APPENDIX:
Data and Methods for Estimating the Impact of Proposed State Minimum Wage Law

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$18.00
MINIMUM WAGE IN CALIFORNIA

Who would be affected by the proposal to raise California's minimum wage?

UC BERKELEY
LABOR CENTER

This data and methods appendix accompanies the report "$18 Minimum Wage in California."

Introduction

In this technical report we document a methodology developed by the UC Berkeley Labor Center and the Center on Wage and Employment Dynamics to estimate the number of workers affected by the proposed state minimum wage law, *Living Wage Act (LWA) of 2022*, or LWA, as well as the expected increase in wages and the demographics of the workers who get raises.

In Section A we describe data sources, sample definition, and wage variable creation and data cleaning. In Section B we describe the process for estimating the number of workers affected and the expected increase in wages.

A. Data Sources and Wage Variable Creation

1. Data sources

We use the IPUMS American Community Survey (ACS), typically pooling 2018 and 2019 years to generate large enough sample sizes. We use the ACS rather than the Current Population Survey (CPS) because the ACS (a) has much larger sample sizes (which is critical for local and demographic analyses); (b) is representative at the city or county level (which the CPS is generally not); and (c) allows us to construct a sample based on place of work (which the CPS does not). The drawback is that the ACS does not have a respondent-reported measure of hourly wages; we address this issue below.

We also use the Quarterly Census of Employment and Wages (QCEW) and the LEHD Origin-Destination Employment Statistics (LODES) used by Census' OnTheMap program, to adjust the aggregated numbers of workers; we explain the details below.

2. Sample selection

The sample consists of U.S. civilians aged 16 to 64, who worked in California, had positive income in the previous 12 months, worked last week, and were not self-employed, unpaid family workers, nor in the military. We identify workers based on place-of-work rather than place-of-residence, an important distinction given that low-wage workers are increasingly unable to afford to live in the cities where they work.

While we focus on the impacts of the proposed state minimum wage law, *Living Wage Act (LWA) of 2022* (LWA), many localities (referred as "city" hereafter) in California have local minimum wage laws that can result in lower or (often) higher minimum wages than the state minimum wage. When there are conflicting requirements between state and local minimum laws, the employer must follow the one that is the most beneficial to the employee.

To see which city's local minimum wage is higher than the proposed state minimum wage in which years, we first calculated the projected local minimum wages for each city based on the information collected in our Minimum Wage Ordinances Inventory and our inflation assumptions (see Section B.1.). If the city's projected local minimum wage is constantly higher than the state minimum wage, the local minimum wage always applies, and the city is dropped from our sample. If the city's projected local minimum wage is lower than the proposed state minimum wage in at least one year between 2023 and 2026, we keep the city in the sample.

Because the ACS geographic identifier is often not granular enough to distinguish between different cities within a county, we then calculate the percentage of the workers who worked in those cities in that county, based on the LODES primary job number, and randomly select that percentage of workers from the county sample as the workers covered by the local minimum wage law. We also calculate the percentage of workers who are not covered by any local minimum wage laws in each county, and randomly select the percentage of workers in the county sample.

To simplify the calculation, we assume that all workers in San Francisco and Santa Clara counties are covered by (higher than LWA) local minimum wage laws and exempted from the LWA, and that all workers in Marin and Contra Costa counties[1] are not covered by local minimum wage laws and subject to the proposed LWA. Based on these assumptions, we dropped all workers in San Francisco and Santa Clara counties while including all workers in Marin and Contra Costa counties.

Within the cities that have local minimum wage laws, several groups of workers are subject to the state minimum wage law rather than the local minimum wage laws.[2] In California, these workers include Public In-Home Supportive Services (IHSS) workers, employees of the state and federal governments, and employees of public school districts. These workers are included in our sample.

3. The hourly wage variable

Following standard practice with the ACS, our hourly wage variable is a computed variable, based on the worker's annual earnings, reported number of weeks worked last year, and usual hours worked per week.[3] The annual earnings measure includes wages, salary, commissions, cash bonuses, and tips from all jobs, before deductions for taxes. "Weeks worked last year" is a categorical variable of intervals of weeks worked (such as 14-26 weeks or 50-52 weeks). We convert this variable to a continuous variable by setting the number of weeks worked to the midpoint of each interval.[4]

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1 Around 20% (Marin) and 10% (Contra Costa) of the workers in the two counties are covered by local minimum wage laws.

2 Two exceptions are the Public IHSS workers in San Francisco and Los Angeles county who are subject to local minimum wage laws.

3 Since the ACS surveys respondents over the course of the year and asks about earnings in the previous 12 months, we apply the ACS-provided adjust variable to account for inflation across this reporting window.

4 We tested the validity of the interval midpoint using the continuous version of "weeks worked last year" in the Current Population Survey (March supplement). For low-income workers in California, average weeks worked in each of the intervals was not substantially different from the interval midpoint (except for the first interval, which is dropped in our sample).

The ACS hourly wage variable is computed as annual earnings divided by the product of weeks worked last year and usual hours worked per week. To address the clustering of observations at whole-number wage levels, we smooth the wage distribution by randomly adding or subtracting up to $0.25 from each observation's computed wage. We trim outliers by dropping wages less than $0.50 or greater than $100 in 1989 dollars (typically less than one percent of the sample).[5] Finally, if the calculated wage for tipped wait staff working in restaurants is greater than the current minimum wage, we recode the wage to the minimum wage in order to eliminate tips from their hourly wage.

4. Checks on the computed hourly wage variable

Researchers have long recognized that there is measurement error in the ACS computed hourly wage variable. For example, for the state of California, the ACS variable yields a higher percentage of workers with hourly wages below the statutory minimum wage compared to the CPS. However, these differences are appreciably smaller when specific regions are examined. Also, this is an imperfect comparison, because the ACS estimate is based on place of work, while the CPS estimate is based on place of residence (one might expect that the latter would omit low-wage commuters in the case of high cost-of-living cities, for example).

We more closely examined the distribution of the ACS computed hourly wage variable for those who work in California, and found that most of the observations below the state minimum wage of $8.00 in 2013 were clustered within a few dollars of the minimum. For these respondents, we also tested for any patterns in the components that were used to calculate the hourly wage variable (weeks worked, hours per week, or yearly earnings) that might indicate incorrect reporting of one or more of the components; however, no patterns emerged. The large majority of these respondents had very low annual earnings, indicating they are clearly low-wage workers. The measurement error appears to stem mainly from reporting of weeks and hours worked.

B. Simulating the Impact of the State Minimum Wage Increase

In this section, we outline our methods for estimating the number of California workers that would be affected by the LWA, using the data and wage variable described in Section A.

The logic of our method is to simulate each area's future wage distribution, with and without the proposed state minimum wage law, given the current state or local minimum wage laws. First, we model the "baseline" scenario, simulating what the wage distribution would look like under the current state or local minimum wage law, whichever applied, in each year and area. We then model the "proposal" scenario, simulating what the wage distribution would look like under the proposed LWA, in each year and area.

5 This step follows the methodology of *The State of Working America*, Economic Policy Institute.

In cases where the current or proposed minimum wage laws have multiple phase-in steps, we repeat the minimum wage simulation for each successive step, cumulating the number of workers affected and the increase in wages over those steps. We also repeat the simulation for the baseline scenario in cases where current laws call for increases in the minimum wage during the study timeline. For both the baseline and proposal simulations, we adjust for projected employment growth and projected wage growth, as explained below.

Finally, we compare the baseline and proposal wage distributions to identify the workers whose wages are higher in the proposal scenario than in the baseline scenario in 2026. We also estimate the impact of the minimum wage increase, above and beyond any currently scheduled minimum wage increases. With this comparison, we are able to estimate (a) the number of workers affected (both directly and indirectly) by the proposed minimum wage increase, and (b) the additional wages earned as a result of the increase.

1. Assumptions of the inflation rate and wage growth rate

Our analyses employ a set of assumptions of the inflation rates and wage growth rate. We list them as follows:

Table1. Inflation and Wage Growth Assumptions

Year	Inflation rate (%)	Wage growth rate (%)	Current state minimum wage law
2017	2.9	2.57	$10.50
2018	3.9	2.99	$11.00
2019	2.95	3.3	$12.00
2020	1.8	2.9	$13.00
2021	4.7	5.7	$14.00
2022	6.9	6.1	$15.00
2023	3.4	3.4	$15.50
2024	3	3	$16.03
2025	3.1	3.1	$16.51
2026	2.8	2.8	$17.02

Inflation rates between 2017 and 2021 are calculated from the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W) published by California Department of Industrial Relation; inflation rates in 2022-2025 are calculated from the CPI-W forecasts made by California Department of Finance; inflation rate in 2026 is the 2022-2031 long-term annual average inflation rate forecast published in the Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters in 2022 Q2.

Wage growth rates between 2017 and 2019 are the annual average wage growth rates based on the Economic Policy Institute's Nominal Wage Tracker; wage growth rates in 2020-2021 are extracted from a study by the Federal Reserve Bank of Dallas that takes into account of the compositional change during the pandemic; wage growth rates in 2022-2026 are assumed to keep up with inflation.

Based on the current state minimum wage law, California minimum wage (for employers with 26 employees or more) in 2022 is $15. On May 12, 2022, the governor announced that California's minimum wage is to increase to $15.50 per hour on Jan. 1, 2023, for all businesses regardless of size, in response to high inflation. Starting in 2024, the state minimum wage will be increased following the inflation rate. Because we can't identify the size of the firm in the ACS, we apply the minimum wage for employers with 26 employees or more to all workers in our sample.

2. Method to calculate the projected local minimum wages

As mentioned in Section A.2., we calculated the projected local minimum wages for each city based on the information collected in our Minimum Wage Ordinances Inventory and the inflation assumptions (see Section B.1.), and used the results to select samples. Our projected local minimum wages are as follows:

Table 2. Projected local minimum wages

Locality	2023	2024	2025	2026
Alameda	$16.54	$17.10	$17.61	$18.16
Fremont	$16.80	$17.37	$17.89	$18.45
Hayward	$16.51	$17.07	$17.58	$18.13
Oakland	$15.98	$16.52	$17.02	$17.55
San Leandro	$15.00	$15.00	$15.00	$15.00
Berkeley	$18.03	$18.64	$19.20	$19.79
Emeryville	$18.76	$19.40	$19.98	$20.60
Los Angeles	$17.02	$17.60	$18.12	$18.69
LAC Unincorporated	$16.93	$17.51	$18.03	$18.59
Malibu	$16.93	$17.51	$18.03	$18.59
Pasadena	$17.09	$17.67	$18.20	$18.77
Santa Monica	$16.93	$17.51	$18.03	$18.59
W. Hollywood	$17.50 (January), $18.86 (July)	$19.50	$20.09	$20.71
Navato	$16.48	$17.04	$17.55	$18.09

CONTINUED Table 2. Projected local minimum wages

Locality	2023	2024	2025	2026
San Francisco	$18.03	$18.64	$19.20	$19.79
Burlingame	$16.55	$17.11	$17.63	$18.17
Daly City	$16.07	$16.62	$17.12	$17.65
Half Moon Bay	$16.51	$17.07	$17.58	$18.13
Menlo Park	$16.22	$16.71	$17.21	$17.74
San Carlos	$16.32	$16.88	$17.38	$17.92
S. San Francisco	$16.76	$17.33	$17.85	$18.41
Milpitas	$17.22	$17.81	$18.34	$18.91
Redwood City	$17.19	$17.77	$18.31	$18.87
San Mateo	$17.19	$17.77	$18.31	$18.87
Belmont	$17.19	$17.77	$18.31	$18.87
Cupertino	$17.22	$17.81	$18.34	$18.91
E. Palo Alto	$16.55	$17.11	$17.63	$18.17
Los Altos	$17.22	$17.81	$18.34	$18.91
Mountain View	$18.14	$18.76	$19.32	$19.92
Palo Alto	$17.45	$18.05	$18.59	$19.16
San Jose	$17.01	$17.59	$18.12	$18.68
Santa Clara	$17.22	$17.81	$18.34	$18.91
Sunnyvale	$18.14	$18.76	$19.32	$19.92
Petaluma	$16.82	$17.39	$17.91	$18.47
Santa Rosa	$16.82	$17.39	$17.91	$18.47
Sonoma	$17.00	$17.58	$18.11	$18.67
Richmond	$16.49	$17.05	$17.56	$18.10
El Cerrito	$17.37	$17.96	$18.50	$19.07
San Diego	$15.92	$16.46	$16.95	$17.48

However, because the ACS geographic identifier is often not granular enough to distinguish between different cities within a county, to estimate our baseline scenario, we need to calculate the average local minimum wage across cities that have local minimum wage laws within each county. We did this by calculating the average local minimum wage in each county, weighted by the LODES primary job number in each city that has a projected local minimum wage higher than LWA in at least one year.

3. Method to estimate wage growth

We first inflate wages in our dataset to the current year using the appropriate regional CPI for Urban Wage Earners and Clerical Workers (CPI-W). In some cases, a minimum wage increase has recently gone into effect but is not reflected in our dataset because it occurred after the ACS survey data was collected. When this occurs, we inflate wages to the month and year of that minimum wage increase, simulate the increase as described in Section B.3, and then inflate wages to the current year. At this point, our dataset is ready to model the proposal and baseline scenarios.

For the proposal scenario, we next inflate wages to the month and year of the proposed minimum wage increase and simulate the increase as described in Section B.3. We adopt the future wage growth rate based on the assumptions laid out in Section B.1.

If the proposed law includes a series of phase-in steps, we inflate wages once again to the month and year of the second proposed minimum wage increase. However, we assume that workers who were directly affected by the first minimum wage increase only receive 50% of the future wage growth rate (since they just received a wage increase). Subminimum wage, indirectly-affected, and not-affected workers receive the full wage growth rate (see B.2 for definitions of these groups). We then repeat this process for any additional years of minimum wage increases in the proposed law.

For the baseline scenario, we inflate wages from the current year to the month and year of the final proposed minimum wage increase. If minimum wage increases are already planned under existing laws, we model the effect of those scheduled increases and apply future wage growth using the same method as we use in the proposal scenario.

4. Method to adjust wages based on changes to the statutory minimum wage

Our method for simulating minimum wage increases identifies workers affected directly and indirectly (via spill-over effects) by the minimum wage increase. We divide workers into four groups depending on their wage just prior to conducting the simulation:

- Subminimum wage: workers earning between 50% and just under 90% of the old minimum wage. We drop from the estimation workers earning less than 50% of the old minimum wage.

- Directly-affected: workers earning 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% of the old minimum wage). This is the main group of affected workers.

- Indirectly-affected: workers already earning the new minimum wage or just above it, up to 115% of the new minimum wage. These are the workers who receive raises due to spill-over effects.[6]

6 There is no clear consensus estimate of the size of the ripple-effect from minimum wage increases. For our estimation, we draw on Wicks-Lim (2006), who finds a modal ripple effect of 115% across state and federal minimum wage increases from 1983-2002.

- Not-affected: workers already earning more than 115% of the new minimum wage. These workers are unaffected by the proposed minimum wage increase.

We adjust individual workers' wages based on which group they belong to, as summarized in Table 1. Workers who are directly affected by the minimum wage increase 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 115% of the new minimum wage. Not-affected workers do not receive a raise.

Table 3. Summary of method to identify workers that will be affected by a minimum wage increase

	Wage before increase	**Estimate of new wage after the increase**
Subminimum wage workers	50-89% of OMW	OW + (OW * ((NWM-OMW)/OMW))
Directly-affected workers	90% of OMW to NMW	NMW
Indirectly-affected workers	NMW to 115% of NMW	OW + (0.25 * ((1.15*NMW) - OW))
Not-affected workers	Greater than 115% of NMW	OW

Note: OMW = Old Minimum Wage, NMW = New Minimum Wage, OW = Old Wage

5. Method to obtain employment totals and adjust for employment growth

To obtain employment totals, we use data from the Quarterly Census of Employment and Wages (QCEW), which gives us an official count of the total number of workers covered by the law. We calculate the industry employment shares in QCEW, and use the shares to adjust the personal weights in ACS so that the employment distribution across industries in ACS is consistent with QCEW.

After we simulate the proposal and baseline scenarios, we estimate the share of workers who get raises. We multiply the estimated share by the QCEW total employment number to get the total number of affected workers. To account for the employment growth to the month and year of implementation of the proposed law, we draw on official state long-term (ten-years) employment projections. We do not make any adjustments for potential positive or negative changes in employment due to the minimum wage increase.