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AKADÉMIAI KIADÓ

Income inequality and the cost of recessions

MOSTAFA SHAHEE[1*] and GLENN P. JENKINS[2]

[1] Department of Policy Studies, Queen's University, Robert Sutherland Hall, Kingston, Ontario, K7L 3N6, Canada

[2] Department of Economics, Queen's University, Kingston, Ontario, Canada and Eastern Mediterranean University, Famagusta, North Cyprus

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ABSTRACT

This study empirically examines the relationship between the severity of recessions experienced by countries and their income distributions. The analysis is carried out for 28 higher middle- and high-income countries between 1970 and 2013. The empirical evidence derived from the changes in the Gini-index suggests that a greater degree of income inequality increases the cumulative loss of GDP inflicted by recessions. The increased cost emerges from both a longer duration and a deeper amplitude for the contractionary phase of the business cycle.

KEYWORDS

recession, income inequality, business cycle, income loss

JEL CLASSIFICATION INDICES

E25, E32

1. INTRODUCTION

Since the 1950s, income inequality and its impact on economic development has been the topic of many investigations. These studies were mainly concentrated on the relationship between economic growth and inequality of income within the countries from different perspectives. Kuznets (1955) was one of the first researchers who proposed that there exists an 'inverted

* Corresponding author. E-mail: mostafa.shahee@queensu.ca, msshahee@gmail.com

U-shape' relationship between per capita income and the inequality of income distribution, in which economic development eventually reduces income inequality. Later on, other researchers, such as Alesina – Rodrik (1994), Persson – Tabellini (1994), Clarke (1995), Lee – Kang (1998), Birdsall (2007) studied this relationship by addressing the impact of income inequality on economic growth. Their findings showed that income inequality has a negative effect on economic growth. Assane – Grammy (2003) were concerned about the impact of economic growth on inequality. Using U.S. data, they found that economic growth was associated with increased inequality. Bishop et al. (1997) and Burkhauser et al. (1999) were concerned about the impacts of recessions and expansions on individuals in different quintile. They found that higher-income individuals suffer less than those with lower incomes during economic downturns. Furthermore, those higher income individuals also benefit more during expansionary periods compared with lower-income individuals. These results were subsequently confirmed by Hoover et al. (2009) who pointed out that during the periods of recession an increase in unemployment intensifies income inequality, whereas the effect of an expansion in reducing income inequality is short-lived.

However, one important question that has not been widely addressed is how income inequality may affect the amplitude, duration and cumulative loss of GDP as a negative shock hits the economy. The first objective of our research is to find out how income inequality represented by the Gini index is related to the magnitude of cumulative loss of recessions for the countries under study. The cumulative loss is defined by the duration and the amplitude of the recession. Empirically we investigate how income inequality may affect both of the components of the cumulative loss of the contractionary phases of the cycles.

For this purpose, a set of 28 countries was selected for a period of over 40 years from 1970 to 2013. The sample has been chosen from higher middle-income and high-income countries possessing different levels of income inequality. Each of the selected countries possesses Economic Freedom Index greater than 60 indicating that they are categorized as moderately free, mostly free, or free economies. This sample of countries was selected because their economies had a greater degree of similarity as compared to a sample that was extended to lower income countries.

A higher value of Gini coefficient corresponds to an economy with a more unequal distribution of income. As the Gini index data for some years of many selected countries are missing, conducting a comparative analysis to monitor the impacts of income inequality on the magnitude of recessions within the countries has its shortcomings. Therefore, our analysis is on the basis of the estimating the impacts of the average Gini indices on the average magnitude of the recessions of the selected countries, represented by the duration, amplitude and cumulative losses of GDPs, over the period of study.

2. HOUSEHOLDS' CONSUMPTIONS AND INCOME INEQUALITY

A growing empirical literature supports the idea that a wider income inequality, shown by a substantial heterogeneity of marginal propensity to consume (MPC) among different income groups, may produce insufficient aggregate demand since the economy allocates a growing share of national income to a group with the lowest MPC (Blundell et al. 2008; Parker et al. 2013; Broda – Parker 2014; Kaplan – Violante 2014; Carroll et al. 2017).

Recent research on estimating MPCs for different income groups has placed a greater emphasis on the relative income hypothesis, proposed by Duesenberry (1948) and Alpizar et al. (2005), rather than other well-known consumption theories (Keynes 1936; Friedman 1956; Modigliani 1957). Based on this hypothesis, Palley (2010) has developed a synthetic Keynes-Duesenberry-Friedman model and exerts that low-income households have a higher marginal and average propensity to consume. Likewise, Jappelli et al. (2014) showed that the higher-income groups have a lower average MPCs as compared to the lower-income groups.

A wider income inequality, if households face a tight borrowing constraint, intensifies the recession since the households' consumptions are only driven by current disposable income. Hence, a shock to the economy shrinks households' consumptions followed by a reduction in the disposable income of low-income households and eventually causes a fall in aggregate demand.

Meyer et al. (2013) already showed that during a severe recession, when asset prices decline, higher income groups who even did not lose their income but a proportion of their wealth (properties, savings etc.) would revise their expectations about the availability of long-run resources and most likely cut their consumptions, causing aggregate demand to fall even further.

On the other hand, income inequality might also intensify a recession if it is accompanied by a loose credit constraint where households finance their current consumptions through borrowing from future rather than current disposable income. This has been suggested by many researchers (e.g., UN Commission of Experts 2009; Stiglitz 2009; IMF–ILO 2010; Rajan 2010; Reich 2012; Galbraith 2012; Palley 2012; Kumhof et al. 2015; Stockhammer 2015). These studies claim that when a small group of wealthy households acquire a larger proportion of total income while aggregate income is rising, the lower- and middle-income groups respond to this demonstration effect and are motivated to increase their consumption through increased borrowing. This excessive credit growth not only significantly raises the likelihood of financial instability and recession, as pointed out by Drehmann et al. (2010, 2011) and Paul (2017), it can also deepen a recession because a shock to the economy will restrict debt-financed demands. Treeck et al. (2012) showed that the shock in the housing sector in the U.S. put an end to the debt-financed private demand expansion, resulting from credit promotion policies and the deregulation of the financial sector for the years before 2008, and eventually led to a greater recession.

Following these lines of argument, one would expect to find some empirical evidence to support the hypothesis that a more unequal distribution of income among households would intensify the severity of recessions (shown by durations and amplitudes of recessions) in a country as compared to the situation for other countries that have a less unequal distribution of income. This may arise due to the fact that the share of household final consumption expenditures in total GDP for the countries under study ranges from 46 to 72 per cent[1] of their GDPs (World Bank 2016). Hence, it is reasonable to expect that movements in consumption will have an impact on GDP.

[1]The average share of household final consumption expenditures in total GDP for Sweden and Singapore was approximately 46% and for Turkey was approximately 72% for the period from 1970 to 2013.

3. EMPIRICAL INVESTIGATION

In order to empirically address this question, it is first necessary to measure the severity of recessions for each country. The algorithm developed by Harding – Pagan (2002) is used for this purpose. The algorithm not only identifies the potential turning points but also ensures that the peaks and troughs alternate over time. In this way the true business cycles are identified along with their respective durations, amplitudes and cumulative impacts. These are calculated by country and the results are presented as averages of durations, amplitudes, and cumulative losses of GDPs over the period of 1970–2013 for each individual country. Similarly, for the consistency of our final result, the average Gini index for each country over the period of study is estimated as well. The models are estimated using ordinary least squares (OLS) and to investigate the effect of the Gini index (as explanatory variable) on duration, amplitude and the cumulative loss of the contractionary phase of the cycles. To carry out an endogeneity test, two variables of fixed telephone lines (TL) per 100 people in the selected countries and private health care (HE) spending are introduced. Similarly, the Real Interest Rate (*RIR*) and Inflation Rate (*IR*) are used to test for omitted variables in our structural models (OLSs).

3.1. Data employed

The annual data on the GDPs of the selected 28 countries[2] and their Gini indices are available from 1970 to 2013 in the World Bank's *World Development Indicators* (World Bank 2016). In order to include more countries in our study and at the same time prevent the risk of biasedness of estimations due to missing data, we had to limit our study to the period of 1970–2013. Although the Gini index data was missing for some years of the selected countries over the period of study, we believe that taking an average of Gini index over the entire period is unlikely to create a bias in our analysis. This is particularly likely given that the variation of Gini index for a given country over time is very small. In addition, the employed algorithm presents the cumulative losses of recessions of the selected countries in terms of average percentage term.

3.2. Dating the cycles

Following Harding – Pagan (2002a), the turning points of the data series for GDP must first be explored. Harding – Pagan (2002b) showed that their modified algorithm performs well when compared to the National Bureau of Economic Research (NBER) business-cycle dates in the United States. Furthermore, they argue that the algorithm is a transparent and simple method for dating business cycles.

In order to determine these points, the algorithm determines the potential turning points of the series, including peaks and troughs, and selects only those episodes in which the peaks and troughs alternate. It then re-combines the turning points to ensure that the phases of the cycle have a minimum duration of six months and a complete cycle has a minimum duration of 15 months.

[2]Australia, Austria, Belgium, Canada, Chile, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States.

To identify the peaks and troughs, we employ the concept of Contraction Terminating Sequence (CTS). The algorithm uses the rule that requires a recession to have at least two quarters of negative growth. To measure the severity of the cycle it is important to focus on three measures, as shown in Fig. 1: the duration of CTS (shown as AB); the amplitude of the phases of the cycle '*di*', measured as $\sum_{i=A}^{B} di$ and $\sum_{i=B}^{C} di$ (shown by the vertical lines inside the cycle in Fig. 1); and the cumulative losses within each phase of the cycles (shown as the area *PTM* for the CTS or contractionary phase of cycles).

Over the period of the study, the Harding – Pagan algorithm identifies the true cycles for each individual country based on a set of censoring rules. It also calculates the areas of loss accumulated for each phase of the cycles (*PTM* and *MTD*). It then calculates the average (percentage) loss for each phase separately across all the business cycles experienced by a country (1970–2013) with respect to the GDP trend for each country at the time of the business cycle.[3] It should be noted that for the purpose of this article the focus is only on the contractionary (CTS) phases of the cycles. Because annual data on GDPs of the selected countries are used for dating the cycles, the algorithm rules applicable to annual data are employed in Guass program[4] (Harding – Pagan 2006).

The proposed algorithm presents the calculated results of the average duration in terms of the number of quarters it takes to complete each phase of the cycle, average amplitude in terms of percentage decrease in output per phase of the cycle, and the average cumulative loss of a cycle in terms of percentage loss in output per phase of the cycle.

3.3. Application of ordinary least squares method

OLS regression is a method of analysis that estimates the relationship between one or more independent variables and a dependent variable. This method is widely applied by scholars and it basically estimates and presents this relationship by minimizing the sum of the squares of the difference between the observed and predicted values of the dependent variable configured as a straight line.

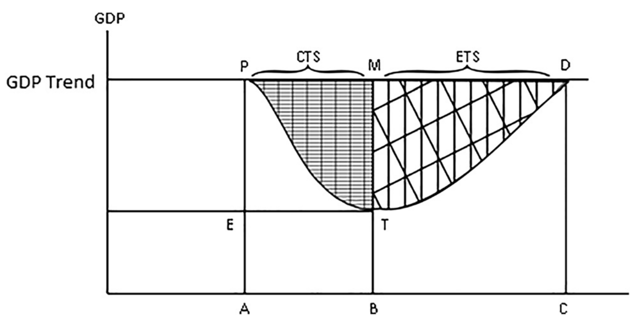

Fig. 1. Duration, amplitude and cumulative loss of the phases of the business cycle

[3]A detailed explanation of the Harding – Pagan algorithm and the way of measuring the average amplitude and cumulative loss (gain) for the CTS and expansionary (ETS) phases of the cycles is provided by Athanasopoulos – Vahid (2001).

[4]Calculus rule.

In order to investigate the extent to which income inequality might affect the recession, the effect of the Gini index on each component of duration, amplitude and the cumulative loss of the contractionary phase of a cycle is examined, using an OLS model. A typical model is formed as follows:

$$Y_i = \beta_0 + \beta_1 {}^* Gini + \varepsilon_{1i} \quad i = 1,\ 2,\ 3 \tag{1}$$

where Y_1, Y_2, Y_3 represent duration (*DUR*), amplitude (*AMP*) and cumulative loss (*CUM*), respectively, of the contractionary phase of cycles. However, this model might suffer from an endogeneity problem (existence of a correlation between the Gini index and ε_{1i} as an error term) in which the application of the OLS method will eventually produce a biased result (Bullock et al. 2010). In order to test for the existence of such a problem, instrumental variables are employed. These variables must satisfy two conditions to be considered as reliable instrumental variables. First, there must be a strong correlation between each of the instrumental variables and the Gini index. Second, in contrast, there must be no correlation between each of the instrumental variables and the residuals of Eq. (1) (ε_{1i}). This requires us to choose two variables of private health spending, (*HE*), and the number of telephone lines per 100 people in the population, (*TL*), as the instrumental variables for this model, in which both variables satisfy the abovementioned conditions reasonably well. The obtained estimators of the following model:

$$Gini = b_0 + b_1 {}^* HE + b_2 {}^* TL + u \tag{2}$$

are significantly different from zero at 1% level of significance, and *R*-squared (0.58) and *F*-statistics (17.523) are high enough to prove that the chosen instruments are not weak for this model (Stock et al. 2002). Hence, Eq. (1) could be transformed to:

$$Y_i = \beta_0^* + \beta_1^* {}^* \hat{Gini} + \varepsilon_{2i} \quad i = 1,\ 2,\ 3 \tag{3}$$

where the Gini is the predicted value from Eq. (2) and the Two-Stage Least Square (TSLS) method should be used in order to obtain the estimators of the model if the Gini index is said to be an endogenous variable (Foster – McLanahan 1996; Greene 1993).

To determine whether the Gini index is an endogenous variable a Hausman test needs to be conducted. As Hausman (1978) proposed, the Gini index is said to be an exogenous variable if there is no correlation between the error term in Eq. (2) and the dependent variables of Eq. (1). In this case, an OLS model (similar to Eq. (1)) would be sufficient to produce unbiased results. On the other hand, Gini index is said to be an endogenous variable if there is a significant correlation between the error term in Eq. (2) and the dependent variables of Eq. (1). In this situation, instrumental variables in the proposed models are required to produce unbiased results. Hence, Eq. (3) using TSLS should be performed. To conduct the Hausman test, Eq. (2) is first estimated. Then its error term (u) is included as an explanatory variable in Eq. (1) as shown in the following equation:

$$Y_i = \varphi_0 + \varphi_1 {}^* Gini + \delta^* u + \varepsilon_{3i} \quad i = 1,\ 2,\ 3 \tag{4}$$

The null hypothesis to be tested is $\delta = 0$, which proves that the Gini index is an exogenous variable. If the null hypothesis is rejected implying that δ is statistically significant it asserts that the Gini index is an endogenous variable. Hence, obtaining unbiased results necessitate the estimation of Eq. (3). On the other hand, if the null hypothesis is not rejected, it reveals that the Gini index is an exogenous variable, and estimation of Eq. (1) is sufficient to produce a reliable conclusion. The result of Hausman test (Eq. (4)), as shown in Table 1, asserts that the Gini index is an exogenous variable since the residuals of Eq. (2) (u) is not significantly related to the duration, amplitude and cumulative loss.

These results indicate that the Gini is an exogenous variable for all three models estimated for DUR, AMP and CUM since the coefficients of u for all models are not statistically different from zero. Therefore, the instrumental variables should be dropped so that estimating Eq. (1) using the OLS method would suffice to produce reliable results.

However, there might be some other variables excluded from the above models that could affect the average duration, amplitude and cumulative losses of the contractionary phase of cycles. As King et al. (1994) observed, if 'relevant variables are omitted, our ability to estimate causal inferences correctly is limited'. In order to tackle this problem, it is necessary to run an omitted variable test. For this purpose, there is a need to find some variables that affect the contractionary phase of business cycles such that their inclusion in Eq. (1) may change the result. In theory, the rate of productivity and the real interest rate lie at the center of the discussion since they have the greatest effect on the business cycles. While the data for productivity rate for the selected countries between 1970 and 2013 is not available, in addition to real interest

Table 1. Endogeneity test results

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
DUR = **C(1)+C(2)****GINI***+C(3)****RES***				
GINI	0.027934	0.014330	1.949312	0.0626
U	0.027925	0.022209	1,257346	0.2202
C	0.375574	0.485784	*0.773131*	0.4467
R-squared	0.369292	Adjusted R-squared		0.318835
Prob. (*F*-statistics)	0.003147	DW	2.001636	
AMP = **C(1)+C(2)****GINI***+C(3)****RES***				
GINI	0.159248	0.050170	3.174175	0.1304
U	−0.027615	0.077754	−0.355155	0.7255
C	−2.659774	1.700709	−1.563921	0.1304
R-squared	0.374780	Adjusted R-squared		0.324762
Prob. (*F*-statistics)	0.002821	DW	1.544763	
CUM = **C(1)+C(2)****GINI***+C(3)****RES***				
GINI	0.153729	0.046008	3.341361	0.0026
U	−0.022989	0.071304	−0.322407	0.7498
C	−3.171690	1.559627	−2.033620	0.0527
R-squared	0.403695	Adjusted R-squared		0.355991
Prob. (*F*-statistics)	0.001561	DW	1.906127	

rate, *RIR*, inflation rate, *IR*, is chosen as a proxy variable to conduct the omitted variable test (World Bank 2016).

Thus, Eq. (1) is estimated for DUR, AMP, and CUM of business cycles assuming that *RIR* and *IR* are omitted variables of these models. The omitted variable test exerts that how inclusion of *RIR* and *IR* would significantly change the coefficient of Gini for the abovementioned models. Table 2 shows the estimation results of Eq. (1) assuming that the Gini index is an exogenous variable, and *RIR* and *IR* are omitted variables.

The results show that there exists at least one variable significantly different from zero in all models (Shown by *F*-test). However, RIR could be dropped from all models because it is not statistically different from zero at 5% level of significance. In addition, C as a constant parameter is not significantly different from zero for AMP and CUM models and it could be dropped from those models as well. The results of the endogeneity test and omitted variable test assert that we can safely drop IVs[5] and RIR and run the models assuming that IR is the only omitted variable from all three models. Hence, the OLS method suffices to explain the variation of DUR, AMP and CUM as the Gini index changes across the countries. The results are presented in Table 3.

As shown in Table 3, the coefficients of the Gini index are statistically significant at the 1% level of significance for all three models. These results indicate that a more unequal distribution of income would lengthen the duration of recessions experienced by countries about 0.063 for a one percentage point increase in the Gini index. For instance, if the duration of a recession is supposed to be one quarter, a one percentage point increase in Gini index (let's say from 32 to 33) would extend the duration of recession to 1.06 quarter. Likewise, it is expected that more unequal income distribution (or a higher Gini index) would intensify the depth or amplitude of recessions by 0.122% for one percentage point increase in the Gini index. The combination of these two effects (or aggregate effects), known as cumulative loss, generates 0.116 % more GDP loss for each percentage point increase in the Gini index of a country when a recession hits the economy.

The findings of this paper provide an additional argument about why governments should pursue income distribution policies more effectively to mitigate the gaps between poor and wealthy households. As studies by Piketty – Saez (2013) and Jenkins et al. (2013) show, the income inequality in the developed countries only declined in the years 2008 and 2009, mainly due to the government support through the tax and benefit system. However, it worsened after 2010 and approaches its long-term trend. This indicates that the long-run trend of income inequality is unlikely to change without applying proper policies.

4. CONCLUSION

From these empirical results, we draw our conclusion: less equal income distribution leads to longer, deeper and more costly recessions. Overall, the length of the duration of contraction when going into a recession is longer and its amplitude is deeper for the countries with a less equal distribution of income. The results show that the decline in aggregate demand in the first phase of the cycles (cumulative income losses of GDP) is greater for the countries experiencing a

[5]Instrumental variables.

Table 2. Omitted variable test for the model in Eq. (1)

DUR = C(1)+C(2)*$GINI$+C(3)*RIR+C(4)*IR (Omitted Variables: *RIR IR*)				
F-Statistic	3.484103	Prob. (*F*-Statistics)		0.0469
Likelihood Ratio	7.137403	Prob. (Likelihood)		0.0282
	Coefficient	Std. Error	*t*-Statistic	Prob.
C	0.814151	0.467247	1,742445	0.0942
Gini	0.027475	0.034675	1.262061	0.8366
RIR	–0.057781	0.037034	–1.560208	0.1318
IR	0.020975	0.007960	2.635030	0.0145
R-squared	0.480299	Adjusted R-squared		0.415336
F-Statistic	7.393456	Prob. (*F*-Statistics)		0.001128
AMP = C(1)+C(2)*$GINI$+C(3)*RIR+C(4)*IR (Omitted Variables: *RIR IR*)				
F-Statistic	6.811584	Prob. (*F*-Statistics)		0.0045
Likelihood Ratio	12.58782	Prob. (Likelihood)		0.0018
	Coefficient	Std. Error	*t*-Statistic	Prob.
C	1.253796	1.442918	0.868931	0.3935
Gini	0.085008	0.089477	1.052578	0.3030
RIR	–0.183760	0.114367	–1.606763	0.1212
IR	0.090055	0.024582	3.663413	0.0012
R-squared	0.599156	Adjusted R-squared		0.549051
F-Statistic	11.95790	Prob. (*F*-Statistics)		0.000055
CUM = C(1)+C(2)*$GINI$+C(3)*RIR+C(4)*IR (Omitted Variables: *RIR IR*)				
F-Statistic	3.174813	Prob. (*F*-Statistics)		0.0598
Likelihood Ratio	6.572450	Prob. (Likelihood)		0.0374
	Coefficient	Std. Error	*t*-Statistic	Prob.
C	−0.361110	1.472623	−0.245215	0.8084
Gini	0.165008	0.174428	1.057093	0.0783
RIR	–0.189840	0.116721	−1.626442	0.1169
IR	0.062693	0.025088	2.498914	0.0197
R-squared	0.526491	Adjusted R-squared		0.467302
F-Statistic	8.895135	Prob. (*F*-Statistics)		0.000384

Table 3. Omitted variable test for the model in Eq. (1)

***DUR* = C(1)+C(2)**GINI*+C(3)**IR* (Omitted Variables: *IR*)**				
F-Statistic	2.820360	Prob. (*F*-Statistics)		0.0051
Likelihood Ratio	2.883595	Prob. (Likelihood)		0.0095
	Coefficient	Std. Error	*t*-Statistic	Prob.
Gini	0.063388	0.004121	15.37862	0.0000
IR	0.000937	0.005584	1.679393	0.0151
R-squared	0.394993	Adjusted R-squared		0.371723
***AMP* = C(1)+C(2)**GINI*+C(3)**IR* (Omitted Variables: *IR*)**				
F-Statistic	15.13080	Prob. (*F*-Statistics)		0.0006
Likelihood Ratio	12.84250	Prob. (Likelihood)		0.0003
	Coefficient	Std. Error	*t*-Statistic	Prob.
Gini	0.122922	0.013940	8.817600	0.00000
IR	0.065510	0.016841	3.889833	0.00006
R-squared	0.554939	Adjusted R-squared		0.537821
***CUM* = C(1)+C(2)**GINI*+C(3)**IR* (Omitted Variables: *IR*)**				
F-Statistic	9.064121	Prob. (F-Statistics)		0.0057
Likelihood Ratio	8.374292	Prob. (Likelihood)		0.0038
	Coefficient	Std. Error	*t*-Statistic	Prob.
Gini	0.116383	0.018589	6.260744	0.0000
IR	0.052641	0.017485	3.010668	0.0057
R-squared	0.455957	Adjusted R-squared		0.435032

greater inequality of income. While it is the case that a more equal income distribution is desirable for many social reasons, these results add one more argument in support of policies that would improve the distribution of income within countries over time. The improvement of the distribution of income would not happen unless governments address it effectively and apply appropriate policies to narrow the gaps between poor and wealthy households.

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