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Permanent income shocks and inflation

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Abstract

A puzzle in the literature on the macroeconomic effects of permanent income shocks is that exogenous permanent Social Security shocks do not have a sustained positive effect on real aggregate consumption. It has been argued that this is due to the implementation of contractionary monetary policy in wake of these benefit increases. This paper documents an alternative, potentially complementary explanation for the puzzle. Namely, using exogenous permanent Social Security shocks as well as minimum wage increases, I show that these permanent income shocks lead to an increase in inflation in less than twelve months. Thus while nominal aggregate consumption gains can be observed in the data, real gains are small to non-existent due to the higher price level.

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1 Introduction

How do permanent income shocks affect aggregate consumption? According to the permanent income hypothesis, if such shocks are anticipated, then they should not have an effect on individual consumption. However, on the aggregate level, there have been deviations from this rule (Wilcox, 1989). But what if we look at exogenous, unanticipated permanent shocks to income? Using the "narrative" method, Romer and Romer (2016) identify exogenous (i.e. neither countercyclical nor anticipated) increases in Social Security benefits, and conclude that exogenous permanent Social Security increases do not increase aggregate consumption expenditures sustainably over a 12-month time horizon. This is a puzzle as a permanent unanticipated increase in income should in fact lead to a sustained increase in consumption.

This paper explores why exogenous permanent Social Security increases do not lead to a sustained rise in real consumption. It complements this analysis by showing that increases in the federal minimum wage behave in a qualitatively identical way. The broad question of interest is, therefore, the macroeconomic effects of permanent income shocks.

I adopt a methodology similar to Romer and Romer (2016). For Social Security increases, I use the exogenous permanent Social Security increases identified by Romer and Romer (2016), and evaluate their effect on a month-on-month basis on real and nominal aggregate consumption, the price level, and the Federal funds rate. The sample period is 1959-1991. The key source of identification comes from the nature of the Social Security shocks, which have been compiled by Romer and Romer (2016) and are exogenous. For the minimum wage increases, I evaluate the effect of changes in the federal minimum wage on the same variables to see whether a different type of permanent income shock has qualitatively similar effects. The sample period for the minimum wage analysis is 1959-2020.

There are three key findings. First, the permanent income shocks considered in this paper do not have a sustained positive effect on real aggregate consumption over a 12-month time horizon. For Social Security benefits, this is line with the finding by Romer and Romer (2016), and for minimum wages no significant effect on real consumption is found. Second, for both Social Security and minimum wage shocks, the price level increases over the twelve months following the shocks. These findings suggest that any potential gains in nominal aggregate consumption are ultimately inflated away in the case of these two permanent income shocks. Third, Romer and Romer (2016) propose that the answer to the puzzle of no sustained increase in real consumption is that the Fed tends to raise interest rates in response to the exogenous permanent Social Security increases. While there is some evidence for this in the case of permanent Social Security increases, it is not very robust. Furthermore, this result does not appear to hold in the case of minimum wage increases. Therefore, in contrast to (Romer and Romer, 2016), this paper's conclusion is that the lack of a sustained effect on real consumption is primarily due to the rising price level.

Overall, the paper finds that permanent income shocks do not lead to significant sustained increases in real aggregate consumption expenditures, and that the key reason for this is that increasing inflation undoes the positive effects of these income shocks over a fairly short horizon (less than 12 months).

In addition to the papers cited above, this research is related to the literature on individual-level evidence on income shocks such as Agarwal et al. (2007); Sahm et al. (2012); Parker et al. (2013), and to the literature on the macroeconomic effects of fiscal policy and government multipliers such as Hall (2009); Fisher and Peters (2010); Romer and Romer (2010); Barro and Redlick (2011);

Ramey (2011); Shoag (2016); Chodorow-Reich et al. (2012); Nakamura and Steinsson (2014); Pennings (2020).

Interestingly, the literature suggests that some fiscal shocks behave differently from the Social Security and minimum wage changes considered in this paper. For instance, Romer and Romer (2010); Barro and Redlick (2011); Romer and Romer (2016) all suggest that tax cuts raise real consumption sustainably. This hints at the fact that the macroeconomic effects of fiscal shocks are complex and context-dependent.

2 Empirical strategy

I estimate regressions of the form

$$\Delta \ln Y_t = \alpha + \sum_{i=0}^{N} \beta_i PIShock_{t-i} + \varepsilon_t, \tag{1}$$

where Y_t is an outcome variable (e.g. real aggregate consumption) in month t, $PIShock_t$ is a permanent income shock (i.e. a permanent increase in Social Security benefits or an increase in the minimum wage), and ε_t is the error term. This effectively amounts to the estimation of an impulse response function (IRF) of Y_t with respect to a permanent income shock. The variable N measures how many months are considered in this IRF. Following Romer and Romer (2016), I set $N = 12$ for my analyses.

For the Social Security shocks, the sample period is 1959-1991 and the data points are observed at a monthly frequency.[1] For the minimum wage shocks, the sample period is 1959-2020, and data points are also observed at a monthly frequency.

As discussed in Section 1, the key source of identification for the Social Security analysis is the fact that only those Social Security increases are considered that have been identified in Romer and Romer (2016) as exogenous using the "narrative" method. As Romer and Romer (2016) shows, these exogenous Social Security shocks do not correlate with various macroeconomic variables. In the case of the minimum wage analysis, there is no explicit identification strategy, as any federal minimum wage increase is included in the sample. This renders that part of the analysis more suggestive and correlational, but the two pieces of analysis are largely consistent with each other lending credence at least to the qualitative findings from the minimum wage analysis.

Broadly speaking, two versions of (1) are estimated in the paper. The baseline specification has no control variables beyond the income shocks of interest. A more robust specification controls for 12-month lags of oil price changes, and 24-month lags of autonomous contractionary monetary policy shocks (as constructed by Romer and Romer (1994)). This is done to be in line with Romer and Romer (2016). The more robust specification is thus

$$\Delta \ln Y_t = \alpha + \sum_{i=0}^{12} \beta_i PIShock_{t-i} + \sum_{i=0}^{12} \gamma_i \Delta \ln OilPrice_{t-i} + \sum_{i=0}^{24} \delta_i MonShock_{t-i} + \varepsilon_t. \tag{2}$$

[1] The data set ends in 1991, because due to low inflation rates from that point onward cost-of-living adjustments to Social Security benefits were relatively small and too regular. This reduced variation in the magnitude of changes (Romer and Romer, 2016).

2.1 Data

The dependent variables used are monthly observations of real personal consumption expenditures (PCE), nominal PCE, the Consumer Price Index (CPI), and the effective Federal funds rate. These time series are obtained from the FRED database and the BEA. The explanatory variables considered are permanent and temporary exogenous Social Security shocks (Romer and Romer, 2016), minimum wage shocks, WTI crude oil spot price changes, and contractionary monetary policy shocks (Romer and Romer, 1994). The sources for these variables is the FRED database unless indicated otherwise. For more detail on the variables used, see Appendix B. The timing and size of the Social Security and minimum wage shocks are depicted in Figure 1.

3 Results

The results are presented in graphs plotting the cumulative sums of the regressions coefficients of interest. For instance, the effect of a unit increase in permanent income on impact would be given by β_0, the effect in one month would be given by $\beta_0 + \beta_1$, the effect in two months is given by $\beta_0 + \beta_1 + \beta_2$. These cumulative coefficient sums are plotted over the 0-12 month time horizon with two-standard-error bands. In all graphs, the coefficient sums are depicted by solid lines, while the standard error bands are depicted by dashed lines.

3.1 Permanent income shocks and aggregate consumption

First, I investigate the effect of permanent income shocks on real and nominal PCE. Figure 2 shows the effect of permanent Social Security increases in real PCE as the solid black line using specification (1). It is apparent that in this specification there is no significant sustained positive effect on real PCE. There is a significant positive effect of 1.07% on impact, but it becomes both insignificant and lower in magnitude as time progresses. The grey line shows the impact temporary (as opposed to permanent) exogenous Social Security increases. This is not of interest now, but it will be interesting to see the difference between permanent and temporary shocks shortly. Figure 3 shows that there is no significant effect of federal minimum wage increases on real PCE at all. The effect is both insignificant throughout and hovers close to 0.

Interestingly, Figure 4 shows that a permanent Social Security shock (black line) does result in a sustained rise in nominal PCE. Note that temporary Social Security shocks (grey line) do not lead to a pick-up even in nominal PCE. Figure 5 shows that for minimum wages, we do not see a significant positive effect on nominal PCE, though the point estimates are now positive and higher in magnitude than for real PCE.

3.2 Permanent income shocks and inflation

To explain the puzzle of no sustained real PCE rise from above, I now look at how these income shocks affect the CPI. Figure 6 shows the dramatic but intuitive result. The combination of the flat real but rising nominal PCE in response to a permanent Social Security shock implies that the CPI takes off in response to permanent Social Security shocks. As a placebo test, one can see that the CPI does not take off in response to temporary Social Security shocks, which do not result in either nominal or real PCE increases.

The same result is apparent for minimum wage increases in Figure 7. In response to a positive minimum wage shock, the CPI takes off starting in month five. Thus permanent income shocks spur inflation, and this can be one explanation for why there is no sustained pick-up in real PCE following these shocks.

3.3 The role of monetary policy

Using a graph similar to Figure 8, Romer and Romer (2016) argue that the reason real PCE does not take off in response to permanent Social Security increases is that the Fed tightens monetary policy after these shocks. This figure uses the effective Federal funds rate as the dependent variable, and shows how it reacts to the permanent Social Security shocks. Focusing only on the pre-Volcker era (until October 1979) when the Fed exercised more discretion, Figure 9 shows that the reaction of the Fed to Social Security shocks was more pronounced.

While this paper does not dispute this finding, it qualifies it in two ways. First, while real PCE might have been stagnant in response to the permanent Social Security shocks at least partially because of contractionary monetary policy, it is obvious from the previous sections that nominal PCE and CPI both took off. So a competing and very robust explanation is that real PCE did not take off also because of rising inflation. Second, Figures 10-11 show that the Fed did not implement contractionary monetary policy in response to minimum wage increases both in the full sample and in the pre-Volcker era. Despite this, as the previous sections showed real PCE did not increase following minimum wage shocks either, but CPI did.

4 Conclusion

The puzzle this paper addressed is why aggregate real consumption does not sustainably increase in response to unanticipated permanent income shocks over a 12-month time horizon. After establishing that this puzzle indeed holds for permanent Social Security and federal minimum wage increases, I showed that a plausible explanation for the lack of pick-up in real PCE is that any potential gains are inflated away as CPI rises. A competing explanation in the previous literature (Romer and Romer, 2016) has been that the Fed tended to respond to permanent Social Security shocks with contractionary monetary policy. While this is true especially in the pre-Volcker era, I show that increasing inflation is another complementary explanation to the puzzle. In addition, for the case of minimum wage increases, there does not appear to be a contractionary monetary policy response by the Fed, while CPI still takes off. These results have important implications for how effectively unanticipated permanent income increases can stimulate the real economy.

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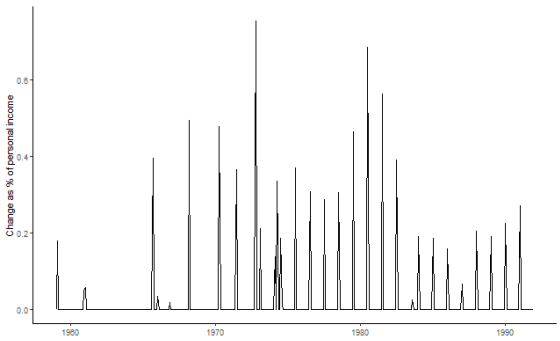
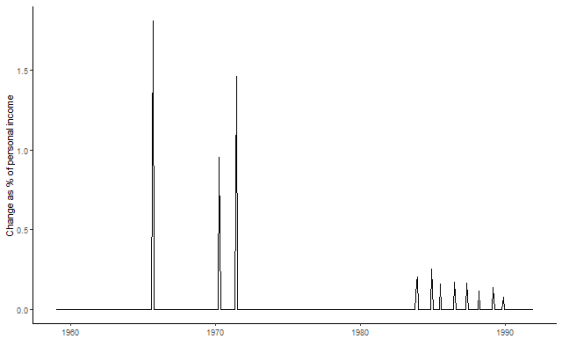
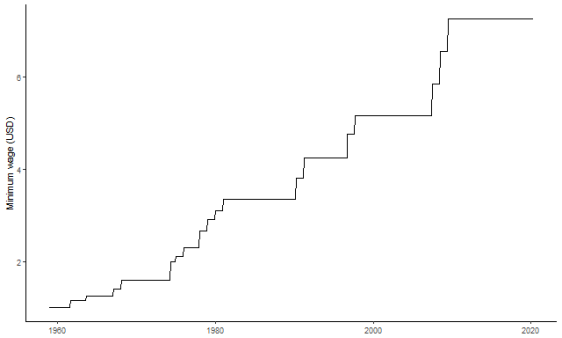
A Figures



(a) Permanent Social Security shocks



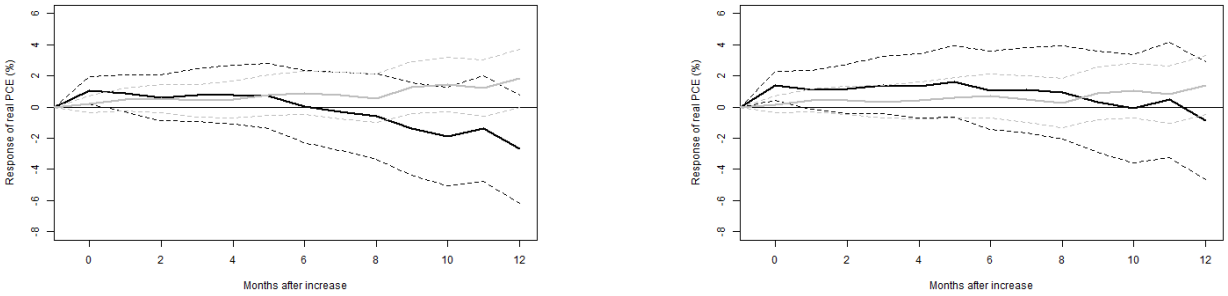
(b) Temporary Social Security shocks



(c) Minimum wage shocks

Figure 1: Timing and size of Social Security and minimum wage shocks

Note: This graph shows when exactly the Social Security and minimum wage shocks considered in the paper happened in time, and how large they were.

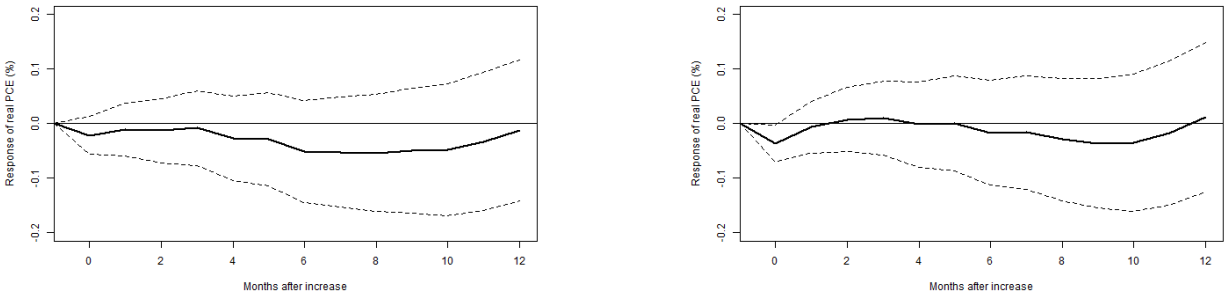


(a) Without controls

(b) With controls

Figure 2: Response of real PCE to permanent and temporary Social Security increases

Note: This graph shows the lack of a persistent effect of Social Security benefit increases on real PCE. The solid lines plot the cumulative sum of regression coefficients meaning that they represent the cumulative impact of a unit increase in Social Security benefits on real PCE in 0, 1, 2, ..., 12 months after the shock. The dashed lines plot two-standard-error bands. The black lines show the effect of permanent, the grey lines the effect of temporary Social Security benefit increases. Controls in Panel (b) include 12-month lags of oil price shocks, and 24-month lags of contractionary monetary policy shocks.

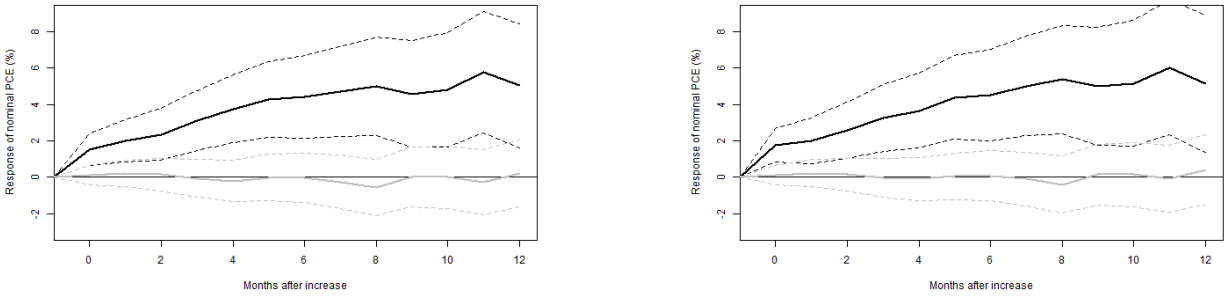


(a) Without controls

(b) With controls

Figure 3: Response of real PCE to minimum wage increases

Note: This graph shows the lack of a persistent effect of minimum wage increases on real PCE. The solid lines plot the cumulative sum of regression coefficients meaning that they represent the cumulative impact of a unit increase in the minimum wage on real PCE in 0, 1, 2, ..., 12 months after the shock. The dashed lines plot two-standard-error bands. Controls in Panel (b) include 12-month lags of oil price shocks, and 24-month lags of contractionary monetary policy shocks.

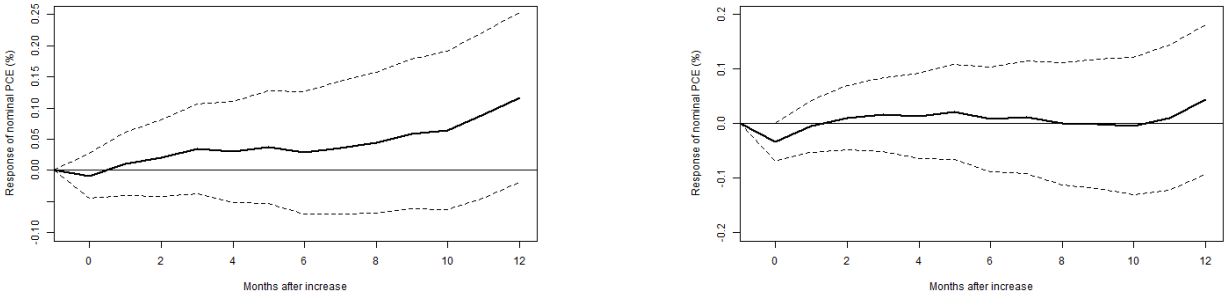


(a) Without controls

(b) With controls

Figure 4: Response of nominal PCE to permanent and temporary Social Security increases

Note: This graph shows that nominal PCE does increase in response to permanent Social Security increases. The solid lines plot the cumulative sum of regression coefficients meaning that they represent the cumulative impact of a unit increase in Social Security benefits on nominal PCE in 0, 1, 2, ..., 12 months after the shock. The dashed lines plot two-standard-error bands. The black lines show the effect of permanent, the grey lines the effect of temporary Social Security benefit increases. Controls in Panel (b) include 12-month lags of oil price shocks, and 24-month lags of contractionary monetary policy shocks.

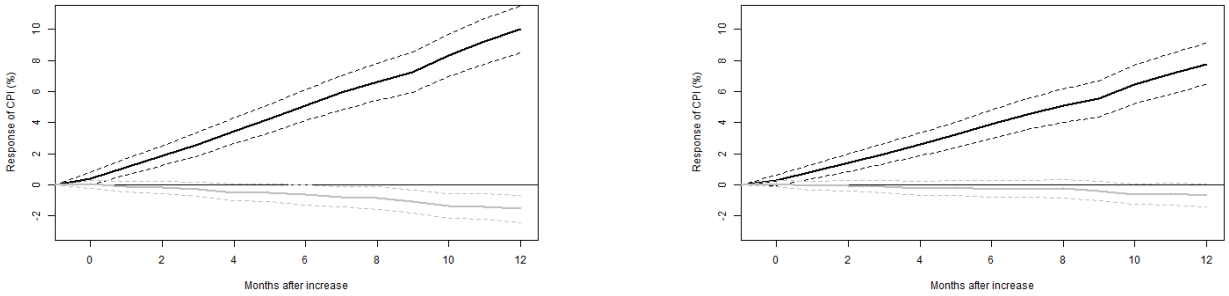


(a) Without controls

(b) With controls

Figure 5: Response of nominal PCE to minimum wage increases

Note: This graph shows that nominal PCE does increase in response to minimum wage increases. The solid lines plot the cumulative sum of regression coefficients meaning that they represent the cumulative impact of a unit increase in the minimum wage on nominal PCE in 0, 1, 2, ..., 12 months after the shock. The dashed lines plot two-standard-error bands. Controls in Panel (b) include 12-month lags of oil price shocks, and 24-month lags of contractionary monetary policy shocks.

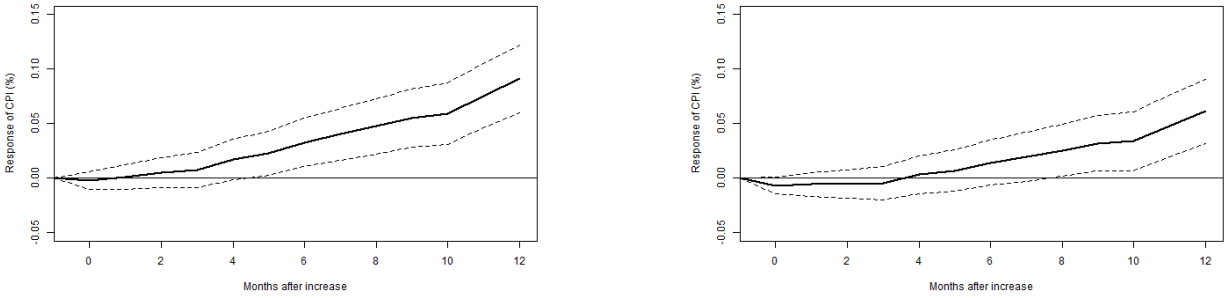


(a) Without controls

(b) With controls

Figure 6: Response of CPI to permanent and temporary Social Security increases

Note: This graph shows that one reason why nominal PCE does, but real PCE does not increase in response to permanent Social Security shocks is the ensuing inflation. The solid lines plot the cumulative sum of regression coefficients meaning that they represent the cumulative impact of a unit increase in Social Security benefits on the CPI in 0, 1, 2, ..., 12 months after the shock. The dashed lines plot two-standard-error bands. The black lines show the effect of permanent, the grey lines the effect of temporary Social Security benefit increases. Controls in Panel (b) include 12-month lags of oil price shocks, and 24-month lags of contractionary monetary policy shocks.

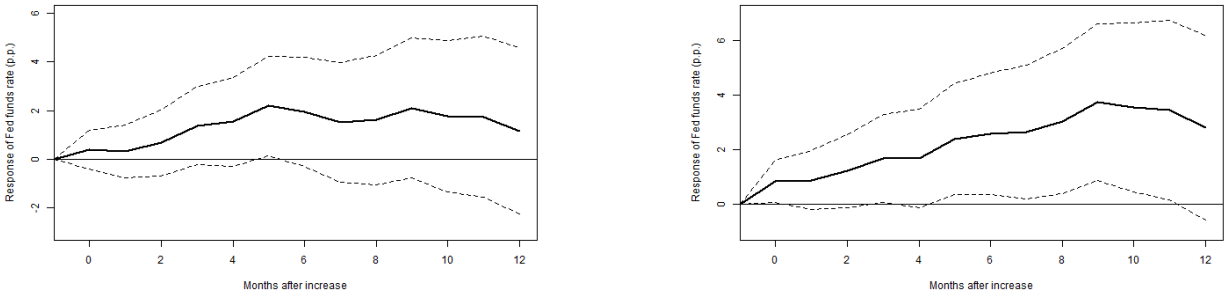


(a) Without controls

(b) With controls

Figure 7: Response of CPI to minimum wage increases

Note: This graph shows that one reason why nominal PCE does, but real PCE does not increase in response to minimum wage shocks is the ensuing inflation. The solid lines plot the cumulative sum of regression coefficients meaning that they represent the cumulative impact of a unit increase in the minimum wage on the CPI in 0, 1, 2, ..., 12 months after the shock. The dashed lines plot two-standard-error bands. Controls in Panel (b) include 12-month lags of oil price shocks, and 24-month lags of contractionary monetary policy shocks.

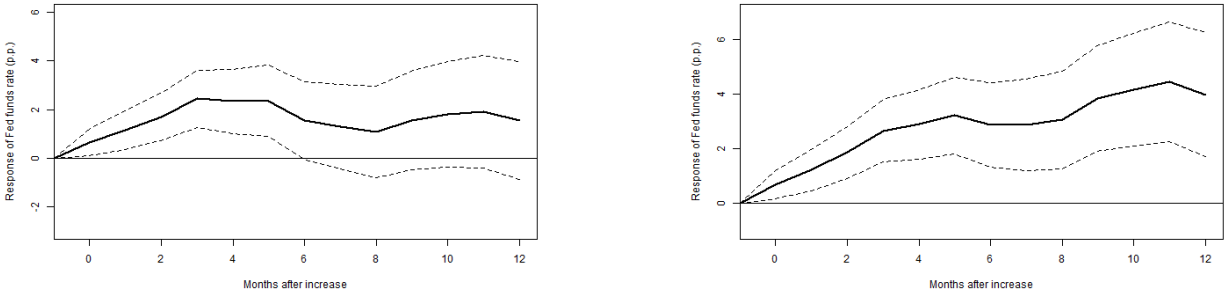


(a) Without controls

(b) With controls

Figure 8: Response of Federal funds rate to permanent Social Security increases

Note: This graph shows that monetary policy is generally tightened in the aftermath of permanent Social Security shocks offering a complementary explanation for why real PCE does not increase. The solid lines plot the cumulative sum of regression coefficients meaning that they represent the cumulative impact of a unit increase in permanent Social Security benefits on the effective Federal funds rate in 0, 1, 2, ..., 12 months after the shock. The dashed lines plot two-standard-error bands. Controls in Panel (b) include 12-month lags of oil price shocks, and 24-month lags of contractionary monetary policy shocks.

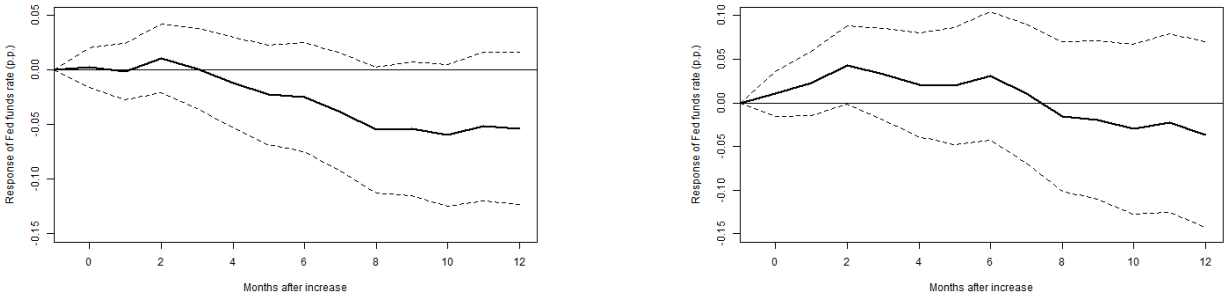


(a) Without controls

(b) With controls

Figure 9: Response of Federal funds rate to permanent Social Security increases in the pre-Volcker era

Note: This graph shows that in the pre-Volcker era monetary policy was generally tightened in the aftermath of permanent Social Security shocks offering a complementary explanation for why real PCE does not increase. The solid lines plot the cumulative sum of regression coefficients meaning that they represent the cumulative impact of a unit increase in permanent Social Security benefits on the effective Federal funds rate in 0, 1, 2, ..., 12 months after the shock. The dashed lines plot two-standard-error bands. Controls in Panel (b) include 12-month lags of oil price shocks, and 24-month lags of contractionary monetary policy shocks. The sample is restricted to the pre-Volcker era (January 1959 to October 1979).

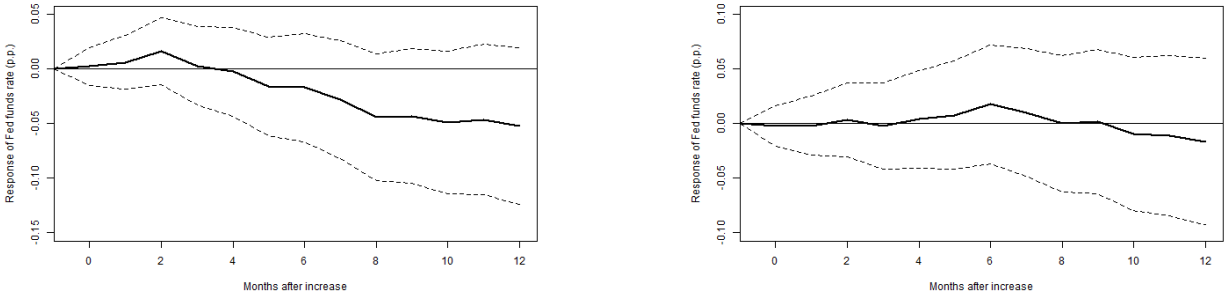


(a) Without controls

(b) With controls

Figure 10: Response of Federal funds rate to minimum wage increases

Note: This graph shows that monetary policy is generally not tightened in the aftermath of minimum wage shocks suggesting that increasing CPI is possibly the sole reason for the lack of pick-up in real PCE. The solid lines plot the cumulative sum of regression coefficients meaning that they represent the cumulative impact of a unit increase in the minimum wage on the effective Federal funds rate in 0, 1, 2, ..., 12 months after the shock. The dashed lines plot two-standard-error bands. Controls in Panel (b) include 12-month lags of oil price shocks, and 24-month lags of contractionary monetary policy shocks.



(a) Without controls

(b) With controls

Figure 11: Response of Federal funds rate to minimum wage increases in the pre-Volcker era

Note: This graph shows that in the pre-Volcker era monetary policy was generally not tightened in the aftermath of minimum wage shocks suggesting that increasing CPI is possibly the sole reason for the lack of pick-up in real PCE. The solid lines plot the cumulative sum of regression coefficients meaning that they represent the cumulative impact of a unit increase in the minimum wage on the effective Federal funds rate in 0, 1, 2, ..., 12 months after the shock. The dashed lines plot two-standard-error bands. Controls in Panel (b) include 12-month lags of oil price shocks, and 24-month lags of contractionary monetary policy shocks. The sample is restricted to the pre-Volcker era (January 1959 to October 1979).

B Data description

B.1 Dependent variables

Real personal consumption expenditures (PCE): This is obtained from the Bureau of Economic Analysis, Table 2.8.3. Coverage is January 1959 to April 2020. Accessed on June 8, 2020.

Nominal personal consumption expenditures (PCE): This is obtained from the FRED database (identifier: `PCE`). Coverage is January 1959 to April 2020. Accessed on June 8, 2020.

Consumer Price Index (CPI): This is obtained from the FRED database (identifier: `CPIAUCSL`). It refers to the CPI for all urban consumers, including all items in a US city average. Coverage is January 1947 to April 2020. Accessed on June 8, 2020.

Effective Federal funds rate: This is obtained from the FRED database (identifier: `FEDFUNDS`). Coverage is July 1954 to May 2020. Accessed on June 8, 2020.

B.2 Independent variables

Permanent Social Security shocks: This is obtained from Romer and Romer (2016). It is expressed in percent of personal income (identifer: `DLEGPERR`). Coverage is January 1951 to December 1991.

Temporary Social Security shocks: This is obtained from Romer and Romer (2016). It is expressed in percent of personal income (identifer: `DLEGTMPR`). Coverage is January 1951 to December 1991.

Federal minimum wage shocks: This is obtained from the FRED database (identifier: `FEDMINNFRWG`). It refers to the federal minimum hourly wage for nonfarm workers. The variable used in the regressions is the percent month-on-month change in the minimum wage expressed as $\Delta \ln MinWage_t$. Coverage is October 1938 to May 2020. Accessed on June 8, 2020.

Oil price shocks: This is obtained from the FRED database (identifier: `OILPRICE`). This is the West Texas Intermediate crude oil spot price per barrel. The variable used in the regressions is the percent month-on-month change in the oil price expressed as $\Delta \ln OilPrice_t$. Coverage is January 1946 to July 2013. Accessed on June 8, 2020.

Contractionary monetary policy shocks: This is obtained from Romer and Romer (1994). Coverage is January 1947 to December 1991.