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## **The Determinants of the Very Highest Income Shares: The Case of France**

***William R. DiPietro\**, *Emmanuel Anoruo\*\** & *Bansi Sawhney\*\*\****

*Since the highest income groups have tremendous influence over economic policy by virtue of money, position, and connection, it is important to identify the interest of these groups with regard to economic conditions. Recently, annual time series data on the shares of the very highest income groups have become available for the French economy. Using this new high-income share data for France, this paper examines the potential relationship between the income shares of the very highest income groups and four macroeconomic variables including the inflation rate, the interest rate, the unemployment rate, and the extent of trade. To be specific, this paper investigates the extent to which the four macroeconomic variables affect the highest income shares. The results indicate that the inflation rate, the interest rate, the unemployment rate, and the extent of trade are important determinants of the top most income shares in France.*

***Keywords:*** *Income inequality, interest rate, unemployment rate, France, Fully modified OLS*

***JEL Classifications:*** *A10*

### **INTRODUCTION**

Most of the recent empirical studies on income inequality were inspired by Kuznets (1955) seminal work. Kuznets hypothesized a U-shaped relationship between economic growth and income equality. The theory suggests that in the process of economic development, as more and more workers enter high productivity sectors in an economy, the ratio of high skilled (high wage) to low skilled (lower wage) workers declines, resulting in reduced wage inequality. Kuznets' argument concerning the changing inequality is based on his observations of some long-term trends for the United States, United Kingdom, and Germany. For the U.S., for example, he states that the share of the bottom 40 per cent of the families rose from 13.5 per cent in 1929 to 18 per cent in the late 1940s and the share of the top 40 per cent dropped from 55 per cent to 44 per cent for the same period.

The Gini coefficient, which is derived from the Lorenz curve, is the most often used single measure of income inequality in many empirical studies. Sylwester (2002) contends that the

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easy availability of the data on Gini coefficients leads to its widespread use as a measure of income inequality but one should bear in mind that more than one Lorenz curve can produce a similar Gini coefficient. Also, the Gini coefficient changes slowly, but such small changes should not be seen as only trivial changes in income distribution.

All this suggests that the Gini concentration ratio has its limitations. To some degree, it may be considered arbitrary since it tries to encompass the whole Lorenz curve in a single number. To minimize this problem, in this paper we suggest that depending on one's focus, one may look at a particular part of the Lorenz curve. Our main concern here is to look at the concentration of income near the top of income distribution and therefore, we propose to look at the factors that influence the top seven groups of income shares in the French society. Fortunately, a high-quality data set is available. Recently Piketty (2001) and Piketty and Saez (2001) have constructed a high quality data series for France and the U.S. They have provided fully homogeneous series on income shares using individual tax returns. This represents a significant contribution to the quality of data on income distribution, although it is limited to the highest income groups only. The data reveal that the French and the U.S. experiences have been quite divergent in relation to income distribution. In France, the average income of the top 1 per cent was about 20 per cent at the beginning of the century, and declined precipitately to approximately 7.7 per cent by the late 1990s. A similar pattern was observed in the top decile bracket. The share of the top decile bracket dropped from 45 per cent at the beginning of the century to about 32-33 per cent by the late 1980s and stabilized thereafter. Contrasting, the French experience, the top deciles share in the U.S. dropped until 1941, remained stable from 1940s to 1970, but then increased back to the level at the beginning of the century. The top centile share dropped from about 18 per cent at the beginning of the century to about 7.8 per cent in 1970 and again rose back to 14.58 per cent in 1998

The purpose of this paper is to analyze the effect of four critical components of the macro economy on the income shares of the uppermost income groups of French society. The highest income groups are in a powerful position to command the direction of public policy and the future course of society. As with all income groups, the primary purpose of the highest income groups is to foster choices that further their own narrow self-interest. In a broad sense, the unrestrained self-interest of the highest income groups is to increase their own income shares. Therefore, the highest income groups will want to enact and to pursue policies that increase their personal income, they will guard against policies that reduce or threaten to lower their shares. Thus, if an individual can identify the effect of changes in a particular dimension of the macro economy on the income share of a highest income group, then it enables the person to ascertain the goal of that particular highest income group with regard to that specific macroeconomic component. Further, knowing the goal of a highest income group, the individual is subsequently in a position to assess whether the aim of that highest income group is consistent with the interests of other classes of society and consonant with the welfare of society as a whole. For instance, if higher unemployment enhances the income shares of the highest income groups, then naturally, one would expect the individuals in these groups not to push for policies that will reduce the levels of unemployment in society. In these circumstances, the pursuit of private interest by the highest income groups is not beneficial to the conditions of low-income people who obtain the lion's share of their income in the labor market.

DiPietro *et al.* (2005) examined the effects of four macroeconomic variables including the extent of trade, inflation, unemployment and the interest rate, on the income shares of the very highest income groups for the United States using annual data for the period 1961 through 1998. They find that all of the four macroeconomic variables have statistically significant effects on the income shares of the very highest income groups of the U.S. The extent of trade and the interest rate had a positive effect on the highest US income shares, but unemployment and inflation had a negative effect. This indicates that within the U.S., the highest income groups according to their class interest, will favor policies that promote trade, raise interest rates, reduce inflation, and lower the unemployment rate. The availability of the French data enables us to undertake a similar study for France, that is, to consider the effects of major macroeconomic variables on the highest income shares, as was undertaken in the study for the U.S. The results will enable us to see whether the finding that major macroeconomic variables have an impact on the highest income shares in the U.S. is merely an anomaly for the U.S. or whether it holds for other countries as well. It will also allow us to compare the results for the two countries to see whether or not identical macroeconomic variables have the same or different effect on the highest income shares for the two different countries.

The paper is organized as follows. Following the present introduction, section two discusses the interest of the highest income groups in relation to the four macroeconomic variables. Section three presents the literature review. Section four details the methodology of the study. Section five provides the data and the descriptive statistics. Section six discusses the empirical results. Finally, section seven offers the conclusions and policy implications of the study.

### **PUBLIC INTEREST AND THE FOUR MACROECONOMIC VARIABLES**

The interest of the highest income groups may or may not be the same as the public interest or the general welfare of society. Ideally, of course, one would like to see the interest of the powerful highest income groups align as closely as possible with the common interest of the country. In order to judge how well the interest of the highest income groups corresponds to the overall interest of the country as a whole it is necessary to first establish what is meant by the public interest with regard to these variables. In this article, two criteria will be used to define the public interest for the four macroeconomic variables. The first is economic growth and efficiency. The second is Rawlsian justice.

Many studies have shown that economic growth is positively related to trade. Indeed, several countries have adopted outward-oriented policies as a primary means for economic development. Therefore, using economic growth and efficiency as a standard for public interest, greater trade is in the overall interest of society. This means that if the income shares of the highest income groups are positively related to trade, then they are in line with the interests of the rest of society from the point of view of economic growth and efficiency. If, on the other hand, there is no relationship between trade and the income shares of the highest income groups, or if one finds that there is a negative relationship between trade and the income shares of the highest income groups, then the interest of the highest income groups and those of society are not consistent from the perspective of economic growth and efficiency.

With regard to unemployment, the social interest using the growth and efficiency criteria would seem to be obvious. Lower unemployment is in the public interest. In order to maximize output, society needs to be on the production possibilities frontier and to employ all of its resources to the fullest extent. Thus, if the interest of the highest income groups is to correspond to the interest of society with regard to unemployment when economic growth and efficiency is used as a criterion to define public interest, then there must be a negative relationship between unemployment and the income shares of the very highest income groups.

Turning to inflation, higher rates of inflation have been found to lead to both lower growth and reduced efficiency. Thus, the public interest in terms of economic growth and efficiency is to maintain price stability. For the interest of the highest income groups to be in tune with public interest with regard to inflation, there must be a negative relationship between the inflation rate and the shares of the highest income groups.

Finally, using the same criteria of growth and efficiency, in the long run, from a public viewpoint, lower interest rates are preferred to higher interest rates. The conventional wisdom is that lower interest rates lead to greater capital formation, and consequently, to higher rates of economic growth. There fore, one would expect a negative relationship between the shares of the highest income groups and the interest rate for their interest to be in line with the larger society in terms of long-term interest rate policy.

From a Rawlsian point of view, one should look on the poorest income groups as a basis of overall societal welfare. In Rawl's book, *A Theory of Distributive Justice*, he asks people to imagine themselves in a position in which they can decide the characteristics of the society they will live in prior to actually living in that society. The hook in Rawl's imaginary world, however, is that although people know that it is possible to be placed in any possible position in society, they do not know beforehand the future position in the society they will actually occupy. They may be placed at the very top or at the very bottom. Rawl argues that under these circumstances individuals will choose to make the worst possible position (in our case, the income share of the very poorest income group) to be as good as possible.

In a highly developed country like France, increases in trade are likely to be detrimental to the income shares of the poorest income groups. Competitive pressures from greater trade are likely to exert downward forces on wages of low skilled workers. The unskilled jobs of the poorest income groups are more likely to be outsourced to labor-abundant countries.

From a Rawlsian point of view, lower levels of unemployment are in the public interest, as most of the income for the poor comes from labor. The poor with their low skill levels are likely to be the most venerable and hardest hit in high unemployment environments. Just as under the economic growth and efficiency criterion, there must be a negative relationship between the income shares of the highest income groups and unemployment for their interests to coincide with the public interest from a Rawlsian's view.

As wage gains generally lag overall price gains, especially for unskilled non-unionized jobs, the poorest income groups are apt to favor low levels of inflation. Therefore, Rawlsian justice sees the public interest served by low levels of inflation.

Lastly, in terms of the interest rate, it seems fairly clear that the poorest income groups favor lower interest rates. It is the poor, not the rich, who are more likely to be overburdened

by debt. Therefore, from a Rawlsian standpoint, one would like to see a negative relationship between the highest income groups of French society and the French interest rate.

Table 1 summarizes this section by showing the required signs between the share of the highest income group and the four macroeconomic variables for the interests of the highest income group to be consistent with the public interest on the basis of the two criteria. The first row shows signs using the economic growth and efficiency standard, and the second shows the signs using the Rawlsian justice standard. Once the statistical relationships between the highest income groups and the four economic variables for French economy are estimated in a forthcoming section, then we can use table 1 to determine how well the interests of the high income groups are in line with the public interests in France.

**Table I**  
**Desired Signs between Income Shares of the Highest Income Groups and Macroeconomic Variables based on Economic Growth & Efficiency Criterion and Rawlsian Justice Criterion**

	<i>Trade Share</i>	<i>Unemployment Rate</i>	<i>Inflation Rate</i>	<i>Interest Rate</i>
Economic Growth and Efficiency	Positive	Negative	Negative	Negative
Rawlsian Justice	Negative	Negative	Negative	Negative

## LITERATURE REVIEW

Kuznets (1955) hypothesis has received considerable support in the literature. However, empirical testing of the hypothesis gives a mixed picture. Piketty (2001) fails to find evidence in support of the Kuznets' curve and observes that in the case of France, the ratio between the average wage of managers and the average wage of production workers has dropped almost 40 per cent between 1950s and late 1990s, even though wage inequality has remained exactly the same in the 1950s and in the 1990 (p. 27). In the case of the U.S., the long run top income and wage shares have displayed a U-shaped pattern. Wage inequality has started to increase significantly, especially, since the 1970s.

While Adelman and Morris (1973) find support for the Kuznets hypothesis and report that the relative share of the lower income groups dropped at the early stages of development, Paukert (1973) and Ahluwalia (1976) find very limited support and point to the serious limitations of the data used and caution that their results are subject to substantial measurement error. Ram (1988) reaches a very similar conclusion—while he does find some support for the Kuznets hypothesis when using data for 32 countries that include both developed and less developed countries. But his results change as he restricts the sample to only less developed countries. In their study, Anand and Kanbar (1993) use different measures of income inequality, yet find no support for the Kuznets hypothesis. Deininger and Squire (1996) of the World Bank have recently developed a new and comprehensive data set that overcomes many of the deficiencies of the data used in earlier studies. They claim that their expanded data set is of high quality; it expands to 108 countries and attempts to make the Gini coefficient comparable over time and between countries. They also investigate the relationship between income inequality, growth, and poverty. However, their results do not show any systematic relationship between growth of aggregate income and changes in income inequality. Contrasting their view, Persson and Tabellini



(1994) and Clarke (1995) report a negative relationship between growth and income inequality. DiPietro and Sawhney (2002), however, argue that in the development literature, the Kuznets hypothesis has been metamorphosed into the hypothesis that there is an inverted U relationship between development and inequality. Using data on a cross-section of countries, they find that at first when development proceeds, inequality rises and beyond some point, further increases in income reduce inequality. Dowson (1997) also finds support for the Kuznets hypothesis when testing this relationship for 36 less developed countries, using per capita incomes as an indicator of economic development.

It is to be noted that even though Deininger and Squire rightly claim a substantial expansion in coverage and improvement in quality of their data, they do however caution that, “variation in the definition of variables used to measure inequality—gross income or net income, income or expenditure, data per capita or data per household—can seriously affect the magnitude of the indicators of inequality and undermine the international and intertemporal comparability of the data (p. 466).”

## METHODOLOGY

To ascertain the time-series properties of the various top most income shares and the macroeconomic variables (i.e. inflation, the extent of trade, unemployment rate and interest rate) we apply the modified Dickey and Fuller (DF) unit root test developed by Elliott, Rothernberg and Stock (1996) and the modified Phillips-Perron (PP) (Phillips and Perron, 1988)  $Z_a$  test suggested by Stock (1991). The modified DF test is known as the DF-GLS test while the modified PP test is referred to as the  $MZ_a$  test. Elliot *et. al.* (1996) and Perron and Ng (1994) have shown that both unit root procedures outperform the standard Dickey-Fuller and Phillips-Perron tests. These tests allow us to test formally the null hypothesis that the series are  $I(1)$  against the alternative that are  $I(0)$ .

The DF-GLS unit root test is based on the following regression equation:

$$\Delta y_t^d = \alpha_0 y_{t-1}^d + \sum_{j=1}^p \beta_j \Delta y_{t-j}^d + \mu_t, \quad \dots(1)$$

where  $p$  is the maximum lag,  $y_t^d$  represents locally detrended series of  $y_t$  [i.e.  $y_t^d = y_t - z_t \tilde{\beta}$ , where  $z_t = (1, t)$  and  $\tilde{\beta}$  is the regression of  $w$  on  $\square$ ]. The Modified Akaike Information Criterion (Ng and Perron 2002) is used to determine the maximum lag lengths. Under the DF-GLS unit root test, the null hypothesis is that  $\alpha_0 = 0$ , while the alternative is  $< 0$ .

This study uses the Johansen and Juselius (1990) and Johansen (1991) maximum-likelihood test procedures to examine whether there are long run relationships between the various highest income shares and the four macroeconomic variables including inflation, interest rate, the extent of trade and unemployment rate. The existence of cointegration according to Granger (1981) suggests that two or more variables move together in the long run. On the other hand, the absence of cointegration indicates that the series in the system do not share long-run relationships. This implies that the variables can randomly deviate from each other (Dickey *et. al.*, 1991). MacDonald and Taylor (1993, 1994), and Moosa (1994) have shown that the Johansen

and Juselius cointegration procedure outperforms the Engle-Granger (1987) two-step framework in detecting the existence of cointegration. The Johansen and Juselius cointegration procedure is based on the following  $\hat{p}$ -dimensional vector autoregressive (VAR) representation with lags:

$$X_t = \delta + \sum_{i=1}^{\hat{p}} \Pi X_{t-i} + \varepsilon_t \quad \dots(2)$$

Equation (2) can be reformulated in error correction form as follows:

$$\Delta X_t = \delta + \sum_{i=1}^{\hat{p}} \Gamma_i X_{t-i} + \Pi X_{t-\hat{p}} + \varepsilon_t \quad \dots(3)$$

where  $\hat{a}$  is the number of variables in the system;  $\Gamma_1, \dots, \Gamma_{\hat{p}-1}$  and  $\Pi$  represent the coefficient matrices and  $c_t$  is a vector of white noise process. The matrix  $\delta$  contains all deterministic elements. Matrix  $\Pi$  captures the long run relationship between  $\hat{a}$  variables in the system. It can be split into two matrices namely  $\alpha$  and  $\beta$ , such that matrix  $\Pi = \alpha\beta'$ . Matrix  $\alpha$  consists of error correction parameters while  $\beta$  contains the cointegrating vectors. The Johansen and Juselius cointegration test produces two likelihood ratio test statistics including the trace test and the maximum eigenvalue ( $\lambda$ -max) test. For the trace test, the null hypothesis that there are at most  $r$  cointegrating vectors is tested against the alternative. For the maximum eigenvalue test, the null hypothesis of  $r$  cointegrating vectors is tested against the alternative of at least  $r + 1$  cointegrating vectors.

This study applies the Phillips and Hansen (1990) fully modified OLS (FMOLS) framework to obtain the long run estimates for the six topmost income groups in France.<sup>1</sup> The FMOLS framework is based on following regression:

$$Y_t = \beta_0 + \beta_1 ET_t + \beta_2 \pi_t + \beta_3 UR_t + \beta_4 R_t + \varepsilon_t \quad \dots(4)$$

where  $Y$  represents the dependent variables [i.e. the six topmost income groups including GROUP1(90-100%), GROUP2(95-100%), GROUP3(99-100%), GROUP4(99.5-100%), GROUP5(99.9-100%), and GROUP6(99.99-100%)].  $ET$  is the extent of trade,  $\pi$  stands for inflation rate,  $UR$  represents unemployment rate,  $R$  represents real interest rate and  $\varepsilon_t$  is the error term. All variables with the exception of the error term ( $\varepsilon_t$ ) are expressed in per centages. The extent of trade (i.e.  $ET$ ) is expected to have positive impact on the various income shares (i.e.  $\beta_1 > 0$ ). On the other hand, inflation rate and unemployment rate are expected to negatively influence the various income shares (i.e.  $\beta_2 < 0$  and  $\beta_3 < 0$ ). However, interest rate could have either positive or negative effect on the income shares (i.e.  $\beta_4 > < 0$ ). The FMOLS is used in this study because unlike the ECM and the other single equation long run models including Engle and Granger (1987) and Stock and Watson (1993) it can alleviate the endogeneity problem in the data and asymptotic bias in the estimated regression coefficients.

## DATA SOURCES AND THE SUMMARY STATISTICS

This paper uses annual observations on the extent of trade, inflation rate, real interest rate (i.e. lending rate), unemployment rate, and the six topmost income shares for France from 1961 to



1998. All four variables are expressed in per centage terms. The extent of trade measures the degree of foreign trade. The data for the extent of trade, inflation rate, and real interest rate were taken from the 2002 *CD-ROM of the World Bank, World Development Indicators*. The unemployment rate data were taken from the *Handbook of U.S. Labor Statistics*. The data for the topmost income shares for France were obtained from Piketty (2001). In this study, we analyze the six high income share groups including the top ten per cent share (90-100 per cent), the top five per cent share (95-100 per cent), the top one per cent share (99-100 per cent), the top one-half per cent share (99.5-100 per cent), the top one-tenth per cent share (99.9-100 per cent), and the top one-hundredth per cent share (99.99-100 per cent).

Table 2 presents the summary statistics for the six topmost income shares and the four macroeconomic variables including the extent of trade (ET), inflation rate ( $\pi$ ), unemployment rate (UR), and interest rate (R). The mean values for the extent of trade, inflation rate, interest rate and unemployment rate are 37.58, 5.68, 2.49, and 6.39 per cent, respectively. The mean values for the topmost income groups varied from a high of 33.02 (Group1) to a low of 0.54 per cent (Group6). For the four macroeconomic variables, the standard deviations reveal that the extent of trade (8.02 per cent) fluctuates the most, while interest rate (3.21 per cent) dispersed the least from the mean. Among the six topmost income shares, Group 1 (3.21 per cent) records the highest standard deviation, while group 6 (0.05 per cent) deviated the least from the mean. The maximum and minimum values reflect movements in the variables for the period under study.

**Table 2**  
**Summary Statistics (Per cent)**

	ET	$\pi$	R	UR	Group1	Group2	Group3	Group4	Group5	Group6
Mean	37.58	5.68	2.49	6.39	33.02	21.83	8.21	5.40	2.04	.54
Maximum	49.58	13.65	7.85	12.10	37.15	29.94	9.88	6.57	2.48	.64
Minimum	24.34	.67	-2.70	1.20	29.93	19.37	6.99	4.51	1.65	.40
Std. Dev.	8.02	3.84	3.21	3.94	3.21	2.04	.78	.53	.20	.05
OBS	38	38	38	38	38	38	38	38	38	38

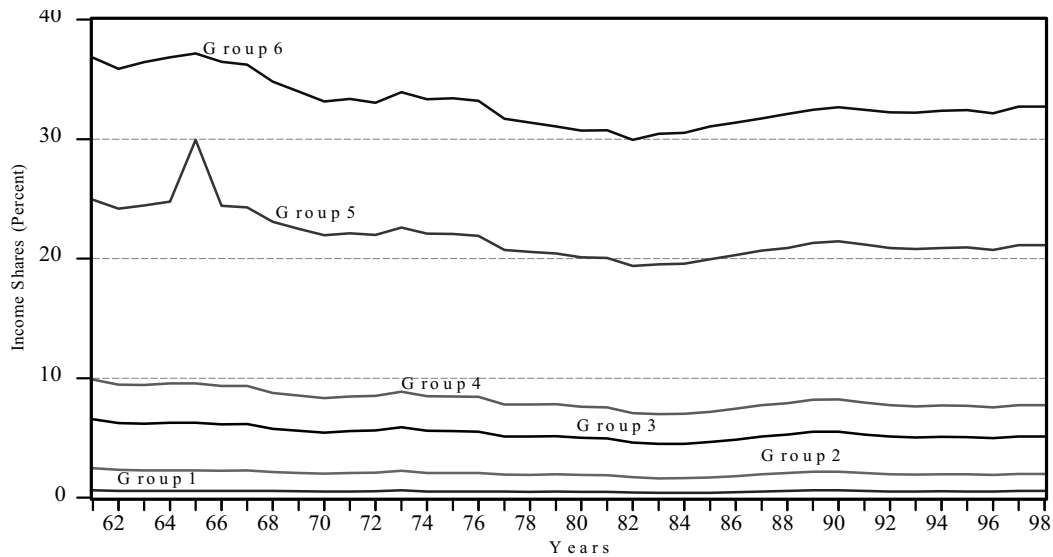
$\pi$  = inflation rate, R = real interest rate, ET = trade variable [(Exports + Imports)/GDP], UR = unemployment rate. GROUP1 = 90-100% income share, GROUP2 = 95 -100% income share, GROUP3 = 99-100% income share, GROUP4 = 99.5 -100% income share, GROUP5 = 99.9-100% income share, GROUP6 = 99.99 -100% income share.

Figure 1 plots the various income shares of the 6 groups under investigation. It can be seen from the graph that the income shares of groups 1 through 4 remained approximately stable for the period under consideration. However, groups 5 and 6 income shares increased in the late 1990s. Figure 2 graphs the four macroeconomic variables including inflation rate, the extent of trade, real interest rate, and unemployment rate. Figure 2 reveals that the extent of trade trended upward throughout the period of analysis. However, inflation declined precipitously from the late 1980s and continued through the 1990s.

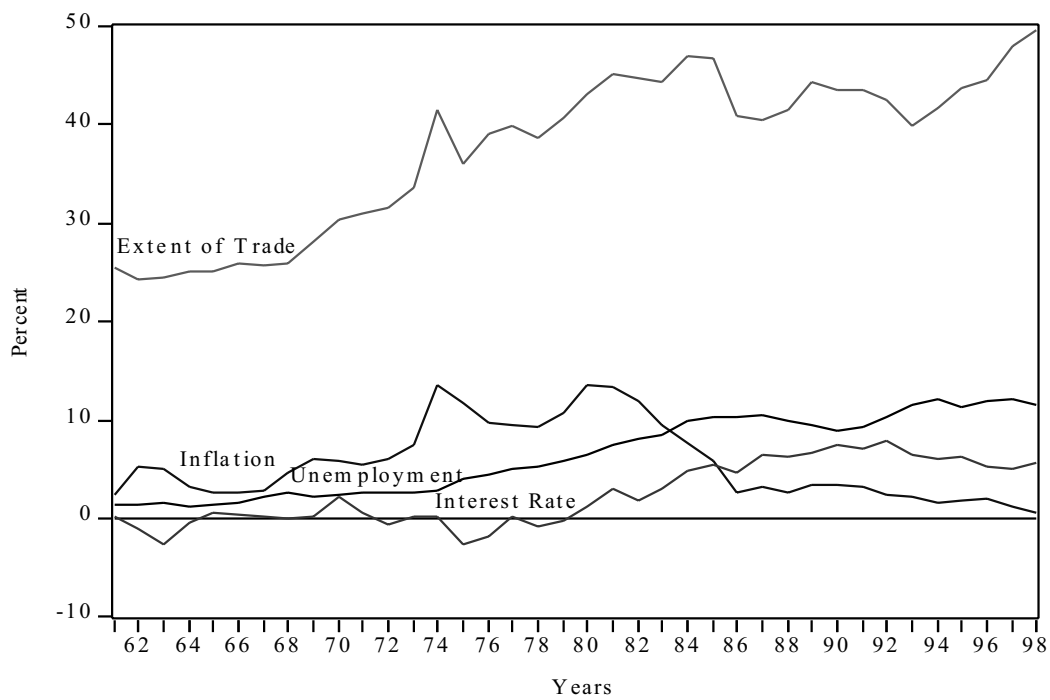
## EMPIRICAL RESULTS

This section presents the empirical results of the study. Table 3 displays the unit root test results obtained from both the DF-GLS and  $MZ_a$  procedures. The results indicate that income

**Figure 1**  
Shares of the Six Highest Income Groups



**Figure 2**  
Macroeconomic Variables



shares, inflation rate, the extent of trade, real interest rate, and unemployment rate have unit roots in their levels. However, they are stationary at the 5 per cent significance level after first differencing. The results suggest that income shares, inflation rate, the extent of trade, real interest rate, and unemployment rate have one order of integration [i.e.  $I(1)$ ].

**Table 3**  
**Modified Dickey-Fuller and Phillips-Perron Unit Root Test Results**

Series	Level		Difference	
	DF-GLS	MZ <sub>t</sub>	DF-GLS	MZ <sub>t</sub>
p	T <sub>m</sub> = -1.41 T <sub>t</sub> = -1.50	Z(a*) = -1.57 Z(t <sub>a</sub> *) = -1.90	T <sub>m</sub> = -2.90** T <sub>t</sub> = -3.99**	Z(a*) = -4.99** Z(t <sub>a</sub> *) = -5.10**
R	T <sub>m</sub> = -0.89 T <sub>t</sub> = -1.95	Z(a*) = -1.01 Z(t <sub>a</sub> *) = -2.44	T <sub>m</sub> = -4.83** T <sub>t</sub> = -5.78**	Z(a*) = -6.65** Z(t <sub>a</sub> *) = -6.66**
ET	T <sub>m</sub> = -0.19 T <sub>t</sub> = -1.79	Z(a*) = -1.04 Z(t <sub>a</sub> *) = -2.09	T <sub>m</sub> = -4.28** T <sub>t</sub> = -4.61**	Z(a*) = -7.37** Z(t <sub>a</sub> *) = -7.01**
UR	T <sub>m</sub> = -0.21 T <sub>t</sub> = -2.16	Z(a*) = -0.79 Z(t <sub>a</sub> *) = -2.58	T <sub>m</sub> = -3.12** T <sub>t</sub> = -3.25**	Z(a*) = -4.09** Z(t <sub>a</sub> *) = -5.02**
GROUP1	T <sub>m</sub> = -0.89 T <sub>t</sub> = -0.90	Z(a*) = -1.97 Z(t <sub>a</sub> *) = -0.94	T <sub>m</sub> = -4.11** T <sub>t</sub> = -5.25**	Z(a*) = -5.21** Z(t <sub>a</sub> *) = -5.32**
GROUP2	T <sub>m</sub> = 1.15 T <sub>t</sub> = -1.89	Z(a*) = -2.03 Z(t <sub>a</sub> *) = -2.44	T <sub>m</sub> = 4.69** T <sub>t</sub> = -5.14**	Z(a*) = -9.27** Z(t <sub>a</sub> *) = -14.39**
GROUP3	T <sub>m</sub> = -0.67 T <sub>t</sub> = -1.50	Z(a*) = -1.12 Z(t <sub>a</sub> *) = -1.91	T <sub>m</sub> = -2.46** T <sub>t</sub> = -3.35**	Z(a*) = -5.07** Z(t <sub>a</sub> *) = -5.13**
GROUP4	T <sub>m</sub> = -0.81 T <sub>t</sub> = -1.66	Z(a*) = -2.26 Z(t <sub>a</sub> *) = -2.10	T <sub>m</sub> = -2.41** T <sub>t</sub> = -3.27**	Z(a*) = -4.81** Z(t <sub>a</sub> *) = -4.85**
GROUP5	T <sub>m</sub> = -1.25 T <sub>t</sub> = -2.02	Z(a*) = -2.57 Z(t <sub>a</sub> *) = -2.50	T <sub>m</sub> = -2.61** T <sub>t</sub> = -3.35**	Z(a*) = -4.63** Z(t <sub>a</sub> *) = -4.65**
GROUP6	T <sub>m</sub> = -1.74 T <sub>t</sub> = -2.16	Z(a*) = -2.76 Z(t <sub>a</sub> *) = -2.67	T <sub>m</sub> = -2.56** T <sub>t</sub> = -3.47**	Z(a*) = -5.26** Z(t <sub>a</sub> *) = -5.20**

\*\* indicates 5 per cent significance level. T<sub>m</sub> and Z(a\*) = without trend. T<sub>t</sub> and Z(t<sub>a</sub>\*) = with trend, respectively for the modified Dickey-Fuller (DF-GLS) and modified Phillip-Perron (MZt) unit root tests. The critical values at the 5% significance level for without and with trend under the DF-GLS are -1.95 and -3.19, respectively. The 5% critical values for without and with trend for (MZt) are -2.94 and -3.54, respectively. The lag lengths are determined by the modified AIC. p = inflation rate, R = real interest rate, ET = trade variable [(Exports + Imports)/GDP], UR = unemployment rate. GROUP1 = 90-100% income share, GROUP2 = 95 -100% income share, GROUP3 = 99-100% income share, GROUP4 = 99.5 -100% income share, GROUP5 = 99.9-100% income share, GROUP6 = 99.99 -100% income share.

Given that income shares, inflation rate, the extent of trade, real interest rate, and unemployment rate have the same order of integration, we next apply the Johansen and Juselius cointegration procedures to ascertain the long run relationship between them. The multivariate cointegration test results for the various topmost income groups are presented in Panels A through F of Table 4. From Panels A and D of Table 4, we observe that there are two cointegrating vectors relative to income groups 1 and 4. Panels B, C, and E reveal that there is one cointegrating vector with respect to groups 2, 3, and 5 and the four macroeconomic variables. From Panel F, we notice that there are three cointegrating vectors in the system consisting of income group 6 and the four macroeconomic variables. In all of the cases, both the trace and eigenvalue ( $\lambda_{\max}$ ) test results reject the null hypothesis of no cointegration (i.e.  $r = 0$ ). The existence of cointegration

indicates that there is a long run equilibrium relationship between the time series in the system. It also indicates the tendency of the series in the system to revert to the previous period's equilibrium level.

**Table 4**  
**Multivariate Cointegration Test Results**

<i>Maximum Eigenvalue Test</i>			<i>Trace Test</i>		
<i>Null Hypothesis</i>	<i>Test Statistic</i>	<i>Critical Value</i>	<i>Null Hypothesis</i>	<i>Test Statistic</i>	<i>Critical Value</i>
<i>Panel A: Johansen Cointegration Test Results (GROUP1)</i>					
$r=0$	45.46**	34.40	$r=0$	102.38**	76.07
$r \geq 1$	28.61**	28.14	$r \geq 1$	56.93**	53.12
$r \geq 2$	16.70	22.00	$r \geq 2$	28.32	34.91
$r \geq 3$	9.00	15.67	$r \geq 3$	11.61	19.96
$r \geq 4$	2.61	9.24	$r \geq 4$	2.61	9.24
<i>Panel B: Johansen Cointegration Test Results (GROUP2)</i>					
$r=0$	35.50**	34.40	$r=0$	81.76**	76.07
$r \geq 1$	23.74	28.14	$r \geq 1$	46.26	53.12
$r \geq 2$	14.29	22.00	$r \geq 2$	22.52	34.91
$r \geq 3$	5.76	15.67	$r \geq 3$	8.23	19.96
$r \geq 4$	2.47	9.24	$r \geq 4$	2.47	9.24
<i>Panel C: Johansen Cointegration Test Results (GROUP3)</i>					
$r=0$	67.81**	34.40	$r=0$	104.87**	76.07
$r \geq 1$	18.84	28.14	$r \geq 1$	37.06	53.12
$r \geq 2$	9.36	22.00	$r \geq 2$	18.22	34.91
$r \geq 3$	8.81	15.67	$r \geq 3$	8.86	19.96
$r \geq 4$	0.05	9.24	$r \geq 4$	0.05	9.24
<i>Panel D: Johansen Cointegration Test Results (GROUP4)</i>					
$r=0$	34.46**	34.40	$r=0$	90.77**	76.07
$r \geq 1$	30.87**	28.14	$r \geq 1$	56.31**	53.12
$r \geq 2$	18.13	22.00	$r \geq 2$	28.44	34.91
$r \geq 3$	7.88	15.67	$r \geq 3$	10.31	19.96
$r \geq 4$	2.43	9.24	$r \geq 4$	2.43	9.24
<i>Panel E: Johansen Cointegration Test Results (GROUP5)</i>					
$r=0$	67.28**	34.40	$r=0$	118.07**	76.07
$r \geq 1$	26.31	28.14	$r \geq 1$	51.79	53.12
$r \geq 2$	14.05	22.00	$r \geq 2$	25.48	34.91
$r \geq 3$	9.17	15.67	$r \geq 3$	11.43	19.96
$r \geq 4$	2.26	9.24	$r \geq 4$	2.26	9.24
<i>Panel F: Johansen Cointegration Test Results (GROUP6)</i>					
$r=0$	68.88**	34.40	$r=0$	139.77**	76.07
$r \geq 1$	33.24**	28.14	$r \geq 1$	70.89**	53.12
$r \geq 2$	22.19**	22.00	$r \geq 2$	38.65**	34.91
$r \geq 3$	11.37	15.67	$r \geq 3$	16.46	19.96
$r \geq 4$	5.09	9.24	$r \geq 4$	5.09	9.24

\*\* Indicates rejection of the null hypothesis at the 5% level of statistical significance. The critical values are obtained from the Microfit 4.0 program. GROUP1= 90-100% income share, GROUP2 = 95 -100% income share, GROUP3 = 99-100% income share, GROUP4 = 99.5-100% income share, GROUP5 = 99.9-100% income share, GROUP6 = 99.99-100% income share.

The application of the FMOLS procedure in this study deserves some justification. Prior to estimating the FMOLS equations for the various income groups, we conducted weak exogeneity

tests to determine the appropriate model for the data. The results of the weak-exogeneity tests are presented in Table 5. The weak-exogeneity test results are reported according to the number of cointegrating ranks ( $r$ ) determined by the Johansen cointegration tests for each income group, as presented in Table 4. It can be observed from Table 5 that the null hypothesis of weak exogeneity is rejected for at least one of the variables in each of the cointegrating vectors. For example, in Panel A with  $r = 2$ , we reject the null hypothesis of weak exogeneity for inflation ( $p$ ), interest rate ( $R$ ), the extent of trade ( $ET$ ), and unemployment rate ( $UR$ ) at the 5 per cent level of significance. These results suggest that these variables should be considered as endogenous in the system. The presence of weak exogeneity indicates that short-term innovations in a given variable have no implications for long run relationships in the system.

**Table 5**  
**Test for Weak-Exogeneity: LR Test CHISQ( $r$ )**

$r$	DGF	CHISQ_5	GROUPS	ET	UR	$\pi$	R
Panel A: Group 1							
1	1	3.84	0.10	0.91	4.24**	0.58	0.51
2	2	5.99	1.11	6.82**	7.98**	6.76**	7.27**
Panel B: Group 2							
1	1	3.84	4.64**	0.20	1.19	4.02	0.00
Panel C: Group 3							
1	1	3.84	3.20	1.74	0.06	0.99	3.96**
Panel D: Group 4							
1	1	3.84	4.02**	0.82	0.01	1.98	3.34
2	2	5.99	4.59	3.18	5.36	6.44**	5.51
Panel E: Group 5							
1	1	3.84	4.21**	0.04	0.29	3.86**	2.13
Panel F: Group 6							
1	1	3.84	2.96	1.12	2.01	7.16**	0.55
2	2	5.99	5.71	4.77	7.85**	12.90**	5.02
3	3	7.81	13.75**	11.98**	13.78**	12.92**	7.18

\*\* Indicates rejection of the null hypothesis of weak exogeneity at the 5% level of significance.  $r$  = cointegration rank, DGF=degrees of freedom, CHISQ\_5 = 5% critical value of Chi Square statistic, GROUPS = various income groups (1, 2, 3, 4, 5 and 6),  $p$  = inflation rate,  $R$  = real interest rate,  $ET$  = trade variable [(Exports + Imports)/GDP],  $UR$  = unemployment rate. GROUP1= 90-100% income share, GROUP2 = 95 -100% income share, GROUP3 = 99-100% income share, GROUP4 = 99.5 -100% income share, GROUP5 = 99.9-100% income share, GROUP6 = 99.99 -100% income share. The weak exogeneity test results are reported according to the number of cointegrating ranks ( $r$ ) suggested by the Johansen cointegration tests.

This study implements the FMOLS to overcome the endogeneity problem in the data. Weak exogeneity test involves testing zero restrictions on the  $\alpha$  matrix (i.e.  $\alpha = 0$ ). Phillips and Hansen (1990) have shown that the FMOLS procedure performs as well as the ECM. They point out that the t-statistic on the long run parameter under the ECM can be misleading. Granger (1986) suggests that the existence of multiple cointegrating vectors in a system can lead to identification problems. Above all, Phillips and Hansen (1990) suggest that the Johansen procedure is not asymptotically optimal, since it does not take into consideration the endogeneity of the explanatory variables in the system. In addition to the weak exogeneity tests, a number of diagnostic tests were also performed to ensure that the models are econometrically sound. The test statistics obtained from the autocorrelation, normality, functional form, and ARCH tests

are statistically insignificant at the conventional levels (i.e. 5 and 10 per cent levels). These results suggest that the statistical attributes of good models are satisfied in all of the cases.

Table 6 displays the long run parameter estimates from the FMOLS. The results support the hypothesis that macroeconomic variables are important determinants of the topmost income groups in France. The results in Table 6 reveal that the extent of trade, inflation rate, real interest rate, and rate of unemployment have significant effects on the various topmost income shares. In all of the cases, the four macroeconomic variables are significant at the 1 per cent level of significance.

**Table 6**  
**Fully Modified Phillips-Hansen Estimates for the Six Highest Income Groups**

	(1) GROUP1	(2) GROUP2	(3) GROUP3	(4) GROUP4	(5) GROUP5	(6) GROUP6
C	24.895*** (25.31)	20.627*** (38.01)	3.493*** (6.73)	1.793*** (4.66)	.047 (0.23)	.057 (0.96)
ET	.649*** (13.70)	.293*** (11.23)	.317*** (12.68)	.235*** (12.67)	.118*** (11.96)	.029*** (9.94)
$\pi$	-.945*** (-16.42)	-.554*** (-17.43)	-.383*** (-12.61)	-.278*** (-12.36)	-.131*** (-10.96)	-.033*** (-9.51)
UR	-1.457*** (-14.18)	-.963*** (-16.98)	-.670*** (-12.35)	-.488*** (-12.14)	-.228*** (-10.65)	-.058*** (-9.37)
R	-.631*** (-7.85)	.203*** (-4.56)	-.296*** (-6.98)	-.206*** (-6.56)	-.094*** (-5.62)	-.014*** (-2.81)

\*\*\*indicates 1 per cent significance level.,  $\pi$  = inflation rate, R = real interest rate, ET = trade variable [(Exports + Imports)/GDP], UR = unemployment rate. GROUP1= 90-100% income share, GROUP2 = 95 -100% income share, GROUP3 = 99-100% income share, GROUP4 = 99.5 -100% income share, GROUP5 = 99.9-100% income share, GROUP6 = 99.99 -100% income share. GROUP1= 90-100% income share, GROUP2 = 95 -100% income share, GROUP3 = 99-100% income share, GROUP4 = 99.5 -100% income share, GROUP5 = 99.9-100% income share, GROUP6 = 99.99 -100% income share. Equal weights window was used in the estimation. The estimates were undertaken via Microfit 4.0 software program.

In terms of sign, the extent of trade (ET) has significant positive effect on the various income groups. On the other hand, inflation ( $\pi$ ), unemployment (UR) and interest rate (R) have negative influence on the income groups. If we focus on group 1 (i.e. column 1 of Table 6), it can be seen that a one point increase in inflation, unemployment or interest rate will depress income shares by approximately 0.635, 0.748, or 0.301 per cent, respectively. Based on the signs and the magnitudes of the regression coefficients on the four macroeconomic variables, we infer that the six topmost income groups in France are pro-trade, anti-inflation, anti-unemployment, and prefer lower interest rates.

Comparing the signs of Table 6 (the estimated signs) to the signs of table 1 (the desired signs based on two different criteria), we observe that all four of the macroeconomic variables have the desired effects on the various high income groups with regard to the economic growth and efficiency criteria. In terms of the Rawlsian justice criteria, three of the four variables, inflation ( $\pi$ ), unemployment (UR), and interest rate (R) are in line with the Rawlsian justice. It appears that in France the interest of the highest income groups is not consistent with the welfare of the poorer members of society relative to international trade.



### CONCLUSIONS AND POLICY IMPLICATIONS

This paper has used cointegration analysis and the Phillips-Hansen fully modified OLS procedure to investigate the determinants of the French six topmost income shares. Specifically, the study applied the Johansen cointegration approach to determine the rank(s) of the cointegration space spanned by the stochastic process of the various income shares and the four macroeconomic variables. The Phillips-Hansen fully modified OLS is implemented to obtain the long run estimates for the six topmost income shares.

This paper makes several important findings. First, conditions in the macro economy are important determinants of the highest income shares in France. Statistically, every one of the four variables is a relevant factor in explaining income shares of the highest income groups. This means that the powerful highest income groups are personally concerned with what happens in the macro economy and given the opportunity will likely intervene to protect their interest.

Second, the results show that the highest income groups in France favor a certain configuration for the economy with regard to the four macroeconomic variables we have studied here. In particular, the findings suggest that the highest income groups in France would prefer high trade, low levels of unemployment and inflation, and low interest rates. The implications are that they will tend to favor policies that will benefit them.

Third, the results of the present paper are consistent with DiPietro *et al.* (2005) who examined the relationship between the highest income shares and macroeconomic variables for the U.S. The consistency in findings lends credence to the results of the present study. It is interestingly to observe that similar results are found for the U.S. and France, with completely different cultures, histories and institutions, along with different rates of unemployment and inflation over time. In both studies the four macroeconomic variables are found to significantly influence the various income shares of the highest income groups. In addition, except for the interest rate, the direction of the effect of the four macroeconomic variables on the shares of the highest income groups is the same for both countries.

Fourth, when using economic growth and efficiency as the basis for defining public interest, the personal interests of the highest income groups are compatible with the public good for all four variables, the trade share, the unemployment rate, the inflation rate, and the interest rate.

Finally, using Rawlsian justice as public interest criteria, the private interest of the highest income groups correspond to the public interest only for three of the four variables. There is a conflict between the private and public interest only for the trade share. Therefore, when higher income groups benefit from expansion of trade leading to a higher trade share, perhaps there is some need for a compensation mechanism that allows transfers of income from the highest income groups to the poorest members of society.

It is to be noted that, although France and the U.S. have experienced different dynamics in income inequality overtime, three of the four macroeconomic variables (i.e. the extent of trade, inflation rate, and the unemployment rate) studied in this paper show quite similar effects on income shares of the highest income groups. Future research aimed at explaining the differences in income equality between the two countries and perhaps other developed countries would surely benefit by focusing on additional variables other than the four considered in this study.

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