.1 in the main report.

Price elasticity of demand

The price elasticity of demand measures the effect of a price increase on reducing consumer demand. We use a price elasticity of 0.72. This estimate is based on Taylor and Houthakker (2010), who report price elasticities for six categories of goods and services. We adjust their estimates to account for changes in the elasticity of health care spending attributable to the Affordable Care Act and other changes in the health care system.

GDP for San Jose and Santa Clara County in 2019

The 2019 GDP used in our model has been forecasted using the following methodology:

- We start with the 2014 GDP reported in IMPLAN, i.e. $84.4 billion in San Jose, and $213.7 billion in Santa Clara County;

- We then forecast the GDP for San Jose (respectively for Santa Clara County) by applying the employment growth of 6.79 percent from 2014 to 2019 (respectively 6.79 percent for Santa Clara County), the projected wage growth using the last 10 years of CPI-W growth of

12.9 percent (respectively 12.9 percent for Santa Clara County), and the GDP deflator in IMPLAN for 2019 (1.039 for both San Jose and Santa Clara County).

Share of consumer spending in GDP

Our estimate of the share of consumer spending in GDP includes only consumer spending that flows through households. We therefore reduce the BEA's estimate of the consumption share by 14.1 percent.

Offsets from benefit reductions and payroll tax increases

We estimate that the total offset from reduced EITC to be 0.6 percent, the offset from reduced SNAP benefits to be 4.20 percent, the offset from lower premium tax credits under the ACA to be 2.3 percent, and the offset from reduced payroll taxes to be 7.65 percent (the remaining personal income taxes are removed by IMPLAN). These estimates have been calculated using Congressional Budget Office (2012). These results are for the year 2012, and we assume they will remain constant until 2021.

Share of in-commuters

We use 2014 ACS data to estimate the proportion of affected workers in Santa Clara County who live outside of the county (16.2 percent). However, we are not able to estimate the share of in-commuters for San Jose with ACS data alone because the ACS does not provide place of work data at the city level. LEHD Origin Destination Employment Statistics (LODES) data accessed through the Census Bureau's On the Map website provides employer location and worker residence data at the city level, but is not as reliable as ACS data because employers' addresses do not always correspond to a worker's physical workplace. To estimate the share of in-commuters for San Jose, we therefore first calculate the ratio of the ACS estimate of the share of in-commuters in Santa Clara County to the LODES estimate of the share of in-commuters in Santa Clara County. We then apply that ratio to the LODES estimate to the share of in-commuters in San Jose.

ENDNOTES

[1] Portions of this report draw from Reich et al. 2016.

[2] The April 2016 non-seasonally adjusted unemployment rate for San Jose reported by California EDD was 4.1 percent. We do not include this statistic here because it is not seasonally adjusted.

[3] See, for example, the report on inequality from the California Budget and Policy Center: http://calbudgetcenter.org/wp-content/uploads/Inequality-and-Economic-Security-in-Silicon-Valley-05.25.2016.pdf

[4] However, Aaronson, Agarwal and French (2012), Table A-3, report a positive earnings effect for adults and nonetheless find no detectable effect on employment.

[5] Neumark, Salas and Wascher (2014), the best-known researchers who find negative effects, report a 0.06 minimum wage employment elasticity for restaurants, very close to the findings in Allegretto et al. (2015).

[6] The study was prepared for the Los Angeles City Council; see Reich, Jacobs, Bernhardt and Perry (2015).

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

[8] Constant dollar values are calculated using the average annual change for the past ten years of the San Francisco-Oakland-San Jose Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W).

[9] One exception is child care assistance, which does have a maximum income threshold that, once exceeded, results in the immediate loss of benefits. However, since there is a substantial waiting list for child care assistance benefits, any affected workers who lose eligibility will be replaced by lower-wage workers not currently receiving benefits. Workers who are no longer eligible for Medi-Cal will be eligible for subsidized health care through Covered CA. While most families will come out well ahead financially, the change in costs for specific families will depend on income and health care utilization.

[10] This analysis is based on data gathered before the full implementation of the Affordable Care Act.

[11] This analysis is based on data gathered before the full implementation of the Affordable Care Act.

[12] Hirsch, Kaufman, and Zelenska (2011) and Reich, Hall, and Jacobs (2003) found improvements in worker productivity following higher wage mandates.

[13] The turnover savings are considered constant in 2017 and 2018, at 17.5 percent of increased labor costs, a midpoint estimate in the literature (Hirsch, Kaufman, and Zelenska 2011; Reich, Hall, and Jacobs 2003). These savings are likely to accrue at smaller rates as wage levels go higher; we therefore assume that by 2019 the marginal increase in earnings relative to 2017 no longer yields any additional turnover savings. As a result, we estimate that the total savings from turnover at a $15 minimum wage in 2019 would be 11.3 percent of increased labor costs for San Jose and 11.9 percent of increased labor costs for Santa Clara County.

[14] We use a payroll tax rate of 7.65 percent (6.2 percent for Social Security and 1.45 percent for Medicare). Workers' compensation insurance rates vary by industry (see Table 6: http://www.wcirb.com/sites/default/files/documents/state_of_the_wc_system_report_140815.pdf.

[15] The turnover savings are considered constant in 2017 and 2018, at 17.5 percent of increased labor costs, a midpoint estimate in the literature (Hirsch, Kaufman, and Zelenska 2011; Reich, Hall, and Jacobs 2003). These savings are likely to accrue at smaller rates as wage levels go higher; we therefore assume that by 2019 the marginal increase in earnings relative to 2017 no longer yields any additional turnover savings. As a result, we estimate that the total savings from turnover at a $15 minimum wage in 2019 would be 11.3 percent of increased labor costs for San Jose and 11.9 percent of increased labor costs for Santa Clara County.

[16] Since workers often increase their wages by moving from one employer to another, we cannot assume that the correlation between wages and turnover indicates that low wages are causing higher turnover. As we discuss below, however, policy experiments with living wages and minimum wages have provided the evidence needed to determine that wages do, in fact, affect turnover.

[17] These averages include the low-turnover period of the Great Recession, and can be expected to increase towards higher pre-recession levels as the labor market tightens.

[18] The estimate of 17.5 percent represents the midpoint between the 20 percent estimate of Pollin and Wicks-Lim (2015) and a 15 percent (unpublished) estimate that draws upon Dube, Freeman and Reich (2010) and Dube, Lester and Reich (2016).

[19] Burda et al. 2016, Table 6 (cols. 3 and 5) reports that a $1 increase in weekly pay reduces the incidence of shirking by -.027 (.0054), on a base of .032 (from Table 1). For a full-time worker, going from $10 to $15 per hour raises weekly pay by $200, so the effect on productivity would be about .2x.027 = .005, or 0.5 percent. This estimate measures just the effect of reducing

idleness. Positive effects on absenteeism and worker engagement would add to the productivity improvement.

[20] Taylor and Houthakker's industry elasticities are based on regressions of U.S. panel data across over 300 cities and pooled over 1996-99. As we discuss below in Section 5.5, we do not expect that a substantial component of consumer sales will move outside the state's borders. Liu and Chollet (2006)'s review essay suggests that the price elasticity of demand for out-of-pocket individual healthcare expenses is -0.2. Our health care elasticity recognizes that employers shift their cost of health care on to employees. We also recognize that for those with subsidized coverage, increases in premium costs for lower-income families—who are more price-sensitive—are borne by the federal government.

[21] Annual consumer spending for San Jose (respectively Santa Clara County) is estimated at 58.8 percent of IMPLAN's estimated GDP for San Jose (respectively Santa Clara County). This percentage excludes the government share of health care costs.

[22] IMPLAN household spending model (proportional to city consumer spending patterns by household income level), using reduced consumer spending in Row 3 and forcing IMPLAN to apply 100 percent of the reduction in the city; see the appendix for details on IMPLAN modeling.

[23] This includes an offset of 4.20 percent for reduction in SNAP, and 2.3 percent in lower premium tax credits and cost sharing subsidies under the ACA (Congressional Budget Office 2012). We also reduce the aggregate increase in wages by lost earnings due to estimated job loss in Panel A. This offset may be too high. According to Chodorow-Reich and Karabarbounis (2015), the consumption expenditures of the unemployed equal 75 percent of the consumption expenditures of the employed, even after taking into account the limited duration of unemployment insurance benefits. Their result echoes a similar result by Aguiar and Hurst (2005) for food expenditures only.

[24] IMPLAN household income model for New York State, using net wage increase from Row 5 and subtracting net wage increase going to affected workers who live outside New York State; see Appendix A2 and Day (2013) for more details on IMPLAN. The net wage increase is distributed across household income categories by the household distribution of increased wages from the minimum wage increase. Our wage simulation model estimates that 6.6 percent of increased wages will go to workers living outside the state.

[25] IMPLAN household income model for New York State, using net wage increase from Row 5 and subtracting net wage increase going to affected workers who live outside New York State; see Appendix A2 and Day (2013) for more details on IMPLAN. The net wage increase is distributed across household income categories by the household distribution of increased wages from the

minimum wage increase. Our wage simulation model estimates that 6.6 percent of increased wages will go to workers living outside the state.

[26] Neumark, Salas and Wascher (2014) have criticized these findings. A response paper (Allegretto et al. 2015) refutes the criticisms.

[27] Federal law permits a 90-day subminimum wage for workers under the age of 20.

[29] For example, the State of California uses the following definition in SB-3 Sec. 3(b)(4): "Employees who are treated as employed by a single qualified taxpayer under subdivision (h) of Section 23626 of the [California] Revenue and Taxation Code, as it read on the effective date of this section, shall be considered employees of that taxpayer for the purposes of this ordinance."

[30] There is no single consensus estimate of the size of the ripple-effect from minimum wage increases. We draw on Wicks-Lim (2006), who finds a modal ripple effect of 115 percent across state and federal minimum wage increases from 1983-2002. Cooper (2013) uses a common convention of defining the ripple-effect band as equal to the new minimum wage plus the absolute value of the minimum wage increase being studied.

REFERENCES

Aaronson, Daniel. 2001. "Price Pass-Through and the Minimum Wage." *Review of Economics and Statistics* 83 (1): 158–69.

Aaronson, Daniel, Sumit Agarwal, and Eric French. 2012. "The Spending and Debt Responses to a Minimum Wage Hike." *American Economic Review* 102 (7): 3111–39.

Aaronson, Daniel, Eric French, and James MacDonald. 2008. "The Minimum Wage, Restaurant Prices, and Labor Market Structure." *Journal of Human Resources* 43 (3): 688–720.

Aaronson, Daniel, Eric French, and Isaac Sorkin. 2015. "Firm Dynamics and the Minimum Wage: A Putty-Clay Approach." Working Paper 2013-26. Research Department, Federal Reserve Board of Chicago. https://www.chicagofed.org/digital_assets/publications/working_papers/2013/wp2013_26.pdf.

Aaronson, Daniel, and Brian Phelan. 2015. "Wage Shocks and Technological Substitution." Federal Reserve Bank of Chicago.

Abowd, John, Francis Kramarz, Paul Lengermann, Kevin McKinney, and Sebastien Roux. 2012. "Persistent Inter-Industry Wage Differences: Rent Sharing and Opportunity Costs" 1 (7).

Achdou, Yves, Jiequn Han, Jean-Michel Lasry, Pierre-Louis Lions, and Benjamin Moll. 2014. "Heterogeneous Agent Models in Continuous Time." *Preprint*. http://www.princeton.edu/~moll/HACT.pdf.

Aguiar, Mark, and Erik Hurst. 2005. "Consumption versus Expenditure." *Journal of Political Economy* 113 (5): 919–48.

Akee, Randall, William Copeland, Gordon Keeler, Adrian Angold, and E. Jane Costello. 2010. "Parents' Incomes and Children's Outcomes: A Quasi-Experiment Using Transfer Payments from Casino Profits." *American Economic Journal: Applied Economics* 2 (1): 86–115.

Akerlof, George, and Janet Yellen, eds. 1986. *Efficiency Wage Models of the Labor Market*. New York: Cambridge University Press.

Allegretto, Sylvia, Arindrajit Dube, and Michael Reich. 2011. "Do Minimum Wages Really Reduce Teen Employment? Accounting for Heterogeneity and Selectivity in State Panel Data." *Industrial Relations* 50 (5): 205–40.

Allegretto, Sylvia, Arindrajit Dube, Michael Reich, and Ben Zipperer. 2015. *Credible Research Designs for Minimum Wage Studies: A Response to Neumark, Salas and Wascher*. Industrial and Labor Relations Review.

Allegretto, Sylvia, and Michael Reich. 2015. “Minimum Wage Effects on Prices: Preliminary Results.”

Alvarez-Cuadrado, Francisco, Ngo Van Long, and Markus Poschke. 2015. “Capital-Labor Substitution, Structural Change and the Labor Income Share.".” IZA Discussion Paper 8941. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2393997.

Autor, David. 2014a. “Polanyi’s Paradox and the Shape of Employment Growth.” Working Paper 20485. NBER. http://www.nber.org/papers/w20485.pdf.

———. 2014b. “Skills, Education and the Rise of Earnings Inequality Among the ‘Other 99 Percent.’” *Science* 344 (6186): 843–51.

Autor, David H., Alan Manning, and Christopher L. Smith. 2016. “The Contribution of the Minimum Wage to US Wage Inequality over Three Decades: A Reassessment.” *American Economic Journal: Applied Economics* 8 (1): 58–99. doi:10.1257/app.20140073.

Belman, Dale, and Paul J. Wolfson. 2014. *What Does the Minimum Wage Do?* Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

———. 2015. “15 Years of Research on Employment and the Minimum Wage.” Working Paper 2705499. Tuck School of Business. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2705499.

Blake, Frank. 2000. *New Ideas for Retaining Store-Level Employees*. Atlanta, GA: Coca-Cola Research Council.

Blundell, Richard, Panos Pashardes, and Guglielmo Weber. 1993. “What Do We Learn About Consumer Demand Patterns from Micro Data?” *American Economic Review* 83 (3): 570–97.

Boushey, Heather. 2005. “No Way Out: How Prime-Age Workers Get Trapped In Minimum-Wage Jobs.” *WorkingUSA* 8 (6): 659–670.

Boushey, Heather, and Sarah Glynn. 2012. *There Are Significant Business Costs to Replacement Employees*. Center for American Progress. https://cdn.americanprogress.org/wp-content/uploads/2012/11/CostofTurnover.pdf.

Brown, Charles. 1999. “Minimum Wages and the Distribution of Family Income.” In *Handbook of Labor Economics*, edited by Orley Ashenfelter and David Card.

Burda, Michael, Katie Genadek, and Daniel Hamermesh. 2016. “Not Working at Work: Loafing, Unemployment and Labor Productivity.” Working Paper 21923. NBER. http://www.nber.org/papers/w21923.

Cahuc, Pierre, Stephane Carcillo, and Andre Zylberberg. 2014. *Labor Economics*. 2nd ed. Cambridge, MA: MIT Press.

California Department of Industrial Relations. 2013. “Child Labor Laws.” Division of Labor Standards Enforcement. http://www.dir.ca.gov/DLSE/ChildLaborLawPamphlet.pdf.

California Employment Development Department, Labor Market Information Division. 2015. “2012-2022 Industry Employment Projections, San Jose-Sunnyvale-Santa Clara Metropolitan Statistical Area, (Santa Clara and San Benito Counties).” http://www.labormarketinfo.edd.ca.gov/file/indproj/sjos$indproj.xlsx.

Card, David, Ana Ruta Cardoso, Joergen Keining, and Patrick Kline. 2016. “Firms and Labor Market Inequality: Evidence and Some Theory.” IRLE Working Paper 104–16. Institute for Research on Labor and Employment, University of California, Berkeley. http://www.irle.berkeley.edu/workingpapers/104-16.pdf.

Card, David, and Alan Krueger. 1995. *Myth and Measurement: The New Economics of the Minimum Wage*. Princeton: Princeton University Press.

Casselman, Ben. 2015. “It’s Getting Harder To Move Beyond A Minimum-Wage Job.” *FiveThirtyEight*. October 8. http://fivethirtyeight.com/features/its-getting-harder-to-move-beyond-a-minimum-wage-job/.

Center on Wisconsin Strategy (COWS). 2002. “A Public Investment in Quality Care for Kids: An Evaluation of the Local Child Care Wage Initiative.” University of Wisconsin-Madison. http://www.cows.org/_data/documents/1018.pdf.

Chirinko, Robert S., and Debdulal Mallick. 2016. “The Substitution Elasticity, Factor Shares, Long-Run Growth, and the Low-Frequency Panel Model.” SSRN Scholarly Paper ID 2479816. Rochester, NY: Social Science Research Network. http://papers.ssrn.com/abstract=2479816.

Chodorow-Reich, Gabriel, and Loukas Karabarbounis. 2015. “The Cyclicality of the Opportunity Cost of Employment.” Working Paper 19678. NBER. http://scholar.harvard.edu/files/chodorow-reich/files/opportunity_cost_employment.pdf.

Congressional Budget Office. 2012. “Effective Marginal Tax Rates for Low- and Moderate-Income Workers.” U.S. Congress. https://www.cbo.gov/sites/default/files/11-15-2012-MarginalTaxRates.pdf.

Cooper, David. 2013. “Raising the Federal Minimum Wage to $10.10 Would Lift Wage for Millions and Provide Economic Boost.” Briefing Paper 371. Economic Policy Institute. http://s1.epi.org/files/2014/EPI-1010-minimum-wage.pdf.

Cooper, Kerris, and Kitty Stewart. 2013. *Does Money Affect Children’s Outcomes? A Systematic Review*. Joseph Rowntree Foundation. http://www.jrf.org.uk/sites/files/jrf/money-children-outcomes-full.pdf.

Costello, E. Jane, Scott Compton, Gordon Keeler, and Adrian Angold. 2003. "Relationships between Poverty and Psychopathology: A Natural Experiment." *Journal of the American Medical Association* 290 (15): 2023–29.

Cotton, John L., and Jeffrey M. Tuttle. 1986. "Employee Turnover: A Meta-Analysis and Review with Implications for Future Research." *The Academy of Management Review* 11 (1): 55–70.

Dahl, Gordon, and Lance Lochner. 2012. "The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit." *American Economic Review* 102 (5): 1927–56.

Day, Frances. 2013. "Principles of Impact Analysis & IMPLAN Applications." IMPLAN Documentation. http://implan.com/index.php?view=download&alias=32-piaia-sample&category_slug=demo-1&option=com_docman&Itemid=1764.

Dixit, Avinash K., and Joseph E. Stiglitz. 1977. "Monopolistic Competition and Optimum Product Diversity." *The American Economic Review* 67 (3): 297–308.

Draca, Mirko, Stephen Machin, and John Van Reenen. 2011. "Minimum Wages and Firm Profitability." *American Economic Journal: Applied Economics* 3 (1): 129–51.

Dube, Arindrajit. 2013. "Minimum Wages and the Distribution of Family Incomes." *A Paper Series Commemorating the 75 Th Anniversary of the Fair Labor Standards Act*, 172.

———. 2014. "Designing Thoughtful Minimum Wage Policies at the Local and State Levels." In *Policies to Address Poverty in America*, edited by S. Kearney Melissa and Benjamin H. Harris. 2014: The Hamilton Project.

Dube, Arindrajit, Eric Freeman, and Michael Reich. 2010. "Employee Replacement Costs." Working Paper 201–10. IRLE, UC Berkeley. http://www.irle.berkeley.edu/workingpapers/201-10.pdf.

Dube, Arindrajit, T. William Lester, and Michael Reich. 2010. "Minimum Wage Effects Across State Borders: Estimates Using Contiguous Counties." *Review of Economics and Statistics* 92 (4): 945–64.

———. 2016. "Minimum Wage Shocks, Employment Flows and Labor Market Friction." *Journal of Labor Economics*.

Dube, Arindrajit, Suresh Naidu, and Michael Reich. 2007. "The Economic Effects of a Citywide Minimum Wage." *Industrial and Labor Relations Review* 60 (4): 522–43.

Evans, William, and Craig Garthwaite. 2010. "Giving Mom a Break: The Impact of Higher EITC Payments on Maternal Health." Working Paper 16296. NBER. http://www.nber.org/papers/w16296.pdf.

Fairris, David. 2005. “The Impact of Living Wages on Employers: A Control Group Analysis of the Los Angeles Ordinance.” *Industrial Relations* 44 (1): 84–105.

Giuliano, Laura. 2013. “Minimum Wage Effects on Employment, Substitution, and the Teenage Labor Supply: Evidence from Personnel Data.” *Journal of Labor Economics* 31 (1): 155–94.

“Groups Supporting the Repeal of Section 14(c) of the Fair Labor Standards Act | National Federation of the Blind.” 2016. *National Federation of the Blind*. February 19. https://nfb.org/groups-supporting-repeal-section-14c-fair-labor-standards-act.

Hall, Robert. 2009. “By How Much Does GDP Rise If the Government Buys More Output?” *Brookings Panel on Economic Activity* 2: 183–231.

Harasztosi, Peter, and Attila Lindner. 2015. *Who Pays for the Minimum Wage?* https://www.dropbox.com/s/4wdvae5oo68v8mo/HungaryMW_wpFinal.pdf?dl=0.

Harmuth, Susan, and Susan Dyson. 2005. *Results of the 2005 National Survey of State Initiatives on the Long-Term Care Direct-Care Workforce*. The National Clearinghouse on the Direct Care Workforce; The Direct Care Workers Association of North Carolina. http://www.phinational.org/sites/phinational.org/files/clearinghouse/RESULTS%20OF%20THE%202005%20NATIONAL%20SURVEY%20FINAL%2092205.pdf.

Hinkin, Timothy, and J. Bruce Tracey. 2000. “The Cost of Turnover: Putting a Price on the Learning Curve.” *Cornell Hotel and Restaurant Administration Quarterly* 41 (4): 14–21.

Hirsch, Barry T., Bruce Kaufman, and Tetyana Zelenska. 2011. “Minimum Wage Channels of Adjustment.” IZA Discussion Paper 6132. Institute for the Study of Labor. http://www2.gsu.edu/ecobth/IZA_HKZ_MinWageCoA_dp6132.pdf.

Howes, Candace. 2002. *The Impact of a Large Wage Increase on the Workforce Stability of IHSS Home Care Workers in San Francisco County*. UC Berkeley: University of California Institute for Labor and the Economy; Center for Labor Education and Research. http://laborcenter.berkeley.edu/pdf/2002/Howes.pdf.

Jacobs, Ken, and Dave Graham-Squire. 2010. “Labor Standards for School Cafeteria Workers, Turnover and Public Program Utilization.” *Berkeley Journal of Employment and Labor Law* 31 (2): 447–59.

Larson, Sheryl, Amy Hewitt, Charlie Lakin, and David Felce. 2004. “Multi-Perspective Analysis of Workforce Challenges and Their Effects on Consumer and Family Quality of Life.” *American Journal of Mental Retardation* 109 (6): 481–500.

Lawrence, Robert. 2015. “Recent Declines in Labor’s Share in US Income: A Preliminary Neoclassical Account.” Working Paper 15–10. Peterson Institute for International Economics.

Leigh, J. Paul, and Juan Du. 2012. “Are Low Wages Risk Factors for Hypertension?” *European Journal of Public Health* 22 (6): 854–59.

Liu, Su, and Deborah Chollet. 2006. *Price and Income Elasticity of the Demand for Health Insurance and Health Care Services: A Critical Review of the Literature*. Mathematica Policy Research. http://www.mathematica-mpr.com/Inc. /media/publications/PDFs/priceincome.pdf.

Manning, Alan. 2016. “CEP Discussion Paper No 1428 May 2016 The Elusive Employment Effect of the Minimum Wage.” http://cep.lse.ac.uk/pubs/download/dp1428.pdf.

Marans, Daniel. 2016. “Hillary Clinton Takes A Stand Against ‘Subminimum Wage’ For People With Disabilities.” *The Huffington Post*. March 29. http://www.huffingtonpost.com/entry/hillary-clinton-subminimum-wage-people-with-disabilities_us_56faf630e4b083f5c605ef20.

McCully, Clinton. 2011. “Trends in Consumer Spending and Personal Saving, 1959-2009.” *Survey of Current Business* 91 (6): 14–23.

Montialoux, Claire, Tobias Renkin, and Michael Siegenthaler. Forthcoming. “The Pass-through of Minimum Wages into US Retail Prices: Evidence from Supermarket Scanner Data.” Working Paper.

Morris, Pamela, and Lisa Gennetian. 2003. “Identifying the Effects of Income on Children’s Development Using Experimental Data.” *Journal of Marriage & Family* 65 (3): 716–29.

Neumark, David, J. M. Ian Salas, and William Wascher. 2014. “More on Recent Evidence on the Effects of Minimum Wages in the United States.” Working Paper Series 20619. NBER. http://www.nber.org/papers/w20619.pdf.

Neumark, David, and William Wascher. 1992. “Employment Effects of Minimum and Subminimum Wages: Panel Data on State Minimum Wage Laws.” *Industrial and Labor Relations Review* 46 (1): 55–81.

O’Connor, Sarah. 2016. “World Watches Britain’s ‘living Wage’ Experiment.” *FT.com*. March 29. http://www.ft.com/cms/s/2/2ae61f24-f2a9-11e5-aff5-19b4e253664a.html#axzz48ZT31htR.

Organization for Economic Co-operation and Development (OECD). 2013. “Minimum Wage Relative to Average Wages of Full-Time Workers.” OECD StatExtracts. http://stats.oecd.org/viewhtml.aspx?datasetcode=MIN2AVE&lang=en.

Perry, Ian, Sarah Thomason, and Annette Bernhardt. 2016. “Data and Methods for Estimating the Impact of Proposed Local Minimum Wage Laws.” UC Berkeley Labor Center.

Pollin, Robert, and Jeannette Wicks-Lim. 2015. “A $15 U.S. Minimum Wage: How the Fast-Food Industry Could Adjust Without Shedding Jobs.” Working Paper 373. Political Economy Research Institute, University of Massachusetts Amherst.

http://www.peri.umass.edu/fileadmin/pdf/working_papers/working_papers_351-400/WP373.pdf.

Reeves, Aaron, Martin McKee, Johan Mackenbach, Margaret Whitehead, and David Stuckler. 2016. "Introduction of a National Minimum Wage Reduced Depressive Symptoms in Low-Wage Workers: A Quasi-Natural Experiment in the UK." *Health Economics*, January, n/a-n/a. doi:10.1002/hec.3336.

Reich, Michael, Sylvia Allegretto, Ken Jacobs, and Claire Montialoux. 2016. "The Effects of a $15 Minimum Wage in New York State." Center on Wage and Employment Dynamics, Institute for Research on Labor and Employment, University of California, Berkeley. http://irle.berkeley.edu/cwed/briefs/2016-01.pdf.

Reich, Michael, Peter Hall, and Ken Jacobs. 2003. "Living Wage Policies at San Francisco Airport: Impacts on Workers and Businesses." ILRE Working Paper No. 98-03. ILRE.

Reich, Michael, Ken Jacobs, and Miranda Dietz, eds. 2014. *When Mandates Work: Raising Labor Standards at the Local Level*. Berkeley, CA: University of California Press.

Ruggles, Steven, Katie Genadek, Ronald Goeken, Josiah Grover, and Matthew Sobek. 2015. *Integrated Public Use Microdata Series: Version 6.0 [Machine-Readable Database]*. Minneapolis: University of Minnesota.

Schmitt, John. 2015. *Why Does the Minimum Wage Have No Discernible Effect on Employment?* Industrial Relations. http://www.cepr.net/documents/publications/min-wage-2013-02.pdf.

Statistics, U. S. Bureau of Labor. 2014. *Job Openings and Labor Turnover Survey*. http://www.bls.gov/jlt/data.htm.

Taylor, Lester, and Hendrik Houthakker. 2010. *Consumer Demand in the United States: Prices, Income and Consumption Behavior*. New York: Springer.

Ton, Zeynep. 2012. *Why `Good Jobs' Are Good for Retailers*. Harvard Business Review. https://hbr.org/2012/01/why-good-jobs-are-good-for-retailers.

Whitebook, Marcy, Carollee Howes, and Deborah Phillips. 1989. *Who Cares? Child Care Teachers and the Quality of Care in America. Final Report, National Child Care Staffing Study*. Child Care Employee Project. http://www.irle.berkeley.edu/cscce/wp-content/uploads/2010/07/Who-Cares-full-report.pdf.

———. 2014. *Worthy Work, STILL Unlivable Wages: The Early Childhood Workforce 25 Years after the National Child Care Staffing Study*. Center for the Study of Child Care Employment, Institute for Research on Labor and Employment, UC Berkeley. http://www.irle.berkeley.edu/cscce/wp-content/uploads/2014/11/ReportFINAL.pdf.

Wicks-Lim, Jeannette. 2006. “Mandated Wage Floors and the Wage Structure: New Estimates of the Ripple Effects of Minimum Wage Laws.” Working Paper 116. Political Economy Research Institute, University of Massachusetts Amherst. http://www.peri.umass.edu/fileadmin/pdf/WP116.pdf.

Wolfers, Justin, and Jan Zilinsky. 2015. “Higher Wages for Low-Income Workers Lead to Higher Productivity.” PIEE Briefing 2–15. Peterson Institute for International Economics. http://www.iie.com/publications/briefings/piieb15-2.pdf.

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