

# Monetary Policy and Inequality

Alisdair McKay and Christian K. Wolf

**M**onetary policy affects incomes, employment rates, asset prices, and interest rates. Because different households hold different financial assets, work in different sectors, and are differentially attached to the labor force, it follows that monetary policy will almost certainly have heterogeneous effects across households. The last decade has seen an explosion of empirical and theoretical research on the links between monetary policy and inequality. In this article, we take stock of this important research agenda. We organize our discussion around three main questions.

First, how unevenly distributed are the effects of monetary policy, and why? Monetary stimulus—that is, lower nominal interest rates—affects households through many different channels. Most directly, households may pay lower interest rates on their debts and are likely to earn lower returns on their savings. In addition, changes in interest rates also set into motion changes in the broader economy that indirectly affect households: jobs become easier to find, wages and prices increase, and asset prices rise. Taking any one of these channels in isolation, the effects of a monetary policy easing can look very uneven. For example, many households will not benefit at all from an increase in stock prices, simply because they do not own

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any stocks. When aggregating across all of these transmission channels, however, the gains appear much more evenly distributed. Roughly speaking, low-income households benefit from a tighter labor market, middle-class households benefit from lower mortgage rates, and wealthy households benefit from capital gains on assets. To reach this conclusion, we review recent empirical work on the incidence of monetary policy across households. We also provide descriptive measures of the heterogeneity in household balance sheets and their exposure to changes in monetary policy.

Second, does a more careful account of the microeconomic effects of monetary policy affect our understanding of its propagation to the macroeconomy at large? Yes and no. Theoretical analyses that dig into the microeconomic propagation of monetary policy have materially altered our views on transmission channels. For example, we have learned that an important component of the transmission of monetary policy to consumer spending is actually indirect: by changing nominal interest rates, monetary policy first of all directly increases consumer and firm demand; this increase in demand then in general equilibrium leads to higher income, which in turn leads to meaningful second-round effects on consumer spending. At the same time, however, there is rather limited scope for such microlevel studies to change our overall view on the macro effects of monetary policy. The reason is simple: we already have good empirical evidence on the overall response of aggregate output and inflation to changes in interest rates, and any structural model of monetary policy transmission—with or without microeconomic heterogeneity—needs to be broadly consistent with that evidence. That said, the more detailed view of the micro-level effects of monetary policy that emerges from recent research does suggest new reasons to expect the economy's sensitivity to monetary policy to vary over time and with the state of the business cycle.

Third, how—if at all—should the interaction between monetary policy and inequality affect the behavior of central banks? We argue that even if the central bank's mandate includes distributional concerns, appropriate policy is unlikely to differ too much from the optimal policy of a central bank that is solely focused on macroeconomic goals like stabilizing inflation and aggregate activity. The reason is related to our answer to the first question: because the effects of monetary policy are relatively evenly distributed, the scope for achieving distributional objectives through monetary policy is likely to be rather limited.

## **The Distributional Effects of Monetary Policy**

Our objective in this section is to assess how monetary policy affects consumption across different groups of households. One could, in principle, instead ask how monetary policy affects other measures of inequality, such as income or wealth. We will ask these questions as well, but with the end goal of translating income and wealth into consumption. We do so because, while of course consumption is not

synonymous with utility, it is more directly related to a household's well-being than are its wealth and income.

At any given point in time, monetary policy will of course explain very little of the overall differences in consumption across different groups of households. Therefore, we discuss how consumption *changes* across household groups following a *change* in monetary policy. These consumption responses will depend—at least to some degree—on the institutions of the economy (for example, whether mortgages are mostly fixed-rate or floating-rate). We focus primarily on the US context, though many of the forces we describe are likely to be similar across countries. We will also phrase our discussion in terms of the effects of monetary stimulus; in many respects a monetary contraction would have the mirror image effects, though there are some important sources of asymmetry that we will note. We proceed in two steps. First, we review the key channels through which monetary policy will affect consumption. Second, we combine all of those channels to arrive at overall conclusions for how monetary policy will affect the consumption of heterogeneous households.

### Channels of Transmission

Monetary policy affects the consumption of an individual household by changing the prices, wages, interest rates, and opportunities it faces. Many of these changes are indirect in nature; for example, expansionary policy may lead to a tighter labor market, thus resulting in higher wages for workers. This section considers some of the main channels of transmission from monetary policy decisions to household consumption decisions: via income, revaluation of nominal contracts, mortgages, asset prices, and intertemporal substitution.<sup>1</sup> For each channel, we will describe its strength in the aggregate as well as its heterogeneous incidence across households. To do so, we will combine empirical evidence on the aggregate effects of changes in monetary policy with data on heterogeneity in household finances. That data is taken from the 2019 Survey of Consumer Finance (Federal Reserve Board 2019), a nationally representative survey of households that collects data on their income, assets, and liabilities.

Throughout this section we will repeatedly refer to Figure 1. Each panel of three figures (the rows of the figure) shows a different feature of household balance sheets. The left column of the figure splits households into five wealth quintiles and reports the average within each quintile. The middle and right columns do the same splitting households into income and age quintiles, respectively. We focus on these dimensions of heterogeneity across households as they interact most closely with the mechanisms studied in the recent literature.

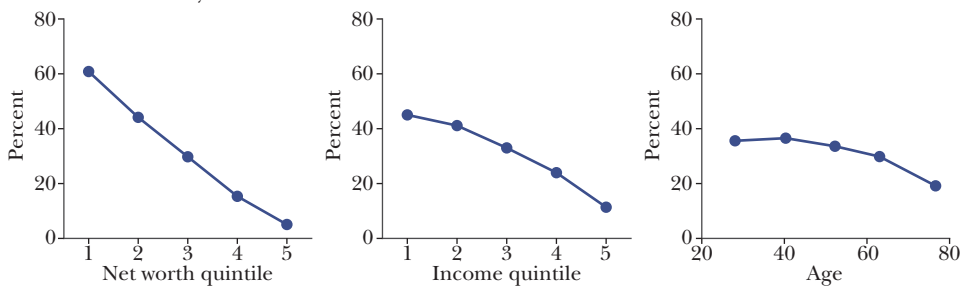
*Income.* Expansionary monetary policy stimulates the aggregate economy and thereby raises labor income. These gains are unlikely to be distributed equally, as labor incomes of low-income households tend to be disproportionately exposed to the business cycle (Okun 1973; Guvenen, Ozkan, and Song 2014; Guvenen et al.

<sup>1</sup>A theoretical decomposition of individual consumption responses to monetary policy that includes these channels can be found in Auclert (2019).

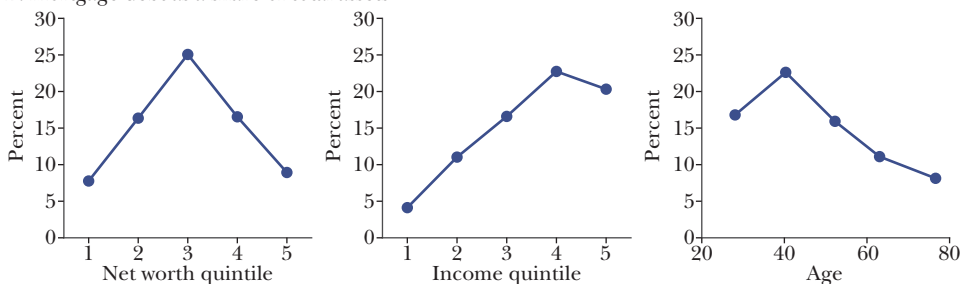
Figure 1

**Some Summary Measures of Household Balance Sheets**

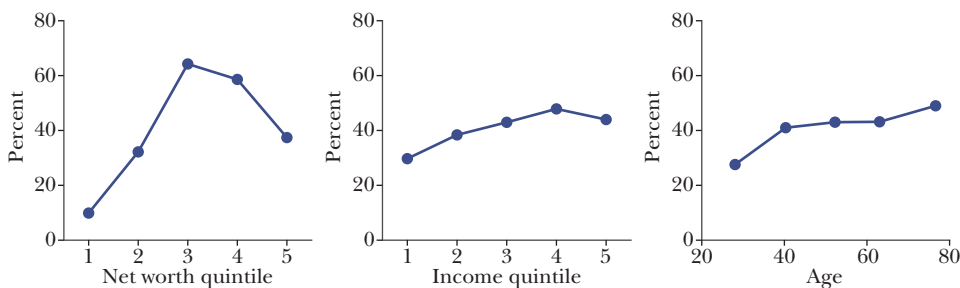
A: Percent financially constrained



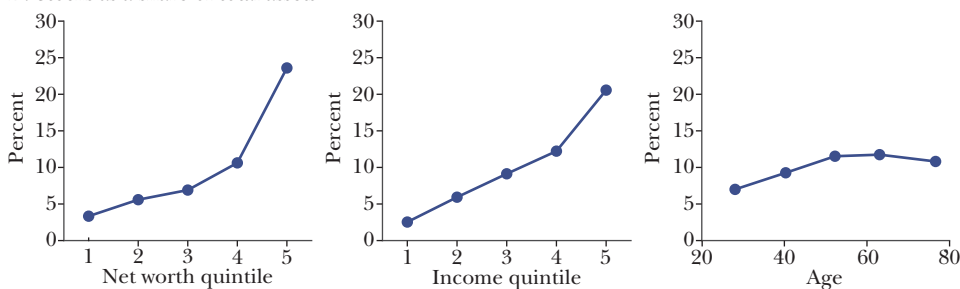
B: Mortgage debt as a share of total assets



C: Real estate as a share of total assets



D: Stocks as a share of total assets



Source: Data from the 2019 Survey of Consumer Finances. Author's calculations shown in online Appendix.

Note: Each figure divides the sample into quintiles by net worth, income, or age and then plots the mean level within that quintile. Panel A shows the fraction of households that have liquid assets of less than two weeks' income. Panel B shows the mean ratio of mortgage debt to total assets. Panel C shows the share of real estate in household asset holdings. Panel D shows the share of stocks in households' assets.

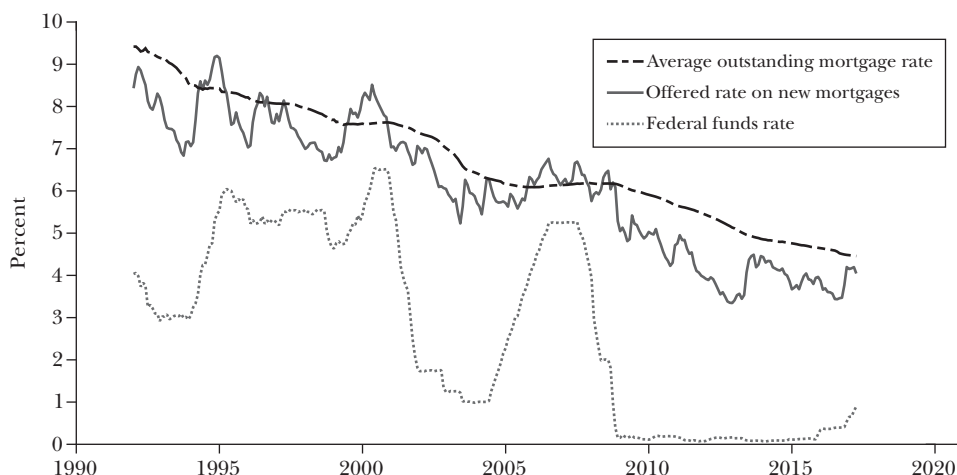
2017; Patterson 2022). This pattern holds both for business cycles in general, and also for expansions and contractions that result from changes in monetary policy in particular (Andersen et al. 2021; Amberg et al. 2021; Holm, Paul, and Tischbirek 2021). The inequality in earnings resulting from this income incidence channel is quite pronounced. For example, data from the recession of 1979–1983 (which was arguably caused by a monetary contraction) shows that the earnings losses for low-income households were many times larger than those for high-income households (Guvenen, Ozkan, and Song 2014).

These heterogeneous responses of income are then further amplified when translated to changes in consumption. In particular, low-income households are more likely to be financially constrained—that is, with no savings and no access to credit. Without a buffer of savings or credit, such households are then likely to have a stronger response of consumption to a change in income. To illustrate the empirical relevance of this point, we report in panel A of Figure 1 the fraction of households that are financially constrained. To construct the figure, we follow Kaplan, Violante, and Weidner (2014) and classify households as financially constrained if their liquid assets amount to less than two weeks' worth of income. According to this definition, it is possible even for high-net-worth households to be financially constrained if their assets are held in illiquid forms (such as real estate). Overall, we classify 31 percent of households as being constrained in this fashion, with households of lower net worth and with lower income much more likely to be constrained.

*Revaluation of nominal contracts.* Expansionary monetary policy raises the general level of prices by temporarily raising the rate of inflation. In most borrowing and lending arrangements, the contracting parties agree to a repayment that is set in nominal terms, and so a surprise increase in the price level will reduce the real value of the repayment. Doepke and Schneider (2006) document the heterogeneity in household exposure to such surprise inflation. A typical middle-class household has substantial nominal debts in the forms of mortgages, auto loans, credit card debts, and student loans. For a typical household, nominal assets (like bank deposits and bond holdings) are smaller than nominal debts, and so it follows that a surprise increase in inflation will lower the real value of their debts by more than it will lower the real value of their assets. This is especially true of young households—a group that tends to have large mortgage balances. Old, rich households, on the other hand, tend to have more nominal assets than nominal liabilities and so the net worth of these households declines after an unexpected increase in the price level.

How large are these effects? It is widely believed that inflation is actually fairly insensitive to short-run changes in monetary policy (for example, Mavroeidis, Plagborg-Møller, and Stock 2014). On the other hand, since most central banks nowadays try to stabilize rates of inflation, even small changes in the inflation rate can accumulate over time to have a substantial effect on the overall price level. In particular, as we describe further below, a change in monetary policy that raises GDP by 1 percentage point for two years approximately leads to a 0.5 percentage point permanent increase in the price level. For a household with a mortgage

Figure 2

**Monetary Policy and Mortgage Interest Rates**

Source: Berger et al. (2021), Freddie Mac, and Federal Reserve Board.

Note: The outstanding rate is the average rate currently paid by homeowners. The federal funds rate is an overnight interest rate and in particular the target rate for monetary policy implementation with data from the Federal Reserve. The offered rate is the average rate currently offered by mortgage lenders.

balance that is twice its annual income (about the average ratio for young homeowners), this channel represents a decrease in the real value of their liabilities equal to 1 percent of their annual income.

*Mortgages.* A homeowner with a mortgage not only benefits from the change in the price level, but may also benefit from a reduction in the nominal interest rate. Mortgage interest rates are tightly linked to monetary policy: a 1 percentage point change in the federal funds rate typically translates to roughly a 0.5 percentage point change in the 30-year mortgage rate (for a review of evidence, see Wong 2021 and references therein). The design of mortgage contracts varies across countries. In the United States, most mortgages have fixed nominal interest rates, but the borrower is free to repay the loan at the time of their choosing. This option to repay the loan creates an asymmetry: when nominal interest rates fall, homeowners can benefit by refinancing their loans at lower interest rates; if rates rise, homeowners can simply keep their original loans. Figure 2 plots the average interest rate paid on outstanding mortgages (as computed by Berger et al. 2021) along with the rate currently offered on new 30-year mortgages, as well as the federal funds rate. Offered mortgage rates, which are long-term rates, are less volatile than the federal funds rate. Moreover, as most borrowers have fixed-rate contracts and refinancing is gradual, the rates they actually pay are even smoother than the offered rates. Finally, due to the asymmetry mentioned above, average mortgage rates tend to co-move more closely with the federal funds rate following rate cuts than rate hikes.

Panel B of Figure 1 shows what kind of households will tend to gain from lower interest rates through this mortgage channel. In particular, the figure shows the ratio of mortgage debt to household assets. We see that mortgage debt is particularly important for households in the middle of the wealth distribution. Moreover, the ratio of mortgage debt to assets tends to decline with age, so young households are more exposed to changes in mortgage rates than are older households. Returning to our example of a young household with a mortgage balance of twice their income, a 1 percentage point reduction in their mortgage rate implies a 2 percent increase in disposable income for the life of the loan, which is typically between five and ten years.

Of course, whenever households pay lower interest rates on their debts, somebody else is receiving less interest income. In the US mortgage market, the lenders are often the owners of mortgage-backed securities—financial contracts that entitle the owner to receive the principal and interest payments on a pooled group of mortgages. It is generally difficult to say how this lost interest income will feed back to households, as mortgage-backed securities are typically held by financial institutions, governments, and foreign investors rather than outright by households.<sup>2</sup> Because this loss of interest income is directly borne by financial institutions, governments, and foreign investors, it is rather unlikely to have a substantial effect on household consumption decisions, at least in the short run.

*Asset prices.* Expansionary monetary policy tends to increase the values of long-lived assets such as stocks and real estate. As real interest rates decline, the present discounted value of future cash flows increases, thus leading to a revaluation of assets and liabilities. At first glance, this channel may appear to be a key channel of monetary policy-induced redistribution: asset-holders get wealthier when rates fall. However, lower interest rates also mean lower expected returns on these assets—a force pushing in the opposite direction. Which of these effects dominates depends on the horizon at which the asset-holder plans to consume.<sup>3</sup> Fagereng et al. (2022) provide an intuitive way for thinking about the redistributive effects of changes in asset prices: those who plan to sell the asset benefit when its price increases, and those who plan to buy the asset are harmed. Additional important effects relate to the role of assets as collateral and as buffers against changes in income: through these channels, higher asset prices may lead households to spend more even if they do not plan to buy or sell the asset. In what follows, we elaborate on the connection between changes in wealth and changes in consumption for two important asset classes: stocks and housing.

Stock prices are highly sensitive to changes in interest rates (Bernanke and Kuttner 2005; Bauer and Swanson 2022). As discussed above, the effect of stock

<sup>2</sup> Data from 2010 shows that the US government and foreign investors owned nearly 50 percent of outstanding agency mortgage-backed securities (Tracy and Wright 2012).

<sup>3</sup> More precisely, what matters is how a household's plan to consume at various dates lines up with the existing claims to cash flows across those dates. Households with front-loaded consumption and back-loaded cash flows benefit from lower rates (Auclet 2019; Greenwald et al. 2021; Fagereng et al. 2022).

price changes on household consumption is likely to depend on the future savings and consumption plans of the household. Empirical evidence overall suggests that higher stock market wealth does translate to an immediate (if moderate) increase in consumer spending, with an extra \$1 of stock wealth increasing consumption by \$0.03 (Chodorow-Reich, Nenov, and Simsek 2021). Across households, the ownership of stocks is highly concentrated, with wealthy households holding the vast majority. Panel D of Figure 1 reveals that wealthy households also devote a much larger share of their portfolios to stocks.

House prices tend to increase following expansionary monetary policy (Iacoviello 2005). Moreover, housing is particularly important as a share of household balance sheets for the middle class (for example, see panel C of Figure 1).<sup>4</sup> Many homeowners expect to remain in their houses for many years; since they then do not plan to either buy or sell the asset, it may seem that they are unaffected by a change in house prices. Intuitively, following a monetary easing, those households now own a more valuable house, but they now also want to live in a more expensive house. However, houses often serve as valuable sources of liquidity for households, either as collateral for loans or through the reassurance that they can rely on their home equity as a financial backstop in the future (for example, Berger et al. 2018). Empirical evidence suggests that homeowners as a group overall do increase their consumption when their homes appreciate—a “housing wealth effect.” In particular, recent estimates show that an additional dollar of housing wealth leads to an increase in consumption of between \$0.03 (Guren et al. 2021) and \$0.07 (Mian, Rao, and Sufi 2013).

*Intertemporal substitution.* Finally, monetary policy can induce households to substitute consumption across time. Intuitively, the real interest rate is the price of consumption today relative to consumption in the future, and a decline in this relative price should result in households increasing consumption today and reducing consumption in the future. How strongly households respond to these incentives depends on the types of consumption we are considering. For nondurable goods and service consumption, empirical evidence (Best et al. 2020) suggests that this intertemporal substitution effect is quite small; it is also homogeneous across households, thus limiting its redistributive effects.

### **Assessing Consumption Effects through Direct Measurement**

We have seen that monetary policy affects household balance sheets through several distinct margins, with each channel likely to benefit different groups of households. Ultimately, we are interested in how the sum of these changes translates to household consumption. In the rest of this section, we describe two broad approaches to answering this question: a direct approach (this subsection) and an indirect approach (the next one).

<sup>4</sup> Here we study asset price changes and thus we focus on homeowners rather than renters. Renters that do not plan to purchase a home are not directly affected by these asset price changes, though they could be affected indirectly if rents adjust to reflect these changes in home prices.



A direct measurement approach, in which one measures consumption at the household level and then asks how the distribution of consumption responds to changes in monetary policy, is perhaps the most natural way to proceed. The key challenge with this approach is that high-quality data on individual consumption is needed—the data need to allow the researcher to tease out the role of monetary policy among the many other (and actually more important) factors that also affect inequality across households.

*US data.* For the US economy, the best source for individual consumption data is arguably the Consumer Expenditure Survey—a nationally representative survey of households that is conducted quarterly by the Census Bureau on behalf of the Bureau of Labor Statistics. Coibion et al. (2017) use these data to create quarterly time series of statistics that summarize the consumption distribution—for example, the tenth, fiftieth, and ninetieth percentiles of the consumption distribution in each quarter. They then explore how these distributional measures evolve after a plausibly exogenous change in monetary policy. They find that expansionary monetary policy reduces consumption inequality, because the ninetieth percentile of the distribution moves closer to the tenth and fiftieth percentiles. Chang and Schorfheide (2022) also use Consumer Expenditure Survey data for the same purpose, though with a somewhat different econometric approach and a different measure of monetary policy. They instead find that expansionary policy *increases* consumption inequality, with the top-end of the distribution now moving away from the rest. Overall, one of the challenges with this direct approach—and a potential reason behind the conflicting findings in prior work—is that the contribution of monetary policy shocks is small relative to other factors that affect a cross-section of households. As a result, sampling variation can be an important obstacle in isolating the heterogeneous effects of policy.

One way of circumventing these challenges is to estimate heterogeneous consumption effects of monetary policy across broader groups of households, notably across homeownership status. Cloyne, Ferreira, and Surico (2020) find that the consumption levels of homeowners with a mortgage and renters respond to changes in interest rates by similar percentage amounts, while the consumption of homeowners without a mortgage does not appear to react as strongly. Specifically, they find that a 1 percentage point reduction in nominal interest rates leads to about a 1 percentage point increase in nondurable consumption for mortgagors and renters, and no statistically significant spending response for homeowners without mortgages. This broad gradient by homeownership is then likely to translate into heterogeneity in the effects of monetary policy by wealth, income, and age. First, for the United States, the fraction of households in the Survey of Consumer Finance that has a mortgage is about 60 percent for the top three wealth quintiles and rises steadily across the income quintiles, reaching 73 percent for the highest quintile. This pattern suggests consumption gains that are somewhat increasing in wealth and income. Second, older households are less likely to have a mortgage, so younger households should benefit by more than older households. The implied gradient in consumption responses by age is consistent with results reported in Wong (2021). She finds that the consumption response to monetary policy is concentrated among

homeowners who take out a new mortgage (either to refinance an existing one or purchase a new home) after the change in monetary policy.

*Evidence from other countries.* Another way of circumventing the challenge of sampling variation is to use an administrative dataset that contains the entire population of households. Such data is not available for the United States. However, Holm, Paul, and Tischbirek (2021) construct measures of household consumption using Norwegian tax data on the incomes and assets of households. The key insight behind this approach is that household-level consumption can be imputed reasonably well by using the assets held by a household at the start of the year, adding the income received during that year, and then subtracting the assets held at the end of the year. A further key benefit of the Norwegian data is its panel structure, allowing Holm et al. to measure the *change* in consumption at the household level following a change in monetary policy.

The results of Holm, Paul, and Tischbirek (2021) suggest that expansionary monetary policy has *U-shaped* effects on consumption across the wealth distribution, with asset-poor and asset-rich households increasing their consumption somewhat more than households in the middle. The authors find similar patterns for disposable income, reflecting strong responses of nonfinancial income at the bottom of the asset distribution and financial income at the top of the distribution. The largest changes in consumption and disposable income occur with a substantial delay after the change in policy. At these horizons, the least-wealthy and wealthiest groups increase consumption by 1.5 to 2 percentage points, while those in the middle increase consumption by about 1 percentage point. Overall, we view the Holm, Paul, and Tischbirek (2021) study as particularly informative given its use of high-quality panel data. However, caution should be used in applying the Norwegian results in a US context; for example, Norwegian mortgages usually have adjustable interest rates, and Norwegian households have relatively few direct holdings of stocks.

### **Assessing Consumption Effects through Indirect Measurement**

An indirect approach offers an alternative to direct measurement: by using a combination of theory and empirical evidence, one can aggregate the various individual channels of monetary transmission discussed earlier into a total effect on household consumption.<sup>5</sup> On the whole, taking into account all channels, we will argue that the consumption changes from a monetary easing appear relatively evenly distributed in the cross-section of households.

*Ingredients.* Table 1 presents the ingredients that we use for our indirect calculation of household consumption responses to a monetary easing. The table lists a variety of “prices” to which households are exposed—that is, the transmission channels discussed earlier and how sensitive those prices are to changes in monetary

<sup>5</sup> Auclert (2019) is an important and well-known example of the indirect approach to assessing the distributional effects of monetary policy. Slacalek, Tristani, and Violante (2020) focus on European data and pursue an approach closely related to the one we present here.

Table 1

### Inputs for Calculation of Consumption Effects of Monetary Policy

	Price change	Marginal prop. to consume	
		Unconstrained	Constrained
Labor earnings	1.3%	0.05	0.5
Business income	1.0%	0.05	0.5
Interest income	−1.5%	0.05	0.5
Return on stocks	4.8%	0.03	0.03
Return on housing	0.6%	0.03	0.03
Return on cash	−0.56%	0.05	0.5
Mortgage rates	−0.65%	0.8	1.0
Other interest rates	−0.88%	0.8	1.0

*Source:* See online Appendix for details.

*Note:* Each row of the table corresponds to a channel of monetary policy effects on household consumption. The table lists how strongly the price or income associated with that channel responds to monetary policy and how strongly households spend out of that income category. The constrained column applies to households with liquid assets less than two weeks' worth of income. Changes in incomes, assets, returns, and interest rates are in real terms.

policy. To construct the values in the second column, we estimate how those various prices respond to a plausibly exogenous change in interest rates induced by monetary policy (with details on identification and estimation presented in Appendix A). All estimates are in real terms and have been scaled to correspond to a monetary stimulus that leads real GDP to increase by 1 percent on average over the first two years following the change in policy. The first row shows that labor earnings respond slightly more than GDP, while the second row reveals that business income moves about one-for-one with GDP. Further down the table, we see that stock prices are very sensitive to monetary policy, increasing by about five times more than GDP. Lower real interest rates—including in particular lower mortgage rates—reflect both lower nominal rates as well as an increase in the price level.

The third and fourth columns of the table list an assumed marginal propensity to consume for each type of income—that is, the strength of the consumption change following a change in income, for each income category. For example, a value of 0.05 means that a \$1 increase in income would lead to an increase of \$0.05 in consumption. It is important to note that a household's marginal propensity to consume is likely to depend on its (financial) circumstances; for example, economic theory suggests that a household that is financially constrained may spend strongly out of any additional income, while households with access to savings or credit are more likely to save additional income or use it to pay down debt. To capture these effects in a transparent way, we assume that households with few liquid assets are financially constrained and have a high marginal propensity to consume out of transitory changes in income; high liquid-wealth, unconstrained households, on the other hand, will have lower marginal propensities to consume. The third and fourth

columns of the table reflect this split—one for financially constrained households and one for unconstrained households. We assume that all households have high marginal propensities to consume with respect to changes in debt service payments (based on the discussion in Di Maggio et al. 2017) but a low marginal propensity to consume with respect to house and stock price appreciation (as discussed above).

*Towards total consumption responses.* By combining the ingredients in Table 1 we can construct our indirect estimates of cross-sectional consumption responses to monetary policy changes. We proceed as follows. For each household in our Survey of Consumer Finance dataset, we first classify them as financially constrained or unconstrained depending on their ratio of liquid assets to income, as already discussed above for Figure 1. Based on this classification we assign them the corresponding marginal propensities to consume reported in Table 1. Then, for each channel of policy transmission corresponding to a row in the table, we calculate their exposure to that channel. For example, a household's exposure to the stock market depends on the size of their stock holdings, while their exposure to mortgage rates depends on their current mortgage balance, and so on.<sup>6</sup> For labor income, we assume that low-income households are disproportionately exposed to the labor market, consistent with the findings in Guvenen et al. (2017). For each channel, we then compute a household's change in consumption as their exposure times the estimated price change (as listed in the table) times the assumed marginal propensity to consume. Summing across the different transmission channels, we arrive at a total effect on the household's consumption. We report the results in terms of a *percentage* change in consumption.<sup>7</sup>

Our calculation gives us an estimate of how each household in the Survey of Consumer Finances would change its consumption following a hypothetical monetary stimulus. We then summarize the distribution of these consumption changes in Figure 3. The figure shows the consumption effects across different quintiles of net worth (left panel), income (top right), and age (bottom right).

The left panel shows an average consumption change of 0.8 percent among low-wealth households and an average consumption change of 1.2 percent for wealthy households. The shaded areas in this left panel decompose the total consumption effect, revealing that labor income and nonmortgage debt drive the consumption response for low-wealth households, wages and mortgages are the main factors in the middle of the wealth distribution, and stock market gains are increasingly important at high wealth levels.

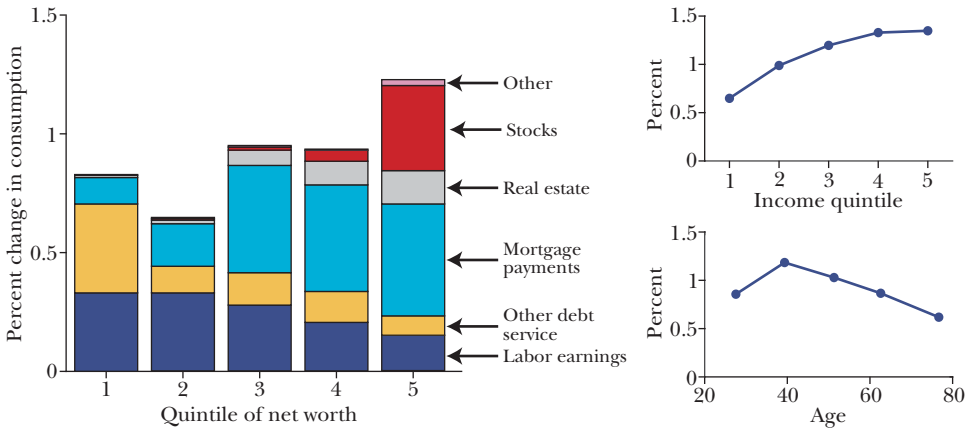
The top-right panel of Figure 3 instead shows the total consumption effect across income levels for working-age households. The average consumption responses within the top four quintiles are all between 1.0 and 1.3 percent, while

<sup>6</sup>To account for fixed-rate contracts and gradual refinancing we scale the change in mortgage rates and other interest rates by a factor of one half.

<sup>7</sup>To compute a percentage change, we need a baseline level of consumption. As the Survey of Consumer Finances does not report consumption, we impute it using the relationship between consumption and income in the Panel Study of Income Dynamics (Institute for Social Research 2019).

Figure 3

### Indirect Calculation of Consumption Change across Quintiles of Net Worth, Income, and Age



Source: See online Appendix A for details on construction of sample and results.

Note: Sample restricted to households with net worth less than \$2.5 million.

the lowest income quintile response is lower at 0.6 percent. Mechanically, a partial explanation for the insensitivity of consumption among the low-income group is that a substantial part (32 percent on average) of the income in this group is derived from social insurance and other transfers, which our analysis assumes is insensitive to monetary policy. Another potential explanation is that our analysis may actually understate the response of labor earnings in this group. Among households in the lowest income quintile, 34 percent had zero labor income during 2018, which was the reference year for the survey data we use. As our analysis “scales up” the existing income categories, the households that start with zero labor income will by construction not gain any labor income in our calculation; in practice, however, it may well be possible that these households would in fact enter employment in an expanding economy.

Finally, the bottom-right panel of Figure 3 shows the total consumption effect across age. Consistent with the logic discussed earlier (which suggested that young homeowners benefit substantially), we here find that the consumption effect peaks in early middle age and declines thereafter. Another factor driving the relatively small consumption response for old households is that a substantial part of their income comes from Social Security payments, which we assume are unaffected by monetary policy.

Overall, Figure 3 suggests two main takeaways on the cross-sectional incidence of monetary policy on household consumption. On the one hand, the incidence of the *individual channels* of monetary policy transmission to households is quite uneven. For example, mortgage payments and stocks have much stronger effects

at the top of the wealth distribution, while other debt services and labor income have stronger effects at the lower end. On the other hand, once aggregated across all channels, the *overall* consumption changes are much more evenly distributed. In particular, across the various cuts of the data, *all* groups materially increase their consumption. While there are some differences across groups, we view them overall as relatively modest. In particular, after a monetary stimulus that raises total GDP by 1 percent, even the least affected groups increase their consumption by a still material 0.6 percent (versus 1.3 percent for the most affected).

*A more structural approach.* While the indirect calculation above is attractive for its simplicity, it does require a large number of strong, reduced-form assumptions about household marginal propensities to consume. A more structural alternative is to use a model of household consumption decisions to infer how household consumption responds to the changes in income and prices induced by monetary policy. We do exactly that in McKay and Wolf (2022), using a general-equilibrium model in which households own a variety of long-duration assets and are unequally exposed to changes in labor earnings, in line with our earlier discussion of transmission channels. In that analysis, we also find that monetary stimulus leads to a quite evenly distributed increase in consumption across the population of households. Figure 4 summarizes our results, showing the consumption responses to monetary stimulus by net worth quintiles. The key takeaway is that, across all levels of wealth, consumption responds by nearly the same percentage amount. In this case, expansionary monetary policy roughly scales up everyone's consumption by the same amount as the aggregate, leaving each household's *share* of total consumption approximately unchanged.

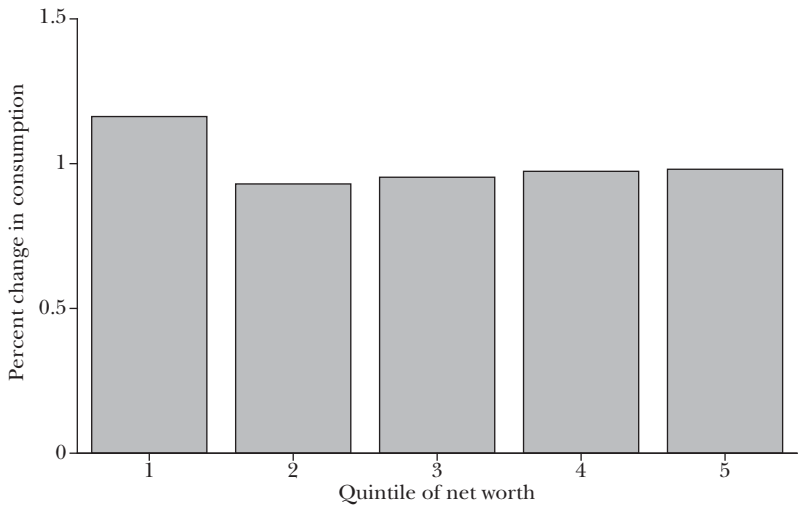
## **Inequality and the Aggregate Effects of Monetary Policy**

Traditionally, the transmission of monetary policy to the macroeconomy has been analyzed in models populated by a representative household that chooses aggregate consumption, savings, and labor supply (for textbook treatments see Woodford 2003; Galí 2015). Recent research has pursued a different approach that explicitly incorporates household heterogeneity. This research agenda starts from microeconomic modeling of the choices of individual, heterogeneous households. We then arrive at predictions for aggregate variables by summing up across these heterogeneous households. This bottom-up, heterogeneous-agent approach can account for many of the distributional channels that we discussed in the previous section.

*A new view on the channels of policy transmission.* The heterogeneous-agent approach, with its emphasis on consumption-savings decisions at the household level, has changed our understanding of the *decomposition* of monetary policy effects into different underlying channels of transmission. Two margins of the transmission mechanism have received particular attention: the role of mortgage refinancing and the consumption response to changes in income.

Figure 4

**Consumption Response to Monetary Stimulus at Different Levels of Net Worth from a General Equilibrium Model**



Source: McKay and Wolf (2022).

Note: The figure shows results from a simulation of a monetary expansion that increases aggregate consumption by 1 percentage point.

As we have described above, expansionary monetary policy is typically associated with a decline in mortgage interest rates. Importantly, in the United States, homeowners often have the option to refinance their fixed-rate mortgages to take advantage of lower rates on new mortgages. As households refinance their mortgages to lower interest rates, their disposable income increases, allowing them to consume more. Propagation through such mortgage refinancing—rather than intertemporal substitution, as emphasized in traditional macroeconomic models—thus emerges as one of the most important direct transmission channels of monetary policy to consumer spending (Beraja et al. 2019).

In general equilibrium, the extra demand induced by monetary policy then translates to tighter labor markets, decreasing the unemployment rate and increasing labor incomes. Empirical evidence on the consumption response to changes in income shows that households spend quite strongly out of such temporary income gains (Johnson, Parker, and Souleles 2006). Many of the new heterogeneous-agent models of monetary policy transmission are designed to match these empirically estimated strong spending responses to changes in income. This leads to an important *indirect* channel of policy transmission: expansionary policy raises incomes and then households spend strongly out of that income, reinforcing the initial increase in demand. These indirect effects can be particularly strong due to a Keynesian multiplier logic: income increases spending, which then further increases household income, and so on (Kaplan, Moll, and Violante 2018; Auclert, Rognlie, and



Straub 2018; Bilbiie 2020; Patterson 2022). Important empirical support for these model predictions was provided in Holm, Paul, and Tischbirek (2021).

*Reassessing the aggregate effects of monetary policy.* The heterogeneous-agent view has changed our understanding of the precise channels through which monetary policy operates. Does this translate to a change in thinking about how monetary policy affects the macroeconomy as a whole? The answer is somewhat nuanced.

At a broad level, we would argue that our understanding of the effects of monetary policy on macro outcomes has not changed very much. Economists already have good *empirical* evidence on the average effects of monetary policy on macroeconomic outcomes (Ramey 2016). Any structural model of monetary policy transmission needs to be consistent with this evidence on the total effect, and so at best microeconomic heterogeneity will affect our understanding of the decomposition of this total effect into different channels. However, as we refine our understanding of the channels through which monetary policy operates, we may then also change our perspective on why policy may be more or less powerful at a given point in time depending on the state of the economy—a phenomenon known as “state dependence” in the effectiveness of policy. Such state dependence is difficult to identify from purely empirical analysis of time series data because it requires the researcher to estimate the effects of policy in different states of the economy (as opposed to just estimating some average effect). Structural modeling—and in particular modeling that carefully accounts for microeconomic channels of transmission—is thus the most promising avenue to learn about such state dependence.

*The role of mortgage refinancing.* One likely reason for state dependence in the aggregate effects of monetary policy is related to household mortgage refinancing (Berger et al. 2021; Eichenbaum, Rebelo, and Wong 2022). The incentives for households to refinance their mortgages depend on the difference between the mortgage rate offered on a new loan and their existing interest rates. If households currently have high interest rates on their mortgages, then they will be likely to refinance soon anyway, and thus any additional changes in mortgage rates due to monetary policy will flow through strongly to the rates households actually pay. On the other hand, if households are already paying low interest rates, they will be less likely to refinance, and so any marginal rate change related to monetary policy will have a smaller impact on the rates households are actually paying.

Beraja et al. (2019) analyze another related reason for why the strength of the mortgage refinancing channel is likely to vary over time. In order to refinance a mortgage, the homeowner must be approved for a new loan. Importantly, obtaining a new loan can be more or less difficult depending on a number of factors that are likely to vary over time. For example, some lenders require that the new loan is for no more than 80 percent of the home’s value. In the aftermath of the Great Recession, declines in home prices left many homeowners unable to meet this requirement. These homeowners found it difficult to refinance their mortgages and were unable to take advantage of the low interest rates offered on new mortgages. In the aggregate, at times when many households are in this situation, the mortgage channel of monetary policy transmission will be muted.



*Spending on durables.* Time variation in household demand for durable goods is another reason for why the sensitivity of the economy to monetary policy may change over time (Berger and Vavra 2015; Tenreyro and Thwaites 2016). To make this more concrete, consider a household that is contemplating the purchase of a new car. For such a household, a change in interest rates could make the difference between buying the car and not buying the car. It follows that monetary policy is likely to have large effects when many households are contemplating such purchases, as usually happens in times of economic expansion. Conversely, in a downturn, few households are contemplating any big purchases, and so monetary policy transmission may be weakened.

*Intertemporal shifting of demand.* Finally, in addition to raising the possibility that the power of monetary policy varies over time, the recent heterogeneous-household research agenda has also raised questions about the medium-term effects of policy. We typically think that monetary stimulus raises demand in the short run. But what about at longer horizons? Mian, Straub, and Sufi (2021) as well as McKay and Wieland (2021) highlight forces whereby monetary stimulus raises demand in the near term but depresses it at longer horizons. The logic of these arguments is that monetary stimulus raises demand today, but changes household balance sheets in ways that leave them less willing to spend in the future. This outcome could occur because households take on additional debt (Mian, Straub, and Sufi 2021) or because they purchase durable goods (McKay and Wieland 2021). These studies predict that changes in interest rates will tend to be persistent, because stimulus today requires continued stimulus in the future to offset the endogenous reduction in future demand.

*Taking stock.* Our overall conclusion is that recent research emphasizing microeconomic household heterogeneity has led to an evolution—rather than a revolution—in our understanding of the aggregate effects of monetary policy. Compared to prior work, this research places emphasis on a different set of channels shaping the aggregate effects of policy changes. While these channels introduce some novel sources of state dependence and intertemporal shifting of demand, the existing empirical evidence on the aggregate short-run effects of monetary policy remains an important touchstone for both representative-agent as well as heterogeneous-agent models.

## Optimal Monetary Policy with Household Inequality

So far, we have discussed the interaction between monetary policy and inequality on purely positive grounds, asking whether (1) monetary policy affects the evolution of inequality and (2) inequality affects the propagation of monetary policy. We now turn to a normative question, asking how inequality may change our view of *optimal* monetary policy.

In the long run, real economic outcomes—including inequality across households—are largely outside the control of monetary policy. For optimal monetary

policy, inflation stabilization remains the only long-run consideration. Here, we will focus instead on how monetary policy should respond to fluctuations in the economy in the short run. We will start by considering a central bank with a narrow mandate, seeking only to stabilize macroeconomic aggregates. We then consider how a central bank with a broader mandate that includes distributional concerns would act differently. Much of the intuitive discussion in this section is based on our formal analysis in McKay and Wolf (2022).

### A Narrow Mandate

Traditionally, central banks have pursued the dual objectives of stabilizing (1) inflation as well as (2) real aggregate activity measures (such as employment or GDP). Will household inequality affect the behavior of a central bank with these targets?

*Policy problem.* Figure 5 illustrates the policy problem faced by a central bank with a mandate to stabilize inflation and aggregate output. The top panel begins by showing policymaker preferences (in orange) and constraints (in blue). The figure features output on the horizontal axis and inflation on the vertical axis, with the output-inflation pair marked as  $(y^*, \pi^*)$  as the policymaker's desired outcome. The orange curve then shows an indifference curve corresponding to policymaker preferences, with better outcomes closer to the target.<sup>8</sup> The blue line is the constraint set—the set of inflation-output pairs that the policymaker can in principle implement. The line corresponds to an aggregate supply curve, with its upward slope reflecting the usual logic that higher utilization of the economy's resources leads to upward pressure on costs and thus prices. Intuitively, if the economy is going to produce more output, then workers will have to be incentivized to work longer hours and wages and prices will increase. The bottom panel of the figure on the other hand represents the aggregate demand block of the economy: to achieve a given amount of real activity (output, again on the horizontal axis), real interest rates (nominal rates less inflation, shown on the vertical axis) need to be set at a certain level. The line is downward-sloping, reflecting the idea that higher interest rates depress aggregate demand, as discussed earlier.

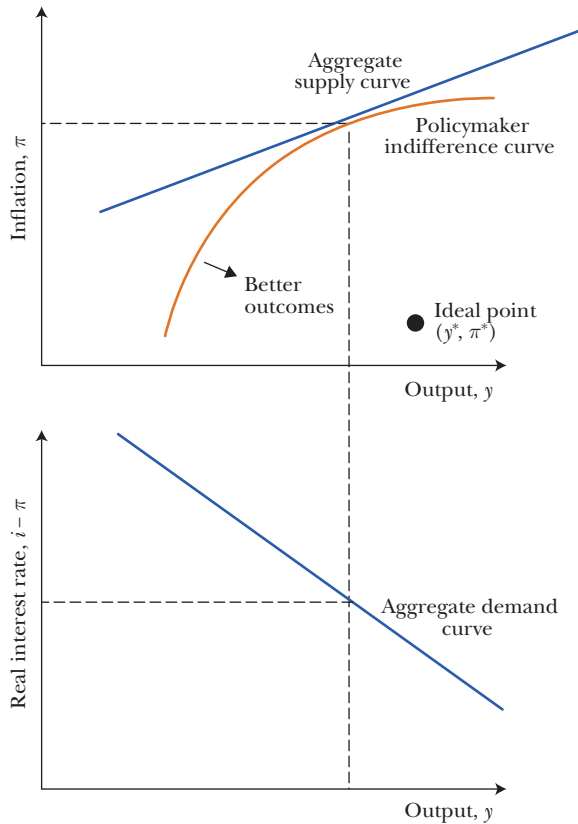
The policy problem is to choose the nominal interest rate so as to minimize the deviations of output and inflation from their target values. As the policymaker changes the nominal interest rate, the real interest rate changes too, moving the economy along the aggregate demand curve (bottom panel) to determine the level of output. Moving to the upper panel, the aggregate supply curve determines the associated level of inflation. The solution to this optimal policy problem is

<sup>8</sup>Central bank preferences are often described by a loss function that captures the idea that the central bank dislikes it when economic outcomes differ from the targeted outcomes. For example, the indifference curve we are plotting corresponds to the loss function

$$(y - y^*)^2 + (\pi - \pi^*)^2,$$

where  $y$  is output,  $\pi$  is inflation, and the starred variables are the targets for output and inflation. Unlike consumer theory where we maximize utility, here we want to minimize the loss function.

Figure 5  
Optimal Monetary Policy with a Narrow Mandate



straightforward: the monetary policymaker focuses on the upper panel of the figure and simply chooses the best feasible output-inflation pair. Visually, the optimal pair is given by the point of tangency with the indifference curve. The policymaker then uses the aggregate demand curve to determine which nominal interest rate to set in order to arrive at the desired level of output. The solution is shown by the dashed lines.

*The role of inequality.* How might household inequality affect this policy problem? Remember that we are assuming (for the moment) that inequality is not a target of the central bank, which implies that the policymaker indifference curve is not affected by inequality. Through the lens of the simple framework shown in Figure 5, most of the research on the connection between monetary policy and inequality discussed in the previous sections may be interpreted as studying ways in which household inequality could change the economy’s aggregate demand relationship—that is, the mapping from interest rates to aggregate demand shown in the lower panel. However, the framing of the problem in the figure shows that

changes in the demand block alone will not affect the optimal output and inflation outcomes, simply because the optimal policy choice is already fully pinned down by policymaker preferences and the supply side of the economy. It follows that changes in aggregate demand due to inequality will not affect the optimal inflation and output levels, though they may affect the nominal interest rate required to implement this optimal output-inflation allocation.

How big are those effects on optimal interest rates likely to be? Graphically, for a given output-inflation outcome, the optimal interest rate is determined by the *slope* and *intercept* of the economy's aggregate demand relationship. The slope of the curve reflects the sensitivity of aggregate demand to changes in real interest rates. As we discussed in the previous section, the heterogeneous-agent view of monetary policy transmission has not materially changed our broad understanding of this sensitivity. The intercept of the line, on the other hand, reflects forces that determine aggregate demand at any given interest rate, with changes in this intercept reflecting so-called "aggregate demand shocks." Many plausible examples of such shocks are explicitly distributional in nature. For example, a tightening of credit conditions could require borrower households to reduce their debt levels, thus leading to a reduction in their spending and thus aggregate demand (for example, Guerrieri and Lorenzoni 2017). Alternatively, fiscal transfer payments to financially constrained households could lead to an increase in total consumer spending (for example, Wolf 2021). The theory sketched here suggests that such shifts in aggregate demand would lead to an equilibrium adjustment in interest rates while leaving optimal inflation and output outcomes unchanged.

### **A Broad Distributional Mandate for Monetary Policy**

We now consider a central bank that explicitly incorporates distributional concerns as one of its policy goals, presumably along with its traditional output and inflation goals.<sup>9</sup> Long-run trends in inequality of course primarily reflect economic forces unrelated to monetary policy and the business cycle at large. However, short-run business-cycle fluctuations may well have material (short-term) effects on inequality, simply because aggregate shocks need not affect everyone in the same way. If a central bank's mandate includes distributional outcomes, then it will try to set its policy in a way that redistributes towards the hardest-hit households, essentially providing some insurance to those most exposed to aggregate shocks.

*The role of insurance.* In an ideal world, households would be able to buy insurance against all types of adverse events—including aggregate cyclical fluctuations—in private markets. For example, a worker could buy an insurance policy against the risk of unemployment. With such perfect insurance markets, standard macroeconomic models would predict that the consumption of all households

<sup>9</sup>Studies of optimal monetary policy that incorporate distributional effects include Bhandari et al. (2021), Acharya, Challe (2020), Le Grand, Martin-Baillon, and Ragot (2021), Dávila and Schaab (2022), and McKay and Wolf (2022). In the latter study, we develop the views we describe in this section more formally.

would move up and down in proportion to aggregate consumption. Due to issues of moral hazard and adverse selection, however, many such insurance markets do not exist. With imperfect insurance markets, the economy will move away from this efficient pattern of risk sharing. Thus, following an aggregate shock, some households may be more severely affected than others and therefore reduce their consumption by more than the rest.

The social insurance benefit of filling in for these missing markets is widely recognized in other areas of public policy, including discussions of unemployment insurance systems, tax policy, and social safety net programs. Similar underlying concerns may thus also guide optimal monetary policymaking: interest rates may be set in a way to both move aggregate consumption to the desired overall level *and* to smooth out consumption changes across households, essentially moving the cross-sectional consumption distribution closer to the desired efficient pattern of risk sharing.

*Can monetary policy provide insurance?* The evidence that we reviewed above is informative about the extent to which monetary policy can provide insurance and thus achieve such distributional objectives. Our main conclusion from that discussion was that monetary policy has rather evenly distributed effects across different groups of households—that is, expansionary monetary policy scales up the consumption of different households by similar proportions. To make the argument particularly stark, suppose for a moment that monetary policy was exactly distributionally neutral in the sense of scaling everyone’s consumption up and down in perfect unison. In that case, monetary policy interventions would not bring us any closer to the efficient risk-sharing outcome, and so social insurance would not be a consideration for optimal monetary policy. Intuitively, even if a monetary policymaker would like to lean against inequality, monetary policy is not well-suited to do so, and so the monetary policymaker will act *as if* it had only a narrow mandate.

The actual situation is of course not as extreme as this—the effects of policy on consumption are not exactly equal in percentage terms—so there is some scope for monetary policy to alter the distribution of consumption. However, given the modest extent of these distributional effects, large changes in monetary policy would be needed to have a substantial effect on the consumption distribution. Such large changes would likely be costly in terms of other policy goals (notably aggregate output and inflation stabilization). As a result, a central bank that targets both conventional aggregate outcomes as well as distributional outcomes is unlikely to deviate too much from the policies pursued by a central bank with a narrow mandate that just targets aggregate outcomes.

## Conclusion

In this paper, we have taken stock of the recent research agenda that studies the connections between monetary policy and inequality, with three main conclusions. First, our reading of the empirical evidence suggests that monetary policy has

a relatively uniform incidence across households. Second, accounting for micro heterogeneity across households changes our understanding of the transmission channels for monetary policy. It has not, however, changed our understanding of the broad patterns of how monetary policy affects the macroeconomy. Third, our first two observations taken together somewhat limit the scope to which household inequality is likely to affect optimal monetary policy design, even if the central bank has a broad mandate that includes distributional considerations.

However, we emphasize that these broad conclusions come with important qualifiers, which we view as topics for future research. First, in keeping with the recent academic literature on inequality and monetary policy, our analysis throughout this article focused on how heterogeneity interacts with the demand side of the economy. Changes to the supply side would affect optimal outcomes even for a central bank with a conventional narrow mandate. Second, our discussion has omitted the heterogeneity in consumption baskets across households. There is, however, evidence that low-income groups and racial minorities consume goods with more volatile prices (for example, Cravino, Lan, and Levchenko 2020; Lee, Macaluso, and Schwartzman 2021), thus adding a further possible layer to the distributional effects of monetary policy. Finally, our conclusions on the distributional effects of monetary policy remain tentative, relying either on noisy consumption measures or assumptions on household consumption-savings decisions. More empirical work on these topics would be very welcome.

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