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Worker Cooperatives as an Innovative Strategy to Address Income Inequality?

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Abstract:

This project explores the relation between the magnitude of the cooperative sector and the degree of income inequality in a country. After a somewhat selective consideration of the possible linkages between the size of the cooperative sector and income inequality, and using Gini as the primary measure for income inequality and two proxies for the size of the cooperative sector, an empirical exploration is done in three ways. First, simple plots are used to judge the gross relation between Gini and each of the two proxies for the size of the cooperative sector. Both plots show a perceptible negative relation. Second, simple regressions of Gini are run on each measure of the cooperative sector to obtain quantitative correlates of the plots. The regression estimates show a highly significant negative relation between each proxy for the cooperative sector and Gini. Third, a more extended regression model is estimated after adding several control variables that have been suggested to affect income inequality. While estimated coefficients for the cooperative proxies continue to have negative signs in the extended model, their statistical significance is somewhat eroded relative to the conventional significance levels. Two other measures of income inequality show an even more perceptible negative association between income inequality and the cooperative sector size. While the multiple regression estimates indicate most control variables to lack statistical significance, mean years of school has a highly significant negative association with Gini, which is an informative outcome of the work. The estimates also show a significant positive association between both unemployment rate and natural resource endowment with the Gini coefficient. The main message from the study seems to be that, despite a low statistical significance in some of the regressions, there is considerable evidence of an inequality-attenuating role of the size of the cooperative sector in an economy.

Introduction:

The subject of worker-owned cooperatives is important and timely because there are significant welfare implications for individuals who work in cooperatives compared to traditional firms. Benefits to cooperative member ownership often include, but are not limited to, increased job security, a smaller earnings gap between the highest and lowest paid worker in an organization, empowerment through economic democracy (one member-one vote), and possibly higher average wages (Perotin 2014; Arando et al. 2011). The motivation for this project is to potentially contribute to an important policy debate surrounding social welfare and income inequality in nations. Social democrats traditionally argue that social welfare programs and government redistribution are ideal to address income inequality. Neoliberals, on the other hand, traditionally argue that limited government and tax cuts for firms to encourage private sector growth is the path to prosperity and reduced income inequality. Worker cooperatives may represent a way to bridge these two opposing viewpoints and help individuals across the political spectrum find common ground. The research question this study seeks to address is the following: Is an expanded scope or size of the cooperative sector in a country associated with reduced income inequality?

The initial hypothesis is that there is an inverse relationship between the prevalence of cooperatives in a country and income inequality. Therefore, I predict that if the cooperative economy grows in a country, the income inequality should be lower, all else held constant. This postulate is based on existing concepts related to cooperatives. Cooperative worker-members are empowered through economic democracy which gives them greater decision-making power than they would otherwise possess in traditional firms (Perotin 2014; pp.41-42). Additionally, workers benefit from the unique distributive nature of the cooperative organizational structure

which provides them with greater ownership over the means of production. This means workers are entitled to a share of the profits earned by the firm, often credited to individual capital accounts (Arando et al. 2011; p.9). I would expect that a larger number of firms with a cooperative character would result in lower income inequality in society.

Background and Literature Review:

Section 1: Worker Cooperatives

Cooperatives vs. Traditional Firms:

The worker-owned cooperative organizational structure is one that has garnered a fair amount of attention over the years. Though interest in cooperatives has grown in recent years, the topic is certainly nothing new. In fact, the famed English economist and philosopher John Stuart Mill (1806-1873) amazingly wrote “The form of association, however, which if mankind continue to improve, must be expected in the end to predominate, is not that which can exist between a capitalist as chief, and work-people without a voice in the management, but the association of the laborers themselves on terms of equality, collectively owning the capital with which they carry on their operations, and working under managers elected and removable by themselves” (Mill 1848; p.199). The reasoning behind this prediction is plausible. One study argues that this prediction should occur due to (1) productivity advantages over traditional capitalist rivals, (2) a survival rate and profitability that is “no worse, and possibly better” than traditional firms, and (3) democratic features that workers value (Schwartz 2012; p.267). If cooperatives truly possess these advantages, and if this claim is supported by empirical evidence, then why did Mill’s prediction remain unrealized? Schwartz (2012; pp.267-268) provides two explanations: (1) A labor-managed firm is a public good and therefore may suffer from the “free-rider” problem whereby collective action tends to produce suboptimal outcomes and (2) cooperatives are relatively unknown to the broader community that includes workers, investors,

and lenders. This reasoning implies that the scarcity of cooperatives relative to traditional firms does not lie in any inherent inferiority of the cooperative organizational structure itself, but rather that cooperatives are less likely to be created in the first place. The author explains that the market will not generally “grow” cooperatives because they share the attributes of public goods (Schwartz 2012; p.283). Schwartz argues that strong sources of institutional support such as unions or governmental bodies should be utilized to create the public good of cooperatives. Collective action problems are often addressed by utilizing an institutional authority with the power to change the incentive structure in a society, through either coercive or non-coercive means (Schwartz 2012; p.283). An important question to ask, of course, is if such a policy should be pursued by governments. Should some sort of action be taken to promote the creation and growth of a cooperative economy? Perhaps an argument could be made for this if the benefits to society outweigh the costs from intervening in the market.

Member Ownership and Democratic Governance:

Worker cooperatives have a unique organizational structure that empowers workers through both (1) member ownership and (2) democratic governance. This makes cooperatives distinctly different from traditional firms which generally give workers little (if any) ownership stake in the firm or effective voice in the firm management. Some traditional capitalist firms provide employees with an employee stock ownership plan (ESOP) which gives workers ownership stake through shares of company stock (Zeuli & Radel 2005; p.46). However, this does not make the firm a worker cooperative unless the economic democracy component is included as well. Economic democracy is the idea that worker-members should be given an equal voice in the decision-making process. This is usually accomplished through the “one-member-one-vote” principle common in cooperatives rather than the “one-dollar-one vote”

principle found in traditional firms (Johanisova and Wolf 2012; p.565). One-member-one vote implies that every cooperative member has an equal voice in the decision-making process. Therefore, unlike the traditional firms, those who own more equity shares do not have more decision-making power. As an added measure of protection, cooperatives usually have an upper limit to the ownership stake that any one member can possess (Johanisova and Wolf 2012; p.565). Here is a table that conveniently explains the differences between a traditional firm and a cooperative firm:

<u>Type:</u>	<u>Worker Cooperative:</u>	<u>Traditional Firm:</u>
<u>Ownership:</u>	Worker-members collectively own means of production through “ownership stake” acquired over time and thus entitled to share of firm profits.	External shareholders (those who own company stock) own the means of production and thus receive profits.
<u>Decision-Making Power:</u>	Generally “one-member-one-vote”. Often a “Board of Directors” is elected directly by worker-members who carry out executive decisions on behalf of worker-members (similar to a representative democracy).	Generally “one-dollar-one-vote”. Decision-making power belongs to corporate managers/executives working for external shareholders (employees have little input on executive decisions at firm level).

It is important to note that not every employee of a cooperative is necessarily considered a “worker-member/worker-owner”. Quite often workers are required to “buy-in” to become full cooperative members. For example, worker-members of the Eroski group of cooperatives in the Mondragon Corporation, a federation of worker cooperatives based in the Basque region of Spain, are required to make a substantial initial capital contribution of approximately 6000 euros

(Arando et al. 2011; p.7). Over time, however, individual stakes in the cooperative grow as distributions from surpluses are credited to individual capital accounts. For example, the average stake in the Eroski Group hypermarket cooperatives is 33,295 euros and the average stake is comparable in the supermarket cooperatives at over 26,000 euros (Arando et al. 2011; p.7). This is significant as it demonstrates that cooperatives have the potential to reduce in the long run wealth inequality as well. Though this is just one example of a cooperative, studies show that members generally contribute between 30 and 50 percent of the total capital required to finance the cooperative (Zeuli & Radel 2005; p.44).

This does not mean there are not negative aspects to democratic governance though. One study found that collective interest is often difficult (i.e. costly) to determine and worker members may have to be sufficiently homogenous along a variety of dimensions in order to arrive at agreeable decisions and policies (Pencavel 2012; p.28). In essence, the study found that a homogenous workforce is preferred. However, it recognizes that “others have suggested that heterogeneous decision-makers make better decisions when faced with complex problems” (Pencavel 2012; p.28). Therefore, a tradeoff may exist when deciding whether or not to employ a more homogenous workforce or membership.

Productivity and Efficiency:

Any serious discussion on cooperatives will include a section on the productivity and efficiency of cooperatives compared to traditional firms. Even though this study is predominantly about the nexus between the size of the cooperative sector and income inequality, it is important to consider whether the cooperative organizational structure is both economically competitive and efficient. If this were not the case, and they truly were suboptimal compared to traditional firms, it would be difficult to argue for them as a potential strategy to address income

inequality. Doucouliagos (1995; p.73) performed a meta-analysis study using data from 34 studies on worker participation and productivity in cooperatives and participatory capitalist firms. The results indicated that democratic governance and various forms of worker participation in decision-making do not hinder productivity. Additionally, the author found that profit sharing is more positively related to productivity than worker participation in decision-making. Another study which used panel data on several thousand French firms found that cooperatives organize their production differently from traditional firms which allows them to use their capital and labor more effectively than traditional firms (Fakhfakh et al. 2013; pp.17-18). They also found that contrary to popular belief, cooperatives are not necessarily smaller than traditional firms when measured by number of employees. Though they found that cooperatives are smaller on average when measured by level of capital, no evidence seems to suggest they are “under-capitalized” or suffer from “capital starvation” or under-investment (Fakhfakh et al. 2013; pp.15-16). Lastly, they found that cooperatives are “at least as productive as conventional firms” and grow “at least as fast as conventional firms in all the industries studied” (Fakhfakh et al. 2013; p.2). Finally, we return to the study conducted on the Eroski group of cooperatives in the Mondragon Corporation in Spain. Using data on hypermarkets and supermarkets from 2006 to 2008, the authors determined that hypermarket cooperative stores grew faster than comparable hypermarket GESPA stores. GESPA stores are defined as stores with modest employee ownership but limited voice (similar to ESOP). The growth rate advantage was approximately 2.4 percentage points per year (Arando et al. 2011; p.20). They also performed a similar analysis on cooperative supermarket stores compared to conventional supermarket stores. They found a growth rate advantage of a considerable 8.4 percentage points per year for the “Supermarket City” subgroup of cooperative supermarket stores compared to conventional stores (Arando et al.

2011; p.21). This is a sizable advantage and indicates that under certain conditions, cooperatives have the potential to grow faster than conventional firms.

Worker Outcomes and Wellbeing:

The cooperative organizational structure is unique in that it seeks to maximize worker outcomes and wellbeing rather than profits necessarily. This means cooperative firms seek to be income-maximizing rather than profit-maximizing. For the typical capitalist firm, the well-being of its workers may be achieved only as a by-product of the firm's profit-maximizing activities. However, for a cooperative firm, the well-being of its worker-members is often a distinct and categorical goal set by the organization itself (Pencavel 2012; p.9). In other words, "the master-servant relation that predates the employer-employee association in the capitalist firm is replaced in the co-op by one of self-employment and the democratic determination of issues" (Pencavel 2012; p.9). Despite the fact that cooperatives are income-maximizing, wages in cooperatives are often more responsive to product market shocks while employment is generally less responsive (Pencavel et al. 2006; p.28). Capitalist firms will typically take wages as a given while adjusting various firm inputs including capital and employment. Cooperatives, on the other hand, strive to minimize the negative impact on employment by varying wages (Pencavel et al. 2006; p.28). This is to be expected considering that cooperative members typically command a greater voice which can protect them from employment reductions (Pencavel et al. 2006; p.42). Another study found similar results and concluded that worker cooperatives tend to choose employment stability (job preservation) over income stability when responding to market shocks (Perotin 2014; p.43). There seems to be a consensus in the literature that cooperatives behave in this manner when faced with shocks and uncertainty.

In the Eroski group of the Mondragon Corporation in Spain, it was determined that the internal wage differences between cooperative employees were significantly compressed with a ratio of incomes from top to bottom that did not exceed 5 to 1 (Arando et al. 2011; p.8). Furthermore, they found that cooperative members in non-managerial positions receive at least 20% higher wages than their outside counterparts. As expected, this is accompanied by the fact that top managers tend to receive much lower wages than their conventional retail store manager counterparts. Their wages are estimated to be about 30% lower than outside rates (Arando et al. 2011; p.8). This finding is important for assessing worker outcomes and wellbeing. Another study actually found conflicting results when using data on cooperative firms in Italy between 1982 and 1994. This study concluded that cooperative firms provided 14% lower wages than capitalist firms, all else held equal (Pencavel et al. 2006; p.36). There is need for additional research on this topic.

Resiliency and Community Impact:

Evidence from the 2007-2008 global recession indicates that cooperatives are remarkably resilient in times of crisis and upheaval. Germany is a country with over 8000 cooperatives which collectively have around 20 million members. During the height of the recession in 2008, there were around 250 cooperatives started, double the numbers started in 2007 (Birchall & Ketilson 2009; p.29). Furthermore, cooperatives tend to have greater survivability than traditional firms. Approximately 1% of businesses in Germany in 2005 were declared insolvent compared to less than 0.1% for cooperatives (Birchall & Ketilson 2009; p.29). Similar statistics can be found around the world. For example, in Quebec and Canada in general, 6 out of 10 cooperatives survive more than 5 years compared to 4 out of 10 traditional firms. When extending the timeframe to 10 years, researchers found that more than 4 out of 10 cooperatives

survive compared to just 2 out of 10 traditional firms (Birchall & Ketilson 2009; pp.29-30). Part of this longevity is explained by the fact that “cooperatives are not purely motivated by achieving the maximum rate of profit” (Birchall & Ketilson 2009; p.30). They often have other goals such as meeting the needs of their members and serving their community (Birchall & Ketilson 2009; p.30).

Finally, it is important to consider cooperatives within the context of the communities in which they operate. Cooperatives represent a significant and often overlooked tool for community development. Greater employment stability over the long run results in more resilient communities. The sustainable (resilient) jobs created by cooperatives are likely to have positive consequences for the communities in which they operate (Perotin 2014; p.43). These positive externalities include a reduction in the use of both unemployment benefits and social services in the community and a sustainable source of tax revenue from continuous employment (Perotin 2014; p.42). This is additional evidence that supports the view that cooperatives are not only beneficial for individual members, but that they can be treated as a public good to some extent.

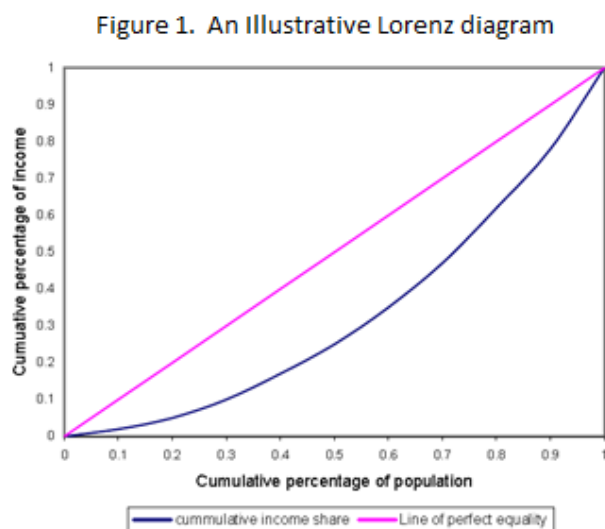
Cooperatives represent an important way to incorporate frequently marginalized groups (such as women) into decision-making processes. Women are often excluded from leadership positions, but evidence from various countries suggests that firm profit is positively correlated with greater representation of women in important leadership positions (Smith & Rothbaum 2013; p.11). Other studies have shown that child health and education outcomes in communities improve when women control a larger share of income or assets (Smith & Rothbaum 2013; p.11). Cooperatives are also important for building social capital in communities. When cooperative members are engaged in democratic decision-making processes, they gain valuable skills and experience that they can take to other areas such as civil society (Smith & Rothbaum

2013; p.3). This is an example of how cooperatives can build social capital in communities around the world.

Section 2: Income Inequality

Measuring Inequality (Lorenz Curve and Gini Coefficient):

A significant amount of economics literature exists on the topic of income inequality. An important pioneering contributor to this area is Max Lorenz of the University of Wisconsin. Lorenz (1905) developed a method for visualizing distributions of wealth or income to show inherent inequality or “concentration” in a society (Kleiber 2007; p.2). This has come to be known as the Lorenz curve. In essence, the Lorenz curve “plots the cumulative share of total income against the cumulative proportion of income-receiving units” (Heshmati 2004; p.2). This curve is useful because it can generate what is known as the Gini coefficient. The Gini coefficient is a measure of the amount of inequality in the income distribution. It can be calculated by finding the area between the Lorenz curve and the line of perfect equality and dividing this by the area below the line of perfect equality (Heshmati 2004; p.2). Here is a graphical representation:



Source: (Heshmati 2004; p.14)

In this representation the 45-degree straight line represents the line of perfect equality. It represents perfect equality and thus zero income inequality in a society (country). As the cumulative income-share curve approaches the line of perfect equality, income inequality decreases and the Gini coefficient becomes smaller. Alternatively, as the cumulative income-share curve moves further away from the line of perfect equality, income inequality increases and the Gini coefficient becomes larger. Thus a larger Gini coefficient represents a greater amount of inequality in society. The Gini coefficient is usually measured as a ratio between 0 and 1, but can also be represented as a percentage from 0 to 100. For the purposes of this study, the Gini coefficient will be measured as a percentage. It is important to note that inequality can be measured relative to income, health, happiness, opportunities, education, skills, and wealth, among others (Heshmati 2004; p.1). This study will focus primarily on income inequality. Now that the measurement of income inequality has been defined, it is important to discuss why income inequality is important and the trends that have been occurring over time.

Developments in Poverty and Income Inequality:

Income inequality is critical to examine from both a community development and academic perspective. From a community development perspective, it is important simply because its negative effects are experienced at the community level. Research indicates that income inequality is a problem that exacts high social costs across all income groups and is positively correlated with factors such as: teen pregnancy, mental illness, drug use, crime, poor educational performance, obesity, and lower life expectancy (Choi 2011; p.3). Additionally, rising income inequality is linked to both lower levels of civic engagement and social capital in communities. Income inequality disproportionately affects those from low and moderate income (LMI) communities. For this reason, addressing widening income inequality is ultimately about

“helping LMI communities reach their full potential, thereby improving their capacity to participate in and contribute to the broader economy” (Choi 2011; p.7). From this perspective it is easy to see that addressing income inequality not only benefits those on the lower end of the income spectrum, but everyone who participates in the local economy as a whole.

The study of poverty and income inequality from an academic perspective has changed considerably since the 1970’s. One major development is that the context in which inequality and poverty is studied has drastically changed over time. Essentially this means that prevalence of inequality and poverty look very different now than they did 40 years ago in various parts of the world (Jenkins & Micklewright 2007; pp.2-5). Other developments include changes in both analytical methods of measurement and quantity and quality of data available. This includes the “immense cross-fertilization” which has occurred between income inequality measurement and other related measures such as mobility, poverty, and social welfare (Jenkins & Micklewright 2007; pp.10-16). Finally, there have been significant changes in the policy environments in both developed and developing nations. Two of these changes include the expansion of the European Union (EU) and the introduction of global initiatives such as the U.N. Millennium Development Goals (Jenkins & Micklewright 2007; pp.5-6).

Lastly, it is important to note that income inequality is a major issue that is truly global in scope. In fact, “global inequality is much greater than inequality within any individual country” (Milanovic 2014; p.10). The global Gini coefficient, a measure of income inequality that incorporates every nation and every individual on earth, is calculated to be around 0.7 or 70% (Milanovic 2014; p.10). This is actually greater than the highest income inequality (0.643 or 63.4%) seen in any of the 66 individual countries covered in this study. The global Gini coefficient, though not particularly important for the purposes of this study, is something to keep

in mind considering that income inequality is an issue that we all face as a global community of individuals and nations.

Determinants of Income Inequality:

Literature on the determinants of income inequality is generally broken into two categories: single country and multi-country studies. For example, one multi-country study tested the economic and other determinants of income inequality using a panel dataset consisting of 81 countries and 5-year averages from 1962-2006. The author concluded that there is no evidence that democracy is linked to higher or lower income inequality. Ultimately, economic determinants of income inequality were seen to be more important than political ones (Nikoloski 2009; p.38). A variety of economic determinants were found significant including: natural resource endowment, industrialization and economic growth, financial sector development, and trade openness. Income inequality was positively correlated with natural resource endowment and financial sector development. It was negatively correlated with both industrialization and economic growth and trade openness (Nikoloski 2009; pp.29-31). Another multi-country study used a panel dataset consisting of 97 countries and 5-year averages from 1980-2012. The authors concluded that financial openness, technological progress, and less regulated labor markets were generally associated with higher income inequality. Government redistributive spending was found to be associated with lower income inequality (Dabla-Norris et al. 2015; p.26). Financial deepening (larger financial sector) was positively correlated with income inequality in countries with low levels of financial inclusion such as developing countries (Dabla-Norris et al. 2015; p.23).

A single country study for Iran was conducted using time series data from 1976 to 2010. This study found GDP growth rate, ratio of government current expenditure, and ratio of oil

revenue to GDP to be positively correlated with income inequality (Mehrara & Mohammadian 2015; p.27). A single country study for South Korea utilizing time series data from 1980 to 2012 found GDP per capita squared, share of elderly in working population, trade openness, and unemployment as positively correlated with income inequality. It also found inflation, growth of agricultural production, share of middle school students in school-age population, and share of investment in total GDP to be negatively correlated with income inequality. GDP growth and the share of government spending in GDP had no effect (Lee et al. 2013; pp.102-104).

Theoretical Considerations and Empirical Model:

Simple economic theory will be utilized to determine the appropriate theoretical framework for this study. Many studies have been conducted on the topic of income inequality in a variety of contexts. These studies used economic theory to determine which variables might be most suitable as determinants of income inequality. It is important to understand the variables that other studies have used as determinants of income inequality in order to construct an appropriate model for this study. The vast majority of studies in this area use the Gini coefficient as the dependent variable. The potential determinants in question then serve as the independent variables in the empirical model. A variety of empirical methods are then utilized (depending on a variety of factors including type of data used) to ultimately conclude which determinants are significant and which ones are not. The statistically significant variables are said to be important determinants of income inequality, while the variables that are not statistically significant are not considered to be determinants of income inequality. This study will follow a similar format where the Gini coefficient will be used as the dependent variable. The independent variables will then be the two main variables of interest that pertain to cooperatives along with the selected important determinants of income inequality, which have been chosen based on the single and

multi-country studies outlined in the literature review. It is important to note that results often differed between studies relative to the variables found significant. Sometimes economic theory would indicate that certain variables were important while empirical analysis indicated something different. Therefore, it is useful to consider a wide range of variables based on both economic theory and empirical results from previous studies. The next section outlines a simple empirical model this study will utilize.

Empirical Model:

$$\text{GINI} = \beta_0 + \beta_1\text{COOP_GDP} + \beta_2\text{COOP_MEMB} + \beta_3\text{NAT_RES} + \beta_4\text{GDP_GROW} + \beta_5\text{LGDPPC} + \beta_6\text{UNEMP} + \beta_7\text{TRAD_OPEN} + \beta_8\text{INFL_CPI} + \beta_9\text{GOV_EXP} + \beta_{10}\text{FIN_DEV} + \beta_{11}\text{LEDUC} + \beta_{12}\text{FIN_OPEN} + e$$

Where:

- GINI = income Gini coefficient measured as a %
- COOP_GDP = cooperative turnover as a % of GDP
- COOP_MEMB = % of population with cooperative membership
- NAT_RES = natural resource endowment proxied by total natural resource rents as % of GDP
- GDP_GROW = annual GDP growth as a %
- LGDPPC = log of GDP per capita, PPP (current international dollars)
- UNEMP = unemployment rate (measured as a %)
- TRAD_OPEN = trade openness determined by sum of exports and imports as a % of GDP
- INFL_CPI = inflation rate (%) based on consumer price index (CPI)
- GOV_EXP = general government final consumption expenditure as a % of GDP
- FIN_DEV = financial development determined by domestic credit to private sector as % of GDP
- LEDUC = log of mean number of years of education of adult population
- FIN_OPEN = financial openness determined by net foreign assets as % of GDP
- e = error term

Expected Variable Signs:

Economic theory would indicate certain relationships between the dependent variable and various independent variables in the model. Considering the positive attributes associated with the cooperative organizational structure, I expect a negative relationship between GINI and both

COOP_GDP and COOP_MEMB. The literature indicates a positive relationship between income inequality and natural resource endowment (Nikoloski 2009; p.4). Next, as GDP growth increases I can expect a lower GINI coefficient (Nikoloski 2009; pp.6-7). Though many studies find conflicting results, the overall view seems to be that there is a positive relationship between income inequality and GDP per capita in the short run and a negative relationship in the long run (Nikoloski 2009; pp.5-6). A positive relationship generally exists between income inequality and unemployment rate (Lee et al. 2013; p.104). There seems to be inconclusive evidence in the literature regarding the relationship between income inequality and trade openness. Some studies find positive relationships while others find negative relationships. However, it is generally accepted that as international trade flows (trade openness) increase, inequality decreases (Nikoloski 2009; pp.7-8). Next, I find that CPI inflation has a negative relationship with income inequality. This is because it often acts as a “progressive tax in that the poor and middle classes lose relatively less than the rich” (Blinder and Esaki 1978 cited by Lee et al. 2013; p.103). Literature indicates that increased government redistributive spending decreases income inequality (Dabla-Norris et al. 2015; p.26). Differing results have been found regarding the relationship between financial deepening or financial sector development and income inequality. However, there generally seems to be a positive correlation between income inequality and financial sector development, especially among countries with low levels of financial inclusion (Nikoloski 2009; pp.29-31 & Dabla-Norris et al. 2015; p.23). Level of education, measured by years of schooling, is generally correlated with lower income inequality. This is because as more individuals in a country receive education, the return to education declines, which reduces income inequality (Gregorio & Lee 2002; p.397). Lastly, financial openness is correlated with higher income inequality (Dabla-Norris et al. 2015; p.20).

Variable:	Expected Sign:
COOP_GDP	Negative (-)
COOP_MEMB	Negative (-)
NAT_RES	Positive (+)
GDP_GROW	Negative (-)
LGDP	Positive (+) in short run / Negative (-) in long run
UNEMP	Positive (+)
TRAD_OPEN	Negative (-)
INFL_CPI	Negative (-)
GOV_EXP	Negative (-)
FIN_DEV	Positive (+)
LEDUC	Negative (-)
FIN_OPEN	Positive (+)

Data:

Data on cooperatives comes from the 2014 Global Census on Cooperatives Dataset compiled by the consulting firm Dave Grace and Associates for the United Nations Secretariat Department of Economic and Social Affairs. This new dataset published in April 2014 was the first serious attempt to quantify the size and magnitude of the cooperative economy in countries around the world. It was first published in a report entitled: Measuring the Size and Scope of the Cooperative Economy: Results of the 2014 Global Census on Co-operatives (Dave Grace & Associates 2014). Data on the GINI coefficient (measured as a percentage) for the countries in the study comes from the World Bank and the CIA World Factbook. Data on the GINI coefficient for some of the 66 countries could not be found for the year 2014. Therefore, the most recent GINI data was used in substitution of 2014 data in such cases. All of the variables used 2014 data when

available, but in a few instances it was necessary to use the most recent data available. Considering the high correlation between a variable and its past lags, this should have little effect on the results. The data is cross-sectional because there is only one year available for the Global Census on Cooperatives dataset. Only 66 countries in the dataset had data availability for both cooperative turnover as a % of GDP and % of population with cooperative membership. I wanted to use the same set of countries for each cooperative sector proxy variable in order to obtain the most consistent results possible. All of the data in the study was gathered directly from various sources except for variable FIN_OPEN. This variable had to be constructed using data on both net foreign assets and GDP measured in the current local currency in 2014 from the World Bank. This data allowed me to construct net foreign assets as a percentage of GDP for 2014, a measure of financial openness. Table 1 contains descriptive statistics for the main variables.

Table 1. Descriptive Statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
GINI	66	37.6197	8.485793	24.6	63.4
COOP_GDP	66	3.115061	4.441129	.0047623	20.0549
COOP_MEMB	66	28.37472	38.06093	.1040061	224.9572
NAT_RES	66	3.471212	4.779629	0	22.1
GDP_GROW	66	2.504545	2.475258	-6.8	7.8
LGDP	66	4.355859	.3079064	3.470425	4.993258
UNEMP	66	8.577273	5.847019	.9	27.9
TRAD_OPEN	66	94.65152	63.79088	25	374
INFL_CPI	66	3.024242	5.290516	-1.4	37.6
GOV_EXP	66	17.16667	4.319592	5.3	26.6
FIN_DEV	66	86.05606	50.50204	4.3	251.5
LELUC	66	.9958596	.1071878	.6434527	1.117271
FIN_OPEN	66	31.17917	81.71958	-43.05903	647.6533
LRP10	62	1.077897	.2647417	.6532125	1.781037
LRP20	62	.8460048	.242324	.39794	1.403121

Methodology:

The methodology for this analysis consists of ordinary least squares (OLS) estimation. This estimation technique was chosen primarily due to the fact that the study uses cross-sectional data for a single year rather than time-series or panel data that spans multiple years. For ordinary least squares estimation to be appropriate, a number of assumptions must be satisfied. The first of these is that the true population relationship is linear in parameters. The second is that I have access to a random sample of observations from the population. The third assumption is that there is no perfect collinearity. This means there is no perfect correlation between the regressors. Another assumption is that the error term has an expected value of zero for all possible values of the independent (explanatory) variables. The fifth OLS assumption is that there is at least some sample variation in each of the explanatory variables. Under these five assumptions I can state that the OLS estimators obtained are unbiased and consistent. A sixth assumption that can be tested is the homoscedasticity assumption. This states that the variance of the error term is constant across all values of the explanatory variables. This assumption is necessary for the OLS estimators to be efficient. The last assumption I must make in order to perform statistical inferences and hypothesis tests is the normality assumption. This assumption states that the error term is normally distributed (with a mean of zero and variance of σ^2). Finally, the regressors are treated as exogenous. Since I assume the requisite OLS assumptions hold, my statistical analysis and results should be reliable.¹

¹ White's (1980) test indicates absence of heteroscedasticity in the models. The White test computed a χ^2 value of approximately 66. This resulted in a p-value of 0.4421 which is greater than 0.05. Since it does not fall within the rejection region, I fail to reject the null hypothesis of constant variance. Therefore, I assume that there is homoscedasticity and that usual OLS standard errors are sufficient for statistical testing. Robust standard errors are not necessary unless heteroscedasticity is present.

Analysis and Results:

A. Graphical Analysis:

I begin with an initial graphical analysis to obtain a visual representation of the relationship between the Gini index and both cooperative turnover as % of GDP and % of population with cooperative membership. The relation is shown in Figure 1a and Figure 1b. Both indicate a slight downward, negatively sloped relationship between the Gini coefficient and each of the two independent variables of primary interest.

Figure 1a. Relationship between Gini Index (%) and Cooperative Turnover as a % of GDP:

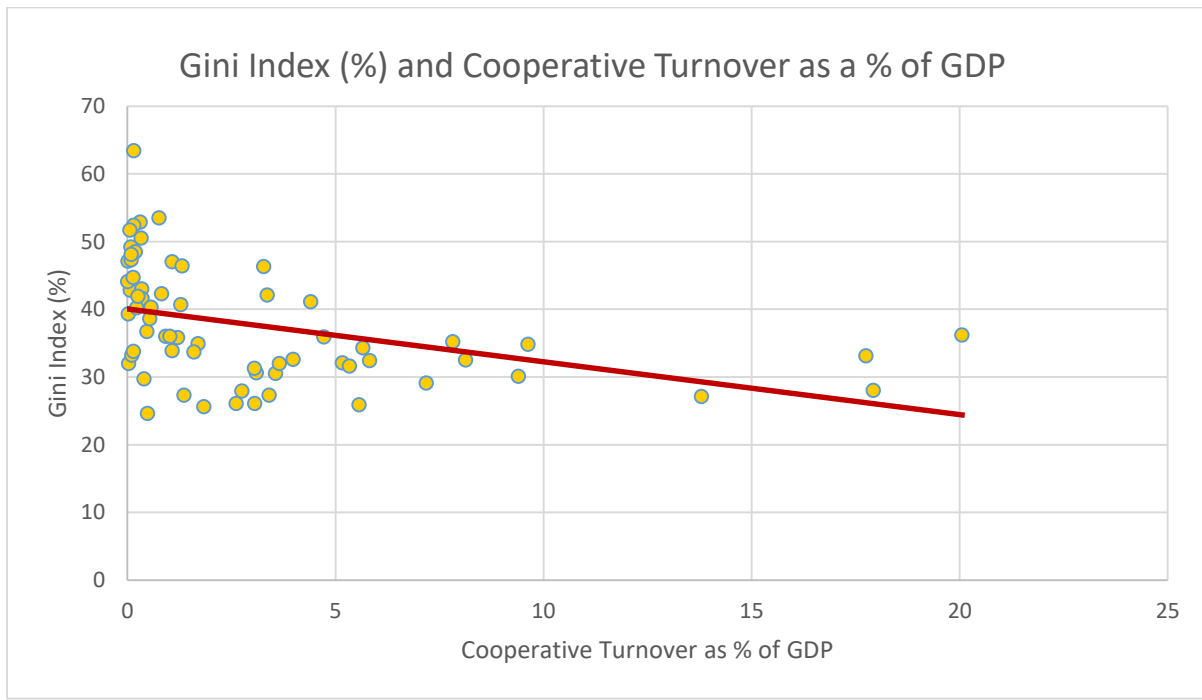
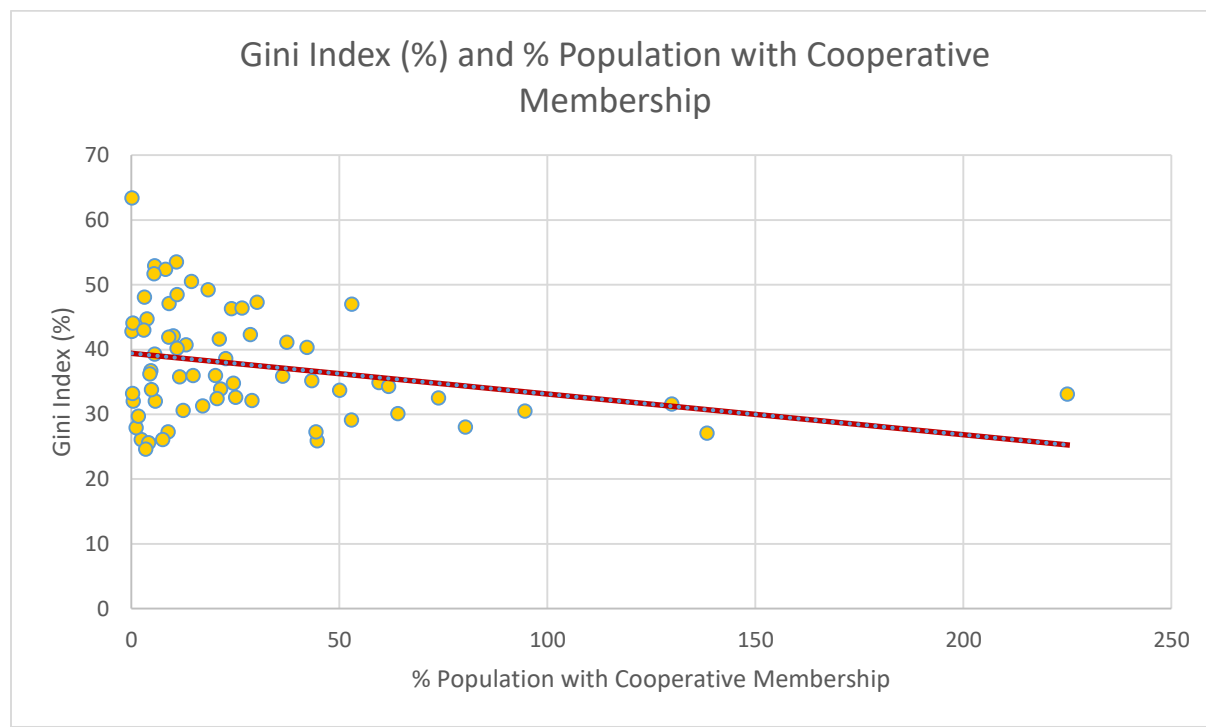


Figure 1b. Relationship between Gini Index (%) and % of Population with Cooperative Membership:



B. Simple Regression Results:

The estimates of simple regressions of GINI on COOP_GDP and COOP_MEMB are shown in Table 2. The results for the simple regression of COOP_GDP with GINI indicate that a 10 percentage point increase in COOP_GDP decreases the Gini coefficient by 7.81 percentage points. Now considering the average cooperative turnover as % of GDP is a mere 3 percent, a 10 percentage point increase in this variable is very large. Nonetheless, even a one percentage point increase would result in a decrease in the Gini coefficient by 0.781 percentage points, which is still significant. Simple regression results of COOP_MEMB on GINI indicate that a 10 percentage point increase in COOP_MEMB decreases the Gini coefficient by 0.627 percentage points. The magnitude of this effect is smaller. The coefficient on COOP_GDP is statistically significant at the 1% level, while the coefficient on COOP_MEMB is significant at better than the 5% level.

Table 2. Simple Regressions of both COOP_GDP and COOP_MEMB with GINI:

Variable	COOP_GDP Coefficients (t-value) (p-value)	COOP_MEMB Coefficients (t-value) (p-value)
COOP_GDP	-0.781*** (-3.58) (0.001)	N/A
COOP_MEMB	N/A	-0.0627** (-2.35) (0.022)
Constant	40.05 (34.04) (0.000)	39.40 (31.19) (0.000)
	N = 66 R² = 0.1669 Adjusted R² = 0.154 Prob > F: 0.0007	N = 66 R² = 0.0792 Adjusted R² = 0.0648 Prob > F: 0.0221

C. Extended Regression Results

The extended regression estimates are shown in Table 3. The results for COOP_GDP indicate there is not a statistically significant relationship between income inequality and cooperative turnover as a percentage of overall GDP at the conventional significance levels. Since the p-value is 0.13, the estimate is not statistically significant even at the 10% level. Before incorporating the control variables there is statistical significance at the 1% level, but this relationship dissipates when control variables are added. The sign is negative and has a magnitude of approximately 0.401. This would be interpreted as a decrease in the Gini coefficient by 4.01 percentage points for a 10 percentage point increase in cooperative turnover as a percentage of GDP. This is the result of a regression with an R-squared value of approximately 0.391 and 66 observations. The regression produced two statistically significant variables: UNEMP and LEDUC. A positive correlation was found between UNEMP and GINI which was expected.

Results indicate that a 10 percentage point increase in the unemployment rate increases the Gini coefficient by 2.97 percentage points. A negative correlation was found between LEDUC and GINI. The estimate indicates that a 10% increase in education decreases the Gini coefficient by 2.91 percentage points. Considering that the mean education level in this study is approximately 10.2 years of schooling, a 10% increase in education equates to roughly a year of schooling. Therefore, an extra year of schooling is correlated with a decrease in the Gini coefficient by almost 3 percentage points.

Extended regression results for COOP_MEMB also indicate no statistically significant relationship between income inequality and percentage of population with cooperative membership. Regression results indicate a negative coefficient with a relatively small magnitude of approximately 0.0277 and a p-value of 0.337. I found a positive coefficient with a magnitude of 0.390 for variable NAT_RES. The variable is statistically significant at the 10% level and has a sign that corresponds with the literature. This is interpreted as an increase in the Gini coefficient by 3.90 percentage points for a 10 percentage point increase in total natural resource rents as a percentage of GDP. This means that a greater natural resource endowment is correlated with higher income inequality, all else held equal. UNEMP is positively correlated with income inequality and has a magnitude of 0.314. It was statistically significant at the 10% level with a p-value of 0.077. This positive relationship corresponds with economic theory. This result implies that a 10 percentage point increase in unemployment rate increases the Gini coefficient by 3.14 percentage points. Logically it makes sense that a country with higher unemployment would also have higher income inequality. The next variable, LEDUC, is the last statistically significant variable in the results. This variable had a coefficient of -30.61 and was statistically significant at the 5% level with a p-value of 0.044. The result can be interpreted as: a 10% increase in education results in a

decrease in the Gini coefficient by 3.061 percentage points. In other words, an additional year of education results in a decrease in the Gini coefficient by roughly 3 percentage points. This means that higher education results in lower income inequality, which corresponds with the literature.

Table 3. Extended Regressions of both COOP_GDP and COOP_MEMB with GINI:

Variable	COOP_GDP Coefficients (t-value) (p-value)	COOP_MEMB Coefficients (t-value) (p-value)
COOP_GDP	-0.401 (-1.54) (0.130)	N/A
COOP_MEMB	N/A	-0.0277 (-0.97) (0.337)
NAT_RES	0.352 (1.61) (0.113)	0.390* (1.78) (0.080)
GDP_GROW	0.546 (1.19) (0.240)	0.445 (0.95) (0.345)
LGDPPC	5.08 (0.850) (0.398)	5.270 0.84 (0.403)
UNEMP	0.297* (1.72) (0.091)	0.314* (1.80) (0.077)
TRAD_OPEN	-0.022 (-1.05) (0.297)	-0.0236 (-1.09) (0.282)
INFL_CPI	0.129 (0.64) (0.528)	0.134 (0.65) (0.518)
GOV_EXP	-0.250 (-0.83) (0.409)	-0.359 (-1.23) (0.225)
FIN_DEV	0.0205 (0.920) (0.361)	0.0165 (0.74) (0.464)
LEDUC	-29.06** (-2.00) (0.050)	-30.61** (-2.06) (0.044)

FIN_OPEN	0.00861 (0.570) (0.568)	0.00696 (0.46) (0.648)
Constant	44.513 (2.450) (0.018)	47.11 (2.55) (0.014)
	N = 66 R² = 0.391 Adjusted R² = 0.267 Prob > F: 0.0024	N = 66 R² = 0.375 Adjusted R² = 0.248 Prob > F: 0.0041

D. Robustness Check:

Two other measures of income inequality besides the Gini coefficient were used to check the robustness of my results. I wanted to see if the statistical significance of the cooperative sector proxies was better using different measures of income inequality. These measures are: the ratio of the average income of the richest 10% to the poorest 10% in a country and the ratio of the average income of the richest 20% to the poorest 20% in a country. Data was collected on these ratios for each of the 66 countries in the study. This data originated from the U.N. Human Development Reports from 2007/2008 and 2009 (Appendix A). The ratios were then logged and defined as the dependent variables LRP10 and LRP20. Using these new dependent variables, regressions were run to see if there were significant results for the two main variables of interest and the estimates are shown in Table 4 and Table 5. However, the new measures of income inequality, COOP_MEMB and COOP_GDP were also not statistically significant at the conventional levels. The results for LRP20 are more significant than those for LRP10, but never falls within the commonly accepted range for statistical significance. The overall pattern for LRP10 and LRP20 is very similar to that for GINI.

Table 4. Extended Regressions of COOP_GDP and COOP_MEMB with LRP10:

Variable	COOP_GDP Coefficients (t-value) (p-value)	COOP_MEMB Coefficients (t-value) (p-value)
COOP_GDP	-0.0074 (-0.86) (0.393)	N/A
COOP_MEMB	N/A	-0.00106 (-1.14) (0.261)
NAT_RES	0.0106 (1.47) (0.147)	0.0112 (1.57) (0.122)
GDP_GROW	0.0188 (1.21) (0.231)	0.0160 (1.04) (0.305)
LGDPCC	0.322 (1.62) (0.112)	0.368* (1.79) (0.080)
UNEMP	0.00582 (1.00) (0.322)	0.00573 (0.99) (0.326)
TRAD_OPEN	-0.000732 (-1.05) (0.298)	-0.000829 (-1.18) (0.242)
INFL_CPI	0.00675 (1.02) (0.315)	0.00669 (1.01) (0.316)
GOV_EXP	-0.00998 (-0.99) (0.328)	-0.0116 (-1.21) (0.234)
FIN_DEV	0.000135 (0.18) (0.856)	0.0000683 (0.09) (0.926)
LEDUC	-0.973** (-2.04) (0.047)	-1.050** (-2.18) (0.034)
FIN_OPEN	-0.000111 (-0.22) (0.823)	-0.000140 (-0.28) (0.777)
Constant	0.740 (1.22) (0.227)	0.670 (1.10) (0.275)

	N = 62 R² = 0.342 Adjusted R² = 0.197 Prob > F: 0.0195	N = 62 R² = 0.349 Adjusted R² = 0.206 Prob > F: 0.0162
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Table 5. Extended Regressions of COOP_GDP and COOP_MEMB with LRP20:

Variable	COOP_GDP Coefficients (t-value) (p-value)	COOP_MEMB Coefficients (t-value) (p-value)
COOP_GDP	-0.012 (-1.59) (0.119)	N/A
COOP_MEMB	N/A	-0.00111 (-1.38) (0.173)
NAT_RES	0.00772 (1.25) (0.217)	0.00883 (1.44) (0.156)
GDP_GROW	0.0154 (1.20) (0.237)	0.0121 (0.93) (0.355)
LGDPCC	0.321* (1.87) (0.067)	0.358* (1.98) (0.053)
UNEMP	0.00413 (0.85) (0.397)	0.00443 (0.91) (0.365)
TRAD_OPEN	-0.000964 (-1.60) (0.115)	-0.00105* (-1.71) (0.093)
INFL_CPI	0.00652 (1.15) (0.255)	0.00661 (1.16) (0.251)
GOV_EXP	-0.0119 (-1.38) (0.173)	-0.015* (-1.81) (0.076)
FIN_DEV	0.00000609 (0.01) (0.992)	-0.000116 (-0.18) (0.856)
LEDUC	-0.897** (-2.20) (0.032)	-0.978** (-2.35) (0.023)

FIN_OPEN	0.0000747 (0.18) (0.861)	0.0000227 (0.05) (0.957)
Constant	0.549 (1.06) (0.293)	0.539 (1.03) (0.310)
	N = 62 R² = 0.428 Adjusted R² = 0.303 Prob > F: 0.0014	N = 62 R² = 0.422 Adjusted R² = 0.294 Prob > F: 0.0018

Conclusion and Policy Implications:

These results are fairly standard in comparison to other studies on income inequality. For the extended regression of COOP_GDP on GINI, two of the ten standard determinants, not including the two cooperative variables of interest, were statistically significant at the usual levels. These variables were UNEMP and LEDUC. For the extended regression of COOP_MEMB on GINI, three of the ten standard determinants were statistically significant: NAT_RES, UNEMP, and LEDUC. There are numerous examples of academic papers on income inequality with models that incorporate 10 or more independent variables where only a handful of the variables are statistically significant. Therefore, I am not overly surprised or concerned by the lack of statistically significant variables.

Although the two cooperative variables of primary interest are negatively associated with income inequality, the statistical significance of the estimates is weak. This might be the result of various factors. One possibility is that there is simply not enough data to capture the true relationships between these variables. Many of the control variables do not return significant results. This could be the result of having only 66 observations. Perhaps 66 observations are not enough to make significant statements regarding the relationships between the core variables. A final consideration is that perhaps income inequality is not an appropriate measure of interest, and

rather wealth inequality is. Due to the worker-ownership aspect of worker-owned cooperatives, perhaps prevalence of cooperatives will be correlated with lower wealth inequality. The problem with performing analysis using wealth Gini data is that it is difficult to obtain the necessary data for this variable. Income inequality data across countries is more abundant than wealth inequality data.

The lack of statistically significant results, of course, implies that there are few policy implications from this paper. It is interesting to note the significant relationship between education and income inequality found in this study. Though there is a significant amount of literature on the relationship between both natural resource endowment and unemployment rate on income inequality, there seems to be relatively fewer cross-country studies that find a clear negative relationship between education and income inequality. Therefore, these results may prove to be important for policymakers interested in addressing income inequality through increased education. Literature on the topic of cooperatives still provides ample evidence in support of the promotion of cooperatives as a strategy to address a wide range of social and economic issues. However, when it comes to addressing the issue of high income inequality, more standard approaches might have to be utilized by governments even though promotion of cooperatives may still be desirable for other reasons related to social and economic welfare.

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Appendix A. Data Sources and Related Information:

Variable	Data Source	Web Address	Year(s)
GINI	World Bank and CIA World Factbook	http://data.worldbank.org/indicator/SI.POV.GINI ; https://www.cia.gov/library/publications/the-world-factbook/fields/2172.html	2013 or most recent year available
LRP10	U.N. Human Development Report 2009; CIA World Factbook; and OECD database	http://hdr.undp.org/sites/default/files/reports/269/hdr_2009_en_complete.pdf ; https://www.cia.gov/library/publications/the-world-factbook/fields/2047.html ; https://data.oecd.org/inequality/income-inequality.htm	2009 or most recent year available
LRP20	U.N. Human Development Report 2007/2008; Mallis (2015); OECD database; and Mijatovic (2015)	http://hdr.undp.org/sites/default/files/reports/268/hdr_20072008_en_complete.pdf ; http://www.mof.gov.cy/mof/mof.nsf/All/525EB3E73120303EC2257DD5002C51D0/\$file/Income%20distribution%20&%20Economic%20Growth%20[Compatibility%20Mode].pdf ; https://data.oecd.org/inequality/income-inequality.htm ; http://socijalnoukljucivanje.gov.rs/wp-content/uploads/2015/10/Poverty-in-Serbia-2014..pdf	2007/2008 or most recent year available
COOP_GDP	2014 Global Census on Co-operatives	http://www.un.org/esa/socdev/documents/2014/coopsegm/grace.pdf **Special requested complete dataset**	2014
COOP_MEMB	2014 Global Census on Co-operatives	http://www.un.org/esa/socdev/documents/2014/coopsegm/grace.pdf **Special requested complete dataset**	2014

NAT_RES	World Bank	http://data.worldbank.org/indicator/NY.GDP.TOTL.RT.ZS	2014 (one observation from 2013)
GDP_GROW	World Bank and CIA World Factbook	http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG ; https://www.cia.gov/library/publications/the-world-factbook/rankorder/2003rank.html	2014
LGDPCC	World Bank and CIA World Factbook	http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD ; https://www.cia.gov/library/publications/the-world-factbook/rankorder/2004rank.html	2014 (two observations from 2015)
UNEMP	World Bank	http://data.worldbank.org/indicator/SL.UEM.TOTL.ZS	2014
TRAD_OPEN	World Bank	http://data.worldbank.org/indicator/NE.TRD.GNFS.ZS	2014 (one observation from 2010, 2011, 2012)
INFL_CPI	World Bank and CIA World Factbook	http://data.worldbank.org/indicator/FP.CPI.TOTL.ZG ; https://www.cia.gov/library/publications/the-world-factbook/rankorder/2092rank.html	2014
GOV_EXP	World Bank and Heritage Foundation	http://data.worldbank.org/indicator/NE.CON.GOVT.ZS ; http://www.heritage.org/index/pdf/2016/countries/srilanka.pdf	2014 (one observation from 2011, 2012, and 2016)
FIN_DEV	World Bank	http://data.worldbank.org/indicator/FS.AST.PRVT.GD.ZS	2014 (one observation from 2006, 2008, 2009, and 2010)

LEDUC	U.N. Human Development Index	http://hdr.undp.org/en/composite/HDI	2014
FIN_OPEN	World Bank	http://data.worldbank.org/indicator/FM.AST.NFRG.CN?page=1; http://data.worldbank.org/indicator/NY.GDP.MKTP.CN	2014 (one observation from 2006, 2008, 2009, 2010, and 2013)

Appendix B. List of Countries and the Corresponding Gini Values:

Country	Income Gini Coefficient (%)
South Africa	63.4
Colombia	53.5
Brazil	52.9
Guatemala	52.4
Panama	51.7
Chile	50.5
Costa Rica	49.2
Kenya	48.5
Mexico	48.1
Ecuador	47.3
Dominican Republic	47.1
Barbados	47
Singapore	46.4
Malaysia	46.3
Peru	44.7
Macedonia (Former Yugoslav Rep of)	44.1
Philippines	43
Israel	42.8
Argentina	42.3
China	42.1
Uruguay	41.9
Russian Federation	41.6
United States	41.1
Morocco	40.7
Trinidad and Tobago	40.3
Turkey	40.2
Thailand	39.3
Sri Lanka	38.6
Greece	36.7
New Zealand	36.2
Bulgaria	36
Portugal	36
Spain	35.9
Mauritius	35.8
Italy	35.2
Australia	34.9
Luxembourg	34.8
Cyprus	34.3

India	33.9
Mongolia	33.8
Canada	33.7
Estonia	33.2
France	33.1
United Kingdom	32.6
Ireland	32.5
Poland	32.4
Japan	32.1
Bangladesh	32
Croatia	32
Switzerland	31.6
Korea (Republic of)	31.3
Hungary	30.6
Austria	30.5
Germany	30.1
Serbia	29.7
Denmark	29.1
Netherlands	28
Malta	27.9
Romania	27.3
Sweden	27.3
Finland	27.1
Czech Republic	26.1
Slovak Republic	26.1
Norway	25.9
Slovenia	25.6
Ukraine	24.6