Online Appendix for Revisiting the Effect of Monetary Policy on Household Consumption: A Functional Approach *

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This Draft: March 17, 2025

Abstract

This paper uses a novel methodology (the functional local projection (FLP) approach developed by Inoue and Rossi (2021)) and US household survey data to investigate the heterogeneous response of household consumption to monetary policy. Measuring shocks as shifts in the entire term structure of interest rates reveals significant heterogeneity in the response of consumption during conventional and unconventional monetary policy. We find that consumption by outright owners is more sensitive to unconventional shocks than that of mortgagors and renters. In addition, we show that the consumption of younger households is more responsive to shocks that affect medium- and long-term interest rates than that of middle-age and older households. Our study provides empirical support in favor of theories that underline the importance of wealth and life cycle effects on the responsiveness of households to unconventional policy.

Keywords: Monetary Policy, Interest Rates, Consumption, EIS, Functional local projections

*We thank participants at the 2022 MEG meetings, the 2023 LACEA-LAMES conference, Steven Lugauer and Elena Pesavento for useful comments. All remaining errors are ours.

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Figure A.2: Tenure Shares Across Time

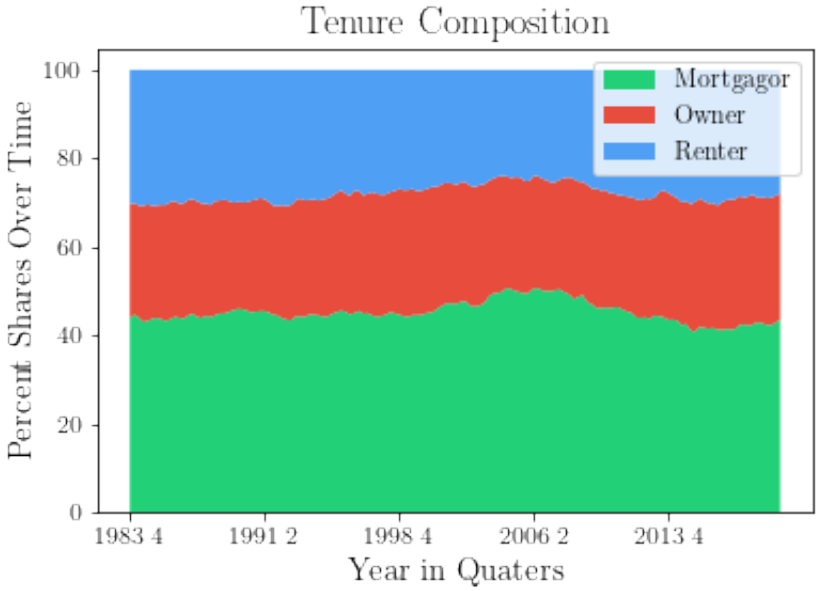


Figure A.2 presents the share of each housing tenure from the Consumer Consumption Survey over time. Each tenure share is relatively slow moving overtime.

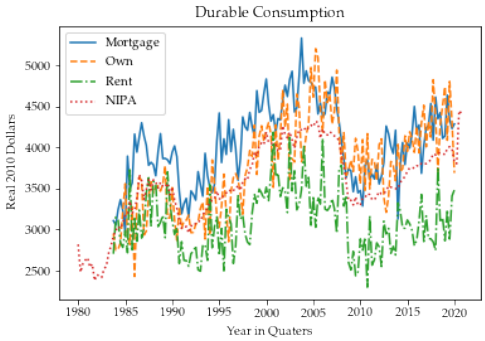
Appendix A: Summary statistics

Table A1: CEX compared to NIPA

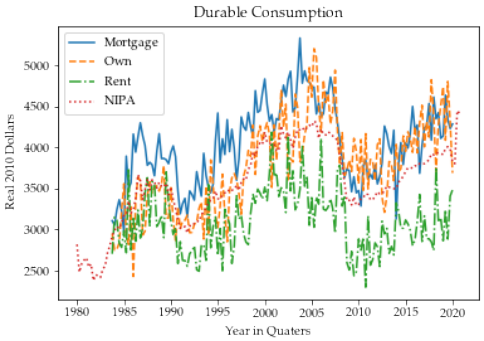
Tenure	Durable	NonDurable	Income	Total Consumption
Mortgagors	0.98	0.87	0.99	0.99
Owners	0.98	0.80	0.98	0.99
Renters	0.68	0.65	0.91	0.97

Table A1 shows the correlation between the CEX data and NIPA data for each real per capita measure. Given researchers use the NIPA data as a consumption measures.

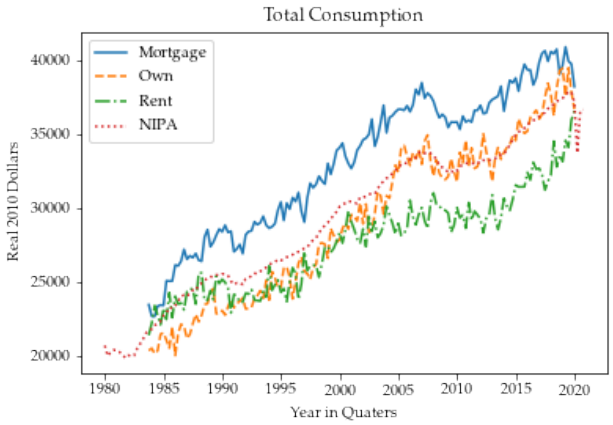
Figure A.3: CEX Compared to NIPA



(a) Durable Consumption



(b) Non-Durable Consumption



(c) Total Consumption

Figure A.3 shows the consumption trends of the CEX data as compared to the NIPA values. The top figures show durable (left) and non-durable (right) consumption, and the bottom figure shows total consumption. Values are reported in 2010 dollars.

Figure A.4: Tenure Shares Across Age Demographics

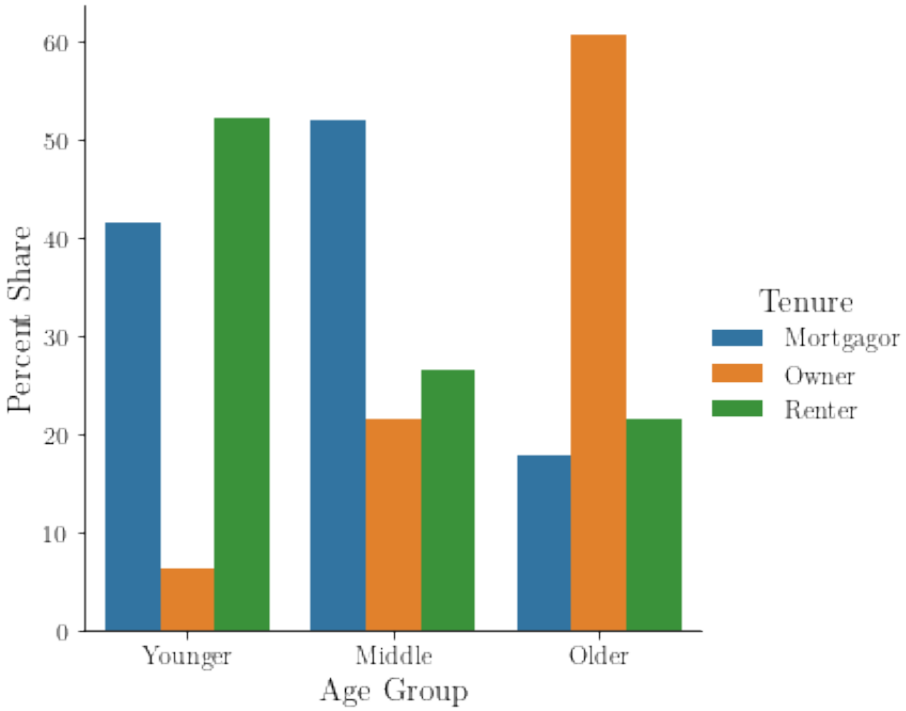


Figure A.4 presents the share of each housing tenure from the Consumer Consumption Survey across age groups.

Figure A.5: Wealth Across Tenures

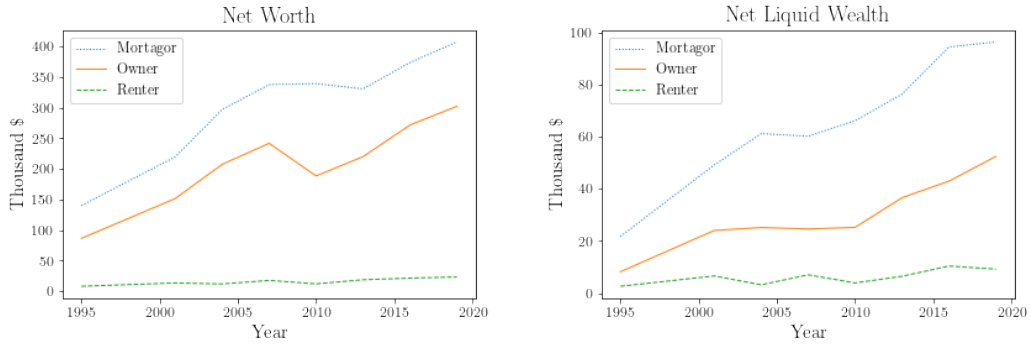


Figure A.5 illustrates two different measures of wealth from the Survey of Consumer Finance across different housing tenures. The figure on the right hand side shows liquid wealth, while the figure on the left depicts overall net worth measured in 2010 US dollars. The definitions of total and liquid wealth are as defined in Kaplan et al. (2018)

Appendix B: Robustness Checks

B.1 The Response of Total Consumption to Functional Shocks - Alternative Measures of Consumption

As noted in Section **??**, our results are consistent across several alternative specifications and estimation strategies. In particular, Figures B.5 and B.6 report similar results for the response of total expenditure by household tenure in the baseline model and in models where we use probability weights to compute consumption or where we remove housing expenses from total consumption by housing tenure. Impulse responses in these alternative models fall within the confidence intervals of the baseline and follow the same shape.

The results by age group retain the shape and magnitude when we use these alternative consumption measures. Figures B.11 and B.12 present the response of total expenditure by age group for the baseline model compared to weighting and removing housing costs in consumption expenditures. The figures show no distinguishable differences between responses computed using alternative measures of consumption.

B.2 The Response of Total Consumption - Alternative Estimation Strategies and Model Specification

In the baseline model, we fit a fourth-order polynomial (Inoue and Rossi, 2021) to avoid excessive variation common to local projections. One may wonder if the normal local projection could alter the results. Figures B.5 and B.6 highlight that both methods produce the same qualitative insights. The only difference is the reduction in the variability of the responses obtained when using the polynomial.

A similar concern could be whether the housing tenure results are robust to specifying the model in levels. Figures B.7 and B.8 plot the impulse responses of a model in levels where linear and quadratic trends are included. The responses from the model in levels exhibit a

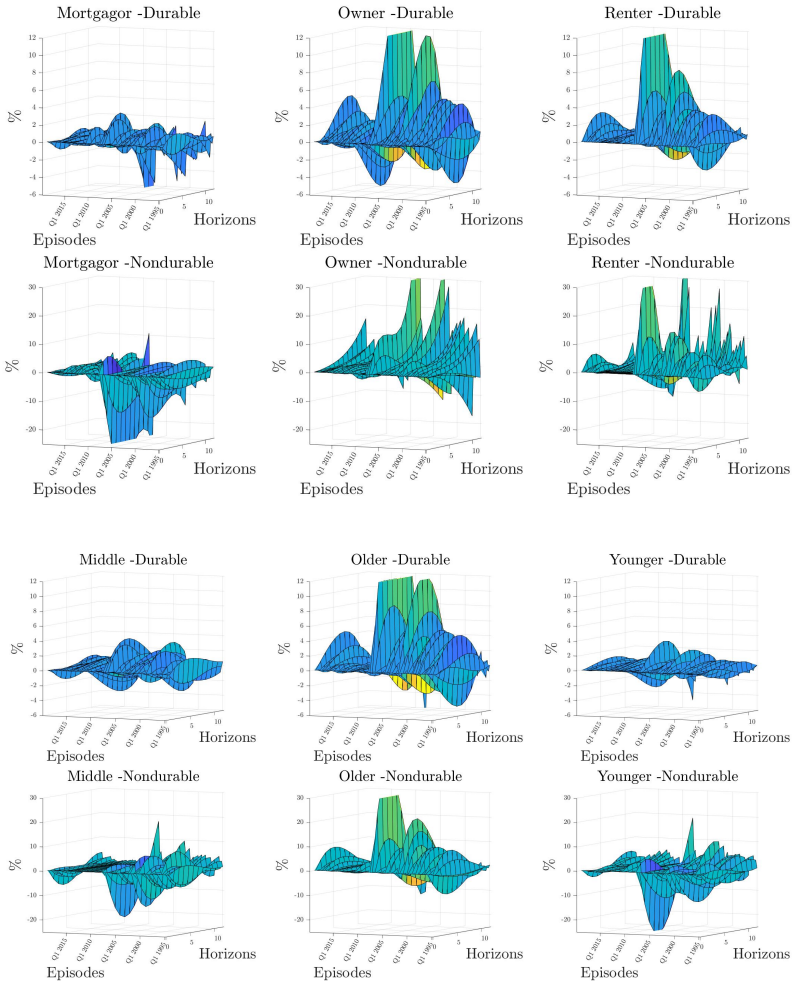
shape similar to the cumulative responses in the main specification.

We repeat the above robustness exercises to evaluate the response of total consumption by age. Figures B.11 and B.12 report the baseline model compared to the local projection without polynomial smoothing. The estimation results do not reveal any significant differences. Similar results are also obtained when we estimate the response of consumption by age group results in levels. Figures B.13 and B.14 differ little from the baseline model.

B.3 The Response of Total Consumption - Alternative Shock Time Aggregation

Because the monetary policy shocks are originally observed at a higher frequency (daily) than the frequency of the consumption data (quarterly), we attributed the shocks to the quarter when they occur by summing up the shocks in a quarter. However, the reader may wonder whether the results are robust to using other methods of aggregation, such as weighting each shock by the days left in the quarter or taking the average of the shocks. We explore these alternative methods of aggregation to quarterly *functional* monetary policy shocks. Figures B.9 and B.10 illustrate how the impulse responses do not show notable differences between aggregation approaches for housing tenure; all responses fall within the confidence intervals for the baseline. Similarly, impulse responses by age groups do not exhibit significant differences between the aggregation methods. Figures B.15 and B.16 report the result by age groups.

Figure B.1: Consumption Response to Functional Shock



Figures B.1 and B.1 plots durable and nondurable consumption by housing tenure (top) and age groups (bottom) for selected conventional monetary policy shocks. The solid black line denotes the impulse response, and the light and dark shaded areas denote the 68 and 90% confidence intervals, respectively. The right panel also plots the functional monetary policy shock at each date.

Figure B.2: Durable Consumption Response Middle by Tenure, Conventional Times

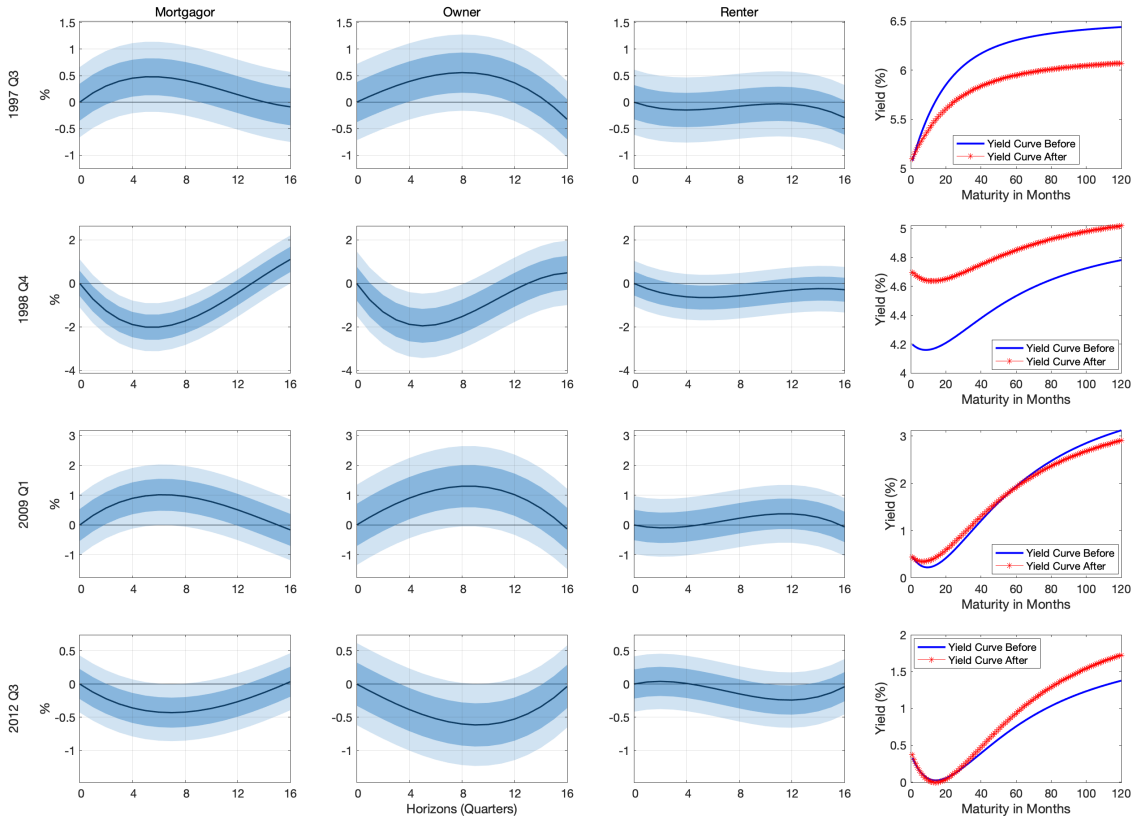


Figure B.2 plots the response of durable consumption by the middle age group by tenure for selected conventional monetary policy shocks. The solid black line denotes the impulse response, the light and dark shaded areas denote the 68 and 90% confidence intervals, respectively.

References

Inoue, A., Rossi, B., 2021. A new approach to measuring economic policy shocks, with an application to conventional and unconventional monetary policy. Quantitative Economics 12, 1085–1138.

Kaplan, G., Moll, B., Violante, G.L., 2018. Monetary policy according to hank. American

Figure B.3: Durable Consumption Response Older by Tenure, Conventional Times

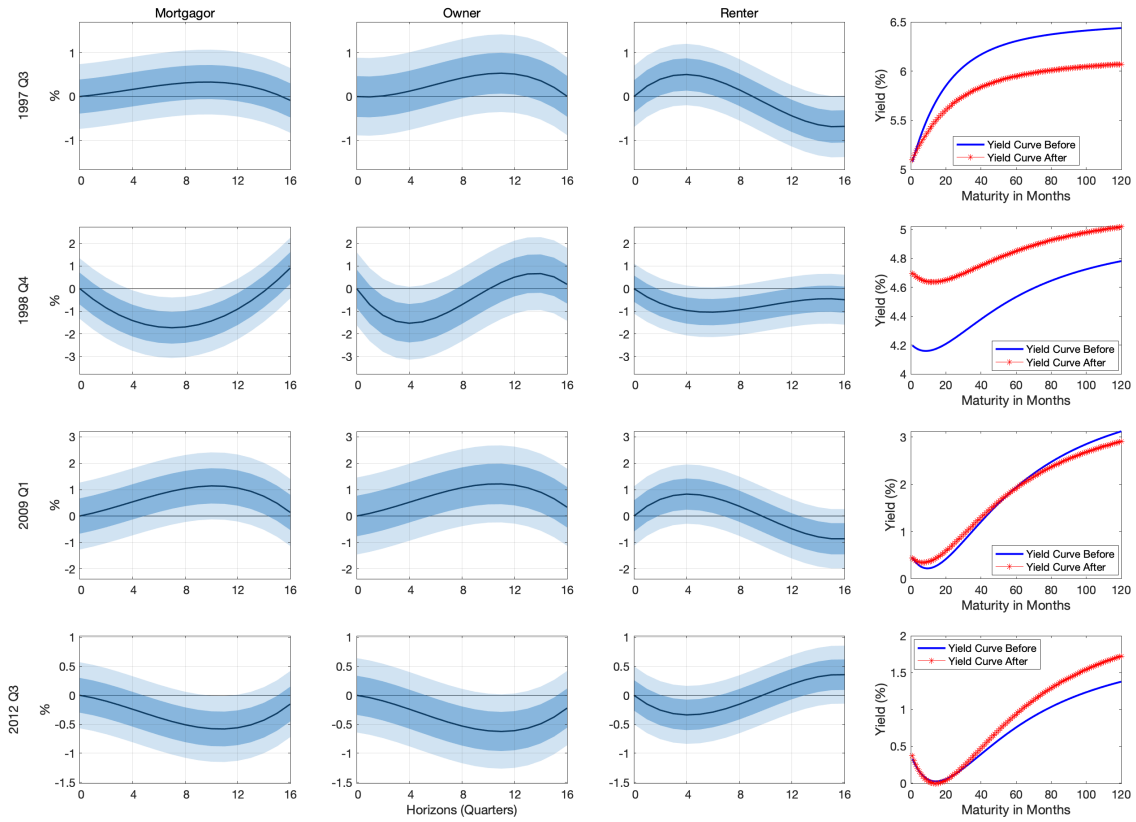


Figure B.3 plots the response of durable consumption by the older age group by tenure for selected conventional monetary policy shocks. The solid black line denotes the impulse response, the light and dark shaded areas denote the 68 and 90% confidence intervals, respectively.

Figure B.4: Response of Durable and NonDurable Consumption- NIPA

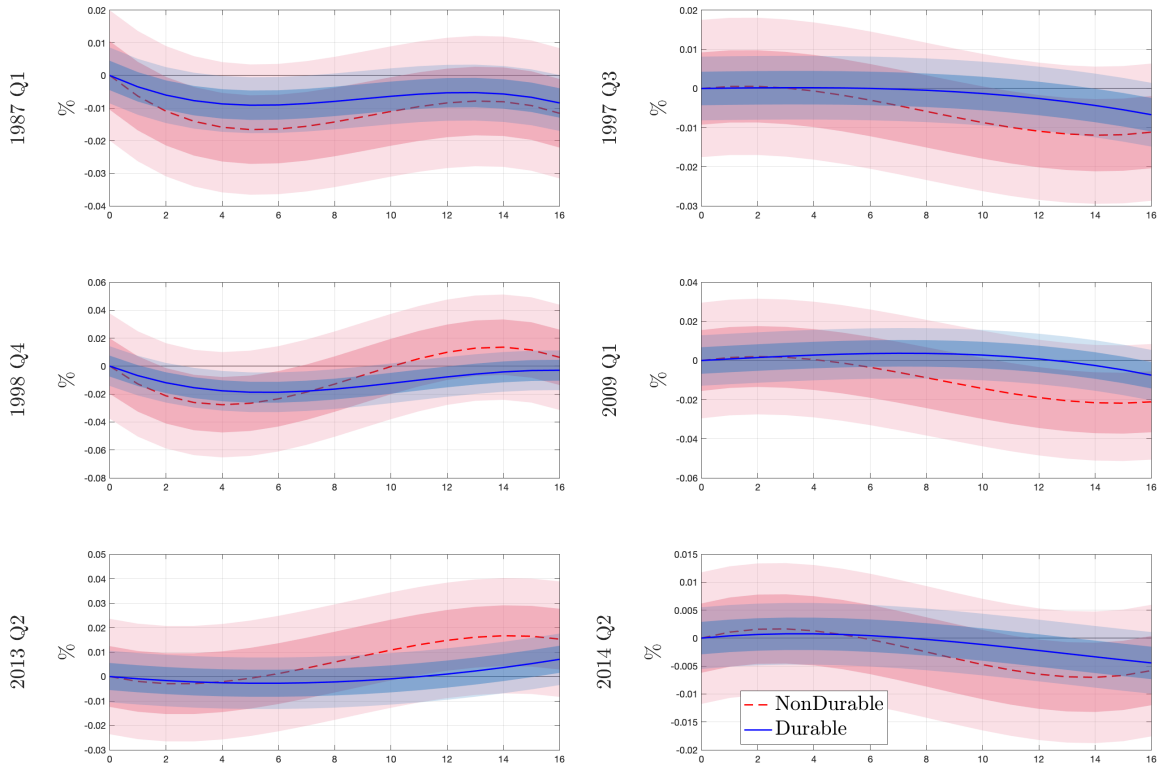


Figure B.4 plots the response of durable (blue) and nondurable (red) aggregate consumption for selected monetary policy shocks. The solid black line denotes the impulse response, the light and dark shaded areas denote the 68 and 90% confidence intervals, respectively.

Figure B.5: Total Consumption Response by Housing Tenure, Conventional Times- Alternative Measures

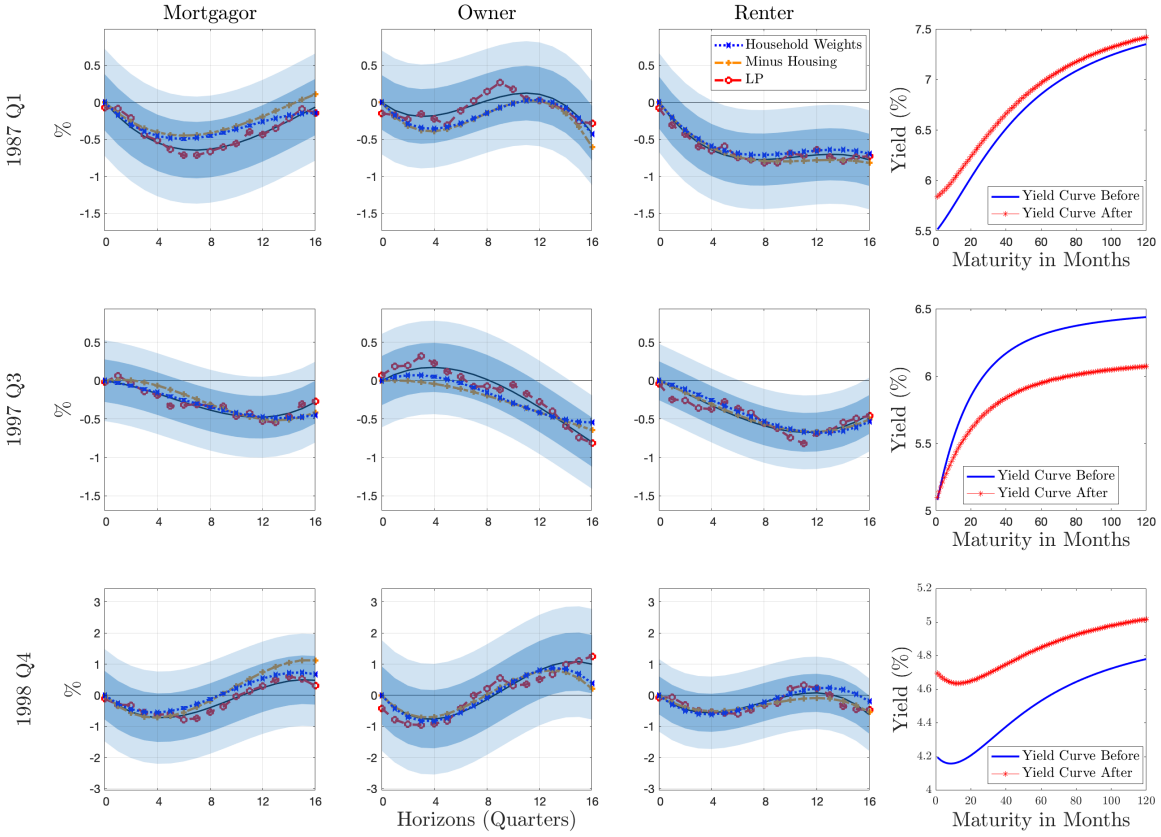


Figure B.5 plots the response of total consumption by housing tenure for selected conventional monetary policy shocks. The solid black line denotes the impulse response, the light an dark shaded areas denote the 68 and 90% confidence intervals, respectively. Each line represents a different measure of total consumption. The blue line with an x marker represents using the CEX probability weights, whereas the red circle line represents using a traditional local projection and yellow line with a + marker total consumption excluding housing costs.

Figure B.6: Total Consumption Response by Housing Tenure, Unconventional Times- Alternative Measures

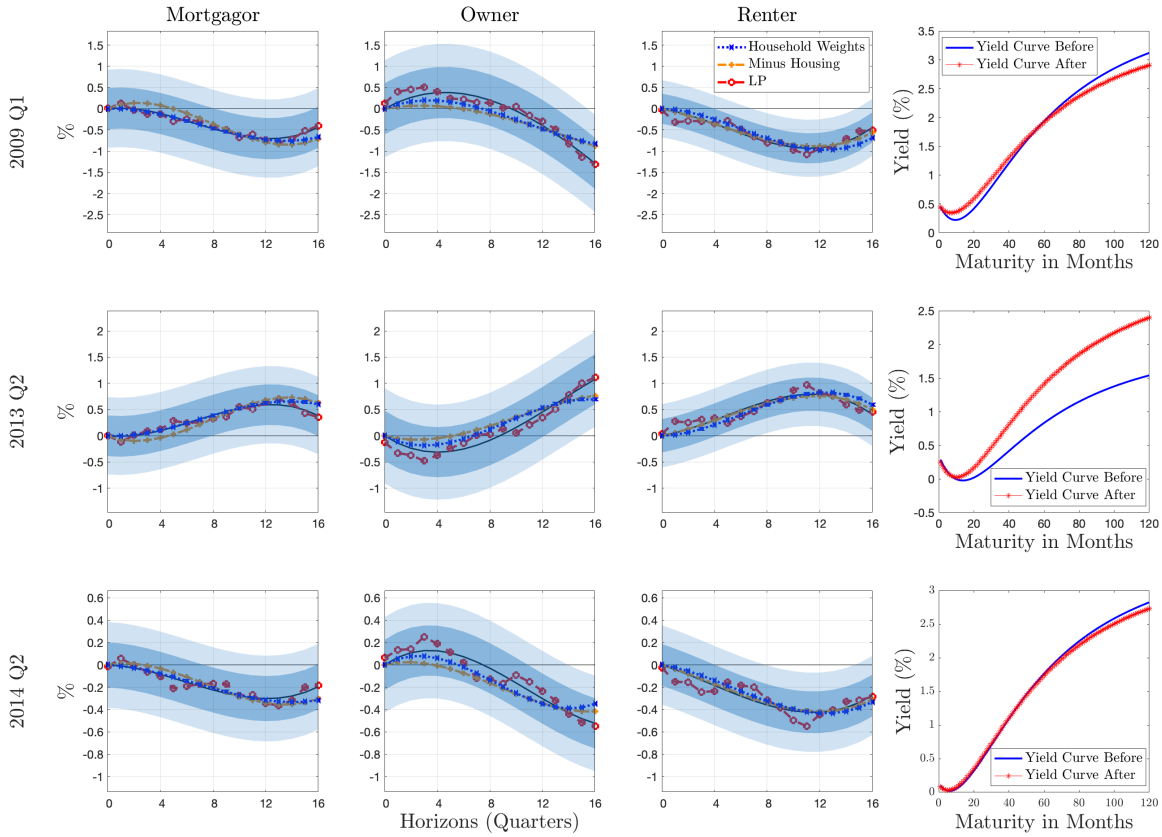


Figure B.6 plots the response of total consumption by housing tenure for selected unconventional monetary policy shocks. The solid black line denotes the impulse response, the light an dark shaded areas denote the 68 and 90% confidence intervals, respectively. Each line represents a different measure of total consumption. The blue line with an x marker represents using the CEX probability weights, whereas the red circle line represents using a traditional local projection and yellow line with a + marker represents total consumption excluding housing costs.

Figure B.7: Total Consumption Response by Housing Tenure, Conventional Times- Levels

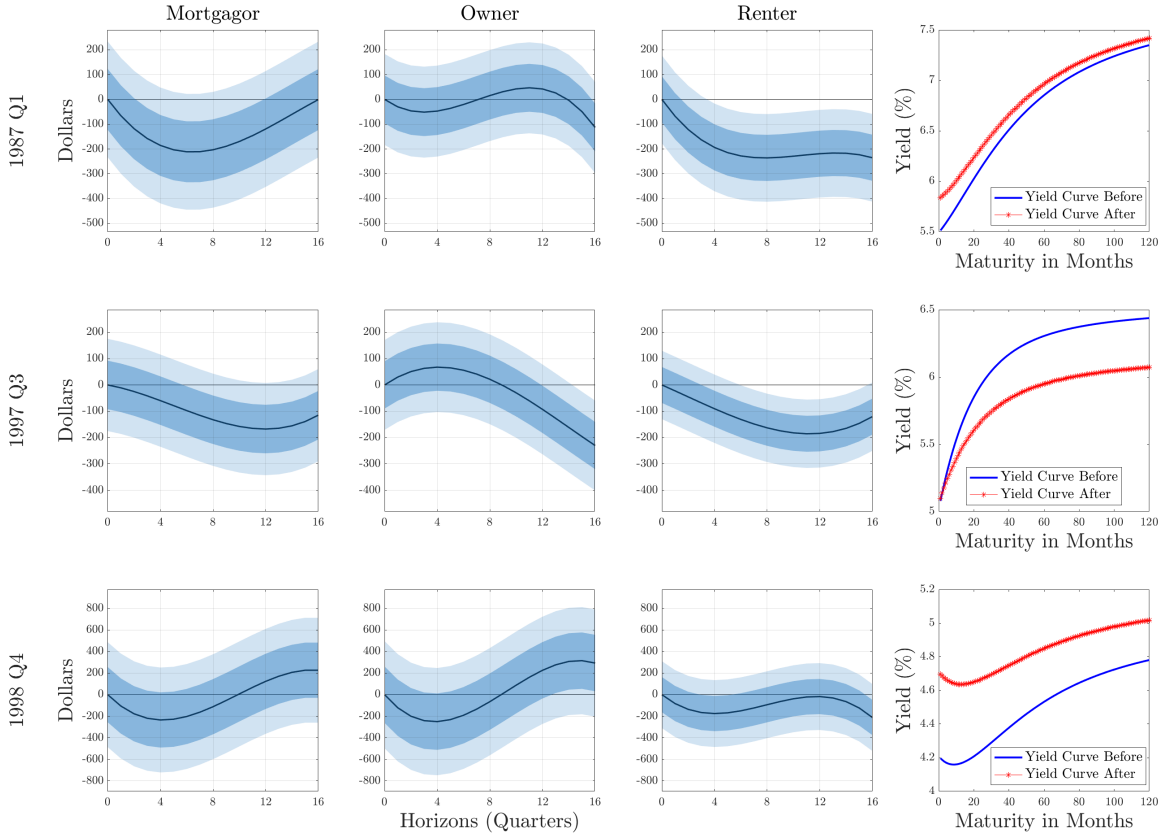


Figure B.7 plots the response of total consumption by housing tenure for selected conventional monetary policy shocks. The solid black line denotes the impulse response, the light an dark shaded areas denote the 68 and 90% confidence intervals, respectively.

Figure B.8: Total Consumption Response by Housing Tenure, Unconventional Times- Levels

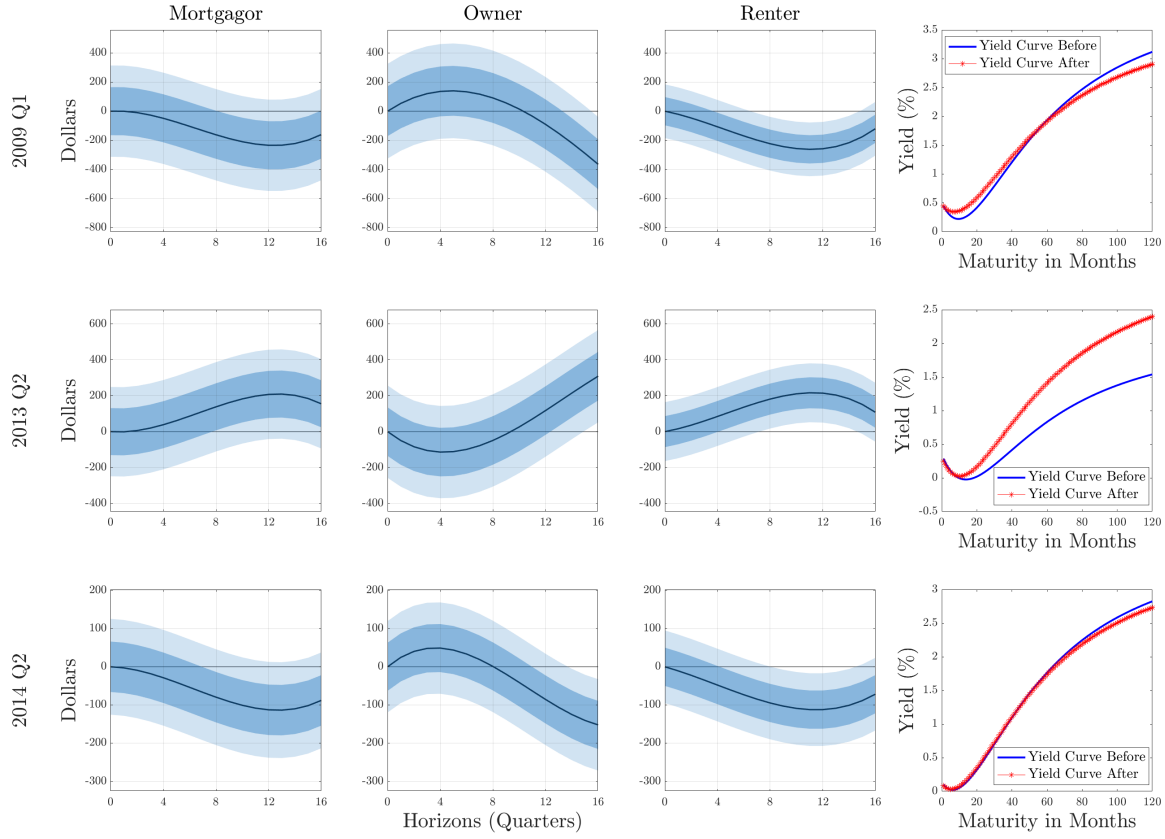


Figure B.8 plots the response of total consumption by housing tenure for selected unconventional monetary policy shocks. The solid black line denotes the impulse response, the light an dark shaded areas denote the 68 and 90% confidence intervals, respectively.

Figure B.9: Total Consumption Response by Housing Tenure, Conventional Times- Alternative Aggregation Measures

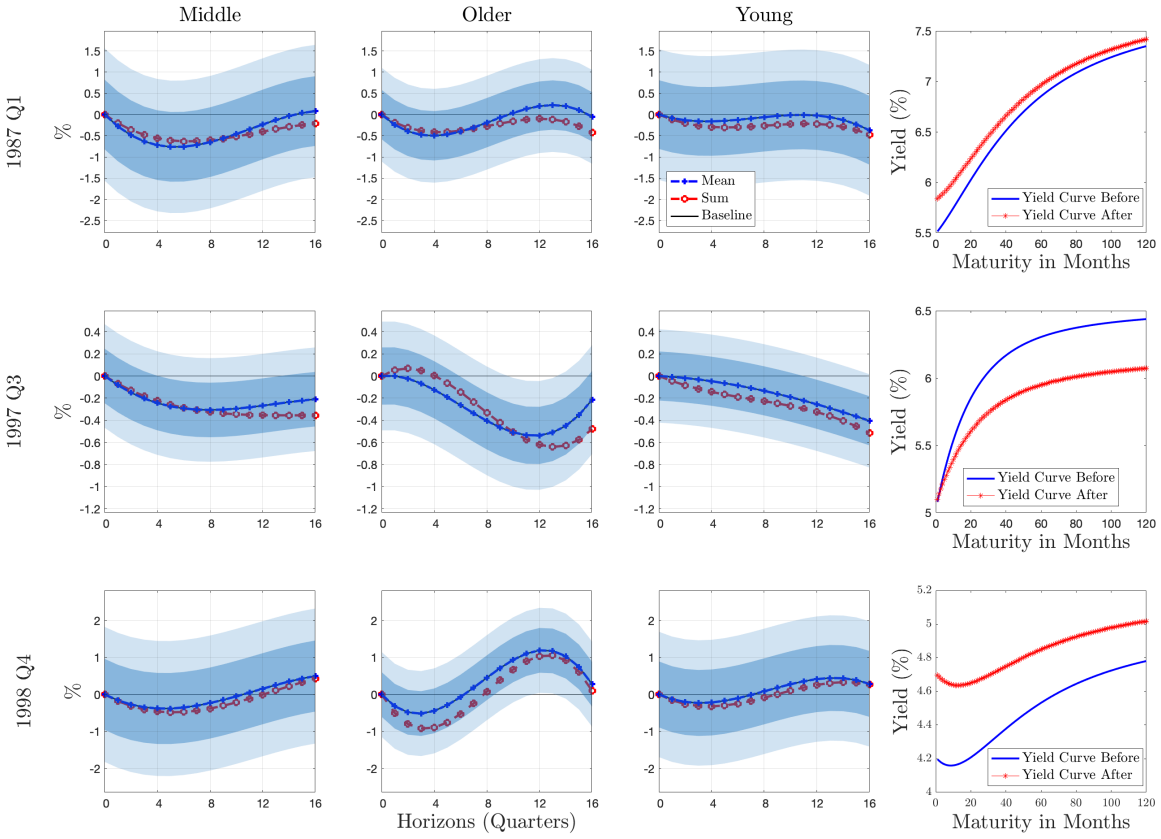


Figure B.9 plots the response of total consumption by housing tenure for selected conventional monetary policy shocks. The solid black line denotes the impulse response, the light an dark shaded areas denote the 68 and 90% confidence intervals, respectively. Each line represents a different aggregation of daily shocks. The blue diamond line represents the response obtained when we take the mean of the daily shocks, whereas the red circle line represents response obtained when we sum the each daily shock.

Figure B.10: Total Consumption Response by Housing Tenure, Unconventional Times- Alternative Aggregation Measures

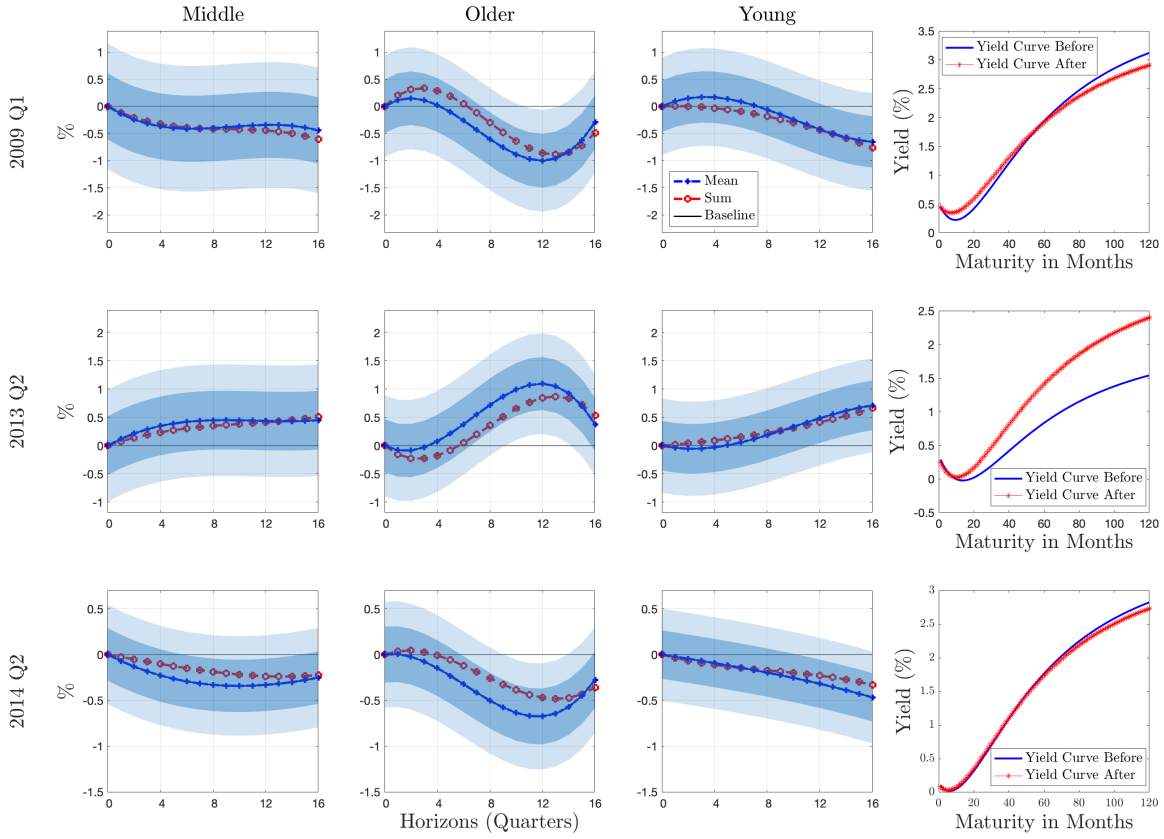


Figure B.10 plots the response of total consumption by housing tenure for selected unconventional monetary policy shocks. The solid black line denotes the impulse response, the light an dark shaded areas denote the 68 and 90% confidence intervals, respectively. Each line represents a different aggregation of daily shocks. The blue diamond line represents the response obtained when we take the mean of the daily shocks, whereas the red circle line represents response obtained when we sum the each daily shock.

Figure B.11: Total Consumption Response by Age, Conventional Times- Alternative Measures

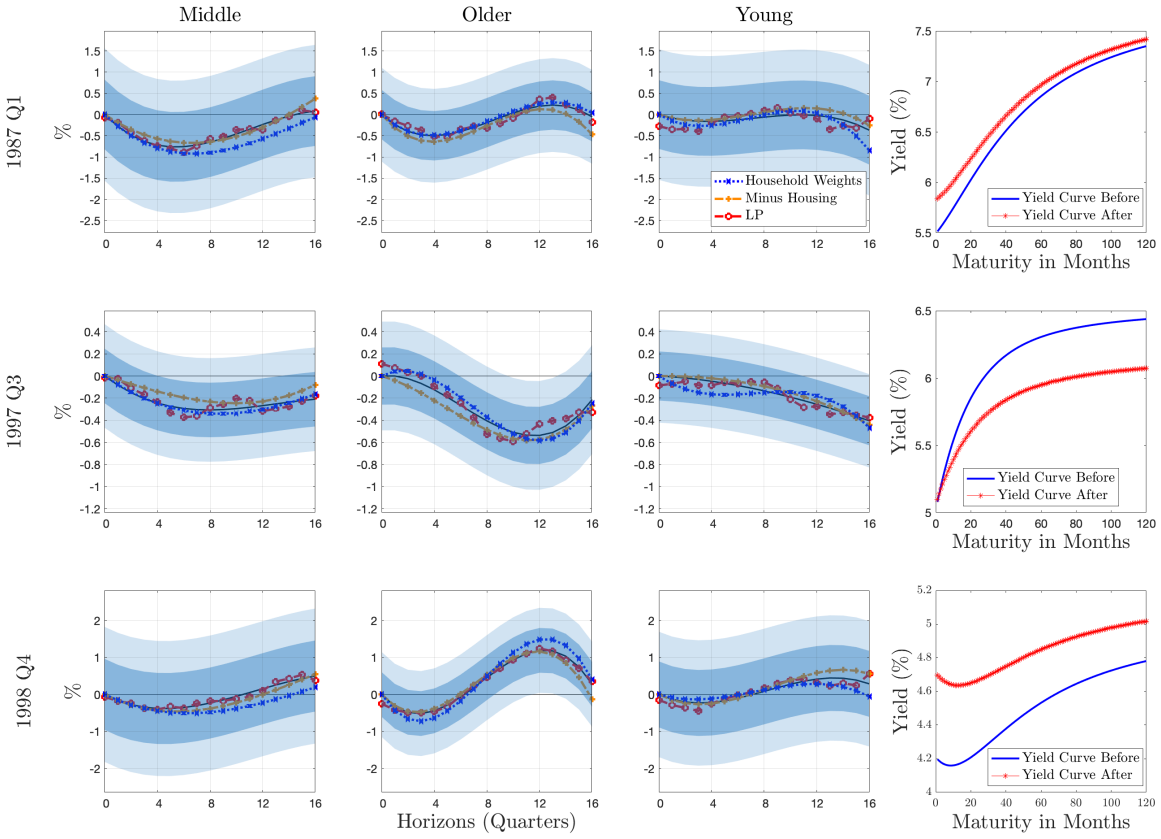


Figure B.11 plots the response of total consumption by age group for selected conventional monetary policy shocks. The solid black line denotes the impulse response, the light an dark shaded areas denote the 68 and 90% confidence intervals, respectively. Each line represents a different measure of total consumption. The yellow * line represents using the CEX probability weights, whereas the red circle line represents using a traditional local projection and blue diamond total consumption excluding housing costs.

Figure B.12: Total Consumption Response by Age, Unconventional Times- Alternative Measures

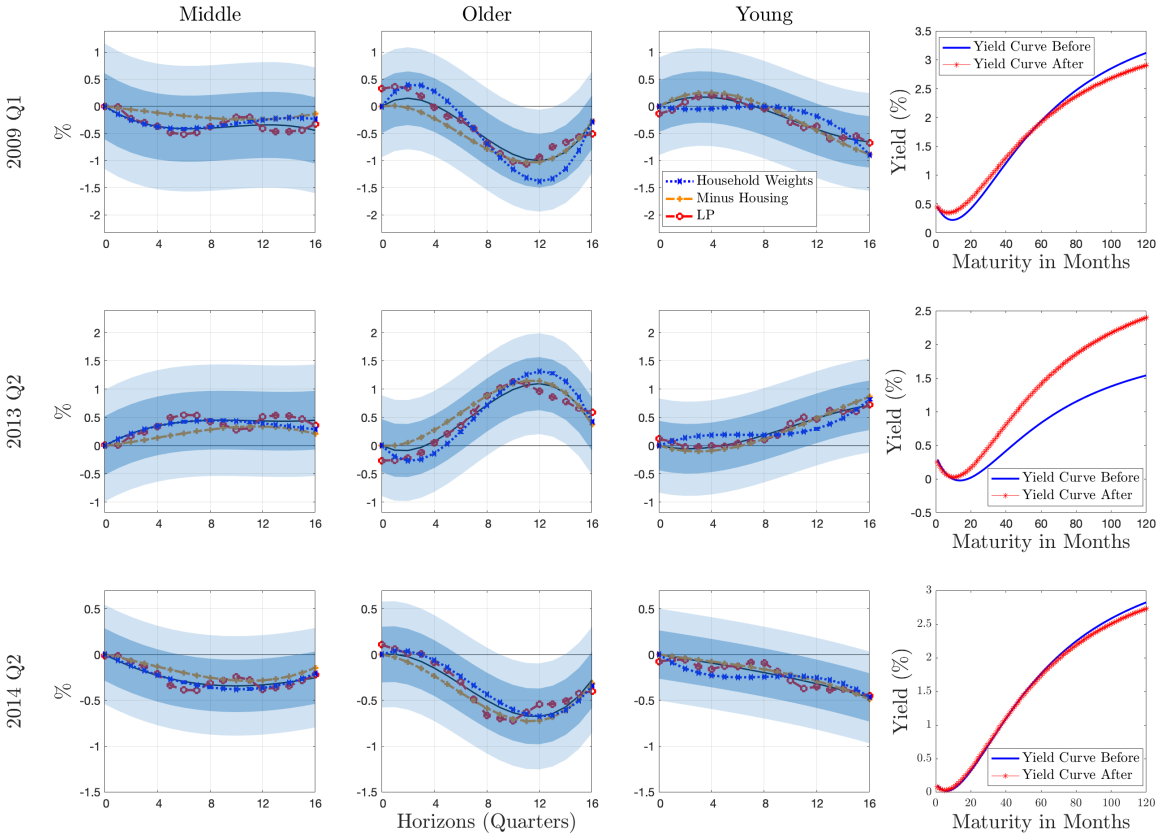


Figure B.12 plots the response of total consumption by age group for selected unconventional monetary policy shocks. The solid black line denotes the impulse response, the light an dark shaded areas denote the 68 and 90% confidence intervals, respectively. Each line represents a different measure of total consumption. The yellow line with the * marker represents using the CEX probability weights, whereas the red circle line represents using a traditional local projection and blue diamond total consumption excluding housing costs.

Figure B.13: Total Consumption Response by Housing Tenure, Conventional Times- Levels

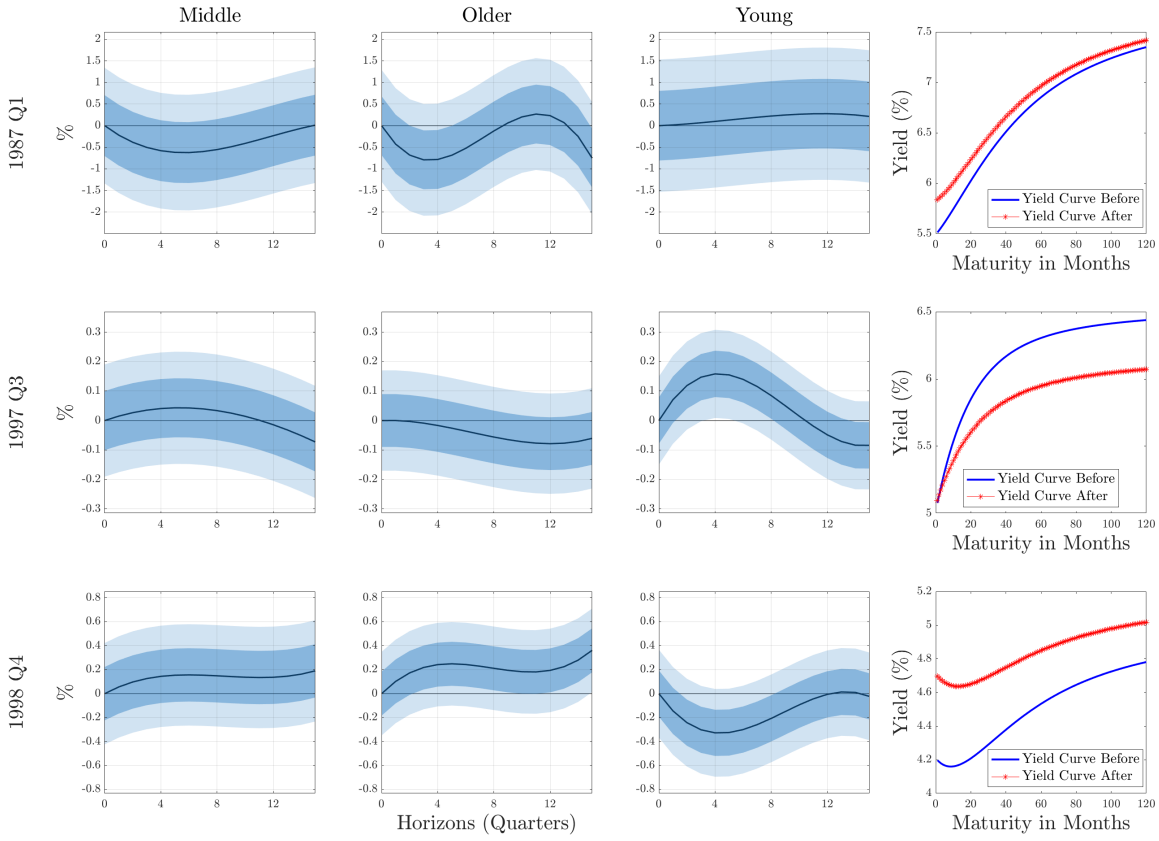


Figure B.13 plots the response of total consumption by age group for selected conventional monetary policy shocks. The solid black line denotes the impulse response, the light an dark shaded areas denote the 68 and 90% confidence intervals, respectively.

Figure B.14: Total Consumption Response by Housing Tenure, Unconventional Times- Levels

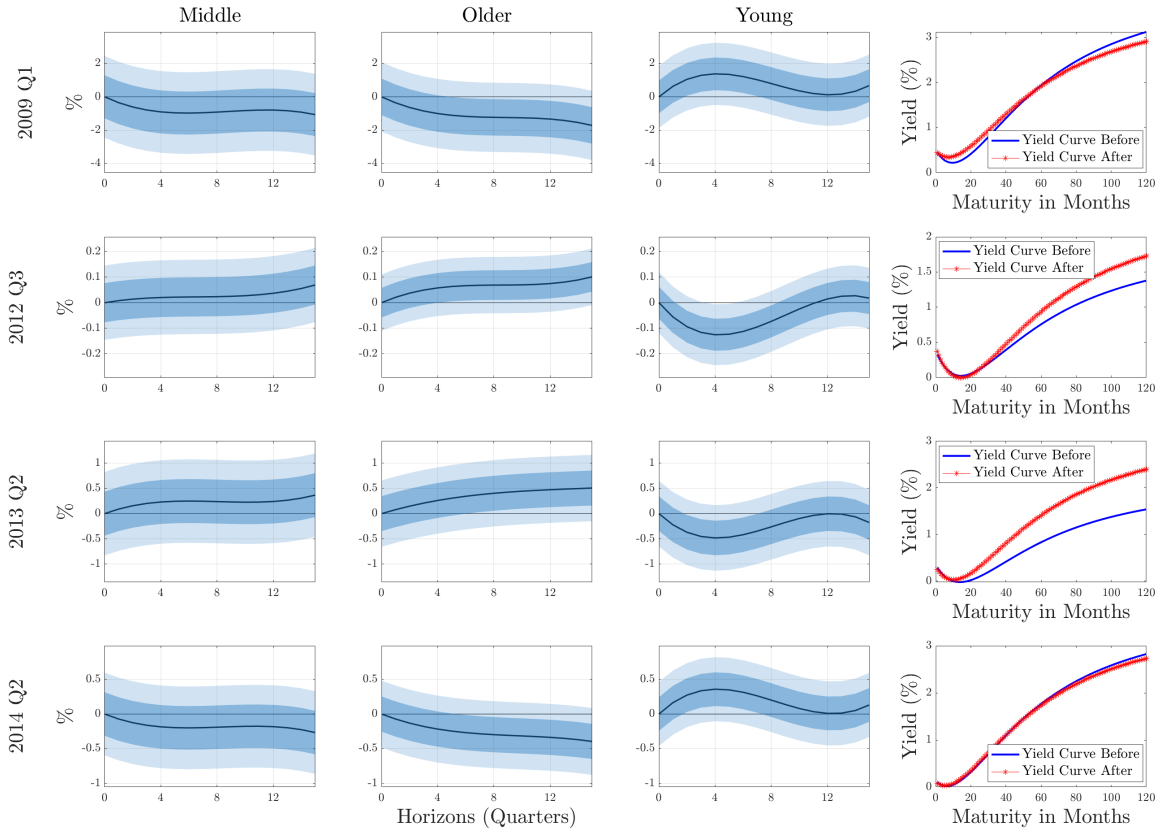


Figure B.14 plots the response of total consumption by age group for selected unconventional monetary policy shocks. The solid black line denotes the impulse response, the light an dark shaded areas denote the 68 and 90% confidence intervals, respectively.

Figure B.15: Total Consumption Response by Age, Conventional Times- Alternative Aggregation Measures

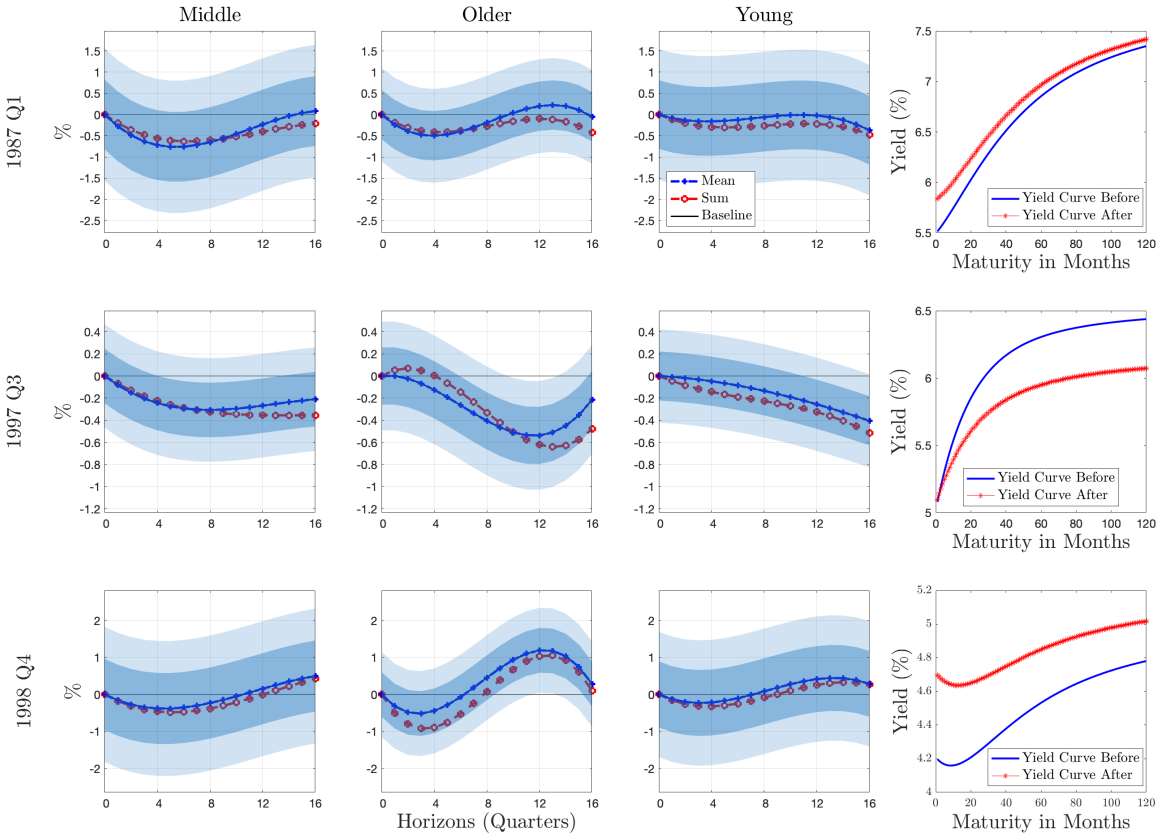


Figure B.15 plots the response of total consumption by age group for selected conventional monetary policy shocks. The solid black line denotes the impulse response, the light an dark shaded areas denote the 68 and 90% confidence intervals, respectively. Each line represents a different aggregation of daily shocks. The blue diamond line represents the response when we use the average of the shocks, whereas the red circle line represents the response obtained when we sum the daily shock.

Figure B.16: Total Consumption Response by Age, Unconventional Times- Alternative Aggregation Measures

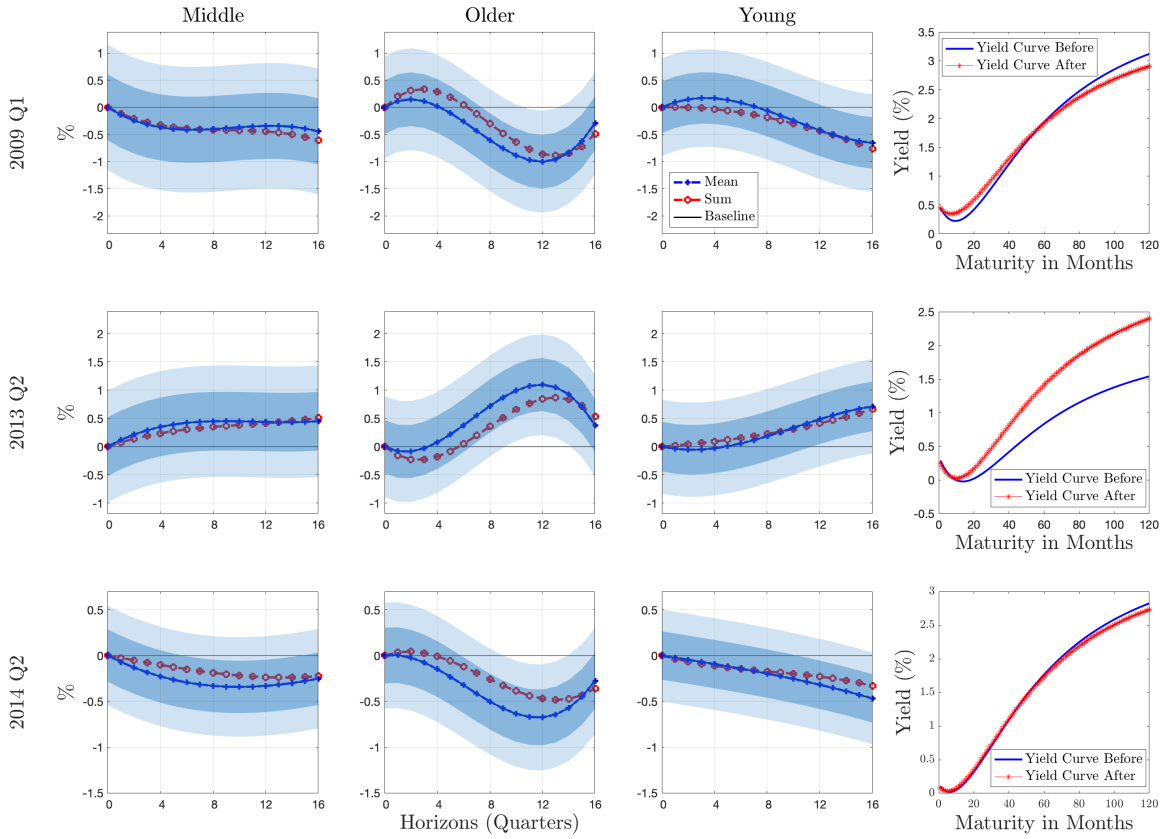


Figure B.16 plots the response of total consumption by age group for selected unconventional monetary policy shocks. The solid black line denotes the impulse response, the light an dark shaded areas denote the 68 and 90% confidence intervals, respectively. Each line represents a different aggregation of daily shocks. The blue diamond line represents taking the mean of the shocks, whereas the red circle line represents summing each daily shock.

Economic Review 108, 697–743.