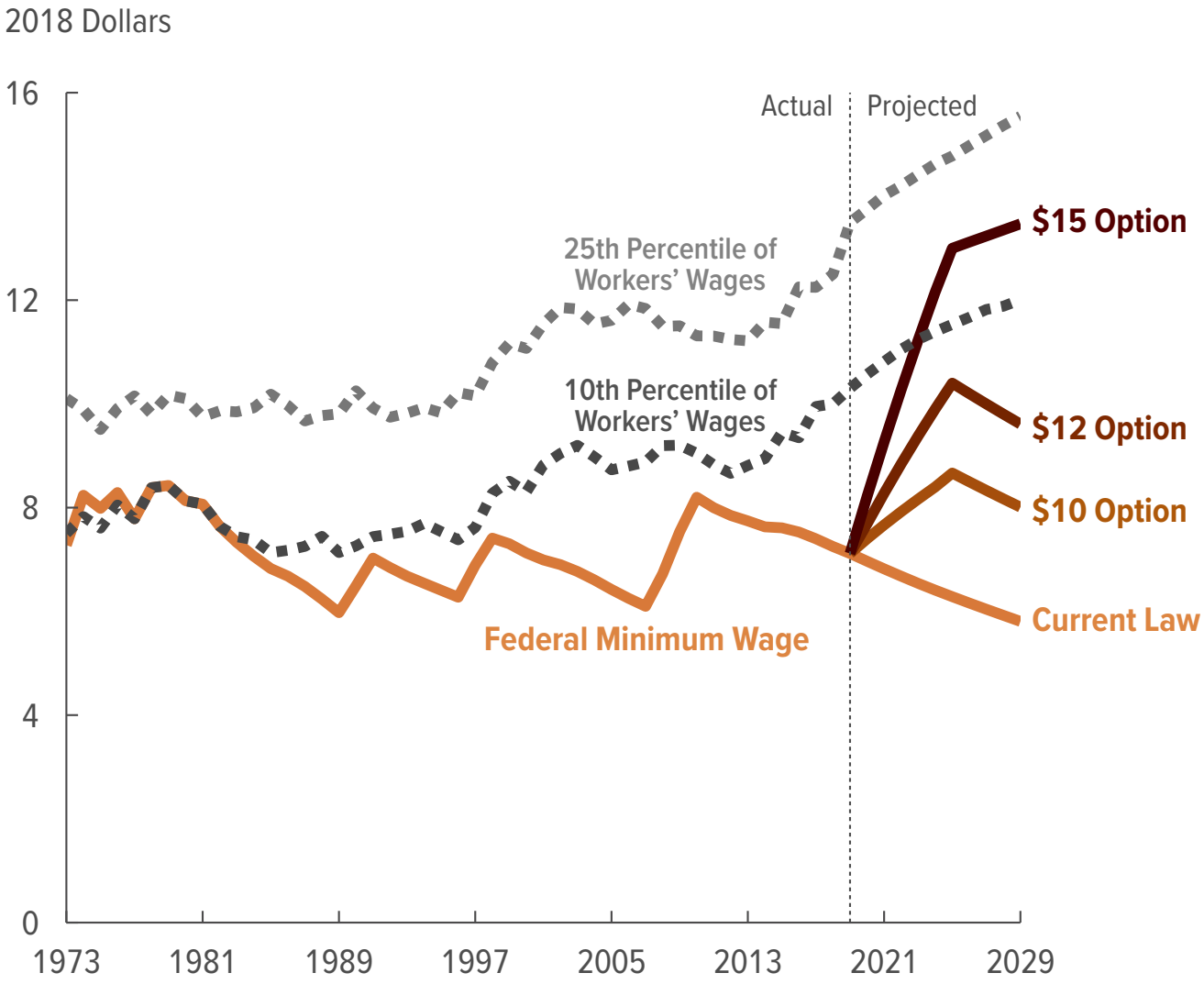
CONGRESS OF THE UNITED STATES
CONGRESSIONAL BUDGET OFFICE

CBO

The Effects on Employment and Family Income of Increasing the Federal Minimum Wage



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At a Glance

The federal minimum wage is $7.25 per hour for most workers. The Congressional Budget Office examined how increasing the federal minimum wage to $10, $12, or $15 per hour by 2025 would affect employment and family income.

- In an average week in 2025, the $15 option would boost the wages of 17 million workers who would otherwise earn less than $15 per hour. Another 10 million workers otherwise earning slightly more than $15 per hour might see their wages rise as well. But 1.3 million other workers would become jobless, according to CBO's median estimate. There is a two-thirds chance that the change in employment would be between about zero and a decrease of 3.7 million workers. The number of people with annual income below the poverty threshold in 2025 would fall by 1.3 million.

- The $12 option would have smaller effects. In an average week in 2025, it would increase wages for 5 million workers who would otherwise earn less than $12 per hour. Another 6 million workers otherwise earning slightly more than $12 per hour might see their wages rise as well. But the option would cause 0.3 million other workers to be jobless. There is a two-thirds chance that the change in employment would be between about zero and a decrease of 0.8 million workers. The number of people with annual income below the poverty threshold in 2025 would fall by 0.4 million.

- The $10 option would have still smaller effects. It would raise wages for 1.5 million workers who would otherwise earn less than $10 per hour. Another 2 million workers who would otherwise earn slightly more than $10 per hour might see their wages rise as well. The option would have little effect on employment in an average week in 2025. There is a two-thirds chance that the change in employment would be between about zero and a decrease of 0.1 million workers. This option would have negligible effects on the number of people in poverty.

The two main sources of uncertainty about the changes in employment are uncertainty about wage growth under current law and uncertainty about the responsiveness of employment to a wage increase.

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Numbers in the text, tables, and figures may not add up to totals because of rounding.

Federal minimum wages are expressed in nominal (current-year) dollars. Unless otherwise indicated, other dollar values are expressed in 2018 dollars, adjusted to remove the effects of inflation using the price index for personal consumption expenditures published by the Bureau of Economic Analysis.

The data underlying the figures in this report are posted along with the report on CBO's website (www.cbo.gov/publication/55410).

The Effects on Employment and Family Income of Increasing the Federal Minimum Wage

Summary

The federal minimum wage of $7.25 per hour has not changed since 2009, though many states and localities have set their minimum wage above that level. Increasing the federal minimum wage would have two principal effects on low-wage workers. For most low-wage workers, earnings and family income would increase, which would lift some families out of poverty. But other low-wage workers would become jobless, and their family income would fall—in some cases, below the poverty threshold.

What Options for Increasing the Federal Minimum Wage Did CBO Examine?

The Congressional Budget Office examined three options for increasing the federal minimum wage.

The first option would raise the federal minimum wage to $15 per hour as of January 1, 2025. That increase would be implemented in six annual increments starting on January 1, 2020. After reaching $15 in 2025, the minimum wage would be indexed, or tied, to median hourly wages. The $15 option would also gradually eliminate exceptions to the minimum wage for tipped workers, teenage workers, and disabled workers.

The second option would raise the federal minimum wage to $12 per hour as of January 1, 2025. The $12 option would be implemented on the same timeline as the $15 option but would not index the minimum wage to wage growth after 2025. It would leave in place current exceptions.

The third option would raise the federal minimum wage to $10 per hour as of January 1, 2025. The $10 option would be implemented on the same timeline as the $15 and $12 options. Like the $12 option, it would not index the minimum wage to wage growth and would leave in place current exceptions.

What Effects Would the Options Have?

Of the three options, the $15 option would have the largest effects on employment and family income (see Figure 1). That is because it would increase wages for the most workers, because it would impose the largest increases in wages, and because, in CBO's estimation, employment is more responsive to relatively large wage increases and increases that will be adjusted for future wage growth. The $12 option would have smaller effects, and the effects of the $10 option would be smaller still.

There is considerable uncertainty about the size of any option's effect on employment. CBO's estimates are based on the median values of likely ranges for wage growth and the responsiveness of employment to changes in wages. In particular, the likely ranges for the responsiveness parameter are not symmetric: That value has an equal chance of being smaller or larger than the median, but if it is larger, it could be substantially larger.

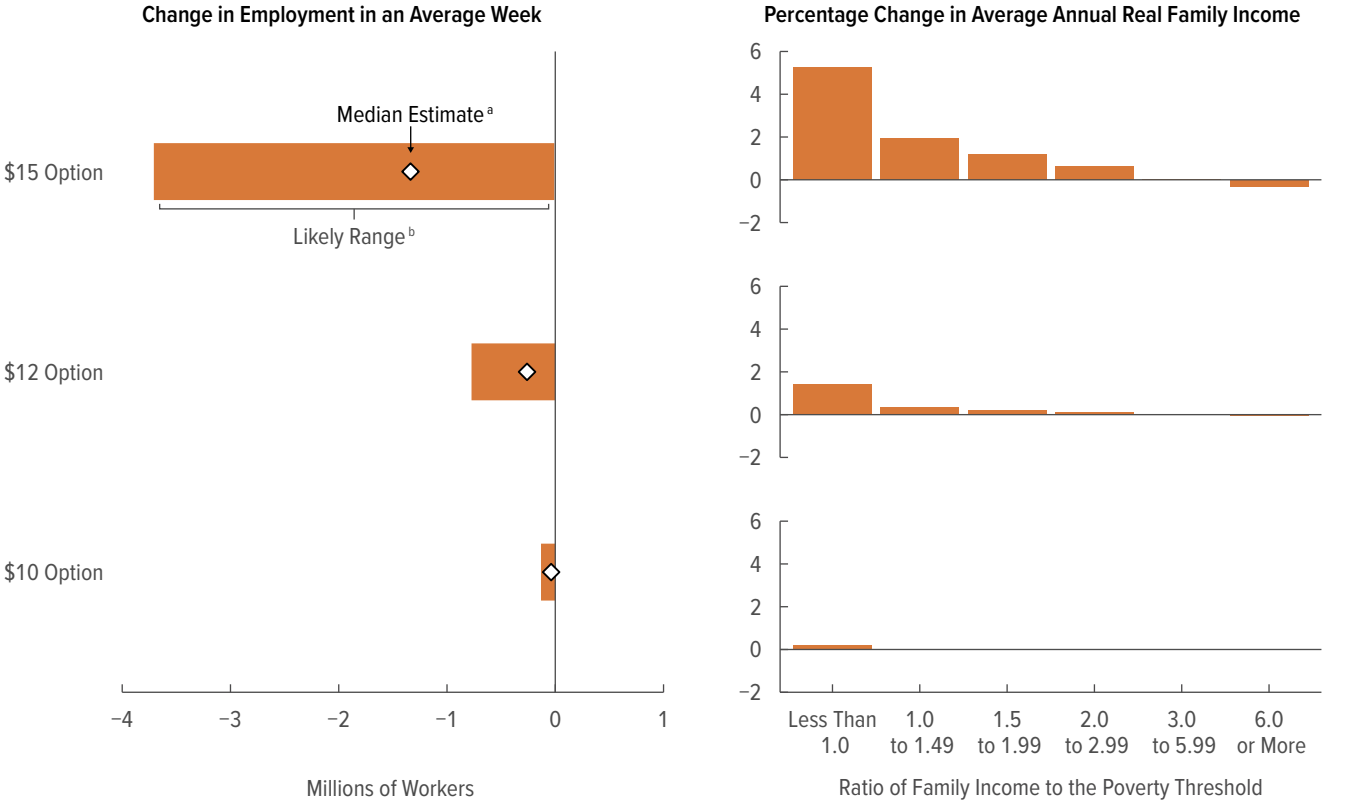
Effects of the $15 Option on Employment and Income.

According to CBO's median estimate, under the $15 option, 1.3 million workers who would otherwise be employed would be jobless in an average week in 2025. (That would equal a 0.8 percent reduction in the number of employed workers.) CBO estimates that there is about a two-thirds chance that the change in employment would lie between about zero and a reduction of 3.7 million workers (see Table 1).

In addition, in an average week in 2025, the $15 option would increase the wages of 17 million workers whose wages would otherwise be below $15 per hour, CBO estimates. The wages of many of the 10 million workers whose wages would be slightly above the new federal minimum would also increase.

Figure 1.

Effects of Increases in the Federal Minimum Wage on Employment and Family Income, 2025



Source: Congressional Budget Office, using monthly and annual data from the Census Bureau's Current Population Survey.

The options would raise the minimum wage to $15, $12, and $10, respectively, in six steps between January 1, 2020, and January 1, 2025. Under the $15 option, the minimum wage would then be indexed to median hourly wages; under the $12 and $10 options, it would not.

Changes in real (inflation-adjusted) income reflect changes in before-tax family cash income. Those changes include increases in earnings for workers who would receive a higher wage, decreases in earnings for workers who would become jobless, losses in income for business owners, and decreases in income because of increases in prices.

The definitions of income and of poverty thresholds are those used by the Census Bureau to determine the official poverty rate. CBO projects that in 2025, the poverty threshold (in 2018 dollars) will be $20,480 for a family of three and $26,330 for a family of four.

a. Median estimates are calculated using median values of likely ranges for wage growth and the responsiveness of employment to changes in wages.

b. In CBO's assessment, there is a two-thirds chance that the effect would be within this range.

The $15 option would affect family income in a variety of ways. In CBO's estimation, it would:

- Boost workers' earnings through higher wages, though some of those higher earnings would be offset by higher rates of joblessness;
- Reduce business income and raise prices as higher labor costs were absorbed by business owners and then passed on to consumers; and
- Reduce the nation's output slightly through the reduction in employment and a corresponding decline in the nation's stock of capital (such as buildings, machines, and technologies).

On the basis of those effects and CBO's estimate of the median effect on employment, the $15 option would reduce total real (inflation-adjusted) family income in 2025 by $9 billion, or 0.1 percent.[1]

1. That dollar amount and others in this report are expressed in 2018 dollars, unless otherwise indicated.

Table 1.

Effects of Increases in the Federal Minimum Wage on Employment, Income, and Poverty, 2025

	Option		
	$15	**$12**	**$10**
Change in Employment in an Average Week (Millions of workers)			
Median estimate[a]	-1.3	-0.3	*
Likely range[b]			
Low end	*	*	*
High end	-3.7	-0.8	-0.1
Number of Workers Who Could See Increases in Their Earnings in an Average Week (Millions)			
Directly affected workers[c]	17.0	5.0	1.5
Potentially affected workers[d]	10.3	6.4	1.9
Change in Real Annual Income			
Families with income below the poverty threshold			
Billions of 2018 dollars	7.7	2.3	0.4
Percentage	5.3	1.6	0.3
Families with income between one and three times the poverty threshold			
Billions of 2018 dollars	14.2	2.3	0.3
Percentage	3.5	0.6	**
Families with income between three and six times the poverty threshold			
Billions of 2018 dollars	-2.1	-0.3	***
Percentage	-0.1	**	**
Families with income more than six times the poverty threshold			
Billions of 2018 dollars	-28.4	-5.1	-0.6
Percentage	-0.3	-0.1	**
All families			
Billions of 2018 dollars	-8.7	-0.8	-0.1
Percentage	-0.1	**	**
Change in the Number of People in Poverty (Millions)[e]	-1.3	-0.4	*

Source: Congressional Budget Office, using monthly and annual data from the Census Bureau's Current Population Survey.

The options would raise the minimum wage to $15, $12, and $10, respectively, in six steps between January 1, 2020, and January 1, 2025. Under the $15 option, the minimum wage would then be indexed to median hourly wages; under the $12 and $10 options, it would not.

Changes in real (inflation-adjusted) income reflect changes in before-tax family cash income. Those changes include increases in earnings for workers who would receive a higher wage, decreases in earnings for workers who would become jobless, losses in income for business owners, and decreases in income because of increases in prices.

The percentage change in total real annual income shown here is consistent with but not necessarily equal to the percentage change in average annual real family income shown elsewhere in this report.

The definitions of income and of poverty thresholds are those used by the Census Bureau to determine the official poverty rate. CBO projects that in 2025, the poverty threshold (in 2018 dollars) will be $20,480 for a family of three and $26,330 for a family of four.

* = between −0.05 million and 0.05 million; ** = between −0.05 percent and 0.05 percent; *** = between −0.05 billion and 0.05 billion.

a. Median estimates are calculated using median values of likely ranges for wage growth and the responsiveness of employment to changes in wages.

b. In CBO's assessment, there is a two-thirds chance that the effect would be within this range.

c. Directly affected workers are those whose hourly wage, in the absence of the change in the minimum wage, would range from just below the old minimum to the new, higher minimum. All of those workers would either be jobless or see increases in their earnings in an average week.

d. Potentially affected workers are those whose hourly wages are above the proposed minimum wage—specifically, between the proposed minimum and that amount plus 50 percent of the increase in their applicable minimum wage. Only some of those workers would have increased earnings under the options.

e. Calculated using before-tax family cash income.

The effects of those income changes would vary across families. Changes in earnings would mainly affect low-income families, but many higher-income families would be affected, too. The loss in business income would be mostly borne by families well above the poverty line. All consumers would pay higher prices, but higher-income families, who spend more, would pay more of those costs. And the cost of effects on the overall economy would generally accrue to families in proportion to their income, which means they would largely be absorbed by families with income well above the poverty threshold.

Taking those effects into account, CBO estimates that families whose income would be below the poverty threshold under current law would receive an additional $8 billion in real family income in 2025 under this option. That would amount to a 5.3 percent increase in income, on average, for such families. That extra income would move, on net, roughly 1.3 million people out of poverty. Real income would fall by about $16 billion for families above the poverty line; that would reduce their total income by about 0.1 percent.

Effects of the $12 Option on Employment and Income. Under the $12 option, according to CBO's median estimate, about 0.3 million workers who would otherwise be employed would be jobless in an average week in 2025. (In percentage terms, the number of employed workers would fall by about 0.2 percent.) There is a two-thirds chance that the change in employment would lie between about zero and a reduction of 0.8 million workers, in CBO's assessment. However, in an average week in 2025, the increase in the federal minimum wage would boost the wages of 5 million workers who would otherwise earn less than $12 per hour, CBO estimates. Wages would also increase for many of the 6 million workers who would otherwise earn just above $12 per hour.

Like the $15 option, this option would boost wages, but it would also increase joblessness, reduce business income, raise prices, and lower total output in the economy. On balance, real family income in 2025 would fall by $1 billion, or less than 0.05 percent. The effects of those changes would again vary across families. CBO estimated that families with income below the poverty threshold under current law would receive $2.3 billion in additional real income under the option. The option would move, on net, about 0.4 million people out of poverty. Families above the poverty line would receive about $3 billion less in real income, a very small share of their total income.

Effects of the $10 Option on Employment and Income. According to CBO's median estimate, the $10 option would have virtually no effect on employment in an average week in 2025. There is a two-thirds chance that the effect on employment would lie between about zero and a decrease of 0.1 million workers. In an average week in 2025, wages for 1.5 million workers who would otherwise be paid less than $10 per hour would increase, CBO estimates. Wages would also increase for many of the 2 million additional workers who would otherwise earn slightly more than $10 per hour in 2025.

Real annual family income would again be affected by changes in earnings, business income, and prices. On balance, the $10 option would reduce real family income in 2025 by $0.1 billion, a very small percentage. CBO estimates that real income would increase, on net, by $0.4 billion for families whose income would otherwise be below the poverty threshold. Families with higher incomes would see very small changes to their real income. The option would also have a small effect on the number of people in poverty.

Other Effects. Numerous studies have examined the link between minimum wages and a range of outcomes other than employment and family income. Those include labor force outcomes such as labor force participation (whether a person is working or actively seeking a job); health outcomes such as depression, suicide, and obesity; education outcomes such as school completion and job training; and social outcomes such as crime. CBO did not examine those other possible outcomes in this analysis.

CBO also did not estimate how any of the three options would affect the federal budget. However, the agency previously estimated how proposed changes to the minimum wage under the Raise the Wage Act (H.R. 582) would affect the federal budget by boosting the pay of certain federal employees.[2] The policy analyzed in that estimate is very similar to the $15 option in this report.

2. Congressional Budget Office, cost estimate for H.R. 582, Raise the Wage Act (April 22, 2019), www.cbo.gov/publication/55152.

Why Are the Outcomes Uncertain?

There are two main reasons why CBO's median estimates of the effects of increases in the minimum wage on employment are uncertain. First, future wage growth under current law is uncertain. If wages grow faster than CBO projects, then wages in 2025 will be higher under current law than CBO anticipates. In that case, increases in the federal minimum wage would have smaller effects on employment than CBO expects. If wages grow more slowly than CBO projects, the options would have larger effects on employment than CBO expects.

Second, there is considerable uncertainty about the responsiveness of employment to an increase in the minimum wage. If employment is more responsive than CBO expects, then increases in the minimum wage would lead to larger declines in employment. By contrast, if employment is less responsive than CBO expects, then such increases would lead to smaller declines in employment. Findings in the research literature about how changes in the federal minimum wage affect employment vary widely. Many studies have found little or no effect of minimum wages on employment, but many others have found substantial reductions in employment.

The Current Federal Minimum Wage

The Fair Labor Standards Act of 1938 (FLSA) established the federal minimum wage. Under current law, the FLSA covers most low-wage workers, but it does not cover workers who are self-employed, work for certain small employers, or are paid by the number of projects they complete rather than the amount of time they work.[3] For other categories of workers, the FLSA makes some exceptions to the federal minimum wage. Tipped workers, such as waiters and bartenders, are subject to two separate minimum wages. Their total hourly earnings (including tips) must equal or exceed $7.25—the regular minimum wage—and, separately, their "cash" earnings (excluding tips) must exceed $2.13 per hour. CBO estimates that 3 million workers are subject to those provisions. The FLSA also allows employers to pay teenage workers $4.25 per hour during their first 90 days of employment.[4] Employers certified by the Department of Labor are allowed to pay disabled workers wages below $7.25 per hour—though those lower wages must be justified by analyses of prevailing wages and worker productivity. There are about 125,000 such workers.

Over the years, the federal minimum wage has risen in nominal terms (that is, not adjusted for inflation). The most recent changes raised the minimum wage in three steps, from $5.15 per hour in July 2007 to $7.25 in July 2009, where it stands today.[5] The real value of the minimum wage has both risen and fallen over the years, however, as the nominal increases have been eroded by inflation (see Figure 2).[6] That erosion was pronounced between 1981 and 1989, between 1998 and 2006, and between 2010 and 2019—periods during which the nominal minimum wage was unchanged.

As of 2019, 29 states and the District of Columbia have a minimum wage higher than the federal minimum. (Many of those states have boosted their minimum wage in recent years.) The minimum wage is indexed to inflation in 17 of those states, and future increases have been mandated in 6 more. Some localities also have minimum wages higher than the applicable state or federal minimum wage; in San Francisco, for instance, the minimum wage increased to $15.59 per hour as of July 1, 2019, and is adjusted for inflation annually. About 60 percent of all workers currently live in states where the applicable minimum wage is more than $7.25 per hour. And in 2025, about 30 percent of workers will live in states with a minimum wage of $15 or higher, CBO estimates (see Figure 3).

Three Options for Increasing the Federal Minimum Wage

Lawmakers have proposed various options for increasing the federal minimum wage, including the Raise the Wage Act (H.R. 582), which would increase it to $15 per hour

3. For details about who is covered by the FLSA, see Department of Labor, "Fact Sheet #14: Coverage Under the Fair Labor Standards Act (FLSA)" (July 2009), www.dol.gov/whd/regs/compliance/whdfs14.htm.

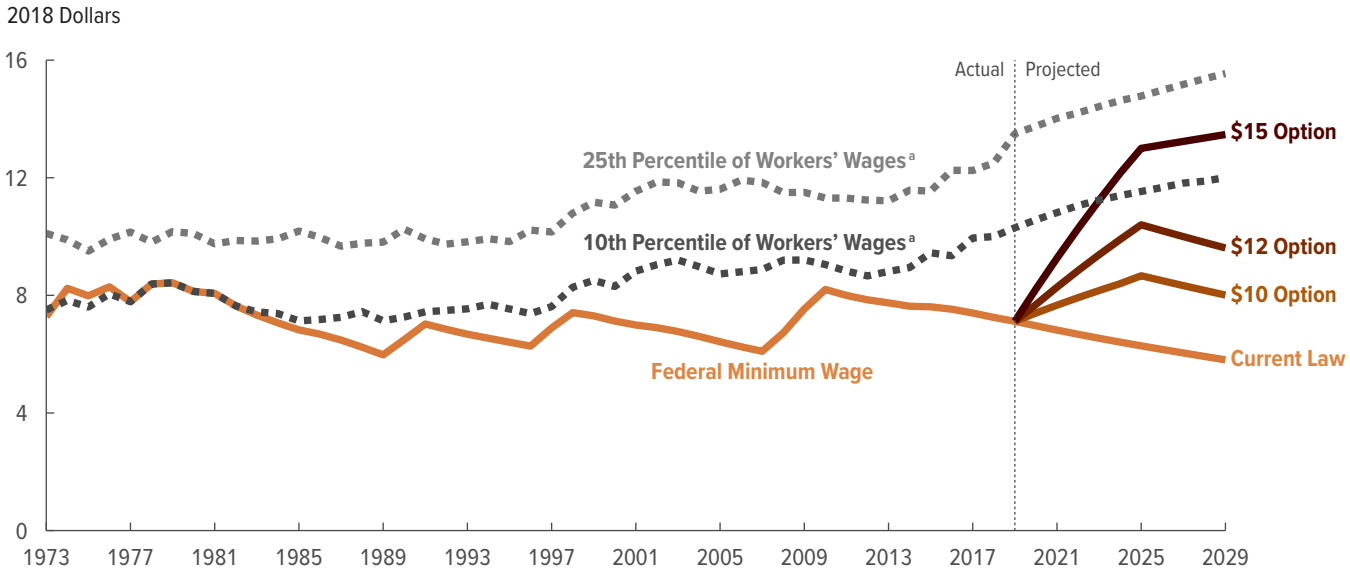
4. For details about the FLSA's minimum-wage requirements, see Fair Labor Standards Act of 1938, 29 U.S.C. §201 et seq. (2012). See also Department of Labor, "Wages and Hours Worked: Minimum Wage and Overtime Pay (accessed May 22, 2019), https://webapps.dol.gov/elaws/elg/minwage.htm.

5. There is a separate minimum wage of $10.60 per hour that applies to federal contractors as of January 1, 2019. See Department of Labor, "Executive Order 13658, Establishing a Minimum Wage for Contractors: Annual Update" (accessed June 28, 2019), www.dol.gov/whd/flsa/eo13658/.

6. Adjusted for inflation, the federal minimum wage reached its historical peak in 1968. In that year, its value was $1.60 in 1968 dollars, which is equal to $9.42 in 2018 dollars if the conversion is done using the price index for personal consumption expenditures published by the Bureau of Economic Analysis.

Figure 2.

Workers' Hourly Wages and the Federal Minimum Wage, 1973 to 2029



Source: Congressional Budget Office, using monthly data from the Census Bureau's Current Population Survey and data from the Department of Labor.

The options would raise the minimum wage to $15, $12, and $10, respectively, in six steps between January 1, 2020, and January 1, 2025. Under the $15 option, the minimum wage would then be indexed to median hourly wages; under the $12 and $10 options, it would not.

CBO converted wages to 2018 dollars using the price index for personal consumption expenditures published by the Bureau of Economic Analysis. For example, nominal values in 2025 of $15, $12, and $10 were adjusted downward to account for projected inflation between 2018 and 2025. After 2025, the minimum wage under the $15 option would increase slightly because it would be indexed to median hourly earnings, which would grow faster than the price index for personal consumption expenditures, CBO projects. Actual and projected values are as of January 1 of each year.

a. The hourly wage of workers who did not report an hourly wage was estimated as their weekly earnings divided by their usual hours worked per week. Values beyond 2018 are projected under current law.

and subsequently index it to growth in median wages.[7] CBO assessed the impact of a similar option and of other options that would boost the minimum wage to $12 and $10 per hour, respectively. (See Appendix A for more information.) The $15 option would gradually eliminate the lower minimum wages for workers whose earnings depend heavily on tips, for teenage workers, and for disabled workers. The other options would not.

The $15 Option

The first option would increase the federal minimum wage from $7.25 per hour to $15 per hour by 2025. The change would be in six steps: five annual increases of $1.30 beginning on January 1, 2020, and a final increase of $1.25 on January 1, 2025. The minimum wage would rise with the median hourly wage in each ensuing year. The increase in the federal minimum wage between 2020 and 2025 under this option would be about 105 percent, a percentage increase considerably higher than any increase mandated by prior legislation.[8]

Under this option, the minimum cash wage for tipped workers would immediately increase from $2.13 per hour to $3.60 per hour and would then increase by $1.50 each year until it reached the regular minimum wage. That would happen in 2029, CBO projects.

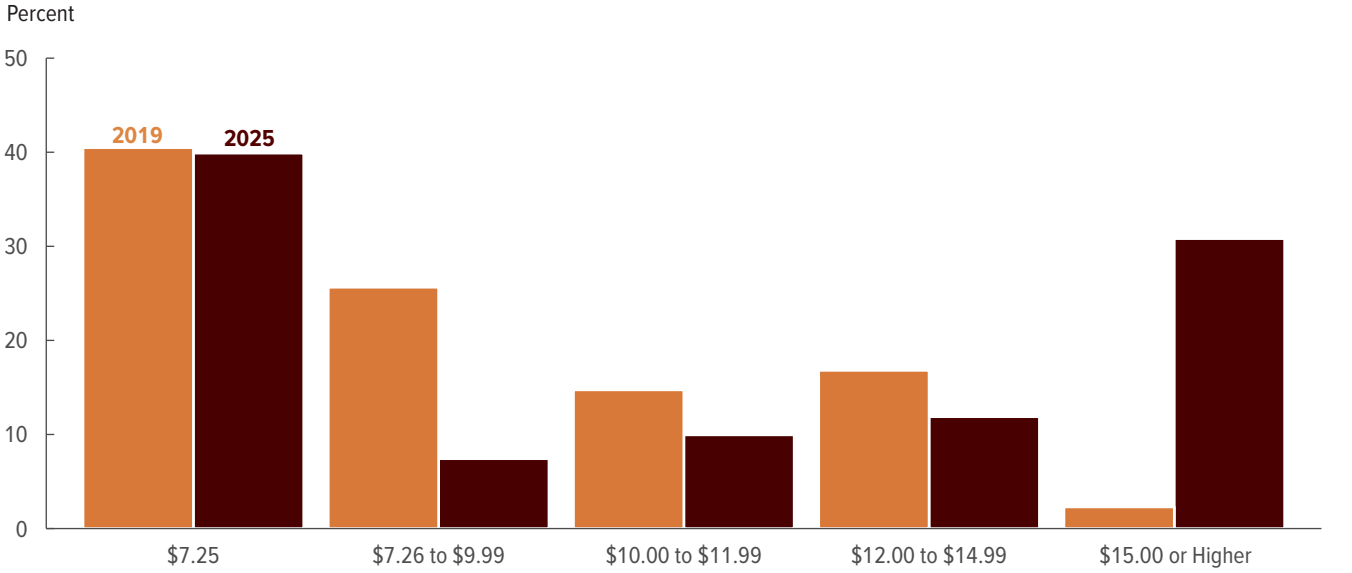
The Raise the Wage Act would phase out the lower minimum wage that applies to teenagers during the first 90 days they work for an employer. In particular, that lower minimum would increase from $4.25 to $5.50 in 2020 and would continue to increase by $1.25 in each

7. H.R. 582, the Raise the Wage Act, was ordered reported by the House Committee on Education and Labor on March 6, 2019.

8. The FLSA applies to Puerto Rico and certain other U.S. territories, but because of limitations in available data, CBO's analysis is restricted to the effects of minimum-wage increases on employment and family income in the 50 states and the District of Columbia.

Figure 3.

Shares of Workers, by States' Applicable Minimum Wage



Source: Congressional Budget Office, using monthly data from the Census Bureau's Current Population Survey and data from the websites of states' departments of labor.

For 2019, the share of workers in each category is estimated on the basis of current state law. For 2025, those are also based on scheduled changes in state minimums and how states have changed their minimum wages in the past.

subsequent year until 2028, when the lower minimum for teenagers would be eliminated. Teenagers may be paid less than the regular minimum wage for a number of other reasons, including working for an exempt employer or in an exempt occupation. In CBO's assessment, relatively few teenagers are paid less than the regular minimum wage during their first 90 days with an employer.

The Raise the Wage Act would also phase out the lower minimum wages that apply to people with disabilities. The lower minimum for disabled workers would rise to $4.25 in 2021, to $6.40 in 2022, to $8.55 in 2023, to $10.70 in 2024, to $12.85 in 2025, and to the regular minimum wage in 2026. In its analysis of the $15 option's effects, CBO applied the regular minimum wage to disabled workers in 2025.

The $15 option's effect on wages would be unprecedented in recent history, CBO estimates. The option would place the federal minimum wage at the 20th percentile of projected hourly wages in 2025, higher in the wage distribution than it has been at any time since 1973.[9] And mandated increases in wages under the option—amounting to 21 percent, on average—would be greater than those under any recent change to the federal minimum wage (see Figure 4).[10] Furthermore, past increases have been eroded by inflation in subsequent years. Under the $15 option, by contrast, the minimum wage would increase in real terms after 2025 because CBO expects median wages to grow faster than prices.

The $12 Option

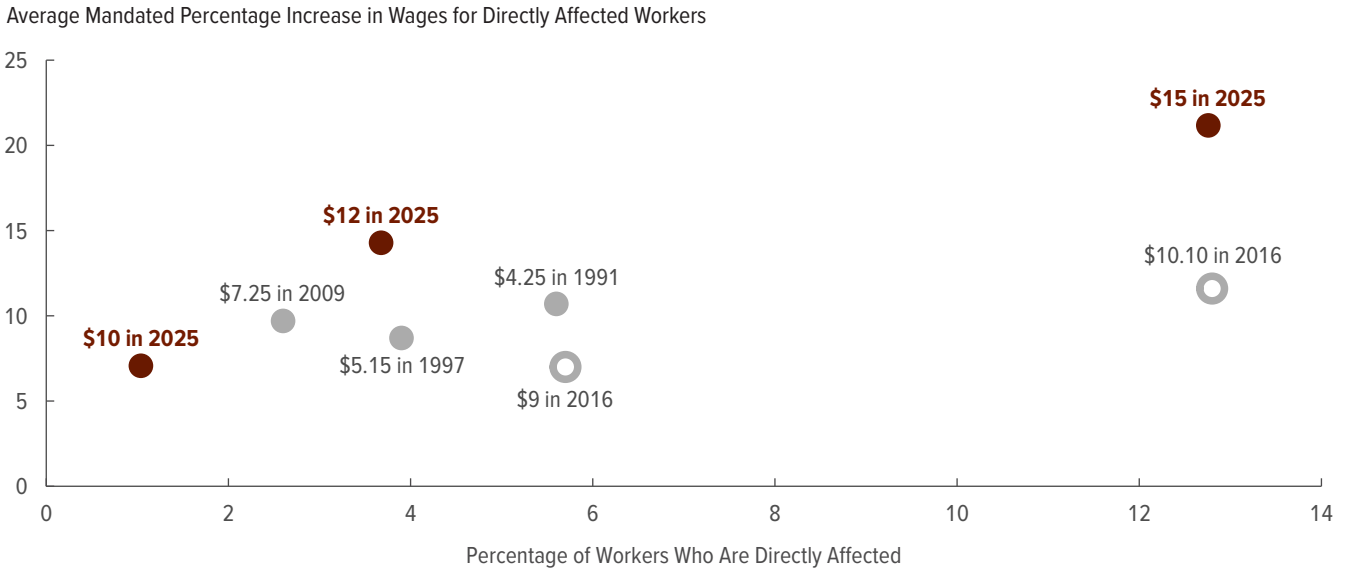
The second option CBO examined would effect a smaller change, increasing the federal minimum wage to $12 per hour in six annual increments from January 1, 2020, to January 1, 2025. The lower minimum wages for tipped, teenage, and disabled workers would remain unchanged under this option. Like previous increases in the federal minimum wage, this option would not be indexed to

9. The federal minimum wage increased on May 1, 1974, and on January 1 of each of the subsequent seven years before remaining unchanged (in nominal terms) between January 1, 1981, and April 1, 1990.

10. The wage increases mandated by the $15 option would also be larger than those mandated by the state and local laws that have been studied to date.

Figure 4.

Magnitude of Historical and Proposed Increases in the Federal Minimum Wage



Source: Congressional Budget Office, using monthly data from the Census Bureau's Current Population Survey.

Directly affected workers are those whose hourly wage, in the absence of the change in the minimum wage, would range from just below the old minimum to the new, higher minimum.

The two points labeled 2016 are options CBO analyzed in *The Effects of a Minimum-Wage Increase on Employment and Family Income* (February 2014), www.cbo.gov/publication/44995. Those options were not enacted.

subsequent wage growth. The $12 option is more similar than the $15 option to past minimum-wage increases in terms of the fraction of the employed workers it would affect and the size of the wage increases it would mandate. The option would affect 4 percent of workers in 2025, and mandated increases in wages under this option would amount to 14 percent, on average.

The $10 Option

The last option CBO examined would make an even smaller change to the federal minimum wage, increasing it to $10 per hour in six annual increments from January 1, 2020, to January 1, 2025. Like the $12 option, this option would not change the lower minimum wages for tipped, teenage, and disabled workers or index the minimum wage to subsequent increases in wages. The option would affect 1 percent of workers in 2025, and the average mandated increase in wages for those workers would be 7 percent. Together, those effects would be smaller than the effects of the three most recent increases in the federal minimum wage.

How Increases in the Minimum Wage Affect Employment and Family Income

Raising the minimum wage has a variety of effects on both employment and family income. By increasing the cost of employing low-wage workers, a higher minimum wage generally leads employers to reduce the size of their workforce. However, for certain workers or in certain circumstances, employment can increase. The effects would differ across workers, employers, and states. The effects on employment would also cause changes in prices and in the use of different types of labor and capital.

By boosting the income of low-wage workers who keep their jobs, a higher minimum wage raises their families' real income, lifting some of those families out of poverty. However, real income falls for some families because other workers lose their jobs, business owners lose income, and prices increase for consumers. For those reasons, the net effect of a minimum-wage increase is to reduce average real family income.

Employment

In general, increasing the minimum wage tends to reduce employment in two ways.[11] First, higher wages increase the cost to employers of producing goods and services. The employers pass some of those increased costs on to consumers in the form of higher prices, and those higher prices, in turn, lead consumers to purchase fewer goods and services. The employers consequently produce fewer goods and services, so they reduce their employment of both low-wage workers and higher-wage workers.

Second, when the cost of employing low-wage workers goes up, the relative cost of employing higher-wage workers or investing in machines and technology goes down. Some employers therefore respond to a higher minimum wage by reducing their low-wage staff and shifting toward those substitutes. That reduces employment among low-wage workers but might increase it among higher-wage workers.

In some limited circumstances, increasing the minimum wage can boost employment. Those circumstances arise when employers have what is known as monopsony power—that is, bargaining power that allows them to set wages below the rates that would prevail in a more competitive market. (For example, employers have monopsony power when workers require substantial time and resources to search for and switch to a new job.) Firms that have monopsony power can thus pay their current workers less than the wage needed to attract new hires.

All employers—including those without monopsony power—have incentives to hire until an additional worker would generate less in revenue than he or she would cost to employ. That extra cost of a new worker's employment is called the marginal cost. For a firm without monopsony power, the marginal cost is the new hire's wage, so increasing the minimum wage can only raise the firm's marginal cost and thereby reduce hiring. For a firm with monopsony power, however, the marginal cost can be greater if current workers must be paid at least as much as new hires to make the pay of current workers and new hires equitable. In that case, the marginal cost would be the new hire's wage *plus* the cost of raises the firm gave to current employees doing similar work.

An increase in the minimum wage affects those two components in offsetting ways. It increases the cost of employing new hires for firms with monopsony power, just as it does for other firms. But it also makes firms with monopsony power raise wages for all current employees whose wages are below the new minimum, regardless of whether new workers are hired. If the employer then seeks to hire new staff, it will have already incurred the cost of increasing the wages of current employees, so the marginal cost of hiring new workers will be lower. Thus, a higher minimum wage can lead firms with monopsony power to hire new workers. However, if the minimum wage is high enough to diminish monopsony power, further increases in the minimum would tend to reduce employment.

Effects Across Workers. Workers who would be affected by an increase in the minimum wage—through either lost employment or higher earnings—tend to come from groups in which low wages (defined here as less than $19 per hour) are common. Teenagers and adults without a high school diploma are relatively likely to earn low wages, but because they make up small shares of the working population, those groups together account for only about 20 percent of low-wage workers. Women are more likely to have low-wage jobs than men. Part-time workers are also disproportionately represented in low-wage jobs, but most low-wage workers are employed full-time (see Table 2).

In some cases, a higher minimum wage can increase wages for workers who would otherwise earn slightly more than the new minimum. That can occur if employers wish to maintain differentials in pay or if collective bargaining agreements tie wages to the federal minimum wage. That increase in wages can affect the employment of such workers, some of whom may become jobless. That effect typically becomes stronger over time.

However, the increase in the wages of workers paid less than the minimum can cause the employment of those who earn slightly more than the new minimum to increase. The wages of workers earning slightly more

11. The reduction in employment could come from a reduction in the number of people employed or a reduction in the number of hours worked by people who remained employed. The research literature that CBO reviewed focused on changes in the number of people employed. Relatively few studies have addressed how minimum-wage increases affect the number of hours worked, conditional on being employed, and among those that have, there is no consensus as to the size or sign of such effects. On the one hand, employers might reduce the hours of workers. On the other hand, part-time workers might be most likely to become jobless. On net, CBO projects, there would be no change in the average hours worked among workers who retained their jobs.

Table 2.

Projected Shares of Low-Wage Workers, by Group, 2025

Group	Percentage Who Are Low-Wage Workers	Percentage of All Low-Wage Workers
Age		
16 to 19	94	10
20 or older	30	90
All	32	100
Sex		
Female	37	56
Male	27	44
All	32	100
Educational Attainment		
Less than high school	69	16
High school diploma or some college	44	71
Bachelor's degree or more	11	13
All	32	100
Hours Worked per Week		
Fewer than 35	62	44
35 or more	23	56
All	32	100
Family Income		
Below the poverty threshold	90	12
Between one and three times the poverty threshold	59	46
Three or more times the poverty threshold	19	42
All	31	100

Source: Congressional Budget Office, using monthly and annual data from the Census Bureau's Current Population Survey.

Low-wage workers are people who are projected, under current law, to be paid less than $19 per hour in 2025.

Values for family income are based on annual data, whereas other values are based on monthly data. Although CBO estimates that the numbers of workers earning less than the new federal minimum wages considered in this report are the same in both sets of data, the share of workers paid less than $19 per hour in 2025 differs slightly. That share is 31 percent in the annual data and 32 percent in the monthly data.

Family income groups are determined on the basis of before-tax family cash income. The definitions of income and of poverty thresholds are those used by the Census Bureau to determine the official poverty rate. CBO projects that in 2025, the poverty threshold (in 2018 dollars) will be $20,480 for a family of three and $26,330 for a family of four.

than the new minimum will increase by a smaller amount, so the relative cost of hiring those workers will be lower. As a result, they may be hired in place of those who would have otherwise been paid less than the minimum. That effect also typically becomes stronger over time.

Effects Across Employers. Employers vary in how they respond to a minimum-wage increase. Employment tends to fall more, for example, at firms whose sales decline when they raise prices and at firms that can readily substitute machines or technology for low-wage workers. Employment tends to fall less, by contrast, at firms where higher wages reduce employee turnover (and therefore the cost of training new employees) and where employees work harder to keep their newly better-paying jobs. At other firms, employment can rise. For instance, firms with few low-wage workers might see demand rise for their goods and services as their competitors' costs rise, and such firms might hire more workers—including low-wage workers—as a result.

Employers might also respond in other ways to an increase in the minimum wage. They might reduce workers' fringe benefits (such as health insurance or pensions) and job perks (such as employee discounts), which would lessen the effect of the higher minimum wage on total compensation. That, in turn, would weaken employers' incentives to reduce their employment of low-wage workers. Such benefit reductions would probably be modest, however, in part because low-wage workers receive few noncash benefits and because some employers face tax penalties if they offer noncash benefits only to higher-wage workers. Employers could also partly offset their higher costs by cutting back on training or by assigning work to independent contractors who are not covered by the FLSA. The evidence is mixed on the extent to which employers respond to minimum-wage increases in such ways. (For examples of such evidence, see Appendix B.)

Effects Across States. The effects of a higher minimum wage would vary across states. States that have, or will have, a minimum wage of $15 or more per hour would see little effect from a $15 federal minimum wage in 2025, for example, because workers' wages in those states would be unaffected by the new federal minimum. States that have minimum wages higher than $7.25 (but less than $15) in 2025 would generally see some effect if the federal minimum wage became higher in that year, as

workers affected by the new minimum would see their hourly wage increase and be at some risk of joblessness. Finally, states with no state minimum wage in 2025 would see the biggest effects from a higher federal minimum wage. Low-wage workers in those states would see significant increases in their hourly wages and, for that reason, be at greater risk for joblessness.

Macroeconomic Effects. Reductions in employment would initially be concentrated at firms where higher prices quickly reduce sales. Over a longer period, however, more firms would replace low-wage workers with higher-wage workers, machines, and other substitutes. Thus, CBO expects that the percentage reduction in employment of low-wage workers would generally rise over time for any given increase in the minimum wage.

In the short term, an increase in the minimum wage can boost the employment of low-wage workers through changes in the economywide demand for goods and services. A higher minimum wage shifts income from higher-wage consumers and business owners to low-wage workers. Because low-wage workers tend to spend a larger fraction of their earnings, some firms see increased demand for their goods and services, which boosts the employment of low-wage workers and higher-wage workers alike. Those developments could have economic effects. For example, that increased demand could create inflationary pressure that the Federal Reserve would adjust interest rates to restrain. In any case, CBO expects that by 2025, the economic effects from increases in demand would completely dissipate.[12]

A decrease in the number of low-wage workers reduces the productivity of machines, buildings, and other capital goods. Although some businesses use more capital goods if labor is more expensive, that reduced productivity discourages other businesses from constructing new buildings and buying new machines. That reduction in capital reduces low-wage workers' productivity, which leads to further reductions in their employment.

12. CBO expects that the economic effects of increases in demand would completely dissipate by 2025 for two reasons. First, CBO projects that the economy will be close to its maximum sustainable output in 2025, which would limit how much employment could be affected by changes in overall demand. Second, because the options examined here would take until 2025 to go into effect, the short-term effects of any boost to overall demand would have more time to dissipate.

Family Income

A higher minimum wage can affect family income in a variety of ways. Most directly, a higher minimum wage boosts income for the families of most low-wage workers, though a small share of low-wage workers may see their family income fall if they are jobless for an extended period. Minimum-wage increases affect family income through other channels as well, including effects on prices and business income.

Effects on Families of Low-Wage Workers. A higher minimum wage boosts the income of most families with low-wage workers (including those whose wages would otherwise be slightly above the new minimum) by increasing their earnings. A much smaller number of low-wage workers become jobless for some time because of the higher minimum wage, which causes their families to lose income. For families of low-wage workers, the effect of a higher minimum wage depends on how many such workers are in a family, whether those workers become jobless (and, if so, for how long), and whether there are other changes in family income. For instance, the decline in income from losing a job can be partly offset by increases in nonlabor income, such as unemployment compensation, or by increases in the work of other family members.

Income for any particular family is affected by whether and for how long family members become jobless. Some people who became jobless because of a minimum-wage increase would be out of work for many weeks, whereas others would be jobless for much shorter periods. To determine the length of time workers are jobless, CBO examined the duration of unemployment of workers in 2018. In particular, CBO used that distribution as the basis for estimating the length of time that a person who became jobless because of an increase in the minimum wage would be out of work.

Low-wage workers might face long-lasting reductions in family income if a minimum-wage increase keeps them from developing skills. For example, low-wage workers who are jobless because of a minimum-wage increase cannot acquire skills through formal on-the-job training or informal learning by doing. Reductions in training might occur even among employed workers if firms cut their spending on training to offset their higher payroll expenses. And a higher minimum wage might draw some workers who would otherwise attend school into the

labor force. Those potential effects on family income are not accounted for in this analysis.

Effects on Businesses and Consumers. A higher minimum wage reduces the family income of business owners to the extent that firms' profits are reduced. Those losses in business income are biggest in the first years after a higher minimum wage is introduced. Real income is also reduced for nearly all people because increases in the prices of goods and services weaken families' purchasing power. Over time, as businesses increasingly pass their higher costs on to consumers, the losses in business income diminish and the losses in families' real income grow.

Macroeconomic Effects. In the short term, raising the minimum wage would increase the economywide demand for goods and services, CBO expects. That is because the families with increased income—who tend to have lower income, on average—tend to boost their spending more than families with decreased income tend to reduce their spending. The increased demand for goods and services, in turn, would raise the nation's output and income.

In the long term, however, the key determinants of the nation's output and income are the size and quality of the workforce, the stock of productive capital (such as factories and computers), and the efficiency with which workers and capital produce goods and services (known as total factor productivity). Raising the minimum wage would probably reduce employment, capital, and efficiency, in CBO's assessment. Over time, those reductions would lower the nation's output and income.

In CBO's analysis, the effects that increase the nation's output, and therefore total family income, are larger in the short term than the effects that reduce output. As a result, the agency expects that the macroeconomic effects of a minimum-wage increase (separate from other effects of increasing the minimum wage) would boost family income slightly for a few years. By 2025, however, the long-term effects that reduce output would be larger. On balance, those two offsetting effects would cause a slight decrease in family income by 2025.

Effects of the Three Options on Employment and Family Income

CBO estimated how the three options for raising the minimum wage would affect employment and family income in 2025. In each case, increasing the minimum wage would have two main effects on low-wage workers. The large majority would have higher wages and family income, but a smaller group would be jobless for a long enough period that they would have lower family income. The options would affect other groups of people as well. The increased cost of retained workers would be borne by business owners and by consumers. The options would also affect savings and capital accumulation, which would further affect the income of business owners.

Increasing the federal minimum wage could also affect the federal budget (see Box 1). However, CBO has not assessed those effects in this report.

Effects of the Options on Employment

CBO's estimates of the effects on employment varied across the three options. In general, the size of the effects depends on the number of workers affected by the option and on the size of changes in wages induced by the higher minimum. Moreover, the options would alter employment more for some groups than others (see Table 3).

The $15 Option. Under the first option, according to CBO's median estimate, about 1.3 million workers who would otherwise be employed would be jobless in an average week in 2025. That decrease would account for 0.8 percent of all workers and 7 percent of directly affected workers who would otherwise earn less than $15 per hour. Wages would rise, however, for 17 million directly affected workers who remained employed and for many of the 10 million potentially affected workers whose wages would otherwise fall slightly above $15 per hour—specifically, between the new federal minimum and that amount plus 50 percent of the increase in their applicable minimum wage. The higher wages for those potentially affected workers might lead to reductions in their employment, but some firms might hire more of those workers as substitutes for lower-paid workers whose wages had increased by larger amounts. Those two factors would roughly offset for those higher-wage workers, CBO anticipates.

The $15 option would alter employment more for some groups than for others. Almost 50 percent of the newly jobless workers in a given week—600,000 of 1.3 million—would be teenagers (some of whom would live in families with income well above the poverty threshold). Employment would also fall disproportionately among part-time workers and adults without a high school diploma.

Box 1.

How an Increase in the Minimum Wage Would Affect the Federal Budget

An increase in the federal minimum wage would directly affect the federal budget by requiring the government to increase wages for a small number of hourly federal employees. A minimum-wage increase would also indirectly affect the budget by boosting the prices of some goods and services purchased by the government. Most of those added costs for wages, goods, and services would need to be covered by discretionary appropriations. If discretionary appropriations were not increased, federal budget deficits would not be affected by the higher costs, but the benefits and government services that could be provided under those appropriations would be reduced. If, instead, lawmakers increased discretionary appropriations to cover the higher costs, then deficits would be larger.

In addition, an increase in the federal minimum wage would indirectly affect the federal budget by changing people's income and the prices consumers face. As a group, the workers whose earnings increased would pay more in taxes and receive less in benefits than they would have otherwise, reducing the federal budget deficit. However, the workers and business owners with reduced income would pay less in taxes and receive more in benefits, increasing the deficit. More broadly, the increase in prices and the resulting increases in nominal income associated with a higher minimum wage would also boost spending for some federal programs (because many parameters of such programs are indexed to increases in prices) and federal revenues (because revenues are closely tied to nominal income). The inflationary pressure created as a higher minimum wage was phased in could lead to higher interest rates, which could increase federal interest payments and have other budgetary effects.

Although the Congressional Budget Office has not estimated how the options in this report would affect the federal budget, the agency recently estimated the budgetary cost of the Raise the Wage Act (H.R. 582), which is very similar to the $15 option.[1] CBO's estimate included only the direct effects of raising the pay of a small group of federal employees who are paid an hourly wage. According to that estimate, over the next 10 years, the bill would increase spending subject to annual appropriation acts by $76 million and would increase mandatory spending of the Postal Service by $1 million.

H.R. 582 would also boost the prices of some goods and services that the government purchases. Moreover, tax receipts and federal spending for health and income security programs would be indirectly affected as income increased for some people and fell for others. CBO has not estimated whether the net result of those indirect effects over the coming decade would be to increase or decrease budget deficits.

1. Congressional Budget Office, cost estimate for H.R. 582, Raise the Wage Act (April 22, 2019), www.cbo.gov/publication/55152.

There is considerable uncertainty about the option's effect on employment. CBO estimates that there is a two-thirds chance that the change in employment would fall between about zero and a decrease of 3.7 million workers; thus, there is a one-third chance that the effect lies outside that likely range. The option's effect on employment is uncertain for two main reasons. First, future wage growth under current law may differ from CBO's projections. If wages grow more slowly than CBO projects, for example, then the option would induce both larger increases in wages and larger decreases in employment than CBO estimates. Second, employment's responsiveness to mandated wage increases might be stronger or weaker than CBO anticipates. If employment is less responsive than CBO expects, for example, then the option would have a smaller effect on employment than CBO has estimated. There are other sources of uncertainty, but CBO expects that their effects would be small (for details, see Appendix A).

The $12 Option. Under the second option, according to CBO's median estimate, about 0.3 million workers who would otherwise be employed would be jobless in an average week in 2025. That decrease would account for 0.2 percent of all workers and 5 percent of the directly affected workers who would otherwise earn less than $12 per hour. Wages would rise, however, for 5 million directly affected workers who remained employed and for many of the 6 million potentially affected workers earning slightly more than $12 per hour.

The $12 option would have a smaller effect on employment than the $15 option, in CBO's assessment, because it would affect fewer workers, because it would cause workers' wages to rise by smaller amounts, and because employment would be less responsive to the wage

Table 3.

Effects of Increases in the Federal Minimum Wage on Employment and Weekly Earnings, by Group, 2025

Group	Option $15	$12	$10
	Change in Employment in an Average Week (Millions of workers)		
All	-1.3	-0.3	*
Age			
16 to 19	-0.6	-0.2	*
20 or older	-0.7	-0.1	*
Sex			
Female	-0.8	-0.2	*
Male	-0.5	-0.1	*
Educational Attainment			
Less than high school	-0.5	-0.1	*
High school diploma or some college	-0.8	-0.1	*
Bachelor's degree or more	-0.1	*	*
Hours Worked per Week			
Fewer than 35	-0.9	-0.2	*
35 or more	-0.4	-0.1	*
	Change in Weekly Earnings Among Directly Affected Workers (Percent)[a]		
All	11.9	8.8	5.3
Age			
16 to 19	0.3	3.9	3.3
20 or older	13.6	10.2	6.2
Sex			
Female	12.3	8.8	5.3
Male	11.2	8.9	5.2
Educational Attainment			
Less than high school	9.3	6.9	4.2
High school diploma or some college	12.4	9.5	5.8
Bachelor's degree or more	12.2	9.3	5.8
Hours Worked per Week			
Fewer than 35	11.9	8.6	5.0
35 or more	11.9	9.2	5.8

Source: Congressional Budget Office, using monthly data from the Census Bureau's Current Population Survey.

The options would raise the minimum wage to $15, $12, and $10, respectively, in six steps between January 1, 2020, and January 1, 2025. Under the $15 option, the minimum wage would then be indexed to median hourly wages; under the $12 and $10 options, it would not.

Directly affected workers are those whose hourly wage, in the absence of the change in the minimum wage, would range from just below the old minimum to the new, higher minimum.

* = between −0.05 million and 0.05 million.

a. Includes the effect of joblessness.

increases induced by the $12 option.[13] CBO also expects that employment would respond less to a minimum wage that was not indexed.

CBO estimates that there is a two-thirds chance the change in employment under this option would be between about zero and a reduction of 0.8 million workers. The primary sources of uncertainty again are wage growth and employment's responsiveness to higher wages.

The $10 Option. Under the last option, CBO estimates almost no effect on employment in 2025. That is because a relatively small number of workers (1.5 million) would be affected, because wages would not rise much for those who were affected, and because CBO expects that employment would not respond much to a small wage change that was not indexed to inflation. CBO estimates that there is a two-thirds chance that the change in employment would be between about zero and a reduction of 0.1 million workers.

Effects of the Options on Family Income

The most direct effect of the options would be to increase the earnings of workers while they are employed. That would increase family income. However, the options would have a number of other effects. Families would lose the earnings of family members who became jobless. The increased cost of employing retained workers would be absorbed by business owners (in the form of reduced profits) and by consumers (in the form of higher prices). But CBO also expects that the options would boost the productivity of workers by 20 percent of the increase in their earnings, with the benefits of that higher productivity accruing to businesses (meaning that profits would be reduced by less than they otherwise would) and to consumers (meaning that prices would increase less than they otherwise would). Finally, CBO estimates that the options would affect savings and capital accumulation, which would in turn affect the income of business owners. The size of those effects—both positive and negative—would vary across the three options.

The $15 Option. The first option would reduce total real income by about $9 billion in 2025, CBO estimates.

13. For the $12 option, CBO's median estimate of employment's responsiveness to a change in the applicable minimum wage is 0.11 for teenagers, for example, which means that the employment of teenagers would be reduced by 1.1 percent after a 10 percent increase in the minimum wage. The equivalent estimate for the $15 option is 1.25 percent. See Appendix A for more information.

Table 4.

Effects of Increases in the Federal Minimum Wage on Average Annual Real Family Income, 2025

Ratio of Family Income to the Poverty Threshold	Average Real Family Income (2018 Dollars)	Change in Average Annual Real Family Income					
		$15 Option		$12 Option		$10 Option	
		Dollars	Percent	Dollars	Percent	Dollars	Percent
Less Than 1.0	10,700	600	5.3	200	1.4	*	0.2
1.0 to 1.49	28,900	600	1.9	100	0.4	*	**
1.5 to 1.99	39,200	500	1.2	100	0.2	*	**
2.0 to 2.99	55,700	300	0.6	100	0.1	*	**
3.0 to 5.99	95,300	*	**	*	**	*	**
6.0 or More	232,800	-700	-0.3	-100	-0.1	*	**

Source: Congressional Budget Office, using annual data from the Census Bureau's Current Population Survey.

Income values are for annual real family income measured in 2018 dollars.

The options would raise the minimum wage to $15, $12, and $10, respectively, in six steps between January 1, 2020, and January 1, 2025. Under the $15 option, the minimum wage would then be indexed to median hourly wages; under the $12 and $10 options, it would not.

Values reflect changes in real (inflation-adjusted) before-tax family cash income. Those changes include increases in earnings for workers who would receive a higher wage, decreases in earnings for workers who would become jobless, losses in income for business owners, and decreases in income because of increases in prices. Results are weighted by the number of people in each family; for example, when CBO calculated the averages, a family of three would be represented three times.

The definitions of income and of poverty thresholds are those used by the Census Bureau to determine the official poverty rate. CBO projects that in 2025, the poverty threshold (in 2018 dollars) will be $20,480 for a family of three and $26,330 for a family of four.

* = between −$50 and $50; ** = between −0.05 percent and 0.05 percent.

That net effect is due to the combination of factors described above:

- Real earnings for workers while they remained employed would increase by $64 billion,
- Real earnings for workers while they were jobless would decrease by $20 billion,
- Real income for business owners would decrease by $14 billion, and
- Real income for consumers would decrease by $39 billion.

Those changes in real income would not be distributed evenly across families at different income levels (see Table 4 and Figure 5). For families under the poverty line, this option would increase real family income by an average of $600 per year, or 5.3 percent. (In 2025, the poverty threshold will be roughly $20,500 in 2018 dollars for a family of three and $26,300 for a family of four, CBO projects.) Families with income between one and three times the poverty threshold would also see increases in family income, though the percentage changes would be smaller. The option would have virtually no effect on the real income of families with income between three and six times the poverty threshold. Finally, the option would reduce the real income of families with income more than six times the poverty threshold by an average of about $700 per year, or about 0.3 percent.

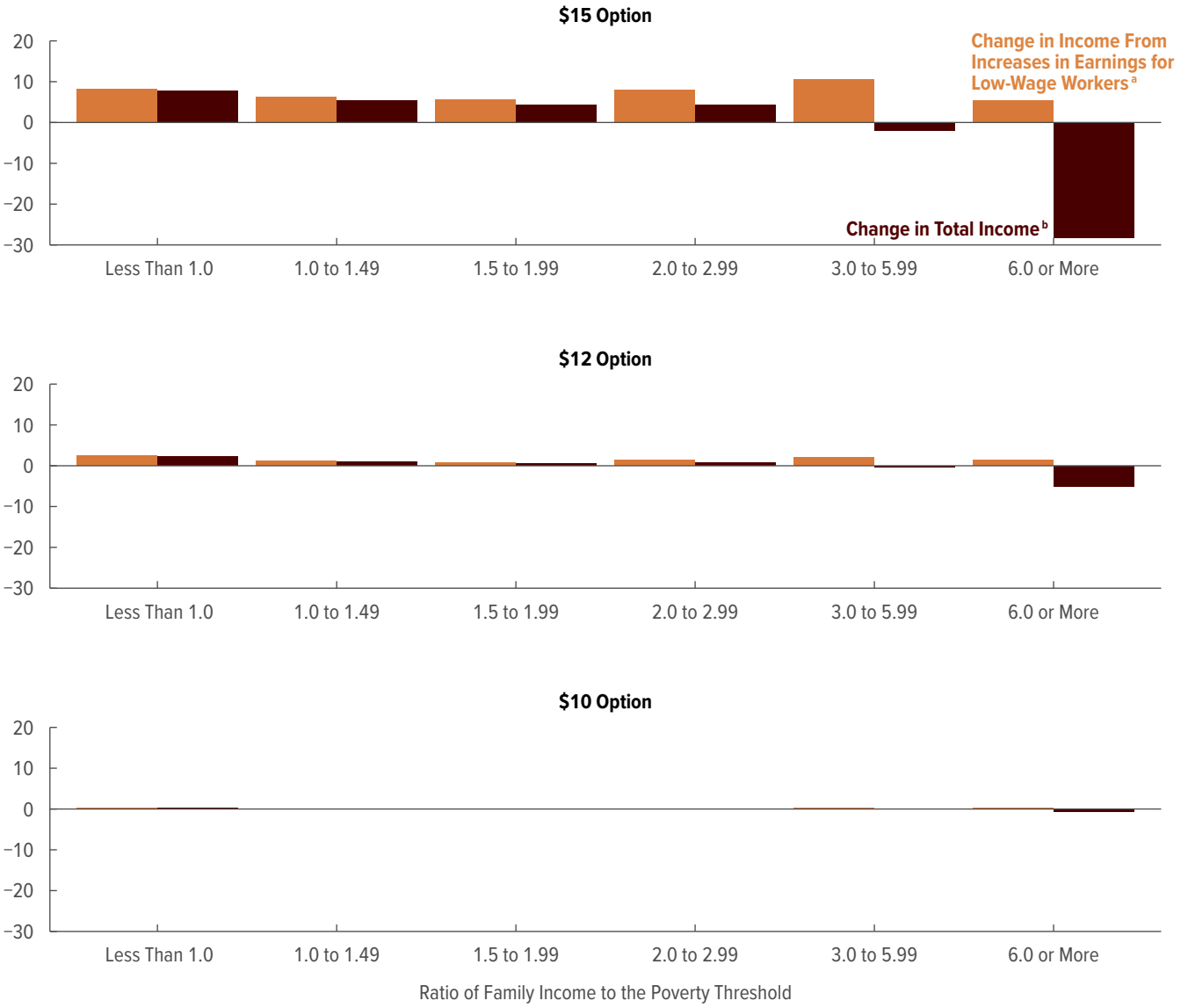
Low-wage workers are not necessarily members of low-income families. Many low-wage workers are in families with high incomes—for instance, some low-wage workers are teenagers in high-income families. In particular, about 40 percent of low-wage workers are in families with income three times the poverty level or more (see Figure 6). According to CBO's estimates, the increase in earnings for low-wage workers living in families with incomes more than three times the poverty threshold would be more than offset by income reductions, in part because losses in business income and in real income from price increases would be concentrated in those families.

The effects of the option on real family income would vary even among families with similar incomes. For example, low-income families with minimum-wage workers who remained employed would typically

Figure 5.

Effects of Increases in the Federal Minimum Wage on Real Family Income, 2025

Billions of 2018 dollars



Source: Congressional Budget Office, using annual data from the Census Bureau's Current Population Survey.

The options would raise the minimum wage to $15, $12, and $10, respectively, in six steps between January 1, 2020, and January 1, 2025. Under the $15 option, the minimum wage would then be indexed to median hourly wages; under the $12 and $10 options, it would not.

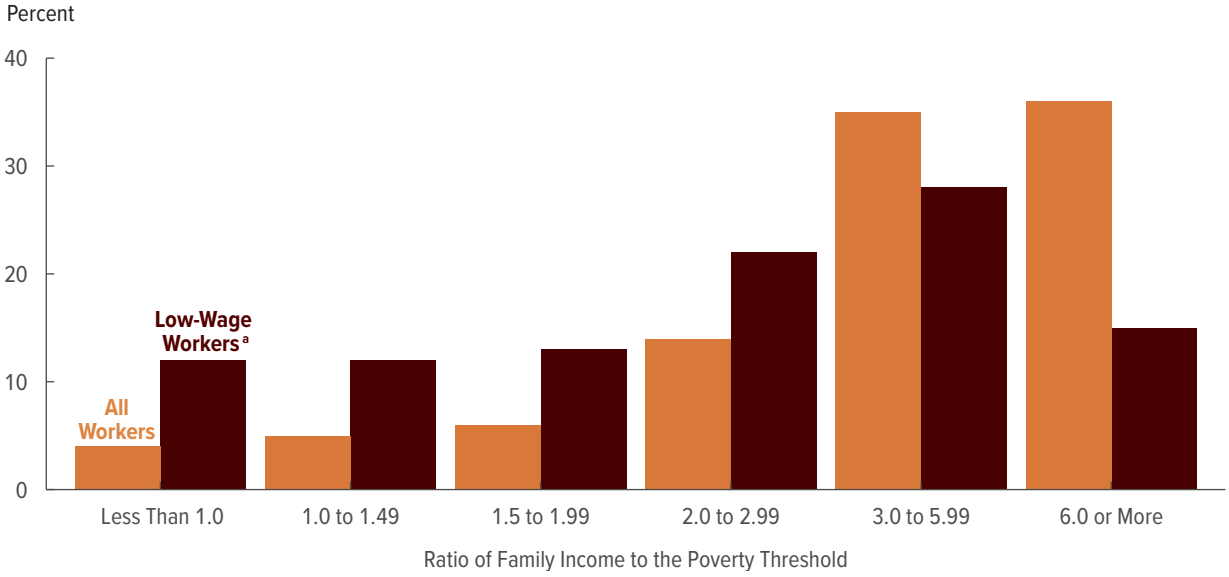
The definitions of income and of poverty thresholds are those used by the Census Bureau to determine the official poverty rate. CBO projects that in 2025, the poverty threshold (in 2018 dollars) will be $20,480 for a family of three and $26,330 for a family of four.

a. Low-wage workers are people who are projected, under current law, to be paid less than $19 per hour in 2025.

b. Values reflect changes in real (inflation-adjusted) income. Those changes include increases in earnings for workers who would receive a higher wage, decreases in earnings for workers who would become jobless, losses in income for business owners, and decreases in income because of increases in prices.

Figure 6.

Shares of Workers, by Family Income Group, 2025



Source: Congressional Budget Office, using annual data from the Census Bureau's Current Population Survey.

Family income groups are determined on the basis of before-tax family cash income. The definitions of income and of poverty thresholds are those used by the Census Bureau to determine the official poverty rate. CBO projects that in 2025, the poverty threshold (in 2018 dollars) will be $20,480 for a family of three and $26,330 for a family of four.

a. Low-wage workers are people who are projected, under current law, to be paid less than $19 per hour.

see their income rise. For other low-income families, however, real income could decline slightly (because of higher prices) or significantly (because of higher prices combined with a family member's joblessness).

CBO projects that the $15 option would reduce the number of people in poverty by about 1.3 million—a net effect of families moving both into and out of poverty. That estimate uses a measure of family income called cash income, which the Census Bureau uses to determine the poverty rate. Cash income includes earnings and cash transfers from the government, such as Supplemental Security Income benefits. It excludes noncash transfers, such as benefits from Medicaid and the Supplemental Nutrition Assistance Program; taxes; and tax credits, such as the earned income tax credit (EITC). (Because the EITC provides cash to many lower-income families, it is sometimes compared with the federal minimum wage in discussions about how to boost lower-income families' resources; see Box 2.)

The people the $15 option would move out of poverty tend to come from specific groups (see Table 5). Almost 60 percent would be adults without a high school diploma, and about 45 percent would be 18 years old or younger. Women would also be more likely than men to see their family income rise above the poverty threshold.

The $12 Option. The second option would reduce total real income by about $1 billion, CBO estimates. That net effect is again due to a combination of factors:

- Real earnings for workers while they remained employed would increase by $12 billion,
- Real earnings for workers while they were jobless would decrease by $3 billion,
- Real income for business owners would decrease by $3 billion, and
- Real income for consumers would decrease by $7 billion.

Families with income below or slightly above the poverty threshold would see their real income rise by an average of about $200 per year, or 1.4 percent. Changes in the real income of families at higher income levels would be very small. The option would move some people into poverty and others out of poverty, but on balance, the

Box 2.

The Minimum Wage and the Earned Income Tax Credit

The earned income tax credit (EITC) provides cash assistance through the federal income tax system to low- and moderate-income families on the basis of their earnings, adjusted gross income, and family structure.[1] EITC benefits increase as family earnings rise above zero up to a certain threshold (the phase-in range); when earnings reach that threshold, the benefits stop increasing; when earnings reach a higher point (the beginning of the phaseout range), the benefits decline; and when earnings are high enough, the benefits end.[2] For a tax filer with three qualifying children, the maximum credit in 2025 will be $7,488. In 2025, the Congressional Budget Office projects, the earnings level at which EITC benefits will end will range from $17,785 for an unmarried worker without children to $63,920 for a married couple with three or more children.

Differences Between the Minimum Wage and the EITC

An increase in the credit amount available in the EITC would go almost entirely to lower-income families, whereas an increase in the minimum wage raises earnings for many workers who are not in low-income families as well. For example, roughly 40 percent of workers directly affected by the $15 option in 2025 would be members of families with income more than three times the federal poverty threshold.

The EITC increases the employment of people in low-income families—particularly custodial parents, for whom the EITC is most generous.[3] However, increases in the supply of workers tend to reduce workers' wages, which causes some of the benefit of the EITC to accrue to employers rather than to workers themselves.[4] In contrast, a higher minimum wage would reduce employment, in CBO's assessment.

Different groups would bear the cost of boosting low-income families' resources by increasing the minimum wage or increasing the EITC. An increase in the minimum wage would initially be paid for by business owners (in the form of reduced profits), by consumers (in the form of increased prices), and by workers who became jobless. Over time, the latter two groups would shoulder an increasingly greater share of the costs.

Increasing the EITC would require some combination of increased taxes, reduced spending in other areas, or larger budget deficits. If the increase was funded through an increase in taxes, the cost would be largely borne by taxpayers, but people with higher income—who pay more in taxes—would shoulder more of the cost. If the increase was funded through a reduction in spending, the cost would be borne by people who experienced reductions in the amount of goods and services provided by the federal government. And to the extent that the increase in the EITC was funded through larger deficits, the cost would be borne by people in the future.

Interactions Between the Minimum Wage and the EITC

An increase in the minimum wage would affect EITC benefits in different ways for different families. For families with income in the phase-in range of the EITC schedule, increased earnings would probably lead to additional EITC benefits (unless the increase in earnings pushed the family into the phaseout range of the EITC or beyond). But for families with income in the phaseout range, higher income from the higher minimum wage would be partly offset by reduced EITC benefits. Families with income between the phase-in and phaseout ranges would see no change in EITC benefits from a minimum-wage increase unless it moved their income into either range.

1. Adjusted gross income is income from all sources not specifically excluded from the tax code, minus certain deductions.

2. For a more extensive description of the EITC, see Congressional Budget Office, *Refundable Tax Credits* (January 2013), www.cbo.gov/publication/43767.

3. See Bruce D. Meyer and Dan T. Rosenbaum, "Welfare, the Earned Income Tax Credit, and the Labor Supply of Single Mothers," *Quarterly Journal of Economics*, vol. 116, no. 3 (August 2001), pp. 1063–1114, www.jstor.org/stable/2696426.

4. See David Lee and Emmanuel Saez, "Optimal Minimum Wage Policy in Competitive Labor Markets," *Journal of Public Economics*, vol. 96, no. 9 (October 2012), pp. 739–749, http://dx.doi.org/10.1016/j.jpubeco.2012.06.001; and Jesse Rothstein, "Is the EITC as Good as an NIT? Conditional Cash Transfers and Tax Incidence," *American Economic Journal: Economic Policy*, vol. 2, no. 1 (February 2010), pp. 177–208, www.jstor.org/stable/25760056.

number of people below the poverty line would fall by 0.4 million. Again, the effects would vary among families depending on their situation.

The $10 Option. The third option would reduce real total income by $0.1 billion, CBO estimates, and it would have similarly small effects on the distribution of family income. Low-income families would see their yearly income change by less than $50, on average, and the option would have a small effect on the number of people in poverty. The effects on family income would be small because the option would affect few workers and would not change earnings or employment much among those it did affect.

Uncertainty About the Estimates

The options' effects on employment and family income are uncertain. Those effects depend on, among other things, how employment responds to higher wages, how much wages grow, and how long workers who lost their jobs would remain jobless. The more responsive employment is to an increase in the minimum wage, the less effective the policy would be at lifting families out of poverty. And if wages grew more quickly than CBO projects under current law, then fewer workers would be affected and fewer families would be lifted out of poverty. (If wages grew less quickly than CBO projects, then the opposite would occur.) Whether a smaller number of workers would be jobless for long periods or a larger number of workers would be jobless for short periods would also affect the distribution of family income. It is uncertain, however, whether differences in the duration of joblessness would affect the number of people in poverty.

Table 5.

Effects of Increases in the Federal Minimum Wage on the Number of People in Poverty, by Group, 2025

Millions

	Option		
Group	**$15**	**$12**	**$10**
All	-1.3	-0.4	*
Age			
0 to 18	-0.6	-0.1	*
19 to 64	-0.7	-0.2	*
65 or older	*	*	*
Sex			
Female	-0.7	-0.2	*
Male	-0.6	-0.2	*
Educational Attainment			
Less than high school	-0.8	-0.2	*
High school diploma or some college	-0.5	-0.2	*
Bachelor's degree or more	-0.1	*	*
Hours Worked per Week			
Fewer than 35	-0.3	*	*
35 or more	-0.4	-0.2	*
None (Children and nonworking adults)	-0.7	-0.2	*

Source: Congressional Budget Office, using annual data from the Census Bureau's Current Population Survey.

The options would raise the minimum wage to $15, $12, and $10, respectively, in six steps between January 1, 2020, and January 1, 2025. Under the $15 option, the minimum wage would then be indexed to median hourly wages; under the $12 and $10 options, it would not.

Reported numbers are the difference between the number of people leaving poverty and the number entering poverty.

* = between −0.05 million and 0.05 million.

APPENDIX

A

The Basis for CBO's Findings

This appendix describes how the Congressional Budget Office estimated the effects of options for increasing the minimum wage on employment and on the distribution of family income. It also describes how the methods used in this report differ from those CBO used in a similar analysis in 2014.[1]

How CBO Estimated the Effects of the Options on Employment

CBO's estimates of each option's effects on employment were based on four underlying estimates. First, CBO estimated the number of workers likely to be affected by the option in 2025. Second, CBO made an assessment about the percentage by which low-wage workers' employment would change in response to any percentage increase in the minimum wage. Third, CBO calculated the percentage change in the wages of the workers who would be affected by the option. Fourth, CBO examined the macroeconomic feedback effects—primarily effects on aggregate demand and capital accumulation. CBO's estimates of each option's employment effects result from multiplying the percentage change in affected workers' wages by the responsiveness of employment, summing the employment effects across all affected workers, and then making any adjustments for the macroeconomic feedback effects.

How CBO Estimated the Number of Workers Affected by the Options

For each option, CBO estimated the number of workers who could be affected. Directly affected workers are those whose hourly wage, in the absence of the change in the minimum wage, would range from just below the old minimum to the new, higher minimum and who therefore would either receive a higher wage or become jobless if the new federal minimum were adopted. Potentially affected workers are those whose wages would otherwise be slightly above the new federal minimum in 2025; their wages would also be affected by a higher minimum. CBO projects that such workers' employment would not be affected by their newly higher wages, though it might be affected by changes in overall demand induced by the options.

Workers Directly Affected by Increases in the Minimum Wage in 2025. CBO estimated the number of directly affected workers in three main steps: determining hourly wages in 2018, projecting wages in 2025, and identifying the workers directly affected by a higher federal minimum wage in 2025. Those steps led CBO to conclude that the $15, $12, and $10 options would directly affect 17 million, 5 million, and 1 million workers, respectively, in 2025.

In the first step, CBO estimated hourly wages in 2018 using data from the Current Population Survey (CPS), which is jointly conducted by the Bureau of Labor Statistics and the Census Bureau. The CPS is designed to be representative of the U.S. civilian population as a whole; each observation in the survey represents a number of people, and that number is the observation's "sample weight." CBO used those sample weights to estimate hourly wages for workers in 2018 on the basis of the roughly 160,000 workers who were surveyed.

Many CPS respondents directly reported their hourly wage, and in such cases CBO used that information.[2] But many other survey respondents did not report an hourly wage—many were not paid on an hourly basis—and in those cases, CBO calculated their hourly wages as their usual earnings per week divided by their usual hours worked per week.[3] Before making that calculation, CBO adjusted the CPS data on hours worked to correct

1. Congressional Budget Office, *The Effects of a Minimum-Wage Increase on Employment and Family Income* (February 2014), www.cbo.gov/publication/44995.

2. If the Census Bureau imputed an hourly wage for a worker, CBO used that wage.

3. If the number of hours the respondents usually worked per week varied, CBO used the number of hours they reported having worked during the week before the survey.

for measurement errors inherent in survey data.[4] Those adjustments moved reported hours upward when they were particularly low and downward when they were particularly high.[5] Because calculated wages are still subject to error, CBO further adjusted them by moving them closer to the mean wages of workers with similar characteristics.[6]

CBO also adjusted the data from the CPS to make it appropriate for an analysis of 2025 outcomes. In particular, CBO adjusted the sample to reflect the agency's forecast of population growth between 2018 and 2025, both as a whole and separately for groups defined by sex, age, education, race and ethnicity, and employment status.

In the second step, CBO used those 2018 wages to forecast hourly wages in 2025. To do so, CBO projected wage growth rates separately for demographic groups defined by sex, education, and age. Those projections extrapolated average growth from 20 years of historical data.[7] CBO then accounted for the effects on workers of future increases in some states' minimum wages. The share of workers affected by such increases was estimated on the basis of current state law, including scheduled changes in state minimums, and how states have changed their minimum wages in the past. (CBO's analysis did not account for localities' minimum wages because the CPS does not identify the localities in which respondents work.) Finally, the overall growth in wages was adjusted to equal the agency's forecast of aggregate wage growth. Altogether, CBO projected that nominal wages of low-wage workers would grow at an average annual rate of 3.5 percent between 2018 and 2025.

In the third step, CBO identified workers who would be directly affected by a change in the federal minimum wage in 2025. Some directly affected workers would not be covered by the Fair Labor Standards Act (FLSA), which determines the federal minimum wage, but CBO expects that their wages would nevertheless be boosted by an increase in the federal minimum. That group consists of employees of some firms with less than $500,000 in annual revenues and workers in occupations generally exempt from the FLSA.[8] The directly affected group does not include workers whose wages were below their applicable minimum in 2018—in CBO's assessment, such workers either are exempt from the FLSA or work for employers that do not comply with the FLSA. In either case, CBO expects that the wages and employment of those workers would not be affected by a change in the federal minimum wage.[9] CBO projects that there will be 4.6 million such workers in 2025.

Because the $15 option would modify the minimum wage for tipped, teen, and disabled workers, CBO identified people in each of those groups. CBO identified tipped workers as those in any of 11 occupations (such as waiters, bartenders, and hairdressers) whose compensation depends heavily on tips; using that definition, roughly 1.5 million tipped workers would be directly affected by the $15 option in 2025. CBO identified teenagers using reported age; in 2025, about 2.9 million teen workers would be directly affected by the option. CBO identified CPS workers as disabled if they answered "yes" to any one of five questions about disability in the monthly CPS survey. Although the FLSA defines disabled workers differently, the CPS-based estimate of the number of disabled workers earning less than the current minimum wage is similar to the number of exemptions granted by the Department of Labor—about 125,000.

4. For one discussion of measurement error in earnings, income, and wages, see Bruce D. Meyer, Wallace K. C. Mok, and James X. Sullivan, "Household Surveys in Crisis," *Journal of Economic Perspectives*, vol. 29, no. 4 (Fall 2015), pp. 199–226, http://dx.doi.org/10.1257/jep.29.4.199.

5. Extensive research has examined the accuracy of CPS-based measurements of hours worked. CBO relied most heavily on Harley Frazis and Jay C. Stewart, "Is the Workweek Really Overestimated?" *Monthly Labor Review* (June 2014), http://go.usa.gov/xWPZW.

6. That adjustment was based in part on findings from Thomas Lemieux, "Increasing Residual Wage Inequality: Composition Effects, Noisy Data, or Rising Demand for Skill?" *American Economic Review*, vol. 96, no. 3 (June 2006), pp. 461–498, http://dx.doi.org/10.1257/aer.96.3.461.

7. That extrapolation method provided projections that were as accurate—when compared with data on recent growth in wages—as more complex methods CBO evaluated, such as those that used data spanning a longer period or that were based on the relative supply of groups of workers estimated to have similar ages and skills.

8. Department of Labor, "Wages and Hours Worked: Minimum Wage and Overtime Pay" (accessed February 21, 2019), https://webapps.dol.gov/elaws/elg/minwage.htm.

9. To project the percentage of low-wage workers who would not be covered or affected by the FLSA in 2025, CBO estimated the number of workers earning less than their applicable minimum (the federal minimum or a higher state minimum) in 2018. The agency concluded that nontipped workers who reported being paid up to 25 cents less and tipped workers who reported being paid a cash hourly wage up to 13 cents less had probably misreported their wages; therefore, it did not count such workers as being paid less than the minimum wage.

Workers Potentially Affected by Increases in the Minimum Wage in 2025. A minimum-wage increase could have positive or negative effects on the wages and employment of potentially affected workers, depending on whether their value to employers rose or fell when lower-wage workers became more expensive to employ. Available research, however, suggests that the average effects on the wages of those workers would be positive. (See Appendix B for a list of studies that CBO reviewed.)

In its analysis, CBO estimated that the options would have ripple effects on workers whose wages would otherwise fall between the minimum wage specified in the option and that minimum plus 50 percent of the increase in their applicable minimum wage. That is, wages for those workers would increase as employers sought to retain some of the differences in pay that had existed between those workers prior to the increase in the minimum wage. For instance, in states where the current minimum wage is $7.25, CBO anticipates that many workers earning up to $19 per hour would be affected by the $15 option.[10] In states with a higher minimum wage, the ripple effect would apply to a smaller range of wages. CBO projects, for example, that the minimum wage in Oregon will be $14.55 in July 2025, and the agency therefore estimates that workers earning up to $15.21 per hour in that state would be affected by a federal minimum of $15. In 2025, there would be 10.3 million potentially affected workers under the $15 option, 6.4 million under the $12 option, and 1.9 million under the $10 option. Most of those potentially affected workers would receive a small wage increase, CBO's projects, but their employment is unaffected.

Uncertainty About the Estimates. Estimates of the number of directly and potentially affected workers are uncertain for a number of reasons. Most importantly, CBO's forecast of wage growth under current law could be too high or too low, which would lead to an underestimate or an overestimate, respectively, of the number of affected workers. If wages grow more quickly, for example, then fewer workers would be affected by an increase in the federal minimum wage and the effect on employment and wages would be smaller than CBO has estimated. By contrast, if wage growth is slower than CBO projects, then more workers would be directly affected by higher minimum wages and the options' effects on both wages and employment would be larger than CBO has estimated. There are other, probably less consequential, sources of uncertainty as well—for instance, CBO may have misidentified which workers are covered by the FLSA, the share of workers affected by changes in states' minimum wage laws could differ from CBO's projections, and ripple effects could affect a smaller or larger number of workers than CBO projects.

How CBO Estimated the Responsiveness of Employment to Increases in Minimum Wages

The responsiveness of employment to a change in the minimum wage is generally represented by an employment elasticity. An elasticity of zero implies that employment does not respond at all; a negative elasticity implies that employment falls with an increase in the minimum wage; and a positive elasticity implies that employment rises. As measured elasticities move further from zero, the implication is that employment is increasingly responsive to changes in the minimum wage. An elasticity of 0.10, for example, implies that a 10 percent increase in the minimum wage would raise employment by 1 percent, whereas an elasticity of –0.40 implies that the same increase in the minimum wage would reduce employment by 4 percent.

Much research on employment elasticities has focused on elasticities for all teenagers, regardless of whether they would be directly affected by minimum-wage increases. That focus on teenagers was driven by the fact that a disproportionately large share of teens has been directly affected by past minimum-wage changes, which has made it easier to detect effects on employment in that population. CBO reviewed the literature to determine employment elasticities for all teenagers and then adjusted those elasticities to arrive at elasticities for directly affected teenagers.

A growing but still small body of research has focused on employment elasticities for the broader population of affected workers—both teenagers and adults with low wages. That research has identified groups at risk for reductions in employment because of their industry (particularly restaurant workers), educational attainment (typically those with no postsecondary education), or hourly wage itself. CBO reviewed this more recent literature to determine employment elasticities for directly affected adults. (See Appendix B for a bibliography of the research that CBO reviewed.)

10. Thus, CBO refers to workers with wages up to $19 per hour in 2025 as low-wage workers in this report.

CBO concluded that the options would not have a significant net effect on the employment of potentially affected workers, either teen or adult. On the one hand, wages would probably rise for some potentially affected workers (such as the supervisors of minimum-wage workers) whose employers sought to maintain a differential between their wages and those of employees earning the minimum wage, and that wage increase would tend to lower employment. On the other hand, some firms would probably employ more workers with wages higher than the new minimum because their productivity relative to their wages would be higher than that of workers whose wages had been pushed up to the new minimum. On balance, in CBO's assessment, those opposing factors would offset each other.

Elasticities for All Teenagers. In CBO's assessment, the most convincing estimates of employment elasticities are based on a comparison of rates of employment or employment growth in states that have different minimum wages but otherwise similar labor markets. Many recent studies of changes in the minimum wage have taken that approach as state-level minimum wages have become more prevalent in the past decade, and CBO gave those studies special attention. The agency views such studies as particularly relevant if they compare states that had their minimum wage increased by federal law with states that were not affected by a new federal minimum because their minimum wage exceeded it. CBO also referred to studies that compared rates of employment or employment growth among localities with different minimum wages. By contrast, CBO put less emphasis on studies based on changes in the entire economy over time, international comparisons, or changes in the prices and quantities of goods and services produced by low-wage workers (which can provide indirect evidence about employment).

Most research defines the employment elasticity (e) as the percentage change in employment ($\%\Delta E$) of workers induced by a percentage change in the applicable minimum wage ($\%\Delta MW$), as shown in the following equation (Equation 1):

$$e = \frac{\%\Delta E}{\%\Delta MW}$$

Virtually all the studies CBO reviewed estimated that elasticity by comparing employment changes in places that had increased their minimum wage with employment changes in places that had not. In its review, however, CBO found substantial differences across studies in the details of how the elasticity was estimated. In particular, studies varied in the time period they analyzed, in the type of minimum-wage change they studied (federal, state, or local), in the size of the increase in the minimum they analyzed (sometimes small and sometimes as large as 25 percent), and in the data sources they examined. Even more important, studies varied in the states or areas they used as control groups—that is, the places compared with the states or areas where the minimum wage increased. Some studies used neighboring states, others used all states, whereas still others chose control areas on the basis of statistical analyses.

In CBO's assessment, for the average change in the minimum wage studied in the literature, the employment elasticity for teenage workers is –0.07. That value is CBO's median estimate of the elasticity that would apply in the short run (one year after the implementation of the higher minimum wage) to a minimum-wage change that was close to the average of past changes. CBO used its own synthesis of the research literature as the basis of that estimate, recognizing that there is no consensus in that literature as to the size, or even the sign, of the teen employment elasticity and that there is publication bias in that literature. (Publication bias is the tendency of academic journals to publish studies that show statistically significant effects.) As a point of comparison, CBO's median estimate lies within the lower part of the range of teen employment elasticities estimated in one recent meta-analysis.[11]

In CBO's view, however, the teen employment elasticity applicable to any given option varies from that median elasticity depending on four factors. First, employment elasticities are higher when more workers are affected. Employers are more likely to reduce the number of employees if wages increase for a substantial fraction of their workforce. By contrast, employers may merely absorb higher costs or pass them on to consumers if the higher minimum affects a small share of their workforce.

Second, employment elasticities are higher when the new minimum wage mandates a larger increase for affected workers. Employers are more likely to modify their business practices—including employment—when there

11. Paul Wolfson and Dale Belman, "15 Years of Research on U.S. Employment and the Minimum Wage," *Labour* (forthcoming).

Table A-1.

Employment Elasticities Estimated by CBO for 2025, by Age Group

	Adults			Teenagers		
	$15 Option	$12 Option	$10 Option	$15 Option	$12 Option	$10 Option
	Employment Elasticities for All Workers in an Age Group With Respect to the Change in the Minimum Wage					
Median Estimate	-0.004	-0.004	-0.003	-0.128	-0.111	-0.100
Likely Range[a]						
Low end	*	*	*	*	*	*
High end	-0.013	-0.011	-0.010	-0.255	-0.222	-0.201
	Employment Elasticities for Directly Affected Workers in an Age Group With Respect to the Change in Their Own Wage					
Median Estimate	-0.269	-0.234	-0.212	-0.829	-0.721	-0.653
Likely Range[a]						
Low end	*	*	*	*	*	*
High end	-0.806	-0.701	-0.635	-1.658	-1.442	-1.306

Source: Congressional Budget Office.

The options would raise the minimum wage to $15, $12, and $10, respectively, in six steps between January 1, 2020, and January 1, 2025. The $15 option would then be indexed to median hourly wages; the $12 and $10 options would not.

Directly affected workers are those whose hourly wage, in the absence of the change in the minimum wage, would range from just below the old minimum to the new, higher minimum.

* = between −0.0005 and 0.0005.

a. In CBO's estimation, there is a two-thirds chance that the elasticity would be within this range.

is a large change in the cost of labor. This point applies even to employers that have monopsony power and must raise wages of current workers to hire additional workers. Moreover, that monopsony power itself tends to diminish when the minimum wage is sufficiently high. Those employers might not cut back on their number of employees (and might even hire more) in response to a small minimum-wage increase, but they would reduce employment if the minimum wage increased by a large enough amount.

Third, employment elasticities are higher when firms have more time to respond to an increase in the minimum wage. In the short run, employers may view buildings, machines, and other forms of capital as fixed. In the longer run, however, employers can change the size of their buildings, the number of machines they deploy, and the number of higher-wage workers they employ, and those changes typically lead the employment of low-wage labor to respond more to an increase in the minimum wage than it would in the short run.

Fourth, employment elasticities are higher when minimum wages are indexed to inflation or wage growth. Indexation makes the increase permanent in real terms, and employers are more responsive to permanent changes in the price of inputs to production, such as labor.[12]

After considering those factors, CBO concluded that the elasticities of teen employment applicable to the analysis of the three options would differ from the short-run elasticity of –0.07 that was based on CBO's assessment of the literature. In particular, CBO's median estimates of the teen elasticities for 2025 are –0.128, –0.111, and –0.100 for the $15, $12, and $10 options, respectively (see Table A-1). The differences arise because the options differ from the average minimum-wage change of the past and because a short-run analysis would not apply to the 2025 projection.

All of the options would be implemented over a five-year period—longer than most of the increases that have been

12. For discussions of this relationship, see Isaac Sorkin, "Are There Long-Run Effects of the Minimum Wage?" *Review of Economic Dynamics*, vol. 18, no. 2 (April 2015), pp. 306–333, https://doi.org/10.1016/j.red.2014.05.003; and Peter Brummund and Michael R. Strain. "Does Employment Respond Differently to Minimum Wage Increases in the Presence of Inflation Indexing?" *Journal of Human Resources* (forthcoming), http://dx.doi.org/10.3368/jhr.55.2.1216.8404R2.

studied in the literature, which would give employers more time to respond. The elasticity for each option would exceed that for the average historical increase in the minimum wage largely because of that lag. Variations among the other three factors cause the elasticities CBO used for the three options to differ from one another. The $15 option has the largest elasticity, in CBO's assessment, because it would induce the largest wage increases for the most workers and because it would index the minimum wage to subsequent wage growth. The $12 option has a smaller elasticity because it would affect fewer workers, because it would increase their wages less than the $15 option would, and because it would not index the minimum wage to wage growth. The $10 option has the smallest elasticity because it would affect the smallest number of workers, because it would increase wages by the smallest amounts, and because it would not be indexed.

Modified Elasticities for Directly Affected Teenagers. The elasticities above (those typically estimated in the literature) apply to all teen employment; CBO made two adjustments before using them to calculate employment changes. First, CBO expects that any decline in employment induced by a higher minimum wage would be concentrated among directly affected workers. CBO therefore translated the employment elasticity for all teenagers to account for the fact that not all teenagers would be directly affected.

Second, CBO modified the elasticities so that they relate employment to the change in workers' wages rather than to the change in the minimum wage itself. Consider a worker making $12 per hour where the minimum wage is $7.50. Raising the minimum to $15 would double the minimum wage but would raise that worker's wage by only 25 percent. The elasticities in the literature are typically scaled to the increase in the statutory minimum wage, but that approach can yield misleading estimates of employment changes. For example, using that approach in a projection of the $15 option, it would make no difference whether most workers would otherwise have earned $7.25 or $14.99. That approach also regards all directly affected workers as equally likely to experience changes in their employment after a minimum-wage increase. By contrast, CBO expects that workers whose wages were just below the new minimum would be more likely to remain employed than workers with substantially lower earnings. CBO's approach accounts for the distribution of workers' wages and for the differences in the likelihood of losing one's job.

CBO made those modifications by multiplying the elasticities drawn from the literature by the inverse of the portion of employed teenagers directly affected by past minimum-wage changes (P_{direct}) and by the ratio of the percentage change in the applicable minimum wage (%ΔMW) to the average percentage change in the wages of directly affected teenagers ($\%\Delta W_{direct}$).[13] The following equation (Equation 2) shows the calculation:

$$e_{direct} = \frac{\%\Delta E_{direct}}{\%\Delta W_{direct}} = e \times \frac{1}{P_{direct}} \times \frac{\%\Delta MW}{\%\Delta W_{direct}}$$

Historically, increases in the minimum wage have directly affected about one-quarter of employed teenagers, and the change in wages was about 60 percent of the change in the statutory minimum wage. Thus, the elasticities for directly affected teenagers with respect to their own wage change are about 6.5 times higher, CBO estimates, than the elasticities for all teenagers with respect to the change in the minimum wage itself (those typically estimated in the literature). By construction, of course, that higher elasticity for directly affected teenagers with respect to their own wage change applies to a smaller wage change and to a more narrowly defined population.

Elasticities for Directly Affected Adults. Whereas a relatively large share of teenagers are minimum-wage workers, minimum-wage changes tend to affect a very small share of adults, which means that small, proportionate changes in the employment of affected adult workers would probably be masked by other fluctuations in adult employment, such as regional or national business cycles. Yet teenagers account for only about one-third of the workers affected by the typical minimum-wage increase. If the employment of adults responds differently from that of teenagers, then using the teen elasticity for all workers would lead to incorrect estimates.

13. A similar conversion was used in Charles Brown, "Minimum Wages, Employment and the Distribution of Income," in Orley Ashenfelter and David Card, eds., *Handbook of Labor Economics*, vol. 3B (Elsevier, 1999), pp. 2101–2163, http://tinyurl.com/mmkdrme, and in David Neumark and William L. Wascher, *Minimum Wages* (MIT Press, 2008), http://mitpress.mit.edu/books/minimum-wages.

To better inform its analysis of adults, CBO reviewed a number of recent papers that have studied the effects of minimum-wage changes on affected workers of all ages. The newer literature has focused its attention on subsets of workers that are particularly likely to be affected by a change in the minimum wage. Some of those studies looked at specific industries, such as the restaurant industry, but CBO's views were most informed by studies that examined employment among workers deemed to be affected—or not—by changes in the minimum wage on the basis of their hourly wage.

CBO's review focused specifically on 11 studies that reported short-run employment elasticities for all or most directly affected workers (see Table A-2).[14] The minimum-wage changes analyzed in most of those studies roughly reflected historical increases, but in several instances the changes analyzed were larger than average. For each of the 11 studies, CBO endeavored to identify the authors' preferred estimate of the short-run employment elasticity for all directly affected workers, in several cases contacting the authors for clarification. There is considerable variation in those elasticities. Several are positive, indicating that a higher minimum wage would boost employment. Most of the estimated elasticities are negative, however, including several in the range of –1.5, which would imply that a 10 percent increase in the wages of affected workers would reduce their employment by 15 percent.

Drawing on its review of those 11 studies, CBO formed a median estimate of –0.25 for the short-run employment elasticity for all directly affected workers (both teenagers and adults) for a historically representative change in the minimum wage. CBO reports median estimates to account for the potential asymmetry of the response. The agency concluded that there is a one-third chance that the elasticity would be between about zero and –0.25 and a one-third chance that it would be between –0.25 and –0.75. That is, the response could be smaller or substantially larger.

Although CBO's median estimate was informed by the results from the 11 most applicable studies, the information they provide about that median is uncertain, and

Table A-2.

Employment Elasticities for All Directly Affected Workers, by Study

Study	Short-Run Elasticities	Ratio of Long-Run to Short-Run Elasticities
Cengiz and others (2019)	0.4	1.0
Cengiz (2019)	0.3	1.0
Derenoncourt and Montialoux (2018)	0.2	1.0
Bailey, DiNardo, and Stuart (2018)	-0.1	2.0
Aaronson, French, and Sorkin (2018)	-0.2	2.0
Neumark, Schweitzer, and Wascher (2004)	-0.2	n.a.
CBO's Median Estimate	**-0.25**	**1.5**
Gopalan and others (2018)	-0.9	n.a.
Monras (2019)	-1.0	1.5
Meer and West (2015)	-1.2	1.7
Jardim and others (May 2018)	-1.7	n.a.
Clemens and Wither (2016)	-1.7	n.a.

Source: Congressional Budget Office.

The employment elasticity shown here is the ratio of the percentage change in employment of directly affected workers to the percentage change in those workers' wages mandated by an increase in the minimum wage. Directly affected workers are those whose hourly wage, in the absence of the change in the minimum wage, would range from just below the old minimum to the new, higher minimum. Mandated changes in wages exclude any changes that do not directly result from the change in the federal minimum wage (for example, changes in wages that occur because employers seek to maintain differentials in wages for employees in different positions).

An elasticity of zero implies that employment does not respond; a negative elasticity implies that employment falls with an increase in the minimum wage; and a positive elasticity implies that employment rises. As an example of how to interpret elasticities, an elasticity of −0.2 implies that a minimum-wage change that increased directly affected workers' wages by 10 percent would also reduce their employment by 2 percent.

Elasticities in this table apply to all directly affected workers, regardless of age.

The ratio of long-run to short-run elasticities could not be calculated in some instances—usually because a long-run elasticity was not available.

For full references, see Appendix B.

n.a. = not available.

14. CBO included one study focused on the restaurant industry because the agency determined that its findings might be relevant to most industries that employ affected workers; see Daniel Aaronson and others, "Industry Dynamics and the Minimum Wage: A Putty-Clay Approach," *International Economic Review*, vol. 59, no. 1 (February 2018), pp. 51–84, https://doi.org/10.1111/iere.12262. CBO did not include a study that examined most directly affected workers because the agency could not synthesize its findings on continued employment and hiring into one elasticity estimate; see Ekaterina Jardim and others, *Minimum Wage Increases, Wages, and Low-Wage Employment: Evidence from Seattle*, Working Paper 23532 (National Bureau of Economic Research, May 2018), www.nber.org/papers/w23532.

the agency's estimate reflects consideration of four additional factors. First, sensitivity analyses using resampling from the distribution of the 11 estimates in those studies suggested that the median might be higher if a study was added or subtracted from the set considered. For example, the elasticities from the 3 studies in the middle of the distribution of those 11 were –0.20, –0.20, and –0.90; if the middle value was removed, the median estimate would be –0.55. Second, as mentioned above, there is evidence of publication bias in the minimum-wage literature, suggesting that the published elasticities might systematically overstate the true elasticity. Third, several of the studies considered minimum-wage changes that were larger than the average historical change, which would probably cause their reported elasticities to be higher than average. Fourth, other research suggests that the adult elasticity is probably no higher than the teen elasticity, and a much larger literature has studied the teen elasticity.

CBO concluded that, for projecting effects in the future, its synthesis of the research findings would be more useful than a meta-analysis combining point estimates from studies weighted by their precision. CBO's approach allowed it to focus on the median estimate and to account for the four additional factors just discussed. In addition, in CBO's view, most of the uncertainty about the accuracy of estimates from various studies arises from uncertainty about study design and external validity—issues not readily addressed by precision-weighted meta-analytic methods—rather than from the statistical precision of their reported results.

Evidence on longer-run effects—applicable for three years after a given option was implemented—were available in only a subset of studies that CBO reviewed. To obtain a median estimate of the long-run elasticity that reflected studies both with and without long-run estimates, CBO first calculated the ratio of long-run to short-run elasticities for the subset of studies with both types of estimates. CBO again found considerable variation in the ratios of long-run to short-run elasticities, some as low as 1 (implying no difference between short- and long-run elasticities) and others as high as 2, with the median being 1.5. As with the short-run elasticities, CBO used resampling methods to gauge the methods' sensitivity to the inclusion of any given study; that analysis supported the use of a value of 1.5. CBO then obtained its median estimate of the long-run elasticity by applying that ratio to its median estimate of the short-run elasticity. That process led CBO to a median estimate of –0.38 for the long-run elasticity for all directly affected workers.

The direct elasticities in Table A-2 apply to all affected workers—both adults and teenagers. To estimate direct elasticities specifically for adults, CBO used the fact that the elasticity for all affected workers can be viewed as a weighted average of the teen and adult elasticities. After estimating the options' teen elasticities and the teen share of directly affected workers, as discussed above, CBO used that information to calculate estimates of the long- and-short-run direct elasticities for adults for each option. CBO's median estimates of the direct adult elasticity for 2025 were –0.27, –0.23, and –0.21 for the $15, $12, and $10 options, respectively.

Equation 1 above and the adjustment factors for adults can be used to calculate the type of elasticities familiar from the literature on teen employment. In this case, however, those elasticities relate the change in employment for all adults to the change in the minimum wage itself. (The conversion factors are much larger than those used for teenagers because a much smaller share of adults are affected.) Those adult elasticities for 2025 are –0.004, –0.004, and –0.003 for the $15, $12, and $10 options, respectively—less than one-tenth the size of the corresponding teen elasticities of –0.128, –0.111, and –0.100. (The elasticities that CBO used in its analysis differ from those in that they relate the employment change for directly affected workers to the change in those workers' wages.)

Uncertainty About the Estimates. There is considerable uncertainty about how the employment of either teens or adults responds to changes in the federal minimum wage. That uncertainty comes from three distinct sources. First, as noted in the discussion of adult direct elasticities above, findings on the subject vary widely. Many studies have found little or no effect of minimum wages on employment, but many others have found substantial reductions in employment. The variation across studies arises in part because comparing one state (or locality) to another requires that researchers make a number of decisions: What state (or localities) will serve as the basis for comparison? How will a researcher account for trends in employment and wages that were already occurring when the minimum wage increased? Does the researcher address the possibility that states consider how their economy is performing when choosing to raise their

minimum wages? And does the researcher consider that increases in the federal minimum wage mainly affect states that have chosen not to increase their minimum wage? Researchers have answered those questions in different ways, and those different answers lead to different results. CBO reviewed studies with a wide range of methods and findings in developing its own estimates of the teen and adult employment elasticities.

Second, there is uncertainty about how to best use studies of state and local minimum wages to inform estimates of elasticities under a national minimum-wage policy. The elasticity for state minimum wages might be higher than the national elasticity, for example, because employers can more easily shift employment across states than across nations. The state-level elasticity might be lower than the national elasticity, however, if nationwide employers are reluctant to change their business model—say, by deploying more capital and less labor—to best fit each of tens or even hundreds of state and local policies, even though they would do so in response to a national minimum wage. The literature has produced little convincing evidence on how state and local elasticities translate to national elasticities. Because of that uncertainty, CBO tended to place more weight on studies that examined how state-level employment is affected by changes to the federal minimum wage.

Third, as mentioned above, there is evidence of publication bias in the studies that CBO reviewed. Academic journals tend to publish studies that show statistically significant effects. Multiple researchers have found that this tendency has skewed the published literature toward concluding that an increase in the minimum wage reduces employment. CBO used that information to reduce its estimates of the elasticities for both teenagers and adults. There is considerable uncertainty, however, about how to account for publication bias when estimating employment elasticities, so CBO's adjustments for publication bias could be too big or too small.

To reflect those sources of uncertainty, CBO developed a range of elasticities relating the change in employment for all teenagers to the change in the minimum wage itself (that is, similar to those typically estimated in the literature) for each option (see Table A-1). In each case, that range covers two-thirds of what CBO estimates is the total range of possible outcomes for teen employment—including CBO's median estimate. For the $15 option, that range is from about zero to –0.255, with a median estimate of –0.128. For the $12 option, that range is from about zero to –0.222, with a median estimate of –0.111. For the $10 option, that range is from about zero to –0.201, with a median estimate of –0.100.

Regarding the elasticity for directly affected teenagers with respect to their own wage change, for the $15 option the range is from about zero to –1.658, with a median estimate of –0.829. For the $12 option, that range is from about zero to –1.442, with a median estimate of –0.721. And for the $10 option, that range is from about zero to –1.306, with a median estimate of –0.653. CBO incorporated those ranges of estimates into its calculations of the range of possible outcomes presented in the body of this report.

CBO addressed uncertainty about the direct elasticity for adults in a somewhat different fashion. The possibility of large negative elasticities led CBO to conclude that the range that would cover two-thirds of possible elasticities is asymmetric. For example, CBO estimates that there is a two-thirds chance that the employment elasticity for directly affected adults would range between about zero and –0.806 for the $15 option, with a median estimate of –0.269. CBO incorporated that range, along with its range of elasticities for teenagers, into its calculations of the range of possible outcomes presented in the body of this report.

How CBO Estimated Increases in the Wages of Directly Affected Workers

Taking its projection of wages in 2025 as a baseline, CBO calculated the wage increase required to bring each directly affected worker into compliance with the new minimum wage. CBO then used the increase and the baseline wage to calculate the percentage changes in directly affected workers' wages (before accounting for any reductions in employment). Under the $15 option, CBO projects average increases of 28 percent for directly affected teenagers and 19 percent for directly affected adults. The projected changes are smaller under the $12 option, amounting to increases of 17 percent for teenagers and 13 percent for adults. The projected changes are smaller still for the $10 option, amounting to increases of 7 percent for teenagers and 7 percent for adults. All those changes are much smaller than the percentage changes in the statutory minimum wage that would be

mandated by each option because most affected workers in 2025 would earn more than $7.25 under current law.

How CBO Estimated Effects on Overall Demand and Capital Accumulation

CBO examined two channels through which a higher minimum wage might affect the overall economy and, by extension, employment. The first macroeconomic feedback effect involves increases in overall demand. The second channel, which tends to work in the opposite direction, involves slowdowns in capital accumulation.

Overall Demand. Each of the options would shift, on net, income toward families with lower income. In the short run, that shift of income would increase overall demand because lower-income families spend a larger proportion of any additional income on goods and services than do families with higher incomes and higher savings rates. However, CBO projects that output will be near its maximum sustainable amount by 2025, which would limit the effect of greater overall demand on employment.[15] Moreover, an increase in demand under those conditions would create inflationary pressure, and CBO expects that the Federal Reserve would adjust short-term interest rates to prevent inflation from rising above the central bank's long-term goal. Those higher interest rates would offset the boost in overall demand that might otherwise result from the net shifts in income induced by the options. The effects of interest rate increases would probably lag behind the initial boost in overall demand. Thus, the effect on employment through the overall-demand channel would be strongest in the first few years after an option went into effect before being counteracted by monetary policy. However, even during that initial period, the effect of increased demand would be relatively small. For instance, CBO estimates that several thousand fewer workers would be jobless in 2022 under the $15 option because of the effect.

Capital Accumulation. The higher labor costs induced by the options would reduce businesses' use of labor, which would make capital—such as buildings, machines, and technology—less productive than it otherwise would be. That reduction in capital productivity would, in turn, slightly reduce the rate at which income was saved and transformed into buildings, machines, and other capital goods. Over time, reductions in capital would further reduce employment among workers at all wage levels. That effect on employment is already integrated into CBO's estimates of employment elasticities, so this channel would have no additional effect on employment. It would, however, diminish overall business income and, by extension, the incomes of families with income from businesses.

To estimate the magnitude of the effect through this channel, CBO used a general equilibrium model in which minimum-wage workers and other workers are imperfect substitutes for each other. CBO then examined how changes in labor income and profits stemming from an increase in the minimum wage affected the return to capital in that model. CBO estimated that the size of the effect of decreased business income would be roughly one-sixth that of each option's net effect on real gross domestic product. Accordingly, effects of that size were incorporated into the options' effects on family income.

Uncertainty About Macroeconomic Effects. As with other aspects of this analysis, there is considerable uncertainty about the precise size of the macroeconomic feedback effects. CBO developed a range of potential effects and identified the middle two-thirds of the distribution. To estimate the range of effects for the overall-demand channel, CBO formulated a range of possible outcomes for baseline overall demand in 2025 and then estimated how each of those possible outcomes would affect employment. The net effects through the channel were small but uniformly positive. CBO also estimated a range of employment effects for the capital-accumulation channel, but in all instances those effects were small.

How CBO Estimated Total Effects on Employment

CBO used the four estimates described above—the number of affected workers in 2025, the responsiveness of employment to changes in the minimum wage, the change in 2025 wages likely to be induced by the new minimum, and the size of any macroeconomic feedback effects—to estimate the overall effect of each option on employment.

The first step in that calculation for each option was to identify the set of workers directly affected by the option. The second step was to calculate the percentage change in each affected worker's hourly wage that would be required to bring it up to the new minimum. The third step was to assign each affected worker a probability of not being employed by multiplying his or her percentage

15. Congressional Budget Office, *The Budget and Economic Outlook: 2019 to 2029* (January 2019), www.cbo.gov/publication/54918.

wage change by the relevant option's employment elasticity. That probability varied considerably across workers (because their wage changes varied) and, to a lesser extent, across options. The total effect on employment for any option was obtained by summing those probabilities across all affected workers. (As a simplified example of such a calculation, suppose that there were 100 affected workers, each of whom would see a 10 percent increase in wages, and that the employment elasticity was –0.50. In that case, CBO would estimate that there would be 5 workers—that is, 100 workers × 0.10 × 0.50—who would be jobless as a result of the option.) Any changes in employment from the macroeconomic feedback effects were then added to that total.

CBO considered uncertainty about baseline wage growth and uncertainty about the elasticity of employment.[16] The agency estimated a range of outcomes for each of those factors and then used those ranges to calculate an overall range of possible employment outcomes for each option. To estimate a range of wage growth projections, CBO examined how rates of wage growth have varied over historical five-year periods. To estimate a range of employment elasticities, the agency used the likely ranges for teenagers and adults for each option that are discussed above as a basis. CBO then took independent, random draws from two uniform distributions. The first determined the percentile used from the wage growth range. The second determined the percentile used from the elasticity ranges. The agency then calculated the change in employment each combination would entail, repeating that process 1,000 times. The range of possible effects reported covers the middle two-thirds of the distribution of employment changes resulting from those 1,000 draws.

How CBO Estimated the Effects of the Options on Family Income

CBO analyzed the options' effects on family income using many of the steps used in its employment analysis. However, assessing the effects on family income required data on the joint distribution of wages and annual family income, the latter of which are unavailable in the monthly CPS (the data used to analyze the options' effects on employment). CBO therefore merged the effects on wages and employment estimated in the monthly CPS with information on family income and poverty from the March 2018 Annual Social and Economic Supplement (ASEC) of the CPS. The analysis proceeded in four steps: CBO first calculated hourly wages and family income in 2017, then used that distribution to project family income in 2025, then combined that with the estimates of the option's wage rate and employment effects in 2025, and finally examined the effects of the options on people across that 2025 income distribution.

How CBO Estimated the Joint Distribution of Hourly Wages and Family Income in 2017

CBO used the ASEC to measure before-tax family cash income, which the Census Bureau uses to measure poverty. That measure of income includes labor earnings, capital and business income, and other private sources of income, as well as cash transfers from the government.[17] It does not include noncash government transfers, such as benefits provided through the Supplemental Nutrition Assistance Program (SNAP), Medicaid, or Medicare, nor does it reflect the taxes people pay or the tax credits they receive, such as the earned income tax credit (EITC). Because the ASEC is a retrospective survey, the 2018 survey contains information on earnings, employment, and family income in 2017.

CBO also used the ASEC to estimate hourly wages in 2017. That analysis proceeded in several steps. First, hours worked per week were adjusted for measurement error as in CBO's analysis of employment, meaning that very high and very low numbers of reported hours were adjusted toward the mean hours reported in the survey. Second, hours worked during the year were calculated as the product of weeks worked and (adjusted) hours worked per week. Third, workers' hourly wages were calculated as their annual earnings divided by hours worked in 2017.[18] Finally, CBO adjusted calculations of workers' wages that were particularly low or high to correct for measurement error.

16. CBO concluded that sampling variability in the CPS and the level of state minimum wages in 2025 were sources of uncertainty but did not consider those factors when creating its range of possible outcomes.

17. Specifically, before-tax family cash income includes wage and salary earnings; pension or retirement income; income from self-employment, Temporary Assistance for Needy Families, Supplemental Security Income, Social Security, child support, unemployment compensation, workers' compensation, disability benefits, educational assistance, and financial assistance from outside the household; and other cash income.

18. CBO included observations for which the Census Bureau imputed annual earnings, the number of hours worked per week, or the number of weeks worked per year.

How CBO Projected the Joint Distribution of Hourly Wages and Family Income in 2025

CBO then adjusted the 2017 ASEC data to make it appropriate for an analysis of 2025 outcomes. First, CBO adjusted the sample to reflect the agency's forecast of population growth between 2017 and 2025, both as a whole and separately for groups defined by sex, age, education, race and ethnicity, and employment status. Second, CBO projected growth in the poverty threshold and in each of about 20 types of income. CBO projected earnings growth to be somewhat higher for the top 10 percent of earners than for the bottom 90 percent.

CBO then projected the joint distribution of hourly wages and family income in 2025 by grafting its estimates of the options' effects on wage rates and employment in 2025, which are discussed above, to its projections of income in 2025.

How CBO Estimated the Effects of Increases in the Minimum Wage on Family Income

The steps above produced a distribution of employment, earnings, and family income in 2025 under current law. CBO used that distribution and the estimated effects on employment and earnings described above to simulate the effect of a higher minimum wage on annual earnings, family income, and the number of people in poverty.

Changes in Workers' Annual Earnings. CBO considered a range of approaches to projecting earnings changes in the ASEC data. The most direct approach would be to calculate employment and earnings effects directly from the ASEC data, using the elasticities and methods the agency used in its employment analysis. However, the distribution of hourly wages in the ASEC is quite different from that in the monthly CPS, even after corrections for measurement error. That is in part because the ASEC is a retrospective survey about activity over the entire prior year, and respondents' reports of their labor market activity over that lengthy period are less accurate. Moreover, all wages in the ASEC data must be calculated—that is, hourly wages are calculated as annual earnings divided by annual hours worked—and calculated wages are less accurate than respondents' reported hourly wages in the monthly CPS. Whatever the cause of the differences between the distributions, applying the same methods to each would yield quite different employment effects. Because CBO views the monthly CPS as more reliable for projecting changes in employment and earnings, the agency relied on an alternative approach.

That approach was to take employment and earnings effects as estimated in the monthly CPS and graft them onto the ASEC data. In particular, CBO first divided workers in both the monthly CPS and the ASEC into groups based on wage percentiles. CBO then added each option's average effects on wages (including ripple effects for workers with wages near the new minimum) and employment for each wage percentile in the monthly CPS to the workers in the corresponding ASEC percentile. CBO matched percentiles of wages in the base year of both analyses—that is, 2018 wage percentiles in the employment analysis were matched to 2017 wage percentiles in the ASEC.

In the employment analysis, CBO also calculated ripple effects for workers with wages near the new minimum for use in the family income analysis. To estimate those ripple effects, CBO first calculated 50 percent of the change in each worker's applicable minimum—that is, the maximum of his or her federal, state, or local minimum wage. CBO then applied ripple effects to all workers whose wages were within a range of the new minimum plus or minus that amount. For workers whose baseline applicable minimum wage was $7.25, that amount would be 50 percent of $15.00 minus $7.25, or about $3.90; for workers whose baseline applicable minimum was $14.50, the amount would be $0.25. Ripple effects were applied to workers with wages between $11.10 and $18.90 in the first case and between $14.75 and $15.25 in the second case. Those ripple effects were presumed to start at zero, rise linearly to a peak at the new minimum, and then phase out as baseline wages reached the upper bound. The ripple effects were then added to any wage increase necessary to bring a worker's wages into compliance with the new higher minimum. Consistent with the analysis discussed above, those ripple effects did not change employment.

The average effects on employment and earnings for each wage percentile in the monthly CPS were then attached to workers in the same percentile in the ASEC. That is, the averages for the first percentile of the monthly CPS were assigned to each worker in the first percentile of the ASEC, and so forth. Finally, the averages in the ASEC were adjusted to account for differences in the number of hours worked in the two sources. At the end of this process, each worker in the ASEC was assigned an earnings increase (conditional on being employed) and a probability of being jobless that matched the analogous outcomes for workers in the same percentile of the monthly CPS.

CBO considered a range of methods for distributing weeks without a job across workers over the year. At one extreme, a relatively small group of workers might be jobless week after week and never benefit from higher wages. At the other extreme, a large group of workers might shuffle regularly in and out of employment, experiencing joblessness for short spells and also receiving higher wages during the weeks when they were employed. Rather than going to either extreme, CBO used its estimates of the distribution of durations of unemployment in 2018, obtained from the monthly CPS, to assign directly affected workers either no joblessness or a duration of joblessness that was randomly chosen from the 2018 distribution. Thus, some workers in CBO's model were out of work for nearly the entire year, whereas others were jobless for shorter—sometimes much shorter—periods of time.

Other Changes in Families' Annual Income. Earnings are not the only channel through which the options would affect family income. A higher minimum wage would also reduce income for business owners through reduced profits, reduce real income for everyone through higher prices, and alter some people's income through macroeconomic feedback effects.

Business owners' income would decline under all of the options—by $64 billion in 2025 under the $15 option, for example—because they would have to pay higher wages to the workers they retained. Research suggests, however, that business owners would be able to pass a substantial and, over time, increasing share of those cost increases on to consumers in the form of higher prices. In CBO's assessment, business owners would absorb 50 percent of the increase in labor costs in 2020, the year the higher minimum wages first took effect. The share absorbed by business owners would then fall by 5 percentage points each subsequent year, dropping to 25 percent by 2025. For the $15 option, that would translate to a loss of $16 billion (25 percent of $64 billion) among business owners in 2025. CBO allocated that income loss to households in proportion to their share of total business income (including dividends and interest income) reported in the ASEC.

Real income would fall slightly for all households precisely because employers would pass some of their higher costs on to consumers through higher prices. In CBO's analysis, the share of the cost increases absorbed by consumers would rise over time, starting at 50 percent in 2020 and increasing to 75 percent by 2025. Thus, by 2025 under the $15 option, the real income of all households would decrease by $48 billion (75 percent of $64 billion). CBO allocated that income reduction to households in proportion to their share of total income reported in the ASEC.

Those effects on the real income of business owners and consumers would be partially offset if a higher minimum wage improved workers' productivity. On the basis of its review of the limited literature on this topic, CBO projected that under each of the options, the productivity of retained low-wage workers would increase by 20 percent of the percentage increase in their earnings. So, for example, if an option increased a retained worker's hourly earnings by $1.00, then CBO concluded that the worker's hourly productivity would increase by $0.20. That productivity increase would offset 20 percent of the cost of the minimum-wage increase for employers, which would in turn reduce the effects of the minimum-wage increase on business income and prices.

Such productivity effects might occur through a variety of channels. High rates of worker turnover are a common feature of low-wage employers, whose entire workforce may turn over more than once a year. A higher minimum wage typically reduces employee turnover, largely because employees now view minimum-wage jobs as being more lucrative and less easy to replace. That reduced turnover lowers employers' costs of recruiting and training employees. Workers may also work harder or more efficiently when they have a higher-paying job, again in part because they view the job as more valuable and are therefore more inclined to keep it.

There are, however, reasons to believe that wage compression induced by a minimum wage increase could *reduce* productivity. Whereas under current law there would be a range of wages paid between $7.25 and $15, the $15 option would—absent ripple effects—equate the wages of all workers who would otherwise earn between $7.25 and $15. Ripple effects would add back a small fraction of the earlier variation, but the net effect would still be to greatly compress wages among low-wage workers. That compression could adversely affect productivity in two ways. First, workers whose wages under current law were close to the new minimum might resent the equalization of their wages with those of workers who previously made much less, and they might be less productive as a result. Second, wage compression reduces workers'

incentives to improve their skills and performance because it makes the wage benefits of those improvements smaller.

Because they would transfer income toward families with lower incomes, the options would increase overall demand and family income in the first few years after they were initially implemented, as described above. By 2025, however, CBO expects that the options' effects on family income through that channel would be eliminated, in part because the central bank would respond by boosting short-term interest rates. The options would also slightly reduce capital income, which would ultimately reduce the amount of capital deployed in the economy. Those effects are additive to the more direct effects on income discussed above and, in CBO's analysis, are distributed across families in proportion to each family's share of business income.

Changes in the Number of People in Poverty. CBO used its estimates of the change in income to project how many families would move into and out of poverty. The Census Bureau's poverty thresholds identify the income level below which families are classified as being in poverty, and the Census Bureau updates those thresholds annually for inflation in the consumer price index for urban consumers, or CPI-U. CBO projected that those thresholds would grow at the rate it forecasts for the CPI-U. Following the Census Bureau's official definition of poverty, CBO did not consider the effects of a minimum-wage increase on taxes, tax credits, or noncash transfer payments, even though some of those effects would partly offset the gain to families from a higher minimum wage. For example, workers whose wages increased would pay more payroll taxes (though they would later be eligible for more Social Security benefits), and some of their families would be eligible for less in noncash benefits, such as those provided by SNAP. The amount of the EITC received by workers in poor families would increase in some cases and decrease in others, depending on each worker's earnings and family income.

Uncertainty About the Estimates. There is considerable uncertainty about the effects of minimum-wage increases on family income. Some of the sources of uncertainty involve wage growth and the elasticity of employment—the same factors that drive uncertainty about the effects on employment. Yet there are additional sources of uncertainty about the options' effects on family income:

- The shares of labor costs that are passed on to consumers (in the form of higher prices) rather than absorbed by business owners (in the form of lower profits),
- The effect of higher wages on the productivity of retained workers, and
- The effect of a higher minimum wage on other people in low-wage workers' families. Some people might work fewer hours if a family member's earnings rose or more hours if that family member became jobless. Such responses would partially offset some of the options' effects on family income but are not incorporated into CBO's analysis.

How CBO's Approach Compares With Other Approaches

CBO projected the distribution of family income in 2025 and then estimated how a higher minimum wage would alter that distribution. CBO then estimated each option's effect on poverty by comparing families' poverty status under current law with their status under each option.[19]

An alternative approach is to estimate the historical correlation between the poverty rate and the minimum wage and to use that correlation to project a change in the poverty rate for a given change in the minimum wage. Some of the estimates produced by studies taking that approach imply that the $15 option would reduce poverty by more than CBO has estimated. (See Appendix B for examples of such studies.)

The two approaches may yield different results for several reasons. CBO might, for example, underestimate the minimum wage's effect on poor families' income, perhaps because the earnings of potentially affected workers would rise more than CBO expects. The minimum wage might also alter family structure—through increased marriage rates, for example—in ways that reduce the number of families in poverty. Such effects would be captured in the historical correlation approach but not in CBO's method. Alternatively, the effect on the number of people in poverty of a minimum-wage increase might change over time—for example, if the number of low-wage workers in families with income near the poverty

19. CBO's analysis of income focuses on family income, in part because that is how official poverty measures are determined. Some analysts, however, have focused on household income. CBO expects that using that alternative income measure would yield qualitatively similar results.

threshold varied from year to year. In that case, the correlation analysis might be less informative than CBO's simulation method. The correlation analysis might also be misleading if changes in the minimum wage tend to coincide with other events that affect poverty.

How CBO's Approach Differed From Its 2014 Analysis

In 2014, CBO analyzed other proposed changes to the federal minimum wage. CBO's current analysis addresses most of the same questions and follows, in general, most of the analytical steps the agency took in that earlier analysis. There are, however, some important differences.

Group-Specific Wage Forecasts

In its 2014 analysis, CBO projected changes in hourly wages under then-current law using its overall forecast for the growth rate of earnings and wages in the economy. In this analysis, CBO used recent historical data to project rates of wage growth separately for groups defined by sex, age, and education. Doing so had the effect of assigning less wage growth to workers near the bottom of the wage distribution. That, in turn, had the effect of increasing the number of workers projected to be affected by a higher minimum wage in future years.

Teen Employment Elasticities

The median estimates of the elasticities measuring the responsiveness of employment of all teenagers to a change in the minimum wage (those typically estimated in the literature) in the 2014 report were –0.10 for a $10.10 option and –0.075 for a $9 option, whereas the median estimates in the current report are –0.128, –0.111, and –0.100 for the $15, $12, and $10 options, respectively. The changes to the estimates were based partly on CBO's continued review of the literature, including work published since 2014, but mostly on changes in the characteristics of the options analyzed and the way in which the elasticities depend on those characteristics. The elasticity for a given option depends on the number of workers affected, the percentage increase in wages for affected workers required to bring employers into compliance, the time elapsed since the law was initially implemented, and whether or not the new minimum wage is indexed for wage growth. None of the options in either report are precisely the same on all of those dimensions, so the elasticities for each option vary accordingly.

Adult Employment Elasticities

In its 2014 analysis, CBO concluded that the elasticity for directly affected adult workers was one-third the size of the corresponding elasticity for teenagers. The agency's approach in 2014 was driven by the fact that there was little available research on elasticities for adults at the time. Research published since 2014 has provided additional evidence, however, which CBO incorporated into its current analysis. Those studies have typically attempted to identify adults (and teenagers) directly affected by minimum-wage changes by examining their wages before the changes occurred. Although the findings of those studies have varied substantially, most have indicated that the responsiveness of employment is more similar for teenagers and adults than CBO had previously expected. The median employment elasticities for directly affected adult workers (that is, the elasticity measuring the employment response of directly affected adult workers to the change in their own wage) used in the current report are –0.27 (for the $15 option), –0.23 (for the $12 option), and –0.21 (for the $10 option), each higher than those used in the earlier report: –0.15 (for the $10.10 option) and –0.11 (for the $9 option). In the 2014 report, the likely ranges for those elasticities were symmetric; in this report, they are not.

To further explain how CBO arrived at those different elasticities, consider the $10.10 option in the 2014 report and the $15 option in the current report. To get to the –0.15 elasticity for directly affected adults in 2014, CBO took its estimate of the responsiveness of the employment of all teens to a change in the minimum wage of –0.10, converted it to an elasticity measuring the employment response of directly affected teenagers to a change in their own wage of –0.45, and then multiplied that by 33 percent, its assessment of the ratio of adult to teen elasticities. By contrast, CBO developed its current estimate of the elasticity for directly affected adults with respect to a change in their own wage from its review of recent research, so its estimated elasticity of –0.27 was not the result of a corresponding conversion of a teen elasticity. CBO's adult elasticity of –0.27 is about one-third of its corresponding teen elasticity under the $15 option, as it was in 2014. Because adults account for roughly two-thirds of directly affected workers, that higher adult elasticity has a large impact on CBO's estimates of the options' effects on employment and family income.

Conversion Factors for Modifying Teen Elasticities

Most elasticities in the research literature relate percentage changes in the employment of all teen workers to percentage changes in the minimum wage. CBO deemed it more suitable to use elasticities that relate percentage changes in the employment of all directly affected teen workers to the percentage change in their wages induced by a minimum-wage increase. Because many teenagers would not be directly affected, and because wages for directly affected workers would change by less than the minimum wage itself, deriving those elasticities entails multiplying the elasticities from the research literature by a conversion factor. That conversion factor is the product of the inverse of the share of teenage workers who would be directly affected and the ratio of the change in the minimum wage to the change in wages induced by the minimum-wage increase.

Changes in both components drove CBO to use a different conversion factor in the current analysis than it used in 2014. In particular, CBO now estimates that, on average, historical minimum-wage changes have directly affected about a quarter of employed teenagers. Therefore, the first adjustment factor is about 4, whereas CBO's 2014 estimate of that factor was 3. And CBO now estimates that, on average, historical minimum-wage changes have been about 60 percent larger than the percentage changes in the wages of directly affected workers. Therefore, the second adjustment factor is now about 1.7, whereas CBO's 2014 estimate was 1.5. The net effect of these changes is to move the conversion factor from 4.5 in the 2014 analysis to 6.5 in this one.

Macroeconomic Effects

Estimates of macroeconomic effects are different than those in CBO's 2014 report for two reasons. First, CBO projects that the economy will be close to its maximum sustainable output in 2025, which would limit how much employment could be affected by changes in overall demand. Second, because the options examined here would take longer to go into effect than those in the 2014 report, the short-term effects of any boost to aggregate demand would have more time to dissipate. In the 2014 report, CBO estimated small increases in employment and income stemming from macroeconomic factors; in this report, those effects are negligible.

Projecting Changes in Wages and Employment in the Family Income Analysis

In its 2014 analysis, CBO used the ASEC data to calculate average hourly wages for all people who reported any earnings in the previous year. A challenge to that analysis was that the distributions of hourly wages in the monthly CPS and in the ASEC are quite different. Those differences arise in part because the ASEC does not record hourly wages directly and because, without some adjustment, the ASEC has a larger proportion of part-year workers than does the monthly CPS. Recognizing those differences, CBO adjusted the survey weights in the ASEC sample in its 2014 analysis to ensure that the reweighted number of affected workers in the ASEC was equal to the number of affected workers estimated from the monthly CPS. CBO then used the hourly wages in that reweighted ASEC sample to estimate the 2014 options' effects on earnings and employment.

In reviewing its methods for the current analysis, CBO concluded that, even with reweighting and other adjustments, there were still important differences between the hourly wage distributions in the ASEC and in the monthly CPS. CBO therefore estimated the earnings and employment effects separately for each percentile of the monthly CPS sample and then assigned those effects to the corresponding percentile of the ASEC wage distribution, taking care that the total earnings change in the ASEC summed to the total calculated from the monthly CPS. The earnings effects were distributed proportionally to each person within a percentile. The change in methods had no effect on CBO's analysis of employment, but in CBO's analysis of income, it modestly reduced the estimated effects on the number of people in poverty.

CBO also changed the way it apportioned durations of unemployment induced by the higher minimum wage. In its 2014 analysis, CBO estimated the effects of employment loss on low-wage workers by distributing the reduction in employment so that affected people worked, on average, about half as many weeks as they otherwise would have. CBO therefore lowered projected earnings by 50 percent for twice the number of people who would become jobless (rather than lowering earnings by 100 percent for precisely the number of people who would become jobless). The particular workers who experienced that half year of joblessness were randomly chosen from among the population of affected workers, with workers whose mandated wage increases were higher having a higher probability of selection. In the

present analysis, CBO randomly assigned jobless spells to affected workers so that the number of people who were jobless in any given week was equal to the number estimated in CBO's analysis of employment. However, those unemployment spells were themselves randomly chosen from the distribution of durations of unemployment that CBO estimated from the CPS. Some were longer than 26 weeks, but many were shorter. Spells lasting for 17 weeks or less account for about half of the projected unemployment among workers who are younger than 25 and did not complete high school.

APPENDIX

B

Research About the Effects of Minimum-Wage Increases

To develop its estimates of the effect of minimum-wage increases on employment and family income, the Congressional Budget Office drew on the following research.

Review Articles on Employment Effects

CBO examined the following review articles that synthesize information from many studies of the effects of the minimum wage on employment.

Analyses of Published Estimates of Employment Effects That Account for Journals' Tendency to Publish Studies Showing Significant Effects

Isaiah Andrews and Maximilian Kasy, *Identification of and Correction for Publication Bias*, Working Paper 23298 (National Bureau of Economic Research, March 2017), www.nber.org/papers/w23298.[1]

Paul Wolfson and Dale Belman, "15 Years of Research on U.S. Employment and the Minimum Wage," Working Paper 2705499 (Tuck School of Business, December 2016), http://dx.doi.org/10.2139/ssrn.2705499.[2]

Georgios Giotis and Michael Chletsos, "Is There Publication Selection Bias in Minimum Wage Research During the Five-Year Period From 2010 to 2014?" Discussion Paper 2015-58 (*Economics*, August 2015), https://tinyurl.com/y4kkv9z3.

Dale Belman and Paul Wolfson, "Does Employment Respond to the Minimum Wage? A Meta-analysis of Recent Studies From the New Minimum Wage Research," in *What Does the Minimum Wage Do?* (Upjohn Institute, 2014), https://research.upjohn.org/up_press/227/.

Hristos Doucouliagos and T.D. Stanley, "Publication Selection Bias in Minimum-Wage Research? A Meta-Regression Analysis," *British Journal of Industrial Relations*, vol. 47, no. 2 (June 2009), pp. 406–428, https://tinyurl.com/y6ks3gck.

David Card and Alan B. Krueger, "Time-Series Minimum-Wage Studies: A Meta-analysis," *American Economic Review*, vol. 85, no. 2 (May 1995), pp. 238–243, www.jstor.org/stable/2117925.

Reviews of Methods and Data Used to Estimate Effects on Employment

Sylvia Allegretto and others, "Credible Research Designs for Minimum Wage Studies: A Response to Neumark, Salas, and Wascher," *Industry and Labor Relations Review*, vol. 70, no. 3 (May 2017), pp. 559–592, https://doi.org/10.1177/0019793917692788.

Alan Manning, "The Elusive Employment Effect of the Minimum Wage," Discussion Paper 1428 (Center for Economic Performance, May 2016), http://eprints.lse.ac.uk/67646/1/dp1428.pdf (PDF, 270 KB).

David Neumark and William L. Wascher, "The Effects of Minimum Wages on Employment," *Federal Reserve Bank of San Francisco Economic Letter*, 2015-37 (December 21, 2015), https://tinyurl.com/y2mwxya6.

Reviews of Minimum-Wage Effects in Other Countries

Low Pay Commission, *National Minimum Wage: Low Pay Commission Report 2017* (November 2017), Chapter 2, pp. 45–101, https://tinyurl.com/y6xc4h4u.

1. For a newer version, see Isaiah Andrews and Maximilian Kasy, "Identification of and Correction for Publication Bias," *American Economic Review* (forthcoming), https://tinyurl.com/y6jbofxu.

2. For a newer version, see Paul Wolfson and Dale Belman, "15 Years of Research on U.S. Employment and the Minimum Wage," *Labour* (forthcoming).

David Neumark and William L. Wascher, *Minimum Wages* (MIT Press, 2008), http://mitpress.mit.edu/books/minimum-wages.[3]

Early Reviews of the Research Literature

Charles Brown, "Minimum Wages, Employment, and the Distribution of Income," in Orley C. Ashenfelter and David Card, eds., *Handbook of Labor Economics*, vol. 3, part B (Elsevier, 1999), pp. 2101–2163, http://tinyurl.com/mmkdrme.

Organisation for Economic Co-operation and Development, "Making the Most of the Minimum: Statutory Minimum Wages, Employment and Poverty," in *OECD Employment Outlook 1998—Towards an Employment-Centred Social Policy* (OECD Directorate for Labour and Social Affairs, June 1998), Chapter 2, pp. 31–79, http://tinyurl.com/q6rs9a2.

David Card and Alan B. Krueger, *Myth and Measurement: The New Economics of the Minimum Wage* (Princeton University Press, 1995), http://press.princeton.edu/titles/5632.html.

Charles Brown, Curtis Gilroy, and Andrew Kohen, "The Effect of the Minimum Wage on Employment and Unemployment," *Journal of Economic Literature*, vol. 20, no. 2 (June 1982), pp. 487–528, www.jstor.org/stable/2724487.

Original Research About Effects on Employment

CBO also considered the following original studies that are generally too recent to have been covered by the reviews listed above.

Studies Focused on Employment Among Teenagers

David Powell, *Synthetic Control Estimation Beyond Case Studies: Does the Minimum Wage Reduce Employment?* Working Paper WR-1142 (RAND Corporation, July 2017), www.rand.org/pubs/working_papers/WR1142.html.

Evan Totty, "The Effect of Minimum Wages on Employment: A Factor Model Approach," *Economic Inquiry*, vol. 55, no. 4 (October 2017), pp. 1712–1737, https://doi.org/10.1111/ecin.12472.

Arindrajit Dube, T. William Lester, and Michael Reich, "Minimum Wage Shocks, Employment Flows, and Labor Market Frictions," *Journal of Labor Economics*, vol. 34, no. 3 (July 2016), pp. 663–704, https://doi.org/10.1086/685449.

Saul D. Hoffman, "Employment Effects of the 2009 Minimum Wage Increase: New Evidence From State-Based Comparisons of Workers by Skill Level," *Berkeley Electronic Journal of Economic Analysis and Policy*, vol. 14, no. 3 (July 2014), pp. 695–721, http://dx.doi.org/10.1515/bejeap-2012-0004.

Laura Giuliano, "Minimum Wage Effects on Employment, Substitution, and the Teenage Labor Supply: Evidence From Personnel Data," *Journal of Labor Economics*, vol. 31, no. 1 (January 2013), pp. 155–194, http://dx.doi.org/10.1086/666921.

Sylvia A. Allegretto, Arindrajit Dube, and Michael Reich, "Do Minimum Wages Really Reduce Teen Employment? Accounting for Heterogeneity and Selectivity in State Panel Data," *Industrial Relations*, vol. 50, no. 2 (April 2011), pp. 205–240, http://dx.doi.org/10.1111/j.1468-232X.2011.00634.x.

Studies on the Influence of Different Economic Conditions

Joseph J. Sabia, "The Effect of Minimum Wages Over the Business Cycle," *Journal of Labor Research*, vol. 35, no. 3 (September 2014), pp. 227–245, https://doi.org/10.1007/s12122-014-9180-x.

John T. Addison, McKinley L. Blackburn, and Chad D. Cotti, "Minimum Wage Increases in a Recessionary Environment," *Labour Economics*, vol. 23 (August 2013), pp. 30–39, http://dx.doi.org/10.1016/j.labeco.2013.02.004.

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Studies Focused on Industries in Which Low Wages Are Prevalent

Jeffrey Clemens and Michael R. Strain, "The Short-Run Employment Effects of Recent Minimum Changes: Evidence From the American Community Survey," *Contemporary Economic Policy*, vol. 36, no. 4 (February 2018), pp. 711–722, https://tinyurl.com/yxe4s5z4.

Jonathan Meer and Jeremy West, "Effects of the Minimum Wage on Employment Dynamics," *Journal of Human Resources*, vol. 51, no. 2 (November 2016), pp. 500–522, https://tinyurl.com/yy64qdad.

David Neumark, J. M. Ian Salas, and William Wascher, "Revisiting the Minimum Wage Employment Debate: Throwing Out the Baby With the Bathwater," *Industrial and Labor Relations Review*, vol. 67, no. 3 (Spring 2014), pp. 608–648, www.jstor.org/stable/pdf/24369649.pdf (PDF, 2.1 MB).

William E. Even and David A. Macpherson, "The Effect of the Tipped Minimum Wage on Employees in the U.S. Restaurant Industry," *Southern Economic Journal*, vol. 80, no. 3 (January 2014), pp. 633–655, https://www.jstor.org/stable/23809644.

Arindrajit Dube, "Minimum Wages and Aggregate Job Growth: Causal Effect or Statistical Artifact?" Discussion Paper 7674 (Institute for the Study of Labor, October 2013), http://tinyurl.com/kx6t2yz.

John T. Addison, McKinley L. Blackburn, and Chad D. Cotti, "The Effect of Minimum Wages on Labour Market Outcomes: County-Level Estimates From the Restaurant-and-Bar Sector," *British Journal of Industrial Relations*, vol. 50, no. 3 (September 2012), pp. 412–435, http://tinyurl.com/ot9apya.

Arindrajit Dube, T. William Lester, and Michael Reich, "Minimum Wage Effects Across State Borders: Estimates Using Contiguous Counties," *Review of Economics and Statistics*, vol. 92, no. 4 (November 2010), pp. 945–964, http://dx.doi.org/10.1162/rest_a_00039.

Recent Studies of Locality-Specific Minimum Wages

Ekaterina Jardim and others, *Minimum Wage Increases, Wages, and Low-Wage Employment: Evidence From Seattle*, Working Paper 23532 (National Bureau of Economic Research, May 2018), www.nber.org/papers/w23532.

Sylvia Allegretto and others, "The New Wave of Local Minimum Wage Policies: Evidence From Six Cities," Center on Wage and Employment Dynamics (September 6, 2018), https://tinyurl.com/yy5rh6rm.

Studies Focused on Groups That Tend to Earn Low Wages

Arindrajit Dube, T. William Lester, and Michael Reich, "Minimum Wage Shocks, Employment Flows, and Labor Market Frictions," *Journal of Labor Economics*, vol. 34, no. 3 (July 2016), pp. 663–704, https://doi.org/10.1086/685449.

Joseph J. Sabia, Richard V. Burkhauser, and Benjamin Hansen, "Are the Effects of Minimum Wage Increases Always Small? New Evidence From a Case Study of New York State," *Industrial and Labor Relations Review*, vol. 65, no. 2 (April 2012), pp. 350–376, http://tinyurl.com/mn566b3.

David Neumark, "The Employment Effects of Minimum Wages: Evidence From a Prespecified Research Design," *Industrial Relations*, vol. 40, no. 1 (January 2001), pp. 121–144, http://dx.doi.org/10.1111/0019-8676.00199.

Richard V. Burkhauser, Kenneth A. Couch, and David C. Wittenburg, "Who Minimum Wage Increases Bite: An Analysis Using Monthly Data From the SIPP and the CPS," *Southern Economic Journal*, vol. 67, no. 1 (July 2000), pp. 16–40, www.jstor.org/stable/1061611.

Studies Focused on Most Affected Workers

Joan Monras, "Minimum Wages and Spatial Equilibrium: Theory and Evidence," *Journal of Labor Economics*, vol. 37, no. 3 (July 2019), pp. 853–904, https://doi.org/10.1086/702650.

Doruk Cengiz, "Seeing Beyond the Trees: Using Machine Learning to Estimate the Impact of Minimum Wages on Affected Individuals" (draft, University of Massachusetts, Amherst, January 2019), https://tinyurl.com/y2tpsouv (PDF, 6.4 MB).

Doruk Cengiz and others, *The Effect of Minimum Wages on Low-Wage Jobs: Evidence From the United States Using a Bunching Estimator*, Working Paper 25434 (National Bureau of Economic Research, January 2019), www.nber.org/papers/w25434.[4]

Martha J. Bailey, John DiNardo, and Bryan A. Stuart, "The Economic Impact of a High National Minimum Wage: Evidence From the 1966 Fair Labor Standards Act" (draft, Michigan University, December 2018), https://tinyurl.com/y6kkujz8 (PDF, 1.8 MB).

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Radhakrishnan Gopalan and others, "State Minimum Wage Changes and Employment: Evidence From One Million Hourly Wage Workers" (draft, Washington University in St. Louis, August 2018), https://tinyurl.com/yyhjsnrm.

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Daniel Aaronson and others, "Industry Dynamics and the Minimum Wage: A Putty-Clay Approach," *International Economic Review*, vol. 59, no. 1 (February 2018), pp. 51–84, https://doi.org/10.1111/iere.12262.

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Isaac Sorkin, "Are There Long-Run Effects of the Minimum Wage?" *Review of Economic Dynamics*, vol. 187, no. 2 (April 2015), pp. 306–333, https://doi.org/10.1016/j.red.2014.05.003.

Dale L. Belman and Paul Wolfson, "The Effect of Legislated Minimum Wage Increases on Employment and Hours: A Dynamic Analysis," *Labour*, vol. 24, no. 1 (March 2010), pp. 1–25, https://doi.org/10.1111/j.1467-9914.2010.00468.x.

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Peter Brummund and Michael R. Strain, "Does Employment Respond Differently to Minimum Wage Increases in the Presence of Inflation Indexing?" *Journal of Human Resources* (in press), http://dx.doi.org/10.3368/jhr.55.2.1216.8404R2.

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John J. Horton, *Price Floors and Employer Preferences: Evidence From a Minimum Wage Experiment*, Working Paper 6548 (Center for Economic Studies, July 2017), https://tinyurl.com/yyqcha7x.

Peter Harasztosi and Attila Lindner, "Who Pays for the Minimum Wage?" (draft, Joint Research Centre European Commission and University College London, March 2017), https://www.sole-jole.org/17708.pdf (PDF, 1.6 MB).[6]

Shanshan Liu, Thomas J. Hyclak, and Krishna Regmi, "Impact of the Minimum Wage on Youth Labor Markets," *Labour*, vol. 30, no. 1 (2016), pp. 18-37, http://dx.doi.org/10.1111/labr.12071.

Jeffrey Clemens, "The Low-Skilled Labor Market From 2002 to 2014: Measurement and Mechanisms" (unpublished manuscript, University of California, San Diego, March 2016), https://mpra.ub.uni-muenchen.de/75690/.

Research About Effects on Family Income

To develop its estimates of the effects of minimum-wage increases on family income, CBO drew on the following research.

Analyses of Effects on Family Income and the Poverty Rate

Joseph J. Sabia, Richard V. Burkhauser, and Taylor Mackay, "Minimum Cash Wages, Tipped Restaurant Workers, and Poverty," *Industrial Relations*, vol. 57, no.4 (October 2018), pp. 637–670, http://dx.doi.org/10.1111/irel.12215.

Arindrajit Dube, *Minimum Wages and the Distribution of Family Incomes*, Working Paper 25240 (National Bureau of Economic Research, November 2018), www.nber.org/papers/w25240.[7]

Kevin Rinz and John Voorheis, *The Distributional Effects of Minimum Wages: Evidence for Linked Survey and Administrative Data*, Working Paper 2018-02 (Center for Economic Studies, 2018), https://ideas.repec.org/p/cen/cpaper/2018-02.html.

Thomas MaCurdy, "How Effective Is the Minimum Wage at Supporting the Poor?" *Journal of Political Economy*, vol. 123, no. 2 (April 2015), pp. 497–545, https://doi.org/10.1086/679626.

Joseph J. Sabia and Robert B. Nielsen, "Minimum Wages, Poverty, and Material Hardship: New Evidence From the SIPP," *Review of Economics of the Household*, vol. 13, no. 1 (March 2015), http://dx.doi.org/10.1007/s11150-012-9171-8.

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Congressional Budget Office, *Response to a Request by Senator Grassley About the Effects of Increasing the Federal Minimum Wage Versus Expanding the Earned Income Tax Credit* (attachment to a letter to the Honorable Charles E. Grassley, January 9, 2007), www.cbo.gov/publication/18281.

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David R. Morgan and Kenneth Kickham, "Children in Poverty: Do State Policies Matter?" *Social Science Quarterly*, vol. 82, no. 3 (September 2001), pp. 478–493, http://dx.doi.org/10.1111/0038-4941.00037.

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John T. Addison and McKinley L. Blackburn, "Minimum Wages and Poverty," *Industrial and Labor Relations Review*, vol. 52, no. 3 (April 1999), pp. 393–409, www.jstor.org/stable/2525141.

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About This Document

This Congressional Budget Office report was prepared in response to interest expressed by a number of Members of Congress. In keeping with CBO's mandate to provide objective, impartial analysis, the report contains no recommendations.

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CBO continually seeks feedback to make its work as useful as possible. Please send any comments to communications@cbo.gov.

Phillip L. Swagel
Director
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