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The Spending and Debt Responses to Minimum Wage Increases

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Abstract

Following a minimum wage hike, household income rises on average by about $250 per quarter and spending by roughly $700 per quarter for households with minimum wage workers. Most of the spending response is caused by a small number of households who purchase vehicles. Furthermore, we find that the high spending levels are financed through increases in collateralized debt. Our results are consistent with a model where households can borrow against durables and face costs of adjusting their durables stock.

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1 Introduction

Many U.S. social insurance programs provide economic assistance to low-income households. Yet there is little evidence on the spending response to income changes among such households. In this paper, we estimate the magnitude, composition, distribution, and timing of the income, spending and debt responses to minimum wage hikes among households with adult minimum wage workers. We find that spending and debt rise substantially for a small set of these households following a minimum wage hike. These findings are consistent with a model where households can borrow against durables and face costs of adjusting their durables stock, suggesting that borrowing constraints and adjustment costs are important factors driving spending patterns among low-income households.

Using panel data from the Consumer Expenditure Survey (CEX), Survey of Income and Program Participation (SIPP), Current Population Survey (CPS), and administrative bank and credit bureau data, we identify households with adult minimum wage workers when the household is first observed. We then measure their ensuing spending, income and debt before and after a minimum wage hike. Identification is based on a fixed effects procedure that compares households with minimum wage workers in states that experience a minimum wage increase to similar households in states that do not.

We present four key empirical findings. First, a $1 minimum wage hike increases household income by roughly $250 and spending by approximately $700 per quarter in the year following a minimum wage hike. These findings are corroborated by independent data showing that debt rises substantially after a minimum wage increase. The results are particularly surprising given that many adults earning the minimum wage at a point in time make above the minimum two years later. Second, the majority of this additional spending is in durable goods, particularly vehicles.[1] The majority of the additional debt increase is in collateralized

[1] A large response in durable spending is consistent with many papers that focus on sizable disposable income changes, including those based on tax refunds (Parker 1999, Souleles 1999, Parker et al. 2010), the EITC (Barrow and McGranahan 2000, Adams, Einav, and Levin 2009), job loss (Browning and Crossley 2009), expansions in public health insurance programs (Leininger, Levy, and Schanzenbach 2010), and other large income changes (Krueger and Perri 2008). Moreover, Adams, Einav, and Levin (2009), Souleles (1999), Leininger et al (2010), and Parker et al. (2010) also find evidence that much of this additional durable spending is on vehicles. Other papers find no response in durable spending (e.g., Browning and Collado 2001, Hsieh 2003) or a highly imprecise response (e.g., Coulibaly and Li 2006). Our reading of the literature is that positive effects tend to be found in papers based on large relative income gains among more liquidity constrained households.

debt, such as auto loans. Consequently, the spending response is concentrated among a small number of households. Third, total spending increases within one quarter of a minimum wage increase and not prior, despite legislation typically passing 6 to 18 months before enactment. Finally, high levels of durables spending and debt accumulation persist for several quarters after a minimum wage hike. These results are robust to changes in sample selection criteria and a variety of covariates. Furthermore, we find that the minimum wage has no income or spending effect on households with workers earning at least double the minimum wage.

We consider whether various permutations of the life cycle model can fit the facts above. Two canonical models – the permanent income model and the buffer stock model with no borrowing – fail to do so. If households were spreading an income gain over their lifetime, as in the permanent income hypothesis, the short-run spending increase should be much smaller than what we observe in the data. Augmenting the permanent income model to account for durables raises the predicted short-term spending response. However, it is still an order of magnitude smaller than what our empirical estimates imply. Moreover, a buffer stock model in which households cannot borrow against durable goods generates a spending response of less than $200 and fails to explain why some minimum wage households increase their debt after a minimum wage hike.

Next, we consider an augmented buffer stock model in which households are collateral constrained – i.e., they can borrow against part, but not all, of the value of their durable goods. If households face collateral constraints, small income increases can generate small down payments, which in turn can be used for large durable goods purchases. With a 20 percent down payment, each additional dollar of income can be used to purchase five dollars of durable goods.

While this model fits the data better than the others, it still underpredicts the total spending response and does not match the highly concentrated distribution of additional spending. However, for plausible parameters, an augmented buffer stock model that allows for a cost of adjusting durables produces a spending response as large as $400 per quarter and replicates the skewness of the spending responses in the data. The model reproduces the larger observed spending response when we assume more widespread borrowing constraints among minimum wage households.

Models where households can borrow against durable goods are increasingly common for understanding the dynamics of consumer durables (Fernandez-Villaverde and Krueger 2011, Campbell and Hercowitz 2003), housing (Carroll and Dunn 1997, Attanasio et al. 2008, Hryshko et al. 2009) and entrepreneurship (Kaboski and Townsend 2008). However, there is little direct micro evidence on the quantitative importance of the constraint. Our paper provides such direct evidence.

That said, our estimates are silent about the aggregate effects of a minimum wage hike. Our estimated responses are for households that had a minimum wage job prior to an increase in the minimum wage. It is possible that a minimum wage increase reduces the odds that those without a job will be able to find one. Moreover, we ignore most teenagers, where the evidence of disemployment is most compelling. However, for those adults who had a minimum wage job prior to a minimum wage hike, spending (particularly on vehicles), income, and debt rise afterward and a model that incorporates collateral constraints and a cost to adjusting durables can mimic many of these patterns.

The rest of the paper is organized as follows. Section 2 provides a brief description of the CEX, SIPP, CPS, and administrative bank and credit bureau data sets used to estimate the spending, income, and debt responses. Section 3 describes the empirical results. Section 4 outlines a calibrated model of household spending responses to a minimum wage increase when borrowing constraints are present versus absent and links these results to the empirical findings. Section 5 concludes.

2 Data

This section describes the data that we rely on to measure income, wages, spending, and debt. Appendix A and Table A1 provide additional description of the data and sample selection criteria. All nominal values are deflated to 2005 dollars.

Our empirical analysis draws heavily from the Consumer Expenditure Survey (CEX), a representative sample of U.S. consumer units providing detailed information on household spending.[2] The surveys span 1982 through 2008, a period in which six federal and numerous state minimum wage increases were enacted. The CEX interviews households up to four times, spaced three months apart. In each interview, households are asked about detailed

[2]For ease of exposition, we refer to consumer units as households.

spending patterns for the previous three months. While this design provides monthly data, we follow Johnson, Parker, and Souleles (2006) and aggregate to the quarterly frequency.

In the first and fourth interview, households are also asked about individual income and hours worked over the previous year. This information is used to calculate the hourly wage of the first two adult (older than 18) members of the household, which is compared to the states effective minimum wage to identify minimum wage workers and households. After sample restrictions described in appendix A, we are left with 206,652 household-survey observations, of which 11 percent derive some income from the minimum wage.

Two additional datasets – the 1983 to 2007 Survey of Income and Program Participation (SIPP) and the 1979 to 2007 outgoing rotation files of the Current Population Survey (CPS) – are used to corroborate the income patterns in the CEX. We show these results because of the larger samples (785,930 and 485,427 observations for the CPS and SIPP, respectively) and because each are specifically designed to measure earnings and wages. For the purpose of identifying minimum wage workers, it is particularly useful that both surveys report the hourly wage of those paid-by-the-hour. SIPP and CPS variables are coded, and wage, self-employment, and family composition restrictions are introduced, to be as close as possible to the CEX sample.

Finally, as a verification of the spending patterns documented in the CEX, we use a proprietary dataset from a large, national financial institution that issues credit cards. This institution appends quarterly credit bureau reports about the credit card holders' loan portfolio of auto, home equity, mortgage, and credit card balances to all credit card accounts. We draw two samples from this data: a two-and-half year overlapping panel containing 4,610,497 observations from 1995 to 2008 and a separate sample of 644,037 observations that begins in January 2000 and runs for four years. This is not a random sample of households since an individual needs a credit card to be in this dataset. Appendix A shows that, according to the Survey of Consumer Finances, those with a credit card are less likely to be borrowing constrained than those without a credit card.

3 Empirical Results

3.1 Estimating Equations

Our empirical strategy is standard. We estimate equations of the form:

$$z_{it} = f_i + \sum_{k=-K}^{K} \phi_k w_{min,it+k} + \omega' x_{it} + u_{it} \tag{1}$$

where z_{it} is either income, spending, or change in debt, and $w_{min,it+k}$ is the minimum wage rate for the state that individual i resides in at time $t+k$.[3] x_{it} includes year and quarter dummies or a full set of month dummies, and f_i is a household fixed effect.[4] The ϕ_k parameters are separately identified from the time dummies and household fixed effects because many states raise the minimum wage above the federal minimum (see appendix table A2). Thus we can control for time effects, and in doing so the possibility that both the minimum wage and household spending rise in response to strong aggregate income growth.

Equation (1) is run separately for minimum wage and non-minimum wage households. In particular, let S_i be the share of total household income that is derived from adult minimum wage workers:

$$S_i = (E_1 \times I\{w_1 \leq w_{min,i} \times L\} + E_2 \times I\{w_2 \leq w_{min,i} \times L\})/F, \tag{2}$$

where E_1 and E_2 are the salary income for persons 1 and 2 (typically, the head and spouse), F is total pre-tax non-asset income, and $I\{w_1 \leq w_{min,i} \times L\}$ and $I\{w_2 \leq w_{min,i} \times L\}$ are indicators of whether the wage of persons 1 and 2 are within L percent of the minimum wage, all measured at the first period the household is observed.[5]

We report estimates of ϕ_k for households with no initial minimum wage earnings ($S = 0$), households with any adult minimum wage earnings ($S > 0$), and households with at least 20

[3]When using quarterly CEX and debt data, $w_{min,it+k}$ is the average value of the minimum wage over the quarter.

[4]When available, we also condition on the number of adults and the number of kids in the household in order to be consistent with other research (e.g. Johnson, Parker, and Souleles 2006). However, once the household fixed effect is included, we find no observable covariates in the CEX or the debt data that substantively impact our coefficient of interest, ϕ_k.

[5]Previous research (e.g. Card and Krueger 1995, Wellington 1991, Lee 1999) has shown that minimum wage hikes increase the wages of workers that make slightly above the minimum wage. Thus we set L to be 1.2 in equation (2) (i.e. 120 percent of the minimum wage) for most of our analysis. The results are not sensitive to other reasonable values of L.

percent of total income from adult minimum wage earnings ($S \geq 0.2$). The latter highlights those households that rely more extensively on minimum wage income.[6]

One drawback to the debt data is the limited nature of available wage and demographic information to compute S. Indeed, the only income data available is self-reported annual earnings of the account holder at the time of the credit card application.[7] Hours worked is not recorded.

Therefore, the debt regressions weight the minimum wage variable $w_{min,it+k}$ in equation (1) by the probability that the holder is a minimum wage worker, P_i. In other words, we assume spending is as in equation (1) with probability P_i and is equal to $f_i + \omega' x_{it} + u_{it}$ with probability $(1 - P_i)$, which gives rise to the following regression:

$$z_{it} = f_i + \sum_{k=-K}^{K} P_i \phi_k w_{min,it+k} + \omega' x_{it} + u_{it}. \tag{3}$$

To compute the weights, we use the CPS to estimate a probit model of whether a non-self-employed worker was within 120 percent of the minimum wage. Covariates are a quartic in annual earnings, a quartic in age, an age times annual earnings quartic, female, married, and female times married. The estimated probit model reveals that about 60 percent of all individuals earning \$10,000 per year are minimum wage workers, whereas virtually no one earning over \$20,000 per year is a minimum wage worker. We therefore present the results separately for individuals whose earnings at credit card application are above and below \$20,000.

3.2 The Magnitude of the Income Response

Table 1 begins by documenting the impact of a \$1 increase in the minimum wage on household income. In these initial results, we ignore dynamics, i.e. set $K = 0$ in equation (1).[8] Each cell in the table represents a different regression. The top number is the point estimate,

[6]Results are not sensitive to other reasonable S thresholds, such as 10 and 30 percent.

[7]Technically, we only have information for individual card-holders, not the unit of interest, the household. We partially circumvent this limitation since debt contracts are typically written at the household level. Therefore, the credit bureau data are often, but not always, at the household level.

[8]A handful of studies have estimated similar income equations. Recent examples include Draca, Machin, and Van Reenen (2008), Addison, Blackburn, and Cotti (2008), and Neumark, Schweitzer, and Wascher (2004, 2005). Each of these studies finds evidence that minimum wage hikes increase household income in the short-run.

the second number is the standard error corrected for within-household serial correlation, and the third is the sample size. Rows are organized by S, the share of household head and spouse earnings that come from employment at minimum wage jobs as measured at the initial time the household enters the survey. Thus, the first row includes households with no initial minimum wage income ($S = 0$) and the next two include households where total household income includes any ($S > 0$) or at least 20 percent ($S \geq 0.2$) adult minimum wage earnings.

Column (1), based on the CEX, shows that a $1 increase in the minimum wage causes after-tax income to rise by $218 and by $181 among $S > 0$ and $S \geq 0.2$ households.[9] In contrast, there is no income increase among households without minimum wage income. However, precision is low; for the minimum wage households, point estimates and standard errors are of a similar-size.

Therefore, the next two columns provide estimates from the CPS and SIPP.[10] For households with any minimum wage income, we find that quarterly earnings rise by $311 ($104) and $172 ($146) in the CPS and SIPP immediately after a $1 minimum wage increase. The final column reports a weighted average income response, where the weights are based on the precision of the three individual estimates. These calculations suggest that, in the near-term, $S > 0$ household quarterly income rises by roughly $250 with standard errors, calculated using standard GMM formulas, of around $75. The point estimates are a little smaller, albeit statistically not different, for $S \geq 0.2$ households.

By comparison, the effect on non-minimum wage households is not statistically different from zero (-$53 with a standard error of $32), suggesting the impact of the minimum wage law is limited to households with workers very close to their state's effective minimum wage. That is also the case when, as a finer test, we look at households near the minimum wage but not necessarily directly impacted by the law. Columns (5) to (8) define S as the share of income earned by adult workers with a wage between 120 and 300 percent of the minimum wage.[11]

[9]The after-tax income measure is based on self-reported federal, state and local, and other taxes paid. It does not include payroll taxes.

[10]Unlike the CEX, these samples are restricted to households with hourly workers. As expected, when we use a computed wage from the CPS and SIPP, we find smaller earnings responses. The CPS and SIPP earnings measures are also pre-tax. In the CEX, we found the tax adjustment makes little difference to our estimates.

[11]These samples exclude households with an adult worker within 120 percent of the minimum. That is, they only include the $S = 0$ households from columns (1) to (3), thereby comparing households with workers paid 120 to 300 percent of the minimum to those households where the adult workers earn over 300 percent of the minimum.

For households with such earners, we find no evidence of an income gain after a minimum wage increase in the CEX and CPS, although we observe a notable gain in the SIPP. A weighted average of the three datasets suggests the income gain is economically small and statistically indistinguishable both from zero and from the near zero gain among those with hourly wages more than triple the minimum (column 8, row 1). Moreover, the SIPP income gain is concentrated in households earning 120 to 200 percent of the minimum wage. Excluding these households that might plausibly be contaminated by the minimum wage law change (e.g. Card and Krueger 1995, Wellington 1991, Lee 1999), the estimated (but unreported) weighted average income gain among 200 to 300 percent households in the three datasets is \$7 (\$45).

It is important to note that household income need not rise among minimum wage workers if the legislated minimum wage increase leads to enough job loss. That does not appear to be the case, however. In table A3, we show that employment and hours do not fall after a minimum wage increase among our samples of adult CPS workers. Rather, wages rise among workers in minimum wage households and not among non-minimum wage households, explaining the majority of the earnings pattern in table 1.[12]

Beyond the first few quarters, the long-run effect of the minimum wage on income is more difficult to measure with existing data. Neumark et al. (2004, 2005) find that any income gain from a minimum wage increase dissipates substantially, perhaps even evaporates, within two years. This result is consistent with the empirical finding that many individuals who earn the minimum wage at a point in time will earn well above the minimum wage two years later (Smith and Vavrichek 1992; Carrington and Fallick 2001). Indeed, we find that only half of SIPP workers within 120 percent of their state's effective minimum wage are still within that range a year later and only 40 percent two years later.

3.3 The Magnitude of the Total Spending Response

Table 2 reports the size of the spending response to a minimum wage increase. Like table 1, each cell represents a separate regression and rows are stratified by S, the share of

[12] Among $S \geq 0.2$ households, average wages rise by roughly \$0.34 per hour. $S > 0$ household hours worked per week average about 56. That implies roughly a \$250 increase in quarterly earnings (0.34*56*13 weeks). There is also a small, positive hours impact of just under one hour per week, mostly driven by spouses. At a \$5.15 minimum wage, the extra hours would imply an additional \$50 in earnings per quarter.

household income from minimum wage jobs.

Column (1) shows that total spending increases by an economically important and usually statistically significant amount for households that derive income from minimum wage labor. Total spending in households where minimum wage labor is the source of any or at least 20 percent of household income rises by \$566 (standard error of \$407) and \$847 (\$451) per quarter, or on average roughly \$700, representing 7 and 13 percent of an average quarter's spending (column 6). In contrast, spending among households without minimum wage workers does not respond to a minimum wage change (-\$13 with a standard error of \$149). Moreover, spending among households with workers that are 120 to 300 percent above the minimum wage (column 2, rows 2 and 3) is likewise not statistically different from zero, matching the income patterns reported in table 1 and confirming that the spending effect is likely caused by the minimum wage and not a vestige of state-specific unobservable trends in consumption that are specific to low-wage families.

This basic pattern is robust to many perturbations of the sample and the statistical model. In column (3), we show that the spending response is large for households that might be particularly liquidity constrained. Liquidity constraints are proxied, as in Johnson et al. (2006), by whether a household's balance in checking and savings accounts is below \$5,000. The results are also strongest in states that instituted substantial hikes (column 4 versus 5).[13] More generally, we find similar estimates when we remove data restrictions on family composition, age, wage levels, and wage changes, or control for other factors in the regressions, such as state-specific time trends, the age of the head, survey fixed effects, and changes to other relevant social policies – such as the EITC, welfare/TANF, and unemployment insurance described in appendix A – that could conceivably be passed in tandem with a minimum wage increase.

Using the estimated spending effect in column (1) and the income estimates from table 1, we report the marginal propensity to spend (MPS) in columns (7) and (8). We find that $S \geq 0.2$ households spend 4.1 (standard error of 2.5, where standard errors are calculated using the formulas in appendix B) times the short-term increase in income that arises from minimum wage hikes. There is no impact among non-minimum wage households.

[13]We re-estimated the model with a dummy for whether the minimum wage change was "small" and an interaction between this small indicator and the minimum wage. Small increases include years when a minimum wage increase was less than 25 cents or automated by CPI adjustments.

To help motivate our explanation for the high MPS and to further corroborate this result, we next use the detailed spending breakdown in the CEX and the debt data from the credit bureaus to show the composition, heterogeneity, and timing of spending and debt.

3.3.1 Composition of Spending Responses

Table 3 displays the estimated durable and nondurable spending response to a minimum wage increase for households where $S = 0$, $S > 0$, and $S \geq 0.2$. We find that the majority of the large MPS reported in table 2 is from spending on durable goods. For example, households with $S \geq 0.2$ increase durables spending by \$882 (\$385) per quarter following a \$1 increase in the minimum wage, an amount that, on average, doubles the typical household's quarterly spending on durables. Again, households with no minimum wage income report no additional durables spending after the minimum wage hike. By contrast, we cannot statistically reject that the impact on nondurables and services is different from 0. The results are particularly striking considering that non-durables and services comprise 85 percent of total spending.

Since most of the spending response is in durables, the rest of the table decomposes this category more finely. In particular, we classify durable goods into eight categories: furniture, floors and windows, household items, large appliances, electronics, leisure activities, miscellaneous household equipment, and net outlays on transportation (measured as the difference between the price of the vehicle purchased and the vehicle sold).[14]

For most categories, the impact is small and hard to distinguish from zero. The notable exception is transportation goods. Households in the full sample with $S \geq 0.2$ spend an additional \$772 (\$380) on transportation durables, representing about 90 percent of the total spending response.

Table 4 further decomposes transportation spending. In columns (1) to (3), we report estimates of the probability of buying various types of vehicles from linear probability models with individual fixed effects. For households with $S \geq 0.2$, the probability of purchasing

[14] Floors and windows include carpets, rugs, curtains, drapes, blinds. Household items include clocks, lamps, linens, silverware, plates, glasses, decorative items, and outdoor equipment. Large appliances include kitchen and laundry appliances. Electronics includes televisions, VCRS, DVDs, stereo and sound equipment, computers, telephones, PDAs, antennas, and satellite dishes. Leisure activities include musical instruments, sports equipment, bikes, camping equipment, toys, games, playground equipment, arts and crafts, CDs, and DVDs. Miscellaneous household equipment includes small appliances, smoke alarms, cleaning equipment, tools, lawn equipment, window air conditioners, and portable heaters and coolers. Transportation includes cars, trucks, vans, motorcycles, and boats. These purchases are net of trade-ins.

a new vehicle rises by 2.7 percent (1 percent) per quarter. Column (4) shows that those additional purchases leads to an extra $503 ($209) in quarterly expenditures, on average. There is little impact on used vehicles or other transportation goods, possibly because they might be harder to debt finance.

Column (7) presents estimates of the spending response over the 1992 to 2008 period where additional questions were asked about the financing of new vehicle purchases. Column (8) shows that only $44 of the $417 spending response comes from vehicle purchases that were not financed. Of the remaining $373, $118 is an increase in down payments (column 9) and the remainder comes from loans collateralized by the vehicle (column 10). Thus, most of the additional spending on new vehicles is debt-financed.

3.3.2 Distribution of the Spending Responses

Since an additional 2.7 percent of minimum wage households purchase a new vehicle in the quarters immediately following a minimum wage increase, we would expect that the spending response is concentrated among a minority of households. This pattern is displayed in figure 1, which graphs a set of quantile regressions of total spending, ranging from the 10^{th} to 98^{th} percentiles (quantiles shown on the x-axis), for households where either $S = 0$ (connected by the blue line) or $S \geq 0.2$ (red line).[15] The key insight is that, for minimum wage households, the mean response is much bigger than the median response, the latter of which is not statistically or economically different from 0. In particular, the average effect reported in earlier tables appears to be substantially driven by the tails of the spending response distribution, especially households beyond the 90^{th} percentile of the distribution. We would not want to overemphasize these results given their precision. Indeed, 90 percent error bands show that the estimates are statistically distinguishable from zero only after the 95^{th} percentile. But the point estimates are broadly consistent with the heterogeneity in spending responses that we would expect given that average spending is driven by expensive durables purchases.

[15] In order to remove the household fixed effect, we first demeaned all variables, and then used standard quantile estimation techniques. Because a quantile estimator is not a linear model, demeaning the data will generate inconsistent estimates. However, when we performed our procedure on our simulated data, we found that this problem is very minor. Since we perform identical procedures on the simulated data, the estimates on actual and simulated data are comparable.

3.3.3 Timing of Spending

Figures 2a-2d show the timing of the spending response for the $S \geq 0.2$ households. The plots are based on equation (1) where we allow for three quarters of lags and leads of the minimum wage (K=3). The figures highlight three additional key facts.

First, the initial total spending increase (thick blue line in figure 2a) happens primarily in the contemporaneous quarter of the minimum wage change. There is little evidence that total spending increases prior to the minimum wage change, even though minimum wage hikes are typically passed into law 6 to 18 months prior to the time of the hike.[16]

Second, while total spending is flat prior to the minimum wage increase, this masks an offsetting increase in nondurables and services (dashed red line, figure 2a) and a decline in durables spending (dotted green line, figure 2a). When the hike occurs at t=0, durables spending spikes up. Though nondurables and service spending increased two quarters before the hike, it does not increase further during the quarter of the hike.

Third, spending does not immediately revert back to pre-hike levels after the initial increase. Rather, it bounces around $1,000 per quarter in the near term before starting to slowly decline.

For clarity, standard errors are presented in the other panels of figure 2. Generally, we find that the patterns in nondurables spending (figure 2c) are not statistically different from zero, which is unsurprising given the nondurables results in table 3. In contrast, durables spending (figure 2d) tends to be statistically and economically significant and, as we argue later, broadly consistent with the borrowing constraint model we introduce in section 4.

3.4 Debt

If spending rises more than income after a minimum wage increase, it follows that net financial assets decline. Although we do not have panel data on assets, we have panel data on debt. Table 5 shows quarterly changes in debt, as measured by the credit bureaus, after a minimum wage hike, broken into subcategories: vehicle loans, home equity loans, mortgages, and credit card debt. The results are reported separately for individuals reporting annual

[16] For example, of the 19 state minimum wage changes between 2000 and 2004 (excluding CPI adjustments), the median time between legislation and enactment date was 9 months. Only two increases (California in 2001 and Rhode Island in 2000) occurred less than five months after the bill's passage. Even among those exceptions, a public legislative debate began well before passage.

income above and below $20,000 at the time of credit card application.[17]

In each category, debt increases after a minimum wage increase, but particularly in collateralized loans tied to vehicles. We estimate that a $1 minimum wage increase causes auto loan balances to increase by $205 ($85), similar to the increase in debt collateralized by vehicles estimated from the CEX and shown in column (10) of table 4.[18] Furthermore, home equity lines, which can be used to purchase vehicles,[19] rise be $130 ($85). Auto loans, home equity, and credit card debt combined increase by $440 ($147).[20] There is no increase in debt among higher income ($\geq \$20,000$) individuals.

These numbers are consistent with the income and spending results presented thus far. Assuming that financial assets do not change after a minimum wage hike, rearranging a standard asset accumulation equation (like equation (5) below) shows that spending is equal to the sum of the debt and income response. Taking the mean income response of $S > 0$ and $S \geq 0.2$ minimum wage households to be $250 and $209 and the debt response to be $440 (this cannot be estimated by specific levels of S), we impute a spending response of $650 to $700, close to what we observe in the CEX, with a standard error of around $165. This result is shown in table 6. A weighted average of the imputed and estimated spending effects is roughly $675 with a standard error of $155. Such a spending response implies a marginal propensity to spend of roughly 3 with a t-statistic of just over 3.[21]

Figure 3 displays the dynamics of household debt (auto, home equity, and credit card), in the nine quarters that follow a minimum wage increase. To provide a longer panel, this figure is based on the sole cohort of accounts that are followed for four years starting in January 2000 rather than the series of two year panels used in table 5. The figures clearly show total debt rising in the first year after a minimum wage increase for households with income below

[17]Recall, we do not have wages for this sample and therefore cannot compute S. All observations are weighted based on the estimated relationship, described in section 3.1, between annual earnings and an indicator for whether the hourly wage is at or below 120 percent of the minimum wage.

[18]Likewise, we find that new loans increase by 2.8 percent (with a standard error of 0.8 percent) in the first quarter after a minimum wage increase. Roughly three-quarters are automobile loans and the remainder are home equity loans. Again, these figures are comparable to the estimated increase in automobile purchases in the CEX (column (1) of table 4).

[19] According to CNW Research, home equity lines were used in 12 to 14 percent of vehicle purchases made between 2003 and 2007. These data were generously provided to us by CNW. They are based on monthly phone and mail interviews of more than 14,000 households.

[20]The estimated credit card debt response of $105 ($95) is based only on our institution. However, if we use accounts where the balance ratio is high, and therefore the individual relies primarily on only our card, the change in debt following a minimum wage increase is similar albeit less precisely estimated. Our total debt also excludes loans not recorded by the credit bureau, including educational debt.

[21]Standard error derivations are shown in appendix B.

$20,000 (blue line) but not for higher income households (red line). In subsequent quarters, debt rises by less, to the point that by the end of the second year, we cannot reject that debt among low-income households is beginning to fall. This pattern provides direct evidence that much of the early consumption response is in fact debt-financed, and corroborates the independent CEX measures of debt-financed vehicle spending and the large MPS estimates that arise from the income and spending regressions.

Finally, figure 4 plots a set of quantile debt regressions, ranging from 0.10 to 0.98, for households with $< \$20,000$ and $\geq \$20,000$ in income. We again find that the median and mean effects are quite different. The average effect reported in table 5 is driven by the upper tails of the debt response distribution, consistent with the heterogeneity in spending responses that we would expect given that spending is driven by expensive durables purchases.

Despite the rise in debt, we find little evidence of an increase in defaults in the near-term. The probability that an account is 60 days-past-due actually falls slightly from 5.79 to 5.64 percent (with a standard error of 0.15 percent) six months after a minimum wage increase. This result is again based on a single cohort of credit bureau accounts, but the cohort is large and followed for four years, and the linear probability models include controls for account holder fixed effects and time dummies.

3.5 Summary of Empirical Results

We identify several stylized facts about income, spending, and debt following a minimum wage increase.

First, spending and income increase approximately $700 and $250 per quarter immediately following a minimum wage hike among households that derive income from minimum wage jobs. Consequently, we should see debt rising dramatically, a pattern that we document with the CEX and credit bureau data.

Second, the majority of the spending response occurs in the form of durable goods and, in particular, new vehicles that are debt financed. Consequently, the spending response is concentrated among a small number of households.

Third, total spending begins to rise within one quarter of a minimum wage increase rather than at the legislation's passage, which typically occurs 6 to 18 months prior. Moreover, there are some compositional differences in the timing. Prior to the minimum wage hike, durables spending falls and non-durables spending rises by roughly equal amounts, so the total spending response is almost zero. After the minimum wage hike, non-durables spending barely increases further, but durables spending immediately spikes upward.

Finally, high levels of durables spending and debt accumulation persist for several quarters after a minimum wage hike.

4 A Model with Durable Goods and Borrowing Limits

In this section, we describe a model that can explain many of these key empirical findings. Define C_t as consumption of non-durable goods at time t and D_t as the durables stock at time t (where time is measured in quarters). The household maximizes

$$E_{t_0} \sum_{t=t_0}^{T} \beta^t (C_t^{1-\theta} D_t^{\theta})^{1-\gamma}/(1-\gamma) \tag{4}$$

subject to the constraints below. Within period preferences are Cobb-Douglas between durables and non-durables. Thus, consistent with the evidence, expenditure shares are assumed constant.[22] We model individuals for 188 quarters, from age 18 to 65.

The asset accumulation equation is:

$$A_{t+1} = (1+r)A_t + Y_t - C_t - I_t, \quad A_{T+1} \geq 0 \tag{5}$$

where A_t denotes net financial assets (i.e., financial assets less debt), r the interest rate, I_t investment in consumer durables, and Y_t income. The law of motion for durables is

$$D_{t+1} = (1-\delta)D_t + I_t \tag{6}$$

where δ is the depreciation rate.

In contrast to much of the literature, but often observed in practice, we allow individuals

[22] For example, among CEX households with no adult minimum wage earners, the durables share of expenditures is roughly 17 percent. Among those households where income comes entirely from minimum wage labor, it is 12 percent. Fernandez-Villaverde and Krueger (2011) review the evidence on the substitutability of durables and non-durables and conclude that Cobb-Douglas is consistent with the evidence.

to borrow against durable goods. Assets must satisfy the borrowing constraint

$$-A_t \leq (1-\pi)D_t \tag{7}$$

where π is the down payment rate, or the fraction of the value of newly purchased durable goods that does not serve as collateral. Such a constraint may exist because of limited enforcement, where collateral guards against the temptation to default (e.g. Kiyotaki and Moore 1997). Rewriting equation (7) shows that the "buffer", defined as

$$\text{buffer}_t \equiv A_t + (1-\pi)D_t,$$

must always be greater than 0.

Finally, the income process is:

$$\ln Y_t = \alpha_t + P_t + u_t \tag{8}$$

where α_t is the life-cycle profile of income. We assume that $\alpha_t = \alpha_{t_0} + \alpha_1 t$ for the first 80 quarters of an individual's life, and is constant at $\alpha_t = \alpha_{t_0} + \alpha_1 \times 80$ afterwards, which is consistent with estimates showing that income growth tapers off after 20 years in the labor force (e.g., Gourinchas and Parker 2002) for low-skill workers. Because we found virtually no change in employment or hours worked following minimum wage hikes, we do not allow for an hours choice.

The stochastic components of income are the white noise term u_t and the AR(1) term P_t:

$$P_{t+1} = \rho P_t + \epsilon_{t+1} \tag{9}$$

where $\epsilon_t \sim N(0, \sigma_\epsilon^2)$ and $u_t \sim N(0, \sigma_u^2)$.

The model is complex and thus we solve it numerically using the solution techniques described in appendix C.

4.1 Calibration of the model

To calibrate the model, parameters are set to the values listed in table 7. In this section, we highlight those that are less standard.

First, we pick θ to match the CEX's estimate of non-residential durables share of total non-residential expenditure, $I_t/(I_t + C_t)$. Second, for δ, we use Campbell and Hercowitz's (2003) estimate of quarterly depreciation rates for non-residential durable goods, which is similar to Adda and Cooper (2000). Third, we choose $1 + r = \sqrt[4]{1.03}$ to correspond to a 3 percent real rate of interest, a standard in the literature.

Fourth, we assume the down payment rate, π, is 0.4. The Federal Reserve's G19 Consumer Credit release reports that the loan-to-value ratio, (1-π), on new cars averaged 90 percent between 1982 and 2005, covering most of the years in our CEX sample. However, only 57 percent of our estimated durables spending response came from new vehicles.[23] The rest of durables spending likely requires larger down payments, including some products for which collateralized financing may not be readily available (e.g., small appliances).

Fifth, we choose β to match the share of households who are liquidity constrained. Using data from the 1989 to 2007 waves of the Survey of Consumer Finances (SCF), the 25^{th} and 50^{th} percentiles of the buffer $(A_t+(1-\pi)D_t)$ at ages 22, 34, and 50 (which are the midpoints of the age tertiles of CEX minimum wage workers) are -\$70 and \$452.[24] We choose $\beta = \sqrt[4]{0.93}$, or 0.93 at an annual rate, so that the model matches the 25^{th} and 50^{th} percentiles of the buffer reasonably well.

Lastly, we estimate the parameters of the income process using the SIPP. We estimate $\alpha_1 = 0.0108$ using a household fixed effects regression of log income on age for households with minimum wage workers and heads younger than 40.[25] We choose α_{t_0} such that average income at ages 22, 34, and 50 is \$4,500, roughly the average of all minimum wage households in the SIPP, CEX, and SCF samples.[26] We assume $\rho = 0.995$ (or 0.98 at an annual rate), $\sigma_u^2 = 0.05$, and $\sigma_\epsilon^2 = 0.005$, similar to Gourinchas and Parker (2002) and Meghir and Pistaferri (2004).

[23] e.g. Tables 3 and 4 show that for $S \geq 0.2$, the durables response is \$882 and the new vehicle response is \$503.

[24] The 75^{th} percentile of the buffer is \$7,563, and thus the 75^{th} percentile of individuals do not appear liquidity constrained. The statistics above were calculated for ages 21, 33, and 49, which is one year before the age of the minimum wage hike. We do the calculation one year before the hike so that the model predictions are unaffected by savings behavior in response to the minimum wage hike. The 25th, 50th, and 75th percentile of the "buffer" for the full SCF at all ages is \$204, \$3,118, \$12,034, which shows that the distribution is somewhat sensitive to the sample used.

[25] This translates into 4 percent average annual income growth, close to estimates for early career low-skill workers (e.g. French, Mazumder, and Taber 2006).

[26] For example, SCF mean income of minimum wage workers is \$4,748 at all ages, and \$4,252 when averaging over ages 21, 33, and 49.

4.2 Initial Joint Distribution of the State Variables

Each simulated individual begins her life with a vector of state variables: the permanent component of income, net financial assets,[27] and the stock of durable goods. We generate the state vector by taking random draws of minimum wage households headed by an individual aged 18 to 25 in the SCF. Appendix A and table A4 present key descriptive statistics.

4.3 Modeling Minimum Wage Hikes

In order to assess the impact of the minimum wage on spending, we simulate the model with and without a minimum wage hike. The hike is modeled as an innovation to the deterministic component of income, α_t. Given our estimates in section 3.2, we assume that income increases by $250 immediately following the hike. That immediate gain is assumed to dissipate over the next 10 quarters. After 10 quarters, income once again grows by 1.08 percent per period for younger households and 0 percent for older households.

We assume that the size of the minimum wage hike does not vary with age, which is consistent with the data.[28] We simulate the model, with and without the minimum wage hike-induced income gain at ages 22, 34, and 50.[29] Figure 5 plots the difference in income profiles between simulated individuals who received a minimum wage hike (averaged over the ages surrounding the three minimum wage hikes) and those who did not (averaged around the same ages as those who received the hike). In total, a 10 percent minimum wage hike increases total discounted lifetime income by just over $1,250.

Finally, we assume that households learn about the minimum wage hike three quarters before it occurs. This is consistent with the observation that minimum wage legislation is typically passed into law at least three quarters before the minimum wage hike is implemented.

[27] More precisely, the state variable is cash-on-hand, which is the sum of net financial assets and current income.

[28] When adding $w_{min,it+k} \times age_{it}$ and $w_{min,it+k} \times age_{it}^2$ terms to the estimating equation (1), the predicted income responses in the CEX data are $237, $211, and $209 at ages 22, 34, and 50 for the $S > 0$ sample. Because the level of income rises with age, the percent increase in income is smaller at older ages. For example, we increase α_t by 7.88 percent at age 22 for those who receive a hike at age 22, by 5.35 percent at age 34 for those who receive a hike at age 34, and by 4.31 percent at age 50 for those who receive a hike at age 50.

[29] At age 22 this means that rather than grow at 1.08 percent per quarter, income only grows by 0.3 percent in the nine quarters after the hike for households receiving a minimum wage increase. This allows any income gain from the minimum wage to be eroded after 10 quarters.

4.4 Model Results without Uncertainty and Borrowing Constraints

We first describe the calibration results for the case when households face neither borrowing constraints (so π is unimportant) nor income uncertainty ($\sigma_u^2 = \sigma_\epsilon^2 = 0$) in order to clarify the dimensions on which this model succeeds in describing the empirical facts. We use the parameters in table 7,[30] with the exception that the time discount factor β is set to 1.01 to allow the model to generate a more plausible wealth distribution. When $\beta = \sqrt[4]{0.93}$, median net financial assets at the time of the minimum wage hike are implausibly low.[31]

Figure 6 shows the predicted spending response to a minimum wage hike (averaged over ages 22, 34, and 50), i.e., the difference between predicted spending of those who received a minimum wage hike and those who did not. Three key features of the figure are worth highlighting.

First, the initial spending increase is \$80, followed by \$18 spending per quarter thereafter. The present value of this stream of spending is roughly \$1,250, the lifetime income gain from the minimum wage hike. These estimates are substantially smaller in the near-term than what we observe in the spending data. To better understand the size of the spending responses, we use the parameter values in table 7 and formulas in appendix D to show that if T is large or there is a resale market for durables, the marginal propensity to spend on non-durables and durables is well below 1:

$$\left.\frac{\partial C_0}{\partial A_0}\right|_{D_0} = (1-\theta)\left[\frac{1-\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}}{1-\left(\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}\right)^{T+1}}\right] = 0.01, \tag{10}$$

$$\left.\frac{\partial I_0}{\partial A_0}\right|_{D_0} = (\beta(1+r))^{\frac{1}{\gamma}}\left(\frac{\theta}{r+\delta}\right)\left[\frac{1-\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}}{1-\left(\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}\right)^{T+1}}\right] = 0.04 \tag{11}$$

where θ and $1-\theta$ are the shares of lifetime expenditure devoted to non-durables and durables,

[30] We continue to make the model predicted mean income $E(Y_t) = \$4,500$ and income jump after a minimum wage hike be \$250. Because $E(Y_t) = \exp(\alpha_{t_0} + (\sigma_{P_t}^2 + \sigma_u^2)/2)$ (where $\sigma_{P_t}^2$ is the variance of the permanent component of income) and earnings variance varies across specifications, we adjust α_{t_0} and how α_t changes after minimum wage hikes across specifications to hold $E(Y_t) = \$4,500$ and the size of the income jump constant across specifications.

[31] When $\beta = \sqrt[4]{0.93}$, households are more impatient, and spend more in the short-run. For example, the short-run spending response increases from \$80 when $\beta = \sqrt[4]{1.01}$ to \$111 when $\beta = \sqrt[4]{0.93}$.

respectively. The term $r+\delta$ is a user cost, or the per period price of durables relative to non-durables, and $\left[\frac{1-\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}}{1-\left(\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}\right)^{T+1}}\right]$ is an annuitization factor.

Second, the household purchases large quantities of durables and more modest quantities of non-durables upon learning about the minimum wage hike. The reason for the durables increase is that if the household wishes to permanently increase the *service flow* of durables by a small amount, she must increase durables *spending* by a larger amount. After an initial jump, durables spending can decline again as the household only spends to maintain the new higher durables stock (Mankiw 1982).

Third, the spending response occurs when the household learns about a minimum wage hike in quarter -3, not when the hike occurs in quarter 0.

The magnitude, composition, and timing of these predictions are inconsistent with the empirical findings described in section 3.

4.5 Model Results with Borrowing Constraints and Income Uncertainty

Next, we introduce collateral constraints and income uncertainty to the model. Figure 7 plots the spending response to a minimum wage hike that emerges from this model. It illustrates several noteworthy, and ultimately testable, implications.

The first is the sheer magnitude of the spending increase. Total spending increases by over $300 per quarter and over $1,000 in the year after the minimum wage hike. This increase in spending is larger than the gain in income in the first year.

The second finding relates to timing. Most of the spending increase occurs at the date of the minimum wage change, not when the household learns about the impending hike in quarter -3. Because households are unable to borrow against future income in order to finance current spending, their spending does not rise until the minimum wage increases. Between quarters -1 and 0, the total spending response increases from -$8 to $445.

The last two features of the model have to do with the composition of spending before and after the minimum wage increase. Prior to its implementation but after its legislative enactment (quarters -3 to -1), there is a small increase in spending. This spending increase is heavily skewed toward nondurables. Indeed, durables spending declines slightly. However, once the minimum wage is implemented in quarter 0, durables spending soars by $461 relative to the previous quarter, while nondurables spending continues along a relatively stable path that began at quarter -3. In the face of borrowing constraints, fluctuations in durables spending is optimal because a short-run decline in durables spending has a small effect on the durables stock and its corresponding service flow. Put simply, it is easier to postpone buying a car than food (see Browning and Crossley 2000 for a proof).

That leads us to our final notable result – the persistence of durables spending. Although the durables spending response begins to decline after period 0, it remains elevated and is as high as the nondurables response at least a year later.

One of the striking aspects of this model is that spending exceeds income in the near-term. To see the intuition behind this result, and why spending may be concentrated in durables expenditures, assume that the borrowing constraint (7) always binds, i.e. $A_t = -(1-\pi)D_t$. Combining (7) with the asset accumulation equation (5) and the law of motion for durables, equation (6), it can be shown that:

$$\pi I_t + C_t + (1-\pi)(r+\delta)D_t = Y_t. \tag{12}$$

Households spend income on durables I_t, nondurables C_t, and interest payments on durables D_t. Since the household only needs \$$\pi$ in income to purchase \$1 worth of durables, spending gains can temporarily exceed income gains.

The magnitude, timing, composition, and persistence of the spending response following a minimum wage increase generated by the model with borrowing constraints and income uncertainty better matches the patterns observed in the data than the model without these features. Figures 8a-8d plots our estimates (solid lines) against the predictions of our model without borrowing constraints (dotted lines) and the model with borrowing constraints (dashed lines). Figure 8a displays the response of total spending, figure 8b nondurables, figure 8c durables, and figure 8d debt.[32] The figure emphasizes that the predicted spending response of the model with borrowing constraints is smaller than that estimated in the data, but is much larger than the response predicted by the model with no borrowing constraints. Furthermore, the timing of the model with borrowing constraints matches up well with what is observed in the data.

[32] As above, we assume there is no change in financial assets around minimum wage hikes, so the debt change is -ΔA_t).

4.6 Robustness Checks

Table 8 describes a number of checks of our model predictions. In particular, we report how spending responses vary with the size of the down payment constraint and the income process. The particular way parameters are adjusted for each of these tests is explained in the first column. The next three columns report non-durables, durables, and total spending responses to minimum wage hikes given the new parameter values.[33] The fifth and sixth columns report the 25^{th} and 50^{th} percentiles of the buffer, $A_{it} + (1 - \pi)D_{it}$, which is a measure of how borrowing constrained the agent is.

The first row reviews our estimated spending response from the CEX and the 25^{th} and 50^{th} percentiles of the buffer in the SCF. The second row reviews our baseline borrowing constraint model, as described in section 4.5 and figure 7. Non-durables and durables spending rise by \$18 and \$390 per quarter or \$408 in total per quarter.

The next row increases the down payment rate to 100 percent, as in the standard buffer stock model with durable goods. The spending response in this case is \$181 when $\beta = \sqrt[4]{0.93}$, and the response falls to \$146 when we increase β to $\sqrt[4]{0.95}$ to better match the observed distribution of the buffer. The higher the down payment rate, the fewer the durable goods that can be purchased with a given level of income. Thus, spending is less sensitive to income when the down payment is higher.

The next two rows explore the sensitivity of the results to differences in the income process. Given that some of the income heterogeneity estimated in Meghir and Pistaferri (2004) or Gourinchas and Parker (2002) may not reflect uncertainty so much as income changes known to individuals, we explore lower levels of income risk than in the benchmark specification. Reducing income uncertainty while holding the distribution of the buffer fixed has a relatively small effect on the predicted responses. That is, eliminating the variance of transitory income shocks and reducing the variance of persistent shocks so that σ_ϵ^2=0.002 and σ_u^2=0.0, but setting $\beta = \sqrt[4]{0.95}$ to keep the buffer roughly fixed, leads to a spending response of \$332.

This result, however, does not mean that income risk is immaterial. The sensitivity of

[33] These are estimated on the simulated data using a household fixed effects regression similar to equation (1). In order to be consistent with the empirical methods and CEX data, we use simulated spending data two quarters before to two quarters after the minimum wage hike. To further match the empirical methodology, we assume the share of minimum wage households that receive minimum wage hikes is similar to that in the data.

the spending response to the income process arises from the extent to which precautionary motives are important. When there is no income risk, there is little incentive for agents to hold precautionary wealth. With little precautionary wealth, the borrowing constraint is more likely to bind. When the borrowing constraint binds, equation (12) shows that we should expect large spending responses. For example, in the absence of income uncertainty, the median "buffer" available for spending is \$162. Because agents are borrowing constrained in this framework, the total spending response rises to \$674 per quarter. That is, we can replicate the estimated spending responses in the data when we assume near universal borrowing constraints among minimum wage households.

The next row reports spending responses when there are adjustment costs, which we discuss in greater detail in section 4.7. For completeness, the final two rows report spending responses in the model without borrowing constraints, as in section 4.4.[34] As before, spending barely responds under this version of the model.

4.7 Adjustment Costs and the Distribution of Spending Responses

Because much of the spending increase comes from vehicles, there is considerable heterogeneity in spending after a minimum wage increase. Figure 9 compares the estimated distribution of the spending response, as shown in figure 1 and re-plotted with the solid green line, to that predicted by our baseline model (the dashed blue line), as well as the baseline model augmented for adjustment costs (the dotted red line). The baseline model predicts roughly the same sized effect throughout the spending distribution and thus underpredicts the spending response at the right tail relative to what is seen in the data.

Now, consider the possibility that households face a cost of adjusting their durables stock, as in Carroll and Dunn (1997) and Kaboski and Townsend (2008). Households might face transactions costs of adjusting their durables stock if it takes time to shop for a new car and because the trade-in-value of an used car is less than the price of buying the same car off a used car lot. We follow Grossman and LaRoque (1990) and Eberly (1994) by assuming that in order to increase the durables stock, five percent of the previous stock would be lost.[35] Given this assumption, the model predicts that purchases occur every 12 quarters, which is consistent with actual vehicle expenditures in the CEX. This adjustment cost transforms

[34] As in section 4.4, we set $\beta = \sqrt[4]{1.01}$ to generate a plausible wealth level.

[35] See also Attanasio (2000) and Bertola, Guiso, and Pistaferri (2005) for more evidence.

equation (5) into:

$$A_{t+1} = (1+r)A_t + Y_t - C_t - I_t - 0.05D_t \times 1\{I_t \neq 0\} \tag{13}$$

where $1\{I_t \neq 0\}$ is an indicator for whether the individual purchases or sells a durable good.

When we make this modification, but leave other parameters at the baseline, the average total spending response moves from \$408 to \$359 per quarter (see table 8) when we hold β at its baseline level and \$448 when we reduce β to $\sqrt[4]{0.91}$ to better match the distribution of the buffer. Thus the model with adjustment costs does no better at explaining large mean spending responses in the data.

That said, adjustment costs, combined with the borrowing constraint, have important implications for heterogeneity in spending responses. This is displayed in the green dotted line in figure 9. The model with adjustment costs displays a significant spike in spending at the top end of the spending distribution. In particular, for those at the 98^{th} percentile, the spending response is \$5,759 per quarter, larger than the \$3,600 observed in the data.

This higher result comes about because households upgrade their durables stock periodically in the adjustment cost model. Thus, for the majority of households, the durables spending response is 0 in any given quarter. Conditional on a minimum wage increase, the probability of a durables purchase, as well as the amount spent conditional on a purchase, rises. This causes the spending response to be very large at the 95^{th} and 98^{th} percentiles but small below that. Consequently, the model with a five percent adjustment cost overstates the right tail of the spending distribution whereas the model without adjustment costs understates it.

5 Discussion

In this paper, we estimate the magnitude, timing, composition, and distribution of the income, spending and debt response to minimum wage hikes among households with adult minimum wage workers. We present four key empirical findings.

First, a \$1 minimum wage hike increases total spending by approximately \$700 per quarter in the near-term. This exceeds the roughly \$250 per quarter increase in family income following a minimum wage hike of similar size. These patterns are corroborated by independent data showing that debt rises substantially after a minimum wage increase. Second, the majority of this additional spending goes toward durable goods, in particular vehicles. Consequently, the spending response is concentrated among a small number of households. Third, total spending increases within one quarter of a minimum wage increase and not prior, despite legislation typically passing 6 to 18 months before enactment. Finally, high levels of durables spending and debt accumulation persist for several quarters after a minimum wage hike.

We find that the model that best matches these facts is an augmented buffer stock model in which households can borrow against part, but not all, of the value of their durable goods. If households face collateral constraints, small income increases can generate small down payments, which in turn can be used for large durable goods purchases. With a 20 percent down payment, each additional dollar of income can be used to purchase five dollars of durable goods. Consistent with this model, we find that most of the debt increase following a minimum wage hike is in collateralized debt, such as auto loans. Adjustment costs (representing, say, the trade-in cost of a vehicle) can help to reproduce the fact that the spending response is skewed.

While our model goes a good ways towards explaining the spending patterns in the data, it still falls short. One explanation is that borrowing constraints are more widespread than we assume based on observed asset holdings. Indeed, our model can reproduce the estimated spending responses if we assume near universal borrowing constraints among minimum wage households.[36] A better understanding of this and other alternative explanations is left for future work.

[36]Alternatively, our model might miss an important incentive that people face. For example, minimum wage hikes cause the wage, and thus the price of time, to rise. Although we find no evidence that the minimum wage affects adult hours or employment, a higher minimum wage may cause workers to purchase cars so that they can ensure that they hold onto their job. See Gurley and Bruce (2005) and cites within for evidence on the importance of access to cars on the probability of work among low-income households.

Appendix A: Data (not for publication)

The Consumer Expenditure Survey (CEX)

The empirical analysis primarily relies on the CEX and is briefly described in section 2. In this appendix, we provide further details about the sample selection criteria.

Our sample is driven by requirements to compute S. This is particularly relevant in two cases. State codes are needed to know effective minimum wage levels, but the CEX does not report actual state of residence for the 24 percent of the sample residing in smaller states. These observations are dropped.[37] Another 16.7 percent of the remaining sample are excluded because of incomplete income responses.

To further refine the sample to households with adults that have well-measured hourly wages, we also exclude the self-employed (6.6 percent of remaining sample)[38], households headed by those under 18 or over 64 (20.7 percent), households in the survey for only one period (11.2 percent), households without an initial wage for the head and spouse (14.7 percent), and households where either of the two member's hourly wage is only 60 percent (that is, implausibly low) or 40 times greater than the effective minimum wage in the initial survey (4.2 percent). Finally, we exclude 2.4 percent of the remaining sample because of large changes in family composition (either the number of kids or the number of adults changes by more than 2), head's age (greater than two years), or head's gender, or log hourly wages between the initial survey and the last survey (log change of 1.5 of greater). These restrictions are meant to reduce the impact of measurement error or to exclude large and hard-to-model changes in circumstances likely unrelated to minimum wage legislation.

We ultimately use 206,652 household-surveys, representing 62,478 households. Of these, 11.1 percent, or 22,923 household-surveys, are from households with some minimum wage income in the initial period (i.e. $S > 0$). Just over 16,000 are from families where minimum wage income makes up over 20 percent of total pre-tax income (i.e. $S \geq 0.2$).

Panel A of table A1 includes descriptive statistics of the key variables, including real total, durables, and nondurables and services spending, real family income, and selected demographics.

[37] The CEX assigns states to these residents. Our results do not change if we use the CEX-assigned state rather than dropping those residents. We also drop the District of Columbia because of its complicated minimum wage structure.

[38] The percentages reported are ordered in that each one reflects the share of excluded observations relative to the sample that remains up to that point.

The Survey of Income and Program Participation (SIPP) and The Current Population Survey (CPS)

To provide corroboration of the income results estimated from the CEX, we also compute the income response to a minimum wage hike using the SIPP and CPS. The main advantage to these datasets is that they provide larger samples and are specifically designed to collect high-quality earnings and wage information.

The first SIPP panel we use begins in 1986 and the last ends in 2007. Each panel lasts between two and four years and provides interviews with between 12 and 40 thousand households. Households are interviewed every four months during the time they remain in a panel. While they are asked to recall labor market information for each month between interviews, we only use the current month information.

Variables are coded, and wage, self-employment, and family composition restrictions are introduced, to be as close as possible to the CEX sample described above. Like the CEX, the numerator on S – total income from minimum wage earners – is also computed on the household head and, when applicable, spouse, only in the first period that we observe them.

The one important difference, relative to the CEX, is that we restrict the SIPP sample to workers who are paid by the hour. This restriction is meant to increase the liklihood that minimum wage workers are correctly identified. As can be seen in table A1, this also reduces the family income of the $S = 0$ control group.[39] There are 485,427 household-survey observations remaining after all our sample restrictions,[40] of which 10.4 percent report some minimum wage earnings and 8.1 percent report at least 20 percent of their total household nonproperty income from minimum wage earners.

Panel B of table A1 provides summary statistics for the key SIPP variables.

The CPS data that we use begins in 1979 and ends in 2007. Individuals are in the CPS for four months, out for the following eight, and then in again for four more months. Those in the fourth and eight months of their participationn are known as the outgoing rotation files and are asked questions specifically about weekly earnings and hours and hourly wages for those paid-by-the-hour. Therefore, we have up to two responses for each CPS respondent.

[39] We can compute a wage from monthly income and monthly hours worked, which is more analogous to the CEX wage measure. In this case, SIPP mean income would be about 20 percent higher.

[40] The definition of a household is not as straightforward as in the CEX. We rely on the variable *ppentry* to define households. Experimentation with other methods, such as holding composition fixed (stable households), does not qualitatively change the results.

Again, we define variables and sample restrictions to be analogous to the CEX.

Like the SIPP, variables are coded, and wage, self-employment, and family composition restrictions are introduced, to be as close as possible to the CEX sample. The numerator on S is likewise computed on the household head and, when applicable, spouse, in the first period that we observe them.

Using the sample of hourly wage workers, there are 785,930 observations remaining after our sample restrictions, of which 14.7 percent report some minimum wage earnings and 11.5 percent report at least 20 percent of their total household nonproperty income from minimum wage earners. Panel C of table A1 provides summary statistics for the key variables.[41]

Credit Bureau Reports

We use a proprietary dataset from a large financial institution that issues credit cards nationally. See Agarwal et al (2007) for details. We primarily rely on the credit bureau reports that are appended to these accounts because it allow us to look at the portfolio of debt of these households and test whether the financing of large durables, particularly vehicles, rise after a minimum wage increase.

There are important limitations to this data that give us some pause. First, by construction, the sample is selected on individuals holding a credit card. Minimum wage workers with credit cards are plausibly a selected sample of all minimum wage workers. According to our estimates from the Survey of Consumer Finances, 45 percent of all minimum wage workers have a credit card. This is similar to Johnson's (2007) estimate that 43 percent of households in the bottom quintile of the income distribution own a credit card. Median quarterly income is \$3,656 and \$3,047, median durables are \$9,463 and \$2,291, and the median buffer is \$3,663 and \$452 for those with and without a credit card, respectively. Thus it appears that we are selecting on a group of minimum wage workers who are less borrowing constrained than others. Second, as section 2 notes, demographics and income measures are limited. In particular, we only have the annual income of the account holder at the time of application. However, that data allows us to compute the probability that a worker is paid at the minimum wage (see section 3.1).

Panel D of table A1 provides some key descriptive statistics.

The Survey of Consumer Finances (SCF)

[41] Mean family income is significantly higher, about \$51,000 for $S = 0$ households, if the sample is not restricted to hourly workers.

Finally, we use the SCF to provide descriptive information on the initial joint distribution of the state variables used in the dynamic programming problem. The three state variables are the permanent component of income P_{it}, cash on hand X_{it} (which is the sum on income and net financial assets), and the stock of durable goods D_{it}. Equation (8) shows that $P_{it} = Y_{it} - \alpha_t$ when there are no transitory shocks, so we just need Y_{it} to infer P_{it}. We assume that permanent income is the same as current income, and define the durables stock as the sum of vehicles plus the stock of non-vehicle durables. We define net financial assets as financial assets less debt against these financial assets or durable goods.

Table A4 presents descriptive statistics from the 1989, 1992, 1995, 1998, 2001, 2004, and 2007 waves of the SCF. The table includes the state variables as well as total debt and assets which contain other assets, such as housing and business wealth, to provide a more complete picture of household balance sheets.

We present means for both minimum wage households ($S = 0$) and above minimum wage households ($S \geq .2$). To compute S, we use a methodology very similar to the CEX (described in section 3.1). First, we define someone as a minimum wage worker if that individual makes between 60 and 120 percent of the minimum wage. Next, if an individual is a minimum wage worker, we multiply that individual's hourly wage by hours per week times weeks per year. Because the SCF reports pay at frequencies chosen by the respondent, we compute the wage using given pay and frequency of pay, adjusted appropriately by hours per year. Finally, we take total household income from minimum wage workers and divide through by total household wage income (where wage income is the income of respondent and spouse and is derived using the procedure described above) which gives S, the share of income from minimum wage workers.

Table A4 shows that for minimum wage households[42], mean income, durables, and durables debt are all about one half to one third as large as for non-minimum wage households. However, mean net financial wealth of minimum wage households is only 16 percent of that of non-minimum wage households. Median net financial assets are only \$180. Note that that our definition of assets and durables excludes housing and business wealth. Roughly 35 percent of all minimum wage households own their home. For these households, housing represents

[42]Similar to the CEX, the unit of observation in the SCF is the "primary economic unit," which is usually a household. In order to preserve confidentiality of respondents, noise is added to SCF data. Each responding economic unit is turned into five observations.

close to 50 percent of all wealth and housing debt represents over 50 percent of all debt.

State-level Data

We obtained the state minimum wage histories from the January issues of the Monthly Labor Review. See table A2.

When estimating the effect of the minimum wage on spending and income, we sometimes control for maximum cash welfare benefit for a family of three by state and year, the refundable EITC attainable in a state in a given year, and state unemployment rates to account for possible UI extensions. The welfare levels are obtained from past issues of the Greenbook. For the years 1981, 1988, 1996, and 2006, we used table 7-22 from the 2008 Greenbook (http://waysandmeans.house.gov/media/pdf/110/tanf.pdf). For the years 1994, 1998, 2000, 2002, and 2003, we used table 7-10 from the 2003 Greenbook (http://waysandmeans.house.gov/media/pdf/greenbook2003/Section7.pdf). We were unable to find 1997, 1999, 2001, 2004, 2005, and 2007 and therefore assumed that they were the same as the following year (in most cases the previous and following year were the same). All remaining years were obtained from Diane Schanzenbach and are based on past Greenbooks. The annual EITC measure is the refundable EITC attainable in a state as a percent of the attainable federal EITC. We take this from Baughman and Dickert-Conlin (2007) through 1999 and table I-2 in http://www.cga.ct.gov/2008/rpt/pdf/2008-R-0102.pdf thereafter. In some instances (e.g. Iowa), the sources conflict, in which case we use the Baughman and Dickert-Conlin number. State unemployment rates are taken from the BLS tabulation of the Current Population Survey. Note that the correlation between the change in the state minimum wage and the change in state EITC and welfare benefits are essentially zero, consistent with out finding that these additional controls have little impact on our minimum wage point estimates.

Appendix B: Standard error calculation when averaging over multiple estimates(not for publication)

Define the population marginal propensity to spend (MPS) as β and the estimated MPS as $\hat{\beta} = \frac{\hat{C}}{\hat{Y}}$, where $\hat{C}$ = the estimated coefficient on the minimum wage from a regression of total spending (so C includes durables investment) on the minimum wage (which at the population level we define as C), $\hat{Y}$ = the estimated coefficient on the minimum wage from a regression of income on the minimum wage (which at the population level we define as

Y). The spending estimate comes from the CEX, which we define as $\hat{C} = C + \varepsilon_C$. We have three estimates of the income response from the CEX, SIPP, and CPS, defined as $\hat{Y_{CEX}} \equiv Y + \varepsilon_{Y_{CEX}}, \hat{Y_{SIPP}} \equiv Y + \varepsilon_{Y_{SIPP}}, \hat{Y_{CPS}} \equiv Y + \varepsilon_{Y_{CPS}}$. We assume that ε_C and $\varepsilon_{Y.}$ are white noise. We take the weighted average of these estimates for our estimated income response,

$$\hat{Y} = w_{CEX}\hat{Y_{CEX}} + w_{SIPP}\hat{Y_{SIPP}} + (1 - w_{CEX} + w_{SIPP})\hat{Y_{CPS}} \equiv Y + \varepsilon_Y. \tag{14}$$

A Taylor's series expansion for $\hat{\beta}$ is

$$\hat{\beta} \;=\; \beta + \frac{1}{\hat{Y}}\varepsilon_C - \frac{\hat{C}}{\hat{Y}^2}\varepsilon_Y$$

so the variance is:

$$Var(\hat{\beta}) = E(\hat{\beta} - \beta)^2 \;=\; \frac{1}{\hat{Y}^2}Var(\varepsilon_C) + \frac{\hat{C}^2}{\hat{Y}^4}Var(\varepsilon_Y) - 2\frac{\hat{C}}{\hat{Y}^3}Cov(\varepsilon_C, \varepsilon_Y). \tag{15}$$

Our estimate of $Var(\varepsilon_C)$ is the variance of the estimated coefficient $\hat{C}$ (or the square of its standard error). Next, we estimate $Var(\varepsilon_Y)$ using equation (14)

$$Var(\epsilon_Y) = Var(\hat{Y}) = w_{CEX}^2 Var(\hat{Y_{CEX}}) + w_{SIPP}^2 Var(\hat{Y_{SIPP}}) + (1 - w_{CEX} + w_{SIPP})^2 Var(\hat{Y_{CPS}}) \tag{16}$$

where $Var(\hat{Y_{CEX}}), ...$ are the variance of the coefficients $\hat{Y_{CEX}}, ...$ Finally, consider estimating $Cov(\varepsilon_C, \varepsilon_Y)$. This will be nonzero because the CEX is used to estimate both $\hat{C}$ and $\hat{Y}$. Analogous to equation (15) we can recover this covariance using:

$$Var(\hat{\beta_{CEX}}) = \frac{1}{\hat{Y_{CEX}}^2}Var(\varepsilon_{C_{CEX}}) + \frac{\hat{C_{CEX}}^2}{\hat{Y_{CEX}}^4}Var(\varepsilon_{Y_{CEX}}) - 2\frac{\hat{C_{CEX}}}{\hat{Y_{CEX}}^3}Cov(\varepsilon_{C_{CEX}}, \varepsilon_{Y_{CEX}})$$

where $\hat{\beta_{CEX}}$ is the 2SLS estimate of β using the CEX. Rearranging yields

$$Cov(\varepsilon_{C_{CEX}}, \varepsilon_{Y_{CEX}}) = \frac{\hat{Y_{CEX}^3}}{2\hat{C_{CEX}}}\left[\frac{1}{\hat{Y_{CEX}}^2}Var(\varepsilon_{C_{CEX}}) + \frac{\hat{C_{CEX}}^2}{\hat{Y_{CEX}}^4}Var(\varepsilon_{Y_{CEX}}) - Var(\hat{\beta_{CEX}})\right]. \tag{17}$$

Because the SIPP and CPS estimates come from different data sets, the covariance of the income estimates with either the income or spending estimates in the CEX should be 0. Thus

$$\begin{aligned} Cov(\varepsilon_C, \varepsilon_Y) &= Cov(\varepsilon_C, \hat{Y} - Y) \\ &= Cov(\varepsilon_C, w_{CEX}\varepsilon_{Y_{CEX}}) \\ &= w_{CEX}Cov(\varepsilon_C, \varepsilon_{Y_{CEX}}). \end{aligned} \tag{18}$$

Thus $Var(\hat{\beta})$ can be estimated using equation (15), using equations (17) and (18) to estimate $Cov(\varepsilon_C, \varepsilon_Y)$, and (14) to estimate $Var(\hat{Y})$.

Including Debt Information

Assuming the interest rate is close to zero and $\Delta debt = -\Delta A$, then the asset accumulation equation yields $C = Y + \Delta debt$. Thus a second measure of the MPS is $\hat{\beta}_2 = \frac{\hat{Y} + \Delta \hat{debt}}{\hat{Y}} = 1 + \frac{\Delta \hat{debt}}{\hat{Y}}$. Analagous to equation (15), the of variance of the second measure of the MPS is

$$Var(\hat{\beta}_2) = E(\hat{\beta}_2 - \beta)^2 = \frac{1}{\hat{Y}^2} Var(\varepsilon_{\Delta debt}) + \frac{\Delta \hat{debt}^2}{\hat{Y}^4} Var(\varepsilon_Y) \tag{19}$$

It is also possible to take a weighted average over the two MPS estimates:

$$\hat{\beta}_3 = w\hat{\beta} + (1 - w)\hat{\beta}_2 \tag{20}$$

The variance of this object is:

$$Var(\hat{\beta}_3) = w^2 Var(\hat{\beta}) + (1 - w)^2 Var(\hat{\beta}_2) + w(1 - w)Cov(\hat{\beta}, \hat{\beta}_2). \tag{21}$$

The covariance $Cov(\hat{\beta}, \hat{\beta}_2)$ is not 0 because (i) the same income information is used in both measures and (ii) the CEX income measure is correlated with the CEX spending measure. The covariance is:

$$Cov(\hat{\beta}, \hat{\beta}_2) = -\frac{\Delta \hat{debt}}{\hat{Y}^3} Cov(\varepsilon_Y, \varepsilon_C) + \frac{\Delta \hat{debt}\hat{C}}{\hat{Y}^4} Var(\hat{Y}) \tag{22}$$

where $Cov(\varepsilon_Y, \varepsilon_C)$ is calculated in equation (18), so (22) can be written as:

$$Cov(\hat{\beta}, \hat{\beta}_2) = -\frac{\Delta \hat{debt}}{\hat{Y}^3} w_{CEX} Cov(\varepsilon_C, \varepsilon_{Y_{CEX}}) + \frac{\Delta \hat{debt} \hat{C}}{\hat{Y}^4} Var(\hat{Y}) \tag{23}$$

Minimizing the right hand side of equation (21) with respect to w yields the value of w that minimizes the variance of $\hat{\beta}_3$:

$$w = \frac{Var(\hat{\beta}_2) - Cov(\hat{\beta}, \hat{\beta}_2)/2}{Var(\hat{\beta}) + Var(\hat{\beta}_2) - Cov(\hat{\beta}, \hat{\beta}_2)}. \tag{24}$$

Appendix C: Solving the model (not for publication)

In order to reduce the number of state variables, we follow Deaton (1991) and redefine the problem in terms of cash-on-hand:[43]

$$X_t = (1 + r)A_t + Y_t. \tag{25}$$

Assets and cash-on-hand follow:

$$A_{t+1} = X_t - C_t, \tag{26}$$

$$X_{t+1} = (1 + r)(X_t - C_t - I_t) + Y_{t+1}. \tag{27}$$

Thus, the borrowing constraint becomes

$$-\left(\frac{X_t - Y_t}{1 + r}\right) \leq (1 - \pi)D_t. \tag{28}$$

Note that all of the variables in X_t are known at the beginning of period t. We can thus write the individual's problem recursively, using cash-on-hand as a state variable. In recursive form, the household's problem is to choose non-durables consumption and durables investment to maximize :

$$V_t(Z_t) = \max_{C_t, I_t} \{(C_t^{1-\theta} D_t^{\theta})^{1-\gamma}/(1 - \gamma) + \beta \int V_{t+1}(Z_{t+1}) dF(Z_{t+1}|Z_t, C_t, I_t, t)\} \tag{29}$$

subject to the constraint in equation (28), where the state variables of the model are $Z_t =$

[43]Using cash-on-hand allows us to combine assets and the transitory component of income u_t into a single state variable.

(X_t, D_t, P_t), and $F(.|.)$ gives the conditional cdf of the state variables, using equations (6), (8), (9), and (27). Solving the model gives optimal consumption and durables investment decision rules.

The source of uncertainty in the model is from income. We integrate over the distribution of income by discretizing P_t using discrete state Markov Chains (Tauchen 1986).

To simulate the model, we take the initial joint distribution of the state variables from the data. We then take draws of income from the data generating process of income. Given the initial joint distribution of (X_0, D_0, P_0) that we observe in the data, we use the decision rules to obtain C_0, I_0, which gives us a value of (X_1, D_1). We take a draw for P_1, which then gives income. We repeat this for $T = 200$ periods. The figures presented are based on 5,000 simulations of the model.

Appendix D: Certainty and no borrowing constraints (not for publication)

Using assets instead of cash on hand as the state variable, Bellman's equation (29) without uncertainty is:

$$V_t(A_t, D_t, P_t) = \max_{C_t, I_t}\{U(C_t, D_t) + \beta V_{t+1}(A_{t+1}, D_{t+1}, P_{t+1})\}. \tag{30}$$

The only constraints in this case are the law of motion for assets (equation 5) and durables (equation 6) and that final period assets must be non-negative. The first order conditions for non-durables consumption and durables investment are, respectively:

$$\frac{\partial U_t}{\partial C_t} = \beta \frac{\partial V_{t+1}}{\partial A_{t+1}} \tag{31}$$

$$\frac{\partial V_{t+1}}{\partial A_{t+1}} = \frac{\partial V_{t+1}}{\partial D_{t+1}}. \tag{32}$$

Differentiating with respect to assets and the durables stock and using the envelope condition yields, respectively:

$$\frac{\partial V_t}{\partial A_t} = \beta(1+r)\frac{\partial V_{t+1}}{\partial A_{t+1}} \tag{33}$$

$$\frac{\partial V_t}{\partial D_t} = \frac{\partial U_t}{\partial D_t} + \beta \frac{\partial V_{t+1}}{\partial D_{t+1}}(1-\delta). \tag{34}$$

Combining equations (32), (33), and (34) yields

$$\beta(1+r)\frac{\partial V_{t+1}}{\partial A_{t+1}} = \frac{\partial U_t}{\partial D_t} + \beta \frac{\partial V_{t+1}}{\partial A_{t+1}}(1-\delta). \tag{35}$$

Combining equations (31) and (35) yields

$$(r+\delta)\frac{\partial U_t}{\partial C_t} = \frac{\partial U_t}{\partial D_t}. \tag{36}$$

Inserting the specific functional forms for the utility function from equation (4) into equation (36) yields

$$(r+\delta)\left(\frac{1-\theta}{\theta}\right)D_t = C_t. \tag{37}$$

Combining equations (31), (33), and (37) yields the Euler Equation

$$C_{t+1} = C_t(\beta(1+r))^{\frac{1}{\gamma}}. \tag{38}$$

Define

$$PV \equiv A_0 + \sum_{t=0}^{T}\left(\frac{1}{1+r}\right)^t Y_t \tag{39}$$

as "full wealth", i.e., the present value of lifetime income plus wealth. Given that the present value of lifetime spending is equal to full wealth (and given that the annual cost of durables is $(r+\delta)$), the lifetime budget constraint is

$$\sum_{t=0}^{T}\left(\frac{1}{1+r}\right)^t (C_t + (r+\delta)D_t) = PV. \tag{40}$$

Inserting equation (37) into equation (40) yields

$$\sum_{t=0}^{T}\left(\frac{1}{1+r}\right)^t \left(C_t + \left(\frac{\theta}{1-\theta}\right)C_t\right) = PV. \tag{41}$$

Combining equation (38) with equation (41) yields

$$\sum_{t=0}^{T}\left(\frac{1}{1+r}\right)^{t}\left(\left(1+\left(\frac{\theta}{1-\theta}\right)\right)C_0(\beta(1+r))^{t/\gamma}\right)=PV. \tag{42}$$

Using the formula for an infinite sum and rearranging yields

$$C_0=(1-\theta)\left[\frac{1-\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}}{1-(\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r})^{T+1}}\right]PV \tag{43}$$

where $(1-\theta)\left[\frac{1-\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}}{1-\left(\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}\right)^{T+1}}\right]$ is the marginal propensity to consume non-durables. Inserting equation (37) into equation (43) yields

$$D_0=(\frac{\theta}{r+\delta})\left[\frac{1-\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}}{1-\left(\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}\right)^{T+1}}\right]PV. \tag{44}$$

Holding last period's durables stock fixed, increases in this period's durables stock can only come from increases in investment. Thus

$$\left.\frac{\partial I_0}{\partial PV}\right|_{D_0}=\left.\frac{\partial D_1}{\partial PV}\right|_{D_0}=(\beta(1+r))^{\frac{1}{\gamma}}(\frac{\theta}{r+\delta})\left[\frac{1-\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}}{1-\left(\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}\right)^{T+1}}\right] \tag{45}$$

is the marginal propensity to spend on durables. Inspection of equation (40) shows that the marginal propensity to spend is the same for increases in assets and the present value of lifetime income. In order to get time period 1 non-durables and durables spending, note that equation (38) shows that consumption grows at rate $(\beta(1+r))^{\frac{1}{\gamma}}$, and thus the marginal propensity to consume non-durables at time 1, given an increase in full wealth at time 0, is $(\beta(1+r))^{\frac{1}{\gamma}}(1-\theta)\left[\frac{1-\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}}{1-\left(\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}\right)^{T+1}}\right]$. To derive the time 1 durables spending response, note that the ratio of durables to non-durables is a constant, and thus the durables stock grows at a rate $(\beta(1+r))^{\frac{1}{\gamma}}$. Using this result, the law of motion for durables, and equation (45) yields the marginal propensity to spend on durables at time 1:

$$
\begin{aligned}
\left.\frac{\partial I_1}{\partial PV}\right|_{D_0} &= \left.\frac{\partial D_2}{\partial PV}\right|_{D_0} - (1-\delta)\left.\frac{\partial D_1}{\partial PV}\right|_{D_0} \\
&= (\beta(1+r))^{\frac{1}{\gamma}}\left.\frac{\partial D_1}{\partial PV}\right|_{D_0} - (1-\delta)\left.\frac{\partial D_1}{\partial PV}\right|_{D_0} \\
&= \left[(\beta(1+r))^{\frac{1}{\gamma}} - (1-\delta)\right]\left.\frac{\partial D_1}{\partial PV}\right|_{D_0} \\
&= \left[(\beta(1+r))^{\frac{1}{\gamma}} - (1-\delta)\right](\beta(1+r))^{\frac{1}{\gamma}}\left(\frac{\theta}{r+\delta}\right)\left[\frac{1-\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}}{1-\left(\frac{(\beta(1+r))^{\frac{1}{\gamma}}}{1+r}\right)^{T+1}}\right].
\end{aligned} \tag{46}
$$

Solving for time period 2 spending propensities is straightforward.

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Table 1
Total Household Nonproperty Quarterly Income Response to Change in the Minimum Wage

Share of income from minimum wage jobs (S)	CEX (1)	CPS (2)	SIPP (3)	Weighted Average[1] (4)	"Minimum wage" worker = 120 to 300% of mimimum[2] CEX (5)	CPS (6)	SIPP (7)	Weighted Average[1] (8)
0	23	-48	-92	-53	38	60	-100	12
	(100)	(42)	(60)	(32)	(176)	(95)	(135)	(71)
	183,729	670,593	434,942		76,956	147,272	113,963	
>0	218	311	172	255	39	-16	184	48
	(174)	(104)	(146)	(76)	(105)	(44)	(64)	(34)
	22,923	115,337	50,485		106,773	523,321	320,979	
>=0.2	181	218	211	209	-24	-4	195	46
	(175)	(105)	(140)	(76)	(96)	(43)	(65)	(34)
	16,073	90,267	39,459		97,271	494,169	282,363	
Time period	1983-2008	1979-2007	1986-2007		1983-2008	1979-2007	1986-2007	
Sample of workers[3]	All	Hourly wage workers	Hourly wage workers		All	Hourly wage workers	Hourly wage workers	

Notes:
Each cell represents a separate regression. S is the share of pre-tax total household income from near minimum wage salaries earned by the top two adults in the household. See the text for additional details. All standard errors are cluster corrected by household (consumer unit in CEX).
[1] The weighted average estimate uses a GMM formula where weights are based on the precision of the individual estimates.
[2] Columns (5) to (8) show the "minimum wage effect" for workers that are between 120 and 300% of the minimum wage. These regressions drop households with workers that are 120 percent or less (ie S>0 in columns 1 to 3) of the minimum wage.
[3] The CEX sample includes all workers and is based on a computed wage equal to annual earnings divided by annual hours worked. The SIPP and CPS samples consist of workers paid by the hour.

Table 2
Total Spending Response to Change in the Minimum Wage
CEX, 1983-2008

Share of income from minimum wage jobs (S)	Baseline Estimates (1)	120-300% of minimum wage[1] (2)	Liquid assets[2] <$5,000 (3)	Size of increase[3] Small (4)	Size of increase[3] Large (5)	Real average quarterly spending (6)	Implied MPS[4] CEX income (7)	Implied MPS[4] CPS/SIPP/CEX avg income (8)
0	-13	132	62	148	-16	11,068		
	(149)	(251)	(167)	(427)	(149)			
	183,729	76,956	85,278					
>0	566	-140	643	-31	586	7,708	2.6	2.2
	(407)	(172)	(354)	(756)	(409)		(2.3)	(1.6)
	22,923	106,773	13,703					
>=0.2	847	-233	883	-37	897	6,507	4.7	4.1
	(451)	(173)	(394)	(668)	(455)		(4.6)	(2.5)
	16,073	97,271	9,988					

Notes:
Each cell represents a separate regression. S is the share of pre-tax total consumer unit income from near minimum wage salaries (<120% of the state minimum wage) earned by the top two adults in the consumer unit. See the text for details.
All standard errors are cluster corrected by consumer unit.

[1] S is defined as the share of household income coming from workers making 120 to 300% of the minimum wage. The sample is all households with S=0 in column (1).

[2] Liquid assets are defined as savings plus checking accounts, as in Johnson et al. (2006).

[3] Small increases include years when a minimum wage increase was less than 25 cents or automated by CPI adjustments.

[4] MPS is equal to the CEX spending response reported in table 2, column (1) divided by the income response from table 1, columns (1) or (4).

Table 3
Decomposition of Spending Response
CEX, 1983-2008

Share of income from minimum wage jobs (S)	Nondurables & Services (1)	Durables (2)	Durables subcomponents: Furniture (3)	Floors and windows (4)	HH items (5)	Big appls. (6)	Electr. (7)	Leisure activities (8)	Misc HH equip. (9)	Transp. (10)	Non-Transp. (11)
0	11	-24	21	1	-8	3	8	-3	-5	-40	27
	(76)	(123)	(18)	(7)	(6)	(7)	(11)	(8)	(6)	(119)	(84)
>0	155	411	9	12	-1	48	-8	-20	42	328	238
	(158)	(365)	(35)	(10)	(9)	(35)	(28)	(37)	(14)	(354)	(178)
>=0.2	-36	882	-5	11	5	16	18	10	55	772	75
	(188)	(385)	(34)	(8)	(7)	(12)	(31)	(15)	(15)	(380)	(195)
Real average amount spent (2000$):											
0	9,224	1,844	167	36	99	48	230	110	56	1,097	9,971
>0	6,569	1,138	88	15	51	32	151	69	33	699	7,008
>=0.2	5,615	892	69	9	36	23	124	53	24	552	5,955
Conditional on purchase (2000$):											
0		1,969	613	348	180	690	303	174	209	11,825	
>0		1,316	420	199	114	506	245	131	163	7,546	
>=0.2		1,069	385	152	92	439	219	112	143	6,692	

Notes
Each cell represents a separate regression. All standard errors are cluster-corrected by consumer unit.

Table 4
Decomposition of Transportation Spending Response
CEX, 1983-2008

Share of income from minimum wage jobs (S)	Probability of Purchase (1983-2008): New Cars/ Trucks (1)	Probability of Purchase (1983-2008): Used Cars/ Trucks (2)	Probability of Purchase (1983-2008): Other transp. (3)	Expenditure (1983-2008): New Cars/ Trucks (4)	Expenditure (1983-2008): Used Cars/ Trucks (5)	Expenditure (1983-2008): Other transp. (6)	Expenditures on new cars and trucks (1992-2008): Expenditure (7)	Expenditures on new cars and trucks (1992-2008): Net outlay, not financed (8)	Expenditures on new cars and trucks (1992-2008): Financed with loan: Down-payment (9)	Expenditures on new cars and trucks (1992-2008): Financed with loan: Expenditure less downpayment (10)
0	-0.003	0.006	-0.001	-7	29	-62	-104	-60	-12	-31
	(0.004)	(0.005)	(0.002)	(92)	(65)	(39)	(118)	(60)	(18)	(92)
>0	0.023	-0.002	-0.005	408	-38	-42	334	78	105	151
	(0.009)	(0.021)	(0.008)	(180)	(197)	(227)	(192)	(60)	(62)	(142)
>=0.2	0.027	0.005	-0.006	503	43	226	417	44	118	255
	(0.010)	(0.026)	(0.007)	(209)	(201)	(259)	(226)	(69)	(73)	(169)
Average (2000$ for expenditures):										
0	0.027	0.058	0.010	562	466	70	560	82	59	419
>0	0.013	0.075	0.008	226	424	49	212	12	24	176
>=0.2	0.009	0.070	0.005	152	367	34	133	6	16	111
Conditional on positive number:										
0				20,769	8,003	6,688	22,618	22,560	4,414	19,876
>0				18,007	5,681	6,426	19,803	15,456	3,687	17,668
>=0.2				16,971	5,278	6,203	18,214	15,392	3,313	16,068

Notes:
Probability of a purchase is estimated using a linear probability model with individual fixed effects.
Each cell represents a separate regression. All standard errors are cluster-corrected by consumer unit.

Table 5
Debt Response to Change in the Minimum Wage
Credit Bureau and Credit Card Data, 1995-2008

Income at credit card application	Auto debt	Home equity debt	Mortgage debt	Credit card debt	Total debt	Total minus mortgage debt
	(1)	(2)	(3)	(4)	(5)	(6)
>=$20,000	16	10	6	12	46	38
	(99)	(85)	(136)	(7)	(133)	(74)
<$20,000	205	130	155	105	602	440
	(85)	(85)	(371)	(95)	(337)	(147)

Notes:
Data on collateralized debt (auto, home equity, and mortgage) are from the Credit Bureaus. Data on credit card debt is based on cards from our institution. All observations are weighted by P, the probability that an individual account holder is a minimum wage worker. See text for details. Sample sizes are 4 million and 582,000 for account holders with incomes of at least $20,000 and incomes less than $20,000. Each cell represents a separate regression. All standard errors are cluster-corrected by account holder.

Table 6
Alternative Estimates of Spending Response

Share of income from minimum wage jobs (S)	Spending			Weighted average MPS[3]
	CEX[1]	Imputed from income/debt[2]	Weighted average	
	(1)	(2)	(3)	(4)
>0	566	695	677	2.7
	(407)	(166)	(153)	(0.8)
>=0.2	847	649	672	3.1
	(451)	(165)	(155)	(1.0)

Notes:
[1] From table 2, column (1).
[2] Table 1, column (4) plus table 5, column (6). See text.
[3] Column (3) / table 1, column (4). See appendix B for details on the standard error calculations.

Parameter	Quarterly value	Definition
β	$\sqrt[4]{0.93}$	Discount factor
γ	2	Coefficient of relative risk aversion
θ	0.15	Utility weight on durables
$T - t_0$	188	Number of time periods
r	$\sqrt[4]{1.03} - 1$	Quarterly interest rate
δ	0.034	Durables depreciation rate
π	0.4	down payment rate
$E(Y)$	$4,500	Average income of minimum wage households
α_1	0.0108	Income growth
ρ	0.995	Autocorrelation of income
σ_ϵ^2	0.005	Variance of AR(1) innovations
σ_u^2	0.05	Variance of transitory innovations

Table 7: Parameters Used for Calibration

Parameters	Non-durables spending	Durables spending	Total spending	25th percentile buffer***	Median buffer***
Estimates*	-36	882	847	-70	452
Baseline**	18	390	408	104	208
$\pi = 1.0$	7	174	181	0	172
$\pi = 1.0$, $\beta = \sqrt[4]{0.95}$	21	125	146	11	224
$\sigma_\epsilon^2 = 0.002$, $\sigma_u^2 = 0.0$, $\beta = \sqrt[4]{0.95}$	40	292	332	104	208
$\sigma_\epsilon^2 = 0$, $\beta = \sqrt[4]{0.95}$	49	615	674	0	162
Adjustment cost = 0.05	-21	380	359	351	723
Adjustment cost = 0.05, $\beta = \sqrt[4]{0.91}$	3	445	448	258	532
$\beta = 1.01$, $\sigma_\epsilon^2 = 0$, no borrowing constraints	1	7	8	na	na
$\beta = 1.01$, $\sigma_\epsilon^2 = 0$, adjustment cost = 0.05, no borrowing constraints	1	-5	-4	na	na

* Spending estimates from table 3, buffer from table A4

** Baseline parameters shown in table 7. All parameters are set to baseline values unless otherwise indicated

*** Buffer defined as $A_{it} + (1 - \pi)D_{it}$

Table 8: Robustness Checks

Figure 1
Spending Response to Change in Minimum Wage, CEX
Quantile Regressions

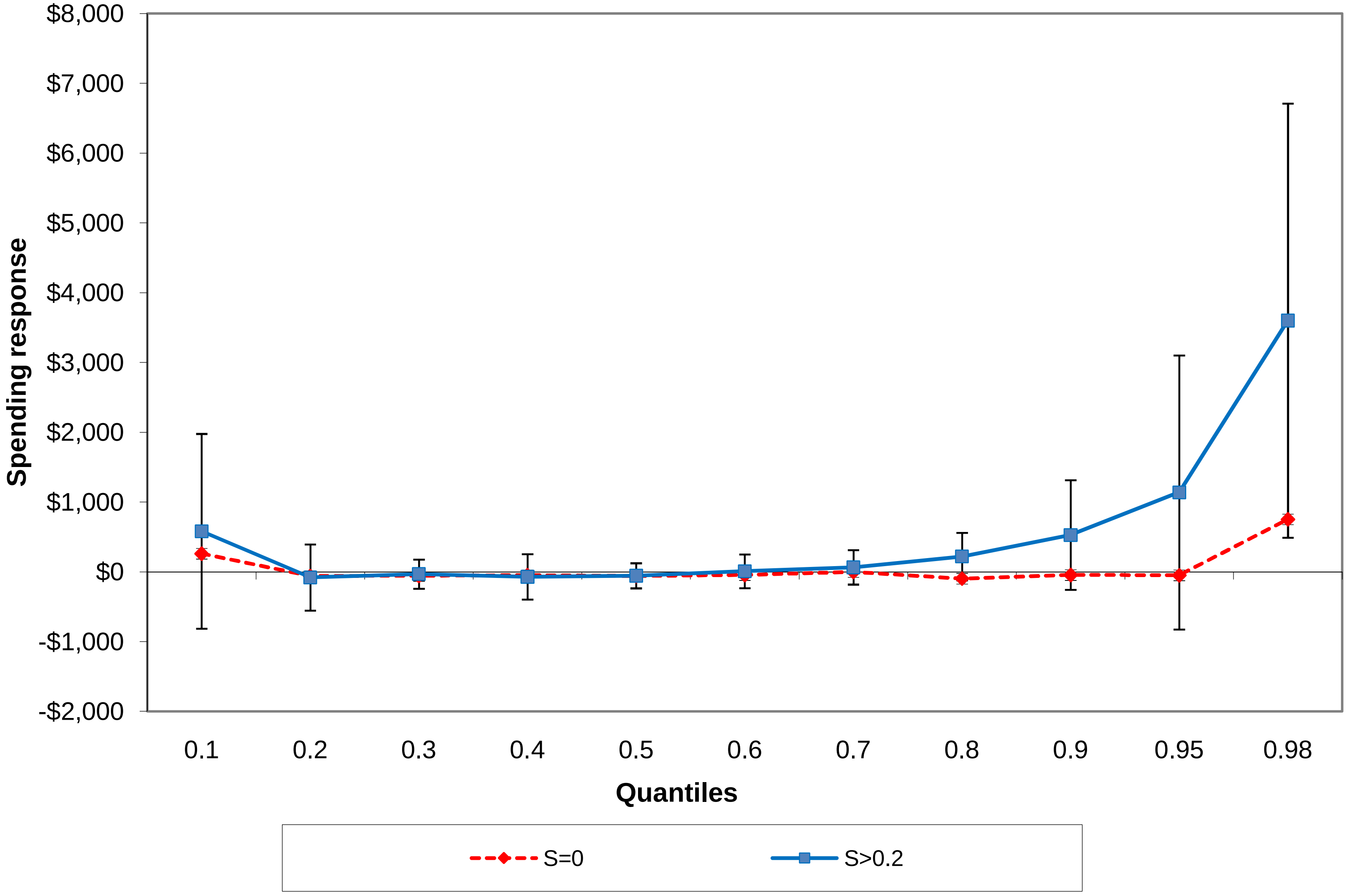


Figure 2a
Decomposition of CEX Spending Response to a Change in the Minimum Wage

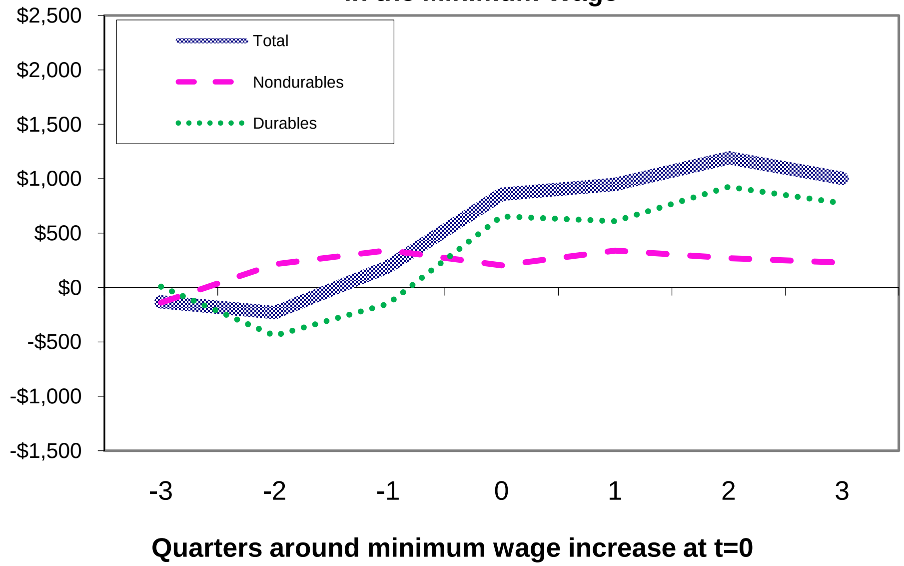


Figure 2b
Total Spending Response to a Change in the Minimum Wage

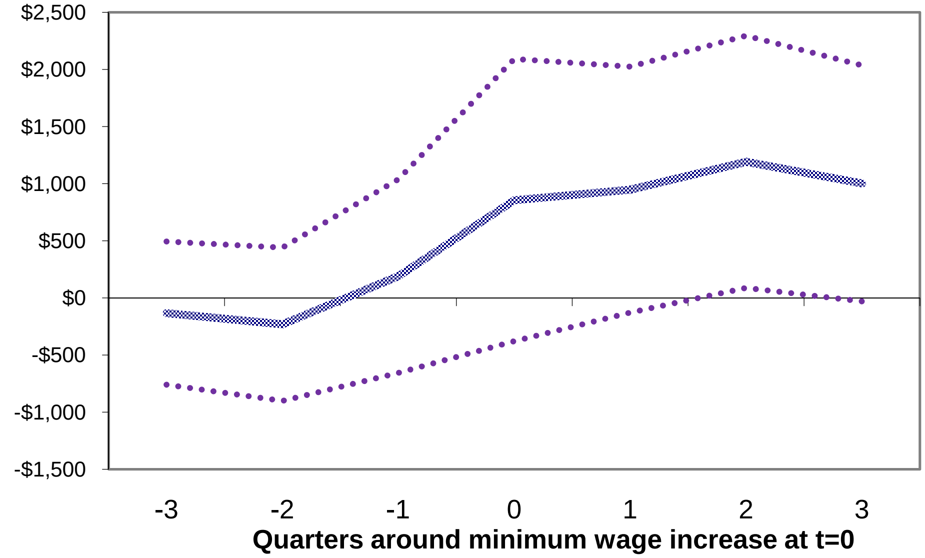


Figure 2c
Nondurables Response to a Minimum Wage Change

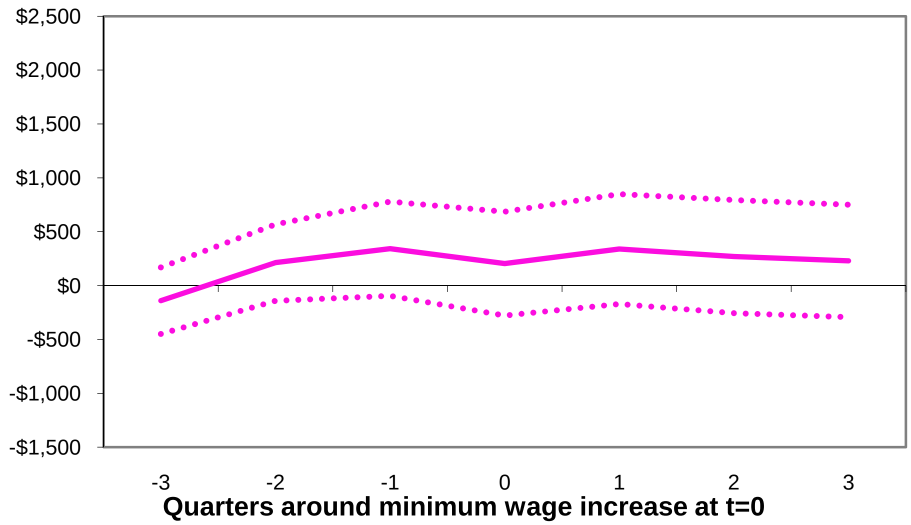
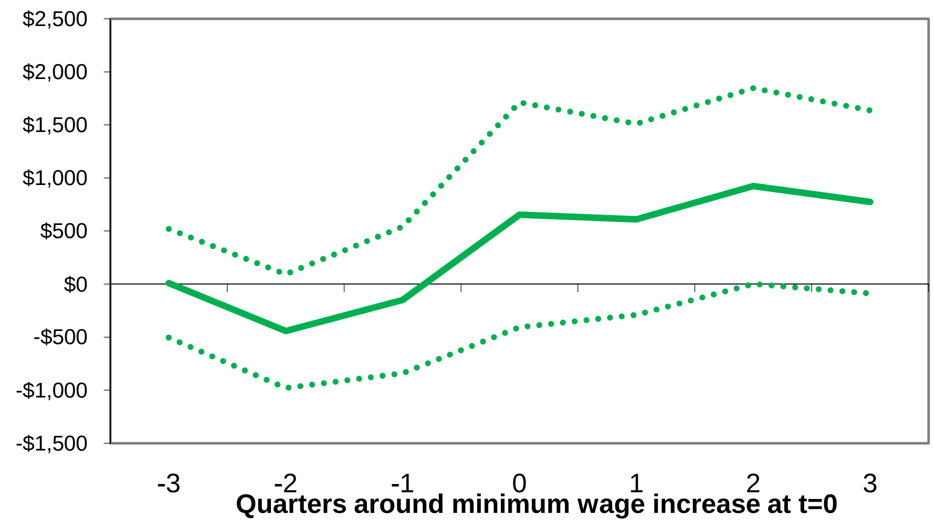


Figure 2d
Durables Response to a Minimum Wage Change



Note: Dashed lines are 90 percent confidence intervals. Sample is S>0.2. Plots are very similar for S>0.

Figure 3
Debt (auto, home equity, and credit card) Response to a Change in the Minimum Wage
Credit Card/Credit Bureau Data

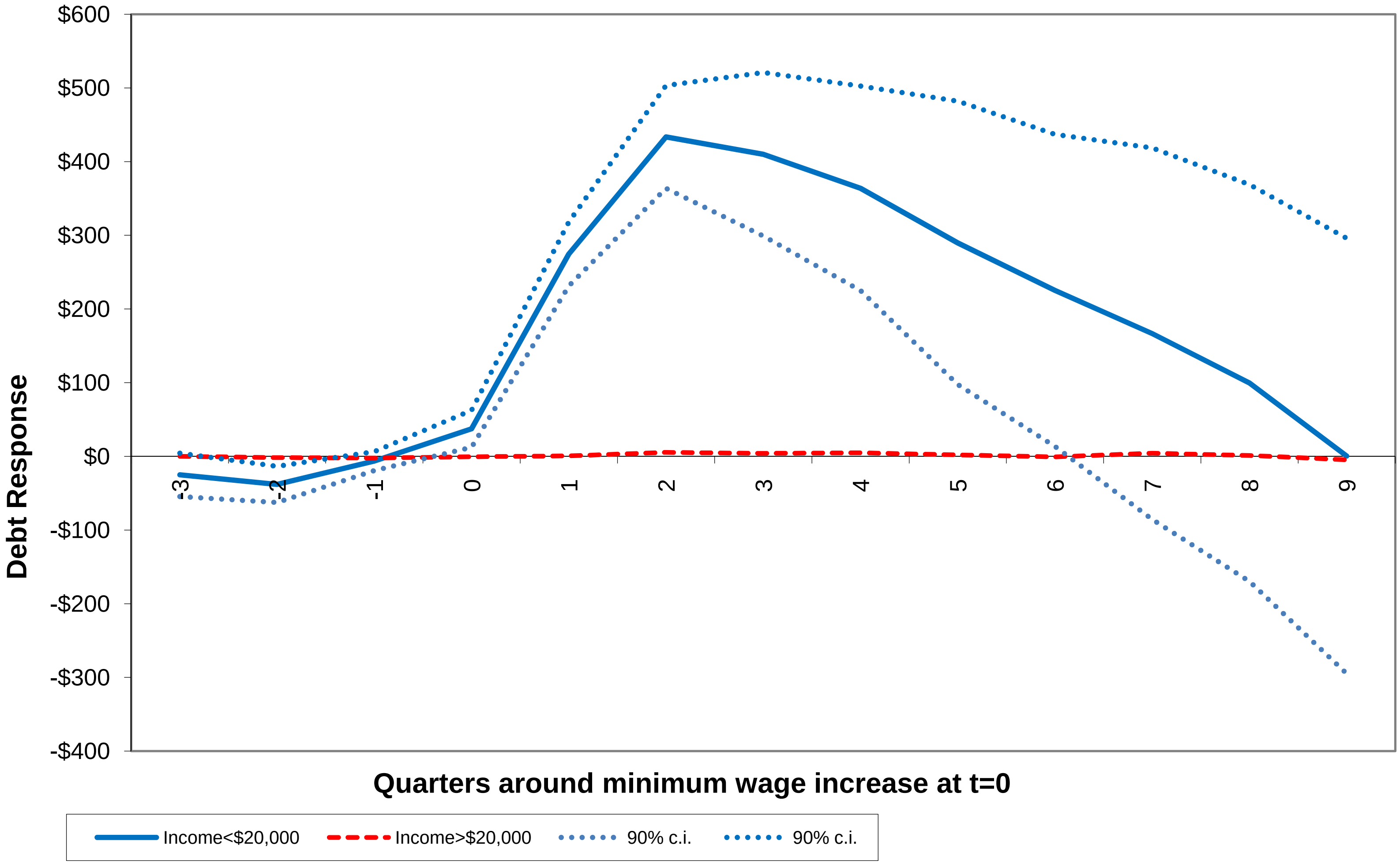


Figure 4
Debt Response to Change in Minimum Wage
Credit Bureau Quantile Regressions

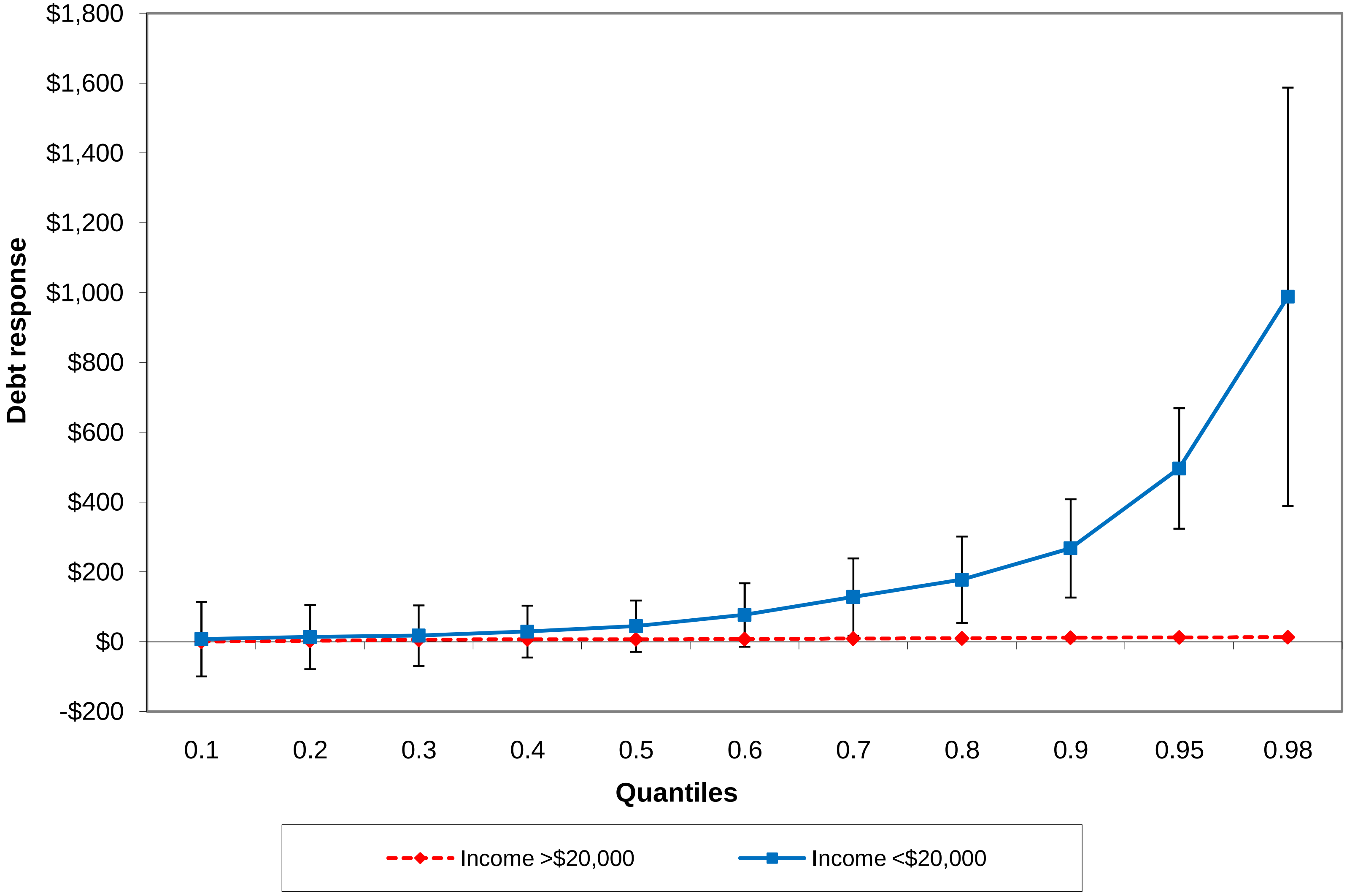


Figure 5
Simulated Income Change Around a Minimum Wage Increase

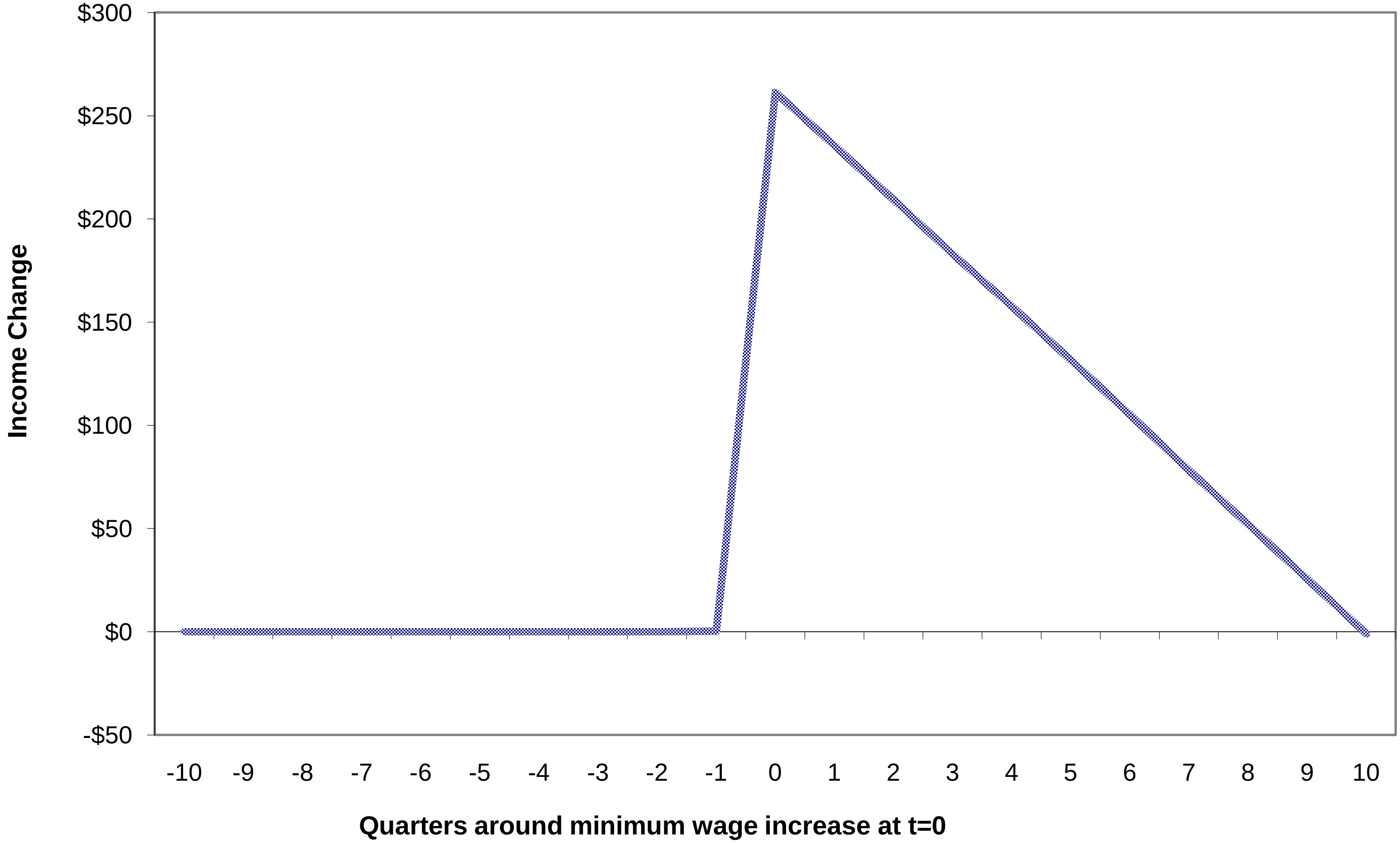


Figure 6
Spending Change Around a Minimum Wage Increase
Simulation without Borrowing Constraints

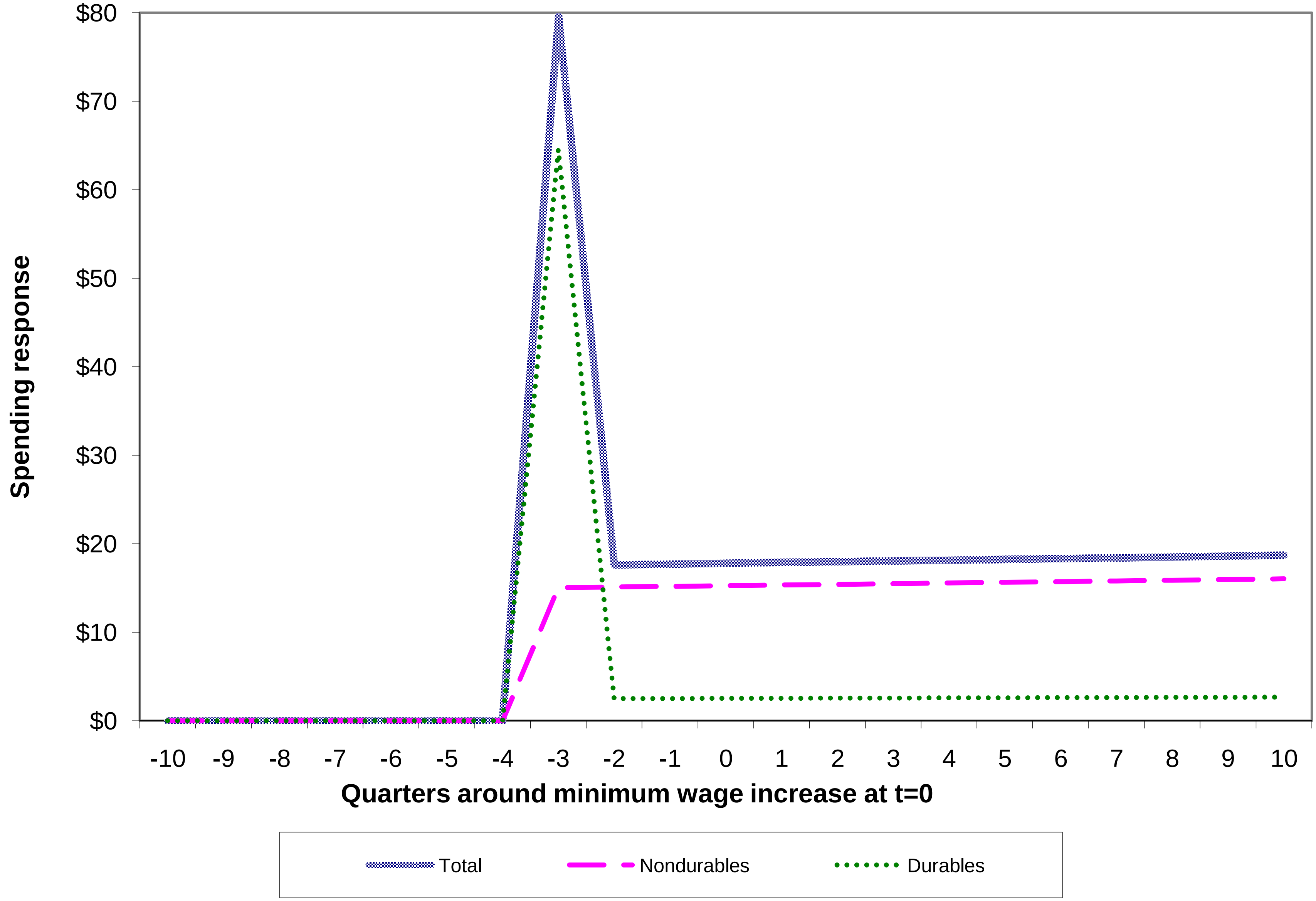


Figure 7
Spending Change Around a Minimum Wage Increase
Simulation with Borrowing Constraints

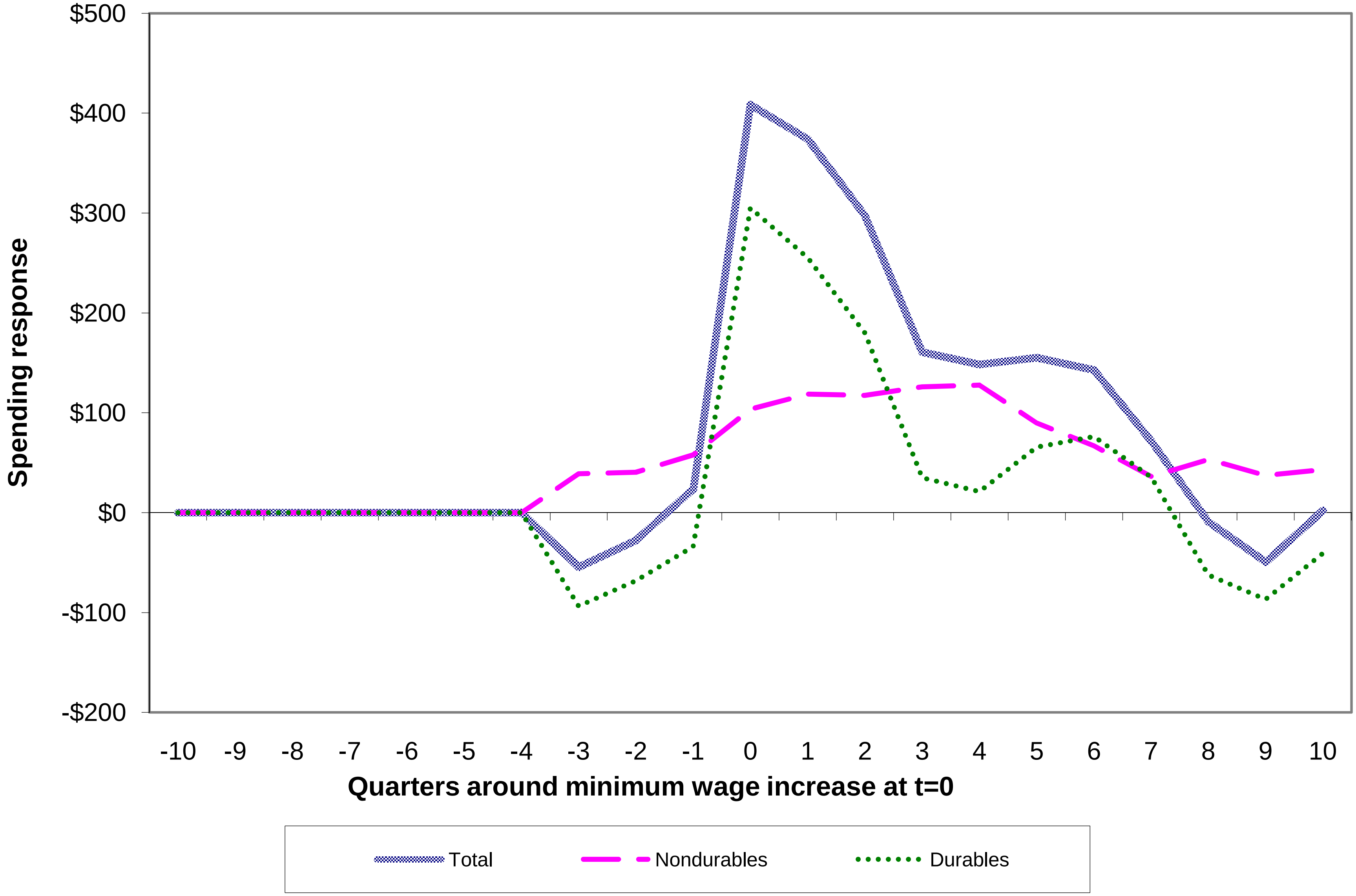


Figure 8a
Total Spending Response to a Change in the Minimum Wage

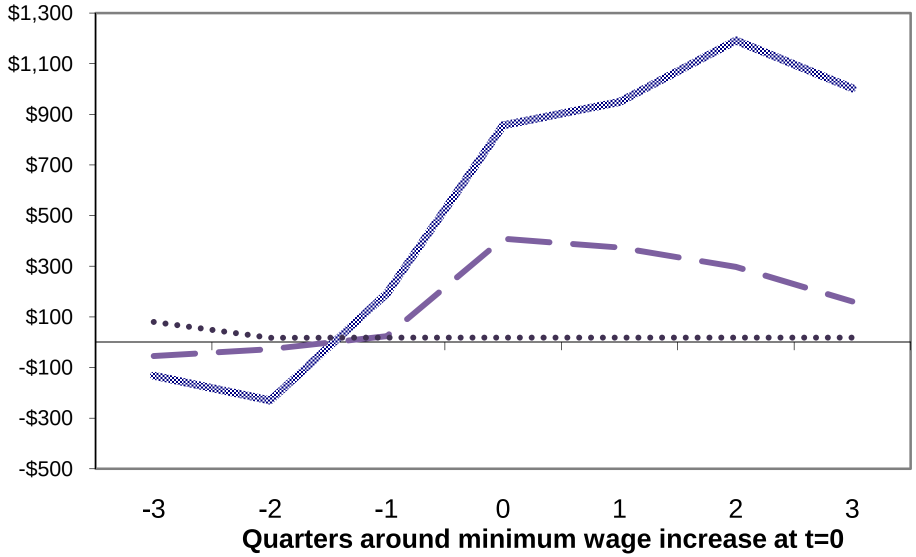


Figure 8b
Nondurable Response to a Minimum Wage Change

Figure 8c
Durables Response to a Minimum Wage Change

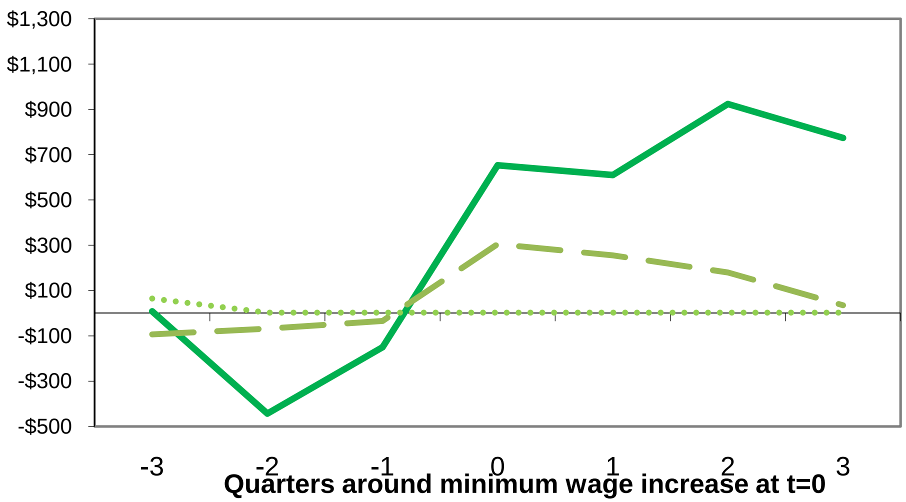
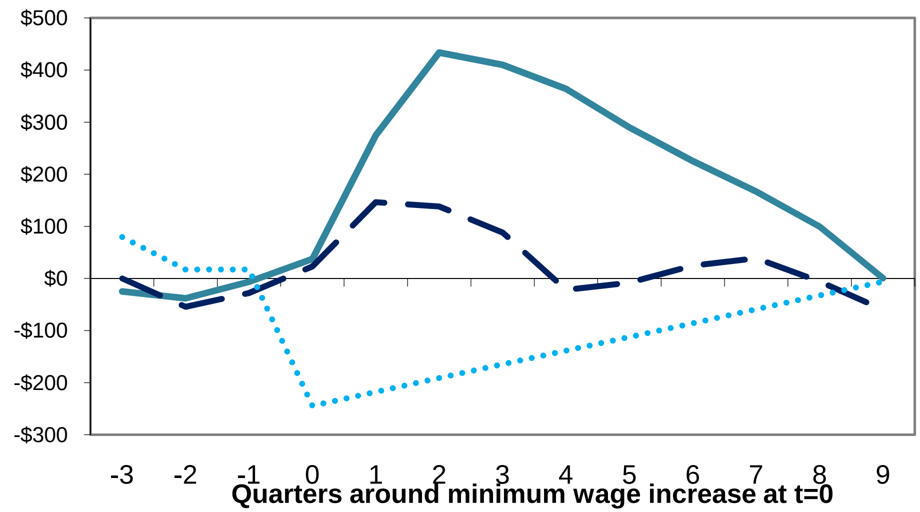


Figure 8d
Debt Response to a Minimum Wage Change



Notes: Solid lines are data (see figures 2 and 3). Dashed and dotted lines are model predictions with and without borrowing constraints. See text.

Figure 9
Model Predicted Spending Response to Change in Minimum Wage
with and without Adjustment Costs
Quantile Regressions

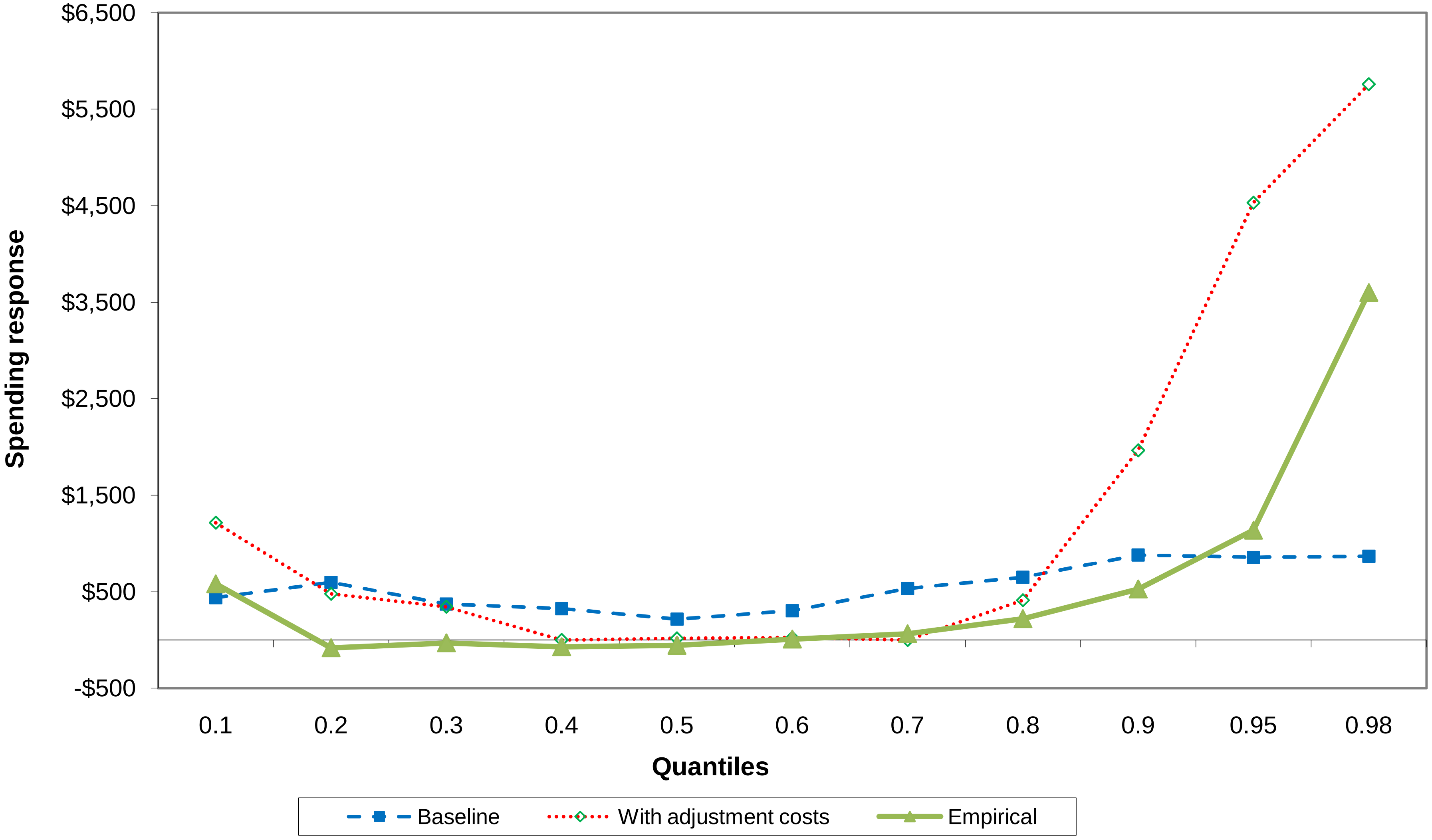


Table A1
Summary Statistics

Variable	Units with S=0 in initial survey		Units with S>=0.2 in initial survey		Income >= $20,000 at application		Income < $20,000 at application	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
A. Consumer Expenditure Survey, 1983-2008								
Real average quarterly spending	11,068	7,948	6,507	4,744				
Real Durables	1,844	4,996	892	3,076				
Real Nondurables and services	9,224	5,375	5,615	3,095				
Real before tax family nonasset annual income	62,945	45,083	20,947	16,052				
Share of income from MW earners	0.00	0.00	0.68	0.31				
Member 1 age	40.5	11.1	35.7	12.8				
Number of adults	1.92	0.81	1.80	0.85				
Number of kids under 18	0.84	1.12	0.88	1.22				
Number of unit-surveys	183,729		16,073					
Number of units	55,147		5,272					
B. Survey of Income and Program Participation, 1986-2007								
Real before tax family nonproperty annual income in initial survey	51,728	35,858	25,756	20,736				
Share of income from MW earners	0	0	0.65	0.31				
Head age	41.5	10.9	38.2	12				
Number of adults	1.9	0.8	1.76	0.79				
Number of kids under 18	0.96	1.14	1.14	1.26				
Number of household-surveys	434,942		39,459					
Number of households	62,531		6,216					

Table A1
Summary Statistics

Variable	Units with S=0 in initial survey		Units with S>=0.2 in initial survey		Income >= $20,000 at application		Income < $20,000 at application	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
C. Current Population Survey, 1979-2007								
Real annualized family income	34,396	20,212	19,216	13,652				
Share of income from MW earners	0	0	0.66	0.32				
Head age	42.0	10.9	41.3	12.1				
Number of adults	2.11	0.83	2.16	0.88				
Number of kids under 18	0.88	1.11	0.92	1.17				
Number of household-surveys	670,593		90,267					
D. Credit Card and Credit Bureau, 1995-2008								
Annual salary income at application					74,623	49,576	14,033	9,381
Fico Score					736	84	700	73
Active Credit Cards					3.0	2.6	2.3	2.6
Credit Card Balance on All Cards					6,162	7,775	4,713	4,368
Home Equity Balance					703	5,375	752	8,653
Mortgage Balance					20,806	162,737	30,595	118,130
Auto Balance					3,313	8,365	3,432	7,117
Number of observations					4,028,327		582,170	
Number of consumers					317,116		31,624	

Notes: Real spending and income in 2005 dollars. All CEX, SIPP, and CPS descriptive statistics are weighted.

Table A2
Minimum Wage Changes, 1982-2008

	Date	New	Change		Date	New	Change
U.S.	Apr-90	3.80	0.45				
U.S.	Apr-91	4.25	0.45				
U.S.	Oct-96	4.75	0.50				
U.S.	Sep-97	5.15	0.40				
U.S.	Jul-07	5.85	0.70				
U.S.	Jul-08	6.55	0.70				
Alaska	Jan-03	7.15	1.50	Illinois	Jan-04	5.50	0.35
Arizona	Jan-07	6.75	1.60	Illinois	Jan-05	6.50	1.00
Arizona	Jan-08	6.90	0.15	Illinois	Jul-07	7.50	1.00
Arkansas	Oct-06	6.25	1.10	Illinois	Jul-08	7.75	0.25
California	Jul-88	4.25	0.90	Iowa	Jan-90	3.85	0.50
California	Mar-97	5.00	0.25	Iowa	Jan-91	4.25	0.40
California	Sep-97	5.15	0.15	Iowa	Jan-92	4.65	0.40
California	Mar-98	5.75	0.60	Iowa	Oct-96	4.75	0.10
California	Jan-01	6.25	0.50	Iowa	Apr-07	6.20	1.05
California	Jan-02	6.75	0.50	Iowa	Jan-08	7.25	1.05
California	Jan-07	7.50	0.75	Kentucky	Jun-07	5.85	0.70
California	Jan-08	8.00	0.50	Maine	Jan-85	3.45	0.10
Colorado	Jan-07	6.85	1.70	Maine	Jan-86	3.55	0.10
Colorado	Jan-08	7.02	0.17	Maine	Jan-87	3.65	0.10
Connecticut	Oct-87	3.75	0.38	Maine	Jan-88	3.75	0.10
Connecticut	Oct-88	4.25	0.50	Maine	Jan-90	3.85	0.10
Connecticut	Apr-91	4.27	0.02	Maine	Apr-91	4.25	0.40
Connecticut	Oct-96	4.77	0.50	Maine	Jan-02	5.75	0.60
Connecticut	Mar-97	5.00	0.23	Maine	Jan-03	6.25	0.50
Connecticut	Sep-97	5.18	0.18	Maine	Jan-05	6.35	0.10
Connecticut	Jan-99	5.65	0.47	Maine	Jan-06	6.50	0.15
Connecticut	Jan-00	6.15	0.50	Maine	Oct-06	6.75	0.25
Connecticut	Jan-01	6.40	0.25	Maine	Oct-07	7.00	0.25
Connecticut	Jan-02	6.70	0.30	Maine	Oct-08	7.25	0.25
Connecticut	Jan-03	6.90	0.20	Maryland	Jan-07	6.15	1.00
Connecticut	Jan-04	7.10	0.20	Massachus	Jul-86	3.55	0.20
Connecticut	Jan-06	7.40	0.30	Massachus	Jul-87	3.65	0.10
Connecticut	Jan-07	7.65	0.25	Massachus	Jul-88	3.75	0.10
Delaware	May-99	5.65	0.50	Massachus	Apr-90	3.80	0.05
Delaware	Oct-00	6.15	0.50	Massachus	Jan-96	4.75	0.50
Delaware	Jan-07	6.65	0.50	Massachus	Jan-97	5.25	0.50
Delaware	Jan-08	7.15	0.50	Massachus	Jan-00	6.00	0.75
Florida	Jan-06	6.40	1.25	Massachus	Jan-01	6.75	0.75
Florida	Jan-07	6.67	0.27	Massachus	Jan-07	7.50	0.75
Florida	Jan-08	6.79	0.12	Massachus	Jan-08	8.00	0.50
Hawaii	Jan-88	3.85	0.50	Michigan	Oct-06	6.95	1.80
Hawaii	Mar-91	4.25	0.40	Michigan	Jul-07	7.15	0.20
Hawaii	Apr-92	4.75	0.50	Michigan	Jul-08	7.40	0.25
Hawaii	Jan-93	5.25	0.50	Minnesota	Jan-88	3.55	0.20
Hawaii	Jan-02	5.75	0.50	Minnesota	Jan-89	3.85	0.30
Hawaii	Jan-03	6.25	0.50	Minnesota	Jan-90	3.95	0.10
Hawaii	Jan-06	6.75	0.50	Minnesota	Jan-91	4.25	0.30
Hawaii	Jan-07	7.25	0.50	Minnesota	Aug-05	6.15	1.00

Table A2 -cont-
Minimum Wage Changes, 1982-2008

	Date	New	Change		Date	New	Change
Missouri	Jan-07	6.50	1.35	Rhode Isla	Jul-86	3.55	0.20
Missouri	Jan-08	6.65	0.15	Rhode Isla	Jul-87	3.65	0.10
Montana	Jan-07	6.15	1.00	Rhode Isla	Jul-88	4.00	0.35
Nevada	Nov-06	6.15	1.00	Rhode Isla	Aug-89	4.25	0.25
Nevada	Jan-07	6.33	0.18	Rhode Isla	Apr-91	4.45	0.20
New Hampshire	Jan-87	3.45	0.10	Rhode Isla	Oct-96	4.75	0.30
New Hampshire	Jan-88	3.55	0.10	Rhode Isla	Jul-99	5.65	0.50
New Hampshire	Jan-89	3.65	0.10	Rhode Isla	Sep-00	6.15	0.50
New Hampshire	Jan-90	3.75	0.10	Rhode Isla	Jan-04	6.75	0.60
New Hampshire	Apr-90	3.80	0.05	Rhode Isla	Mar-06	7.10	0.35
New Hampshire	Jan-91	3.85	0.05	Rhode Isla	Jan-07	7.40	0.30
New Hampshire	Apr-91	4.25	0.40	South Dak	Jul-07	5.85	0.70
New Hampshire	Sep-07	6.50	1.35	Vermont	Jul-86	3.45	0.10
New Hampshire	Sep-08	7.25	0.75	Vermont	Jul-87	3.55	0.10
New Jersey	Apr-92	5.05	0.80	Vermont	Jan-89	3.65	0.10
New Jersey	Sep-97	5.15	0.10	Vermont	Jul-89	3.75	0.10
New Jersey	Oct-05	6.15	1.00	Vermont	Apr-90	3.85	0.10
New Jersey	Oct-06	7.15	1.00	Vermont	Apr-91	4.25	0.40
New Mexico	Jan-08	6.50	0.65	Vermont	Jan-95	4.50	0.25
New York	Jan-05	6.00	0.85	Vermont	Jan-96	4.75	0.25
New York	Jan-06	6.75	0.75	Vermont	Jul-97	5.15	0.40
New York	Jan-07	7.15	0.40	Vermont	Sep-97	5.25	0.10
North Carolina	Jan-07	6.15	1.00	Vermont	Nov-99	5.75	0.50
North Dakota	Jul-07	5.85	0.70	Vermont	Jan-01	6.25	0.50
Ohio	Jan-07	6.85	1.70	Vermont	Jan-04	6.75	0.50
Ohio	Jan-08	7.00	0.15	Vermont	Jan-05	7.00	0.25
Oregon	Sep-89	3.85	0.50	Vermont	Jan-06	7.25	0.25
Oregon	Jan-90	4.25	0.40	Vermont	Jan-07	7.53	0.28
Oregon	Jan-91	4.75	0.50	Vermont	Jan-08	7.68	0.15
Oregon	Jan-97	5.50	0.75	Washingto	Jan-89	3.85	0.50
Oregon	Jan-98	6.00	0.50	Washingto	Jan-90	4.25	0.40
Oregon	Jan-99	6.50	0.50	Washingto	Jan-94	4.90	0.65
Oregon	Jan-03	6.90	0.40	Washingto	Sep-97	5.15	0.25
Oregon	Jan-04	7.05	0.15	Washingto	Jan-99	5.70	0.55
Oregon	Jan-05	7.25	0.20	Washingto	Jan-00	6.50	0.80
Oregon	Jan-06	7.50	0.25	Washingto	Jan-01	6.72	0.22
Oregon	Jan-07	7.80	0.30	Washingto	Jan-02	6.90	0.18
Oregon	Jan-08	7.95	0.15	Washingto	Jan-03	7.01	0.11
Pennslyvania	Feb-89	3.70	0.35	Washingto	Jan-04	7.16	0.15
Pennslyvania	Apr-90	3.80	0.10	Washingto	Jan-05	7.35	0.19
Pennslyvania	Jan-07	6.25	1.10	Washingto	Jan-06	7.63	0.28
Pennslyvania	Jul-07	7.15	0.90	Washingto	Jan-07	7.93	0.30
				Washingto	Jan-08	8.07	0.14
				West Virgir	Jul-06	5.85	0.70
				West Virgir	Jul-07	6.55	0.70
				West Virgir	Jul-08	7.25	0.70
				Wisconsin	Jun-05	5.70	0.55
				Wisconsin	Jun-06	6.50	0.80

Table A3
Employment, Hours, and Wage Responses to a Minimum Wage Increase
Current Population Survey, 1979-2007
Sample: Hourly Wage Workers

Share of income from minimum wage jobs (S)	Employment			Hours			Hourly Wage		
	Total	Head	Spouse	Total	Head	Spouse	All	Head	Spouse
0	-0.005	-0.001	-0.005	-0.14	-0.02	0.04	0.01	-0.02	0.06
	(0.003)	(0.002)	(0.003)	(0.12)	(0.06)	(0.08)	(0.04)	(0.05)	(0.06)
	670,593	654,251	520,554	670,593	601,427	427,700	871,304	497,492	373,812
>0	0.007	-0.002	0.012	0.92	0.27	0.65	0.45	0.46	0.43
	(0.010)	(0.007)	(0.009)	(0.45)	(0.24)	(0.30)	(0.11)	(0.15)	(0.11)
	115,337	111,334	96,386	115,337	99,193	86,728	161,111	77,895	83,216
>=0.2	0.009	-0.001	0.014	0.74	0.03	0.62	0.34	0.42	0.35
	(0.011)	(0.009)	(0.011)	(0.54)	(0.29)	(0.36)	(0.11)	(0.15)	(0.14)
	90,267	86,954	71,911	90,267	76,357	63,783	121,679	60,555	61,124

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Table A4

Summary Statistics, 1989, 1992, 1995, 1998, 2001, 2004, and 2007 Survey of Consumer Finances

Variable	Households with S=0		Households with S>=0.2	
	Mean	Median	Mean	Median
Family income	54,106	40,735	20,007	14,295
Value of durables (S(it))	19,579	12,590	9,231	5,146
Value of loans against durables	6,447	0	3,911	0
Financial assets	136,383	17,034	24,548	824
Net inancial assets (A(it))	129,936	11,367	20,637	180
Buffer (A(it)+(1-pi)S(it))	130,753	17,954	26,176	2,841
Homeowner (=1 if yes)	0.62	1.00	0.40	0.00
Age of head	41.7	41.0	37.1	35.0
Number of households	79,385		3,842	

Notes: Real income, assets, and debt in 2000 dollars. All descriptive statistics are weighted. Income variable is pre-tax earnings of husband and wife. Financial assets includes stocks, bonds, checking and money market accounts, less liabilities against these. Net financial assets is financial assets less value of loans against durables.

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