



GAUGING THE IMPACT OF THE FED ON INEQUALITY DURING THE GREAT RECESSION

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SUMMARY

Criticism that the Federal Reserve's very low interest rates and large-scale asset purchases (LSAPs), commonly known as quantitative easing, increased inequality by driving up the price of stocks and other assets is misplaced. To the extent that the Fed pushed the economy closer to full employment, it reduced inequality. Critics of the Fed ignore the crucial "compared to what" question. Bivens compares the distributional consequences of Fed policy to two counterfactuals: (1) a fiscal stimulus that with roughly the same boost to output as low interest rates and LSAPs produced and (2) no macroeconomic stimulus at all.

Monetary Stimulus versus Equivalent Fiscal Stimulus

A 2010 fiscal deal—which included a two-year payroll tax cut, an extension of the emergency unemployment compensation, and accelerated depreciation—produced roughly the same positive effect on output and employment as all the Fed's LSAPs. Comparing the distributional effects of these similar-sized policies, the relative impact on inequality of monetary policy seems quite small; it's not even clear if it is slightly progressive or slightly regressive.

The reason: Housing is a much larger share of assets for the middle-class than it is for wealthier households as the accompanying table shows. Wealthier households hold a disproportionate share of stocks and bonds. Houses, stocks and bonds all benefitted from the Fed's LSAPs. Stock price increases disproportionately benefit the top 1%; house price increases, the bottom 90%. Drawing from the other research, Bivens estimates home prices were boosted by 7 percent due to LSAPs, stock prices by 5% and bond prices between 9% and 14%. Boosting house prices reduces inequality because home equity represents such a large share of middle-class wealth; boosting stock prices increases inequality. These effects are largely offsetting. Moreover, the effects of LSAPs on asset prices are likely to dissipate over time when credit is tightened.

Monetary Stimulus versus No Stimulus

But Fed officials in 2007 had little influence over fiscal stimulus; they had to decide what monetary policy to pursue given what Bivens considers to be inadequate fiscal stimulus. As bad and unequal as wage growth was since the onset of the Great Recession, it would have been even slower and less equal had the Fed not pursued its easy money policies. In short, compared to a counterfactual of no change in fiscal policy in response to a recession, monetary stimulus reduces inequality significantly. If the Fed were to tighten credit before the economy reaches full employment, Bivens argues, this would hurt low- and moderate-wage workers and increase inequality. In addition, the unconventional monetary policies of recent years, including LSAPs, don't have a substantially different effect on inequality than changes in short-term interest rates.

INTRODUCTION

The Federal Reserve exhausted its conventional macroeconomic stabilization tool—lowering short-term interest rates—in December 2008, when it lowered overnight interest rates to essentially zero. Because the U.S. economy remained in a deep recession even after this tool was exhausted, the Fed turned to less conventional tools, with large-scale asset purchases (LSAP, popularly known as “quantitative easing”) being the most well-known and controversial. These purchases, undertaken in three rounds (QE1, QE2, and QE3, popularly) have increased the value of the Fed’s balance sheet from just under \$1 trillion in 2007 to well over \$4 trillion by the end of 2014.

While most of the debate over the desirability of large-scale asset purchases has focused on their effectiveness in spurring growth and boosting inflation expectations, some observers have raised concerns about the effects of LSAP on income inequality. For example, William D. Cohan, writing in *The New York Times’ Dealbook*, asserted that the recent Fed policies have “compounded the problem” of inequality.¹ Mitt Romney identified quantitative easing as the leading cause of the recent increases in income inequality.² Even some Fed insiders have made the argument. Former Fed Governor Kevin Warsh has called Fed policies a “reverse Robin Hood,” making the well-to-do even more well-to-do.³ These concerns have been taken seriously enough to spur some preliminary research from sources like the Bank of England and the McKinsey Global Institute (MGI). However, many of these investigations have suffered from a failure to articulate clear benchmarks against which to gauge the distributional consequences of LSAP.

This paper examines the distributional consequences of the Fed’s LSAPs in recent years, and aims to provide clear benchmarks against which to judge them, with a particular focus on comparing monetary stimulus to fiscal stimulus. The key findings are as follows:

- Monetary stimulus does not necessarily increase inequality, even when ignoring its effects on output stabilization. Instead, monetary stimulus (including LSAPs) has cross-cutting effects. For example, if home values (one type of asset price) are boosted more by LSAPs than equity prices, this actually has a progressive impact on the wealth distribution.
- Aside from an effect on output stabilization, the inequality implications of fiscal stimulus are nearly impossible to generalize. Some discretionary fiscal stimulus programs have been quite progressive (cutting taxes and boosting transfers to the bottom half of the income distribution), while others have been quite regressive (cutting income taxes across the board). In fact, the two methods used by the Congressional Budget Office (CBO) to assess the distributional effect of government consumption and investments yield starkly different outcomes. One approach (allocating spending proportional to population) is progressive, while another (allocating spending proportional to household income) is not.

¹ Link: http://dealbook.nytimes.com/2014/10/22/how-quantitative-easing-contributed-to-the-nations-inequality-problem/?_r=1

² Link: <https://www.youtube.com/watch?v=gAoTEDlxznc>

³ Link: <http://video.cnbc.com/gallery/?video=3000287822>

- Indirect impacts of fiscal and monetary stimulus, aside from output stabilization, are likely to have very minor impacts on inequality. For example, the rise in employment in interest-sensitive industries following a monetary stimulus may push employment into generally higher-wage sectors (especially after accounting for the labor force characteristics) but will generally not be large enough to significantly affect the earnings distribution.
- The output stabilization effects of both fiscal and monetary stimulus have large and progressive effects on income distribution. Stimulus that reduces unemployment disproportionately benefits low and moderate-wage workers and leads to a compression of earnings.
- The post-2008 stance of monetary policy has significantly favored reduction in inequality relative to a baseline of less expansionary policy. However, with pressure building to begin unwinding the last major component of monetary stimulus—the near-zero short-term policy rates that have prevailed since the end of 2008—this could change in coming years. Ample historical evidence suggests that *ex ante* estimates of the natural rate of unemployment are often too high, and inequality (particularly inequality of labor earnings) can be strongly reduced at only minimal risk of sparking undesired rates of inflation if the Fed allows a genuinely high-pressure labor market to develop.

QUICK BACKGROUND ON UNCONVENTIONAL MONETARY POLICY SINCE 2008

During the Great Recession, the Fed expanded its balance sheet (roughly doubling it) to provide direct lending via emergency facilities in order to restore financial market functioning following the banking crisis in fall 2008. This direct lending roughly doubled the size of the Fed's overall balance sheet (raising it from just below \$1 trillion to roughly \$2 trillion). By the spring of 2009, this direct lending through the emergency lending facilities had substantially declined. Without further action, the size of the Fed's balance sheet (and hence the liquidity being provided to the U.S. economy) would have shrunk back down to pre-recession levels.

Largely driven by the desire to keep providing monetary support to a still-contracting economy, the first round of LSAPs (known popularly as QE1) began when the Fed announced in March 2009 that it would commit to purchasing \$300 billion in Treasury securities, \$200 billion in agency debt, and \$1.25 trillion in mortgage-backed securities.⁴ The purchases were completed by the spring of 2010. This raised the question of what to do about maturing assets; if the Fed did not replace them as they matured, the balance sheet would decline by \$100 to \$200 billion annually. To forestall this, the Fed announced in August 2010 that it would purchase Treasury securities to replace the maturing securities to keep the size of its balance sheet stable.

It's important to remember the economic context behind the decision to engage in LSAP. Prior to the first round in March 2009, the previous six months had seen the U.S. economy lose a staggering 4.2 million jobs, despite the fact that the Fed had begun cutting conventional short-term interest rates in August 2007, had reached zero on these rates by December 2008, and had already instituted unprecedented levels of

⁴ In November 2009 it announced it would only purchase \$175 billion in agency debt because of limited availability.

direct lending to financial institutions to alleviate financial market distress. The job loss persisted despite the fact that in May President George W. Bush signed into law the Economic Stimulus Act of 2008 (which Congress had already passed) to provide \$160 billion in fiscal stimulus.

The second round of LSAPs (QE2) began in November 2010 with an announcement that the Fed would purchase an additional \$600 billion in Treasury securities (at a pace of roughly \$75 billion per month) by June 2011. It further committed to continuing to replace maturing securities with Treasury purchases. While the official end of the Great Recession had occurred in June 2009, more than a year before, the U.S. unemployment rate in November 2010 was higher than at the recession's trough (9.8 versus 9.5 percent). Employment had fallen by nearly 300,000 since the recession's trough and contracted in four of the five months before November 2010. In retrospect, a consistent round of job growth (which of course could be in part endogenous to the introduction of QEII) actually began in October 2010, but in real-time the recovery seemed to be stubbornly stalled.

The final round of LSAPs (QE3) began with an announcement in September 2012 that the Fed would purchase \$40 billion in market-backed securities (MBS) per month. This announcement had no end date and no ceiling on the total amount that would be purchased. In December of 2012, the Fed then announced that it would also begin purchasing \$45 billion in Treasury securities (in addition to the MBS purchases).⁵ In December 2013, the Fed announced that it would begin reducing the size of monthly purchases, and in February the pace of total purchases declined from \$85 billion to \$65 billion. The purchases ended in October 2014, with the Fed's balance sheet at roughly \$4.5 trillion. When QE3 was announced, the unemployment rate stood at 7.8 percent after having declined a full percentage point in the previous year.

Yet there were reasons to think this progress could slow. For one, about a third of the change in unemployment between November 2010 (the beginning of QE2) and September 2012 (QE3) was due to falling participation rather than employment growth. Further, the "fiscal cliff" was clearly on the horizon. In January 2013 a number of fiscal stimulus measures were set to expire, and the long-scheduled expiration of tax cuts passed in 2001 and 2003 was set to occur. If all the different elements of the fiscal cliff had come to pass, there would have been a very large increase in fiscal drag in 2013, and the first half of that year would likely have seen negative output growth. It seems hard to believe that this worry was not a significant part of the Fed's decision making regarding QE3.

DID LSAPS LEAD TO INCREASED INEQUALITY?

The rise of income inequality in the United States during the past few decades has garnered interest and concern in recent years. This concern is completely understandable. The scale of income concentration has become so large that it has significantly impacted the trajectory of income growth for the vast majority of American households. Table 1 below shows the share of average household income growth that can be accounted for by the top 10 and top 1 percent of households over various time periods.

⁵ These purchases were largely to offset the end of the Maturity Extension Program (MEP), a program started in September 2011 that swapped long-term for short-term Treasuries on the Fed's balance sheet. Because this move had no effect on the overall size of the Fed's balance sheet or the size of the monetary base, it is not included in the discussion here of LSAPs.

Between 1979 and 2007, for example, the top 1 percent accounted for 59.8 percent of the average growth in cash and market-based income, and 36.3 percent of growth in comprehensive income (income that includes transfers and noncash income sources).

Table 1: Share of Average Income Growth Accounted for by Different Income Groupings

	Top 1	Top 5	Top 10	Bottom 90
<u>CBO comprehensive incomes</u>				
1979-2007	34.6%	49.8%	59.2%	40.8%
2007-2009	67.2%	82.0%	87.0%	13.0%
2009-2011	66.9%	80.8%	84.8%	15.2%
1979-2011	35.7%	59.0%	75.5%	24.5%
<u>Piketty-Saez cash, market-based incomes</u>				
1947-1979	7.8%	21.1%	34.1%	65.9%
1979-2007	59.8%	80.9%	91.4%	8.6%
2007-2009	49.0%	60.2%	65.1%	34.9%
2009-2011	135.6%	170.3%	171.5%	-71.5%
2009-2012	94.8%	112.5%	115.7%	-15.7%
1935-1980	7.1%	19.2%	30.3%	69.7%
1980-2012	74.6%	103.0%	116.6%	-16.6%

Author's analysis based on data from Piketty and Saez (1998, updated) and the Congressional Budget Office (CBO). The Piketty-Saez data only includes cash, market-based incomes, while the CBO data also included non-cash income and government transfer payments. 2007-2009 saw income losses across-the-board. So, the numbers reported here show the share of average income losses accounted for by each group.

In order to assess the overall desirability of LSAPs as economic policy, the potential of LSAPs to cause inequality needs to be addressed. Among other things, a counterfactual (or baseline) should be specified against which the LSAP can be judged.⁶ The rest of this paper will consider two such counterfactual baselines: (1) a fiscal stimulus that equals the output effects of any LSAP and (2) no macroeconomic stimulus at all.

The first counterfactual—a fiscal stimulus that equals the output effects of any LSAP—likely holds more interest for academics, for a couple of reasons. First, academics presumably take it for granted that the precise degree of economic stimulus is knowable and politically achievable, hence less of any one type of stimulus means policymakers will provide more of another type of stimulus. One can see this thinking clearly in a blog post by Rowe (2012), who writes:

⁶ For the purposes of this paper, unless otherwise separated, the term LSAP is used to mean the combination of extremely low short-term policy interest rates and the large-scale asset purchases undertaken by the Fed to lower longer-term rates. Given that such asset purchases only occur because short-term policy rates are at zero, it makes sense to use as shorthand.



Does monetary policy have (bad) distributional consequences? Some questions are bad questions. This is one of them. We can get a lot clearer and more useful answer if we change the change the question...Here's a better question: "If we used fiscal policy instead of monetary policy to remove a shortage of aggregate demand, would that switch from one policy to another have distributional consequences?"

This takes for granted that the specific output stabilization goal (to remove a shortage of aggregate demand) will be met regardless of the precise monetary/fiscal mix.

The second counterfactual—the absence of any additional offsetting macroeconomic stimuli—is one that is likely more interesting to policy-minded macroeconomists (like the author). Economic history since the onset of the Great Recession should have made clear that one should not take for granted in federal policy debates that less of one type of macroeconomic stimulus (such as a scaling back of LSAPs) will be met by a concomitant increase in another type of stimulus (a boost to fiscal measures, for example). Instead, recent history has shown that the most likely response from other policymakers to a change in monetary policy is no predictable response at all.

Given this unpredictability, the impacts on inequality of pushing the economy closer to full employment—which is not considered at all in the first counterfactual—must be considered. As we will see, the evidence indicates that this effect of lowering unemployment is by far the largest impact of monetary policy changes on inequality.

LSAPs AND INEQUALITY, COUNTERFACTUAL I: A MONETARY 2010 EQUIVALENT OF THE 2010 FISCAL DEAL?

This section examines the aspects of LSAPs that generate inequality relative to a baseline counterfactual of an equivalent fiscal stimulus. Again, this approach tends to remove from consideration the most interesting inequality impact of LSAPs: their role in pushing the economy closer to full employment. However, it is useful to explore this scenario because many who complain about the inequality-generating effects of LSAPs are likely to have the counterfactual in mind.⁷ In essence, the question this answers is whether or not the impact on inequality provides another compelling factor to consider when comparing the desirability of fiscal versus monetary stimulus as a method of macroeconomic stabilization.

FISCAL VERSUS MONETARY STIMULUS: OVERVIEW OF DIRECT DISTRIBUTIONAL CHANNELS

One direct impact on inequality of monetary stimulus is relatively straightforward: by increasing the demand for certain types of financial assets, monetary stimulus boosts their prices and lowers the interest rates associated with them. Proof in point, LSAPs have boosted the price of U.S. Treasuries and MBS directly. Because financial assets are (imperfect) substitutes, the LSAPs have also likely

⁷ Of course, some complaining about the inequality-generating effects of LSAPs may simply not accept that fact that the economy has had a shortfall of aggregate demand needing to be filled since the onset of the Great Recession.



boosted asset prices across the board. Those concerned with the inequality-generating aspects of LSAPs often highlight the large stock market increases since their implementation. There is some basis for this worry, given the extraordinary concentration of stock ownership: roughly 90 percent of all stock market wealth is held by only 10 percent of households.

The direct impact of fiscal policy on inequality is much less general. The first-round impacts of some forms of fiscal stimulus are keenly inequality reducing, such as refundable tax credits targeted to lower-income families or unemployment insurance extensions. Other types of fiscal stimulus—such as across-the-board cuts in individual income tax brackets or business tax cuts—could actually increase inequality. As a general rule of thumb, however, the most effective fiscal stimulus (meaning the greatest amount of output response per dollar increase in deficits) undertaken through tax and transfer changes is progressive in terms of income distribution. So, expanding means-tested transfers like food stamps and Medicaid provide greater macroeconomic stimulus than policies whose direct benefits disproportionately accrue to higher-income households like cutting rates for all income taxpayers. The reason why progressive tax and transfer policies make for more effective macroeconomic stimulus is straight-forward: low- and moderate-income households tend to have higher propensities to consume than higher income families; effective stimulus should therefore aim to boost incomes lower in the distribution curve.

Finally, the direct incidence of increases in government consumption and investment spending is far from straightforward. Given that theoretical models often identify increases in government purchases as the most effective form of stimulus, the distributional implications of such spending is important to know. The Congressional Budget Office (CBO) has provided two methods of allocating government consumption and investment spending across the household income distribution: (1) allocating it proportionately to population or (2) allocating it proportionately to household market income. The first method is clearly progressive—essentially constituting a lump-sum payment across the income distribution, with the sum being a larger share of household income for lower- and moderate-income households. The second method is regressive, as the distribution of market income is much less than the distribution of comprehensive income.⁸

In fact, subject to only very loose limits, fiscal stimulus can essentially have any distributional impact that policymakers want it to have. But evidence strongly suggests there is a correlation between how progressive fiscal policy is and how effective it is at stabilizing output and employment (see, for example, the assessment of fiscal multipliers provided by Zandi (2009)). For taxes and transfers, more progressive fiscal policy changes are nearly unambiguously more effective as a macroeconomic stimulus. And this same evidence strongly indicates that increases in government consumption and investment spending are highly effective as macroeconomic stimuli, but assessments of their progressivity depend strongly on how the incidence of these direct spending increases are estimated. And this assessment of the incidence of spending increases across income groups may differ strongly depending on the specific type of spending. Increases in investment in

⁸ See Congressional Budget Office (2014) for a discussion of their methodology in estimating the incidence of government spending.



public transit, for example, could be more progressive than spending on highways. And means-tested spending on school facilities could be more progressive than spending on defense-related equipment.

LSAPs AND THE 2010 FISCAL DEAL

To avoid the ambiguities of talking generically about the first-round distributional implications of fiscal policy, this section compares an actual fiscal policy measure to a monetary stimulus that yielded equivalent output gains. Given that the most famous fiscal policy measure passed in recent years was the American Recovery and Reinvestment Act (ARRA) of 2009, this would seem to be the most obvious case to use for comparison. But the estimated macroeconomic effects of ARRA are quite a bit larger than the estimated macroeconomic effects of the Fed's LSAPs of recent years. So a key question emerges regarding how linear one thinks the effects of LSAPs are. If one is comfortable assuming linear effects, then it's not a big problem to extrapolate an alternative LSAP program that matched the macroeconomic effects of ARRA. But given the very large uncertainty around the impacts of LSAPs, this linear assumption is potentially problematic. What this means in practice is that we should compare the LSAPs to a fiscal policy stimulus that provided roughly equivalent increases to output and employment.

A discrete fiscal policy stimulus that yielded estimated output and employment gains comparable to those generated by the LSAPs is the deal struck at the end of 2010. Undertaken explicitly to provide fiscal stimulus, the deal provided a payroll tax cut for 2011 and 2012, an extension of the emergency unemployment compensation program (EUC) for the next year, an extension of expanded refunds of some tax credits, and accelerated depreciation.⁹ Because the combined impact of these stimulus measures was substantially smaller than that of the full ARRA package (in its peak years), and the largest item included in the measures—payroll tax cuts—was not the most efficient fiscal stimulus alternative in terms of output gains relative to deficit additions, it is much easier to use in-sample estimates of monetary stimulus of equivalent effect as our comparison. In fact, recent analysis of the Fed's LSAPs since 2009 show a pre-2015 peak impact in reducing unemployment (1 percent) that is quite close to the unemployment impact that was estimated for the 2010 fiscal deal (0.8 percent).

Table 2 provides an estimate of the output effects of the payroll tax cuts and the three rounds of LSAPs per dollar committed. The fact that the U.S. economy was at the zero lower bound (ZLB) for short-term interest rates during the period in question strongly affects estimates of each policy's effect.

⁹ The total 2010 fiscal deal included many more components—most notably postponing the expiration of the 2001 and 2003 tax cuts. However, relative to current policy (as opposed to current law) the components identified above provided all of the net new fiscal stimulus to the economy.



Table 2: Output and Employment Effects of LSAPs and 2010 Fiscal Deal Stimulus

	Fiscal cost	Federal Reserve Balance Sheet Change	GDP effect (peak)	Unemployment effect (peak)
2010 fiscal stimulus	\$235 billion	N/A	1.7%	-0.8
<i>Payroll tax cut</i>	120	N/A	0.9%	-0.4
<i>EUC extension</i>	50	N/A	0.5%	-0.3
<i>Tax extenders</i>	20		0.2%	-0.1
<i>Accelerated Depreciation</i>	45		0.1%	0.0
LSAP	N/A	~\$4 trillion	2	-1

Note: Estimates on fiscal cost of 2010 deal from Zandi (2010). Multipliers from Zandi as well. GDP and unemployment impacts from LSAP from Engen et al. (2014) - only pre-2015 effects included. GDP effects inferred from Engen et al. (2014) estimates of GDP impact of LSAP with an Okun coefficient of 2 applied (they note this is their preferred value in footnote 43). Same Okun coefficient is applied to fiscal GDP estimates to yield unemployment impact.

With regard to fiscal policy, the existence of the ZLB is almost universally thought to greatly increase the effectiveness of fiscal stimulus and provide a basis for potential fiscal multiplier effects. Essentially, the effectiveness of deficit-financed fiscal stimulus when the economy is not near the ZLB is thought to be severely blunted by the upward pressure on interest rates that will result from it. Interest rates can rise in response to deficit-financed fiscal stimulus either (1) due to the increased demand for money that results from the output boost it provides (as in old-fashioned textbook investment-saving (IS)–liquidity preference money supply (LM) models or (2) because the monetary authorities raise interest rates more than one-for-one with the increase in inflation expected to result from the fiscal stimulus (as in New Keynesian models). Either way, some private absorption (either consumption or investment) is crowded out by the higher interest rates resulting from fiscal stimulus. However, when the economy is stuck at the ZLB, only fiscal stimulus large enough to completely erase the output gap will begin putting upward pressure on interest rates, so its effectiveness is not blunted at all.

Traditional monetary stimulus—lowering short-term interest rates controlled directly by the Fed—works to boost demand by inducing more private investment in both equipment and structures (both residential and commercial structures) and more private consumption of interest-sensitive sectors (mostly durable goods). Monetary stimulus works by lowering short-term rates, which puts downward pressure on long-term rates resulting from arbitrage, and the resulting drop in long-term rates makes investments more attractive by lowering the cost of capital. Lower interest rates can also put downward pressure on the value of the dollar, and hence boost demand by increasing net exports.

At the ZLB, further exchange of short-term bonds for reserves held at the Fed will not push interest rates lower than zero. This means that the ZLB requires the Fed to act directly on longer-term interest rates if they want these lowered to provide stimulus. Because the stock of outstanding U.S. Treasuries and MBS are so large, a three-fold increase in the size of the Fed’s balance sheet would



likely have only modest direct impacts on long-term rates. Further, while a key transmission mechanism for long-term rates to boost consumer spending has traditionally been the refinance of residential mortgages, the housing price decline in the years before 2013 meant that millions of homeowners that could have theoretically benefited from the LSAPs through this refinancing channel were not eligible. Their home's loan-to-value ratios were simply too large for banks to allow refinancing and this had potentially significant effects on blunting the impacts of LSAPs.

On a more hopeful note, demand can be boosted via wealth and net export effects resulting from LSAPs. Lower interest rates and higher bond prices stemming from LSAPs are generally have spillover effects on other asset markets (like currency markets and the stock market).

Finally, in theoretical models predicting the effects of LSAPs, the impacts stemming from the changes in expectations that result from Fed purchases are large. Such expectational changes are very hard to empirically quantify, and thus make the output and employment estimates of LSAPs subject to large uncertainties. Failing to observe the expectational effects, however, is likely make estimates of LSAP's effect on output and employment lower than suggested by the direct effects on interest rates and asset prices.

THE INEQUALITY IMPACTS OF EQUIVALENT FISCAL AND MONETARY STIMULUS

From here we can provide some rough estimates of the impacts on inequality of two policies: (1) the 2010 fiscal deal and (2) LSAPs in recent years that yielded an equivalent macroeconomic stimulus. Much like in our assessments of the employment and output effects of fiscal versus monetary policy, the distributional outcomes of the fiscal policy interventions examined here are much more straightforward to assess than the monetary interventions.

FISCAL STIMULUS AND DISTRIBUTION

The first-round distributional impacts of the 2010 fiscal deal are straightforward to track. The CBO estimates the incidence of payroll taxes throughout the income distribution, and using their estimates we can assign this incidence by income group. Because the payroll tax cut included in the 2010 tax deal was on the workers' side of the payroll tax, we need not be too concerned about the accuracy of CBO assumptions regarding the incidence of employer-side payroll taxes, nor the pace at which employer-side payroll tax changes are passed on to wage changes. Similarly, we can use the same data to allocate the EUC payments by income group, as the CBO data provide an estimate of cash transfers besides Social Security for each household income group. It is likely that unemployment insurance is a very large part of these non-Social Security cash transfers, so we can use the CBO estimates on these to allocate gains from EUC extension.

The same data can be used to roughly allocate the benefits of extending refundability in certain tax credits by assigning benefits only to those income percentiles that have negative personal income tax liability. **Table 3** shows the income impacts of the payroll tax cut, EUC extension, and refundable extenders by income grouping, and then calculates the total benefits of the 2010 fiscal deal



accounted for by each of these income groups. We do not provide a distributional analysis of the accelerated depreciation components because while these provisions were relatively expensive in budget terms (as shown earlier in Table 2), they had very little impact on output or employment.

Table 3: First-Round Distributional Consequences of the 2010 Fiscal Deal

	Payroll tax cut	EUC extension	Refundable credits	Overall income
Lowest fifth	5.6%	15.0%	75.0%	5.1%
Second fifth	9.9%	23.6%	25.0%	9.3%
Middle fifth	15.6%	24.3%	-	13.7%
Fourth fifth	24.0%	20.8%	-	19.8%
81-90th pct	17.6%	9.2%	-	14.2%
91-95th pct	11.4%	3.8%	-	9.8%
96-99th pct	11.0%	2.8%	-	12.7%
Top 1	4.3%	0.3%	-	16.7%
Overall	100.0%	100.0%	100.0%	100.0%

Note: Author's analysis using Congressional Budget Office (2012) data on household income distribution. For EUC extension, benefits allocated based on income shares of cash transfers excluding Social Security. Benefits of extending refundability of tax credits restricted to those household groupings with negative personal income tax liability in CBO data. The negative income tax rate is multiplied by pre-tax income to gauge total benefit of refundability, and then benefit is allocated across bottom two fifths of distribution in proportion.

Table 3 shows the share of overall income earned by each income group to use as a benchmark to assess the progressivity of each policy. The payroll tax cut is slightly progressive for the bottom four quintiles of the household income distribution. The bottom fifth sees 5.6 percent of the benefits of an across-the-board payroll cut, compared to their overall income share of 5.1 percent. The middle fifth sees 15.6 percent of the benefits of an across-the-board cut while they claim 13.7 percent of overall income. The CBO data may slightly overstate the benefits of the payroll tax cut for the top 5 percent of the household income distribution because their overall payroll tax burden includes Medicare taxes, which are not capped. The 2010 payroll tax holiday only applied to the Social Security portion of the payroll tax, and hence the lower tax rate was capped to the first \$106,800 of labor earnings in 2011.

The benefits of the EUC extension are, unsurprisingly, much more progressive. The bottom three-fifths of the household income distribution claim a combined 62.9 percent of all non-Social Security cash transfers, compared to 28.1 percent of overall income.

Finally, the benefits of the refundable extenders are even more progressive, with the large majority going to families in the lowest fifth in income, and the remainder going to households in the second fifth. Given that refundability of tax credits, by definition, only helps tax filers with relatively low incomes, this seems sensible enough.



MONETARY STIMULUS AND DISTRIBUTION

The first-round distributional implications of the LSAPs are much less straightforward to track than those of the 2010 fiscal deal. Given their importance to both the output and employment impacts as well as to distributional outcomes, our preferred estimates of the LSAP effects on interest rates and asset prices are provided in Table 4. The key indicator in each of these is the effect of LSAPs on long-term Treasury yields, since the estimates for other asset prices tend to be derived from historic estimating relationships between these yields and other financial markets. These Treasury estimates are a key issue in judging the robustness of assessments about LSAPs effects on either stabilization or distribution; assessments of what LSAPs have done for asset markets hinge largely on what they were estimated to have done to Treasury yields. Though an oversimplification of the impact of LSAPs, for our purposes here we estimate that the combined LSAPs reduced long-term Treasury yields by an average of 100 basis points since their introduction in March 2009.

Much of the empirical research on the financial market effects of LSAPs uses event studies to track changes in Treasury yields following successive announcements or implementations of LSAP programs (see for example, Gagnon et al. (2011) and Krishnamurthy and Vissing-Jorgensen (2011)). This means that the effects of LSAPs are not uniform over time; the effects tend to spike upon announcement and then fade over time. Further, the impact of LSAPs hinges crucially on the overall state of financial markets at times of announcement and implementation, with LSAPs thought to be particularly effective in changing interest rates during periods of keen financial market distress. As financial markets stabilized over the 2009–2014 period, it is possible that larger asset purchases were needed to provide the same downward pressure on interest rates.

The empirical research on the impacts of LSAPs on long-term Treasury yields is generally consistent. Most studies find a significant non-zero effect of LSAPs, most agree clearly on the direction of LSAP's effects (i.e., they reduced long-term Treasury rates) and the estimates for the first round of purchases (QE1) are quite large—tending to fall in the 30 to 150 basis point range following initial announcement. The estimated effects of QE2 are substantially smaller, and the effects of QE3 (having just ended at the end of 2014) have not yet been fully estimated. Undertaken during times of less financial market distress and including only purchases of Treasuries (as opposed to mortgage-back securities), QE2 had smaller estimated effects. This strongly suggests that the market stabilization effects of LSAPs are a key channel through which they boost bond prices and reduce yields. This supports the assumption that non-Treasury yields fell more than one-for-one with Treasury yields due to LSAPs. Even with relatively weak estimated effects of QE2, our estimates of LSAPs' effects on long-term interest rates over the entire period since March 2009 may not be too optimistic. For one, QE3 was weighted more heavily towards MBS than QE2, so perhaps this could boost its effectiveness. Further, QE3 was open-ended: no total value of purchases was specified by the Fed. This total limit on purchases was identified by some as a potential weakness in earlier rounds of LSAPs.

Finally, Engen et al. (2015) estimate that the macroeconomic impact of the combined LSAPs has only reached its peak in recent years. This does not guarantee that their impact on long-term interest rates peak in the same year, but it does suggest that the large estimated effects of QE1 likely did not fade completely away as successive rounds of LSAPs were undertaken.

**Table 4: Financial Market Effects of LSAPs**

Financial yield or price	Assumed LSAP effect	General range in survey literature
10-year Treasury interest rates	100 bps	38-150 basis points for QE1. More mixed results for QE2 and very little direct estimates of QE3 extant.
10-year MBS	150 bps	Gagnon et al. (2011) and Krishnamurthy and Vissing-Jorgensen (2011) find larger impacts on non-Treasury rates. Rough ratios from their papers applied to Treasury rate above.
10-year bond prices	9-14 percent	Given starting interest rate of 3 percent on 10-year bond, then assuming 100-150 basis point decline.
Equity prices	5 percent	Range from < 3 percent in Dobbs et al. (2013) to 8.5 percent in Engen (2014).
Home prices	7 percent	Constructed from existing literature on elasticity of home prices to long-term rates. Also in line with Dobbs et al. (2014) finding.

Using our baseline estimate that LSAPs reduced long-term Treasury rates by 100 basis points, we can provide estimates of changes in other asset markets such as non-Treasury interest rates, bond prices, equity prices, and home prices.

Non-Treasury Interest Rates

The LSAP programs purchased MBS as well as Treasuries, and interest rates on these mortgage-backed securities are thought to be more closely tied to other market interest rates that could affect households and businesses (home mortgage rates, consumer credit rates, and rates for industrial loans, for example). Most research shows that the LSAPs reduced long-term rates more in the MBS market than the Treasury market (Gagnon et al., 2011; Krishnamurthy and Vissing-Jorgensen, 2011). The main rationale for this amplified effect is that the market for MBS was more impaired by the financial crisis of late 2008, and so LSAPs provided a bigger boost to MBS prices (reducing interest rates more) through this market stabilization effect. The rest of this analysis generally uses the ratio estimated by Gagnon et al. (2011) and assumes interest rates on MBS and mortgages fell by 150 basis points over the time period that LSAPs were in force.

Bond Prices

LSAPs started when interest rates were already historically low, and these purchases changed long-term interest rates directly. The resulting 100 to 150 basis point change in rates induced by LSAPs has the potential to make a large impact on long-term bond prices. Take a 10-year bond with par value of \$1,000 and a 3 percent coupon rate before the announcement of LSAPs: If the subsequent LSAPs lowered market interest rates by 100 to 150 basis points, this implies an increase in bond prices of 9 percent to 14 percent.

Equity Prices

Perhaps surprisingly (given all the discussion of the effect of LSAPs on equity prices), a number of researchers find quite modest LSAP effects on equity prices. Both Kiley (2014) and Rogers et al.



(2014) find that policy-induced declines in long-term interest rates have substantially fewer effects on equity prices in normal circumstances than they do when the economy is at the ZLB.

For a 100-basis-point decline in Treasury rates, we will assume a 5 percent rise in equity prices. This is actually larger than either the Kiley (2014) or the Rogers et al. (2014) results, both of which imply a 3 percent rise in equity prices following a 100-basis-point decline in long-term rates. This is also larger than the Dobbs et al. (2013) finding of only a 3 percent increase in equity prices. It is a slightly smaller effect, however, than reported by Engen et al. (2015) in their survey of event studies, which shows a 100-basis-point decrease in long-term interest rates associated with a 8.5 percent rise in stock prices. Given that the effect of LSAPs on stock prices is a key distributional variable, and given that it is one parameter around which there is the least agreement regarding the effect of LSAPs, it is probably the most uncertain piece of the following analysis.

Home Prices

Few studies seem to directly estimate the effect of LSAPs on home prices. But given that homes are by far the largest asset holding of the nonwealthy in the United States, this parameter is key in any distributional assessment of LSAPs. Luckily, there is a significant amount literature that estimates the elasticity of home prices to mortgage interest rates.¹⁰ If we assume that mortgage interest rates are reduced 100 basis points in response to LSAPs (i.e., falling one-for-one with Treasury rates, but less than one-for-one with MBS), then home prices are boosted by 7 percent due to LSAPs.

Existing Distribution of Assets and Implications of LSAPs

Table 5 shows the distribution of assets by wealth class in the U.S. economy. **Panel A** shows what share of total wealth is held in various assets for the overall population, the top 1 percent, the 80th to 99th percentiles (“Net 19”), and the middle three quintiles (“Middle 3,” or middle class). A number of things stand out. First, housing is a much larger share of assets for the broad middle class than for other wealth classes. The middle class has 62.5 percent of total assets tied up in their principal residence, while the 80th to 99th percentiles have 28 percent, and the top 1 percent just 8.7 percent of total assets in residential real estate. Conversely, stocks and bonds combined constitute just 3.4 percent of total assets for the middle class, but make up more than a quarter of the holdings of the top 1 percent. The middle class holds a higher share of assets as liquid assets than the top 1 percent, but less than the 80th to 99th percentiles. Similarly, the middle class holds more of their total assets in the form of pension entitlements than the top 1 percent, but less than the 80th to 99th percentiles. Finally, the ratio of total debt to income shows that the middle three-fifths of the population have much higher debt burdens than either of the two wealth classes above them.

¹⁰ See, for example, Kuttner (2012) or IMF (2008).



Table 5: Distribution of Assets by Wealth Class, 2013

**Panel A: Composition of Household Wealth by Wealth Class, 2013
(Share of gross assets)**

	<u>Share of Wealth Class Holdings</u>				<u>Nominal rates of return</u>		
	All	Top 1	Next 19	Middle 3	1983-2007	2007-2013	1983-2013
Housing	28.5	8.7	28	62.5	4.6	-1.2	3.5
Stocks and securities	17.4	27.3	16.3	3.4	10.5	4.9	9.2
Liquid assets	7.6	6.1	8.4	8.1	5.3	0.7	4.0
Pensions	16.5	9.2	21.7	16.1	9.0	4.0	7.6
Business equity	28.5	46.9	24.2	8.6	-	-	-
Misc	1.5	1.9	1.4	1.2	-	-	-
Total	100	100	100	100			
Debt/income	107.1	38.2	96.6	125			

**Panel B: Percent of Total Assets Held by Wealth Class
(Share of gross assets)**

	<u>Share of asset class</u>				<u>Share of total assets</u>		
	Total	Top 1	Next 9	Bottom 90	Top 1	Next 9	Bottom 90
Housing	28.5	9.8	31.1	59.2	2.8	8.9	16.9
Stocks and mutual funds	12.7	49.8	41.2	9.1	6.3	5.2	1.2
Liquid assets	7.6	24.8	42.4	32.8	1.9	3.2	2.5
Pensions	16.5	17.8	47.5	34.8	2.9	7.8	5.7
Securities (bonds)	1.5	54.7	39.6	5.7	0.8	0.6	0.1
Business equity	18.3	62.8	31	6.2	11.5	5.7	1.1
Commercial RE	10.2	33.7	44.1	22.2	3.4	4.5	2.3
Misc	3.2	49.5	34	16.5	1.6	1.1	0.5
Total					31.3	37.0	30.3
Debt	15.2	5.4	21.1	73.5			

Source: Wolff (2014). Panel A shows what proportion of wealth holdings are in a particular asset class and what the historical rates of return associated with that asset class are. Panel B shows what share of total assets are held by a particular wealth class, and then estimates how much each wealth class's holdings of a particular asset are as a share of total national wealth.

Panel B shows the share of total wealth that is held by the particular asset holdings of each wealth class (note here that the breakdowns are different than above: top 1 percent, 90th to 99th percentiles, and bottom 90 percent). So, for example, the first row shows that the top 1 percent holds 9.8 percent total housing wealth, as compared to 59.2 percent held by the bottom 90 percent. However, the top 1 percent holds 49.8 percent of wealth in stocks and mutual funds, while the bottom 90 percent holds just 9.1 percent. The right-hand block of columns in Panel B shows each wealth class's holding of a



particular asset expressed as a share of total national asset holdings. So, the right-hand side of the first row shows that residential real estate holdings of the top 1 percent constitute 2.8 percent of total national asset holdings. The right-hand side of the second row shows that stock and mutual fund holdings of the top 1 percent account for 6.3 percent of total national asset holdings. Summed across wealth classes, this shows that the top 1 percent holds 30.3 percent of total gross wealth holdings, while the bottom 90 percent holds 31.3 percent.¹¹

The rough impact of LSAPs on relative wealth holdings is fairly easy to extrapolate from this basic data. While stock price increases stemming from LSAPs accrue disproportionately to the top 1 percent, home price appreciation disproportionately benefits the bottom 90 percent. In fact, the symmetry of the respective holdings of stocks and home equity is striking: the top 1 percent owns just 9.8 percent of total housing wealth while the bottom 90 percent owns just 9.1 percent of total stock and mutual fund wealth. Given this pattern, there would have to be a very large difference in the effect of LSAPs on the prices of stocks versus the prices of homes to really gain distributional traction. Not only is there no particularly large difference in the effects of LSAPs on these prices, but the impact on home prices (the more democratically held asset) seems in our estimate to be larger.

Beyond these two asset classes, there is very little that can be said about the effects of LSAPs on prices that would have large distributional consequences. The share of total assets held in liquid deposits is not that different for the top 1 percent and bottom 90 percent, for example. And while the top 1 percent has nearly 10 times as much in bond holdings as the entire bottom 90 percent, bond holdings among households are small enough as a share of total wealth (just 1.5 percent) to make these not a big distributional player in assessing the impact of LSAPs.

Business equity is a very important wealth class (18.3 percent of total wealth holdings) that is quite concentrated at the top (with the top 1 percent holding nearly 63 percent of it). However, pensions (compared to overall wealth) are concentrated in the bottom 90 percent, with the top 1 percent accounting for only 17.8 percent of pension wealth. It seems that the assets of pensions are at least as likely to see valuation boosts from LSAPs as business equity, so it is again a bit hard to see where LSAP valuation effects could have great traction in boosting wealth inequality relative to current levels.

ARE STATIC WEALTH IMPACTS A GOOD MEASURE OF LSAP DISTRIBUTIONAL EFFECTS?

These effects of LSAPs in boosting asset values and the concentration of asset-holding seem to be what is fueling much of the concern over the possible regressive implications of LSAPs. However, even these relatively mechanical wealth impacts are far often less straightforward than some might imagine. While ownership of corporate equities is indeed quite concentrated, as we noted above the boost to equity prices provided by LSAPs is often estimated in the academic literature to be quite modest – almost certainly smaller than what is commonly alluded to in popular discussions. In

¹¹ It should be stressed that this shows each wealth class's share of gross assets, not net worth. Given that debt as a share of gross assets is smaller for the top 1 percent than for the bottom 90 percent, the top 1 percent's share of national net worth is larger than their share of gross asset holdings.



addition, the boost to home prices—and the relatively democratic holding of housing wealth—is often overlooked in this sort of balance sheet accounting of LSAP impacts.

Further, a static look at wealth holdings and the estimated impact on asset values from the LSAPs presents far too simple-minded a model of how to think about the distributional implications of LSAPs. For example (a further section will touch on this issue), while asset purchases by the Fed put upward pressure on asset prices, eventually these purchases will be reversed and symmetric asset price reductions will likely ensue. For those who simply held on to a given asset over both the run-up and the (future) winding down of LSAPs, there is little reason to expect any permanent increase in wealth. Further, while LSAPs bid up the price of assets, this also bids down expected returns for holding them.

Take the case of bonds held for retirement in pension funds. When the existing stock of bonds held by a pension fund has risen in price, replacing those bonds in the fund's portfolio when they mature becomes more expensive, meaning that the long-run value of bonds for meeting future retirees' income obligations has not risen. Given that equity ownership has always been extraordinarily concentrated, higher stock prices can be seen largely as a transfer from tomorrow's wealthy households to today's wealthy households.

Importantly, the reduction in interest rates provides a potentially progressive boost to wealth and income, as debt is a much larger ratio of either income or gross assets for the bottom 90 percent of households. Essentially, net borrowers (holders of mortgages, credit card debt, and student debt) see incomes rise after accounting for debt burdens due to the LSAPs. Conversely, if home prices rise sharply with mortgage rate declines, housing affordability might not be boosted as much by reduction in interest costs.

In the end, one key reason to suspect why LSAPs will have only relatively modest impacts on wealth holdings and distribution over any lengthy period of time is that returns on wealth have powerful fundamental drivers. Home prices, for example, are mostly a function of the demand and supply for land and housing. In contrast, stock prices are mostly a function of the economic growth and profitability of corporations. While the price of assets traded in markets can diverge from these fundamental determinants for periods of time, they will eventually move back much closer to their fundamental values.

DISTRIBUTIONAL IMPLICATIONS OF LSAPs COMPARED TO CONVENTIONAL MONETARY POLICY

Finally, it is worth asking whether there is anything particularly different about the impact of LSAPs on distributional outcomes when compared to more conventional monetary stimulus (i.e., the lowering of Federal Reserve policy rates). After all, it can be hard to see what is particularly unique about LSAPs. The goal of conventional expansionary policy is to lower longer-term interest rates; the same is true for LSAPs. So while the mechanism that causes long-term interest rates to decline is different from LSAPs, the purpose is the same. Given that other asset market effects of LSAPs are driven by lower interest rates, it is not clear why there is anything noteworthy about the distributional implications of LSAPs relative to conventional monetary expansion.



In fact, while much of the attention on monetary policy's distributional effects has focused on LSAPs, some asset prices—like equity prices—have likely been more affected since 2008 by conventional monetary expansion of lowering short-term interest rates to zero by reducing corporations' interest payments and lower discount rates applied to dividends.

The most direct channel that people have identified as a conduit through which LSAPs can lead to regressive outcomes is their effect on equity prices. Yet this channel has been shown by a number of authors (Kiley, 2014; Rogers et al., 2014) to actually be much weaker at the ZLB when LSAPs stand-in for conventional monetary easing.

In short, there is very little in the distributional critique of LSAPs and unconventional monetary policy that could not be said about conventional expansionary monetary policy as well.

WHAT HAPPENS WHEN STIMULUS IS REVERSED?

It is worth thinking about the implications of the reversal of macroeconomic stimulus on inequality. For a fiscal stimulus, the reversal comes when debt accumulated to finance the period of stimulus must be amortized. This requires either tax increases or spending cuts. In theory, either could increase or decrease income progressivity. In recent decades, the two clearest episodes of tax increases undertaken (at least in part) to reduce primary budget deficits have been the 1993 tax increases and the 2013 negotiated phase-out of some of the 2001 and 2003 tax cuts. Both of these episodes saw quite progressive tax increases. Similarly, both episodes were also associated with spending cuts—particularly to discretionary spending. The assessed impact of these spending cuts depends on how one assigns the value of government spending across the income distribution.

Reversal of monetary stimulus occurs when the stock of assets accumulated by the Fed begins to fall, either through outright asset sales undertaken by the Fed or because they do not replace securities that reach maturity. This stimulus reversal seems much more straightforward than the fiscal policy reversal in its inequality impact: it should essentially be the mirror-image of whatever impact on inequality accompanied the asset purchases. As the stock of assets held by the Fed falls, this implies upward pressure on interest rates and potential downward pressure on asset prices.

The impact on inequality from both the adoption of LSAPs and their unwinding is likely to be quite idiosyncratic. The likely “winners” are those who held assets whose value increased during the LSAPs and then sold before the LSAPs were completely reversed. Those who did not hold assets during the LSAPs but who sold assets during or after the unwinding of the Fed's balance sheets are likely to be “losers.”

There is a caveat to the argument for the symmetric effect of LSAPs and their future reversal. If LSAPs helped stabilize financial markets in the wake of the 2008 financial crisis—and boosted asset prices sufficiently to allow some economic agents to avoid bankruptcy until asset values rose enough for them to regain solvency—they could have boosted wealth during the run-up more than depressing it during the reversal. An argument against this interpretation is that the LSAPs generally began only after the clearest period of financial market dysfunction. For example, the large increase in the spread between short-term US Treasuries and the interest rate banks charge each other for short-term loans (sometimes known as the TED spread) had already been substantially reduced



relative to its crisis high by the time the first round of LSAPs began in March 2009. But if one includes the lending facilities that pre-dated the LSAPs in the consideration of unconventional monetary policy since the Great Recession began, then this interpretation may well hold.

INDIRECT EFFECTS FROM STIMULUS-EQUIVALENT FISCAL AND MONETARY POLICY INTERVENTIONS

The indirect effects on inequality from these two policy interventions that are nearly equivalent in their output effects are quite a bit less straightforward to track. However, we can discuss the likely transmission mechanisms of each for inequality and provide a qualitative sense of how important they're likely to be.

The fiscal indirect effects are likely to be very small when compared to a benchmark of equivalent alternative stimulus (again, abstracting from its effects in boosting output growth and reducing unemployment). In theory, debt-financed fiscal stimulus can put upward pressure on interest rates, which could have distributional consequences. However, a key (and now famous) feature of the Great Recession and subsequent recovery is that the U.S. economy seems firmly entrenched in a “liquidity trap,” whereby aggregate demand shortfalls are putting such intense downward pressure on interest rates that only a fiscal stimulus sufficient to wholly close the output gap will begin boosting interest rates. As such, there is likely insignificant upward pressure that was placed on interest rates as a result of the 2010 fiscal deal.

The monetary indirect effects have a little more scope to operate. While fiscal stimulus at levels below what is necessary to fully close the output gap are unlikely to place upward pressure on interest rates, monetary stimulus only works if it manages to reduce interest rates. The lower interest rates that prevail in a scenario of monetary stimulus could have second-round effects on inequality over and above those sketched out in the previous section. For example, the distribution of output and employment growth could be different in a monetary stimulus. Low interest rates could lead to reductions in the value of the dollar, which boosts tradable goods production in the U.S. economy. Tradable goods employment tends to pay higher wages than other economic sectors, even after including controls for workers' characteristics, so there is a possibility that boosting international competitiveness through exchange rate depreciation may lead to a shift in the factor shares of income towards labor. Another key economic sector that could benefit (in theory) from lower interest rates is housing construction. Like manufacturing, construction tends to pay higher wages than average, particularly when controlling for the labor force characteristics of its workforce.

Table 6 provides a quick survey of hourly wages and total compensation per full-time employee for construction and durable goods manufacturing (the most obviously interest-sensitive sector of the economy outside of construction). Compensation per full-time employee (FTE) is significantly higher in durable goods production than the rest of the economy, while it is slightly higher in construction. Moreover, the comparison between hourly wages and education credentials in each sector makes clear that both provide disproportionately good (and compressed) wages for a workforce that has fewer formal educational credentials than the rest of the economy. For example, the number of workers with a 4-year college degree or greater in the construction workforce is less than 13 percent, compared to over 30 percent for the nonconstruction, nondurable goods workforce.



Yet only 10 percent of construction jobs pay wages in the bottom fifth of the overall wage distribution, and fully 70 percent of its jobs are in the middle 60 percent of the overall wage distribution.

Table 6: Wages and Educational Attainment in Interest-Sensitive Industries

	FTE (000s)	COMP (\$Bil)	COMP/ FTE (\$000s)	Percent with 4-year college degree	Share low- wage (Bottom fifth)	Share middle wage (Middle 3 Fifths)	Share high- wage (Top Fifth)
Total	106,911	7,094,310	66.4	29.8	20	60	20
Durable goods	7,414	613,122	82.7	27.2	8.1	66.8	25
Construction	5,809	390,384	67.2	12.8	10.1	70.1	19.8
All other	93,688	6,090,804	65.0	30.5	23.5	57.9	18.5

Note: Author's analysis using data on FTEs and Compensation per FTE from the Bureau of Economic Analysis (BEA), Tables 6.2D and 6.5D. Data on share of employment by wage fifth and percent with 4-year college degree based on calculations with the Current Population Survey Outgoing Rotation Groups (CPS-ORG)

Despite these significant wage differences, the impact LSAPs have on inequality by boosting jobs in interest-sensitive sectors is likely very modest. Engen et al. (2015) estimates a 1.5 percent reduction in the value of the dollar resulting from the LSAPs. Using conventional estimates of the effect of the dollar's value on net exports, this implies a boost in net exports of roughly 0.15 percent of U.S. GDP.

Similarly, the *IMF World Economic Outlook* (2008) has estimated an elasticity of roughly 5 for residential investment to short-term interest rates for the United States. Given research by Hanson and Stein (2015) that each 100-basis-point change in the short-term rate is associated with a 42-basis-point change in long-term rates, this likely implies one can double this estimated elasticity for the response of residential investment to long-term rates.

Combining this elasticity estimate with the Engen et al. (2014) estimate on the effect of LSAPs on long-term interest rates, this implies a 10 percent increase in residential investment stemming from a 100-basis-point fall in long-term Treasury rates. This is not trivial. But because this implies a roughly 0.5 percent increase in construction as a share of GDP, the wage differences of construction would have to be much higher than the rest of the economy for this shift to either boost the economy-wide wage share or compress the economy-wide earnings distribution.

The last indirect channel through which macroeconomic stimulus could plausibly affect inequality is through its impact on inflation. There is extensive literature examining the impact of inflation on inequality. Macroeconomic stimulus impacts inequality to the degree to which it keeps inflation higher than it would have been otherwise.

The most direct way that higher inflation has distributional implications is through its effect in transferring wealth from net lenders to net borrowers. Doepke and Schneider (2006) quantitatively evaluate this channel. They find that young, middle-wealth households gain substantially from



inflation shocks (as high as 30.9 percent of net worth for middle-class households under the age of 35 with an inflation shock of 5 percent), while wealthier households—particularly older ones—suffer nontrivial losses (as large as 2.5 percent for households over the age of 56 following a 5 percent inflation shock). Young wealth-poor households see net worth gains of nearly 20 percent, though this group generally has very low levels of net worth to begin with.

Several attempts have been made to identify the impact of inflation on income inequality beyond its impact on wealth valuations. A number of studies examining cross-country evidence seem to show that inflation is positively correlated with inequality (for example, Albanesi, 2006). Albanesi shows that in a cross-section including both developed and developing economies, there is a positive correlation between inflation and inequality. While the association is stronger for developing countries, Albanesi estimates that it is statistically significant even for pre-1973 Organisation for Economic Co-operation and Development (OECD) countries. Albanesi hypothesizes that this positive correlation is the result of distributional conflict over government policies.

However, Galli and van der Hoeven (2001) have disputed the findings from cross-country regressions estimating the link between the levels of inflation and income inequality by highlighting the importance of controlling for the initial level of inflation. Specifically, they argue: “Though in high inflation countries restrictive monetary policy is often beneficial for inequality, reducing inflation in economies with initially low inflation might increase inequality. Empirical investigations for the U.S. and a sample of 15 OECD countries seem to support this hypothesis.” They find for the U.S. that at initial inflation rates as high as 6 percent, further reductions in inflation are likely to increase inequality. Given today’s very low rates of inflation, the Galli and van der Hoeven results seem to directly contradict the Albanesi findings.

Alcalá and Sancho (2000) examine the empirical relationship between inflation and another measure of inequality: the factor share distribution of income. They found a robust positive relationship between inflation and the labor share of income in a group of 15 OECD countries (including the U.S.). The positive and significant (5 percent) relationship between inflation and labor shares holds in 12 of 15 separate, country-specific regressions examined by the authors, including U.S. data.

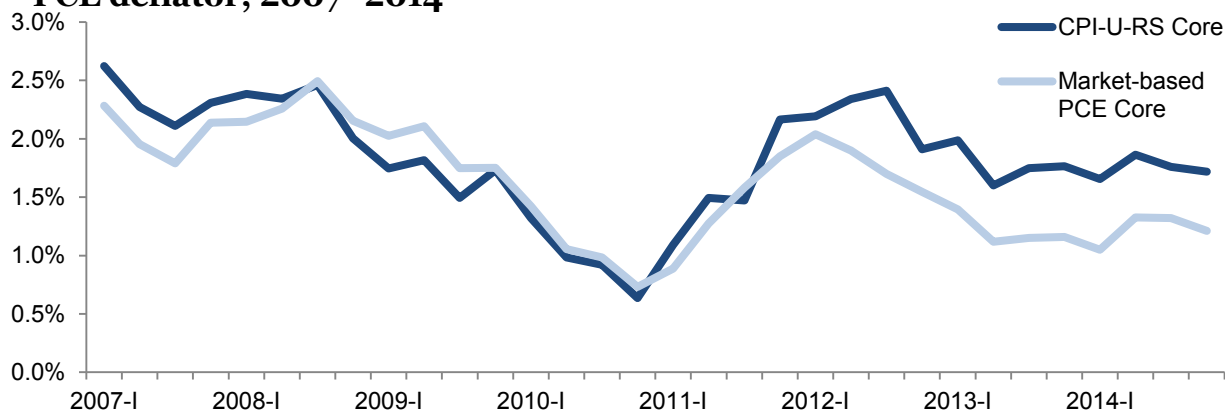
All in all, there is no consensus on whether or not higher rates of inflation have clear causal effects on income inequality. It is especially hard to gauge the causal impact of inflation rates on inequality because inflation changes nearly always come bundled with changes in many other changes in the state of the economy: the stance of monetary policy, output gaps, etc. This ambiguity in evidence regarding inflation, as well as the relative modest magnitudes of the findings either way, argue for caution in trying to estimate inflation’s impact on income inequality.

Finally on this score, there is the difficulty of assessing which type of stimulus—fiscal or monetary—is more powerful in boosting inflation (or at least muffling disinflation). Macroeconomic theory—particularly newer models relevant to issues regarding economies mired in a liquidity trap—strongly indicates that it is monetary policy that can affect inflation most powerfully and directly. This theory has clearly influenced the actual decision making of the Fed in recent years, as the LSAPs have been complemented by “forward guidance”—a clear attempt by the Fed to reassure market participants that it will try hard to not consistently miss their long-run inflation target on the down side.



Both macroeconomic data (see inflation trends in Figure 1) and the estimates of Engen et al. (2015), however, seem to indicate that the LSAPs had limited effect in boosting inflation; they estimate that the peak boost to inflation from the LSAPs is 0.5 percent, and this is forecast to occur in 2016. Even if one assumes that fiscal policy interventions have had zero effect in boosting inflation, this means that the relative boost to inflation stemming from monetary policy in recent years is quite small.

Figure 1: Year-over-year change in CPI-U-RS core and market-based core PCE deflator, 2007–2014



Source: EPI analysis of Bureau of Labor Statistics' *Consumer Price Index (CPI)* and of BEA NIPAs Tables 2.3.4 *Prices Indexes for Personal Consumption Expenditures by Major Type of Product*

SUMMING UP DISTRIBUTIONAL IMPLICATIONS

In conclusion, the relative effects of monetary or fiscal stimulus on inequality seem poor criteria upon which to judge the desirability of one versus the other. The relative impact on inequality of monetary policy stabilizations seems likely to be quite small, and even the direction of distributional effects (progressive or regressive) is far from clear. In practice, the inequality effect of fiscal policy stabilizations are impossible to generalize because they depend entirely on the specific set of fiscal instruments chosen. Fiscal stimulus can be progressive (targeted tax credits and transfers), regressive (across-the-board individual income tax cuts), or ambiguous (increases in government consumption and investment). For taxes and transfers, efficient fiscal stimulus (that associated with larger output effects per dollar increase in the fiscal deficit) is progressive; and likely more so than monetary policy stabilization that yields the same output and employment outcomes. Yet the recoveries of the early 1980s and early 2000s were boosted by quite large and quite regressive fiscal impulses.

FISCAL VERSUS MONETARY IS THE WRONG BASELINE

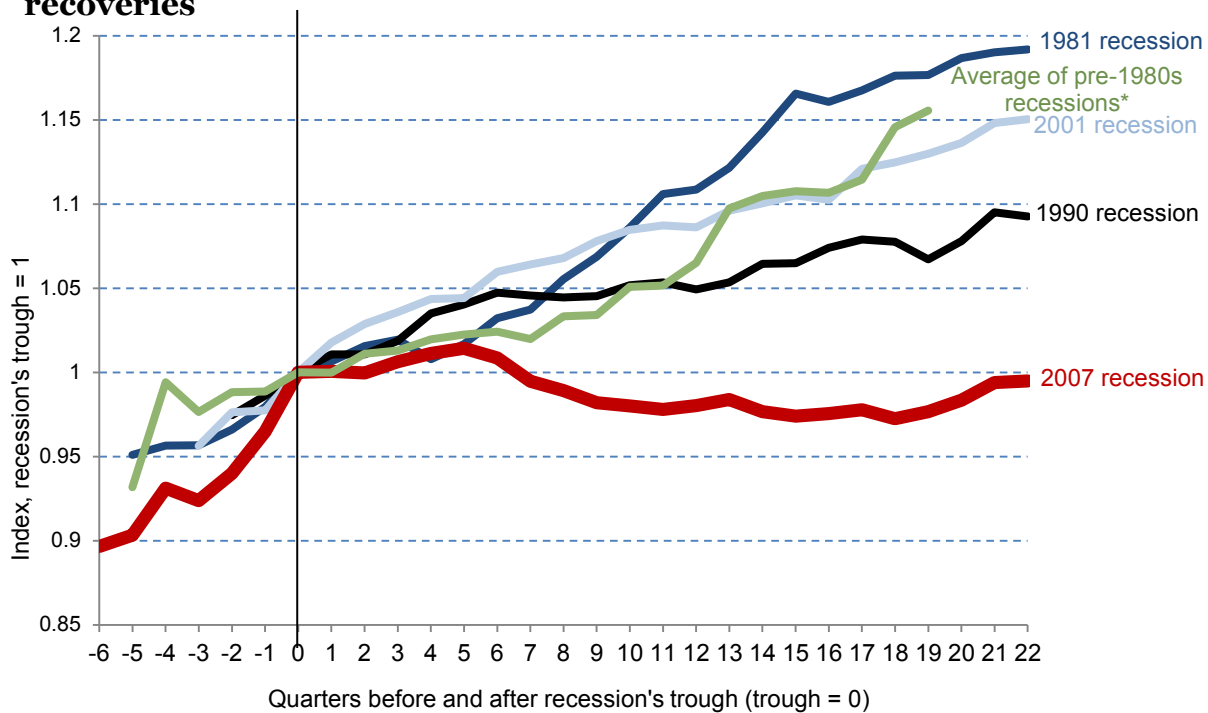
The discussion above argues that if one is concerned simply about inequality, a fiscal stimulus whose first-round distributional outcomes were strongly progressive would dominate a monetary stimulus that was equivalent in its effects on overall output. But while there might be academic interest in the relative inequality outcomes of stabilization-equivalent policy interventions, recent history has shown clearly that this has not been the real choice facing American policymakers. Instead, fiscal



policy became steeply contractionary relative to historic performance during recoveries beginning in 2011, even in the face of the following: (1) a very large output gap, (2) lack of evidence that this gap would, or could, be closed by more aggressive monetary policy, (3) and no obvious assurance from monetary policymakers that the fiscal contraction would (or even could) be met one-for-one with monetary stimulus.

The best summary indicator of this can be seen in Figure 2, which charts real government expenditures (including transfers) over a range of business cycles. Government expenditures rose more sharply in the recession phase of the most recent business cycle, due both to automatic stabilizers that were larger than most previous cycles and to the Recovery Act passed in early 2009. Over the recovery phase, however, even with the *ad hoc* stimulus measures (like the payroll tax cuts and EUC extensions at the end of 2010), total government expenditures have risen more slowly than during any other post World War II business cycle.¹²

Figure 2: Real government spending in recessions and subsequent recoveries



Note: The average of all pre-1980s recessions is the average of government expenditures for the six recessions and subsequent recoveries between 1953 and 1981.
 Source: Author's analysis of Bureau of Economic Analysis *National Income and Product Accounts* (Tables 1.1.4 and 3.1)



¹² The figure shows federal, state, and local expenditures. The same pattern holds if one examines federal spending only. However, since only federal policymakers have autonomy to run large deficits during economic downturns, and since these federal policymakers have the ability to provide large transfers to state and local governments, we think that examining total government expenditures as a measure of the policy stance of federal fiscal policy makes sense.



If the pace of public spending simply matched its pace during the recoveries following the recessions of the early 1980s, 1990s, or 2000s, it would have been between 10 to 20 percent higher at the end of 2014. This would correspond into at least \$600 billion in additional GDP and the economy today would almost surely be very close (at least) to full employment (Bivens, 2014).

And this spending contraction was surely not swamped by tax stimulus. While the end of 2010 saw the beginning of the payroll tax holiday (which did constitute fiscal stimulus), its impact was swamped by the cutback in spending. Further, it is far from clear that tax changes provided more fiscal stimulus in the current recovery than in previous ones. The early 1980s and early 2000s, for example, saw recoveries accompanied by large income tax cuts.

The sharp contraction of fiscal policy that was not fully offset by monetary stimulus does not imply that monetary policy decisions are completely exogenous to what fiscal policymakers do. It seems clear that Fed policymakers were aware of fiscal policy trends, and decisions to expand LSAPs to QE2 and QE3 were at least in part an effort to provide an offset to the fiscal contraction. But the evidence from the first section of this paper seems clear: the entire macroeconomic stimulus provided by the LSAPs essentially equaled only the stabilization impact of one discrete, *ad hoc* stimulus measure: the fiscal deal of 2010. Given this, it seems ill advised to insist on grading the inequality-generating aspects of monetary policy only against a baseline that sees an equal countervailing fiscal stimulus.

OUTPUT STABILIZATION AND EMPLOYMENT GENERATION AS INEQUALITY FIGHTERS

The scope of the Fed's actions to affect inequality becomes much greater once one changes implicit counterfactuals and allows for the impact of monetary stimulus on output stabilization to be considered as a contributor to inequality.

Coibion et al. (2012) undertake a detailed and comprehensive empirical investigation assessing the general link between expansionary monetary policy and reduced inequality. They identify monetary policy "shocks" using the methodology pioneered by Romer and Romer (2004) to extend the dataset to the end of 2008. However, beyond the response of usual macroeconomic variables like GDP, inflation, consumption, investment, and unemployment, they also examine the response of various types of income flows—labor earnings, interest income, and transfer income—to monetary policy shocks. They also use measures of inequality within total income, and each of the income categories, and assess how they change in response to monetary policy shocks.

Their results for both total income and labor earnings show statistically significant effects of monetary policy shocks on inequality, with contractionary shocks being associated with higher levels of inequality. They further show that the effects on wage income are larger than for total income.

Importantly, the Coibion et al. (2012) results on labor earnings mirror a large and growing body of empirical literature that identifies the level of unemployment as a key driver of trends in wage and income inequality. Among the first empirical studies identifying a positive relationship between



unemployment and inequality of labor earnings were Galbraith (1998), Katz and Krueger (1999) and Baker and Bernstein (2002, updated in 2013).

Galbraith (1998) used the inter-industry dispersion of average hourly earnings as his measure of inequality. He finds that over the time period from 1958 to 1992 this dispersion is positively related to unemployment in a regression that controls for GDP growth, inflation, the real exchange rate, and the real value of the federal minimum wage.

Katz and Krueger (1999) estimate Phillips curves for different deciles of the hourly wage distribution that relate the growth rate of real wages to the level of unemployment, along with controls for the real value of the minimum wage (for the 10th percentile) and time period dummy variables. They find that wage growth is negatively related to unemployment across all deciles, but is more sensitive to unemployment for low- and moderate-wage workers.

Baker and Bernstein (2002) estimate decile-specific wage curves (along the lines of those first identified by Blanchflower and Oswald, 1995) relating the level of real wages to unemployment rates. Like Katz and Krueger (1999), they find that wages for low- and moderate-wage workers are more negatively impacted by higher rates of unemployment than they are for higher-wage workers.

Recent work has confirmed that this differential impact of unemployment on wages persists. Gregg and Machin (2012) estimated decile-specific wage curves for the U.S. over the 1986–2010 period and confirmed that low- and moderate-wage workers' pay is more sensitive to unemployment changes. They also provide evidence that this sensitivity of wages to unemployment may actually be rising over time. Updating their earlier work for 1973–2011 following the Gregg and Machin (2012) methods, Baker and Bernstein (2013) confirmed the much-larger impact of unemployment on low- and moderate-wage workers' pay.

HOW IMPORTANT IS STABILIZATION FOR DISTRIBUTIONAL OUTCOMES?

To assess the resulting impact on wages, we follow the Katz and Krueger (1999) methodology and estimate decile-specific wage Phillips curves. We use national data and regress the log change in nominal hourly wages at various points in the wage distribution on the contemporaneous unemployment rate, lagged values of price inflation, various time-period dummies, lagged productivity, and (for the 10th and 20th percentiles) the value of the federal minimum wage.

Regression results for male hourly wages are provided in **Table 7**. The rough summary of the results is that for men, the sensitivity of wage growth to unemployment is largest for 10th percentile workers, falls in half (but is still statistically significant at the 1 percent level) for median wages, and is statistically insignificant for the 95th percentile wage. For women (not shown here), the same general pattern holds, with wages at the 10th percentile more sensitive to unemployment rates than median wages. For women, however, the 95th percentile wage responds to unemployment, and the point estimate of this elasticity—though smaller than for median wages—is not significantly different from the median wage response.



Table 7: Phillips Hourly Wage Inflation Regressions for Men, 1973–2014

	10th percentile	Median	95 percentile
Unemployment rate	-1.522	-0.887	-0.289
	[6.45]***	[4.14]***	[0.83]
1979-1989	-0.001	-0.002	0.02
	[0.08]	[0.27]	[1.54]
1989-1995	-0.007	-0.017	0.003
	[0.34]	[1.93]*	[0.19]
1996-2001	-0.004	-0.008	0.022
	[0.12]	[0.74]	[1.26]
2002-2007	-0.019	-0.019	0.009
	[0.57]	[1.85]*	[0.52]
2008-2014	0.029	0.001	0.016
	[0.57]	[0.08]	[1.16]
Observations	40	40	40
Minimum wage control	yes	no	no
Productivity (-1)	yes	yes	yes
CPI inflation (-1)	yes	yes	yes

Note: OLS regression of log change in wage. Hourly wages calculated from CPS-ORG Controls for productivity growth and minimum wage levels included in all regressions Coefficient on lagged value of consumer price inflation rate constrained to equal 1.

**** = significant at 1 percent level*

*** = significant at 5 percent level*

** = significant at 10 percent level*

Table 8 displays results from a similar regression of changes in comprehensive household income growth (as measured by the CBO) and unemployment rates. The CBO comprehensive income measure includes market incomes (wages, dividends, rents, and capital incomes) as well as transfer incomes (both cash and in-kind transfers). We examine this to see if, for example, a rise in transfer incomes due to automatic stabilizers might counteract (or even completely swamp) the wage declines accompanying the higher unemployment rates estimated in the previous regressions.


Table 8: Regression Results of Comprehensive Income Growth and Unemployment

	Bottom Fifth	Middle Fifth	Top Fifth	Top 5 percent	Top 1 percent
Unemployment rate, 1979-2007	-1.4***	-1.04***	-.18	-0.26	0.88
	[.4]	[.39]	[1.0]	[.75]	[2.4]
1989-1995	0.015	-0.001	-.014	-0.006	-0.037
	[.01]	[.01]	[.027]	[.02]	[.068]
1996-2001	-0.018	-.005	0.011	0.008	0.032
	[.015]	[.014]	[.037]	[.02]	[.094]
2002-2007	0.003	0.002	0.037	0.029	0.087
	[.013]	[.013]	[.035]	[.027]	[.088]
Unemployment rate, 1979-2011	-0.79**	-0.51*	0.61	0.46	2.1
	[.36]	[.30]	[.93]	[.72]	[2.3]
1989-1995	0.021	0.004	-0.004	0	-0.023
	[.011]	[.011]	[.029]	[.022]	[.07]
1996-2001	-0.001	0.009	0.03	0.028	0.066
	[.014]	[.15]	[.038]	[.029]	[.092]
2002-2007	0.017	0.014	0.054	0.045	0.114
	[.014]	[.014]	[.036]	[.028]	[.088]
2008-2011	0.012	-0.006	-0.06*	-0.042	-0.15*
	[.013]	[.013]	[.032]	[.026]	[.08]

Note: OLS regression of log change in household comprehensive income using data from the Congressional Budget Office. Dependent variable is the annual log-change in (inflation-adjusted) comprehensive household income.

**** = significant at 1 percent level*

*** = significant at 5 percent level*

** = significant at 10 percent level*

Prior to the Great Recession, there does not seem to be much of a compensating effect for comprehensive income growth. The size of the coefficient relating comprehensive income growth to unemployment for the bottom fifth of households is nearly identical to the one relating hourly wage growth for the 10th percentile to unemployment. One thing to note here is that our hourly Phillips wage regressions do not account for the effect of fewer hours worked when the economy slows. We know (based on work by Mishel et al., 2012) that annual hours of work is much more cyclically sensitive for lower-income households, so this effect goes in the opposite direction of counter-cyclical transfers.



Further, in regressions looking at comprehensive income growth, the overall pattern that emerges is that unemployment is more negatively related to income growth the lower down the income distribution one looks. A negative relationship between income growth and unemployment is large and statistically significant for the bottom fifth and middle fifth household income groups, but is statistically insignificant (and positive in magnitude) for higher income groups.

When examining the entire sample period, including the Great Recession through 2011, the relationship between comprehensive income growth and unemployment is substantially attenuated, indicating that transfers did a better job blunting the decline in wages in the post Great Recession period.

HOW EFFECTIVE IS QE IN PUSHING DOWN UNEMPLOYMENT?

To get a sense of how important avoiding large spikes in unemployment can be for measures of inequality, Mishel et al. (2012) replicated the Katz and Krueger (1999) methodology described above to assess what brief periods of high and low unemployment did to hourly wage growth at different points in the wage distribution. They find substantial negative results on hourly wage growth from the high unemployment periods of 1979–1985 and 2006–2011, and substantial positive results on hourly wage growth during the low unemployment period of 1995 to 2000. Their results are replicated in **Table 9**.

**Table 9: Effect of High and Low Unemployment Spells on Wages**

	1979 - 1985 (High unemployment)		1995 - 2000 (Low unemployment)		2006 - 2011 (High unemployment)	
	Men	Women	Men	Women	Men	Women
Panel A: Basic trends (actual change)						
Unemployment rate change	1.4	1.4	-1.6	-1.6	4.3	4.3
Cumulative higher/lower unemployment rate*	13.9	13.9	-5	-5	15.2	15.2
50/10 wage gap (log)	9.6	17.2	-4.1	-1.8	2.7	-0.4
90/50 wage gap (log)	8.7	8	3	1	3.1	2.7
Panel B: Estimated cumulative impact of unemployment on:						
1) Hourly wages**						
Low wage	-25.2%	-18.4%	11.1%	8.2%	-29.4%	-21.5%
Median wage	-11.1	-11.6	4.9	5.2	-13	-13.6
High wage	-6.6	-10.2	2.9	4.6	-7.7	-11.9
2) Wage ratios (log)						
50/10	14.1	6.8	-6.2	-2.9	16.4	7.9
90/50	4.5	1.5	-2	-0.6	5.3	1.7
Panel C: Unemployment contribution to change in:						
50/10 wage gap (log)	146%	39%	150%	168%	617%	-2123%
90/50 wage gap (log)	52	18	-66	-61	169	64
*How much the unemployment rate exceeded or fell below the starting level across the span of the period, measured in percentage points						
** Wages at the 10th, 50th, and 90th percentiles of the wage distribution						
Source: EPI Authors' analysis of Current Population Survey Outgoing Rotation Group microdata and Current Population Survey public data series using model from Katz and Krueger (1999)						

Between 2006 and 2011, Mishel et al. (2012) find that a cumulative 15.2 percent unemployment gap kept nominal wages at the 10th and 50th percentiles 29 and 13 percentage points lower, respectively, at the end of the period than before, compared to declines of just 7.7 percent (not statistically significant) for wages at the 95th percentile.

Estimates in Engen et al. (2015) indicate (see their Figure 12) that between 2009 and 2014, LSAPs provided roughly a 5 percent cumulative decline in excess unemployment. This degree of success in muting unemployment would translate into wages at the 10th and 50th percentiles by the end of 2014 being 10 and 4 percent higher today due to the impacts of the LSAPs, with wages at the 95 percentile being just 2.5 percent higher.



Further, unlike the mechanical effect of LSAPs on asset prices, there is no reason to suspect that the benefits of LSAPs on wage growth will reverse, as long as policymakers wait for the economy to stabilize at full employment before unwinding the asset purchases.

CONCLUSION: EXPANSIONARY MONETARY POLICY STRONGLY REDUCES INEQUALITY

Recent concerns that the Fed's expansionary stance since the onset of the Great Recession may have exacerbated long-running trends towards greater income inequality seem quite misplaced. If a monetary policy stimulus is compared to an equal fiscal policy stimulus that also directly boosts low and moderate incomes through tax cuts or transfers, then it is indeed possible for the monetary stimulus to have less progressive, or possibly regressive, outcomes. However, the scale of any regressive effects stemming from efforts to engage in expansionary monetary policy—particularly measured over any long time period—is much smaller than what is implied in the popular remarks referenced at the beginning of this paper (i.e., Kevin Warsh's claim that the Fed is a "reverse Robin Hood"). The scale of these effects is kept modestly largely because the effects of expansionary monetary policy on asset prices is likely to be unwound in the future as the economy stabilizes at higher output levels and the Fed begins unwinding asset purchases. Further, housing is an asset whose value is likely boosted by LSAPs; it is also the most democratically held asset across wealth classes.

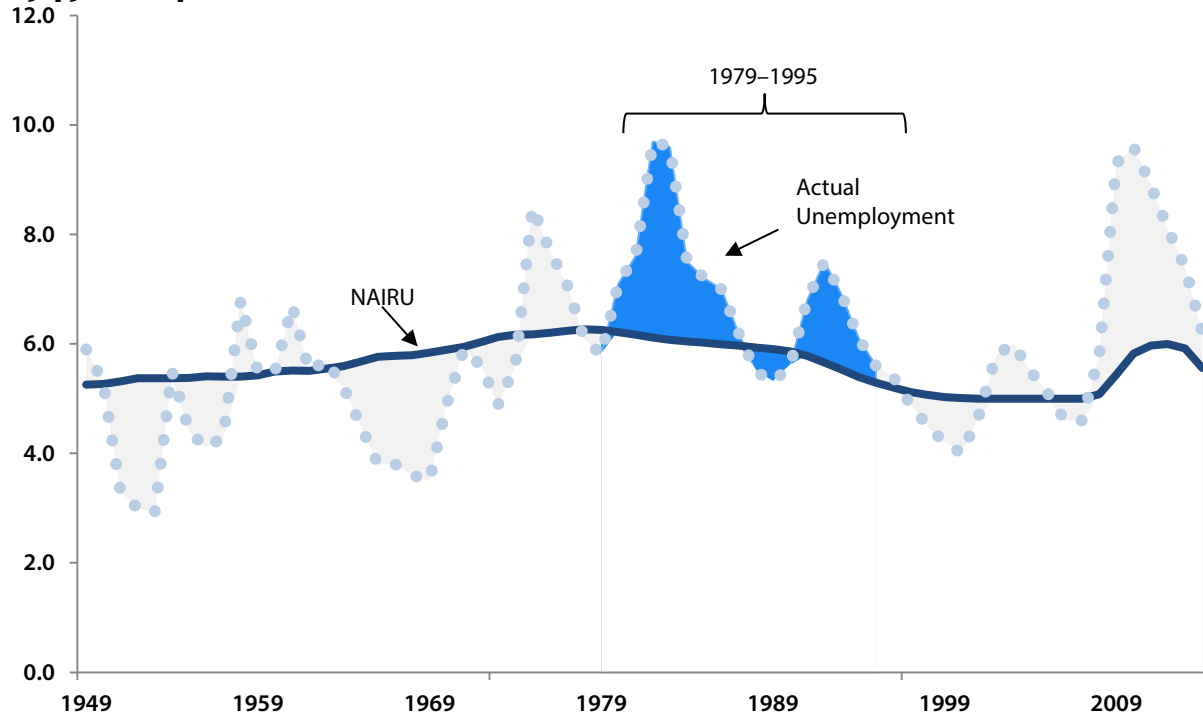
Most importantly, compared to a baseline of no change in fiscal policy, when the economy is operating below potential a monetary stimulus is a strongly progressive policy. The most important distributional effect of expansionary monetary policy is by far the impact that lower unemployment rates have on wages at the bottom and middle of the wage distribution. As weak as wage growth has been since the onset of the Great Recession, it would have been much weaker if monetary policy had been less expansionary. Besides being strongly progressive, wage gains that are realized when expansionary monetary policy keeps unemployment lower than it otherwise would have been are not reversed if monetary policy does not contract before the economy is stabilized near full employment.

However, just because the Fed's actions since 2008 have clearly ameliorated inequality relative to a realistic baseline, it does not mean those concerned about the rise of income inequality would never have grounds to criticize monetary policy. If, for example, the Fed should move monetary policy in a contractionary direction before the economy was stabilized at full employment, this would disproportionately harm the wages of low- and moderate-wage workers. The recent debate about the proper future path of Federal Reserve tightening in the next couple of years, for example, is one in which distributional concerns should rightly be front and center.

Similarly, in the years before the Great Recession, excessively contractionary monetary policy may have played a contributing role in the large rise in earnings inequality that characterized the years between 1979 and 2007. A suggestive piece of evidence in this regard is the amount of time the U.S. economy spent above measures of the natural rate of unemployment since 2007 compared to decades previous (see **Figure 3**).



Figure 3: The NAIRU* versus actual unemployment rate, 1949–2014



Source: Authors' analysis of Congressional Budget Office (2012) and Current Population Series public data series.
 * non-accelerating inflation rate of unemployment (NAIRU)



In short, a central irony of the debate over the distributional consequences of Fed actions since 2008 is that this period began an episode when Fed policies seem unambiguously progressive (from a distributional point of view) after an extended period of more mixed actions.

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