The Redistributive Effects and Cost Effectiveness of Increasing the Federal Minimum Wage*

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Abstract

Simulation methods are applied to investigate the redistributive effects and cost effectiveness of the Fair Minimum Wage Act of 2007 (FMWA) and an additional hypothetical increase in the federal minimum wage to $9.50. The simulations make use of a large data set created by matching and merging the March CPS hierarchical files with the Earner Study files containing the best available information on wages, hours and earnings. Each of FMWA's three 70¢ increments in the minimum wage and the hypothetical rise of $2.25 are compared to two alternative policies – equiproportionate increases in the EITC and equiproportionate rebates of FICA taxes paid by low-income families. The redistributive effects of increasing the minimum wage and alternative policies with equivalent aggregate costs are evaluated using dominance methods. The cost effectiveness of raising the federal minimum wage is assessed by comparing its relative costs to EITC and FICA alternatives that achieve the same policy objective, which is defined and measured by reductions in the aggregate Sen Index of poverty.

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I. Introduction

For more than seven decades increasing the federal minimum wage has been the most widely used policy aimed at reducing poverty and improving the well-being of low-income families. The Fair Labor Standards Act of 1938 (P.L. 75-718) has been repeatedly amended to extend coverage and the nominal minimum wage has increased 22 times, rising from 25¢ per hour to $7.25. During most of these increases the conventional wisdom in economics maintained that government imposed wage floors actually made the poor worse-off and increases in the minimum wage only magnified the harm. Nobel Laureate George Stigler (1946) was an articulate proponent of the conventional view. Thirty years after his influential paper Stigler (1976) continued to believe that minimum wages reduced the well-being of the poor. Today, Neumark and Wascher (2008) adhere to the conventional wisdom asserting that there are no net reductions in poverty when the minimum wages rises. They argue (2008, p. 6-7) that the primary effect is to redistribute income among low income families and suggest that an increase in the minimum wage "may" cause poverty to rise.

The new minimum wage literature [Katz and Krueger (1992), Card (1992a, 1992b), Card, Katz and Krueger (1994), and Card and Krueger (1995)] arrived at two central conclusions that contradict the conventional wisdom. The first, relatively modest increases in the minimum wage have zero disemployment effects, remains controversial and is linked, in the minds of many, with the second conclusion, which asserts that minimum wage increases have small beneficial distributional effects on poor and low-income families. More recent work by Burkhauser, Couch and Wittenburg (1996), Neumark and Wascher (1994, 2001, 2004), Abowd et al. (2000), and Formby, Bishop and Kim (2005), hereafter (FBK), find that small disemployment effects almost certainly accompany even modest rises in the minimum wage. Furthermore, FBK (2005) provide evidence from simulation studies, which show that even the most extreme estimates of the disemployment effects do not completely offset the small income gains by families in the lower tail of the income distribution. Thus, the question of whether there are small gains, small

losses or simply redistributions at the bottom of the income distribution remains open. Moreover, there are additional questions of interest. Exactly how much do poor and other low-income families gain or lose? Exactly how are incomes redistributed? What do minimum wage increases cost?[1] How cost effective are minimum wage increases compared to alternative labor market policies aimed at improving the well-being of the poor and other low-income families? Are alternative equal cost labor market policies superior to the minimum wage in enhancing the overall well-being of American families?

This paper investigates these questions by applying improved simulation studies to analyze the poverty reducing effects, income redistributions and cost effectiveness of three alternative labor market policies. The principal focus and starting point for the analysis is the three 70¢ federal increases mandated by the Fair Minimum Wage Act of 2007 (FMWA). The analysis of the FMWA is extended to consider a hypothetical minimum wage of $9.50. The paper has three distinguishing features. First, successive increases in the federal minimum wage are applied to a unique data set created by matching and merging household, family and person records in the Annual Demographic File of the Current Population Survey (March CPS) with individual records in the annual Earner Study (Out Going Rotation Group) files of the Current Population Survey. The hierarchical March CPS files provide the best available data for studying the impacts of policies on poverty and the income distribution, while the Earner Study files contain the best information on worker's wages, hours and earnings. Second, the data are adjusted to reflect changes in state minimum wage laws across time and the FMWA mandated wage increases are applied to individual workers in the subset of states where the federal minimum wage is binding. The resulting increases in earnings are tracked to family incomes and aggregated. Thus, workers in states in which the federal minimum wage is nonbinding are unaffected, but poverty and income redistribution effects are evaluated using the entire national sample of approximately 56,000 families and 127,000 persons. Third, a number of alternative

[1] 1. There is also the question of how the costs are distributed, which depends upon the distribution of expenditures on goods and services that make use of minimum wage and near minimum wage workers. This paper considers aggregate costs, but does not investigate expenitures or the distribution of costs.

simulations are applied to the matched, merged and state minimum wage adjusted March CPS and Earner Study data.

We consider three general sets of disemployment effects and two distinct wage spillover or ripple effect regimes of rising minimum wages, which results in six different simulation scenarios. The three sets of disemployment effects ─ FBK's (2005) best estimates of adverse effects on specific groups of teenagers and young adults, zero disemployment effects of the sort asserted by the new minimum wage literature and FBK's (2005) extreme elasticities ─ turn out to be very similar. For this reason we focus on and report only the simulations based on the best estimates of disemployment effects. In contrast, the two sets of simulations incorporating different wage spillovers or ripple effects of increases in the minimum wage have dramatically different total policy costs, so we report results for both spillover regimes. The remainder of the paper is organized as follows. Section II provides a brief overview and discusses the simulation methodology. Section III describes the matched, merged and state minimum wage adjusted data. Section IV presents the empirical results. Section V summarizes major conclusions and briefly discusses the policy implications.

II. Overview and Methodology

To examine the redistributive effects and cost effectiveness of increasing the federal minimum wage we simulate the impacts of rising federal minimum wages and compare them to two alternative labor market policies that could have been adopted in lieu of the FMWA. Similarly, these policy alternatives could be used instead of mandating a further increase in the federal minimum wage to $9.50 as proposed by President Obama. Specifically, as an alternative to the minimum wage we consider equiproportionate increases in the Earned Income Tax Credit (EITC) and equiproportionate reductions in payroll (FICA) taxes paid by workers in low-income families. Mandatory increases in the federal minimum wage are the starting point for the analysis. We use the high quality microdata set, described in the next section, to identify workers eligible for federal minimum wage increases. Appropriate wage increases are then

awarded and the simulated gains in worker earnings are tracked to family incomes and poverty and other distributional impacts are then measured. It deserves emphasis that in analyzing poverty and the distribution of income we use the full sample for the 50 states and the District of Columbia. But the minimum wage is rising and wage spillovers are occurring in only the states in which the FMWA mandated increases are binding.

The redistributive effects of rising federal minimum wages and alternative labor market policies are analyzed using quintiles and the top five percent of comprehensive family incomes. To provide more information on redistributive effects in the bottom third of the income distribution we also consider three distinct groups of low-income families, which are identified using poverty lines set at 100%, 150% and 200% of the official US poverty threshold. Families with comprehensive incomes below 200% of the official threshold are referred to as *low-income*. The welfare implications of federal minimum wage increases and alternative labor market policies are evaluated using dominance comparisons of entire income distributions.

The cost effectiveness of the minimum wage vis-à-vis alternative labor market policies are evaluated using comprehensive (after taxes and after transfers) income and distribution sensitive Sen indexes of aggregate poverty. The Sen Index and most other measures of poverty require a set of thresholds that incorporate equivalence scales, which separate the poor from the nonpoor. We calculate Sen Indexes at three different poverty lines drawn at 100%, 150% and 200% of the official poverty threshold. Multiple poverty lines are analyzed for three reasons. First, since the work of Ruggles (1990) it is widely acknowledged that no one knows for sure exactly where to draw the poverty line either in terms of cash income, as in the official poverty statistics, or in terms of comprehensive income, which provides a far better measure of family well-being. Second, the different poverty lines and associated poverty measures allow us to gauge the sensitivity of different segments of the bottom tail of the family income distribution to changes in the federal minimum wage and alternative labor market policies. Third, as noted above, the different poverty lines are also used to segment the low-income population into three

groups to better understand the redistributive effects of alternative policies within roughly the bottom third of the income distribution.

To measure cost effectiveness we proceed as follows. For each FMWA mandated increase in the minimum wage and the hypothetical rise to $9.50, we calculate the costs of the policy and estimate its poverty reducing benefits. Given the reductions in poverty resulting from higher minimum wages we next simulate equiproportionate increases in the EITC and equiproportionate rebates of FICA taxes to workers in low-income families that *achieve the same poverty reducing benefits* as measured by the Sen Index. Finally, we estimate the associated cost of the change in the EITC and FICA policies required to bring about the same poverty reducing policy objective. By design the alternative policies have the same beneficial effects on poverty as the rise in the minimum wage. The ratios of the costs of alternative policies reveal the relative cost effectiveness of one policy vis-à-vis the other.

Reliably simulating the effects of the FMWA requires that three complicating factors be taken into account and incorporated into the methodology. These factors include: state minimum wage laws and nonbinding federal minimum wages, disemployment effects, and ripple or wage spillover effects of rising minimum wages. Each of these aspects of the simulation methodology is briefly explained in the remainder of this section.

State Minimum Wages. The federal minimum wage is typically not binding in all states because it is superseded by a higher, binding state minimum wage. In the period immediately preceding Stage 1 of the FMWA there was a crescendo of new state minimum wage laws and amendments to existing laws that resulted in the federal minimum being binding in only 20 of 51 states,[2] containing just over 30 percent of the U.S. population. The FMWA is binding in all three stages of the phase-in in 19 states. Figure 1 shows the lower tail of the wage distribution in the 19 states where the FMWA is binding in all three stages of the phase-in. Figure 2 shows comparable estimates for the U.S. as a whole. In Stage 2, the FMWA was binding in six

[2] 2. We analyze Washington DC as if it were a state. In 2006 and the first half of 2007 twenty seven states adopted new minimum wage laws or amended existing statutes that raised the minimum wage.

additional states and became nonbinding in one state. In Stage 3 the FMWA became binding in 10 more states. Furthermore, the marginally impacted states in Stages 2 and 3 received minimum wage increases (new federal minimum – state minimum) that were far below the 70¢ increment specified in the FMWA. In addition, a number of state laws were in place when the FMWA became effective (July 24, 2007) mandating future increases in state minimum wages during the phase-in period of the new federal minimum wage. Today, the federal minimum wage is nonbinding in 15 states containing approximately 30% of the U.S. population. Thus, the FMWA has a differential impact across time due to state minimum wage laws and changes in the binding and nonbinding effects of the federal minimum wage.

To incorporate the complications arising from state minimum wage laws into our simulations of the FMWA we proceed as follows. First, we use the state codes in the CPS to create subsamples of workers in the states in which the federal minimum wage is binding. We then identify the low-wage workers in the subset of states in which the federal minimum is binding and award each eligible worker a legally appropriate hourly wage increase. Second, we assume the state minimum wage laws prevailing in July 2007 remain unchanged as FMWA is phased in. Third, increases in state minimum wages in the period immediately prior to FMWA are used to adjust the data of low-wage workers in each state before simulating the initial effects of increasing the federal minimum wage. Finally, provisions in state laws mandating increases in minimum wages during the FMWA phase-in are simulated and assumed to take effect between Stages 1 and 2 and again between Stages 2 and 3.

Disemployment. Simple supply and demand analysis strongly suggests minimum wage increases lead inevitably to disemployment of some minimum wage workers. The EITC and FICA labor market policy alternatives are also likely to have some effects on employment, but the case is most clear and compelling for rising minimum wages. There is now wide agreement that the disemployment effects are small and, as noted above, the new minimum wage literature asserts that they are zero for relatively small minimum wage increases. However, the preponderance of the evidence suggests nonzero, but small elasticities. We follow FBK (2005)

and simulate several alternative sets of employment elasticities. Specifically, we simulate three wide ranging disemployment scenarios: the new minimum wage literature's zero elasticities, FBK's (2005) *best elasticity estimates* and FBK's (2005) extreme elasticity case.

As in our earlier work we find that in terms of redistributive effects it makes little difference which set of disemployment elasticities are used in the simulations. There are only small and non substantive differences in the extreme effects considered. Therefore, we report only the estimates based on FBK's (2005) best estimate of the relevant disemployment elasticities, which are summarized in the following tabulation.

	Negative Elasticities (Disemployment)						Positive Elasticities	
	Teenagers			Young Adults Aged 20-24			All Hispanic Workers (7)	nonHispanic High School Dropouts (8)
	White Males (1)	White Females (2)	Nonwhite & nonHispanic (3)	White Males (4)	White Females (5)	Nonwhite & nonHispanic (6)		
	-0.2	-0.3	-0.65	-0.1	-0.1	-0.3	0.05	0.05

Several additional points concerning disemployment effects are worth noting. We also use FBK's procedure for estimating the small reduction in spouse's hours worked when the EITC increase and FICA tax rebate policies are simulated.[3] All disemployment effects are modeled as a reduction in hours worked by individual workers or, in the case of the EITC and FICA alternatives, their spouses. Finally, the small positive elasticities for two groups in the best estimates suggest that rising minimum wages lead to a substitution of some low wage worker for those losing hours. This substitution is further discussed below.

Spillover or Ripple Effect Wage Increases. It is reasonable to expect increases in the minimum wage to affect workers whose wage rates are below and somewhat above the legal minimum. Gramlich (1976) was the first to argue that minimum increases would spillover and impact other low-wage workers who were not earning the exact minimum. Other researchers have referred to the spillovers as ripple effects and we distinguish between trickle-down effects, which raise the hourly pay of subminimum wage workers, and trickle-up effects that increase

[3] 3. These estimates are based upon the work of Eissa and Liebman (1996) and Eissa and Hoynes (1998). See FBK (2005) for further discussion.

wage rates of some low-paid workers earning more than the minimum. There is a compelling rationale for expecting a ripple effect as is made clear by the following simple model of low-wage labor markets. Suppose there are two classes of workers, minimum wage and near minimum wage workers. Further, employers can and will substitute among workers from the different classes depending upon relative wage rates and worker productivity. Competitive labor markets determine wage rates that reflect compensating differentials in labor productivity. Mandated increases in the minimum wage rate disturb the equilibriums prevailing in low-wage labor markets, which leads unequivocally to substitutions of near minimum wage workers for the now relatively more costly, but less productive, minimum wage workers. As a consequence, the demand for near minimum wage workers rises and their wages increase, which results in wage spillovers. In contrast, the demand for minimum wage workers decreases and disemployment occurs among minimum wage workers. Thus, wage ripple effects impacting near minimum wage workers and disemployment of minimum wage workers are linked as substitution effects and a new set of compensating wage differentials are incorporated into low-wage labor market equilibrium**.**

The theoretical scenario outlined above is both logical and consistent with FBK's (2005) best estimates of the employment and disemployment effects of rising minimum wages and the accompanying substitutions among workers that take place in low-wage labor markets as minimum wages rise. Furthermore, papers by DeNardo et al (1996) and Lee (1999) strongly suggest that minimum wage increases have important spillovers, but they do not investigate their magnitude. In addition, a comprehensive survey by Converse et al. (1981) following the 9.4% and 6.8% federal minimum wage increases of 1979 and 1980 revealed that 40 percent of all business establishments employing minimum wage workers reported paying higher wages to their workers earning above the minimum wage immediately following the change in the law. Thus, there is both a theoretical rationale and empirical evidence suggesting that spillover effects accompany rising minimum wages.

In an early minimum wage simulation Johnson and Browning (1981, 1983) devise a simple procedure for imputing the trickle-down wage increases accruing to sub-minimum wage workers. All such workers are awarded percentage increases equal to what minimum wage workers receive. While acknowledging that trickle-up spillovers are possible, Johnson and Browning argue they are problematical and do not attempt to simulate them. This paper uses two distinct wage spillover simulation scenarios and apply both to the mandated rise in the federal minimum wage in all three stages of the FMWA. The first procedure follows Johnson and Brown (1981, 1983) and applies their method of simulating trickle-down wage spillovers while ignoring trickle-up spillovers. The second uses Johnson and Browning's trickle-down simulation method and a new procedure for simulating trickle-up spillovers.

The difficulty in simulating trickle-up effects is in knowing their size, duration, how far out into the wage distribution they extend and how they dampen at higher wage rates and eventually peter out. We confine the trickle-up wage spillovers to the bottom quintile of the wage distribution. Based upon recent work by Wicks-Lim (2005) we assume the 13.6% minimum wage increase of Stage 1 the FMWA creates a ripple extending out to about the 15^{th} percentile. The 12% and 10.6% increases in Stage 2 and 3 of FMWA are assumed to create ripples extending out slightly further. To estimate individual worker's exact trickle-up wage increase and to model the dampening effect as the ripple fades out we estimate log linear wage distributions. Separate regressions passing through each state's minimum wage are estimated using the entire matched and merged data set. The procedure we use can be summarized as a four step process. In step 1, we fit a log-linear function to the bottom 15 percent of the wage distribution. To improve the fit of the regression we allow the percentile cut-off around 15 percent to vary until we maximize R^2. Using the bottom 15.47 percent of the wage distribution (workers with hourly wages below \$8.55) we obtain the following result:

$$E(wage) = 11.5152 + 1.6633 \log (F),$$

where F is the truncated c.d.f. and $R^2 = 0.994$.

In the second step, we use the intercept estimated from the overall log linear equation and fit separate regressions that pass through the new minimum wage of particular states, again using the entire dataset, not a state sub-sample. We note that at some point (in our case the 14.23th percentile) the actual wage is greater than the regressed wage and we call this point z. To estimate changes in an individual's wage we differentiate between workers with wages above and below point z. If the observed wage is less than or equal to z, the trickle-up wage increase is:

$$\Delta \textit{ wage} = \textit{simulated wage} - \textit{regressed wage.}$$

However, when the observed wage is greater than z the trickle-up increase is:

$$\Delta \textit{ wage} = \textit{simulated wage} - \textit{actual 2007 wage.}$$

Therefore our final value for the individual wage rate is: *Final wage* = *actual wage* + Δ *wage*. Using this procedure the trickle-up spillovers diminish monotonically and are zero at wages above $8.55 per hour.

In step 3 we repeat the trickle-up estimation procedures described above using the $6.55 FMWA minimum wage. In calculating the ripple effects accompanying the $6.55 FMWA minimum we employ the state minimum wages prevailing from July 2008 to July 2009. Further, in these estimations we allow the trickle-up effects to phase out (go to zero) at $8.85 per hour, which is at approximately the 17.5th percentile of the wage distribution. Finally, in step 4 we again repeat the estimation procedures using the $7.25 FMWA minimum wage. This step employs the state minimum wages scheduled to prevail in July 2009 and phases out the trickle-up spillovers at $9.25 per hour, which is at approximately the 20th percentile of the wage distribution.

III. The Matched and Merged March CPS and Earner Study Data

To our knowledge we are the first researchers to merge the Annual Demographic File (March CPS) with the Annual Outgoing Rotation Group (ORG) files, which are also referred to as the Earner Study files. We use the March 2007 CPS, which provides observations of family incomes in calendar year 2006, and match and merge it with the 2006 Earner Study (ORG) files

of the Current Population Survey. The resulting file provides a large and nationally representative data set that contains the best available information for evaluating the effects of a rising minimum wage on poverty and the distribution of income. In studying the impacts of the FMWA the matched and merged data set has all the advantages of both the March CPS and the Earner Study files. Furthermore, the merged file avoids the problems encountered if either the March CPS or Earner Study files alone are used to evaluate the effects on poverty and the distribution of income as the minimum wage increases. To match and merge the March CPS and Earner Study files we use Unicon Corporations CPS Utilities software Version 5.5. Specific files we merge are Unicon's March 2007 CPS, which is extracted from the Annual Social and Economic March Statistics, 1962-2007 and the 2006 Earner Study Outgoing Rotations, which is also extracted from the 1962-2007 file.

The tabulation immediately below shows the sample sizes of the original March CPS file and the matched and merged March CPS and ORG files for calendar year 2006. The original sample is households, but we include a count of families and persons because they are an integral part of our simulations and analysis. Note that the matched and merged data set contains approximately two thirds of the households and families in the March CPS and 62% of the individuals. The overall family sample size of the matched and merged data exceeds 55,000. To put this sample size in perspective we point out that it is larger than virtually all national income surveys of other countries and twice the size of most.

	Sample Sizes	
	March CPS	Matched & Merged March CPS and ORG Files
Households	75,477	50,815
Families	83,543	55,943
Persons	206,639	127,368

Three additional points concerning the matched and merged data warrant emphasis. First, in a manner consistent with our earlier work on poverty, income distributions and minimum wages (FBK 2005), we use microdata to define and analyze families in a somewhat

different manner than does the Census Bureau. The major difference is that our definition includes related subfamilies as a part of the primary family as long as they are within the same households. With the exceptions noted in the Appendix, unrelated subfamilies within a household are treated as separate families. Second, each of the wage and salary workers in the matched and merged data set has an *Earnwt* value, which means the wage rates, hours worked and earnings data have the same quality characteristics as the Earner Study statistics collected in the outgoing rotation group interviews. Third, to match and merge the March CPS and Earner Study data we began with the procedure suggested by Unicon Corporation's technical documentation, which suggests a relatively straightforward matching procedure. However, the Unicon procedure proved inadequate in deriving reliable matches between ORG person data and the hierarchical data files in the March CPS. After much experimentation we supplemented the Unicon procedure by requiring matches between race, gender, age and other variables in the two data sets. The Appendix provides additional details on the matching procedure.

IV. Results

We first report estimates of the effects of increases in the federal minimum wage on the lower tail of the wage distribution using five wage-rate classes, defined as follows: below $5.15 per hour, $5.15 to $5.85, $5.86 to $6.55, and $6.56 to $7.25 (the three phases of the minimum wage increase), and $7.26 to $9.50 (the upper end of the low-wage distribution). Using these wage classes Table 1 shows the distribution of low-wages and annual hours worked immediately before FMWA and after each of the three mandatory 70¢ federal increments. Table 1.b shows comparable results for the simulations that exclude trickle-up ripple effects. Table 1.b also shows the impacts of a hypothetical one-shot increase in the federal minimum wage from $7.25 to $9.50 per hour. This $2.25 per hour increase is not simulated for trickle-up wage spillovers because an increase of this magnitude extends beyond the bottom quintile of the wage distribution. Our estimation procedure for upward wage spillovers is believed to be reliable for the bottom tail of the wage distribution, but extending it to workers above the first quintile of the wage distribution appears problematic. During the two year phase-in period of the FMWA the

minimum wages of a number of states also increased and these too are simulated, but not reported. The increases required by state laws are assumed to occur between Stages 1 and 2 of FMWA and again between Stages 2 and 3. Thus, the required state increases affect the beginning values of each Stage in Table 1 to which the federal induced changes add.[4]

Table 1 clearly shows that the implementation of the FMWA raises average wages for low-income workers, while simultaneously generating disemployment effects that are modeled as a reduction in annual hours worked. The hours affects are small, averaging only five hours per year in Stage 1 and similar reductions in Stages 2 and 3. In no simulation do we find the negative hours effect to be sufficient to offset the gains in hourly wages, so annual earnings rise in all cases. Thus, federal minimum wage increases raise the earnings of low-wage workers and improves the well-being of low-income families. For example, in Stage 3 of the FMWA (Table 1.a) the minimum wage rises from $6.55 to $7.25 and workers in the $6.55 to $7.25 group receive an average wage increase of 37¢. The trickle-down effects to the lower groups are 28¢, 23¢, and 22¢, respectively. The trickle-up effect is 16¢. Thus, average low-wage worker gain 20¢ per hour in Stage 3. Moreover, the number of workers in the $7.25-$9.50 group grows by approximately 12 percent (2,246/19,076). While not shown in Table 1.a, all low-wage workers (those in states where the federal minimum is binding and those in which it is nonbinding) receive an average increase in annual earnings of $306 or 2.5 percent.

It is now generally well understood that there is no strong connection between hourly wage rates of low-paid workers and the well-being of low-income families.[5] The principle reason for this is that many low-income families do not contain a low-wage worker. Table 2 provides evidence from the matched and merged March CPS and Earner Study files on numbers

[4] 4. In reviewing this table the reader should keep in mind that several dynamics are taking place simultaneously. Not only is the minimum wage increase and associated wage spillovers pushing some workers into higher wage classes, the successive 70¢ increments are causing more states (and workers) to be marginally impacted. In addition, state required increases in the minimum wage are reflected in the initial values (starting points) for Stages 2 and 3.

[5] 5. Stigler (1946) was the first to emphasize this point. It has also been stressed by Burkhauser, Couch and Wittenburg (1996) and FBK (2005).

and proportions of low-income families and all families with at least one low-wage worker. Table 2.a shows the results for trickle-up and trickle-down wage spillovers, while Table 2.b shows the impacts of only trickle-down wage spillovers. Column 3 of Table 2.a. shows that 4.4 percent of all families and 6.2 percent of low-income families are affected by the first stage of the FMWA. These numbers expand in stages 2 and 3, but after the FMWA is fully implemented more than 85% of low-income families remain unaffected by the three successive 70¢ minimum wage increases and the accompanying wage spillovers. Table 2.b shows that the numbers are even smaller when in the trickle-up ripple effect is excluded from the simulations. After the FMWA is fully phased in more than 96% of low-income families are unaffected in Table 2.b. The hypothetical $2.25 increase in the federal minimum wage to $9.50, which is assumed to be binding in all states, leaves 91% of low-income families unaffected. These findings have implications that warrant emphasis: *for most, but not all, poor and low-income families there is little relationship between low incomes and low-wage work*.

Table 3 shows the redistributive effects of increases in the federal minimum wage and makes comparisons to two alternative equal cost labor market policies that provide equiproportionate increases in EITC benefits and equiproportionate rebates of FICA taxes. Table 3.a provides results for simulations including both trickle-up and trickle-down ripple effects and Table 3.b shows the impacts of trickle-down wage spillovers only. These tables show clearly that minimum wage increases perform relatively poorly compared to the EITC and FICA alternatives in delivering redistributive benefits to low-income families. However, the small benefits are positive not negative, which goes against the conventional wisdom and supports one of the major conclusions of the new minimum wage literature.

The policy alternatives we consider are simulated as *equal cost*, but by design the EITC and FICA tax rebates are targeted on low-income families. In contrast, the minimum wage policy is targeted on low-wage workers. For example the FICA rebates go only to workers in low-income families, so all benefits flow to the bottom two quintiles of families and are zero

above the second quintile. Likewise, the EITC is targeted for the most part to families in the bottom two quintiles, with only small amounts spilling over into the higher quintiles. Since many low-wage workers belong to families that are not low-income, much of the benefits of the minimum wage accrue to upper quintile families. For example, in Table 3.a the $23 average benefit in Stage 1 of the FMWA received by the third quintile from the minimum wage increase is greater than the average cost of the policy ($20). Clearly, our simulations verify the now widely accepted conclusion that the minimum wage is not "well-targeted."

The redistributions in Table 3 can be used to address Neumark and Wascher's (NW's) claims that minimum wage increases result in no net gains at the bottom of the income distribution and that the primary effect is to redistribute income among low-income families. Contrary to the no net gain assertion, Table 3 shows small increases in comprehensive family income for each subgroup within the low-income population. This is the case in each stage of the FMWA, the hypothetical increase from $7.25 to $9.50 and all simulation scenarios that we consider. The easiest way to investigate the argument that the primary effect is to redistribute income among low-income families is to use the income distribution before the minimum wage increase and the income gains shown in Table 3 to construct the Lorenz curve (LC) and concentration curves (CC) of minimum wage benefits.[6] Figure 3 shows the results for all stages of the FMWA combined. Note that the CC of minimum wage benefits (i.e., income gains) lies *uniformly above and to the left* of the LC, which means minimum wage increases are unambiguously income equalizing. We find similar results for each minimum wage increase and all simulation scenarios we consider. NW's (2008) claim concerning the major effects of minimum wage would require CC to lay below the LC or that CC and LC cross in the income range of the lower tail of the distribution. Thus, evidence from simulation studies is opposite of what would be required to support NW's redistribution claim.

[6] 6. CC shows the cumulative shares of a variable of interest (e.g., minimum wage benefits) *with families arrayed by income before the policy change*. Conceptually, CC can lie above, below or the cross associated LC and multiple intersections are possible. The actual location of CC vis-à-vis LC is an empirical question.

Since all of the simulations we consider are applied to the same initial income distribution the redistributive effects in Table 3 show the marginal impacts of alternative equal cost labor market policies on the distribution of family incomes. It is now generally agreed that dominance principles provide the most general method of assessing the welfare implications of income distributions and redistributions.[7] First order dominance (FOD), also referred to as rank dominance, assumes only anonymity and that larger incomes are preferred to smaller. Distributions and redistributions that cannot be ranked using FOD may be ranked using second order dominance (SOD), which requires an additional and stronger assumption, referred to as the Pigou-Dalton principle of transfers. SOD is equivalent to so called Generalized Lorenz (GL) dominance. Furthermore, SOD and GL dominance are equivalent to ordinary Lorenz dominance (LD) when the means of the distributions and redistributions being compared are the same. When the means are unequal LD shows comparisons of inequality.

Table 4 summarizes the dominance rankings of income redistributions accompanying increases in the federal minimum wage by making pairwise comparisons to redistributions of equal cost EITC and FICA alternatives. Columns 1 and 2 show the results for simulations that include both trickle-up and trickle-down wage spillovers and columns 3 and 4 show comparable results for simulations with only trickle-down ripple effects. As expected, we find none of the redistributions can be ranked using First Order Dominance. This is the case because the minimum wage delivers relatively small benefits to families at the bottom of the income distribution and relatively larger benefits to families in the upper quintiles, while the reverse is true for the equal EITC and FICA alternatives. Thus, the quantile functions cross. However, using Second Order Dominance (Generalized Lorenz) and ordinary Lorenz dominance the EITC dominates the minimum wage in all comparisons (column 1) in the simulations that include trickle-up spillovers. With the exception of Stage 1 of the FMWA this is also the case for the simulations that include only trickle-down wage spillovers (column 3). The results are less clear

[7] 7. Dominance ranking principles are very general. For a more detailed explanation of applications to income distributions, see Bishop, Formby and Thistle (1992) and Bishop and Formby (1994). For proofs of the original theorems see Saposnik (1981, 1983) and Shorrocks (1983).

in comparisons of the minimum wage and the FICA alternative. In the simulations that include both trickle-up and trickle-down ripple effects (column 2) the FICA policy dominates in terms of SOD and LD except in Stage 1 of the FMWA. In contrast, in simulations that exclude trickle-up spillovers, FICA is dominant only in Stage 3 of FMWA, while GL and Lorenz crossings occur in Stage 1, Stage 2 and all stages of FMWA combined.

Dominance analysis of the hypothetical one-shot $2.25 per hour increase in the federal minimum wage is limited to simulations that include only trickle-down wage spillovers. This is the case because the $9.50 minimum wage extends beyond the bottom quintile of the wage earners (see Figures 1 and 2 and Table 1) and our trickle-up estimation procedure is problematic in this range of the wage distribution. Moreover, the costs of the $9.50 minimum wage is so large, even with zero trickle-up spillovers, that an equal cost FICA tax rebate policy is not possible. Equal aggregate costs would require FICA rebates that exceed 100% of the taxes paid by workers in low-income families. Therefore, equal cost FOD and SOD (GL) dominance comparisons are not possible. With these caveats, we find (Table 4, column 3) both second order (GL) dominance and ordinary Lorenz dominance of the equal cost EITC policy compared to the $9.50 federal minimum wage in the trickle-down only simulations.[8]

To analyze the cost effectiveness of raising the federal minimum wage we first estimate the poverty reducing effects and aggregate costs of FMWA and a hypothetical $9.50 minimum, which is assumed to be binding in all states. Table 5 presents these results and compares them to alternative EITC and FICA labor market policies that achieve the *same* reductions in aggregate poverty as measured by Sen's (1976) distribution sensitive index. The Sen index is defined as $S = H\{I + (1-I)Gp[q/(q+1)]\}$, where H is the headcount poverty ratio, I is the ratio of the average income compared to the poverty line (hereafter referred to as the income gap ratio), G_p is the Gini coefficient of income inequality among the poor, and q is the number of people below the

8. Table 4 (column 4) also reports Lorenz dominance of the FICA policy over the $9.50 minimum wage. However, due to differences in aggregate costs and associated mean benefit values such dominance has no welfare implications.

poverty threshold. There are several striking features of Table 5. First, the poverty reducing effects of FMWA, while not zero, are extremely small irrespective of exactly where the poverty line is drawn. In each stage of the FMWA, both simulation scenarios and all three poverty lines, the reduction in the Sen index never exceeds 0.6 of one percent. Across all stages of the FMWA combined the largest simulated reduction in the Sen Index is 1.5 percent (Table 5.a at the 150 percent poverty line), but is less than one percent at the official poverty line in both Table 5.a and 5.b. Second, the trickle-up wage spillovers add marginally to the small poverty reducing effects of the FMWA, but more than double the aggregate costs. Third, the hypothetical $9.50 minimum wage (Table 5.b) is quite costly. Increasing the federal minimum wage from $7.25 to $9.50 is more than seven times more costly than all stages of the FMWA combined. Finally, compared to the final stage of FMWA, the hypothetical $9.50 federal minimum wage reduces the Sen Index of poverty by 3.3 to 3.9 percent depending upon the poverty line, but at a cost of $43.5 billion. This latter result suggests that extending the federal minimum wage beyond $7.25 may be subject to decreasing returns and rising costs in fighting poverty. The larger the federal minimum wage, the lower is the return in aggregate poverty reduction per dollar spent to bring about the mandatory higher minimum wages.

Columns 4 and 5 of Table 5 show the aggregate costs of the EITC and FICA policy alternatives that achieve the same reductions in the Sen Index of poverty as the increases in the federal minimum wage. Inspection of columns 3, 4 and 5 reveals that equiproportionate increases in the EITC is clearly the low cost poverty reducing alternative. Table 6 normalizes the aggregate costs and shows relative cost effectiveness ratios. For each poverty line the low cost EITC policy is set equal to 1.0. The minimum wage and FICA cost effectiveness ratios show how much more costly it is to achieve the same poverty reduction compared to the low-cost policy alternative. The results show that the EITC policy is more cost effective in reducing poverty than raising the minimum wage at every poverty line considered and in both simulation scenarios. While raising the minimum wage is consistently the least cost effective policy, its

degree of cost effectiveness varies depending on the stage of the FMWA and the poverty line. Inspection of the cost effectiveness ratios reveals that the FMWA is relatively more effective, i.e., less ineffective, in Stage 1 when the poverty line is set at 150% of the official level (ratios 1.73 with trickle-up spillovers and 1.42 without). In contrast, its relative ineffectiveness is greatest for the hypothetical $9.50 minimum wage also at 150% poverty line (ratio = 2.9). Examining all stages of the FMWA combined; we conclude that reducing poverty by raising the minimum wage "costs" roughly twice as much as reducing poverty using the ETIC. Furthermore, for all stages of the FMWA combined he FICA tax rebate policy dominates the FMWA in terms of cost effectiveness. Column 4 shows that the poverty reductions achieved by the hypothetical one-shot $2.25 increase in the minimum wage to $9.50 are 2.5 to 2.9 times more costly than the EITC alternative. Finally, we note the FICA tax rebate policy is consistently less cost effective than the EITC, but more cost effective than increasing the minimum wage.

V. Conclusions and Policy Implications

Simulation studies are applied to a unique dataset to evaluate the redistributive effects, aggregate costs, and cost effectiveness of increases in the federal minimum wage. The principal focus is on the three successive 70¢ per hour increases mandated by the Fair Minimum Wage Act (FMWA) of 2007, but a hypothetical one-shot $2.25 increase in the federal minimum wage to $9.50 is also analyzed. The results of two different simulations with distinct minimum wage ripple effects or wage spillovers are reported. The first simulation scenario estimates and incorporates wage spillovers accruing to both subminimum wage workers (a trickle-down wage ripple) and to low-wage workers earning slightly more than the federal minimum (a trickle-up wage ripple). The second simulation includes only downward wage spillovers on workers earning subminimum wages.[9] All simulations include two alternative labor market policies that could have been adopted in lieu of raising the federal minimum wage ─ an increase in EITC

[9] 9. We do not consider upward wage spillovers in analyzing the hypothetical $9.50 minimum wage. As explained above, a $9.50 minimum wage added on top of the FMWA increases takes us well beyond the bottom quintile of the wage distribution observed in the matched, merged and state minimum wage adjusted 2006 data that we use in this study. We have less confidence in estimating upward wage spillovers of rising minimum wages as we go beyond the lower-tail of the wage distribution, which we define as the bottom quintile of wage rates.

subsidies and a rebate of FICA payroll taxes. Further, two versions of the alternative policies are considered. The first version takes the aggregate costs of the FMWA as a given and simulates equal cost EITC and FICA policy alternatives. The equal cost simulations are used to measure the redistributive effects of alternative labor market policies. The second version takes the poverty reducing effects of the federal minimum wage as a given and simulates what it would cost to accomplish the same poverty reduction using the EITC and FICA policy alternatives. These simulations are used to measure the relative cost effectiveness of raising the federal minimum wage vis-à-vis the EITC and FICA alternatives.

A number of major conclusions emerge from the analysis. First, the matched, merged and state minimum wage adjusted March CPS and Earner Study data confirms that for most, but not all, poor and low-income families there is little relationship between poverty and low-wage work. In all but one of the simulations more than half of the total benefits of rising minimum wages accrue to families above the low-income cutoff (twice the official poverty line).[10] Thus, most of the benefits of a minimum wage go to families that are neither poor nor low-income. For this reason increases in the minimum wage have only small positive impacts on the comprehensive incomes of families at or near the bottom of the income distribution. Nevertheless, the effects are not zero and increases in the minimum wage have measureable poverty reducing effects. Second, while poor and low-income families (the bottom 32.6 percent of families) gain from rising minimum wages, those at the very bottom with comprehensive incomes below the official poverty line receive substantially fewer benefits. For example, in the simulations with both trickle-up and trickle-down wage spillovers families below the official poverty line receive less than 10 percent of the total income gains from all stages of the FMWA, whereas other low-income families receive over 30 percent. Families higher up in the income distribution receive the remaining share of gains from increases in the minimum wage.

[10] 10. The exception occurs in Stage 1 of the FMWA (the federal wage minimum rises from $5.15 to $5.85) and in the simulation that includes only trickle down wage spillovers. In this simulation low-income families receive almost 54 percent of the total benefits with the remainder going to higher income families.

Application of dominance methods to evaluate the redistributive effects of equal cost policy alternatives leads to several additional conclusions. Redistributive effects are measured at quintiles and three additional points (quantiles 10.7, 32.6 and 95)[11] within the income distribution. First order dominance leads to inconclusive results in all pairwise comparisons of the redistributive effects of equal cost labor market policy alternatives. However, assuming the Pigou-Dalton principle of transfers and applying second order dominance (equivalently Generalized Lorenz dominance) leads to the unambiguous conclusion that the equal cost EITC policy is uniformly more welfare enhancing compared to increasing the federal minimum wage. This is the case for both wage spillover simulation scenarios, all stages of the FMWA and the hypothetical $9.50 federal minimum wage. The results for pairwise comparisons of minimum wage increases and the FICA policy alternative are less clear and contingent upon the wage spillover simulation scenario. When both trickle-up and trickle-down wage spillovers are included in the simulations we generally find second order FICA policy dominance vis-à-vis the minimum wage policy. The exception is Stage 1 of the FMWA where the results are inconclusive, i.e., the Generalized Lorenz (GL) curves cross. In contrast, in simulations that exclude trickle-up spillovers we find FICA dominance only in Stage 3 of the FMWA. In all other pairwise comparisons the GL curves of the equal cost redistributive effects of the minimum wage and FICA policies cross.

The final set of conclusions relate to aggregate costs, poverty reducing effects, and the cost effectiveness of alternative labor market policies. The poverty reducing effects of raising the federal minimum wage are quite small, but not zero. For all stages of the FMWA combined and for the simulations that include upward and downward wage spillovers the Sen Index of poverty is reduced by less than one percent at the official poverty line and by 1.6 or less at higher poverty lines. For the simulations that exclude upward ripple effects the FMWA poverty reductions are even smaller. In contrast, the costs of raising the federal minimum wage are not

[11] 11. The 10.7 and 32.6 quantile points correspond to families with 2006 comprehensive family incomes below the official poverty thresholds and below 200% of these thresholds, respectively. The 95th quantile point is delineated by separating the top five percent from other American families.

small, totaling more than $12 billion for the FMWA in the more costly simulation scenario and almost $6 billion in the low-cost simulation (no trickle-up spillovers). The hypothetical $9.50 wage simulation is an extension of the low-cost FMWA scenario (no trickle-up spillovers) and its cost is estimated to be $43.5 billion. As a consequence, an increase in the federal minimum to $9.50, as proposed by President Obama, would be more than seven times more costly than all Stages of the FMWA combined. Of course, the poverty reductions accompanying the $9.50 minimum wage would also be larger than those achieved by the FMWA. However, the cost of the minimum wage policy rises much faster than the aggregate poverty rate falls. This result suggests that increasing the federal minimum wage to $9.50 is subject to decreasing returns and rising costs in fighting poverty. Thus, the greater the federal minimum wage, the lower is the return in poverty reduction per dollar spent to bring about the mandatory higher minimum wages.

Measures of the relative cost effectiveness of alternative labor market policies reveal that federal minimum wage increases are much more costly than either the EITC or FICA policies in achieving the same poverty reducing objectives. Compared to the EITC, the minimum wage cost effectiveness ratios for all stages of the FMWA combined vary from 2 to 2.4 depending upon the poverty line considered and the wage spillover simulation scenario. For the hypothetical $9.50 minimum wage the cost effectiveness ratios range from 2.6 to 2.9. Thus, the total cost of achieving the same reduction in aggregate poverty is two to three times greater using a minimum wage policy instead of the more cost effective EITC policy. For minimum wage increases above $7.25 the cost effectiveness ratio is closer to three.

The policy implications of our simulations are clear. The FMWA is neither cost effective nor the best labor market policy for reducing poverty and improving the overall well-being of American families. Equiproportionate increases in the EITC is a more cost effective policy and is superior to the minimum wage in all pairwise comparisons when evaluated using second order (Generalized Lorenz) dominance as well as ordinary Lorenz dominance. Thus, if Congress and

the President are prepared to raise the federal minimum wage to $9.50 per hour, then working families and the nation as a whole will be better-off if the nominal minimum wage is held constant and the EITC is increased to accomplish the same policy objective.

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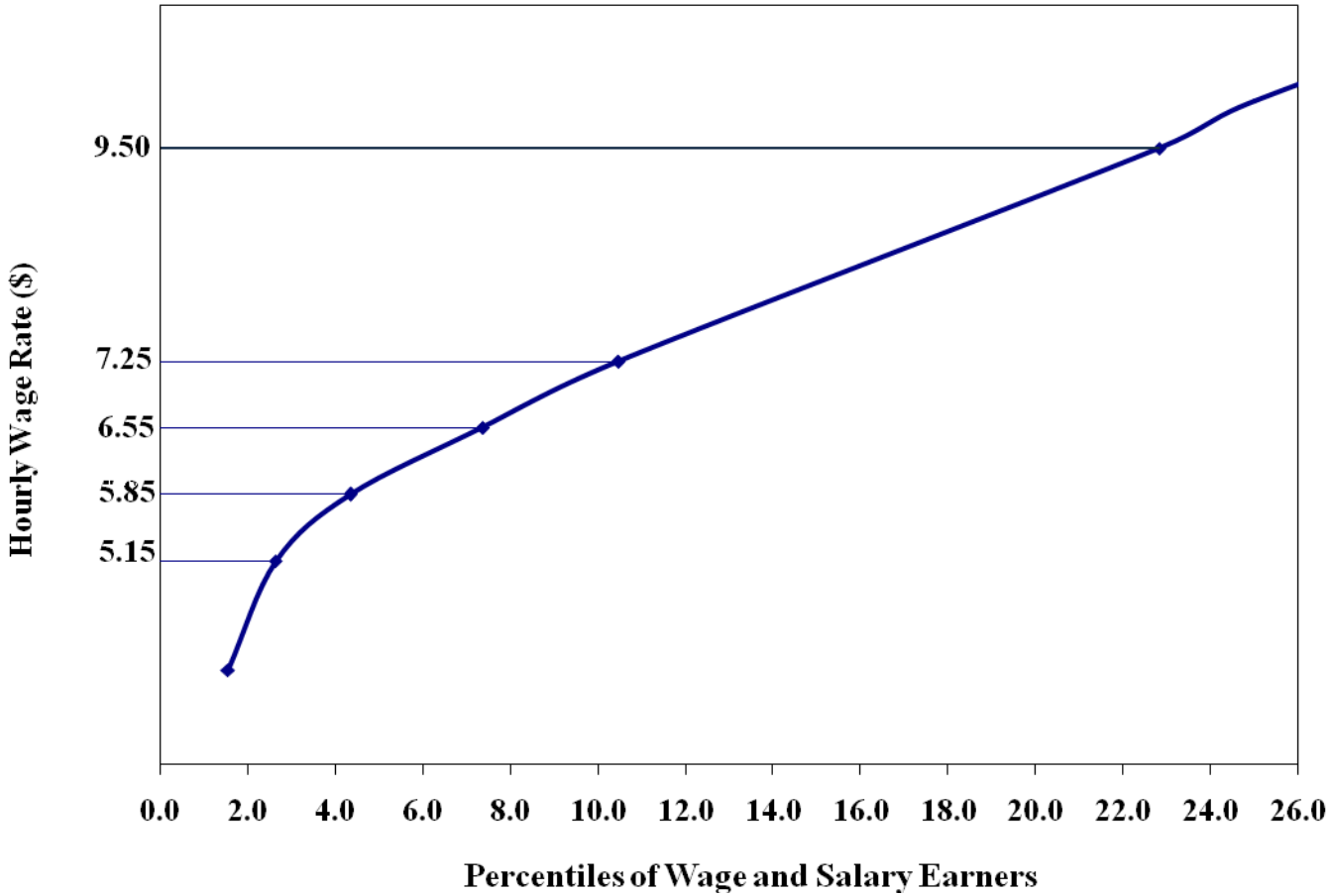
Figure 1

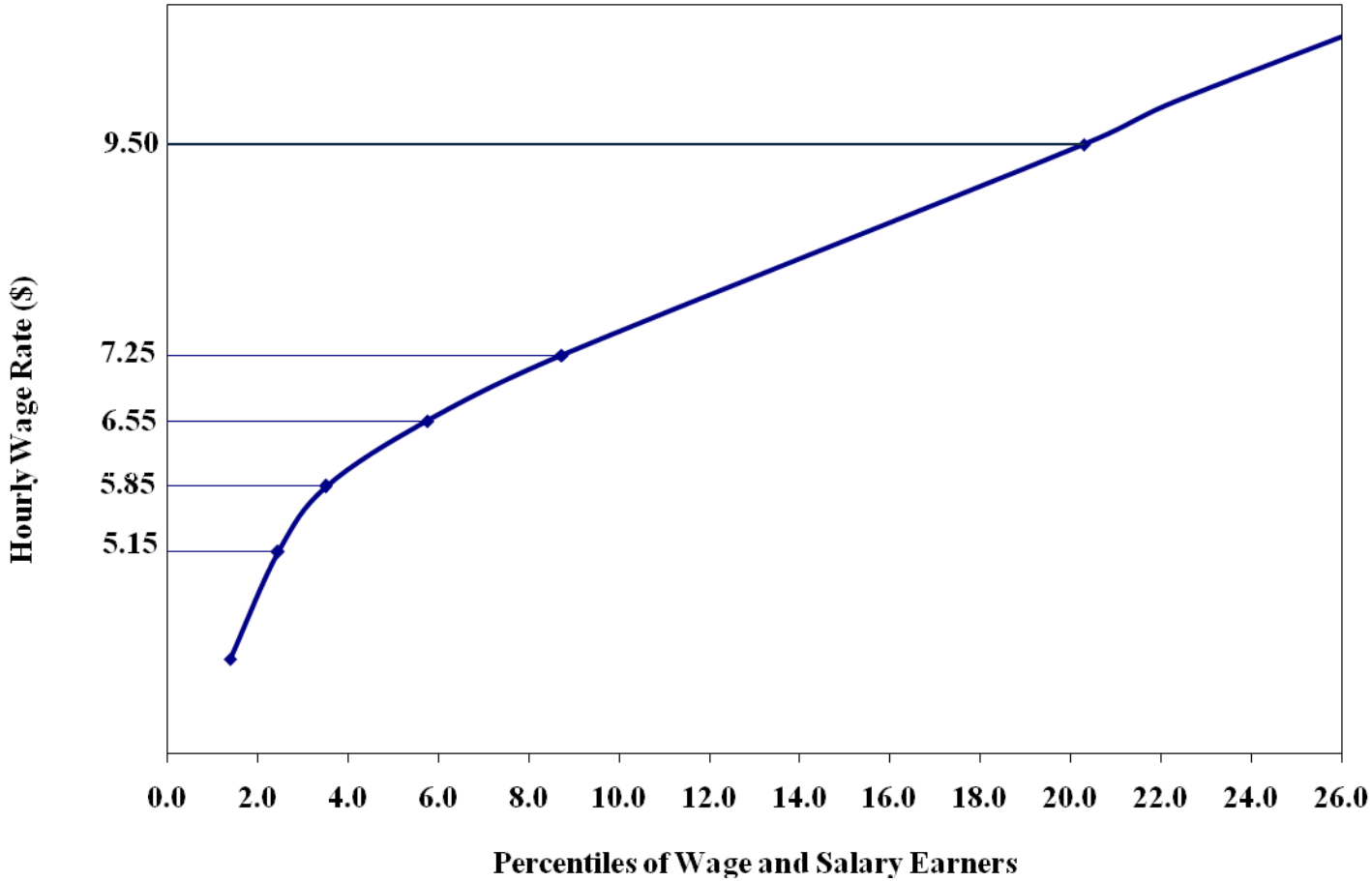
The Wage Distribution Among Low-Wage Workers for the 19 States Where the Federal Minimum is Always Binding, 2006*



*Estimated using the matched and merged March CPS and Annual Earner Study Files

Figure 2

The Wage Distribution Among Low-Wage Workers for the U.S. as a Whole, 2006*



*Estimated using the matched and merged March CPS and Annual Earner Study Files

Figure 3

Lorenz Curve and Concentration Curve of the Benefits of Rising Minimum Wages

Simulation with Trickle Down Wage Spillovers Only – All Stages of FMWA Combined

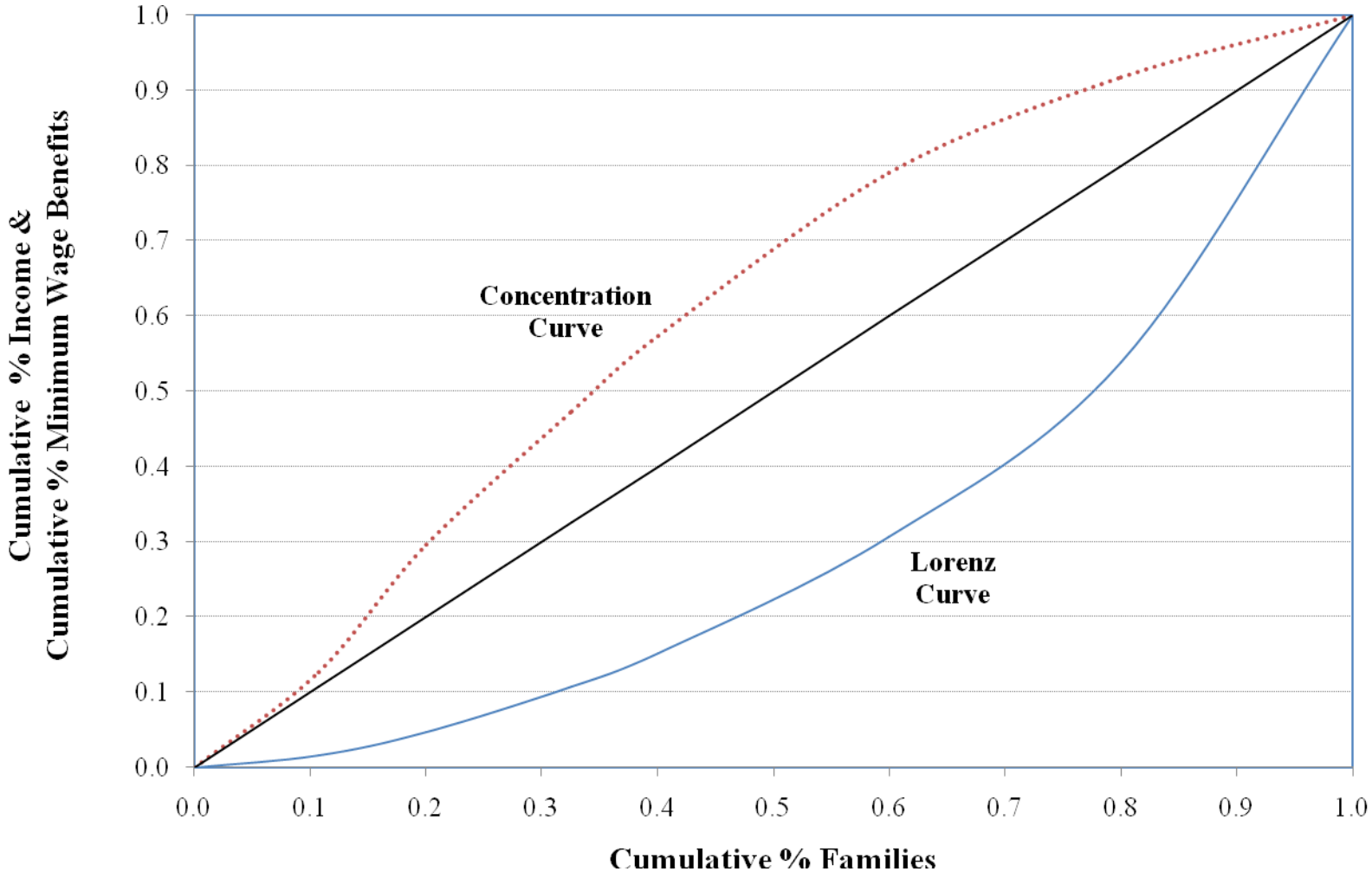


Table 1

The Effects of Rising Federal Minimum Wages on Groups of Workers at Different Hourly Wage Rates

1.a Simulations Based on Both Trickle Up and Trickle Down Wage Spillovers

	Group Means of Workers Classified by Hourly Wage Rates						
FMWA Stage 1 (70¢)	Wage Rates < $5.15 (1)	Wage Rates $5.15 - $5.85 (2)	Wage Rates $5.85 - $6.55 (3)	Wage Rates $6.55 - $7.25 (4)	Wage Rates $7.25 - $9.50 (5)	All Workers Paid < $9.50 (6)	All U.S. Workers (7))
Number of Workers (1,000's)	3,211	1,394	2,785	3,918	15,943	27,252	134,272
FMWA Induced Change	-291	-397	-196	-55	938	0	0
Hourly Wage Rates $	3.70	5.47	6.23	6.96	8.29	7.20	21.19
FMWA Induced Change	0.17	0.32	0.22	0.10	0.02	0.09	0.02
Annual Hours Worked	1,444	1,452	1,545	1,603	1,768	1,667	1,904
FMWA Induced Change	-4	-5	-2	-1	0	-1	0
FMWA Stage 2 (70¢)							
Number of Workers (1,000's)	2,755	951	2,348	3,569	17,631	27,252	134,272
FMWA Induced Change[1]	-155	-183	-895	108	1,124	0	0
Hourly Wage Rate $	3.69	5.49	6.23	6.93	8.28	7.36	21.22
FMWA Induced Change	0.16	0.24	0.32	0.19	0.08	0.13	0.03
Annual Hours Worked	1,457	1,318	1,483	1,562	1,762	1,666	1,903
FMWA Induced Change	-4	-2	-4	-2	0	-1	0
FMWA Stage 3 (70¢)							
Number of Workers (1,000's)	2,518	807	1,398	3,452	19,076	27,252	134,272
FMWA Induced Change[1]	-232	-38	-302	-1,675	2,246	0	0
Hourly Wage Rate $	3.74	5.48	6.24	6.94	8.31	7.52	21.25
FMWA Induced Change	0.22	0.23	0.28	0.37	0.16	0.20	0.04
Annual Hours Worked	1,490	1,188	1,503	1,513	1,746	1,664	1,903
FMWA Induced Change	-6	-3	-3	-4	-1	-2	0

1. FMWA moves some workers into higher wage groups. The FMWA induced change is the net movement caused by the rise in the federal minimum wage.

Table 1 (Cont'd.)

1.b Simulations Based on Trickle Down Wage Spillovers Only

	Group Means of Workers Classified by Hourly Wage Rates						
FMWA Stage 1 (70¢)	Wage Rates < $5.15 (1)	Wage Rates $5.15 - $5.85 (2)	Wage Rates $5.85 - $6.55 (3)	Wage Rates $6.55 - $7.25 (4)	Wage Rates $7.25 - $9.50 (5)	All Workers Paid < $9.50 (6)	All U.S. Workers (7)
Number of Workers (1,000's)	3,211	1,394	2,881	4,203	15,562	27,252	134,272
FMWA Induced Change	-291	-401	692	0	0	0	0
Hourly Wage Rates $	3.70	5.47	6.23	6.98	8.30	7.19	21.19
FMWA Induced Change	0.17	0.20	0.00	0.00	0.00	0.03	0.01
Annual Hours Worked	1,444	1,452	1,532	1,618	1,770	1,667	1,904
FMWA Induced Change	-4	-4	0	0	0	0	0
FMWA Stage 2 (70¢)							
Number of Workers (1,000's)	2,781	922	3,351	3,978	15,221	27,252	134,272
FMWA Induced Change[1]	-155	-179	-1,906	2,239	0	0	0
Hourly Wage Rate $	3.70	5.50	6.16	6.96	8.29	7.27	21.20
FMWA Induced Change	0.14	0.24	0.28	0.00	0.00	0.06	0.01
Annual Hours Worked	1,463	1,298	1,520	1,600	1,768	1,666	1,904
FMWA Induced Change	-4	-2	-4	0	0	0	0
FMWA Stage 3 (70¢)							
Number of Workers (1,000's)	2,526	816	1,376	6,112	16,422	27,252	134,272
FMWA Induced Change[1]	-203	-51	-275	-4,324	4,853	0	0
Hourly Wage Rate $	3.72	5.48	6.24	6.83	8.28	7.35	21.22
FMWA Induced Change	0.18	0.21	0.27	0.37	0.00	0.12	0.02
Annual Hours Worked	1,490	1,216	1,493	1,559	1,768	1,665	1,903
FMWA Induced Change	-5	-3	-3	-4	0	-1	0
Hypothetical $9.50 Minimum Wage – Federal Minimum Rises from $7.25 to $9.50							
Number of Workers (1,000's)	2,323	765	1,101	1,789	21,275	27,252	134,272
Federal Induced Change[1]	-961	-323	-532	-1,244	-17,566	-20,627	0
Hourly Wage Rate $	3.76	5.48	6.24	6.95	8.05	7.47	21.24
Federal Induced Change[1]	1.07	1.50	1.74	1.91	1.44	1.45	0.29
Annual Hours Worked	1,487	1,220	1,531	1,486	1,721	1,664	1,903
Federal Induced Change[1]	-21	-22	-14	-11	-9	-11	-2

1. FMWA moves some workers into higher wage groups. The FMWA induced change is the net movement caused by the rise in the federal minimum wage.

Table 2

Families and Low-income Families Directly Affected

by Federal Minimum Wage Increases

2.a Simulations Including both Trickle Up and Trickle Down Wage Spillovers

	Total Number of Families (millions) (1)	Number of Directly Affected Families[2] (millions) (2)	Percent of Families Directly Affected by FMWA (3)
Stage 1 of FMWA (70¢)			
All Families	124.95	5.49	4.4
Low-income Families[1]	40.95	2.55	6.2
Stage 2 of FMWA (70¢)			
All Families	124.95	8.02	6.4
Low-income Families	40.85	3.58	8.8
Stage 3 of FMWA (70¢)			
All Families	124.95	14.18	11.4
Low-income Families	40.76	5.93	14.5

2.b Simulations Including Only Trickle Down Wage Spillovers

	Total Number of Families (millions) (1)	Number of Directly Affected Families[2] (millions) (2)	Percent of Families Directly Affected by FMWA (3)
Stage 1 of FMWA (70¢)			
All Families	124.95	1.47	1.2
Low-income Families1	40.95	.718	1.8
Stage 2 of FMWA (70¢)			
All Families	124.95	3.14	2.5
Low-income Families	40.92	1.49	3.6
Stage 3 of FMWA (70¢)			
All Families	124.95	7.26	5.8
Low-income Families	40.88	3.19	7.8
Hypothetical $9.50 Minimum Wage ($2.25)[3]			
All Families	124.95	21.50	17.2
Low-income Families	40.77	9.01	22.1

1. Low-income families are defined as those comprehensive incomes below twice the official poverty line.
2. Directly affected families include those with minimum wage workers and low-wage workers receiving spillovers.
3. The hypothetical $9.50 minimum wage is assumed to be binging in all states.

Table 3

The Redistributive Effects of the Federal Minimum Wage and Alternative Equal Cost Labor Market Policies on Family Comprehensive Incomes of Selected Low-Income Groups, Quintiles of All Families and the Top Five Percent

3.a Stage 1 of the Federal Minimum Wage Act of 2007 (Minimum rises from $5.15 to $5.85)

Three Subgroups of Low-income Families, and Quintiles & the Top 5% of Families	Shares of All Families (1)	Mean Comprehensive Income (2)	Changes in Comprehensive Family Income					
			Simulation of both Trickle Up and Trickle Down Wage Spillovers			Simulation of Trickle Down Wage Spillovers Only (No Trickle Up)		
			Minimum Wage (3)	EITC (4)	FICA (5)	Minimum Wage (6)	EITC (7)	FICA (8)
Low-Income Groups								
Below 100%	0.109	7,575	19	22	16	10	7	5
100% - 150%	0.098	16,298	40	61	52	13	20	17
150% - 200%	0.121	24,048	28	55	102	9	18	33
All Families < 200%	0.327	16,264	29	46	59	10	15	19
Quintiles & the Top 5%								
1st Quintile	0.200	11,450	29	39	32	11	13	10
2nd Quintile	0.200	26,098	27	46	64	8	15	21
3rd Quintile	0.200	38,466	23	8	0	7	3	0
4th Quintile	0.200	57,436	13	2	0	4	1	0
5th Quintile	0.200	114,883	8	1	0	3	0	0
Top 5%	0.050	195,021	4	0	0	1	0	0
All Families	1.000	49,668	20	19	19	7	6	6

1. Low-income family Subgroups are categorized by the size of family comprehensive income relative to the official U.S. Government definition of poverty. Thus the <100% group includes all families with comprehensive equal to or below the poverty line. The 100- 150% group includes all families with comprehensive equal to or above the official poverty line, but below 150 % of the value of the poverty line. The group150% – 200% includes families with comprehensive less than twice the official poverty line and above 150 % of the value of the poverty line.

Table 3 (Cont'd.)

The Redistributive Effects of the Federal Minimum Wage and Alternative Equal Cost Labor Market Policies on Family Comprehensive Incomes of Selected Low-Income Groups, Quintiles of All Families and the Top Five Percent

3.b Stage 2 of the Fair Minimum Wage Act of 2007 (Minimum rises from $5.85 to $6.55)

Three Subgroups of Low-income Families, and Quintiles & the Top 5% of Families	Shares of All Families (1)	Mean Comprehensive Income (2)	Changes in Comprehensive Family Income					
			Simulation of both Trickle Up and Trickle Down Wage Spillovers			Simulation of Trickle Down Wage Spillovers Only (No Trickle Up)		
			Minimum Wage (3)	EITC (4)	FICA (5)	Minimum Wage (6)	EITC (7)	FICA (8)
Low-Income Groups								
Below 100%	0.108	7,554	24	34	26	14	14	10
100% - 150%	0.098	16,289	56	94	81	27	39	33
150% - 200%	0.121	24,051	46	86	159	17	35	65
All Families < 200%	0.326	16,283	41	71	92	19	29	37
Quintiles & the Top 5%								
1ST Quintile	0.200	11,493	39	61	50	20	25	20
2nd Quintile	0.200	26,135	44	71	99	18	29	41
3rd Quintile	0.200	38,500	37	13	0	13	5	0
4th Quintile	0.200	57,452	23	3	0	8	1	0
5th Quintile	0.200	114,902	12	1	0	5	0	0
Top 5%	0.050	195,021	6	1	0	2	0	0
All Families	1.000	49,698	31	30	30	13	12	12

1. Low-income family Subgroups are categorized by the size of family comprehensive income relative to the official U.S. Government definition of poverty. Thus the <100% group includes all families with comprehensive equal to or below the poverty line. The 100- 150% group includes all families with comprehensive equal to or above the official poverty line, but below 150 % of the value of the poverty line. The group150% – 200% includes families with comprehensive less than twice the official poverty line and above 150 % of the value of the poverty line.

Table 3 (Cont'd.)

The Redistributive Effects of the Federal Minimum Wage and Alternative Equal Cost Labor Market Policies on Family Comprehensive Incomes of Selected Low-Income Groups, Quintiles of All Families and the Top Five Percent

3.c Stage 3 of the Fair Minimum Wage Act of 2007 (Minimum rises from $6.55 to $7.25)

Three Subgroups of Low-income Families, and Quintiles & the Top 5% of Families	Shares of All Families (1)	Mean Comprehensive Income (2)	Changes in Comprehensive Family Income					
			Simulation of both Trickle Up and Trickle Down Wage Spillovers			Simulation of Trickle Down Wage Spillovers Only (No Trickle Up)		
			Minimum Wage (3)	EITC (4)	FICA (5)	Minimum Wage (6)	EITC (7)	FICA (8)
Low-Income Groups								
Below 100%	0.107	7,597	33	52	40	23	30	22
100% - 150%	0.097	16,285	74	144	126	45	83	71
150% - 200%	0.121	24,037	71	135	247	42	75	139
All Families < 200%	0.326	16,297	59	111	142	37	62	80
Quintiles & the Top 5%								
1ST Quintile	0.200	11,528	52	95	78	34	54	44
2nd Quintile	0.200	26,175	71	109	154	41	62	87
3rd Quintile	0.200	38,559	57	20	0	31	11	0
4th Quintile	0.200	57,479	40	5	0	19	3	0
5th Quintile	0.200	114,920	20	1	0	11	1	0
Top 5%	0.050	195,095	11	1	0	4	1	0
All Families	1.000	49,733	50	50	50	27	26	26

1. Low-income family Subgroups are categorized by the size of family comprehensive income relative to the official U.S. Government definition of poverty. Thus the <100% group includes all families with comprehensive equal to or below the poverty line. The 100- 150% group includes all families with comprehensive equal to or above the official poverty line, but below 150 % of the value of the poverty line. The group150% – 200% includes families with comprehensive less than twice the official poverty line and above 150 % of the value of the poverty line.

Table 3 (Cont'd.)

The Redistributive Effects of the Federal Minimum Wage and Alternative Equal Cost Labor Market Policies on Family Comprehensive Incomes of Selected Low-Income Groups, Quintiles of All Families and the Top Five Percent

3.d Hypothetical $9.50 Federal Minimum Wage (Minimum Wage Rises from $7.25 to $9.50[1]

Three Subgroups of Low-income Families,[2] and Quintiles of Families, and the Top 5%	Shares of All Families (1)	Mean Comprehensive Income (2)	Changes in Comprehensive Family Income					
			Simulation of both Trickle Up and Trickle Down Wage Spillovers			Simulation of Trickle Down Wage Spillovers Only (No Trickle Up)		
			Minimum Wage (3)	EITC (4)	FICA (5)	Minimum Wage (6)	EITC (7)	FICA (8)
Low-Income Groups								
Below 100%	0.107	7,597	Not Simulated[3]			227	378	208
100% - 150%	0.097	16,290				522	1,052	663
150% - 200%	0.121	24,040				497	967	1,298
All Families < 200%	0.326	16,303				416	798	749
Quintiles & the Top 5%								
1ST Quintile	0.200	11,531				362	687	411
2nd Quintile	0.200	26,159				495	786	810
3rd Quintile	0.200	38,540				408	148	0
4th Quintile	0.200	57,479				312	39	0
5th Quintile	0.200	114,904				161	10	0
Top 5%	0.050	195,091				100	8	0
All Families	1.000	49,725				347	334	244

1. The hypothetical $9.50 federal minimum wage is assumed to affect low-wage workers in all states, i.e. the federal minimum is binding in the nation as a whole.
2. Low-income family Subgroups are categorized by the size of family comprehensive income relative to the official U.S. Government definition of poverty. Thus the <100% group includes all families with comprehensive equal to or below the poverty line. The 100- 150% group includes all families with comprehensive equal to or above the official poverty line, but below 150 % of the value of the poverty line. The group150% – 200% includes families with comprehensive less than twice the official poverty line and above 150 % of the value of the poverty line.
3. The hypothetical $9.50 federal minimum wage extends beyond the bottom quintile of the wage distribution and we do not simulate trickle up wage spillovers in this range.

Table 4

Dominance Comparisons of Federal Minimum Wage Increases versus Alternative Equal Cost Labor Market Policies[1]

	Simulations with both Trickle Up and Trickle Down Wage Spillovers		Simulations with Trickle Down Wage Spillovers Only	
	Minimum Wage Versus EITC (1)	Minimum Wage Versus FICA (2)	Minimum Wage Versus EITC (3)	Minimum Wage Versus FICA (4)
Stage 1 of FMWA[2]				
First Order	X	X	X	X
Second Order (GL)	EITC	X	X	X
Lorenz	EITC	X	X	X
Stage 2 of FMWA[2]				
First Order	X	X	X	X
Second Order (GL)	EITC	FICA	EITC	X
Lorenz	EITC	FICA	EITC	X
Stage 3 of FMWA[2]				
First Order	X	X	X	X
Second Order (GL)	EITC	FICA	EITC	FICA
Lorenz	EITC	FICA	EITC	FICA
All Stages of FMWA Combined[2]				
First Order	X	X	X	X
Second Order (GL)	EITC	FICA	EITC	X
Lorenz	EITC	FICA	EITC	X
Hypothetical $9.50 Minimum Wage[3]				
First Order	Not Simulated[4]		X	Comparisons Not Possible[5]
Second Order (GL)			EITC	
Lorenz			EITC	FICA

1. X's denote crossings and an inability to rank the policies. GL is short for Generalized Lorenz dominance.
2. Federal minimum wage rises by 70¢ in each Stage of FMWA and $2.10 overall.
3. Federal minimum wage rises by $2.25 and is binding in all states.
4. The $9.50 minimum wage is not simulated because trickle up wage spillovers extend beyond the bottom quintile of the wage distribution.
5. Equal cost FOD and SOD comparisons are not possible due to the extremely high cost of the $9.50 minimum wage and the structure of the FICA policy alternative.

Table 5
The Costs of Federal minimum Wage Increases and Alternative Labor Market Policies Achieving Equivalent Reductions in Poverty

5.a Simulations Including Both Trickle-up and Trickle-down Wage Spillovers

Stages of FMWA[1] and Alternative Poverty Lines2	Comprehensive Income Sen Index of Poverty		Total Costs of Alternative Labor Market Policies ($ Billions)[3]		
	Before Policy (1)	After Policy (2)	FMWA (3)	EITC (4)	FICA (5)
FMWA Stage 1					
100%	0.05477	0.05461	2.5	1.02125	2.2275
150%	0.09913	0.09877	2.5	1.4475	1.85625
200%	0.15826	0.15787	2.5	1.02125	1.4850
FMWA Stage[2]					
100%	0.05454	0.05434	3.875	1.52875	2.96750
150%	0.09865	0.09820	3875	1.78375	2.59625
200%	0.15769	0.15712	3.875	1.78375	2.34875
FMWA Stage 3					
100%	0.05433	0.05399	6.0	2.53875	4.44375
150%	0.09815	0.09756	6.0	2.15750	3.21
200%	0.15707	0.15626	6.0	2.58125	3.21
FMWA - All Stages Combined					
100%	0.05477	0.05399	12.375	5088.75	9638.75
150%	0.09913	0.09756	12.375	5388.75	7662.50
200%	0.15826	0.15626	12.375	5386.25	7043.75

1. The federal minimum wage rises by 70¢ in each stage of FMWA and by $2.10 across all stages.
2. Alternative poverty lines are defined as a percent of the official poverty cutoff and measured using comprehensive family income.
3. These cost s are computed by multiplying the average costs per family by 125 million American families. Note that the costs of the FMWA do not vary across poverty lines. However, given the costs of the mandated increase in the federal minimum wage in each stage, poverty reductions vary with the different poverty lines,

Table 5 (Cont'd.)

The Costs of Federal minimum Wage Increases and Alternative Labor Market Policies Achieving Equivalent Reductions in Poverty

5.b Simulations Including Trickle-down Wage Spillovers Only[1]

Minimum Wage Increases1 and Alternative Poverty Lines[2]	Comprehensive Income Sen Index of Poverty		Total Costs of Alternative Labor Market Policies ($ millions)3		
	Before Policy (1)	After Policy (2)	FMWA (3)	EITC (4)	FICA (5)
FMWA Stage 1					
100%	0.05477	0.05469	875	500	1,239
150%	0.09913	0.09900	875	618	875
200%	0.15826	0.15813	875	341	500
FMWA Stage 2					
100%	0.05464	0.05454	1,625	596	1,239
150%	0.09892	0.09870	1,625	851	1,239
200%	0.15803	0.15778	1,625	681	991
FMWA Stage 3					
100%	0.05452	0.05430	3,375	1,785	3,375
150%	0.09865	0.09825	3,375	1,530	2,225
200%	0.15773	0.15723	3,375	1,445	1,983
FMWA All Stages Combined					
100%	0.05477	0.05430	5,875	2,881	5,853
150%	0.09913	0.09825	5,875	2,990	4,337
200%	0.15826	0.15723	5,875	2,467	3,474
Hypothetical $9.50 Minimum Wage					
100%	0.05430	0.05252	43,500	16,950	[4]
150%	0.09825	0.09445	43,500	15,000	[4]
200%	0.15723	0.15198	43,500	16,500	[4]

1. The federal minimum wage rises by 70¢ in each stage of FMWA and $2.25 with the hypothetical minimum wage of $9.50.
2. Alternative poverty lines are defined as a percent of the official poverty cutoff and measured using comprehensive family income.
3. These cost s are computed by multiplying the average costs per family by 125 million American families. Note that the costs of the FMWA do not vary across poverty lines. However, given the costs of the mandated increase in the federal minimum wage in each stage, poverty reductions vary with the different poverty lines,
4. The FICA cost is well below FMWA and EITC. This is because we restrict the FICA transfer to workers in families below 200 percent of the official poverty line and the maximum possible rebate to this group is less than the cost of the $9.50 minimum wage increase. Therefore, in analyzing the hypothetical $9.50 minimum wage we do not consider a FICA rebate alternative policy.

Table 6

Relative Cost Effectiveness Ratios of Federal Minimum Wage Increases Compared to Alternative Labor Market Policies

Alternative Poverty Lines[1]	Simulations Including Both Trickle-up and Trickle-down Wage Spillovers			Simulations Including Only Trickle-down Wage Spillovers		
	Federal Minimum Wage (1)	Alternative Labor Market Policies with the Same Poverty Reducing Effects as the Minimum Wage		Federal Minimum Wage (4)	Alternative Labor Market Policies with the Same Poverty Reducing Effects as the Minimum Wage	
		FICA (2)	EITC[2] (3)		FICA (5)	EITC[2] (6)
Stage 1 of FMWA						
100%	2.44	2.18	1.00	1.75	2.48	1.00
150%	1.73	1.28	1.00	1.42	1.42	1.00
200%	2.45	1.45	1.00	2.57	1.47	1.00
Stage 2 of FMWA						
100%	2.53	1.94	1.00	2.72	2.08	1.00
150%	2.17	1.46	1.00	1.91	1.46	1.00
200%	2.17	1.32	1.00	2.39	1.46	1.00
Stage 3 of FMWA						
100%	2.36	1.75	1.00	1.89	1.80	1.00
150%	2.78	1.49	1.00	2.21	1.45	1.00
200%	2.32	1.24	1.00	2.34	1.37	1.00
All Stages of FMWA Combined						
100%	2.43	1.89	1.00	2.04	2.03	1.00
150%	2.30	1.42	1.00	1.96	1.45	1.00
200%	2.30	1.31	1.00	2.38	1.41	1.00
Hypothetical $9.50 Minimum Wage						
100%	Not Simulated[3]			2.57	Not Calculated[4]	1.00
150%				2.90		1.00
200%				2.64		1.00

1. Alternative poverty lines are defined as a percent of the official poverty cutoff.
2. The EITC is the low cost policy alternative. For each poverty line considered the aggregate cost of the EITC is set equal to 1.00.
3. The $9.50 minimum wage is not simulated because trickle up wage spillovers extend beyond the bottom quintile of the wage distribution.
4. Due to the extremely high cost of the $9.50 minimum wage and the structure of the FICA policy alternative the costs of the two policies are noncomparable.

APPENDIX

Procedures Used in Extracting March CPS and ORG Data

The data we use are extracted from CPS Utilities, March 2007 CPS Files and Annual Earner Study files (ORG) for calendar year 2006, which are issued by the Unicon Research Corporation, Santa Monica, California, Version 5.5. The variables mentioned below use Unicon Corporation variable names, which are generally not same as those one appearing in the original CPS data released by the U.S. Census Bureau.

1. **Definition of the Family**. We define the family to include primary families and related subfamilies. Unrelated subfamilies within a household are treated as separate families except as follows:
   - When the age of the age of the head of an unrelated subfamily (or unrelated individual) living in the household is less than 17, then the unrelated subfamily (or individual) is included as a member of the primary family (or primary individual).
   - When the age of the head of an unrelated subfamily (or unrelated individual) is above 17, but earnings are zero, the unrelated subfamily (or individual) is deleted from the sample.
   - When we need to recalculate some income variables relating to taxes (such as Federal Tax or EITC), we employ IRS definitions. Primary family and related subfamily are initially separated and taxes and EITC benefits are awarded and then recombined into extended family units.
2. **Family Income**. Where possible family income is calculated by summing up the incomes of each family member. To these totals we add values for the variables available only at the family and household level. These variables include:
   - Food Stamps
   - Housing Subsidies

- Energy Subsidies
- School Lunch Subsidies
- Implicit Return on Home Equity, and
- Property Taxes.

3. **Components of Family Income**. Key components of family income are defined as follows:
   - Cash Income = the sum of wages and salaries, dividends, rents and interest, self employment income, cash transfers and other cash income items.
   - Other Taxes = the sum of federal, state, and property taxes.
   - Means Tested Transfers from the Government = the sum of supplemental security income + public assistance and welfare + market values of noncash benefits from food stamps, housing subsidies, energy subsidies and school lunch subsidies.
   - Other Transfers = Nonmeans Tested Transfers from the Government + Private Transfers.
   - Payroll taxes = FICA + proportionate share of FedRet (payroll contributions to Federal retirement in lieu of FICA taxes).
4. **Earners**. Earners are defined as all adults age 16 and above who have positive wages or salaries.
5. **Hours Worked**. In general, Hours is the variable used to measure the number of hours worked per week. This variable denotes the number of hours worked in the week preceding the survey. In the following cases the hours variable is not used.
   - If Hoursu (Total usual weekly hours, ORG variable) is reported, we use this variable to measure hours worked each week.
   - When Hoursu is missing or 0, but Ernush (usual hours per week, ORG variable) or Hours (Total hours worked last week, ORG variable) are reported, it is replaced by either Ernush or Hours.
   - When there is no information on hours worked in the ORG data, but Ernhr (hourly wage rate) and Ernwk (weekly earnings before deductions) are available, we calculate the hours worked by dividing Ernwk by Ernhr.

6. **WAGE RATE**. The procedure for determining the hourly wage is as follows:

- If an hourly wage is reported, we use the amount given by the variable ERNHR.
- When the ERNHR of a worker is missing or zero, we calculate the value by dividing the variable WKLYWG (average weekly earnings) by Hours (hours worked last week).
- Any worker with a wage rate less than $2.13 is treated as if they are self-employed and are not included among the wage and salary workers analyzed in this report. Any income generated by such workers is treated as if it were self-employment income.

7. **MATCHING PROCESS - MARCH CPS AND EARNER STUDY (ORG) DATA.**

- In the CPS, a household is in the survey for 4 consecutive months, rotates out for eight months, returns to the survey for four more months and then permanently rotates out. The months in sample (variable name MIS=1-4 or 5-8) is used to identify the ORG data in the March CPS. The outgoing rotation groups are asked the earner study in their 4th (MIS = 4) and last (MIS = 8) surveys. To match the March File, we select the ORG sample by using appropriate interview month identified by the MIS variable.
- To match households, families and individuals in the March File with persons in the ORG File, the following variables are used:
  - MONTH: interview month
  - MIS: month in sample
  - STATE
  - HHID: Household ID (Part #1)
  - HHNUM: Household ID (Part #2)
  - HHSEQ: Household ID within file (March variable)
  - UNIQHH: Unique household identifier within any specific month (ORG variable that is corresponding to Hhseq in March)
  - HHTYP: Type of household record
  - NUMBER: Number of persons in hourhold
  - LINENO: Person line number within a household

- RACE, SEX, and AGE

- In matching the two data sets, one of problem encountered is that the household id (variable name HHID) is not unique. That is, more than one household has the same household id (variable name HHID). In this case, we seperate each household create a unique identifier using HHSEQ in March and UNIQHH in ORG. Next, we match all possible combinations of households and select the best matching case by using the processes explained in the next step.
- When one set of household residents move away and another set takes its place in the same house, the household is identified by using household number (variable name HHNUM) and deleted from our sample.
- To match the individuals within a household, we use the variables of household type (variable name HHTYP), number of person in household (variable name NUMPER), line number within household (variable name LINENO), race, sex and age. When all variables listed above are the same in both the Match and ORG data, each individual is then treated as "matched".
- We next calculate the matching percentage within a family. A 100% match of individuals within a family in both data sets is a perfect match. A zero matching percentage is a perfect nonmatch. All families with a zero matching percentages are deleted from the sample.
- For families for which there is neither a perfect match (100%) nor a perfect nonmatch (0 %), a partial matching of individuals exists. For partially matched families we then focus on the earners within the family. If we are able to match all earners, the family is considered as matched and we include it in the sample. To accomplish this final step in the matching process we proceed as follows:
  - We count the number of earners. If the number of earners or household type (variable name HHTYPE) are not same, the family is deleted from the sample.
  - For the remaining partially matched families, we compare the sex, race, and ages of earners and count the number of matches of these variables for each earner. When

the difference of ages is less than two, we consider that two ages are same. Also, we sum the individual matches within a family and calculate the family matching percentage for all three variables.

- Finally, we select the matching families. When there is at least one earner who has same value for all three matching variables and the family matching percentage is above fifty %, we treat it as matching and include in the sample.

- In summary, to be included in the sample a family must satisfy one of the following matching conditions:
  - Have the same MIS, HHID, STATE, and have a 100 % matching of individuals within a family,
  - Have the same MIS, HHID, STATE, HHTYPE, the same number of earners, at one earner matched perfectly on three personal variables (RACE, SEX, and AGE), and the family matching percentage above 50 percent.
  - Have MIS = 4 or MIS = 8 in the March data, because these cohorts have the key information on both family and household incomes and earner study data.