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Income Inequality and Inflation in Developing Countries : An Empirical Investigation

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Abstract

The main aim of this study is to analyze the relationship between income inequality and inflation in 46 Developing countries for the period 2000 to 2012 using dynamic panel data methodology. The GINI coefficient has been used to measure the income inequality while the inflation rate, the growth rate, the unemployment level, the openness of the economies and the variables of governance have been used as independent variables. Contrary to the more previous studies, we test for a non-linear effect of inflation on income inequality. Using GMM estimator to address endogeneity issues, the econometric results support the hypothesis that there is a non-linear relationship between inflation and income inequality and inflation has a positive significant effect on income inequality. Higher inflation is associated with higher income inequality. As inflation goes up, inequality increases, reaches a maximum with an inflation rate of about 109%, and then starts decreasing again. Further, the paper examines through graphical analysis the channels of causality underlying the relationship between inflation and income inequality. The graphical analysis shows the consistency of the data with the hypothesis according to which openness, GDP per capita and political stability mediate the effect of inflation on income inequality.

1. Introduction

Rapid growth in Developing countries has led to an important decline in poverty both at the national level and at the global level as well. In many emerging markets however, income inequality has risen as more open and market-oriented economies have increased profits and potential wages, particularly for skilled labor. Rapid growth at the same time has pushed up commodity prices around the globe, raising questions about whether a seemingly inexorable rise in consumer prices is aggravating the problems faced by the poor around the world. While inflation is often seen as aggravating poverty and worsening the income distribution, understanding how inflation and income distribution interact and influence each other in Developing countries could be of merit (Walsh and Yu, 2012).

Recent studies have analyzed the relationship between income inequality and selected macroeconomic variables such as growth rate, inflation rate, trade openness, unemployment level etc. Using a panel data approach to investigate hundred countries for the period 1960-1990, Barro (2000) have focused on the linkage of inequality and growth. Azzoni (2001) has analyzed regional inequality in Brazil using data from the period 1939-1995 and as Barro (2000), have focused on the relationship between inequality and growth. Bandelj and Mahutga (2010) have presented one of the cross-national analyses of the Central and Eastern European States after the fall of the communistic regimes and have assessed inequality and socio-economic changes. Beckfield (2009) has developed an argument that regional integration in Europe has affected economic inequality. Also Forbes (2000) has investigated the relationship between inequality and growth.

There is an extensive literature (Crowe, 2004; Lindbeck and Weibull, 1987; Persson and Tabellini, 2000; Beetsma and Van Der Ploeg, 1996; Al-Mahrubi, 1997; Romer and Romer (1998) and Albanesi, 2001, 2007; Erosa and Ventura, 2002; Blejer and Guerrero, 1990; Datt and Ravallion, 1998; Ferreira and Litchfield, 2000; Dolmas et al., 2000; Thalassinos et al., 2012; and others) noting that high inflation can add to income inequality. Sure enough, Crowe (2004) reviews of theories about inflation and income inequality and offers a political economy explanation for the relationship. Adopting the probabilistic voting model originally due to Lindbeck and Weibull (1987), as formulated by Persson and Tabellini (2000), and although the model's key features are unequal access to both inflation-hedging opportunities and the political process, Crowe (2004) found that inequality and 'elite bias' in the political system interact to create incentives for inflation. Also, the theoretical literature has widely recognized the redistributive role of inflation through its effect on wages. Since David Hume, it has been believed that wages lag behind inflation. When inflation is taking place, price rises tend to run ahead of increases in money wages. Therefore inflation leads to a shift of income away from wage earners, and toward profits. On this ground, inflation is claimed to increase income inequality because it hurts the poor relatively more than the rich (see Laidler and Parkin, 1975, and Fischer and Modigliani, 1978). Another main channel of redistribution of income and wealth through inflation is the debtor-creditor hypothesis. The redistribution is from nominal creditors to nominal debtors if interest rates on assets are denominated in terms of money without fully adjusted to the inflation rate. Inflation affects income distribution also through its effect on economic growth. Since the 1960s many models have been produced to show that inflation can increase capital accumulation (the Tobin-Sidrauski portfolio shift model), or reduce capital accumulation (see Fischer, 1981), or does not affect capital accumulation (the Sidrauski superneutrality model).

In the context of income distribution, inflation helps debtors. Sur enough, higher inflation could help reduce public debt through three main channels. First, governments can capture real resources through base money creation (*seigniorage*). Second, inflation can erode the real value of the debt. Third, inflation can affect the primary balance, including if brackets are not indexed under a progressive income tax (Akitoby et al., 2014). In Developing countries, incomes are quite low and the debt level of the economy very high. Besides other taxes, inflation is an additional tax that reduced the purchasing power of consumers and their consumption level. Generally, in these Developing countries, public debt is very high

relative to private debt and the external debt is also very high compared to domestic debt. So, inflation in these conditions would affect much consumption and would increase income inequality.

Many empirical studies seem to support this theoretical knowledge, that is, a positive relationship between income inequality. Thus, Beetsma and Van Der Ploeg (1996), Al-Mahrubi (1997), Romer and Romer (1998) and Albanesi (2001, 2007) have found a strong positive relation between inflation and inequality. Albanesi (2007) for example finds a strong positive correlation between inflation and income inequality for 51 industrialized and Developing countries between 1966 and 1990. Erosa and Ventura (2002) identify inflation as acting like a regressive tax in the United States. Blejer and Guerrero (1990) for the Philippines, Datt and Ravallion (1998) for India, and Ferreira and Litchfield (2000) for Brazil, all find that higher inflation leads to a lower share of income held by the poorest share of the population. Easterly and Fischer (2000), looked at a very large sample of household survey data across a wide range of countries and found the poor were more likely than the rich to cite inflation as a problem, and that inflation tended to worsen their assessment of their own wellbeing more than it does that of the rich. Thalassinos et al. (2012) analyze the relationship between income inequality and inflation in 13 European countries for the period 2000 to 2009 using panel data methodology. The GINI coefficient has been used to measure the income inequality while the inflation rate, the growth rate, the employment level and the openness of the economies have been used as independent variables. The results support the hypothesis that inflation has a positive significant effect on income inequality. Bulir (2001) has used a cross-sectional approach regressing GINI coefficients and has found that higher inflation is associated with more inequality (Crowe, 2004). Al-Marhubi (1997) investigates the inflation-inequality link by using positive political-economy approach and finds that countries which have a greater inequality have a higher average rate of inflation. The dependent variable which is used in Al-Mahrubi model is the average annual inflation rate in log form and independents are the GINI coefficient, openness, political instability, turnover of Central Bank Governors and legal Central Bank independence. Dolmas et al., (2000) find that economies with high levels of income inequality tend to have higher levels of inflation and the direction of causality is from inequality to inflation.

Moreover, Laidler and Parkin (1975), found that the losers from inflation appear to concentrate on the rich and the poor, because the middle-income group, having more nominal debt than those at either extreme of the wealth distribution, are less affected. But there is evidence that, in adjusting to inflation, the rich react more quickly than the poor. "The evidence on these matters is, however, overwhelmingly based on United States data and it is not clear to what extent one may generalize from it to other economies" (Laidler and Parkin, 1975).

Concerning the effect of inflation on income distribution through its effect on economic growth, there is equally conflicting evidence; see Bruno and Easterly (1996), and Clark (1997). However, hypothesis of economic theories is that income inequality is negative related to economic growth. There are three explanations that associate income inequality with economic growth: the political-economy approach (see Alesina and Roderick, 1994; and Person and Tabellini, 1994), the socio-political instability approach (see Perotti, 1993; Alesina and Perotti, 1994; and Benhabib and Rustichini, 1996), and the imperfection of capital markets approach (see Aghion and Boltion, 1992; Banerjee and Newman, 1993; Galor and Zeira, 1993; Aghion and Bolton, 1997; and Chiu, 1998). In the history of economic theory there is strong contradiction among economists regarding the sign and strength of relationship between economic growth and inflation. Furthermore, according to Ho-Yin Yue and Shatin (2011), inflation decreases income inequality through two channels: first, inflation transfers income from nominal lenders to nominal borrowers; second, inflation may also redistribute income through the tax system. Some authors as Sun (2011), Maestri and Roventini (2012) found that inflation reduces average wealth and income inequality. Similarly, Coibion et al. (2012) show that a permanent increase in the inflation target decreases income inequality, and Heer and Maussner (2004) find that higher inflation marginally reduces inequality. Bulir and Gulde (1995) obtain a negative impact of inflation on overall income equality.

Others studies have leaded to the unclear relationship between inflation and inequality. Sure enough, Galli and van der Hoeven (2001) review pre-2000 empirical literature on the topic. They find that "the

results from all these studies are noticeably mixed (some authors find inflation to be a regressive tax, others find it to be a progressive tax, and others find it to be unrelated to income distribution) so that the literature seems to have generated an inflation-inequality puzzle". Li and Zou (2002) use cross-country panel data on income distribution to explore the impact of inflation on income distribution and economic growth. They have found that inflation first, worsens income distribution; second, increases the income share of the rich; third has a negative but insignificant effect on the income shares of the poor and the middle class; and fourth, reduces the rate of economic growth. Monnin (2014) explores the empirical link between income inequality and inflation in ten OECD countries over the period 1971 to 2010 and find a U-shaped link between long-run inflation and income inequality. Cardoso (1992) has concluded that inflation shifts the wage profile. Walsh and Yu (2012) assess whether food inflation affects income inequality differently from nonfood inflation. They find that in an international sample and a sample of Chinese provinces, nonfood inflation exacerbates income inequality while the role of food inflation is more mixed. In a sample of Indian states broken down into urban and rural areas, they fund that nonfood inflation adds to income inequality in both areas, while food inflation has a neutral to positive effect on income inequality in rural areas, providing support for the theory that rural wages may respond elastically to food prices.

Furthermore, Galli and van der Hoeven (2001) offer a reconciliation of these contradicting results by assuming a non-linear relation between inflation and income distribution. They show that a rise in inflation can either reduce inequality or increase inequality, depending on the initial inflation rate. Rising inflation is associated with a decrease in inequality for low initial inflation rates and with an increase for high initial inflation rates. Bulir (2001) and Auda (2010) find similar results. Bulir (2001) studies that do inflation and inequality have a nonlinear relationship. It has used dummy variables for countries which are characterized by hyperinflation, high inflation and low inflation and the results have shown that the relationship between inflation and inequality is nonlinear.

While the empirical evidence compiled in many studies attests a solid link between inflation and income inequality, it lacks a theory that explains the channels through which inflation changes incomes distribution. More theoretical and empirical work is necessary to understand how inflation and income distribution interact and influence each other (Monnin, 2014). The precise mechanisms that lead more inflation to correlate with a decrease or an increase in income inequality until a certain threshold are unclear yet, and warrant further research. Thus, the main aim of this study is to analyze the relationship between income inequality and inflation in 46 Developing countries for the period 2000 to 2012 using dynamic panel data methodology and to examine through graphical analysis the channels of causality underlying the relationship between inflation and income inequality.

The rest of the paper is organized as follows. Section 2 presents the methodology used. Section 3 presents the data and section 4 discusses the results. Section 5 presents the graphical analysis and section 6 concludes.

2. Methodology

The econometric methodology used in this paper to assess the empirical link between inflation and income inequality is those of the dynamic panel data. The change in GINI coefficient is regressed against headline CPI inflation as a baseline to assess the relationship between inflation and inequality. The baseline equation estimated is:

$$y_{it} = \alpha + \gamma y_{it-1} + X'_{it}\beta + \varepsilon_{it} \tag{1}$$

where y denotes the change of GINI coefficients, X includes inflation, inflation squared, lagged inflation and its squared, trade openness, unemployment, GDP per capita and governance variables such as voice and accountability, political stability, governance effectiveness, regulatory quality, rule of law and corruption; ε is the error term. Results are presented under ordinary least squares, as well as for both fixed effects across countries and random effects. However, measuring the relationship between the

change of income inequality and income growth itself raises some endogeneity concerns. In particular, Berg and Ostry (2011) suggest that less equal societies are likely to have shorter spells of income growth, implying that the distribution of income may partly determine a particular year's growth rate. To control for this, the model is also estimated using a Generalized Method of Moments (GMM) dynamic estimator based on the Blundell-Bond methodology. The methodology specifies a dynamic model which allows for time-invariant country-specific effects, which is plausible in the case of inequality analysis, given that many variables outside the analysis, such as political and tax regime, exhibit minimal variation over time. Under Arellano-Bond methodology the equation is estimated using as instruments the lagged values of the left and right-hand side variables in levels. These instruments are valid if the error term η is not serially correlated. The specification is:

$$y_{it} = \alpha + \gamma y_{it-1} + X'_{it}\beta + \mu_i + \eta_{it} \tag{2}$$

where μ represents the country specific and time invariant factor and η is the error term. There are some statistical shortcomings to a straightforward instrumental variables estimation of the above equation, namely that in a small sample with some persistent explanatory variables, lagged levels make weak instruments for the regression when run in differences. Asymptotically, the variance of the coefficients would rise and coefficients could be biased. To address this weakness, Blundell and Bond (1998) developed the system GMM dynamic model, which combines the regression in first differences above with an estimation run in levels, using both lagged levels and lagged differences as instruments. It was shown that using the system GMM would substantially gain efficiency under certain conditions. Thus, Blundell and Bond (1998) showed using Monte Carlo simulations that the system GMM estimator is more efficient than in first differences, it gives biased results in finished samples when the instruments are weak. OLS results are presented alongside fixed- and random-effects GLS estimations, as well as the Blundell-Bond GMM results.

3. Data

We use available panel data of 46 Developing countries observed over the period 2000-2012 to analyze the effects of inflation on income inequality. The data are annual and come from the statistics tables of the World Bank and the *Worldwide Governance Indicators* of the World Bank. Table 1 in appendix A shows a summary description of the variables. Appendix A contains also a variable description with their sources (table 2). Further, a list of the 46 Developing countries (18 of Africa, 14 of Asia, 8 of Europe and 6 of America) included in this study is presented in appendix D.

The GINI coefficient which is the dependent variable in this study is a widely used statistic for measuring inequality[1]. It is derived from the Lorenz curve and defined as the ratio of the area between the Lorenz curve and the perfect equality line. The Lorenz curve plots the relation between the cumulative percentage of the population and the proportion of total income earned by each cumulative percentage. The dependent variable is the GINI coefficient; a common measure of inequality that varies from 0 to 1, where 0 presents perfect equality and 1 perfect inequality. As it is stated in Duro (2004) "the GINI coefficient is more sensitive to the income changes occurred at the middle of the income distribution, treating symmetrically the lower and the upper tails of the incomes ranking" (Thalassinos et al., 2012). The GINI coefficient data are mostly sparse for a number of the countries in our sample. Some countries either have one income base or they have both but only for some years. Furthermore, there are a number of countries for which GINI index data is only available for few years.

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[1] The GINI coefficient has been used extensively in the public health literature, and it remains the most popular measure of income inequality. Yet because it is highly sensitive to inequalities in the middle of the income spectrum, the GINI coefficient is not "neutral" or value free. Because of this property, the GINI coefficient is best seen as simply *one of the many* strategies available for the operationalisation of income inequality. However, a number of alternative methods exist, and they offer researchers the means to develop a more nuanced understanding of the distribution of income. Income inequality measures such as the generalised entropy index and the Atkinson index offer the ability to examine the effects of inequalities in different areas of the income spectrum, enabling more meaningful quantitative assessments of qualitatively different inequalities (See De Maio, 2007).

The explanatory variables include the interest variables of this study and the control variables. The CPI inflation[2] and its squared and lagged represent the interest variables of this study and others variables are the control variables namely GDP per capita, unemployment, trade openness, voice and accountability, political stability, governance effectiveness, regulatory quality, rule of law and corruption.

4. Results and interpretation

Table 4 in appendix A reports the results from the regression of inflation and income inequality in 46 Developing countries (see country list in appendix D). In this table, we have done eight estimations. The three firsts columns of table 4 used panel data estimation techniques such as the pooled OLS (1), the fixed effect (2) and the random effect (3). The last five columns used the GMM estimator in dynamic panel of Blundell-Bond specification which allows controlling individual and temporal specifics effects with short term dynamics and solving variables endogeneity bias, simultaneous bias, inverse causality and omitted variables problems. We used in these last five columns the one-step system GMM estimator. The inflation square is included in columns (5) to (8) to test for a non-linear effect of inflation on income inequality. The two period's lag of inflation and its square are included in columns (6) to (8) to support the graphical analysis on the channels of causality underlying the relationship between inflation and income inequality. The variables of governance are taken in to account in columns (7) and (8) to test the hypothesis according to which these variables mediate the effect of inflation on income inequality. Higher inflation is associated with higher income inequality in all equations (Table 3 in appendix A). Beetsma and Van Der Ploeg (1996), Al-Mahrubi (1997), Romer and Romer (1998) and Albanesi (2001, 2007) have found a strong positive relation between inflation and inequality. Further, higher openness is associated with slightly lower income inequality, while higher unemployment (equation (1) of Table 4) is associated with lower income inequality. Amornthum (2004) and Beckfield (2011) claim that unemployment has a negative effect on income inequality by shifting the wage earners toward the bottom of income distribution. Higher GDP per capita (columns (1) and (2) of Table 4) is associated with decreases in income inequality. There are some controversial results on the effect of GDP and openness as in White and Anderson (2001), Dollar and Kray (2002), Edwards (1997) and Higgins and Williamson (1999). These papers have found that openness by itself is associated with higher inequality. Bandelj and Mahutga (2010) get negative value for unemployment and GDP. Higher political stability, governance effectiveness and regulatory quality (columns (7) and (8) of Table 4) are associated with higher income inequality but higher rule of law is associated with decreases in income inequality.

The econometric results suggest that there is a non-linear relationship between inflation and income inequality and inflation has a positive significant effect on income inequality. Specifically and following column (5) of Table 4 in appendix A the estimation suggest that as inflation goes up, inequality increases, reaches a maximum with an inflation rate of about 109%, and then starts decreasing again.

In term of interpretation and due to the fact that income distribution may have long run effects policymakers should be concerned with the distributional implications of government policies. The extent of the relationship between inequality and inflation is important in the designing of stabilization programs as it is stated in Al-Mahrubi (2000). Specifically, when unemployment rates increase it usually affect

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[2] Inflation has been defined as a process of continuously rising prices, or equivalently, of a continuously falling value of money. Various indexes have been devised to measure different aspects of inflation. The Consumer Price Index (CPI) measures inflation as experienced by consumers in their day-to-day living expenses; the Producer Price Index (PPI) measures inflation at earlier stages of the production and marketing process; the Employment Cost Index (ECI) measures it in the labor market; and the Gross Domestic Product Deflator (GDP-Deflator) measures combine the experience with inflation of governments, businesses, and consumers. Finally, there are specialized measures, such as measures of interest rates and measures of consumers' and business executives' inflation expectations. The "best" measure of inflation for a given application depends on the intended use of the data. The CPI is generally the best measure for adjusting payments to consumers when the intent is to allow consumers to purchase, at today's prices, a market basket of goods and services equivalent to one that they could purchase in an earlier period.

more people in the lower tail of the personal income distribution, thus lowering average per capita income (Levernier, et *al*., 1995). In this perspective, Checchi and García-Peñalosa (2008) argue that when unemployment rate is not too high unemployment and inequality linkage is positive.

5. Graphical analysis

Another main of the paper is to examine through graphical analysis the channels of causality underlying the relationship between inflation and income inequality in Developing countries. Sure enough an alternative empirical approach is to draw on the experience of different countries to investigate how inflation affects income inequality. There is some evidence that how a country inflation matters for income inequality. Figure 1 of appendix B includes a linear regression (pooled (overall) regression) curve and shows the correlation among the Developing countries between inflation and income inequality over the period 2000–2012. Sure enough, figure 1 plots Gini coefficient against inflation for all Developing countries included in the study (181 observations). The linear fit of figure 1 with an enough high trend suggests in accordance with the analytic assessing a dynamic positive relationship, roughly linear between inflation and income inequality in Developing countries.

Figures 2 to 4 in appendix C assess transmission channels of inflation on income inequality in Developing countries. Concretely, figures 2, 3 and 4 portray respectively the relationship between openness, GDP per capita, political stability and the lagged variable of inflation. These figures (2, 3 and 4) suggest that inflation affected income inequality through openness and GDP per capita and these graphical findings are confirmed by the estimation of Table 5 which presented the relationship between openness, GDP per capita and political stability and the two period's lag of inflation[3]. The inflation affects income inequality through the growth rate and the openness of the economies.

In sum, the relationship between inequality and inflation is an issue of major concern with important policy implications and the findings of positive relationship in this study about the 46 Developing countries would imply that policymakers of these Developing countries should be concerned with the distributional implications of government policies.

6. Conclusion

The present research has considered the problem of relationship between income inequality and inflation for 46 Developing countries by using a date set for the period 2000-2012. Using both panel data estimation techniques such as the pooled OLS, the fixed effect and the random effect and dynamic panel data estimation techniques of Blundell-Bond which allows controlling individual and temporal specifics effects with short term dynamics and solving variables endogeneity bias, simultaneous bias, inverse causality and omitted variables problems, the econometric results support the hypothesis that there is a non-linear relationship between inflation and income inequality and inflation has a positive significant effect on income inequality in the 46 Developing countries included in the study. Further, the paper examines through graphical analysis the channels of causality underlying the relationship between inflation and income inequality. The graphical analysis shows the consistency of the data with the hypothesis according to which openness, GDP per capita and political stability mediate the effect of inflation on income inequality. The inflation affects income inequality through the growth rate, the openness of the economies and the political stability. These findings would imply that policy makers in Developing countries should be concerned with the distributional implications of government policies.

Finally, according to the fact that public debt and external debt are both very high in developing countries and could affect the link between debt and inflation on the one hand and inflation and income distribution on the other hand, one of the next steps would be to consider this issue to analyze more finely the transmission channels through which inflation could change incomes distribution.

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[3] Only significant variables are presented in Table 4 for reasons of simplification.

Appendix

Appendix A: Tables

Table 1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Gini index	181	40.08227	9.519379	24.24	67.4
GDP per capita	181	3590.028	3244.441	159.8314	15694.08
Inflation (CPI)	181	10.51042	27.28686	-.845716	324.997
Unemployment	181	8.634489	5.435561	1	32.3
Openness	181	78.56446	35.94989	13.5026	210.374
Voice and accountability	181	-.177446	.7273322	-1.77032	1.15981
Political stability and absence of violence	181	-.3454212	.8031049	-2.57102	1.18038
Governance effectiveness	181	-.2325859	.5545417	-1.65271	1.24741
Regulatory quality	181	-.0822956	.5977503	-1.82574	1.31016
Rule of law	181	-.383871	.5703964	-1.63315	.929167

Table 2: The sources of variables

Variable	Description	Source
Gini index	GINI index	WDI
GDP per capita	GDP per capita (current US$)	WDI
Inflation (CPI)	Annual inflation (in %)	WDI
Unemployment	Unemployment, total (% of total labor force)	WDI
Openness	Export and import as a share of GDP (in %)	WDI
Voice and accountability	Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	WGI
Political stability and absence of violence	Reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.	WGI
Governance effectiveness	Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	WGI
Regulatory quality	Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	WGI
Rule of Law	Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	WGI
Control of Corruption	Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	WGI

Note: WDI and WGI are defining respectively as World Data Indicator and *Worldwide Governance Indicators* of the World Bank.

Table 3: Correlation matrix among the chosen variables

	Gini index	Inflation	Openness	Unemployment	GDP per capita	Voic. and acc.	Pol. stab.	Gov. effect.	Reg. qual.	Rule of law	Corruption
Gini index	1.0000	-	-	-	-	-	-	-	-	-	-
Inflation	0.0318	1.0000	-	-	-	-	-	-	-	-	-
Openness	-0.3690	0.2227	1.0000	-	-	-	-	-	-	-	-
Unemployment	-0.1825	-0.0122	0.0147	1.0000	-	-	-	-	-	-	-
GDP per capita	-0.0818	-0.1199	0.1826	0.1270	1.0000	-	-	-	-	-	-
Voic. and acc.	0.2134	-0.2374	-0.2272	-0.0354	0.4145	1.0000	-	-	-	-	-
Pol. stab.	-0.1138	-0.1301	0.2530	0.2522	0.5004	0.4954	1.0000	-	-	-	-
Gov. effect.	0.1192	-0.2444	0.0952	0.1133	0.5137	0.6582	0.4056	1.0000	-	-	-
Reg. qual.	0.1570	-0.3813	-0.0556	0.1175	0.5202	0.7582	0.3909	0.8275	1.0000	-	-
Rule of law	-0.0194	-0.2396	0.1036	0.1410	0.4581	0.7030	0.5659	0.8753	0.7897	1.0000	-
Corruption	0.1939	-0.1982	0.0092	0.0622	0.5078	0.7213	0.5985	0.8150	0.7108	0.8627	1.0000

Notes: **Voic. and acc.** = Voice and accountability; **Pol. stab.** = Political stability and absence of violence; **Gov. effect.** = Governance effectiveness; **Reg. qual.** = Regulatory quality.

Table 4: Inflation and income inequality in Developing countries

	(1) Pooled OLS Gini index	(2) Fixed Effects Gini index	(3) Random Effects Gini index	(4) Blundel-Bond Gini index	(5) Blundel-Bond Gini index	(6) Blundel-Bond Gini index	(7) Blundel-Bond Gini index	(8) Blundel-Bond Gini index
Openness	-0.106***	0.002	-0.012	-0.178**	-0.172**	-0.145*	-0.098**	-0.110***
	(5.56)	(0.09)	(0.62)	(2.37)	(2.34)	(1.91)	(2.15)	(3.37)
Unemployment	-0.313**	0.160	0.125	-0.171	-0.213	-0.006	-0.174	-0.292
	(2.60)	(1.31)	(1.16)	(0.63)	(0.79)	(0.02)	(0.94)	(1.53)
GDP per capita	0.264	-0.116	-0.200	-1.837	-1.899*	-2.014*	-2.826**	-2.711**
	(0.40)	(0.22)	(0.41)	(1.65)	(1.79)	(1.71)	(2.12)	(2.13)
Inflation	0.042*	0.036***	0.038***	0.168**	0.218**	0.176*	0.131**	0.093**
	(1.72)	(3.42)	(3.71)	(2.33)	(2.19)	(1.81)	(2.18)	(2.03)
Inflation^2					-0.001**	-0.001*	-0.001**	-0.0004*
					(2.17)	(1.82)	(2.12)	(1.69)
Lagged inflation(-2)						0.139*	0.146*	0.136
						(1.93)	(1.69)	(1.61)
Lagged inflation(-2)^2						-0.001**	-0.001**	-0.0004*
						(2.47)	(2.22)	(2.00)
Lagged Gini index(-1)				0.478***	0.479***	0.642***	0.653***	0.542***
				(3.16)	(3.12)	(3.87)	(4.94)	(4.92)
Voic. and acc.							-2.342	-3.141
							(1.20)	(1.68)
Pol. stab.							4.025**	3.924**
							(2.41)	(2.50)
Gov. effect.							7.054***	6.867**
							(2.84)	(2.40)
Reg. qual.							5.527**	5.966**
							(2.08)	(2.52)
Rule of law							-7.823***	-9.616***
							(3.36)	(3.40)
Corruption								3.013
								(0.80)
Constant	48.590***	39.064***	41.426***	49.022***	49.185***	39.017**	42.882***	48.894***
	(9.58)	(7.95)	(9.88)	(2.87)	(2.92)	(2.20)	(3.07)	(4.57)
F statistic	9.74	4.40		14.68	19.19	32.40	76.48	124.01
Observation	181	181	181	180	180	179	179	179
Test on AR(1)				0.060	0.039	0.177	0.050	0.055
Test on AR(2)				0.118	0.105	0.248	0.285	0.208
Sargent Test of overid.				0.037	0.040	0.665	0.867	0.228
Hansen Test of overid.				1.000	1.000	1.000	1.000	1.000

Notes: Significant levels: *** $p<0.01$; ** $p<0.05$; * $p<0.1$. Absolutes values of *t-statistics* are in the parentheses.
Voic. and acc. = Voice and accountability; **Pol. stab.** = Political stability and absence of violence; **Gov. effect.** = Governance effectiveness; **Reg. qual.** = Regulatory quality.

Table 5: Pooled OLS regression: Lagged (-2) inflation versus openness, GDP per capita or political stability in Developing countries

	Openness	GDP per capita	Political stability
Lagged inflation(-2)	0.047*	-0.003**	0.001**
	(1.66)	(2.36)	(2.39)
Constant	76.705***	7.369***	-0.468***
	(14.52)	(47.02)	(3.69)
Observation	179	179	179

Notes: Significant levels: *** $p<0.01$; ** $p<0.05$; * $p<0.1$. Absolutes values of *t-statistics* are in the parentheses.
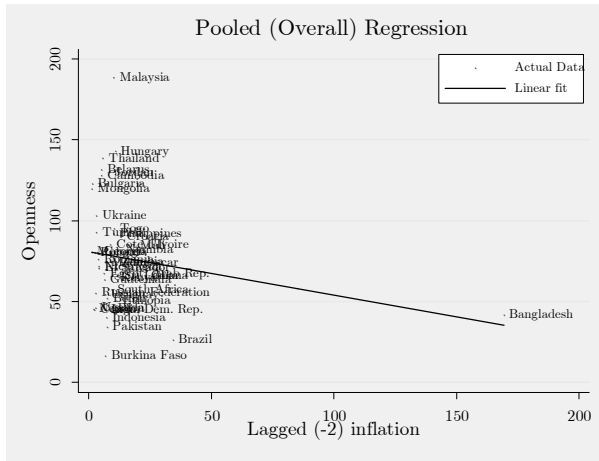
Appendix B: Income inequality versus inflation in Developing countries

Figure 1: Income inequality versus inflation in Developing countries
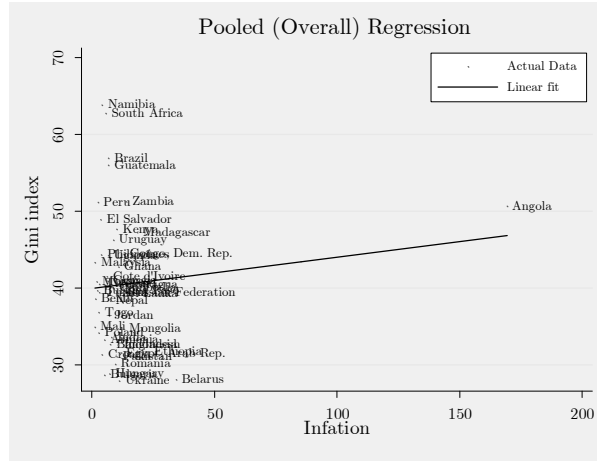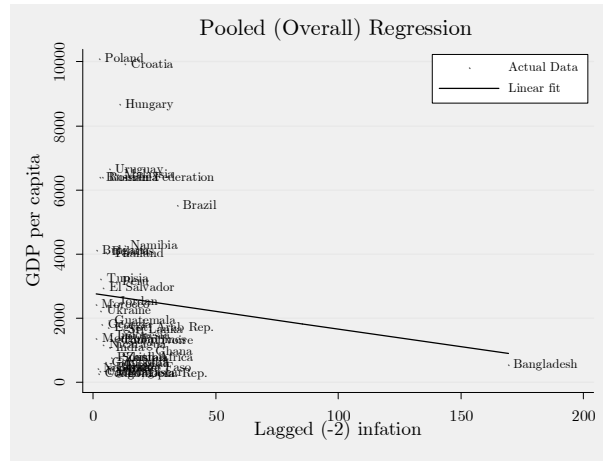

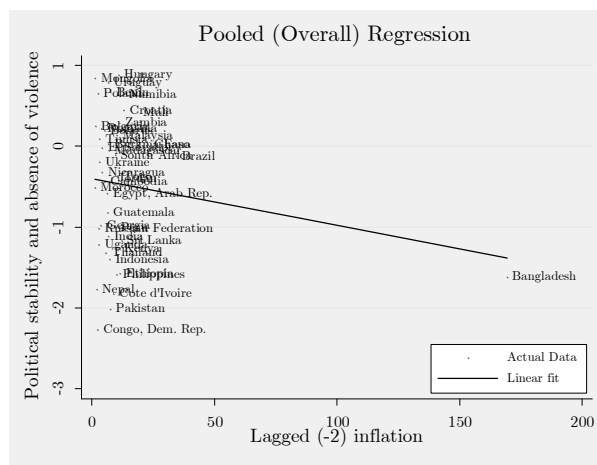# Appendix C: Assessing transmission channels: lagged inflation and control variables

Figure 2: Lagged inflation and openness in Developing countries

Figure 3: Lagged inflation and GDP per capita in Developing countries

Figure 4: Lagged inflation and political stability and absence of violence in Developing countries

Appendix D: Country list

Country	Number of observations	Percentage of the sample	Years included
Angola	2	1.10	2000, 2009
Armenia	7	3.87	2003-2008, 2010
Bangladesh	2	1.10	2005, 2010
Belarus	10	5.52	2000, 2002, 2004-2011
Benin	1	0.55	2003
Brazil	8	4.42	2002-2009
Bulgaria	2	1.10	2003, 2007
Burkina Faso	2	1.10	2003, 2009
Cambodia	4	2.21	2004, 2007-2009
Congo, Dem. Rep.	1	0.55	2006
Cote d'Ivoire	1	0.55	2008
Croatia	3	1.66	2000, 2004, 2008
Egypt, Arab Rep.	2	1.10	2005, 2008
El Salvador	8	4.42	2002-2009
Ethiopia	2	1.10	2005, 2011
Georgia	8	4.42	2000, 2002, 2003, 2006-2010
Ghana	1	0.55	2006
Guatemala	5	2.76	2000, 2002-2004, 2006
Hungary	4	2.21	2000, 2002, 2004, 2007
India	2	1.10	2005, 2010
Indonesia	3	1.66	2002, 2005, 2008
Jordan	4	2.21	2003, 2006, 2008, 2010
Kenya	1	0.55	2005
Madagascar	1	0.55	2005
Malaysia	3	1.66	2004, 2007, 2009
Mali	2	1.10	2006, 2010
Mongolia	2	1.10	2002, 2008
Morocco	1	0.55	2007
Namibia	1	0.55	2004
Nepal	2	1.10	2003, 2010
Nicaragua	1	0.55	2005
Pakistan	4	2.21	2002, 2005, 2006, 2008
Peru	10	5.52	2000, 2002-2010
Philippines	4	2.21	2000, 2003, 2006,2009
Poland	9	4.97	2002, 2004-2011
Romania	9	4.97	2002-2004, 2006-2011
Russian Federation	8	4.42	2002-2009
South Africa	3	1.66	2000, 2006, 2009
Sri Lanka	3	1.66	2002, 2007, 2010
Thailand	4	2.21	2006, 2008-2010
Togo	2	1.10	2006, 2011
Tunisia	3	1.66	2000, 2005, 2010
Uganda	3	1.66	2000, 2006, 2009
Ukraine	9	4.97	2002-2010
Uruguay	10	5.52	2000, 2002-2010
Zambia	4	2.21	2003, 2004, 2006, 2010

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