Does inflation targeting increase income inequality?*

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ABSTRACT

We contribute to the growing empirical literature on the impact of monetary policy on income distribution by focusing on the impact on of adopting an inflation targeting (IT) regime to guide monetary policy. We assess the impact the impact employing a panel of 121 advanced and developing economies, including 27 IT adopters, during the period 1971-2015. Our results suggest that IT adoption has contributed to greater inequality of household income as measured by the Gini coefficient and to a reduced share of GDP going to labor compensation. The results are robust to alternative estimation methodologies and to variations in the sample with respect to countries and data frequency.

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Introduction

Income inequality has risen in many countries since the early 1980s (e.g., Piketty 2014; Atkinson 2015), which researchers have associated with a number of adverse effects. These include lower GDP growth in the medium run (Ostry, Berg, and Tsangarides 2014), political instability and protectionist pressures (Dabla-Norris, Kochar, Rick, Suphaphiphat, and Tsounta 2015), limited opportunities for the poor to invest in education and entrepreneurial activity (Jaumotte and Buitron 2015), and higher household indebtedness that can fuel asset market bubbles and financial instability (Kumhof, Ranciere, and Winant 2015). Several reasons have been advanced for the increase in income inequality, such as skills-biased technological change (Jaumotte, Lall, and Papageorgiou 2013; Dabla-Norris et al. 2015), trade and financial globalization (Jaumotte and Buitron 2015; Dabla-Norris et al. 2015), capital account liberalization (Furceri and Loungani 2018), the growth and liberalization of the financial sector (de Haan and Sturm 2017), and the weakening of labor market institutions (Jaumotte and Buitron 2015). One source that has been largely ignored until relatively recently is monetary policy. In part this is because the traditional view has been that distributional issues should be addressed by elected officials through fiscal policy rather than by unelected central bankers (Bernanke 2015). However, following the financial crisis and the unconventional monetary policy measures that several central banks adopted to combat it, a growing body of literature has developed that tries to assess the impact

of monetary policy on income distribution and how monetary policy design might take account of distributional issues.[1]

In this paper we focus on the impact on income distribution of a particular monetary policy regime—that of inflation targeting (IT). Specifically, we assess the impact of IT on income distribution in a panel data of 121 advanced and developing economies, including 27 IT adopters, during the period 1971-2015. Our research is motivated by three factors. First, although the impact of monetary policy on income inequality is highly topical, the role that an IT regime might play in this has received very little attention in the literature. This is unfortunate since IT has proven to be a highly popular monetary policy regime, having been adopted by at least 38 countries since New Zealand first did so in 1989. Second, evaluations of IT regimes have generally been in terms of how well they have done in terms of reducing the rate and variability of inflation whilst other (including distributional) effects having been largely ignored.[2] Third, economic theory offers us a least two frameworks to guide empirical work examining the likely distributional effects of an IT regime. The framework of New Consensus Macroeconomics (NCM) would generally expect an IT regime to have uncertain effects on income distribution in the short run and little no effects in the long run. In contrast, in the Post Keynesian economics framework, an IT regime would be expected to have adverse effects in the short and long-run. We assess the impact of IT on economic distribution in the context of these two theoretical approaches.

[1] See Colciago, Samarina, and de Haan (2018) for a detailed survey of the relevant literature.
[2] See, for example, Arestis and Sawyer (2003), Ball and Sheridan (2003), Angeriz and Arestis (2006) and Thornton (2016) for assessments of the impact of IT on inflation.

Our results suggest that IT matters for income distribution. In particular, IT appears to have contributed to greater inequality of household income as measured by the Gini coefficient and to a reduced share of GDP going to labor compensation, a result which is robust to alternative estimation methodologies and to variations in the sample with respect to countries and data frequency. This result is more or less what might be expected from the perspective of Post Keynesian economics, especially with the weakening of labor market institutions and the liberalization of product markets in many countries in recent years. In the context of NCM, this means making the IT regime sufficiently flexible to embrace short-run employment objectives and to accompany IT adoption with an aggressive a fiscal policy designed to neutralize or reverse harmful distributional effects. In the Post-Keynesian framework, the IT regime would be in the service of short- and long-run employment objectives with distributional issues being dealt with by fiscal policy and heterodox measures such as prices and incomes policies.

The rest of the paper is organized as follows. In the next section, we examine briefly what economic theory tells us about the likely impact of IT on income inequality and we discuss the practice of IT and recent developments in income distribution. This is followed by a review of recent empirical studies on the distributional effects of monetary policy, including the few studies that relate specifically to the impact of IT. We then introduce our methodology and data for assessing the impact of adopting an IT regime on income distribution and present our empirical results. A final section offers some conclusions.

IT and income distribution: theory and practice

Theory

IT is relatively straightforward in theory (e.g., Bernanke and Mishkin 1997; Heenan, Peter, and Roger 2006). The authorities (central bank, government or both) set a numerical target for the rate of inflation. The central bank forecasts the future path of inflation and compares it with the target rate and the difference between the forecast and the target determines how interest rates have to be adjusted. For IT to be effective, the central bank must be free to choose the instruments (mainly interest rates) to achieve the target and monetary policy should target only the rate of inflation and ignore other indicators (e.g., the level of employment, or the exchange rate), and it should be clear to the public that hitting the inflation target takes precedence over all other objectives of monetary policy. In addition, IT typically emphasizes achieving the inflation target over the medium term (e.g., two to three years) to provide a rule-like framework within which central banks have the discretion to react to shocks. These essential elements of the operating framework for an IT regime can be accommodated by both NCM and Post Keynesian theories, though the ultimate role of IT regime and its impact on income distribution differ in each.

Arestis and Sawyer (2003) demonstrate how an IT regime fits neatly into NCM. That model emphasizes a supply-side determined equilibrium level of unemployment (the “natural rate” of unemployment), demand-determined inflation, equilibrium values of real variables independent of the money supply, sticky prices in the short-run but full price flexibility in the long run (vertical

Philips Curve), and an operating rule for monetary policy that stipulates that the nominal rate of interest is the sum of the real interest rate and expected inflation (see, e.g., Goodfriend and King 1997). The monetary policy rule incorporates a symmetric approach to inflation targeting whereby inflation above the target dictates higher interest rates to contain inflation and inflation below the target requires lower interest rates to increase inflation. In this setting, any effects of an IT regime on income distribution are confined to the short-run and would stem from the transitory effects of monetary policy on "real" variables. However, the nature and size of these transitory effects, the timeline over which they manifest themselves, and the mechanisms through which they are transmitted are unclear. Several channels have been proposed by which the NCM model might affect income inequality, but the impact of each channel depends on the distribution of population characteristics and the ways in which these are associated with different types of household income, assets and liabilities.[3] Thus, whether the net effect of IT in the short-run is to increase or reduce income inequality is unclear. In the medium- to longer-term the picture is clearer, however: changes in the policy interest rate have no impact on "real" variables such as unemployment or income distribution. Also, over the medium to longer-run, a properly managed monetary policy promotes greater economic stability and prosperity for the economy as a whole by mitigating the effects of recessions on the labor market and keeping inflation low and stable. In turn, this should be consistent with a broadly stable income distribution. In this setting, the appropriate policy response to addressing distributional concerns

[3] See, for example, Dolado, Motyovszki and Pappa (2018) and Colciago, Samarina, and de Haan (2018) for a discussion of the many channels through which monetary policy might impact income distribution.

is to use taxes and government spending programs and policies aimed at improving workers skills (Bernanke 2015).

Palley (2003), Setterfield (2006), Lima and Setterfield (2008), os Santos (2011) and Tatliyer (2017) all show that IT can be fit into a Post Keynesian framework, but only to target a rate of inflation that supports the level of aggregate demand necessary to achieve full employment.[4] An IT regime has implications for income distribution, but with the exception of the rentier class, which gains (loses) from higher (lower) interest rates, the outcome for labor and profits shares depends in part upon institutional factors. In this model, aggregate demand is a key determinant of the equilibrium values of real variables. There is no unique or "natural" level of unemployment; rather, any level of unemployment can be sustained as an equilibrium, depending on aggregate demand conditions and fiscal policy can be used to achieve aggregate demand objectives. Inflation is driven mainly by changes in the rate of growth of costs, in particular, wage inflation and interest rates, and the Philips Curve allows for an inflation-unemployment trade-off. In this setting, any IT set by the policy authorities will affect the real equilibrium of the economy and the distribution of income in the short and longer term. For example, a lowering of the inflation target would result in an increase in policy interest rates to bring down inflation, which would bring about a reduction in the equilibrium level of real activity and an increase in the costs of production. In terms of distribution, non-wage (rentier) incomes increase at the expense of the industrial profits and wage share. Argitis and Pitelis (2001) argue that in the ensuing process of adjustment between profits and wages industrial capitalists may attempt to compensate the reduction in industrial profits by

[4] However, other Post Keynesian economists argue that it is not possible to incorporate IT within a monetary theory of production (e.g., Arestis and Sawyer (2006).

passing the higher production costs onto prices, which if successful would affect the interclass income distribution between wage and non-wage income at the expense of workers. However, this is by no means certain with the outcome depending on factors such as product market competition and the relative bargaining strength of labor and industrial capital. The appropriate policy response to distributional concerns includes, for example, lower interest rates, fiscal policies that boost employment, progressive taxation reverse, and prices and incomes policies.

Practice

IT as the nominal anchor to control inflation is a popular monetary policy regime. In Table 1, we list 38 countries that over our sample period were so-called "full-fledged" inflation targeters in the sense that they make an explicit commitment to keep inflation to a specified target or range within a specified time frame, they announce regularly their targets to the public, and they have institutional arrangements to ensure that the central bank is accountable for meeting the target (Carare and Stone 2006). We also show the rate of inflation in the year prior to IT adoption, the initial inflation target, the target in 2015 (the last sample year for our empirical work) and the location of each country in the World Bank's country income classification scheme.[5] The table reveals several interesting points. First, both advanced and developing countries have been IT adopters with only 15 of the 38 countries listed falling into the World Bank's high income country classification. Second, there have been differences in approach to IT, with some countries opting

[5] The World Bank's classification scheme for 2015 defined low-income economies are defined as those with a GNI per capita, of $1,025 or less in 2015; lower middle-income economies are those with a GNI per capita between $1,026 and $4,035; upper middle-income economies are those with a GNI per capita between $4,036 and $12,475; high-income economies are those with a GNI per capita of $12,476 or more.

for a point target, a target range, or targets with a symmetrical range around a midpoint. Third, for the most part, a relatively low rate of inflation was targeted in the year of IT adoption and most countries targeted a rate of inflation lower than that experienced in the year prior to adoption of (though not necessarily lower than forecast inflation), thereby signaling a need to tighten monetary policy.[6] Finally, having chosen their targets, most countries left them unchanged suggesting that although central banks sometimes specified different time horizons for the target, in practice this has made little difference to the operation of monetary policy. More generally, although there is plenty of evidence to suggest that the inflation performance of countries with IT regimes has been no better than that of countries pursuing other anti-inflation policies (see, e.g., Ball and Sheridan 2003; Angeriz and Arestis 2006; Thornton 2016), the regime has proven to be remarkably resilient. As far as we are aware, only Argentina—after a very short-lived experiment and without the so-called perquisites for IT adoption being in place—has abandoned IT, while Finland, Spain, and the Slovak Republic did stop but in these cases the IT regime was always a temporary phenomenon aimed at helping them achieve their goal of adopting the euro as their domestic currency.[7] Moreover, IT continued attract new adherents beyond our sample period (i.e., 2015), especially among developing economies (e.g., Gambia, Jamaica, Tanzania).

[6] For the countries listed in Table 1, the average of the mid-point and point inflation targets in the year of IT adoption was 3.9% and the average rate of inflation in the years prior to adoption was 7.2%.

[7] Argentina adopted IT in September 2016 but abandoned two years later. See Cachanosky and Mazza (2021) for a discussion of the reasons Argentina abandoned IT.

In Table 2 we summarize trends in income distribution for IT-adopters and non-adopters over the sample period.[8] In spite of the controversy generated by recent trends in income distribution in some countries, for many of them changes were more marked during 1971-1995 than during 1996-2015. For IT-adopters (panel A), the median increase in the Gini coefficient fell from 3.02 percentage points to 0.16 percentage points, though there was considerable variation around these figures. For example, In the earlier period, inequality increased particularly sharply in Australia (7.38 percentage points), Poland (7.36 percentage points) and the UK (13.92 percentage points). In the later period, income inequality increased the creases in the later period with an especially large increases in Hungary (7.96 percentage points), Indonesia (7.0 percentage points), and Iceland (5.20) percentage points. Several countries also made considerable progress in reducing income inequality in the later period with quite sharp declines in the Gini coefficient taking place in Brazil (6.56 percentage points), Chile (5.20 percentage points) and Turkey (5.8 percentage points). For the non-IT targeter countries the median deterioration in income inequality was actually larger than for the IT targeters in both periods, though there was again considerable variation around the median.

Changes in the labor share of income were relatively modest for both groups of countries over both time periods, with the median change indicating a marginal deterioration for both in the later period. Summary statistics for all the key variables are reported in the appendix Table A1.

[8] We begin our sample in 1971 to provide a reasonable number of pre-IT adoption observations to include New Zealand (a very early adopter) in our list of IT adopter countries.

The empirical literature

The empirical literature on the impact of monetary policy on income distribution is not conclusive. The earliest studies focused on the impact of inflation without specifying the channel of influence on income distribution. For example, Easterly and Fischer (2001) use polling data for households in 38 countries and find that inflation hurts poor households who are more reliant on state-determined income that is not fully indexed to inflation; they also report that inflation reduces the real minimum wage and transfers to the bottom quintiles of the income distribution, whereas rich households are less affected. Romer and Romer (1998) examine the effects of monetary policy on the well-being of the poor in the short run based on the relation of poverty to unemployment and inflation in the US, and in the long run based on cross-country regressions of income shares of the poor on inflation. They report that the short-run and long-run relationships go in opposite directions: time-series evidence from the US shows that a cyclical boom created by expansionary monetary policy is associated with improved conditions for the poor in the short run, whereas cross-section evidence from a large sample of countries shows that low inflation and stable aggregate demand growth are associated with improved well-being of the poor in the long run. They conclude that because the cyclical effects of monetary policy are inherently temporary a monetary policy that aims at low inflation and stable aggregate demand is likely to permanently improve conditions for the poor. Bulíř and Gulde (1995) use pooled cross country and single country time series models and report that the level of inflation, inflation variability, and the variability of the nominal exchange rate impact negatively on income equality, with the impact depending in part on a country's level of development and the

sophistication of its financial structure. Finally, Galli and von der Hoeven (2001) find a U-shaped relation in a panel of 15 OECD countries wherein expansionary monetary policy reduces income inequality when initial inflation is low but increases it when inflation is above a certain threshold.

Several more recent studies focus on the impact of monetary policy shocks (expansions or contractions) on income distribution. For example, Coibion, Gorodnichenko, Kueng, and Silvia (2017) study the effects of monetary policy shocks in the US over the period 1980Q1-2008Q4 and report that a tightening of monetary policy systematically increases inequality in labor earnings, total income and consumption; Mumtaz and Theophilopoulou (2015) find that contractionary monetary policy shocks lead to a significant deterioration in earnings and income inequality in the UK over 1968-2008; Guerello (2018) reports that expansionary monetary policy measures had a small contractionary effect on income distribution in panel a panel of euro area countries over 1999-2014; and Furceri, Loungani and Zdzienicka (2018) employ a panel of 32 advanced and emerging market countries over the period 1990-2013 and find that the effect of monetary policy tightening on income inequality is larger in countries with high labor income shares in total income. Other papers find that expansionary monetary policy is associated with higher income inequality. For example, Cloyne, Ferreira, and Surico (2020) draw on US household survey data over 1981-2007 and report that expansionary monetary policy raises incomes for mortgagors relatively more than for other groups, which could increase inequality. Inui, Sudo, and Yamada (2017) construct income and inequality measures using micro data on Japanese households over the period 1981 to 2008 and report that an expansionary monetary policy shock increases income inequality through a rise in earnings inequality because of labor market rigidities and nominal

wage stickiness, though their result is not stable over time. O'Farrell, Rawdanowicz, and Inaba (2016) focus on the effects of monetary policy on inequality in OECD countries over the period 2007-2010 via the impacts on asset prices and report that policy easing has only small and diverse effects on income inequality; they also argue that monetary policy might be less effective in reducing income inequality in downturns than increasing it in upturns. Furceri and Loungani (2018) report that unanticipated changes in policy interest rates have an asymmetric effect in income inequality over the business cycle in a panel of 32 advanced and emerging market countries, with increases in rates raising inequality more than reductions in rates lower it. Finally, a few studies examine the effects of monetary policy easing on income distribution via large-scale asset purchases by central banks. For example, Montecino and Epstein (2015) employ data from the US Survey of Consumer Finances covering the period 2007-2013 and report that though the resulting increase in employment reduced income inequality, these effects were smaller than the inequality-raising effects of equity price appreciations; Saiki and Frost (2014) use household survey data from Japan and report that income inequality widened after 2008 largely due to asset prices rising disproportionally compared to wages and employment. In contrast, Inui, Sudo, and Yamada (2017) estimate the response of income and consumption measures in Japan over the period 1981-2008 and report that central bank asset purchases had insignificant distributional effects.

There is very little empirical work that treats explicitly the role of inflation targets in affecting income distribution. Dolado, Motyovszki, and Pappa (2018) incorporate a capital-skill complementarity idea into a New Keynesian model and examine the performance of different

systematic monetary policy rules in the face of shocks in the US over the period 1979-2016. They find that strict inflation targeting is more successful in stabilizing the economy and limiting variations in relative income shares than the other rules considered. Rochon and Rossi (2006) compare developments in the wage share of national income in ten inflation targeter countries before and after the adoption of inflation targeting. They report that the distribution of wage income worsened for eight of the ten countries and substantially so in the case of three of them (Finland, Canada and New Zealand); however, the wage share increased quite sharply in Switzerland and Iceland, the latter of which they attribute to the accommodative nature of the inflation target. Finally, in the Coibion, Gorodnichenko, Kueng, and Silvia (2017) study discussed above, the authors consider a monetary policy tightening from a change in the Federal Reserve's implied inflation target and show that permanent reductions in it systematically increase income inequality.

Methodology and data

We are interested in the within country relationship between inflation targeting adoption and income inequality and estimate a panel model that takes the following form:

$$inq_{it} = \alpha_i + \theta_t + \beta IT_{it} + \gamma X_{i,t-1} + \mu_{it} \quad (1)$$

Our dependent variable, inq_{it} , is either the Gini coefficient based on households' income before taxes or the labor share of compensation in GDP, α_i is country i's specific or fixed effects on

income distribution, θ_t is the time fixed effects, IT_{it} is a dummy variable that takes the value of 1 if the authorities have committed publicly to meeting a numerical target range for the rate of inflation and 0 otherwise. IT_{it} includes 27 of the IT adopter countries listed Table 1, the other 11 countries having been omitted either because of insufficient data observations for all the variables or because they adopted IT only very late in the sample period.[9] $X_{i,t}$ is a vector of control variables thought to impact on income distribution, μ_{it} is a random error term, and "*i*" and "*t*" indicate the individual country and time period, respectively. Data for the Gini coefficient is from Solt's (2009) Standardized World Income Inequality Database (SWIID).[10] We follow de Haan and Sturm (2017) and use household income before taxes to proxy for income inequality before redistribution via the tax system. The labor share of national income is from the Penn World Tables (Feenstra, Inklaar, and Timmer 2015). The control variables in $X_{i,t}$ are typical of the related literature and include: the real per capita GDP growth rate, because low growth is associated with greater income inequality (Piketty 2014); the rate of inflation, because inflation adds to economic uncertainty and can depress both average incomes and the incomes of the poor (Romer and Romer 1998); the ratio of foreign trade to GDP, because theory and much empirical evidence supports the view that trade liberalization is poverty-alleviating in the long run and on average (Winters, McCulloch, and McKay 2004); the Chinn and Ito (2006) index of financial openness because episodes of capital account liberalization has been shown to increase income inequality (Furceri and Loungani 2018); the ratio of government final consumption to GDP, because the median voter theory of government size predicts that greater inequality leads to greater demand for redistribution and larger government (Meltzer and Richard 1981); an index of representative government to capture the

[9] The omitted IT adopters are the Dominican Republic, Georgia, India, Japan, Kazakhstan, Moldova, Paraguay, Russia, Serbia, Uruguay and Uganda.

[10] As the SWIID standardizes incomes it facilitates comparison across countries. We follow de Haan and Sturm (2017) and use household income before taxes to proxy for income inequality before redistribution via the tax system.

impact of voter rights, because democracy is expected to increase redistribution and reduce inequality (Acemoglu, Naidu, Restrepo, and Robinson 2015); and a dummy variable to control for the impact of economic crisis, because the conventional wisdom is that the poor suffer disproportionately from recessions following financial crises (de Haan and Sturm 2017).[11] We employ annual data for 121 countries for the period 1971-2015 with the data organized into five-year non-overlapping periods. We use five-year non-overlapping averages for two reasons. First, annual macroeconomic data are noisy, and this applies especially for data on income inequality. Second, the annual income inequality data in SWIID are imputed for years for which no information was available in the underlying databases (in particular, measures of inequality for much of Africa, Latin America, and Asia are infrequent).

We initially estimate panel regressions with fixed country and year effects with the independent variables lagged one (five-year) period to limit endogeneity issues.[12] In the case of the inflation target, the endogeneity problem might result, for example, if countries with greater inequality were more liable to adopt populist policies including higher inflation targets. In this case, inflation target adoption would be partly driven by income inequality rather than the converse. A second potential source of endogeneity is omitted variable bias, since we are certainly not controlling for all the determinants of income inequality. In addition, we try to obtain consistent estimates of the impact

[11] Data on GDP growth, trade, and inflation are from the World Bank's World Development Indicators database. The index of representative government captures contested and inclusive popular elections for legislative and executive office and is produced by the International Institute for Democracy and Electoral Assistance. The economic crisis dummy variable ranges between 0 to 3 for each year depending upon whether a country experienced no crisis or one or more of a systemic banking crisis, a currency crisis, or a sovereign debt crisis and is based on Laeven and Valencia (2013).

[12] We favored fixed effects because the determinants of income distribution are not well understood and are likely to be many suggesting a strong possibility of omitted variable bias and because our independent variables show reasonably variation over time and are not likely to be highly correlated with the unit fixed effects. The p-value of a Hausman test comparing random and fixed effects estimates of equation (1) suggest that the fixed effects estimates are more efficient.

of inflation target adoption on income distribution by using the dynamic system Generalized Method of Moments (GMM) methodology (e.g., Arellano and Bond 1991; Blundell and Bond 1998). This estimator potentially improves on traditional fixed-effects estimates in at least two important ways. First, unlike traditional fixed-effects estimates, it allows current income inequality to be influenced by previous realizations of, or shocks to, past income inequality. Second, if the underlying economic process is itself dynamic—in our case, if current income inequality is related to past performance—then it may be possible to use some combination of variables from a country's history as valid instruments for current income inequality to account for simultaneity. Thus, an important aspect of the methodology is that it relies on a set of "internal" instruments contained within the panel itself: past values of income inequality and performance can be used as instruments for current realizations of income inequality, which eliminates the need for external instruments.

Empirical results

Prior the estimation of equation (1), we check (but do not report) the stationarity of the variables using the panel unit root test suggested by Levin, Lin, Chu (2002), and we test for cross-sectional dependence using the Pesaran (2021) cross-sectional dependence test. We find that for each variable the null hypothesis that the panels contain a unit root is rejected, whereas the null hypothesis of cross-section independence is not rejected.[13] In Table 3, we report fixed effects panel estimates of the impact of inflation targeting on income inequality for all countries in the

[13] The results of these tests are available on request.

sample. Columns (1) to (4) report results in which the Gini coefficient is the dependent variable. We begin with an estimate in which the IT dummy is the only independent variable and add the controls sequentially. In each estimate the coefficient on IT is positive and statistically significant at the 1% level, indicating that inflation targeting regimes are associated with greater income inequality (i.e., an increase in the Gini coefficient). To the extent that IT regimes have led many countries to tighten monetary policy, this result is consistent with recent research finding that one result of the policy is to systematically increases inequality in labor earnings. Specifically, the coefficients on IT indicate that an inflation target is associated with an increase in the Gini measure of inequality of between 3.6 to 7.6 percentage points. Of the other explanatory variables, only the growth of real GDP appears to reduce income inequality. In contrast, the financial crisis, trade and capital account openness and, perhaps surprisingly, more representative governments and government consumption expenditure appear to promote greater income inequality. In the latter case, government consumption spending may be a poor proxy for social spending aimed at reducing income inequalities, but it may also indicate that much of the spending on transfers is captured by the middle class (Milanovic 1994; Davoodi, Tiongson, and Asawanuchit 2003). The coefficients on inflation are never statistically significant. Columns (5) to (8) report the results when the labor share of compensation in GDP is the dependent variable. In each estimate the coefficient on the IT dummy is negative and statistically significant at the 1% level, indicating that inflation targeting regimes are associated with a reduction in the share of GDP going to labor compensation, with the share falling between 2.5 to 4.5 percentage points. In this case, growth of GDP per capita, government consumption, representative government, and trade and capital account openness all appear to favor a shift in

compensation away from labor, whereas the coefficients on inflation and the financial crisis dummy are not statistically significant.

In Table 4, we report the results from the system GMM estimates. The results differ little from the fixed effects estimates: in particular, the coefficients on the inflation target dummy are always positive and highly significant and indicate that inflation targeting increases the Gini coefficient (by between 4.3 to 5.0 percentage points) and reduces the share of labor compensation in GDP (by between 4.3 to 13.2 percentage points). The impact of the control variables is also broadly similar. For the Gini measure, where the coefficients on the control variables are statistically significant, the growth of per capita GDP reduces income inequality while government consumption, trade and capital account openness, and the financial crisis dummy all increase it. Interestingly, in this estimate, inflation also increases income inequality. For labor compensation, all the statistically significant control variables act to reduce its share in GDP. In both sets of estimates, the Arellano-Bond test statistics suggest no evidence of serial correlation at orders 1 and 2, and the Sargan test statistics do not reject the null hypothesis that the overidentifying restrictions are valid. Thus, the results in Tables 3 and 4 are consistent with IT regimes impacting adversely on income distribution, and with the views of Atesoglu and Smithin (2006), Argitis and Pitelis (2001), Rochon and Rossi (2006) that inflation targeting results in greater inequality in labor earnings and favors rentier and profit income shares relative to the labor income share.

Robustness

We subject our results two robustness tests. First, about one-half of the IT adopters are high-income countries according to the World Bank's country income classification scheme (Table 1). Focusing on the sample of high-income country comparators is challenging as several of them—including the Eurozone countries, the United States, and Switzerland—are often classified as inflation targeters even though their central banks have not formally adopted IT regimes. This tends to bias the sample against finding a significant coefficient on the IT dummy for this sample of countries. Nonetheless, we test the robustness of our results to the high-income country sample by estimating equation (1) for these countries only. The fixed effects and GMM results are reported in Tables 5 and 6, respectively and are broadly similar to those for the full sample of countries. In particular, the coefficient on IT adoption has a positive and statistically significant impact on the Gini coefficient in both sets of results, though the size of the coefficients is somewhat smaller than those for the full sample. In the estimates of the labor share of compensation, the coefficient on IT adoption is again negative though not always statistically significant in the fixed effects estimates. Nonetheless, the results for high-income countries strongly support the conclusion that IT adoption has been associated with an increase in income inequality and a decline in the labor share of compensation in GDP.

Second, although the quality and frequency of data on income inequality lead us to have serious doubts about using annual data on income inequality in estimates, we nonetheless test the robustness of our results in this regard. In spite of our reservations, the use of annual data does at least allow us to be more precise in specifying the timing of IT adoption in the estimates and

hence its impact on income distribution. As we suspect that fixed effects results in this case will be biased because of endogeneity, we focus on the results from the system GMM estimates, which are reported in Table 7. They show that our key result is robust to the use of annual data: IT adoption was associated with an increase in the Gini coefficient and a decline in the share of labor compensation in GDP.

Conclusions

There is a substantial literature seeking to explain the deterioration in income inequality in many countries in recent years. The literature has included a greater recognition of the role that might have been played by monetary policy, but little research has examined the specific role of IT regimes. This paper has contributed to filling that gap in the literature. Our results from employing a panel of 121 advanced and developing economies indicate that IT adoption has been associated with a worsening of income distribution measured by the Gini coefficient and a decline in the labor share of national income relative to the profits share. These results runs counter to what might be expected from the NCM framework but are consistent with Post-Keynesian theory, especially in the context of weaker labor market institutions and more competitive product markets in many countries. Many studies have shown that greater inequality in income distribution has a variety of adverse economic effects. As such, we believe that IT adoption should be accompanied by policies to contain any adverse distributional effects. These policies should embrace progressive taxation, the strengthening of social safety nets, and structural reforms aimed at strengthening the bargaining power of labor.

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Table 1. Inflation targeters, adoption year, targets, and income classification

	Year IT adopted	Inflation in pre-adoption year (%)	Adoption target (%)	2015 target (%)	World Bank country classification, 2015
Albania	2009	3.36	3 (+/− 1)	3 (+/− 1)	Upper middle income
Armenia	2006	2.89	4 (+/− 1.5)	4 (+/− 1.5)	Lower middle income
Australia	1993	1.01	2 to 3	2 to 3	High income
Brazil	1999	3.19	4.5 (+/− 2)	4.5 (+/− 2)	Upper middle income
Canada	1991	5.62		2 (+/− 1)	High income
Chile	1999	3.34	3 (+/− 1)	3 (+/− 1)	High income
Colombia	1999	18.68	15	3 (+/− 1)	Upper middle income
Czech Republic	1997	8.76	5.5 to 6.5	2	High income
Dominican Republic	2012	8.46	4 (+/− 1)	4 (+/− 1)	Upper middle income
Ghana	2007	18.91	8.5 (+/− 2)	8 (+/− 2)	Lower middle income
Georgia	2009	10.00	3 to 7	3	Upper middle income
Guatemala	2005	9.1	4 (+/− 1)	4 (+/− 1)	Lower middle income
Hungary	2001	9.8	3	3	High income
Iceland	2001	5.14	2.5 (+/− 1.5)	2.5 (+/− 1.5)	High income
India	2015	6.35	4 (+/− 2)	4 (+/− 2)	Lower middle income
Indonesia	2005	6.06	5 (+/− 1)	4 (+/− 1)	Lower middle income
Israel	1997	11.35	2 (+/− 1)	2 (+/− 1)	High income
Japan	2013	-0.05	2	2	High income
Kazakhstan	2015	6.72	4	4	Upper middle income
Korea	1998	4.44	3 (+/− 1)	2 (+/− 1)	High income
Mexico	2001	16.58	3 (+/− 1)	3 (+/− 1)	Upper middle income
Moldova	2013	4.55	5 (+/− 1.5)	5 (+/− 1.5)	Lower middle income
New Zealand	1989	6.36	1 to 3	1 to 3	High income
Norway	2001	3.08	2.5 (+/− 1)	2 (+/− 1)	High income
Paraguay	2011	4.65	4 (+/− 2)	4.5	Upper middle income
Peru	2002	1.98	2 (+/− 1)	2 (+/− 1)	Upper middle income
Philippines	2002	5.34	4 (+/− 1)	4 (+/− 1)	Lower middle income
Poland	1998	14.91	2.5 (+/− 1)	2.5 (+/− 1)	High income
Romania	2005	11.87	3 to 6	2.5 (+/− 1)	Upper middle income
Russia	2105	7.82	4	4	Upper middle income
Serbia	2006	16.12	4 (+/− 1.5)	4 to 8	Upper middle income
South Africa	2000	5.18	3 to 6	3 to 6	Upper middle income
Sweden	1995	2.16	2	2	High income
Thailand	2000	0.28	0.5 to 3	2.5 (+/− 1)	Upper middle income
Turkey	2006	8.6	5.5 (+/− 2)	5 (+/− 2)	Upper middle income
Uganda	2011	3.98	5 (+/− 2)	5 (+/− 2)	Lower income
United Kingdom	1992	7.46	2.5	2.5	High income
Uruguay	2007	6.40	3 to 7	3 to 7	High income

Sources: Hammond (2012); Roger (2010); central bank web sites; World Bank World Development Indicators; World Bank Country Income Classification, 2015.

Table 2. Changes (percentage points) in income distribution in inflation targeting and non-targeting countries, 1971-2015

	1971-1995	1996-2015
A. IT-adopters		
Change in Gini coefficient (percentage points)		
Mean change	3.16	-0.17
Median change	3.02	0.16
Standard deviation of change	3.27	3.95
Maximum change	13.92	7.60
Minimum change	-1.76	-6.90
Change in labor compensation share (percentage points)		
Mean change	-0.03	-0.03
Median change	0.00	-0.02
Standard deviation of change	0.06	-0.05
Maximum change	0.03	-0.06
Minimum change	-0.20	-0.15
B. Non-IT adopters		
Change in Gini coefficient (percentage points)		
Mean change	1.08	-0.37
Median change	0.50	0.24
Standard deviation of change	2.41	3.87
Maximum change	8.02	7.20
Minimum change	-5.38	-8.75
Change in labor compensation share (percentage points)		
Mean change	-0.01	-0.03
Median change	0.00	-0.01
Standard deviation of change	0.04	0.06
Maximum change	0.07	0.19
Minimum change	-0.23	-0.20

Notes. Based on data in Solt (2009) and Feenstra, Inklaar, and Timmer (2015).

Table 3. Fixed effects panel estimates of the impact of inflation targeting on the distribution of income

	Dependent variable: Gini coefficient				Dependent variable: labor compensation share of GDP			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inflation targeter	0.0761***	0.0451***	0.0360***	0.0373***	-0.0448***	-0.0301***	-0.0246***	-0.0247***
	(0.0080)	(0.0090)	(0.0089)	(0.0089)	(0.0063)	(0.0069)	(0.0070)	(0.0070)
Growth of GDP per capita		-0.0014**	-0.0015**	-0.0015**		-0.0021***	-0.0023***	-0.0023***
		(0.0007)	(0.0007)	(0.0007)		(0.0005)	(0.0005)	(0.0005)
Government consumption		0.2295***	0.2257***	0.2214***		-0.1516***	-0.1433**	-0.1443**
		(0.0756)	(0.0742)	(0.0739)		(0.0622)	(0.0624)	(0.0625)
Representative government		0.1209***	0.0684***	0.0710***		-0.0017***	-0.0014***	-0.0014***
		(0.0005)	(0.0005)	(0.0005)		(0.0004)	(0.0004)	(0.0004)
Inflation		-0.0106	0.0100	0.0047		0.0162	0.0028	0.0023
		(0.0146)	(0.0148)	(0.0149)		(0.0118)	(0.0122)	(0.0123)
Trade openness			0.0384***	0.0385***			-0.0201*	-0.0203*
			(0.0141)	(0.0141)			(0.0115)	(0.0115)
Capital openness			0.0079***	0.0078***			-0.0051***	-0.0052***
			(0.0023)	(0.0023)			(0.0019)	(0.0019)
Financial crisis				0.0161***				0.0014
				(0.0056)				(0.0046)
Intercept	-0.8072***	-0.8420***	-0.8585***	-0.8600***	0.5626***	0.6108***	0.6211***	0.6212***
	(0.0018)	(0.0162)	(0.0175)	(0.0174)	(0.0016)	(0.0136)	(0.0147)	(0.0147)
Adjusted R^2	0.067	0.078	0.108	0.119	0.060	0.121	0.145	0.145
Observations	710	710	710	710	710	710	710	710

Note: ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 4. System GMM estimates of the impact of inflation targeting on the distribution of income

	Dependent variable: Gini coefficient				Dependent variable: labor compensation share of GDP			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lag of dependent variable	0.9182***	0.8936***	0.7990***	0.8517***	0.3405***	0.4758***	0.5791***	0.0617***
	(0.0313)	(0.0256)	(0.0381)	(0.0438)	(0.1144)	(0.0812)	(0.0905)	(0.0855)
Inflation targeter	0.0501***	0.0493***	0.0427***	0.0426***	-0.1324***	-0.1168***	-0.0427***	-0.0453***
	(0.0097)	(0.0130)	(0.0130)	(0.0174)	(0.0365)	(0.0352)	(0.0229)	(0.0223)
Growth of GDP per capita		-0.0027***	-0.0047***	-0.0042***			-0.0017***	-0.0016**
		(0.0007)	(0.0010)	(0.0011)			(0.0006)	(0.0008)
Government consumption		0.2839***	0.2083***	0.2274***			-0.1944*	-0.1398*
		(0.0653)	(0.0719)	(0.0755)			(0.1089)	(0.0834)
Representative government		-0.0051	-0.0726	-0.0249			-0.2564***	-0.1886*
		(0.0517)	(0.0459)	(0.0521)			(0.0923)	(0.0989)
Inflation		0.0305***	0.0356***	0.0275*			-0.0368*	-0.0491**
		(0.0071)	(0.0134)	(0.0148)			(0.0222)	(0.0233)
Trade openness			0.0373**	0.0384**			-0.0052	-0.0103
			(0.0150)	(0.0164)			(0.0133)	(0.0124)
Capital openness			0.0106***	0.0081**			0.0015	0.0004
			(0.0035)	(0.0037)			(0.0046)	(0.0052)
Financial crisis				0.0485***				-0.0031**
				(0.0141)				(0.0014)
Intercept				-0.1456***	0.3769***	0.3743***	0.3247***	0.2878***
				(0.0398)	(0.0651)	(0.0583)	(0.0599)	(0.0615)
Observations	710	710	710	710	710	710	710	710
Arellano-Bond test for AR(1)	0.010	0.026	0.012	0.001	0.045	0.002	0.001	0.001
Arellano-Bond test for AR(2)	0.159	0.168	0.177	0.121	0.277	0.233	0.233	0.388
Sargan test for over-identification	0.457	0.360	0.346	0.088	0.325	0.441	0.441	0.528

Note: Arellano-Bond test (p-values) for AR(1) and AR(2) are the test for the absence of autocorrelation of the error terms at first and second order, respectively.
The Sargan test (p-value) is the test of the null hypothesis that the over-identifying restrictions are valid.
***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5. Fixed effects panel estimates of the impact of inflation targeting on the distribution of income in high-income countries

	Dependent variable: Gini coefficient				Dependent variable: labor compensation share of GDP			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inflation targeter	0.1324***	0.0682***	0.0682***	0.0713***	-0.0337***	-0.0186**	-0.0079	-0.0077
	(0.0110)	(0.0118)	(0.0118)	(0.0116)	(0.0067)	(0.0081)	(0.0078)	(0.0079)
Growth of GDP per capita		-0.0033*	-0.0033*	-0.0034*		0.0002	0.0000	-0.0001
		(0.0018)	(0.0018)	(0.0018)		(0.0013)	(0.0012)	(0.0013)
Government consumption		0.8956***	0.6686***	0.6528***		-0.1750	-0.0526	-0.0443
		(0.1938)	(0.1923)	(0.1894)		(0.1296)	(0.1353)	(0.1369)
Representative government		0.2615***	0.1737*	0.1684*		-0.1493**	-0.1057*	-0.1061*
		(0.0973)	(0.0944)	(0.0930)		(0.0651)	(0.0633)	(0.0639)
Inflation		-0.0641**	-0.0315	-0.0378		0.0237	-0.0017	-0.0003
		(0.0263)	(0.0254)	(0.0251)		(0.0176)	(0.0169)	(0.0172)
Trade openness			0.0692***	0.0701***			-0.0309*	-0.0340*
			(0.0193)	(0.0190)			(0.0180)	(0.0193)
Capital openness			0.0095***	0.0079**			-0.0105***	-0.101***
			(0.0036)	(0.0036)			(0.0025)	(0.0026)
Financial crisis				0.0254***				-0.0038
				(0.0089)				(0.0064)
Intercept	-0.8321***	-1.0005***	-1.0065***	-1.0045***	0.6018***	0.6455***	0.6565***	0.6481***
	(0.0034)	(0.0434)	(0.0438)	(0.0431)	(0.0021)	(0.0291)	(0.0318)	(0.0323)
Adjusted R^2	0.311	0.376	0.463	0.482	0.074	0.098	0.246	0.145
Observations	234	234	234	234	234	234	234	234

Note: ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 6. System GMM estimates of the impact of inflation targeting on the distribution of income in high-income countries

	Dependent variable: Gini coefficient				Dependent variable: labor compensation share of GDP			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lag of dependent variable	0.6688***	0.4652***	0.5423***	0.4321***	0.4756***	0.5183***	0.7423***	0.7459***
	(0.0186)	(0.0574)	(0.0561)	(0.0656)	(0.0787)	(0.0642)	(0.0452)	(0.0369)
Inflation targeter	0.0062***	0.0670***	0.0203**	0.0302***	-0.0667***	-0.0449***	-0.0429***	-0.0455***
	(0.0074)	(0.0181)	(0.0098)	(0.0107)	(0.0168)	(0.0098)	(0.0080)	(0.0070)
Growth of GDP per capita		-0.0033***	-0.0015	-0.0035***		-0.0013**	-0.0010***	-0.0009**
		(0.0012)	(0.0013)	(0.0011)		(0.0006)	(0.0003)	(0.0005)
Government consumption		0.2953**	0.3030*	0.1163		-0.5494***	-0.0873**	-0.0853*
		(0.1490)	(0.1599)	(0.2628)		(0.1177)	(0.0436)	(0.0489)
Representative government		0.1892*	-0.2460***	-0.2796***		-0.0506	-0.1016***	-0.0982**
		(0.0998)	(0.0895)	(0.0707)		(0.0470)	(0.0255)	(0.0165)
Inflation		0.0163**	-0.0444	-0.0790**		-0.0364***	-0.0036	-0.0037
		(0.0071)	(0.0297)	(0.0372)		(0.0130)	(0.0109)	(0.0104)
Trade openness			0.0785***	0.0985***			-0.0126***	-0.0127***
			(0.0215)	(0.0257)			(0.0030)	(0.0029)
Capital openness			0.0137***	0.0155***			0.0105***	0.0106***
			(0.0029)	(0.0037)			(0.0026)	(0.0022)
Financial crisis				0.0121*				0.0036
				(0.0067)				(0.0027)
Intercept	-0.2638***	-0.4993***	-0.3787***	-0.4411***	0.3169***	0.1958***	0.1891***	0.1854***
	(0.0169)	(0.0707)	(0.0798)	(0.0858)	(0.0480)	(0.0346)	(0.0320)	(0.0290)
Observations	234	234	234	234	234	234	234	234
Arellano-Bond test for AR(1)	0.002	0.003	0.013	0.005	0.003	0.005	0.001	0.001
Arellano-Bond test for AR(2)	0.412	0.160	0.125	0.290	0.478	0.979	0.978	0.909
Sargan test for over-identification	0.192	0.558	0.274	0.400	0.314	0.493	0.447	0.442

Note: Arellano-Bond test (p-values) for AR(1) and AR(2) are the test for the absence of autocorrelation of the error terms at first and second order, respectively.
The Sargan test (p-value) is the test of the null hypothesis that the over-identifying restrictions are valid.
***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 7. System GMM estimates of the impact of inflation targeting on the distribution of income: all countries, annual data

	Dependent variable: Gini coefficient		Dependent variable: labor compensation share of GDP	
	(1)	(2)	(3)	(4)
Lag of dependent variable	0.5640***	0.0537***	0.1564***	0.4594***
	(0.0597)	(0.0405)	(0.0285)	(0.0172)
Inflation targeter	0.0778**	0.0852***	-0.0329**	-0.0245**
	(0.0387)	(0.0315)	(0.0160)	(0.0099)
Growth of GDP per capita		-0.0289***		-0.0606**
		(0.0098)		(0.0099)
Government consumption		0.0784***		0.2120***
		(0.0139)		(0.0198)
Representative government		0.0172**		0.0123
		(0.0067)		(0.0080)
Inflation		0.0194***		-0.0289***
		(0.0039)		(0.0063)
Trade openness		-0.0641*		-0.0192***
		(0.0364)		(0.0027)
Capital openness		0.0364***		0.0028
		(0.0090)		(0.0022)
Financial crisis		0.0090***		0.0062
		(0.0019)		(0.0060)
Intercept	-0.3488***	-0.3882***	0.4706***	0.2766**
	(0.0490)	(0.0019)	(0.0010)	(0.0103)
Observations	4037	4037	4037	4037
Arellano-Bond test for AR(1)	0.026	0.001	0.011	0.019
Arellano-Bond test for AR(2)	0.132	0.376	0.247	0.109
Sargan test for over-identification	0.629	0.517	0.841	0.519

Note: Arellano-Bond test (p-values) for AR(1) and AR(2) are the test for the absence of autocorrelation of the error terms at first and second order, respectively.
The Sagan test (p-value) is the test of the null hypothesis that the over-identifying restrictions are valid.
***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A1. Developments in the Gini coefficient and labor compensation share of GDP inflation targeting and non-targeting countries

	1971-75	1976-80	1981-85	1985-90	1991-95	1996-00	2001-05	2006-10	2011-15
A. Inflation targeters									
Gini coefficient									
Mean	45.69	45.90	45.99	45.39	46.44	47.61	48.05	47.91	47.48
Median	44.41	45.20	45.56	45.96	47.30	47.78	46.96	47.30	47.28
Standard deviation	8.30	8.11	7.90	8.25	8.34	7.71	7.04	6.66	6.69
Maximum	61.50	61.90	62.82	63.78	64.62	65.82	67.14	68.38	67.62
Minimum	31.64	31.50	30.90	30.24	29.00	30.92	32.34	33.90	33.64
Labor compensation share of GDP									
Mean	58.78	58.26	57.14	56.94	55.89	55.29	53.64	52.17	52.34
Median	59.27	59.27	57.38	57.10	55.78	54.63	53.21	53.47	54.92
Standard deviation	9.81	9.25	8.73	9.37	10.19	10.23	9.56	9.87	9.67
Maximum	79.12	79.12	79.12	79.12	77.68	76.56	72.71	74.64	71.56
Minimum	43.80	43.80	43.80	41.26	37.09	36.20	34.74	31.10	33.29
B. Non-inflation targeters									
Gini coefficient									
Mean	43.90	44.03	44.15	44.14	45.20	45.90	46.35	45.95	45.40
Median	44.10	42.72	43.40	43.46	45.05	45.69	46.00	45.42	45.22
Standard deviation	5.70	6.60	6.80	6.42	6.46	6.28	6.25	6.40	6.38
Maximum	53.62	55.88	62.10	63.00	67.23	66.84	66.32	65.40	64.70
Minimum	43.90	44.03	44.15	44.14	45.20	45.90	46.35	45.95	45.40
Labor compensation share of GDP									
Mean	58.03	57.68	57.66	57.20	56.83	56.13	54.32	52.64	53.13
Median	58.00	58.00	57.00	57.00	56.00	56.50	55.00	54.00	54.00
Standard deviation	12.92	12.89	12.40	12.15	11.80	11.70	12.12	12.36	11.12
Maximum	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	77.00
Minimum	58.03	57.68	57.66	57.20	56.83	54.32	54.32	52.64	53.13

Notes. Data are five-year non-overlapping annual averages.
Sources: Solt (2009) and Feenstra, Inklaar, and Timmer (2015).