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A Refinement of the Relationship Between Central Bank Independence, Inflation, and Income Inequality in Developing Countries

Abstract: This paper analyzes the impact on income inequality of a set of variables usually considered in the growth literature as potential growth determinants. There is evidence to suggest that unemployment and inflation are positively associated with income inequality; except for countries with central bank independence where a negative association exists between inflation and income inequality. The empirical evidence shows that income inequality increases when unemployment increases.

Keywords: Central Bank Independence, Income Inequality, Developing Countries, Fixed Effects.

JEL Code: C13, C33, D31

1. Introduction

In a benchmark article, Kuznets (1955) demonstrated that since the beginning of the 19th century, the process of economic growth has reduced income inequality levels in most countries by increasing per capita income. He also showed that the process of economic growth leads to an increase in income inequality at the beginning of the growth and then as growth continues, it gradually leads to reduction of the income inequality. The study produced the famous Kuznets' inverted U-shape curve, manifesting a gradual increase in income inequality at the early

stages of economic growth and gradual reduction in income inequality at the later stages of the growth.

Since 1955, many other scholars have tried to examine the causes of economic growth, whether the causes are accumulations of factors of production or improvements in technology, and their impacts on income inequality in those countries that had experienced growth. Naturally, in their studies, the authors have tried to first replicate the Kuznets' inverted U-shape curve with their available data and then use it as a benchmark explaining their findings.

However, given the time (1955) and given the limited available data at the time, Kuznets' study suffered from a few shortcomings. First, the study focused on mostly high income developed countries with a long tradition of economic growth and well established and matured legal, political, and financial systems. It ignored the process of economic growth and its impact on distribution of income within those countries commonly known as less developed and suffering from the lack of such systems. One would expect the path of economic growth and its impact on distribution of income in Less Developed Countries (LDCs) to be different from those in developed countries. The evidence certainly supports the expectation. Second, what is missing in Kuznets' study and all the other studies since 1955 is the fact that none of these studies explicitly recognizes "democracy" or "lack of democracy" as one of the factors beside economic growth effecting distribution of income. The high-income countries are governed by a democratic system where residents at the lower end of income distribution can use the available system of checks and balances as instruments for bargaining and improving their levels of income, therefore reducing income inequality.

What is missing in the empirical literature is an adequate characterization of how different economies and political structures of countries react to the relationship between income inequality, inflation, and unemployment. This note demonstrates the importance of this interaction between political structures and inequality in driving inflation and unemployment for a large sample of countries over the period 1960-2000. We present empirical evidence supporting the existence of a positive correlation between inflation, unemployment, and inequality but only conditional on political and economical structure.

In light of this, this study uses panel data and fixed effect econometric model to:

- Examine the effects of Central bank Independency, Inflation and Unemployment on distribution of income in low income and high-income developing economies.

This article is organized as follows: section I gives a brief introduction of our study and its importance. Section II continues with a review of the most relevant literature pertaining to economic growth and its impact on income distribution, while in section III, we classify countries according to their income, levels of democracy, and the sources of our data. In section IV, we present the econometric model used in our study, along with the hypotheses to be tested. In section V, we estimate our model and report the findings and, finally, in section VI we try to interpret our results and present some concluding remarks.

2. Literature Review

The impact of Inflation on Income Inequality:

Although there remains some controversy in the empirical literature relating inflation to income distribution, several works (e.g. Romer and Romer (1998), Easterly and Fischer (2001)) present evidence correlating high rates of inflation with income inequality and/or poverty.

Economic theory has identified various costs of inflation, as well as actions that can be taken to avoid these costs. For example, optimizing the holdings of domestic currency can prevent losses associated with expected inflation. Similarly, investing in inflation-indexed bonds or negotiating inflation-adjusted employment contracts helps protect against unexpected inflation. Protecting against inflation uncertainty may be difficult, however, or the transaction cost of doing so may be too high. The connection between inflation and income inequality is usually made, on descriptive grounds, by claiming that the poor have no interest-bearing assets, having more restricted access to interest-bearing money and end up paying a higher proportion of their income as inflation tax¹.

A number of theoretical studies have linked inequality to inflation (Alesina and Drazen, 1991; Cukierman, Edwards and Tabellini, 1992). Several empirical examinations have found evidence of a positive correlation between income inequality and inflation over the period 1965-1990 (Sachs 1989; Beetsma and Van Der Ploeg 1996; Al-Marhubi, 1997). This positive correlation has been attributed to the influence of inequality on populist ideologies, political instability, and distributional conflicts in the determination of fiscal policy. Consequently, and es-

¹ Strictly speaking, the usual economic argument refers to the opportunity cost of holding transacting assets, which is defined in terms of the nominal interest rate, rather than in terms of the rate of inflation.

pecially in the absence of more efficient forms of revenues, governments resort to inflationary financing of fiscal deficits.

Beetsma (1992) presents evidence of a strong positive correlation between inequality and inflation for democratic countries. Romer and Romer (1998) find a strong positive relation between inflation and inequality, with quantitatively similar results obtained by regressing inequality on inflation. They also report the finding of inflation significantly worsening the bottom quintile's average income and inequality in a cross-section of OECD countries in 1988.

Easterly and Fischer (2001) find that direct measures of improvement in the well-being of the poor and inflation are negatively correlated in pooled cross-country regressions. They also find that there is no significant relation between the change in inflation and measures of improvements in the well-being of low-income households. They also present a novel set of empirical evidence on the redistributive impact of inflation. Using household level polling data for 38 countries, they find that the poor are more likely than the rich to mention inflation as a top national concern.

Countries with a more unequal income distribution tend to have higher inflation (Dolmas, Huffman and Wynne, 2000; Beetsma and Van Der Ploeg, 1996); while Datt and Ravallion, (2002) and Epaulard (2003) argue on the fact that high average inflation and high variability of inflation increase income inequality significantly.

Krušković (2022) argues that analyzing the central bank policies and their types are rather critical in reducing income inequality and promoting growth and lowering inflation.

Beetsma and van der Ploeg (1996) use a different measure of inequality and find that there is a statistically significant positive relationship between inflation and income inequality in democratic countries, but not in non-democratic countries. Dolmas et al. (2000) find that the positive relationship between inflation and inequality holds for democracies and non-democracies.

The impact of Unemployment on Income Inequality:

Several empirical studies in the literature have documented the existence of a positive correlation between income inequality and unemployment.

Nolan (1986) measured the impact of changes in unemployment on income distribution in the UK. He found that unemployment led to a change in the shape of the income distribution, with a rise in the top decile. Cardoso (1993) and Cardoso, de Barros and Urani (1995) found the same positive correlation when studying data of Brazil in the 1980s, they concluded that income inequality responded very positively to any increase in employment. Mirer (1973) arrives at similar conclusions through simulations of income experiences of the US population. Blinder and Esaki (1978), Beach (1977), and Budd and Whiteman (1978) all came to similar conclusions that changes in the level of unemployment have a significant impact on the size of income distribution.

The impact of Central Bank Independence on Income Inequality:

Central bank independence refers to the freedom of monetary policymakers from direct political or governmental influence in the conduct of policy. The most widely employed index of central bank independence is due to Cukierman, Webb, and Neyapti (1992), although alternative measures were developed by Bade and Parkin (1984), and Alesina, Masciandaro, and Tabellini (1993), among others.

The Cukierman, Webb, and Neyapti (1992) index is based on four legal characteristics as described in a central bank's charter. First, a bank is viewed as more independent if the chief executive is appointed by the central bank board rather than by the prime minister or minister of finance, is not subject to dismissal, and has a long term of office. These aspects help insulate the central bank from political pressures. Second, independence is higher the greater the extent to which policy decisions are made independently of government involvement. Third, a central bank is more independent if its charter states that price stability is the sole or primary goal of monetary policy. Fourth, independence is greater if there are limitations on the government's ability to borrow from the central bank.

Cukierman, Webb, and Neyapti (1992) combine these four aspects into a single measure of legal independence. Based on data from the 1980s, they found Switzerland to have had the highest degree of central bank independence at the time, closely followed by Germany. At the other end of the scale, the central banks of Poland and the former Yugoslavia were found to have the least independence.

The relationship between inflation and central bank independence has been estimated by Grilli, Masciandaro, and Tabellini (1991), Cukierman (1992), Alesina and Summers (1993), Eijffinger and Schaling (1993), and Franzese (1999), among

others. These empirical studies find that central bank independence and the inflation rate are highly negatively correlated in high-income countries. The theoretical and empirical results have generally been interpreted as supporting the view that effective inflation control requires a high degree of central bank independence, and that greater central bank independence is always better than less. Guler (2020) found that announcement of an inflation target that is not supported by credibility would not be enough to anchor inflation expectations.

Dolmas et al. (2000) find that there is a significant positive relationship between income inequality, measured by the Gini coefficient, and average inflation. Furthermore, when inflation is regressed on income inequality and central bank independence, the coefficient for central bank independence is negative but not statistically significant.

3. Classification of Developed economies by Income

Classifications by Income

World Bank (2020) classifies less developed countries by their levels of per capita income. Countries that have per capita income below \$3500 per year are classified as low income less developed countries and those that have per capita incomes of \$3500 or more than \$3500 per year are classified as high income less developed countries. In our analysis we also separate the low income less developed countries from the high income less developed countries. The low-income countries have many social, political, and economic and financial characteristics which are similar to each other and are different from those of high-income countries. This classification allows us to create more homogenous samples for estimation of our econometric model. In particular, this classification eliminates or drastically reduces the level of heteroskedasticity that otherwise we might face when we estimate our econometric models in section (V).

We undertake several approaches to study whether central bank independence promotes (or detracts from) income inequality for a large panel of developing countries classified as either high-income or low-income. Our hypothesis is that the impact of central bank independence on income inequality is a function of the availability of collateral—and that, in turn, varies with national income. Thus, we follow the World Bank (2020) classification of developing countries into LIDCs and HIDCs. However, it could be argued that this classification—as established

by the World Bank—could be considered somewhat arbitrary². Thus, our final approach is to consider a threshold model and let our sample determine endogenously whether there is a natural cutoff point in income across these countries to distinguish between HIDC and LIDC. We conduct our analysis with an FE model, as well as a dynamic panel approach where we regress our endogenous variable—Gini—on various measures.

We employ annual data from 1970 to 2020 on 111 countries from the World Development Indicator (WDI) database of the World Bank (2020)³. The variables we select are commonly used in empirical studies of inequality and central bank independence. These variables are employed by Dolmas et al. (2000). Our dependent variable Gini is an annual index. We include the CBI index⁴ in our set of regressors. We include per capita gdp (*Gdpp*), inflation (*Inf*) and Unemployment (*Unemp*). These measure the number of students at official school age who are enrolled in primary.

3.1. Benchmark Model

Our sample covers annual data on several macroeconomic aggregates in 55 countries classified as LIDC according to the World Bank, and 56 countries classified as HIDC from 1970 to 2020 (the names of the countries sampled are provided in Tables 1 and 2). We also divide countries in our sample into democratic and non-democratic regime type, and this data was collected from the Freedom House Index (2006).

Economic Variables and Data

Since the overall aim of this study is to determine the effect of central bank independence on distribution of income within LDCs in the presence of democracy

² The World Bank issued the first World Development Report in 1978. Their classification of developing countries has changed over time. For instance, in 1978 they subclassify these countries between "low" and "middle income" countries. The installment we use in this paper (WDR 2012) divides developing countries into "low" and "high" income. The benchmark criteria have also changed. For example, in 1978 the benchmark was based in per capita GNP (US\$250) whereas in 2012 the benchmark was based in Gross National Income (US\$1,035).

³ Given that, for many countries, this data set does not contain schooling information before 1970, the closest comparable variable from Barro and Lee (1993) is selected for the period of 1960-1969.

⁴ See Garriga (2016).

or a lack thereof and in the presence of a number of resources, relevant economic variables must be identified and appropriate data must be collected.

In this study, we have a large sample of Panel data, spanning forty-four years between 1970 and 2020. Our dependent variables and the control variables are taken from the World Bank's World Development Indicators 2020 database. Inflation is measured as the annual percentage change in the consumer price index (CPI) (end-year). Unemployment represents a share of the labor force that is without work but available for and seeking employment.

4. Models and Data

The purpose of this section is to analyze how the Gini coefficient varies as a function of the givens of the model, and how it relates to the rate of unemployment, inflation, and central bank independence.

Regression of Inflation, Unemployment, and Income Inequality:

Fixed Effects Regression for Inflation:

$$G_{it} = \alpha_i + \alpha_1 GDP_{it-1} + \alpha_2 INF_{it-1} + \alpha_3 UNE_{it-2} + \alpha_4 CBI_{it-1} + \varepsilon_{it} \quad (1)$$

$$\varepsilon_{it} = \nu_i + \mu_{it} \quad (2)$$

$$\alpha_i = \alpha_0 + \alpha_5 Z_i \quad (3)$$

The Gini is a measure of inequality developed by the Italian statistician Corrado Gini. It is usually used to measure income inequality. The Gini coefficient is a number between 0 and 1, where 0 corresponds to perfect equality (where everyone has the same income) and 1 corresponds to perfect inequality (where one person has all the income, and everyone else has zero income). Gini figures are drawn from a World Bank updated version of the Deininger and Squire data set (1996). Our data covers a broad range of countries according to Gini and per capita levels of GDPP and are listed according to Gini stratification and the CIA World Fact Sheet/Sheet? (2005).

Z_i represents unobserved characteristics, α_0 and α_5 are coefficients. In this one-way error model, ν_i denotes the time-invariant and unobservable country-specific effects and, μ_{it} denotes the remainder disturbance with the mean zero and variance-covariance $\sigma_v^2 I_{nt}$ (Baltagi, 1995).

Where G_{it} is the income inequality coefficient for country i at time t , $GDPP_{it}$ is natural logarithm of income per capita for country i at time t .

5. Statistical Evidence

In this section we discuss the effects of Inflation and Unemployment on income inequality. We present the results for all our regressions. The empirical models were estimated for seven different categories of less developed countries. Table 1 below presents the results of the estimation of the models. Throughout our results presented in tables 1 and 2, in appendix; the constant is the overall mean or benchmark.

Table 1: Results: All Fixed Effects Regression for Inflation: Dependent Variable is Income Inequality

	Independent Variables				
	$GDPP_{it}$	$GDPP_{it}^2$	INF	Constant	
Low Income Countries	8.43* (4.89)	-0.34* (-2.95)	6.11* (23.46)	84.85* (13.14)	Rsq=0.14 No.Obs= 1993 No of Gp =91 Avg obs/group = 21.9
High Income Countries	17.38* (7.50)	-1.07* (-8.04)	1.64* (3.84)	96.32* (9.86)	Rsq=0.55 No.Obs= 2793 No of Gp = 60 Avg obs/group = 46.5
Democratic Countries	13.96* (9.73)	-0.64* (-7.47)	6.33* (23.30)	78.19* (17.36)	Rsq=0.16 No.Obs= 2950 No of Gp = 71 Avg obs/group = 41.5
Non-Democratic Countries	12.92* (6.26)	-0.78* (-5.35)	3.85* (11.17)	96.79* (12.64)	Rsq=0.23 No.Obs= 1836 No of Gp = 80 Avg obs/group = 22.9
OECD Countries	34.09* (10.52)	-1.75* (-10.36)	3.77* (7.74)	19.58* (12.42)	Rsq=0.46 No.Obs=1031 No of Gp =24 Avg obs/group = 42.9
Countries with CBI	19.19 (1.67)	-10.54 (-1.45)	-7.87* (-2.05)	-77.48* (-2.41)	Rsq=0.17 No.Obs=2517 No of Gp =62 Avg obs/group = 40.6
Countries with no CBI	16.76 (0.88)	-3.33* (-2.19)	10.6* (4.20)	29.97 (1.22)	Rsq=0.19 No.Obs=2269 No of Gp =89 Avg obs/group = 25.5

T-values are in parentheses. * Implies significance at 5% level.

Table 1 reports the results of the regressions of inflation and inflation squared on income inequality. For all of our country sets, except countries with central bank independence, we empirically showed that there exists a positive and significant relationship between inflation and income inequality in these sets of countries. Democratic countries had the highest correlation between inflation and income inequality (6.33) and the lowest correlation exists in high income countries (1.64). Our results are supported by, among many others, Sachs (1989), Beetsma and Van Der Ploeg (1996), and Romer and Romer (1998). As for countries with central bank independence, where inflation normally is low, the relationship between inflation and income inequality is negative; that is, the higher the inflation, the lower the income inequality and vice versa. The main explanation for this occurrence is that when inflation in these countries increases, this mainly occurs due to the increase in foreign investment that leads to an increase in income, and hence creating inflation and at the same time lowering income inequality (Maxfield, 1997; McNamara, 2002).

Table 2 reports results for the regressions of unemployment and unemployment squared on income inequality. For all our sets of countries, there does exist a positive and significant relationship between unemployment and income inequality; hence, the higher the level of unemployment, the higher the income inequality and vice versa. Low-income countries have the highest correlation between unemployment and income inequality (38.83) and the lowest correlation exists in countries with central bank independence (4.07). Our empirical results were like the results of, among others, Cardoso (1993) and Cardoso et al. (1995).

Table 2: Results: All Fixed Effects Regression for Unemployment: Dependent Variable is Income Inequality

	Independent Variables				
	$GDPP_{it}$	$GDPP_{it}^2$	UNEMP	Constant	
Low Income Countries	38.48* (13.30)	-24.74* (-12.33)	38.83 (1.13)	25.80* (4.56)	Rsq=0.16 No.Obs= 2920 No of Gp = 91 Avg obs/group = 32.1
High Income Countries	14.98* (11.53)	-0.84* (-11.37)	4.78* (3.59)	69.68* (2.60)	Rsq=0.31 No.Obs=2072 No of Gp = 60 Avg obs/group = 34.5
Democratic Countries	1.78* (2.39)	-0.13* (-2.29)	5.75* (5.54)	-16.96* (-9.09)	Rsq=0.34 No.Obs= 2570 No of Gp = 71 Avg obs/group = 36.2
Non-Democratic Countries	4.59* (11.50)	-2.67* (-10.11)	4.59 (0.81)	39.10* (4.02)	Rsq=0.14 No.Obs= 2422 No of Gp = 80 Avg obs/group = 30.2
OECD Countries	13.01* (7.88)	-0.66* (-6.68)	6.91* (4.21)	66.05* (2.70)	Rsq=0.11 No.Obs=1031 No of Gp = 24 Avg obs/group = 42.9
Countries with CBI	8.63 (1.31)	-3.16 (-0.25)	4.07 (1.04)	-23.58 (-1.01)	Rsq=0.11 No.Obs=2085 No of Gp = 62 Avg obs/group = 33.6
Countries with no CBI	14.52* (2.04)	-2.92* (-2.08)	5.27* (2.44)	-32.92 (-1.40)	Rsq=0.17 No.Obs=2907 No of Gp = 89 Avg obs/group = 32.7

T-values are in parentheses. * Implies significance at 5% level.

6. Conclusion

This paper has reviewed the impact on income inequality of a set of variables usually considered in the growth literature as potential growth determinants, which is inflation and unemployment. Our paper differs from others in that it (i) uses different groups of countries and the effect of these determinants on income inequality, something that in turn allows us to assess the impact of policies on income inequality specifically to these groups of countries; (ii) relies on a large database (150 countries over forty years); and (iii) allows for fixed effects in a dynamic panel framework. We have shown that countries with high inflation rates tend to be associated with high income inequality. This correlation is particularly evident in democratic countries.

We find support for an inverted U-shaped relationship between income inequality and per capita GDP for all country groups. There is evidence to suggest that unemployment and inflation are positively associated with income inequality; except for countries with central bank independence where a negative association exists between inflation and income inequality. The empirical evidence shows that income inequality increases when unemployment increases.

This link between unemployment, inflation, and income inequality, however, still lacks theoretical formalizations of a dynamic and stochastic nature, by means of which it can be better understood. This paper has tried to add to the understanding of this problem.

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