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By Rachel West and Michael Reich March 2014

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Introduction and summary

How do minimum wage policy increases affect enrollments and expenditures on means-tested public assistance programs? In this report we address this question for the case of the Supplemental Nutrition Assistance Program, or SNAP, formerly known as the food stamp program.

By definition, government spending on a means-tested program should decline as average earnings increase, insofar as benefit levels fall with increased earnings and insofar as the earnings increase makes some individuals ineligible for any benefits. Both of these conditions are satisfied in the case of the effect of minimum wages on SNAP benefits. SNAP benefits decline 30 cents for every $1 increase in family earnings and phase out entirely at about the federal poverty level.[1] Low-wage workers are disproportionately enrolled in SNAP. A minimum wage increase that lifts many families out of poverty should therefore reduce public expenditure on this program.

But the relationship may be more complex. If a minimum wage increase reduces employment, thereby adding to the number of unemployed, the number of SNAP recipients could increase. SNAP recipients who are unemployed, disabled, or retired will not be affected by a minimum wage increase. Conversely, if many SNAP recipients have earnings that already bring them close to becoming ineligible for the program, a minimum wage increase may have a very small effect on SNAP expenditures. The quantitative effect of minimum wages on SNAP spending is not self-evident. It requires a causal analysis.

In an era of historically low real federal minimum wage rates, rising income inequality, job-market stagnation, and contentious debate about government deficit spending, the possibility that a higher minimum wage may lead to increased or reduced public spending has great relevance to the public and to policymakers. This report presents an initial empirical analysis of the effects of minimum wage policy on SNAP participation and expenditures. We do so by exploiting more than two decades of variation in binding state and federal minimum wage changes in an econometric framework. Our future research will examine the effects on SNAP further and apply an analogous framework to two other public assistance spending programs: the Earned Income Tax Credit and Medicaid.

According to the finding in this report a 10 percent increase in the minimum wage reduces SNAP enrollment by between 2.4 percent and 3.2 percent and reduces program expenditures by an estimated 1.9 percent. Taking into account each state's 2014 minimum wage level, we apply these results to the legislative proposal put forward by Sen. Tom Harkin (D-IA) and Rep. George Miller (D-CA) to raise the federal minimum wage to $10.10 per hour.[2] Our results imply that the effects of the Harkin-Miller proposal on wage increases would reduce SNAP enrollments by between 7.5 percent and 8.7 percent (3.1 million to 3.6 million persons).* The total anticipated annual decrease in program expenditures is nearly $4.6 billion, or about 6 percent of current SNAP program expenditures.

Harkin-Miller proposes to index minimum wage levels in subsequent years to the consumer price index, or CPI. The minimum wage would then increase at the same rate as SNAP benefit and eligibility levels, which are also indexed to the CPI. Consequently, the savings over 10 years in 2014 dollars would be 10 times the one-year savings, for a total of approximately $46 billion.

Some of the reduction in SNAP program enrollment and expenditures would occur among workers making less than $10.10 per hour—those whose pay would be directly increased by the minimum wage law. Another part of the reduction would occur among workers currently earning between $10.10 and $11.50, who would also receive pay increases.[3]

Although a large number of studies have examined the impact of minimum wage increases on earnings and employment, the impact of such minimum wage policies on public assistance enrollments and expenditures remains an under-explored subject in the economic literature. Only a few studies discuss the relation between the minimum wage and government transfer spending, much less attempt to identify the causal effect of one upon the other. Professors Marianne Paige, Joanne Spetz, and Jane Millar find positive effects of minimum wage increases on welfare caseloads; as they state, however, their results vary considerably with different sample periods and assumptions about state trends.[4] Professors Marianne Bitler and Hilary Hoynes discuss the importance of SNAP as a safety net program, but they do not examine its relation to minimum wage policy.[5] Research economist Sylvia Allegretto and her University of California at Berkeley colleagues show that low-wage workers in general, and fast-food workers in particular, are much more likely to be SNAP recipients than all workers.[6]

Several studies have examined the relationship between the minimum wage and the Earned Income Tax Credit, or EITC. Professor David Neumark and William Wascher, a researcher at the Federal Reserve Board of Governors, find that a higher minimum wage increases EITC benefits for families in deep poverty, while reducing EITC benefits for some sub-groups.[7] Professors David Lee and Emmanuel Saez argue that the minimum wage and EITC are complementary policies, not substitutes.[8] The Congressional Budget Office, or CBO, argues that a minimum wage increase will not have a substantial effect on EITC spending,[9] while Professor Jesse Rothstein examines whether the positive effect of the EITC on female labor supply has lowered wages.[10] While these studies are of interest, the EITC is quite different from SNAP in having a substantial phase-in period in which EITC benefits increase, as well as a long phase-out period, with complete phase-out at an annual income of about $48,000 for a family of four, quite a bit above the reach of the minimum wage.[11]

Research by Professor Arindrajit Dube on the causal effect of the minimum wage on family poverty represents the study most related to the one at hand.[12] Dube finds that Harkin-Miller would raise about 4.6 million non-elderly Americans above the federal poverty level, or FPL. In contrast, when CBO uses a simple simulation method to address the same question, they find that Harkin-Miller would raise 900,000 people above FPL.[13] The difference between these two estimates highlights the importance of undertaking a causal analysis. The methods used in this paper are in many respects similar to Dube's. Moreover, since eligibility and benefit levels for programs such as SNAP and Medicaid are tied to the federal poverty level, Dube's findings have direct implications for this study. Nonetheless, this report appears to be the first study to examine the effects of the minimum wage on SNAP. In future work, we plan to undertake similar analyses for the EITC and Medicaid.

The report proceeds as follows:

- Section 1 provides background information on the federal minimum wage, state minimum wages, and the SNAP program.
- Section 2 describes our methods and data.
- Section 3 provides our main results, including a simulation of the effects of a Harkin-Miller minimum wage increase, and a state-by-state analysis.
- Section 4 presents our conclusions.

Further details are provided in a series of appendices.

***Correction, April 28, 2014:** This report incorrectly stated the potential reduction in SNAP enrollment from the Harkin-Miller proposal. The correct amount is 7.5 percent and 8.7 percent (3.1 million to 3.6 million persons), as stated in the report's tables.*

Background

The federal minimum wage

The federal minimum wage was last increased in July of 2009, nearly five years ago. During the past two decades, many states have passed legislation fixing the minimum wage at a higher level than the federal minimum. The maps in Figure 1 show that while states in every region of the United States have adopted higher minimum wages, they are not distributed randomly by geography. As shown in the 2013 study "Credible Research Designs for Minimum Wage Studies," by economists Sylvia Allegretto, Arindrajit Dube, Michael Reich, and Ben Zipperer, these states vary systematically from the other states by a number of characteristics that affect low-wage employment trends, but which are not themselves related to minimum wage policy.[14]

The nonrandom pattern of minimum wage adoption has important implications for obtaining unbiased estimates of minimum wages on employment. In particular, national panel studies that use state and time fixed effect models—such as a 1992 study by David Neumark and William Wascher—spuriously estimate negative employment effects. The reason for this result is uncovered using tests for pre-trends. These tests find that low-wage employment was already declining two years before minimum wages were implemented. By making a statistically large number of local comparisons that control for heterogeneity among states and by time eliminates this pre-trend. For this reason, we conduct similar tests for our SNAP outcomes and use model specifications that include local comparisons, as in the study cited above.

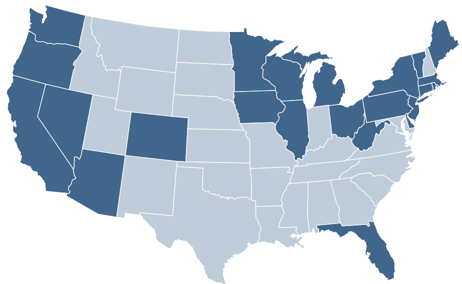
FIGURE 1

High versus low minimum wage states from 1990 to 2012

Means and variances

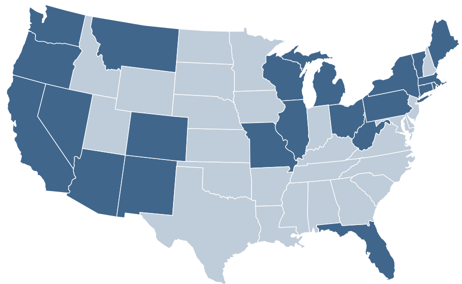
Average minimum wage over 1990–2012

- More than $5.33
- Less than or equal to $5.33



Minimum wage variance over 1990–2012

- More than $1.21
- Less than or equal to $1.21



Notes: State means and variances were calculated using annual state minimum wage data from 1990 to 2012. The shading on the maps partitions the states into above- and below-median values.

Source: Sylvia Allegretto and others, "Credible Research Designs for Minimum Wage Studies." Working Paper 148-13 (Institute for Research on Labor and Employment, 2013), available at http://www.irle.berkeley.edu/workingpapers/148-13.pdf.

The CBO recently projected that in 2016, 17 million workers will earn less than the $10.10 hourly wage proposed in the Harkin-Miller bill. Furthermore, the CBO estimates that an additional 8 million workers earned between $10.10 and $11.50 per hour and were also likely to experience a wage increase.[15]

Supplemental Nutrition Assistance Program

We focus our inquiry on SNAP. Benefits under the program are entirely federally funded; the program is administered by the U.S. Department of Agriculture, together with state agencies, which share in administration costs. Spending on SNAP has grown in the past decade, reaching $78 billion in 2011, with SNAP enrollment increasing to 45 million people, about one-seventh of the U.S. population.[16] According to the CBO, changes since 1990 in SNAP spending and enrollments are primarily the result of cyclical economic conditions, notably changes in the unemployment rate and changes in per capita income.[17] The 2009 American Recovery and Reinvestment Act temporarily increased SNAP benefit amounts by 13.6 percent; as reported by the U.S. Department of Agriculture's Food and Nutrition Service, these higher benefit levels expired on November 1, 2013.[18] The CBO estimates that about two-thirds of the changes in SNAP expenditure are associated with changes in the number of recipients and one-third with changes in the benefits received when recipients' incomes change.[19]

In fiscal year 2014, SNAP's maximum monthly benefits are $189 for a single individual, $497 for a family of three, and $750 for a family of five. Benefits are reduced by 30 cents per dollar received and phase out entirely at gross monthly household incomes of 130 percent of the federal poverty level: $1,245 for a single individual, $2,116 for a family of three, and $2,987 for a family of five. To determine benefits, SNAP also defines a net monthly income concept and sets benefits at 100 percent of the federal poverty level using this concept. Calculation of net monthly income can include certain deductions from monthly gross income such as medical expenses and child care costs. Although states are permitted some latitude on what deductions are allowed, in practice these vary by very small amounts. Our statistical model takes account of state-specific differences in benefits.[20]

SNAP imposes an employment or work-training requirement for able-bodied prime-age adults—those between the ages of 18 and 50 and without disabilities or dependent children. Such households can receive only three months of benefits in a three-year period. In recent years, about 85 percent of households receiving benefits have incomes below the federal poverty level; 49 percent have dependent children; 16 percent are age 60 or older; 20 percent are disabled; and 30 percent report some earned income.[21]

A 2012 CBO report also notes that take-up rates among eligible SNAP recipients average about 70 percent, with much lower take-up among elderly households. The take-up rate increases in harder economic times. It also increased when stigma issues were reduced as SNAP debit cards replaced actual food stamps. Take-up is especially high among those most needy. Administrative spending equaled 91 percent of the potential spending that would have occurred if all eligible recipients were enrolled. Although some SNAP policy changes have occurred since 1990, most were relatively minor and all were national in scope. The 1996 welfare reform bill eliminated SNAP eligibility for some legal immigrants, limited the time length of eligibility for able-bodied childless adults, and reduced maximum benefits. Some of these restrictions were relaxed in 2002 and again in the American Recovery and Reinvestment Act in 2009.[22]

Methods and data

As previously mentioned, we exploit variation in minimum wages by state and time to examine their causal effects on SNAP enrollments and expenditures. To do so, we merge data from 1990 through 2012 drawn from the Annual Social and Economic Supplement of the Current Population Survey—an annual Census Bureau survey, commonly known as the March CPS, that includes[23] information on SNAP enrollments at the family level—with state-level data on minimum wages, SNAP expenditures, population, unemployment rates, and state median income levels. To control for time-varying heterogeneity among states, our specifications include controls for state linear trends and effects by Census division and time. We estimate effects at two levels: allowing for family variation and allowing only for state-level variation. We also employ a set of standard demographic controls, such as family size and composition and race and ethnic composition.

Distinguishing causation from correlation

How can we ensure that our analysis does not pick up a spurious correlation, for example, the tendency of more economically vibrant states to implement higher minimum wages? Distinguishing correlation and policy endogeneity from true causal effects is the primary motivation for econometric analysis. In the ideal experiment, researchers would begin with two states—that are alike in every respect prior to the policy— and "treat" only one of these states with a higher minimum wage. They would attempt to shield these states from any influence that could obscure their understanding of the minimum wage's direct effect on SNAP enrollment. Researchers of course cannot conduct such experiments.

We can, however, use statistical methods to control simultaneously the independent effects on SNAP of state unemployment rates, state income levels, and common trajectories among states within the same Census division. By ensuring similarity along these dimensions, we maximize the likelihood that SNAP activity in two states would have comparable outcomes in the absence of a minimum wage policy change. Thus, if a new minimum wage policy were implemented in one state only, the researchers could attribute all of the difference they observe in SNAP activity to the new minimum wage policy.

In other words, we approximate the ideal experiment by using non-experimental statistical methods. The desirable "pre-existing similarities" between states that we have defined above inform our choice of control variables in a statistical setting. More precisely, in our multiple regression models, we use median family income, the unemployment rate, the employment-to-population ratio, and regional and time identifiers to construct an appropriate group of peers for each state on the eve of a policy change.

Data description

Two data sets include information about both income and participation in public programs. The Survey of Income and Program Participation, or SIPP, which is conducted in intermittent years, has the advantage of following the same individuals over a period of time. In other words, it is a longitudinal data set. It also has the advantage of containing monthly data. However, the sample size of the SIPP is not sufficient for analyzing variations in state-level minimum wages. The March CPS has the advantage of a much larger sample size, and it is conducted annually without any breaks in time. It has the disadvantage of being a cross-sectional data set, so we cannot follow the same individuals over time—strictly speaking, over more than one year. On net, the March CPS is much more suitable for our study. We examine the empirical relationship between minimum wage policy and food stamp activity at two levels of aggregation: the family level and the state level. Family-level data are drawn from the March CPS.

The March CPS comprises responses from the residents of 50,000 to 60,000 dwelling places surveyed per year and contains detailed information on the residents' employment and income, including income from transfer payments. The sample for our analysis comprises more than 1.28 million family units during the period from 1990 to 2012 (inclusive). Survey weights allow us to analyze SNAP participation in a manner that is representative of the U.S. population at large. Over all years, the share of families reporting food stamp receipt in the weighted March CPS sample is 9.1 percent. The enrollment rate was at a low of 6 percent in the year 2000. In 2012, the most recent year in our panel, 13.3 percent of families reported participating in SNAP at some point during the survey year.

The March CPS also collects information on the number of SNAP recipients in the household, the number of months the household receives SNAP benefits, and the cash-equivalent value of the SNAP benefits received. However, the value of SNAP benefits is severely underreported among recipients, perhaps because recipients are unaware of the exact monthly cash-equivalent value of benefits they receive.

Our first empirical strategy focuses solely on SNAP enrollment. By using the family as the unit of analysis, we are able to insert statistical controls to account for non-wage-related factors that influence any particular family's likelihood of program participation, with the intention of isolating any differences in program participation that are due purely to changes in wage policy. This approach identifies the effects of low-wage labor policy on the external margin—that is, the effect of the minimum wage on the likelihood that a family participates in the SNAP program at all—as opposed to the internal margin, or how much SNAP funding the family would receive.

Our second empirical framework uses state-level administrative data. That is, we aggregate the data to obtain a single data point for each state/year back to 1990, representing the mean of the outcome for the state. The state-level estimation serves as a robustness check on the family-level results for SNAP participation. Also, using aggregated data allows us to estimate directly the causal effect of minimum wage changes on SNAP spending. This is not possible at the family level: as discussed above, data on cash-equivalent value of food stamps for SNAP recipients is very frequently not reported in the March CPS, and when it is reported, the information may be unreliable. By contrast, the Bureau of Economic Analysis publishes aggregate SNAP spending at the state level in its National Income and Product Account, or NIPA, tables. Thus, while we are unable to observe the heterogeneity in the cash value of SNAP for families in each state, we are able to calculate average SNAP spending per resident in each state per year. Supporting covariates include the annual unemployment and employment data from the Bureau of Labor Statistics, or BLS, and state-level population series from the inter-decennial census releases. Minimum wage data are available from the BLS's wages and hours division. For state minimum wage changes enacted at other times than the first of the year, an average value for the year is used.

Family level model specifications

We first examine the effect of the minimum wage on participation in public assistance programs. For family i residing in state s and during year t, we estimate an equation of the following form:

$$Y_{\text{ist}} = \alpha + \beta_1 \log\left(MW_{st}\right) + \beta_2 X_{\text{st}} + \beta_3 Z_{\text{i}} + \gamma_{\text{s}} + \phi_{\text{dt}} + \delta_s * t + \varepsilon_{\text{ist}} \qquad (1)$$

Y_{ist} is a binary variable that is set equal to 1 if at least one member of family i received food stamps during the survey year. X_{st} is a set of state-level characteristics, including annual averages of the unemployment rate, the employment-to-population ratio, and the natural log of median family income. Z_i is a vector of family attributes, including indicators for the race and marital status of the family head, size of the family, the presence of children, and the presence of an adult male. State fixed effects are captured by γ_s. To control for time-varying heterogeneity, our preferred model specification also includes year fixed effects that vary by Census division (ϕ_{dt}) and state-level linear time trends $(\delta_s * t)$. In Appendix B, we justify the inclusion of these last two terms. We also compare the results from our preferred specification with less saturated specifications.

The effect of interest, which is captured by β_1, is the expected change in the probability of receiving SNAP benefits with respect to a change in the (log of the) binding minimum wage in state s during year t. We report robust standard errors, clustered at the state level. We estimate the parameters using linear regression, producing a linear probability model. Details of the model selection process are covered in Appendix B below.

State-level model specifications

The state-level models are similarly specified. For state s in year t, we assume that:

$$Y_{st} = \alpha + \beta_1 log(MW_{st}) + \beta_2 X_{st} + \gamma_s + \phi_{dt} + \delta_s * t + \varepsilon_{ist} \quad (2)$$

In this model, Y_{st} is now either the SNAP enrollment rate in state s during year t, or the natural logarithm of per capita SNAP expenditures in state s during year t. X_{st} is once again a set of state-level characteristics, including the same state-level covariates as in the family regressions (annual average unemployment rate, employment-to-population ratio, natural log of median family income), with the addition of family level characteristics averaged across the state (average family size and the shares of population constituted by each of five racial/ethnic groups). State fixed effects are represented by γ_S. As above, our preferred model specification includes year fixed effects that vary by Census division (ϕ_{dt}) and state-level linear time trends ($\delta_s * t$), as elaborated in Appendix B. The effect of interest is captured by β_1.

We estimate both state-level models (enrollment and expenditures) using ordinary least squares regression. Thus, the interpretation of the coefficient is no longer that of a change in probability, as in the binary outcome models described above. Rather, for the state-level SNAP enrollment model, β_1 represents the expected change (in percentage points) in the state's SNAP enrollment rate that is due to a 1 percent change in the minimum wage. For the SNAP expenditures model, β_1 is simply the elasticity of SNAP spending with respect to the minimum wage—that is, the percentage change in state expenditures expected to result from a 1 percent change in that state's minimum wage. For further details on model specification, refer to Appendix B below.

Results

Estimated minimum wage effects on SNAP enrollment and expenditures

Table 1 shows the estimated parameter of interest—the coefficient of the minimum wage for the preferred model of each type. Coefficients on the minimum wage variable are not directly comparable across models because all four models have a different functional form. To understand and compare these estimates, we compute the change in SNAP activity predicted for a particular wage scenario. The final column in Table 1 answers the question: What would be the expected change in SNAP activity in response to a 10 percent increase in the minimum wage? The answer to this question varies with the value of the input parameters; in the table, we calculate the percentage decrease in enrollment or expenditures predicted for the average state with a minimum wage of $7.25 in 2014. The state-level SNAP expenditure model, which is a constant-elasticity model, conveys elasticity information directly for the change in expenditures per capita in the state.

TABLE 1

Comparison of national SNAP predictions for a 10 percent increase in the federal minimum wage

Model	Level	Regression type	Predicted outcome		Coefficient of log (minimum wage) (Standard error)	Effect of a 10 percent increase in the minimum wage on:	
			Variable	Form of variable		Total enrollment	Total expenditures
1	Family	Linear probability	Enrollment	Binary (enrolled=1)	-0.042*** (0.008)	-3.17%	N/A
2	State	Linear regression (ordinary least squares)	Enrollment	State enrollment rate (percent)	-0.031*** (0.012)	-2.35%	N/A
3			Expenditures	Log (state expenditures per capita)	-0.190* (0.103)	N/A	-1.90%

* p<0.1, ** p<0.05, *** p<0.01

Note: Predicted changes are calculated for the average state with a minimum wage of $7.25 in 2014.

According to this model, a 10 percent increase in the minimum wage would result in a 1.9 percent reduction in SNAP expenditures. This result is reassuringly similar to Dube's result for poverty reduction. The two enrollment models are much more precisely estimated than the expenditure model. The state-level enrollment model finds that a 10 percent minimum wage increase in a low-wage state is associated with a 2.35 percent decrease in SNAP enrollments. The family-level linear probability model predicts a somewhat greater elasticity for low minimum wage states: an increase of 10 percent in the federal minimum would result in a 3.17 percent decline in SNAP enrollment.[24] The differences in these estimates stem from a number of factors, including difference in model functional form and data used. We treat this range of elasticity estimates as an upper and lower bound on enrollment impacts.

Harkin-Miller bill: National and state-level predicted impacts

What would be the predicted change for the SNAP program if the federal minimum were raised to $10.10, as proposed in the Harkin-Miller bill? In order to make this inference, we account for the fact that not all states are currently subject to the federal minimum wage; at the beginning of 2014, 21 states maintained higher minimum wages than $7.25. In those states, an increase in the federal minimum wage may or may not be binding for employers in the state, depending upon whether the new federal minimum exceeds the state-level minimum. But regardless of whether a minimum wage change is binding, the impact on SNAP activity will be lower in high minimum wage states. In order to account for this properly, we calculate state by state the percentage wage change that would result from the Harkin-Miller proposal and apply the parameters from each of the three models above to compute the expected decrease in SNAP activity for each state. In this exercise, we use states' current (2014) minimum wage levels and assume as a baseline the 2012 levels of SNAP enrollment and expenditure, as 2012 is the most recent year for which SNAP data are available.

Table 10 and Table 11 in Appendix C report the estimated effects on SNAP enrollment and expenditures, respectively, for each state under the Harkin-Miller bill.[25] An increase to $10.10, if enacted today, would represent between a 39.3 percent wage increase in a $7.25 minimum wage state and an 8.4 percent increase in Washington state, which has the highest minimum wage in the nation at $9.32, as of January 2014.[26] Slightly more than 56 percent of the decrease in expenditures and about 59 percent of the decrease in enrollment would occur in states with present-day minimum wages of $7.25.

In 2012, these states were home to 46 percent of the American population and accounted for a roughly equivalent percentage of total national SNAP expenditures. Not surprisingly, the largest enrollment decreases come from populous states with very high SNAP enrollment rates and/or very low minimum wages. The largest predicted enrollment reduction—between 319,000 individuals and 362,000 individuals—would occur in Texas, which has a $7.25 minimum wage. In California, which has a 20.6 percent SNAP participation rate and an $8 per hour minimum wage, we anticipate SNAP enrollment declines of 310,000 persons to 371,000 persons. And in Florida, which had a SNAP participation rate of 16.6 percent and a $7.93 minimum wage, enrollment could decline by between 164,000 individuals and 196,000 individuals. For the four states that together accounted for the greatest amount of SNAP spending in 2012—Texas, California, Florida, and New York respectively—the combined expenditure reduction from the Harkin-Miller bill is predicted to be $1.4 billion.

Table 2 summarizes the predicted declines in SNAP activity for the nation as a whole that would result from the direct and indirect effects of the Harkin-Miller bill. Enrollment would fall between 3.1 million persons and 3.6 million persons, representing 7.5 percent to 8.7 percent of current enrollment. The anticipated reduction in program expenditures would be nearly $4.6 billion, or 6.1 percent of program expenditures.

TABLE 2

Comparison of national SNAP predictions under the Harkin-Miller bill's $10.10 minimum wage

Model	Enrollment (persons)			Expenditures (millions of dollars)		
	Current (2012)	Predicted	Change	Current (2012)	Predicted	Change
Family enrollment (linear probability)	41,866,195	45,489,339	-3,623,144	$74,861	NA	NA
State enrollment (ordinary least squares)		38,745,435	-3,120,759		NA	NA
State expenditures (ordinary least squares)		NA	NA		$70,305	-$4,556

Note: Calculations use 2014 state minimum wages and the most recent SNAP data from 2012. They assume that per-enrollee expenditures remain constant.

There are, of course, other possibilities for minimum wage legislation. Table 3 shows the expected SNAP changes for the United States under a variety of wage scenarios, calculated using the state-level models. If states were not able to set their minimum wages independently, such that all states were constrained by the federal minimum of $7.25, SNAP would be received by about 514,000 more people across the United States at an additional program cost of nearly three-quarters of a billion dollars. In contrast, the effects of a higher minimum wage proposal—a federal wage floor of $11 per hour—would decrease enrollment in SNAP by more than 10 percent and decrease program costs by 8.3 percent.

TABLE 3

Summary of participation and expenditures under wage scenarios

If all states had minimum wages of:	Enrollment (persons)		Expenditures (millions of dollars)	
	Predicted	Change	Predicted	Change
Recent levels (2014)	41,866,195		$74,861	
$7.25	42,380,520	514,326	$75,604	$743
$8.00	41,423,919	-442,276	$74,209	-$652
$9.00	40,148,451	-1,717,744	$72,350	-$2,511
$10.00	38,872,982	-2,993,212	$70,490	-$4,371
$10.10	38,745,435	-3,120,759	$70,305	-$4,556
$11.00	37,597,514	-4,268,681	$68,631	-$6,230

Note: Calculations use state-level enrollment model coefficient.

Conclusion

An extensive body of literature examines employment effects of the minimum wage. A much smaller set of studies examines how the minimum wage affects poverty, and only a handful of papers examine the effects of the minimum wage on the EITC. Our analysis is the first to examine the effects of the minimum wage on SNAP.

Our findings indicate that increased earnings from minimum wage changes do reduce SNAP enrollments and expenditures. We estimate that the Harkin-Miller bill would save taxpayers nearly $4.6 billion per year, equivalent to 6.1 percent of SNAP expenditures in 2012, the last year for which data are available. Over a 10-year period, the estimated savings amount to nearly $46 billion.

Our report is subject to limitations that we expect to overcome in our future research. First, the findings do not take into account possible interactions among SNAP, the EITC, and Medicaid. The eligibility cutoffs among these programs are quite different, suggesting that such interactions may be minor. Nonetheless, the joint effects can only be determined by further research using a causal model. Second, it would be useful to know the distribution of SNAP reductions along the wage distribution. Using the Congressional Budget Office's calculations of how much the total dollar value of wage would increase under the Harkin-Miller proposal, our findings imply that the decline in overall SNAP spending equals about 15 percent of the total resulting increase in wages. The amount and distribution of this offset are of considerable interest. Minimum wage beneficiaries who come from working families already well above the poverty line would not see any offset, while those who are currently considerably below the poverty line will see larger offsets. These issues will also be a subject for our future research.

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Appendix A: Pre-trend falsification check

Recent minimum wage research[27] highlights a common flaw in previous studies: failure to verify that the outcome variable is free of negative pre-existing trends. If, for example, SNAP activity was already trending down in states that raised their minimum wages before these changes came into effect, our regression analysis could (mistakenly) attribute that reduction to the minimum wage. We check for such pre-trends by introducing variables that represent the prior year's value, or leads, of the minimum wage. If the model estimates the minimum wage to have an effect on the outcome variable before the wage change went into effect, then an unobserved factor, not the minimum wage change, caused the change in SNAP activity.

We test the specifications above for pre-trends by including a one-year lead in all three specifications. We find that the lead terms are small, positive, and not statistically significant, indicating that the concurrent minimum wage—not the wage level in prior periods—is driving the observed changes in SNAP outcomes.[28] In particular, the coefficient (standard error) on the lead term in our preferred family-level enrollment regression is .011 and not significant, while the coefficient and standard error of the contemporaneous minimum wage is unchanged. In the state-level preferred enrollment regression, the coefficient of the lead term is again small, (.07), and it is not significant. The corresponding coefficient on the lead term in the state-level expenditure regression is .16 and is not significant. The positive point estimates on these lead terms results not only rule out distorting negative pre-trends. They also suggest that our main results may underestimate the true effects.

Appendix B: Model selection process

For both the family-level and state-level models, we test three methods to control for unobserved geographic- and time-varying characteristics, as suggested by the minimum wage literature. First, we include only independent state-specific fixed effects and year-specific fixed effects. This specification (specification 1) implicitly assumes that families in any state constitute an equally good statistical "control" group for those in any randomly chosen state, after accounting for various characteristics (median income and unemployment rate, among others). Similarly, simple time fixed effects assume that families surveyed in any year can credibly serve as a control group for families surveyed in every other year of the sample (1990 through 2012).

In other words, specification 1 assumes that a state's immediate neighbor provides no better a counterfactual for the effect of a minimum wage change than does a state across the country. We relax this restrictive specification sequentially in two steps. In specification 2, we replace simple year fixed effects with fixed effects for each Census division/year (captured as an additional variable in the vector. By using division-year effects, we remove the restriction that families in each state are equally good statistical controls for all other families. Rather, we allow for the possibility that families in similar geographic regions (for example, the South, or the Northeast) may be more similar to one another than families farther away. Finally, in specification 3, we add state-specific linear time trends to the previous specification. Thus, specification 3 is the most rigorous model specification, in that it allows for heterogeneity along three dimensions. That is, specification 3 allows each state to have its own time-varying trends, rather than imposing the restriction that states evolve identically over the 22 years in the sample.

We begin building the theoretical specification above from a set of simple unconditional models: regression of SNAP activity (enrollment or expenditures) on the log of the minimum wage and a set of geographic- and time-specific effects (specifications 1, 2, and 3 described above). As shown in Tables 1–3 (for specification 3), we then add covariates sequentially to these models, including first the vector of family-level controls, followed by each of several state-level covariates in turn: the unemployment rate, log of median-family income, and the employment-to-population ratio. Comparable results for specifications 2 and 3 will be available in our forthcoming working paper.

As expected, the simple unconditional models indicate that the relationship between the minimum wage and SNAP enrollment, if one exists, is a more complex one, influenced by other factors: In the unconditional model, the coefficient on the variable of interest—the log of the minimum wage—is small in magnitude and not statistically different from zero. Once we account for the influence of labor market conditions and variation in income levels on program participation (by including unemployment rate and median-family income control variables, respectively), the effect of the minimum wage on SNAP enrollment is precisely estimated. The coefficient of the log minimum wage is slightly higher (-0.042) in the family-level analysis than the coefficient (-.031) in the state-level analysis. The level of precision is also higher in the family-level analysis. This is to be expected when using 1.24 million observations compared to 1,127.

The second dimension of model choice concerns the effect specification. Tables 7–9 compare the primary coefficients of interest for the SNAP enrollment and expenditure models. For both the enrollment models, the effect sizes are smallest for specification 1, largest for specification 2, and intermediate between these two in specification 3. Recall that Specification 3 contains state-specific linear time trends in addition to the census division/year controls included in specification 2. In the family-level enrollment model, the standard error of the minimum wage coefficient is smaller than in the other two specifications. Standard errors on the other variables are much smaller in specifications 2 and 3 than in specification 1. On the basis of coefficient significance (joint and individual), specifications 2 and 3 are strictly preferred in both enrollment models to specification 1, which contains only state and year fixed effects.

A concern with specifications 2 and 3 is that trend controls, such as state linear trends, may incorrectly absorb some of the delayed impact of a minimum wage. When we test this issue by including lagged minimum wages, we do not find that delayed effects are significant. Another concern is that more saturated models use less of the statistical variation, which could reduce the statistical power of the results. However, the standard errors for our more saturated models are not higher, and are lower in some cases, than for the less saturated models. Overall, this evidence supports our use of the saturated model as the preferred model specification. Moreover, Dube's 2013 study shows that more saturated models perform better than models with just state and time fixed effects.

The estimated enrollment regressions at both the family and state levels show large and statistically significant coefficients. The estimated minimum wage effect in the expenditures regressions—for which we have only state-level data—is also large and statistically significant.

We do not use weighted regression for the state-level models, preferring to keep analysis of the "treatment" (that is to say, a minimum wage change) appropriate to the average state rather than the average family or individual. If, instead, our primary interest were the impact of a minimum wage change on the average family or the average individual, we might choose to designate the number of families in each state or the state population, respectively, as analytic weights, in order to obtain a coefficient better suited for such inference.

TABLE 4

SNAP enrollment

Family-level, linear probability

	(3a)	(3b)	(3c)	(3d)	(3e)
Log minimum wage	-0.048***	-0.047***	-0.040***	-0.043***	-0.042***
	(0.013)	(0.013)	(0.01)	(0.008)	(0.009)
Unemployment rate (/100)			0.505***	0.420***	0.280***
			(0.083)	(0.086)	(0.082)
Log median income				-0.057***	-0.039***
				(0.011)	(0.011)
Employment-to-population ratio					-0.239***
					(0.038)
N	1,242,022	1,242,022	1,242,022	1,242,022	1,242,022

* p<0.1, ** p<0.05, *** p<0.01

Note: Robust standard errors are in parentheses. Observations are clustered at the state level. The outcome variable is binary and equal to one if a family is enrolled in SNAP. All models include state fixed effects, Census division x-year fixed effects, and state-specific linear time trends. All specifications except 3a include additional controls for family size, race and marital status of the family head, presence of children, and presence of an adult male.

Source: Annual data from the March Current Population Survey for 1990 to 2012; estimation includes Current Population Survey probability weights.

TABLE 5

SNAP enrollment

State-level, linear regression

	(3a)	(3b)	(3c)	(3d)	(3e)
Log minimum wage	-0.028**	-0.024*	-0.026**	-0.031**	-0.031**
	(0.014)	(0.013)	(0.013)	(0.012)	(0.012)
Unemployment rate (/100)		0.625***	0.466***	0.320***	0.339***
		(0.087)	(0.088)	(0.085)	(0.083)
Log median income			-0.090***	-0.065***	-0.061***
			(0.013)	(0.013)	(0.013)
Employment-to-population ratio				-0.282***	-0.248***
				(0.037)	(0.038)
N	1,127	1,127	1,127	1,127	1,127

* p<0.1, ** p<0.05, *** p<0.01

Note: Robust standard errors are in parentheses. The outcome variable is the SNAP enrollment rate. All models include state fixed effects, Census division x-year fixed effects, and state-specific linear time trends.

Source: Annual data from the March Current Population Survey for 1990 to 2012.

TABLE 6

SNAP expenditures

State-level, linear regression

	(3a)	(3b)	(3c)	(3d)	(3e)
Log minimum wage	-0.181	-0.149	-0.156	-0.153	-0.190*
	(0.11)	(0.103)	(0.102)	(0.103)	(0.103)
Unemployment rate (/100)		4.587***	4.152***	4.232***	4.313***
		(0.622)	(0.621)	(0.633)	(0.628)
Log median income			-0.246***	-0.261***	-0.294***
			(0.075)	(0.078)	(0.078)
Employment-to-population ratio				0.155	0.244
				(0.237)	(0.24)
N	1,127	1,127	1,127	1,127	1,127

* p<0.1, ** p<0.05, *** p<0.01

Note: Robust standard errors are in parentheses. The outcome variable is the natural log of state SNAP expenditures per capita for 1990 to 2012. All models include state fixed effects, Census division x-year fixed effects, and state-specific linear time trends.

Source: Annual data from Bureau of Economic Analysis national income and product accounts tables for 1990 to 2012.

TABLE 7

Comparison of specifications: SNAP enrollment

Family-level, linear probability

	(1)	(2)	(3)
Log minimum wage	-0.028*	-0.049***	-0.042***
	(0.014)	(0.017)	(0.009)
Unemployment rate (/100)	0.275*	0.297***	0.280***
	(0.161)	(0.076)	(0.082)
Log median income	-0.077***	-0.055***	-0.039***
	(0.014)	(0.012)	(0.011)
Employment-to-population ratio	-0.238***	-0.250***	-0.239***
	(0.054)	(0.04)	(0.038)
N	1,242,022	1,242,022	1,242,022
State fixed effects	Y	Y	Y
Year fixed effects	Y		
Division x-year fixed effects		Y	Y
State-specific linear trends			Y

* $p<0.1$, ** $p<0.05$, *** $p<0.01$

Note: Robust standard errors are in parentheses. Observations are clustered at the state level. The outcome variable is binary, or equal to one if a family is enrolled in SNAP. All specifications include additional controls for family size, race and marital status of the family head, presence of children, and presence of an adult male.

Source: Annual data from the March Current Population Survey for 1990 to 2012; estimation includes Current Population Survey probability weights.

TABLE 8

Comparison of specifications: SNAP enrollment

State-level, linear regression

	(1)	(2)	(3)
Log minimum wage	-0.019**	-0.035***	-0.031**
	(0.009)	(0.012)	(0.012)
Unemployment rate (/100)	0.401***	0.370***	0.339***
	(0.063)	(0.077)	(0.083)
Log median income	-0.081***	-0.073***	-0.061***
	(0.011)	(0.013)	(0.013)
Employment-to-population ratio	-0.183***	-0.222***	-0.248***
	(0.039)	(0.039)	(0.038)
N	1,127	1,127	1,127
State fixed effects	Y	Y	Y
Year fixed effects	Y		
Division x-year fixed effects		Y	Y
State-specific linear trends			Y

* p<0.1, ** p<0.05, *** p<0.01

Note: Robust standard errors are in parentheses. The outcome variable is the SNAP enrollment rate. All regressions include the share of households with children and the racial shares of the population.

Source: Annual data from the March Current Population Survey for 1990 to 2012.

TABLE 9

Comparison of specifications: SNAP expenditures

State-level, linear regression

	(1)	(2)	(3)
Log minimum wage	-0.121	-0.203**	-0.190*
	(0.075)	(0.103)	(0.103)
Unemployment rate (/100)	5.292***	5.152***	4.313***
	(0.464)	(0.576)	(0.628)
Log median income	-0.437***	-0.417***	-0.294***
	(0.08)	(0.086)	(0.078)
Employment-to-population ratio	-0.040	-0.220	0.244
	(0.261)	(0.260)	(0.240)
N	1,127	1,127	1,127
State fixed effects	Y	Y	Y
Year fixed effects	Y		
Division x-year fixed effects		Y	Y
State-specific linear trends			Y

* p<0.1, ** p<0.05, *** p<0.01

Note: Robust standard errors are in parentheses. The outcome variable is the natural log of state SNAP expenditures per capita. All regressions include the share of households with children and the racial shares of the state population.

Source: Annual data from Bureau of Economic Analysis national income and product accounts tables for 1990 to 2012.

Appendix C: Harkin-Miller policy simulation results

TABLE 10

SNAP enrollments: Predicted changes by state under the Harkin-Miller bill

State	Minimum wage (2014)	SNAP enrollment (2012)		Predicted change in SNAP enrollment		
		Rate	Total (persons)	Model 1 family enrollment (linear probability)	Model 2 state enrollment (linear regression)	Model 3 state expenditures (linear regression)
Alabama	$7.25	16.4%	788,682	-66,922	-58,897	-58,906
Alaska	$7.75	12.0%	87,436	-8,104	-6,887	-3,288
Arizona	$7.90	20.1%	1,319,323	-67,435	-56,738	-64,356
Arkansas	$7.25	7.8%	230,489	-40,977	-36,063	-35,248
California	$8.00	20.6%	7,813,680	-371,131	-310,222	-182,234
Colorado	$8.00	16.4%	853,155	-50,684	-42,365	-23,926
Connecticut	$8.70	9.1%	326,621	-22,456	-17,975	-13,711
Delaware	$7.25	18.6%	170,262	-12,739	-11,211	-10,647
District of Columbia	$8.25	13.3%	84,009	-5,370	-4,417	-3,632
Florida	$7.93	16.6%	3,208,026	-195,813	-164,426	-130,465
Georgia	$7.25	16.0%	1,586,336	-137,741	-121,224	-110,045
Hawaii	$7.25	9.6%	133,662	-19,310	-16,995	-14,933
Idaho	$7.25	9.2%	147,501	-22,165	-19,507	-15,809
Illinois	$8.25	9.5%	1,225,084	-109,088	-89,742	-70,955
Indiana	$7.25	12.5%	816,233	-90,818	-79,928	-83,985
Iowa	$7.25	15.5%	478,011	-42,716	-37,594	-28,556
Kansas	$7.25	13.5%	388,269	-40,082	-35,275	-27,461
Kentucky	$7.25	13.0%	568,821	-60,840	-53,544	-52,259
Louisiana	$7.25	14.9%	683,832	-63,929	-56,263	-66,083
Maine	$7.50	7.7%	101,976	-16,567	-14,323	-15,234
Maryland	$7.25	14.4%	846,415	-81,748	-71,946	-38,370
Massachusetts	$8.00	13.0%	864,721	-64,902	-54,251	-42,913
Michigan	$7.40	14.6%	1,439,141	-128,801	-112,140	-110,224
Minnesota	$7.25	13.3%	713,646	-74,730	-65,769	-37,878

State	Minimum wage (2014)	SNAP enrollment (2012)		Predicted change in SNAP enrollment		
		Rate	Total (persons)	Model 1 family enrollment (linear probability)	Model 2 state enrollment (linear regression)	Model 3 state expenditures (linear regression)
Mississippi	$7.25	12.9%	386,501	-41,486	-36,511	-46,467
Missouri	$7.50	17.2%	1,036,182	-75,131	-64,952	-56,244
Montana	$7.90	13.2%	132,452	-10,350	-8,708	-5,846
Nebraska	$7.25	12.4%	230,683	-25,773	-22,683	-12,189
Nevada	$8.25	16.2%	446,035	-23,349	-19,209	-11,894
New Hampshire	$7.25	12.7%	168,404	-18,359	-16,157	-5,735
New Jersey	$8.25	16.0%	1,416,666	-75,175	-61,843	-28,236
New Mexico	$7.50	14.9%	310,896	-25,983	-22,463	-22,512
New York	$8.00	19.2%	3,763,553	-191,193	-159,815	-142,182
North Carolina	$7.25	17.4%	1,697,193	-135,417	-119,179	-113,503
North Dakota	$7.25	8.7%	61,225	-9,743	-8,574	-4,021
Ohio	$7.95	14.3%	1,647,345	-115,869	-97,169	-88,580
Oklahoma	$7.25	12.9%	494,053	-53,006	-46,650	-46,854
Oregon	$9.10	12.4%	485,326	-17,036	-13,328	-16,398
Pennsylvania	$7.25	16.1%	2,053,643	-177,315	-156,052	-125,586
Rhode Island	$8.00	15.6%	163,730	-10,258	-8,574	-8,698
South Carolina	$7.25	9.4%	445,277	-65,614	-57,746	-50,304
South Dakota	$7.25	20.8%	173,749	-11,586	-10,197	-7,458
Tennessee	$7.25	14.2%	914,903	-89,667	-78,915	-99,134
Texas	$7.25	11.0%	2,863,779	-362,018	-318,607	-253,285
Utah	$7.25	8.8%	251,107	-39,658	-34,902	-19,390
Vermont	$8.73	15.6%	97,792	-3,823	-3,055	-2,475
Virginia	$7.25	10.1%	829,771	-113,723	-100,086	-58,212
Washington	$9.32	7.2%	496,934	-23,221	-17,947	-17,756
West Virginia	$7.25	5.8%	107,875	-25,792	-22,699	-21,665
Wisconsin	$7.25	7.5%	427,822	-79,521	-69,986	-53,210
Wyoming	$7.25	16.4%	94,590	-8,010	-7,050	-3,104

TABLE 11

SNAP expenditures: Predicted changes by state under the Harkin-Miller bill

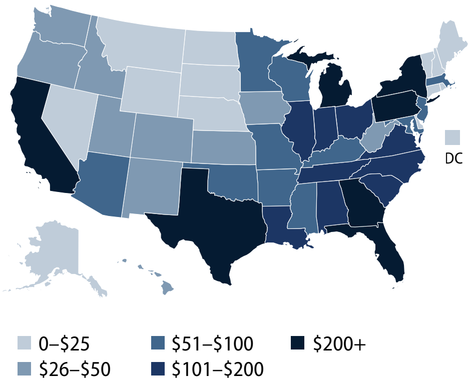
State	Minimum wage (2014)	SNAP expenditures (2012)		Predicted change in SNAP expenditures (millions of dollars)		
		Per resident (millions of dollars)	Total (millions of dollars)	Model 1 family enrollment (linear probability)	Model 2 state enrollment (linear regression)	Model 3 state expenditures (linear regression)
Alabama	$7.25	$290	$1,397	-$118.5	-$104.3	-$104.3
Alaska	$7.75	$253	$185	-$26.2	-$22.3	-$10.6
Arizona	$7.90	$257	$1,686	-$93.5	-$78.7	-$89.2
Arkansas	$7.25	$248	$733	-$63.6	-$56.0	-$54.7
California	$8.00	$189	$7,164	-$727.6	-$608.2	-$357.3
Colorado	$8.00	$157	$816	-$86.2	-$72.1	-$40.7
Connecticut	$8.70	$191	$686	-$34.3	-$27.5	-$21.0
Delaware	$7.25	$250	$229	-$20.5	-$18.0	-$17.1
District of Columbia	$8.25	$366	$232	-$14.6	-$12.0	-$9.9
Florida	$7.93	$294	$5,676	-$442.9	-$371.9	-$295.1
Georgia	$7.25	$317	$3,140	-$293.6	-$258.4	-$234.6
Hawaii	$7.25	$335	$465	-$44.9	-$39.5	-$34.7
Idaho	$7.25	$225	$359	-$37.6	-$33.1	-$26.8
Illinois	$8.25	$249	$3,200	-$209.6	-$172.5	-$136.4
Indiana	$7.25	$220	$1,439	-$116.2	-$102.3	-$107.5
Iowa	$7.25	$192	$589	-$65.8	-$57.9	-$44.0
Kansas	$7.25	$159	$460	-$50.2	-$44.1	-$34.4
Kentucky	$7.25	$298	$1,303	-$113.3	-$99.7	-$97.3
Louisiana	$7.25	$315	$1,450	-$104.7	-$92.2	-$108.3
Maine	$7.50	$281	$373	-$26.7	-$23.1	-$24.6
Maryland	$7.25	$188	$1,109	-$176.5	-$155.3	-$82.8
Massachusetts	$8.00	$206	$1,366	-$103.0	-$86.1	-$68.1
Michigan	$7.40	$300	$2,963	-$240.0	-$209.0	-$205.4
Minnesota	$7.25	$140	$755	-$111.3	-$98.0	-$56.4
Mississippi	$7.25	$326	$973	-$64.9	-$57.1	-$72.6
Missouri	$7.50	$241	$1,452	-$127.8	-$110.4	-$95.6
Montana	$7.90	$190	$191	-$17.9	-$15.1	-$10.1
Nebraska	$7.25	$140	$259	-$40.9	-$36.0	-$19.4
Nevada	$8.25	$191	$527	-$44.1	-$36.3	-$22.5
New Hampshire	$7.25	$126	$167	-$39.9	-$35.1	-$12.5

State	Minimum wage (2014)	SNAP expenditures (2012)		Predicted change in SNAP expenditures (millions of dollars)		
		Per resident (millions of dollars)	Total (millions of dollars)	Model 1 family enrollment (linear probability)	Model 2 state enrollment (linear regression)	Model 3 state expenditures (linear regression)
New Jersey	$8.25	$160	$1,420	-$161.1	-$132.5	-$60.5
New Mexico	$7.50	$324	$675	-$51.3	-$44.4	-$44.5
New York	$8.00	$287	$5,616	-$376.6	-$314.8	-$280.1
North Carolina	$7.25	$252	$2,454	-$218.7	-$192.5	-$183.3
North Dakota	$7.25	$128	$90	-$16.2	-$14.3	-$6.7
Ohio	$7.95	$259	$2,995	-$201.3	-$168.8	-$153.9
Oklahoma	$7.25	$248	$945	-$79.9	-$70.3	-$70.6
Oregon	$9.10	$322	$1,255	-$27.2	-$21.3	-$26.2
Pennsylvania	$7.25	$218	$2,779	-$293.0	-$257.9	-$207.5
Rhode Island	$8.00	$280	$294	-$17.3	-$14.4	-$14.7
South Carolina	$7.25	$291	$1,373	-$133.7	-$117.7	-$102.5
South Dakota	$7.25	$198	$165	-$19.2	-$16.9	-$12.3
Tennessee	$7.25	$324	$2,091	-$141.3	-$124.3	-$156.2
Texas	$7.25	$230	$5,997	-$640.2	-$563.4	-$447.9
Utah	$7.25	$141	$402	-$61.4	-$54.1	-$30.0
Vermont	$8.73	$230	$144	-$6.6	-$5.3	-$4.3
Virginia	$7.25	$173	$1,413	-$206.2	-$181.5	-$105.6
Washington	$9.32	$244	$1,682	-$35.0	-$27.0	-$26.7
West Virginia	$7.25	$273	$508	-$45.1	-$39.7	-$37.9
Wisconsin	$7.25	$204	$1,166	-$130.2	-$114.6	-$87.1
Wyoming	$7.25	$95	$55	-$10.5	-$9.3	-$4.1

FIGURE 2

Raising the minimum wage to $10.10 would cut taxpayer costs in every state

Predicted decreases in cost and enrollment in SNAP in 50 states



Endnotes

1 U.S. Department of Agriculture, "Supplemental Nutrition Assistance Program (SNAP)," available at http://www.fns.usda.gov/snap/eligibility (last accessed February 2014).

2 For this initial analysis, we do not consider Harkin-Miller's increase in subminimum wages for tipped workers. To do so would increase the estimated SNAP savings by an unknown amount.

3 The Congressional Budget Office estimates that workers currently earning between $10.10 and $11.50 per hour would see their wages rise under the Harkin-Miller proposal. Congressional Budget Office, "The Effects of a Minimum Wage Increase on Employment and Family Income" (2014).

4 Marianne Page, Joanne Spetz, and Jane Millar, "Does the Minimum Wage Affect Welfare Caseloads?", *Journal of Policy Analysis and Management* 24 (2) (2005): 273–295.

5 Marianne Bitler and Hilary Hoynes, "The More Things Change, the More They Stay the Same: The Safety Net, Living Arrangements, and Poverty in the Great Recession." NBER. Working Paper 19449, 2013.

6 Sylvia Allegretto and others, "Fast Food, Poverty Wages: The Public Cost of Low-Wage Jobs in the Fast-Food Industry" (Berkeley, California: Center for Labor Research and Education, 2013), available at http://laborcenter.berkeley.edu/publiccosts/fast_food_poverty_wage.

7 David Neumark and William Wascher, "Does a Higher Minimum Wage Enhance the Effectiveness of the Earned Income Tax Credit?", *Industrial and Labor Relations Review* 64 (4) (2011): 712–746.

8 David Lee and Emmanuel Saez, "Optimal Minimum Wage Policy in Competitive Labor Markets," *Journal of Public Economics* 96 (9) (2012): 739–749.

9 Congressional Budget Office, "The Effects of a Minimum Wage Increase on Employment and Family Income," February 2014.

10 Jesse Rothstein, "Is the EITC as Good as an NIT? Conditional Cash Transfers and Tax Incidence," *American Economic Journal: Economic Policy* 2 (1) (2010): 177–208.

11 Congressional Budget Office, "The Effects of a Minimum Wage Increase on Employment and Family Income."

12 Dube, Arindrajit. 2013. "Minimum Wages and the Distribution of Family Income." Unpublished working paper. Available at https://dl.dropboxusercontent.com/u/15038936/Dube_MinimumWagesFamilyIncomes.pdf.

13 As Dube explains in "The poverty of Minimum Wage Facts," the simulation approach underestimate stems from a number of unwarranted assumptions, including the range of actual wage increases and the accuracy of wage data in the Current Population Survey. The causal approach does not make these assumptions.

14 Allegretto, Sylvia, and others. 2013. "Credible Research Designs for Minimum Wage Studies." Working Paper 148-13. University of California, Berkeley: Institute for Research on Labor and Employment. Available at http://www.irle.berkeley.edu/workingpapers/148-13.pdf.

15 Congressional Budget Office, "The Effects of a Minimum Wage Increase on Employment and Family Income."

16 Congressional Budget Office, "The Supplemental Nutrition Assistance Program" (2012).

17 Ibid.

18 Ibid.

19 Congressional Budget Office, "The Supplemental Nutrition Assistance Program."

20 U.S. Department of Agriculture, "Supplemental Nutrition Assistance Program (SNAP)."

21 Congressional Budget Office,, "The Supplemental Nutrition Assistance Program."

22 Ibid.

23 We deviate from the Census Bureau's definition of a family unit, which is "two people or more (one of whom is the householder) related by birth, marriage, or adoption and residing together." U.S. Bureau of the Census, "Current Population Survey Definitions: Family," available at http://www.census.gov/cps/about/cpsdef.html (last accessed February 2014). We count as a family unit any individual residing on his or her own; two or more persons residing together who do not belong to a family in the March CPS sample are constructed as one family in our analysis. For the purposes of food stamp allocations, the consumption resulting from this transfer is probably distributed to family members (rather than household members or a single individual within the household). However, single individuals can—and do—receive SNAP benefits. Excluding them would fail to make the analysis reflective of the population at large.

24 Strictly, the family level linear probability model predicts the percentage-point decrease in the probability that an individual family will receive SNAP payments. When applied to a large number of families, however, we are able to interpret the coefficient as a decrease in the mean of enrollment—that is, a decrease in the enrollment rate—by applying the law of iterated expectations.

25 We generate expenditure predictions from the enrollment models—and, conversely, generate enrollment predictions from the expenditure model—by assuming that expenditures per enrolled family remains the same before and after the minimum wage change. In practice, this is likely to be a conservative estimate—that is, to underestimate the decrease in SNAP activity. Average SNAP benefits per family will also decrease as many families that remain eligible for SNAP experience income gains.

26 Wage and Hour Division, "Minimum Wage Laws in the States – January 1, 2014," available at http://www.dol.gov/whd/minwage/america.htm (last accessed February 2014).

27 See, for example, Sylvia Allegretto and others, "Credible Research Designs for Minimum Wage Studies." Working Paper 148-113 (Berkeley, California: Institute for Research on Labor and Employment, 2013), available at http://www.irle.berkeley.edu/workingpapers/148-13.pdf.

28 We will report these results in a forthcoming working paper.

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