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Savings and Income Distribution*

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While this paper emphasizes the analytical ambiguity of the relationship between savings and income inequality, the empirical examination renders weak support for a negative association between them. However, this relationship is not very robust. Subsamples of OECD countries and Asian countries show that income inequality and the savings rate can be positively and significantly associated.

Key Words: Savings; Income distribution.
JEL Classification Numbers: D3, E2, O5.

1. INTRODUCTION

Many recent studies have explored the relationship between income distribution and economic growth (see, for example, Alesina and Rodrik, 1994, Persson and Tabellini, 1994), without examining the impact of income distribution on savings. This is unfortunate because savings and investment are the driving force of economic growth, and a detailed examination of the relationship between savings and income distribution should proceed before any systematic study on the impact of income distribution on income growth. Our current study intends to fill up this missing gap.

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The literature on savings behavior is enormous. For a detailed survey, see Aghevli et al. (1990). In general empirical evidence shows that countries with a high savings rate, such as Japan, South Korea, and Singapore are typically associated with high growth rates. Kessler et al. (1993) discuss the savings behavior in 17 OECD countries. They find that a large part of the variation in savings behavior van be attributed to the variation across countries. Masson et al. (1995) look at a broad set of possible determinants of savings, such as income growth, financial liberalization, interest rates, terms of trade, and apply them to savings data for a large number of industrial and developing countries. Edwards (1995) studies the determinants of savings for a panel of 36 countries and discusses the cross country differences in the saving ratios. His main results show that per capita income growth, political instability and financial development are important determinants of savings.

This paper traces the impact of income distribution on savings both analytically and empirically, thereby adding an important dimension to previous studies on savings. This task is timely because income distribution has received an enormous amount of attention recently, and has been made much easier using an improved data set on income distribution compiled by Deininger and Squire (1996). Previous empirical studies on income distribution have been hampered by data sets with very different definitions of the Gini coefficients and very few observations over time and across countries. Using this newly compiled and greatly expanded data set on income distribution, we can minimize the methodological differences in the definitions of Gini coefficients by selecting the Gini coefficients from national coverage household survey based on gross income, net income or expenditure. Since we have explicit information on the definitions of Gini coefficients, we are able to control the differences in measuring income distribution based on different criteria and maintain consistency in the definitions of Gini coefficients.

Using the new data set, we found by variance decomposition analysis that income distribution is relatively stable within each country over time, but is significantly different across countries. Because savings rates also vary significantly across countries, it is only natural to ask whether this variation has anything to do with the large variation in income distribution and other structural variables such as the initial income distribution, school attainment, financial development, and the civil liberty index.

Section 2 briefly discusses the patterns of savings and income distribution. Section 3 presents an analytical model explaining the relationship between savings and income distribution. Section 4 empirically examine the relationship between savings and income distribution after controlling the effects on savings of income growth, the interest rate, financial development, and the political system. Section 5 concludes.

2. PATTERNS OF SAVINGS BEHAVIOR AND INCOME DISTRIBUTION

We first study the empirical patterns of savings behavior and income distribution in a panel of 49 industrial and developing countries. The savings rate is defined in three ways based on available data. In particular, *SR* is the ratio of gross domestic savings (GDS) to gross domestic product (GDP), *NSR* is the ratio of gross national savings (GNS) to gross domestic product, and *NSRP* is the ratio of domestic private savings (GNPS) to gross domestic product. For the sources and descriptions of the data, see the Data Appendix.

The data for *SR* for most of the countries in our sample cover a period from 1960 to 1992. For *NSR* and *NSRP* the coverage is from 1970 to 1990. The income distribution data (Gini coefficients from 1947 to 1994) are taken from Deininger and Squire (1996). For most of the countries the number of valid observations of the Gini coefficient is usually small. The summary statistics of the savings rates and Gini coefficients are presented in Table 1.[1]

TABLE 1.

Summary Statistics of Savings Rates and Gini Coefficients for 49 Countries

COUNTRY	Obs. #	MEAN	STDE	MAX	MIN	MAX-MIN	COVERAGE
SR	1473	23.53	8.02	55.15	−3.29	58.54	1960 ∼ 92
NSR	1127	22.51	8.42	47.55	−3.86	51.41	1970 ∼ 92
NSRP	913	19.33	7.46	43.70	−8.79	52.49	1970 ∼ 92
GINI	556	36.09	9.03	61.88	18.44	43.44	1947 ∼ 94

For NSRP no data is available for BHS, BGR, CHN, CRI, JAM and PAN.

A direct visual inspection of the plot of the savings rate and the Gini coefficient data reveals trends in the savings rate or the Gini coefficient time series for some of the countries. Thus we estimate a simple linear trend model to test the trends in the savings rate

$$S_{it} = \alpha_i + \beta_i t + u_{it} \tag{1}$$

where S_{it} $(= SR_{it}, NSR_{it}$, or $NSRP_{it})$ is the savings rate; $u_{it} \sim iid(0, \sigma_u^2)$.

Due to the differences in the definitions for the Gini coefficients, we use a least squares dummy variables (LSDV) regression instead

$$Gini_{it} = \phi_i D_i + \theta_i t_i + \sum\nolimits_k \lambda_k D_{ctrl,k} + \omega_{it} \tag{2}$$

[1]For detailed analysis on the explanation of the variations of income inequality across countries and over time, see Li, Squire, and Zou (1998). The summary statistics are also available for each country upon request.

where $Gini_{it}$ is the Gini coefficient, $D_i = 1$ for country i/0 otherwise, and $\omega \sim iid(0, \sigma_\omega^2)$. The dummy variables $D_{ctrl,k}$ $(k = 1, 2, 3)$ control for the different definitions of the Gini coefficient in the original sources. The control dummies are defined as $D_{ctrl,1} = 1$ if gross income based/0 otherwise; $D_{ctrl,2} = 1$ if net income based/0 otherwise; and $D_{ctrl,3} = 1$ if household based/0 otherwise. In both (1) and (2) $i = 1, 2, \ldots, N$ (number of countries) and $t_i = 1, 2, \ldots, T_i$ (number of years covered).[2]

Tables 2 and 3 present the trend estimation results. For the savings rate, a large proportion of the countries have significant trends. For *SR*, 21 countries have significant negative trends and 19 countries have significant positive trends; for *NSR*, 18 have significant negative trends and 16 have significant positive trends; for *NSRP*, 11 have significant negative trends and 14 have significant positive trends. For *NSRP* only 40 countries are considered in the trend estimation due to data availability. Almost all the OECD countries in our sample have significant negative trends, compared to most Asian countries, or in general the developing countries, which exhibit significant positive trends in savings rates. Recent comparative studies of broad trends in savings behavior can be found in Shafer, et al. (1992), Maddison (1992), among other authors.

For the Gini coefficients, the number of countries that have significant trends is smaller. See results in Table 3. Only half of the countries have significant trends, although the results are highly tentative because the time series of the Gini coefficients have few and non-consecutive observations. In the LSDV regression for the Gini coefficients, definition dummies are included to count for the systematic differences in measuring income distribution. The general pattern of income distribution is relatively stable within a country and varies significantly across countries. The estimation results indicate that Gini coefficients based on gross income are significantly higher (4 points on a scale of 1 to 100) than Gini coefficients based on the other definitions such as net income or expenditure. Thus in our empirical analysis in section 4, the definition-adjusted Gini coefficients are used instead.

3. THE ANALYTICAL AMBIGUITIES ON SAVINGS, INCOME DISTRIBUTION AND POLITICAL ECONOMY

Analytically the relationship between income distribution and savings has been studied since the classical contributions by Lewis (1954), Kaldor (1957) and Pasinetti (1962). But in most of these models, the savings behavior of different social groups and classes is assumed to be very different in

[2]Lagged values can be added in the trend regressions for savings rate and Gini coefficients to test for serial correlation. Because of missing data in the Gini series, we do not pursue this issue.

TABLE 2.

Trend Estimation for Savings Rates

	SR			NSR			NSRP		
COUNTRY	**NOB**	**TREND**	**t-VALUE**	**NOB**	**TREND**	**t-VALUE**	**NOB**	**TREND**	**t-VALUE**
AUS	33	−0.19	−5.46	23	−0.21	−3.97	23	−0.21	−4.61
BHS	11	1.08	3.42	23	0.19	0.80			
BGD	20	0.15	2.08	23	0.22	3.72	23	0.30	3.63
BEL	33	−0.07	−1.34	23	−0.32	−3.00	23	0.08	1.60
BRA	33	0.23	5.75	23	0.09	1.07	23	−0.08	−0.76
BGR	12	−0.76	−2.69	23	−0.88	−7.58			
CAN	33	−0.10	−2.91	23	−0.35	−6.59	23	0.03	0.50
CHL	33	0.30	3.20	23	0.82	4.49	23	1.00	8.32
CHN	16	0.69	10.26	23	0.01	0.07			
COL	33	0.20	5.13	23	0.06	0.59	23	−0.10	−1.06
CRI	33	0.42	7.83	23	0.59	5.03			
CIV	32	−0.36	−4.36	23	−2.25	−14.97	23	−1.50	−6.56
CSK	12	−0.66	−2.89	23	−0.15	−3.53	23	−0.20	−9.26
FIN	33	−0.09	−2.20	23	−0.88	−8.78	23	0.22	1.89
FRA	33	−0.23	−7.59	23	−0.32	−6.35	23	−0.13	−3.64
DFA	33	−0.16	−3.99	23	−0.12	−1.82	23	0.10	2.40
HND	33	0.05	0.78	23	0.13	0.97			
HKG	32	0.40	7.66	23	0.73	7.76	12	0.71	3.12
HUN	23	−0.46	−5.56	23	−0.81	−7.02			
IND	33	0.32	13.36	23	0.13	2.18	23	0.21	3.48
IDN	33	1.00	8.60	23	0.85	9.25			
IRN	19	−0.76	−2.96	23	−0.55	−2.71	23	−0.52	−2.75
ITA	33	−0.31	−15.73	23	−0.38	−11.09	23	−0.18	−3.97
JAM	33	−0.30	−2.55	23	0.29	1.99			
JPN	33	−0.13	−2.88	23	−0.19	−2.49	23	−0.32	−13.19
KOR	33	1.13	25.67	23	0.99	9.38	23	0.78	8.04
MYS	33	0.35	6.39	23	0.51	4.64	23	0.65	5.14
MEX	33	0.23	4.58	23	0.26	2.27	23	0.22	1.66
NLD	33	−0.18	−5.00	23	−0.14	−1.81	23	0.24	4.25
NZL	33	−0.11	−2.89	23	−0.64	−4.44	23	−0.41	−2.17
NOR	33	0.03	0.75	23	−0.16	−1.92	23	−0.02	−0.25
PAK	33	0.11	2.37	23	0.45	4.14	23	0.62	6.64
PAN	33	0.14	1.78	23	−0.64	−6.57			
PER	33	−0.78	−5.89	23	−0.22	−1.45	23	0.22	1.26
PHL	33	0.03	0.61	23	−0.02	−0.33	23	−0.17	−2.48
POL	13	0.32	0.54	23	−0.13	−0.84	23	−0.03	−0.22
PRT	33	0.03	0.42	23	0.90	8.33	23	0.92	8.95
SGP	33	1.56	19.48	23	1.40	8.86	23	1.31	9.34
ESP	33	−0.16	−5.81	23	−0.09	−1.92	23	−0.12	−2.45
LKA	33	0.05	1.09	23	0.47	4.83	23	0.45	4.37
SWE	33	−0.23	−6.88	23	−0.30	−4.46	23	0.09	1.26
TWN	33	0.56	6.38	23	0.29	2.58	16	0.21	0.71
THA	33	0.45	9.10	23	0.60	5.10	23	0.36	4.49
TTO	33	−0.17	−1.18	23	−1.47	−9.02	23	0.12	0.95
TUN	32	0.23	3.63	23	0.06	0.53	23	0.77	6.30
GBR	33	−0.08	−2.92	23	−0.35	−9.31	23	−0.10	−1.51
USA	33	−0.15	−6.44	23	−0.21	−4.26	23	−0.09	−2.19
VEN	33	−0.65	−5.71	23	−0.36	−1.79	23	0.11	0.64
YUG	30	0.34	3.22	23	−0.02	−0.22	23	−0.04	−0.40

1. For SR, 21 countries have significant negative trends, 19 countries have significant positive trends. (A total of 40 countries have significant trends.) A 5% t-test is used. Same below.
2. For NSR, 18 countries have significant negative trends, 16 countries have significant positive trends. (A total of 34 countries have significant trends.)
3. For NSRP, 11 countries have significant negative trends, 14 countries have significant positive trends. (A total of 25 countries have significant trends.) For HND, HUN and IDN, since the number of observations is small, the results are not reported.

TABLE 3.

LSDV Estimation (Gini Coefficients)

Control Dummy	Estimate	t-VALUE
Gross	4.00	4.29
Net	1.60	1.47
HHtype	0.41	0.71

		Constant		t-VALUE	
Country	**Obs**	**Estimate**	**t-VALUE**	**Estimate**	**t-VALUE**
AUS	10	31.09	26.26	0.02	0.15
BHS	11	42.23	35.80	−0.30	−3.78
BGD	9	31.43	24.60	0.13	1.37
BEL	9	31.93	26.83	−0.44	−4.45
BRA	14	53.57	52.91	−0.08	−0.84
BGR	27	19.21	19.74	0.15	3.13
CAN	23	26.63	24.90	−0.03	−0.86
CHL	15	47.86	43.57	0.34	4.04
CHN	12	23.57	15.20	0.79	4.72
COL	7	46.81	38.01	0.05	0.50
CRI	8	41.81	35.44	−0.23	−2.51
CIV	5	39.11	9.69	0.06	0.11
CSK	10	19.29	14.60	−0.18	−2.47
FIN	9	28.47	22.46	0.23	1.72
FRA	7	34.88	23.05	−0.46	−5.40
DEU	8	32.76	26.70	0.36	4.06
HND	6	52.96	37.02	−0.36	−3.59
HKG	10	38.45	31.28	−0.14	−2.20
HUN	8	23.00	18.18	0.12	1.60
IND	29	31.26	59.22	−0.10	−3.29
IDN	7	34.99	39.59	−0.30	−1.79
IRN	6	42.82	28.50	−0.07	−0.39
ITA	15	33.45	27.02	−0.37	−3.44
JAM	5	44.49	45.74	−0.21	−2.64
JPN	22	29.77	26.25	−0.07	−1.18
KOR	10	30.78	24.82	0.14	1.61
MYS	6	45.75	35.83	−0.16	−1.21
MEX	9	43.93	32.87	−0.33	−5.49
NLD	10	25.13	15.51	0.33	1.83
NZL	11	28.29	24.43	0.30	2.40
NOR	9	31.91	25.54	−0.20	−2.54
PAK	12	30.90	29.11	−0.09	−1.35
PAN	4	48.28	34.76	−0.01	−0.06
PER	5	46.13	37.67	−0.55	−4.46
PHL	7	38.99	32.47	−0.03	−0.50
POL	8	23.54	14.84	0.02	0.11
PRT	4	33.79	22.39	−0.22	−1.56
SGP	6	35.66	26.98	0.02	0.09
ESP	8	26.83	27.98	−0.21	−2.08
LKA	9	35.25	35.27	−0.27	−3.96
SWE	15	28.99	25.54	−0.10	−1.00
TWN	26	28.01	24.15	−0.02	−0.44
THA	8	40.90	33.55	0.31	4.23
TTO	4	40.53	22.96	−0.14	−1.19
TUN	5	42.61	45.16	−0.04	−0.40
GBR	31	25.11	21.64	0.18	4.38
USA	45	31.53	30.03	0.06	2.58
VEN	8	38.08	31.35	0.25	1.70
YUG	4	30.20	21.74	0.22	2.09

14 countries have significant negative trend, 11 countries have significant positive trend. (A total of 25 countries has significant trends.) A 5% t-test is used.

an *ad hoc* manner. For example, Lewis (1954) assumes that entrepreneurs save a larger fraction of their profit income than the other groups in the economy; Kaldor (1957) takes the savings rate of the working class to be zero. Thus income inequalities can generate high savings rate if the rich have a larger share of income in an economy. Until now this line of research has not been seriously developed or tested empirically.

In this section, we develop an analytical model to illustrate how income distribution affects savings through both the life-cycle permanent-income argument and the political-economy mechanism. We will see that, unlike the *ad hoc* models, it is very difficult to derive a definite relationship between income distribution and savings from sound microfoundations.

Consider a typical overlapping-generations model. Member h ($h = 1, \ldots, H(t)$) born at time t has a utility function defined on his/her consumption when young, $c_t^h(t)$, his/her consumption when old, $c_t^h(t+1)$, public consumption when young, $g(t)$, and public consumption when old, $g(t+1)$

$$u_t^h(c_t^h(t), c_t^h(t+1), g(t), g(t+1)). \tag{3}$$

His/her budget constraint is given by

$$c_t^h(t) + s_t^h(t) = \omega_t^h(t) \tag{4}$$

$$c_t^h(t+1) = (1 - \tau(t))(1 + r)s_t^h(t) \tag{5}$$

where $s_t^h(t)$ is his/her savings when he/she is young, $\omega_t^h(t)$ is his/her initial income, $\tau(t)$ is the rate of capital income taxation on generation t, r is the exogenously given interest rate on savings. $H(t)$ is the total population of generation t. Public consumption is financed by the government through capital income taxation with $g(t)$ levied on the time t old and $g(t+1)$ levied on the time $(t+1)$ old:

$$g(t) = \sum_{h=1}^{H(t-1)} \tau(t-1)(1+r)s_{t-1}^h(t-1) \tag{6}$$

$$g(t+1) = \sum_{h=1}^{H(t)} \tau(t)(1+r)s_t^h(t) \tag{7}$$

where $H(t-1)$ and $H(t)$ are the numbers of people of generations t and $(t+1)$, respectively.

In this setup, agent h has a savings decision to make in order to smooth consumption over time. The savings by agent h will be determined by his/her preferences, initial income distribution, capital income taxation,

interest rate, and government spending. Without simply assuming away the decision of public spending, we follow the political economy arguments in Alesina and Rodrik (1994), Persson and Tabellini (1994), and Perroti (1993), and propose a voting mechanism on public goods: each agent maximizes his/her utility defined on both private and public goods by choosing the most desired rate of capital income tax. Of course, his/her choices will be in turn determined by various factors mentioned above, in particular, initial income. Then the society's collective choice through the majority voting will be determined by its income distribution and other factors.

To see this more clearly, let us first solve agent h's consumption and savings problem. Given the choices of $g(t)$ and $g(t+1)$, agent h's optimization yields the following first-order condition:

$$\begin{aligned}&\frac{\partial u_t^h(\omega_t^h(t)-s_t^h(t),(1-\tau(t))(1+r)s_t^h(t),g(t),g(t+1))}{\partial c_t^h(t)}\\ =\ &\frac{\partial u_t^h(\omega_t^h(t)-s_t^h(t),(1-\tau(t))(1+r)s_t^h(t),g(t),g(t+1))}{\partial c_t^h(t+1)}(1-\tau(t))(1+r).\end{aligned}$$

From this condition, we have

$$s_t^h(t)=s_t^h(\omega_t^h(t),(1-\tau(t))(1+r),g(t),g(t+1)). \tag{8}$$

By summing savings by the time t young, we have the total savings at time t denoted as $s(t)$:

$$s(t)=\sum s_t^h(t)=\sum s_t^h(\omega_t^h(t),(1-\tau(t))(1+r),g(t),g(t+1)). \tag{9}$$

At this general level, we have the following general result: If, in both periods, consumption is normal, then

$$\frac{\partial s_t^h(t)}{\partial \omega_t^h}>0.$$

But to link savings to income distribution it is necessary to know the sign of $\frac{\partial^2 s_t^h(t)}{\partial \omega_t^h(t)^2}$. If $\frac{\partial^2 s_t^h(t)}{\partial \omega_t^h(t)^2}<0$, then a more equal distribution leads to higher savings because the marginal savings rate from income is decreasing; on the other hand, when $\frac{\partial^2 s_t^h(t)}{\partial \omega_t^h(t)^2}>0$, a more unequal distribution will lead to more savings because the marginal savings are increasing in income. Of course, if $\frac{\partial^2 s_t^h(t)}{\partial \omega_t^h(t)^2}=0$, then it does not matter how income is distributed among the members of the society.

Next, we turn to the political-economy argument for the determination of the tax rate and public service provision. We assume that every member

of this society maximizes his/her utility by choosing the most preferred tax rate

$$\max_{[\tau(t)]} u_t^h(\omega_t^h(t) - s_t^h(t), (1-\tau(t))(1+r)s_t^h(t), g(t), g(t+1))$$

subject to (6), (7) and (8). The society will determine the tax rate $\tau(t)$ by the majority rule. This choice of the tax rate is necessarily determined by each voter's income share among his/her generation, or more generally, $\tau(t)$ is a function of income distribution:

$$\tau(t) = \tau(\{\omega_t^h(t)\}_{h=1}^{H(t)}). \tag{10}$$

As in Alesina and Rodrik (1994), when income distribution for this economy is more equal, the median voter's income share is higher. Since the tax rate is linked to the median voter's income share, therefore, income distribution affects the chosen tax rate. It should be noted that with our preference structure and government budget constraint the time t young determine $g(t+1)$ and $\tau(t)$ while the time t old determine $g(t)$ and $\tau(t-1)$.

Since the interest-rate effect on savings is ambiguous as a result of income and substitution effects, we cannot predict the effect of capital income taxation on savings at this general level. From this observation, it is immediately apparent that a high capital income tax may increase or decrease savings by agent h when he/she is young. This is to say, a higher or a lower tax rate as a result of income distribution has an ambiguous impact on savings by the young.

At any time t, the time t young save while the time t old just consume what they have saved plus the after-tax return. Thus, the aggregate savings rate at time t, denoted as $S(t)$, is a complicated function of income distribution $(\{\omega_{t-1}^h(t-1)\}_{h=1}^{H(t-1)}, \{\omega_t^h(t)\}_{h=1}^{H(t-1)})$, population $(H(t-1), H(t))$, interest rate (r), and capital income tax $(\tau(\{\omega_t^h(t)\}_{h=1}^{H(t)}))$ and other factors:

$$S(t) \equiv \frac{\displaystyle\sum_{h=1}^{H(t)} s_t^h(\omega_t^h(t), (1+r)(1-\tau(\{\omega_t^h(t)\}_{h=1}^{H(t)})))}{\displaystyle\sum_{h=1}^{H(t)} \omega_t^h(t) + (1+r)\sum_{h=1}^{H(t-1)} s_{t-1}^h(\omega_{t-1}^h(t-1), (1+r)(1-\tau(\{\omega_{t-1}^h(t-1)\}_{h=1}^{H(t-1)})))}. \tag{11}$$

In this definition, we see clearly that both intergenerational and intragenerational income distribution can affect the aggregate savings rate not only through pure economic reasoning, but also through the political-

economy mechanism of capital income taxation $\tau(\{\omega_{t-1}^h(t-1)\}_{h=1}^{H(t-1)})$ and $\tau(\{\omega_t^h(t)\}_{h=1}^{H(t)})$.

Equation (11) provides the fundamental analytical result for our empirical examination of the impact of income distribution on savings across countries. To make it empirically operational, we take the following approximation:

$$S(t) = S(Gini(t), \Delta(t), r(t), \lambda(t), p(t)) \tag{12}$$

where $Gini(t)$ is the Gini coefficient of household income, as a measure of income distribution; Δ is the income growth rate($= \frac{\sum \omega_t^h(t) - \sum \omega_{t-1}^h(t-1)}{\sum \omega_{t-1}^h(t-1)} - 1$); $r(t)$ is the interest rate; $\lambda(t)$ is a measure of financial development; and $p(t)$ is a measure of political systems.

It should be noted that we have incorporated $\lambda(t)$ and $p(t)$ to the savings-rate function. This is important because savings are mobilized through the financial structure and taxation is determined and implemented in a particular political system. In different political regimes, even the majority rule on taxation will function differently; see Edwards (1995) for more arguments on this point.

As argued earlier, in general it is not possible to make definite theoretical predictions on the effects of income distribution on savings. To make this point clear, we offer two examples that shed light on our understanding of the relationship between savings and income distribution.

Example 1: Savings are independent of income distribution

All agents ($h = 1, \ldots, H(t)$) have an identical preference, and agent h chooses consumption to maximize

$$\alpha_1 \ln c_t^h(t) + \alpha_2 \ln c_t^h(t+1) + \beta_1 \ln g(t) + \beta_2 \ln g(t+1)$$

subject to the budget constraint in (4) and (5) and with given $g(t)$ and $g(t+1)$. Since the preference is homothetic, it is well-known that agent h's savings are linear in his/her income. Therefore, the economy's aggregate savings rate is independent of income distribution.

To determine the rate of capital income taxation, we assume a majority rule. In this case, each agent h maximizes his/her utility by choosing his/her most preferred tax rate. It is also well-known that, with a homothetic preference structure, all voters will want the same tax rate (Lovell, 1975). Thus the optimal choice of income tax rate is also independent of income distribution.

Example 2: Savings depend on income distribution indirectly through income taxation

In example 1, let the common preference be changed to:

$$\alpha_1 \ln c_t^h(t) + \alpha_2 c_t^h(t+1) + \beta_1 \ln g(t) + \beta_2 g(t+1).$$

Then the savings for agent h become

$$s_t^h(t) = \omega_t^h(t) - \frac{\alpha_1}{\alpha_2(1+r)(1-\tau)}.$$

Now, each individual's savings are still linear in his/her income. For a given tax rate, the savings rate will be independent of income distribution among the $H(t)$ members of the time t generation because

$$S(t) = \frac{\sum \omega_t^h(t) - \frac{\alpha_1}{\alpha_2(1+r)(1-\tau)} H(t)}{\sum \omega_t^h(t) + (1+r)\sum \omega_{t-1}^h(t-1) - \frac{\alpha_1}{\alpha_2(1-\tau)} H(t-1)}.$$

But unlike example 1, each individual's savings are decreasing in the capital income tax since

$$\frac{\partial\, s_t^h(t)}{\partial\, \tau} = -\frac{\alpha_1}{\alpha_2(1+r)(1-\tau)^2} < 0.$$

To determine τ by the society, we first examine each individual's preferred capital income tax. With the required substitution of the savings function in the budget constraint and the revenue constraint of the government in the utility function, we have the following first-order condition for agent h's optimal choice of τ^h:

$$\frac{\alpha_1}{(1-\tau^h)} - \alpha_2(1+r)\omega_t^h(t) + \beta_2 \sum\nolimits_{j=1}^{H(t)} \omega_t^j(t) - \beta_2 \frac{\alpha_1 H(t)}{\alpha_2(1+r)(1-\tau^h)^2} = 0.$$

Let us define $W(t)$ as the total income of the time t young as:

$$W(t) = \sum_{j=1}^{H(t)} \omega_t^j(t)$$

and $\sigma_t^h(t)$ as the income share of agent h of generation t:

$$\sigma_t^h(t) = \frac{\omega_t^h(t)}{\sum_{j=1}^{H(t)} \omega_t^j(t)}.$$

Then, we can rewrite the first-order condition as

$$\frac{\alpha_1}{(1-\tau^h)W(t)} - \alpha_2(1+r)\sigma_t^h(t) + \beta_2 - \beta_2 \frac{\alpha_1}{\alpha_2(1+r)(1-\tau^h)^2 W(t)/H(t)} = 0.$$

To find out how agent h's choice of τ^h changes with respect to his/her income share $\sigma_t^h(t)$ we differentiate the equation above:

$$\frac{d\tau^h}{d\sigma_t^h(t)} = \frac{\alpha_2^2(1+r)^2(1-\tau^h)^3 W(t)}{\alpha_1\alpha_2(1+r)(1-\tau^h) - 2\beta_2\alpha_1 H(t)}.$$

Therefore, if $\alpha_1\alpha_2(1+r)(1-\tau^h)-2\beta_2\alpha_1 H(t)>0$, then $\frac{d\tau^h}{d\sigma_t^h(t)}>0$; and if $\alpha_1\alpha_2(1+r)(1-\tau^h)-2\beta_2\alpha_1 H(t)<0$, then $\frac{d\tau^h}{d\sigma_t^h(t)}<0$. With majority voting on income taxation, the tax rate will be determined by the median voter's preferred choice. Let τ^m denote the optimal tax rate chosen by the median voter and σ^m be the median voter's income share. Then the tax rate chosen by the society is implicitly determined by the median vote's first-order condition:

$$\frac{\alpha_1}{(1-\tau^m)W(t)}-\alpha_2(1+r)\sigma^m(t)+\beta_2-\beta_2\frac{\alpha_1}{\alpha_2(1+r)(1-\tau^m)^2W(t)/H(t)}=0.$$

Again, note that, as in Alesina and Rodrik (1994), more equal income distribution implies a higher income share for the median voter. In this case, income distribution affects the choice of the optimal tax rate of the median voter and the savings of the whole economy. If $\alpha_1\alpha_2(1+r)(1-\tau^m)-2\beta_2\alpha_1 H(t)<0$, and if the income distribution is more equal (i.e., a large income share for the median voter), the median voter will vote for a smaller tax rate. Then everyone will save more. Hence a more equal income distribution leads to a higher savings rate. On the other hand, if $\alpha_1\alpha_2(1+r)(1-\tau^m)-2\beta_2\alpha_1 H(t)>0$, a more equal income distribution (a larger income share for the median voter) will lead to more income taxation and less savings.

4. EMPIRICAL RESULTS

Our theory provides us with a framework identifying the main determinants of savings, but predicts an ambiguous effect of income distribution on savings. In the examples we studied, more equal income distribution can increase aggregate savings, decrease aggregate savings, or not affect aggregate savings. Thus it is important to find out whether this ambiguity between savings and income distribution still holds empirically. For this purpose, we estimate a linear regression model based on (12):

$$S_{it}=\alpha_i+\beta_1 Gini_{it}+\beta_2 GGRW_{it}+\beta_3 R_{it}+\beta_4 FDP_{it}+\beta_5 POLI_{it}+\varepsilon_{it} \quad (13)$$

for $i=1,2,\ldots,N$ and $t=1,2,\ldots,T$, where N is the number of countries and T is the time period. In (13), the dependent variable S_{it} $(=SR_{it}, NSR_{it}$ or $NSRP_{it})$[3] is the savings rate; $\varepsilon_{it}\sim iid(0,\sigma_\varepsilon^2)$.[4] The independent variables are: $Gini_{it}$ (Gini coefficients adjusted for differences

[3]The savings rate s is limited to the range $[0,1]$ (where negative savings is not considered). Simple least squares is inappropriate. A transformation of $\ln(s/(1-s))$ is used in the regression analysis.

[4]Since the Gini coefficients data for individual countries are in general time series with many missing observations, we did not use various specification tests for serial correlation

in definitions), $GGRW_{it}$ (per capita real GDP growth), R_{it} (real interest rate), FDP_{it} (financial development or financial depth measurement, defined as $M2/GDP$, where $M2$ is money ($M1$) plus quasi-money), and $POLI_{it}$ (measure of political freedom, ranked from 1 to 7, with 1 for the most politically free countries and 7 the least politically free ones). For a description of the variables and their sources, see the Data Appendix.

The pooled regression (when assuming $\alpha_1 = \alpha_2 = \cdots = \alpha_N$) and fixed-effects model are estimated. The fixed-effects model allows for country specific effects. Empirically, the evidence found in the literature regarding variations across countries in savings behavior suggests both homogeneity and heterogeneity. Carroll et al. (1994) find no difference in savings behavior based on a study of Canada immigrants. Kessler, et al. (1993), on the other hand, argue that, even within the 17 OECD countries, there is no evidence of homogeneous savings behavior.

In our pooled regression, the OECD country dummy (ODM) and the Asian country dummy (ADM) are included to account for the regional effects discussed in the general patterns of savings behavior. For the fixed-effects model, the measure of political systems (averaged over time) is not included as a regressor because it has no time variation. We also repeat the estimations for subsamples of the OECD countries and the Asian countries. The estimation results are summarized in Tables 4, 5, and 6 where the dependent variable is *SR*, *NSR* or *NSRP*, respectively. Next, we discuss these results in details.

4.1. The relationship between gross domestic savings rate (*SR*) and income distribution

4.1.1. Complete sample estimation

Table 4 summarizes the empirical results regarding regression (13) for the complete sample when the dependent variable is *SR* - the gross domestic savings rate. Due to the lack of data on the other variables, some of the 49 countries are not included in the estimation. For the complete sample we are left with 41 countries with 311 observations. For the pooled regression, different specifications (cases (1) to (4)) are used to test the stability of the regression coefficients. Case (5) gives the results from the estimation of the fixed-effects model. For regression results involving the fixed-effects specification, there are indications that the fixed-effects hypothesis cannot be rejected. However, given the fact that the current panel data is highly unbalanced (for some countries there are only a few observations), regression results based on the fixed-effects model should be explained with caution.

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and causality, or lagged variables as instruments to account for possible endogeneity. See similar work by Li and Zou (1998), Li, Xie, and Zou (2000), and Li, Xu, and Zou (2000).

In all cases, including case (5) for the fixed-effects model, the estimates of the Gini coefficients are not significant. However, in four cases the signs are negative, suggesting that high inequality leads to low savings rate.

The coefficients on GDP growth are all positive and strongly significant. The positive impact of GDP growth on savings has also been found in Masson et al. (1995) for a panel of 64 developing countries in a fixed-effects model. However, for the 21 industrial countries in their study, a negative (not significant) coefficient is found. It is different from our results for the OECD countries, which will be discussed in the next subsection. For financial depth, the coefficients are all positive and significant in all the pooled regressions (1) to (4). Edwards (1995) obtains similar results for private savings. In case (5), which allows for country specific effects, the coefficient of financial depth becomes negative although not significant.

The signs of the coefficients on the real interest rate could be either positive or negative, depending on whether the income effect or the substitution effect dominants. We find that the coefficients are negative in cases (3) and (5), and positive in (1), (2) and (4). In all cases, the coefficients are not significant.

Please note that in case (1), political freedom has a significant and positive coefficient, which suggests that, in general, politically less free countries have higher savings rates. When we add the OECD and Asian country dummies, the coefficient of political freedom becomes insignificant. However, the coefficient of the OECD dummy estimate is negative and significant, which essentially leads to the same conclusion since the OECD countries are politically more free than other countries. The explaining power clearly shifts to the OECD and Asian country dummies.

4.1.2. The OECD countries

We consider two special cases. The OECD country and the Asian country subsamples. As we know from the summary statistics, most of the OECD countries have negative trends in savings rates, while almost all the Asian countries have positive trends. This is also one of the stylized facts often documented in the savings literature. For the OECD country sample, the regressions are based on 15 countries with 180 observations. The GDP growth has positive and significant estimates, which are similar to the complete sample. The financial depth has positive and significant coefficients in the pooled regressions (cases (6) and (7)), while they are negative and significant in case (8), the fixed-effects model.

TABLE 4.

Estimation Results: Relationship between the Savings Rate and Gini

Dependent Variable: *SR* (Gross Domestic Savings Rate)

	COMPLETE SAMPLE					OECD COUNTRIES			ASIAN COUNTRIES		
IND.VAR.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
CONSTANT	−165.06	−128.66	−162.95	−128.77	-	−170.62	−168.05	-	−251.62	−237.96	-
	(−11.41)	(−7.55)	(−11.18)	(−8.10)		(−11.03)	(−11.17)		(−4.06)	(−4.33)	
GINI	−0.18	−0.67	0.11	−0.67	−0.25	0.59	0.59	0.43	0.88	0.77	0.05
	(−0.46)	(−1.70)	(0.31)	(−1.71)	(−0.52)	(1.07)	(1.06)	(1.27)	(0.58)	(0.52)	(0.05)
GGRW	3.43	3.28	4.10	3.28	2.38	3.92	3.96	2.32	5.65	5.93	1.31
	(4.48)	(4.31)	(5.63)	(4.38)	(6.72)	(5.22)	(5.29)	(7.70)	(2.66)	(2.93)	(1.53)
R	0.01	0.03	−0.01	0.03	−0.06	0.63	0.59	−0.81	0.60	0.53	0.15
	(0.13)	(0.27)	(−0.05)	(0.27)	(−1.07)	(2.00)	(1.90)	(−5.40)	(0.70)	(0.64)	(0.41)
FDP	0.53	0.62	0.47	0.62	−0.10	0.22	0.25	−0.28	1.20	1.16	−0.03
	(4.87)	(5.29)	(4.41)	(5.39)	(−1.08)	(2.00)	(2.26)	(−4.08)	(4.46)	(4.55)	(−0.18)
POLI	4.30	−0.04				3.01			2.37		
	(2.54)	(−0.02)				(0.73)			(0.48)		
ODM		−2.29		−2.29							
		(−3.89)		(−4.43)							
ADM		−0.49		−0.49							
		(−0.62)		(−0.65)							
NOC	41	41	41	41	41	15	15	15	14	14	14
NOB	311	311	311	311	311	180	180	180	89	89	89
ADJ-RSQ	0.17	0.21	0.16	0.21	0.86	0.21	0.22	0.89	0.31	0.31	0.92

Regressions (1) - (4), (6), (7), (9) and (10) are pooled regressions; (5), (8) and (11) are fixed-effects model regressions (coefficients for dummy variables not reported). The t-values are reported in parentheses. Same for Tables 5 to 9.

The coefficients for Gini remain insignificant and positive ranging from 0.43 to 0.59. For the OECD countries the political freedom index clearly varies less, which could be the main reason for an insignificant but positive coefficient. The real interest rate has positive coefficients in the pooled regressions in cases (6) and (7). In the fixed-effects model, the coefficient is negative and significant.

4.1.3. The Asian countries

For the Asian countries (cases (9) to (11)), the coefficients for Gini range from 0.05 to 0.88. Again, none of the coefficients for Gini is significant. GDP growth is positive and significant in all three cases. Financial depth is positive in all three cases but not significant in case (11). The coefficients of real interest rate are positive, though insignificant.

In this exercise, one result comes out quite strong. GDP growth is highly correlated to the savings rate in all the three samples with different model specifications. In particular, we find that the relationship between the savings rate and the Gini coefficient is weak and insignificant.

4.2. The relationship between gross national savings rate (*NSR*) and income distribution

The parallel results using *NSR* as the dependent variable are reported in Table 5. Because the coverage of *NSR* is from 1970 to 1992, the number of observations is smaller than the corresponding cases in Table 4. Other differences between *SR* and *NSR* can also be found in the summary statistics reported in Table 1.[5]

Broadly speaking, the coefficient estimates show a similar pattern when compared with the results in Tables 4 and 5. We highlight some of the major differences and similarities here. One major difference is that, for the complete sample, Gini has all negative coefficients and is strongly significant in cases (1) to (4). For the OECD country sample, the coefficients in cases (6) and (7) are negative, although still insignificant.

[5]The major differences between *SR* and NSR are the time coverage and methodology in calculating the savings ratios. Note that *NSR* (gross domestic savings divided by GNP, 1970-1992) is an International Monetary Fund (IMF) definition, while *SR* (1960-1992) is calculated as gross domestic savings divided by GDP using data from the World Bank.

TABLE 5.

Estimation Results: Relationship between the Savings Rate and Gini

Dependent Variable: *NSR* (Gross National Savings Rate)

	COMPLETE SAMPLE					OECD COUNTRIES			ASIAN COUNTRIES		
IND.VAR.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
CONSTANT	−141.61	−106.53	−137.00	−108.91	-	−154.13	−146.88	-	−200.60	−184.30	-
	(−10.73)	(−7.04)	(−10.29)	(−7.79)		(−7.67)	(−7.47)		(−5.86)	(−6.07)	
GINI	−1.43	−1.79	−1.16	−1.80	−0.29	−1.04	−1.06	0.52	0.20	0.07	2.25
	(−4.24)	(−5.19)	(−3.52)	(−5.23)	(−0.37)	(−1.50)	(−1.53)	(0.98)	(0.24)	(0.08)	(2.17)
GGRW	4.90	4.53	5.64	4.47	3.97	5.19	5.34	2.90	3.58	3.96	0.86
	(7.26)	(6.84)	(8.81)	(6.89)	(7.18)	(5.35)	(5.50)	(5.88)	(3.02)	(3.51)	(1.08)
R	0.05	0.06	0.03	0.06	−0.05	−0.22	−0.33	−1.42	0.27	0.21	0.16
	(0.52)	(0.66)	(0.34)	(0.68)	(−0.57)	(−0.56)	(−0.85)	(−6.08)	(0.57)	(0.44)	(0.49)
FDP	0.61	0.61	0.54	0.62	0.05	0.55	0.60	−0.35	1.01	0.96	0.26
	(6.37)	(5.92)	(5.75)	(6.12)	(0.30)	(3.94)	(4.43)	(−3.24)	(6.81)	(6.84)	(1.69)
POLI	4.62	−0.79				7.86			2.82		
	(3.07)	(−0.42)				(1.56)			(1.03)		
ODM		−2.09		−1.98							
		(−3.82)		(−4.12)							
ADM		1.01		0.93							
		(1.47)		(1.41)							
NOC	41	41	41	41	41	15	15	15	14	14	14
NOB	285	285	285	285	285	155	155	155	87	87	87
ADJ-RSQ	0.37	0.41	0.35	0.42	0.68	0.26	0.25	0.83	0.49	0.49	0.85

With respect to the other variables, the pattern is basically consistent. The coefficients of GDP growth are all positive and significant except in case (11), where it is less significant. Real interest rate, again, has negative and significant coefficients in case (8) for the OECD sample, but is not significant in any other cases.

4.3. The relationship between domestic private savings rate (*NSRP*) and income distribution

Finally, we report in Table 6 the estimation results with respect to the gross private savings rate (*NSRP*). The coverage of private savings rate is the same as that of the gross national savings rate. Note that our theoretical model is more relevant to the private savings rate. Empirically, income distribution data is based on national-level household-income surveys. Perhaps it better describes the relationship between savings and income distribution when we use the domestic private savings ratio.

For the complete sample, the Gini has negative and significant coefficients in cases (1) to (4), which indicates that higher inequality leads to lower private savings. When we allow for country-specific effects in case (5) the coefficient is positive, although insignificant. For the OECD sample, the coefficients are all positive but insignificant. In case (11) for the Asian country sample, the coefficient is positive and significant when country specific effects are allowed.

Compared to Tables 4 and 5, GDP growth continues to have a strong positive impact on private savings rate; except for the Asian country sample, the coefficients are positive but insignificant. Financial depth has positive and significant coefficients except in cases of the fixed-effects model. For the OECD country sample, financial depth is negative and significant when we allow for country-specific effects.

The real interest rate is insignificant in most of the cases except in case (8) for the OECD sample, where it is negative and significant. This result is the same for all three measures of savings rate. For the OECD country sample, a negative and significant relationship between savings rate and real interest rate is identified when we allow for country-specific effects.

TABLE 6.

Estimation Results: Relationship between the Savings Rate and Gini

Dependent Variable: *NSRP* (Gross Private Savings Rate)

	COMPLETE SAMPLE					OECD COUNTRIES			ASIAN COUNTRIES		
IND.VAR.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
CONSTANT	−118.44	−80.56	−118.63	−90.30	-	−209.81	−204.89	-	−175.84	−186.01	-
	(−7.53)	(−4.59)	(−7.56)	(−5.23)		(−10.97)	(−11.00)		(−5.77)	(−6.12)	
GINI	−2.03	−2.32	−1.98	−2.62	0.39	0.70	0.68	0.68	0.03	−0.17	3.90
	(−4.75)	(−5.31)	(−5.07)	(−6.19)	(0.42)	(1.06)	(1.03)	(1.22)	(0.04)	(−0.21)	(2.74)
GGRW	2.67	2.35	2.75	2.06	2.03	2.81	2.91	1.07	1.19	0.74	0.24
	(3.11)	(2.79)	(3.40)	(2.45)	(3.09)	(3.04)	(3.17)	(2.06)	(1.08)	(0.69)	(0.26)
R	0.15	0.15	0.15	0.17	−0.03	0.26	0.18	−0.76	−0.28	−0.10	0.36
	(1.44)	(1.45)	(1.42)	(1.68)	(−0.32)	(0.70)	(0.50)	(−3.09)	(−0.65)	(−0.23)	(0.89)
FDP	0.62	0.67	0.62	0.73	0.20	0.66	0.69	−0.31	0.94	0.97	0.28
	(5.61)	(5.43)	(5.65)	(5.97)	(1.17)	(4.94)	(5.37)	(−2.65)	(7.27)	(7.45)	(1.62)
POLI	0.62	−6.43				5.33			−4.55		
	(0.31)	(−2.46)				(1.12)			(−1.73)		
ODM		−2.62		−1.95							
		(−4.03)		(−3.27)							
ADM		0.66		−0.14							
		(0.78)		(−0.17)							
NOC	35	35	35	35	35	15	15	15	11	11	11
NOB	255	255	255	255	255	155	155	155	68	68	68
ADJ-RSQ	0.27	0.32	0.27	0.31	0.64	0.27	0.27	0.79	0.55	0.54	0.75

4.4. The relationship between the savings rate and the income shares of the rich

As mentioned in section 3, many early studies on growth and income distribution have assumed a larger savings rate for the rich than for the middle class and the poor (see Kaldor, 1957, for an explicit mathematical model). If this assumption is valid, an economy with a larger income share for the rich should have a higher savings rate, other things given. To test this classical hypothesis, we consider the following regression

$$S_{it} = \alpha_i + \beta_1 TOP20_{it} + \beta_2 GGRW_{it} + \beta_3 R_{it} + \beta_4 FDP_{it} + \beta_5 POLI_{it} + \varepsilon_{it} \quad (14)$$

where *TOP20* denotes the income share of the top 20 percent of the population.

Tables 7 to 9 report the estimation results regarding the relationship between the savings rate and the income shares of the rich ($TOP20$). Regardless of whether *SR*, *NSR* or *NSRP* is used as the dependent variable, the coefficients of $TOP20$ are mostly insignificant, except in cases (4) and (8) in Table 8. When *SR* is used, $TOP20$ has negative (insignificant) coefficients for the complete sample. However, for the two subsamples the coefficients are all positive. See results in Table 7. As for the results in Tables 8 and 9, except for the fixed-effects model, most of the coefficients are negative, although insignificant. These results seem to weakly suggest that when the rich's income share increases, the savings rate drops.

5. CONCLUSION

While this paper has emphasized the analytical ambiguity on the relationship between savings and income inequality, the empirical examination has rendered some weak support for a negative association between the savings rate and income inequality. In particular, with the complete, world sample, a negative and significant relationship exists between *NSR* (or *NSRP*) - the gross national (or private) savings rate - and the Gini coefficient. This finding implies that income inequality lowers savings across countries worldwide, and it is in line with the negative relationship between inequality and economic growth found by Alesina and Rodrik (1994); and Persson and Tabellini (1994). But this finding is not very robust. In particular, with the subsamples of OECD countries and Asian countries, income inequality and the savings rate can even be positively and significantly associated.

TABLE 7.

Estimation Results: Relationship between the Savings Rate and Top 20% of the Population's Income Share

Dependent Variable: *SR* (Gross Domestic Savings Rate)

	COMPLETE SAMPLE					OECD COUNTRIES			ASIAN COUNTRIES		
IND.VAR.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
CONSTANT	−160.18	−127.14	−144.39	−109.53	-	−192.51	−165.07	-	−229.56	−217.82	-
	(−6.99)	(−4.86)	(−6.18)	(−4.70)		(−6.23)	(−6.38)		(−2.75)	(−3.14)	
TOP20	−0.25	−0.58	−0.10	−0.71	−0.39	1.04	0.44	0.37	0.32	0.19	0.23
	(−0.49)	(−1.11)	(−0.19)	(−1.39)	(−0.69)	(1.31)	(0.63)	(0.79)	(0.21)	(0.13)	(0.21)
GGRW	1.57	1.74	2.47	1.82	1.60	3.70	3.88	2.14	5.64	5.78	1.32
	(1.93)	(2.13)	(3.04)	(2.24)	(4.59)	(4.54)	(4.79)	(6.68)	(2.66)	(2.83)	(1.54)
R	−0.03	−0.04	−0.06	−0.03	−0.09	0.69	0.59	−0.81	0.67	0.64	0.15
	(−0.28)	(−0.35)	(−0.52)	(−0.34)	(−1.95)	(2.00)	(1.73)	(−5.25)	(0.77)	(0.74)	(0.40)
FDP	0.52	0.67	0.41	0.63	−0.11	0.10	0.20	−0.25	1.14	1.11	−0.02
	(4.40)	(5.26)	(3.44)	(5.07)	(−1.14)	(0.80)	(1.70)	(−3.25)	(3.99)	(4.16)	(−0.09)
POLI	7.64	3.49				7.74			1.37		
	(4.39)	(1.47)				(1.61)			(0.26)		
ODM		−2.40		−2.92							
		(−3.85)		(−5.65)							
ADM		−1.47		−1.07							
		(−1.68)		(−1.28)							
NOC	37	37	37	37	37	15	15	15	14	14	14
NOB	284	284	284	284	284	168	168	168	86	86	86
ADJ-RSQ	0.13	0.18	0.08	0.17	0.89	0.18	0.17	0.89	0.29	0.30	0.92

TABLE 8.

Estimation Results: Relationship between the Savings Rate and Top 20% of the Population's Income Share

Dependent Variable: *NSR* (Gross National Savings Rate)

	COMPLETE SAMPLE					OECD COUNTRIES			ASIAN COUNTRIES		
IND.VAR.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
CONSTANT	−179.13	−153.13	−153.68	−120.45	-	−157.11	−121.96	-	−181.82	−167.01	-
	(−10.21)	(−7.62)	(−8.21)	(−6.71)		(−3.91)	(−3.62)		(−4.01)	(−4.44)	
TOP20	−0.38	−0.67	−0.31	−0.94	0.43	−0.71	−1.47	1.71	−0.13	−0.30	1.41
	(−1.00)	(−1.70)	(−0.74)	(−2.39)	(0.58)	(−0.70)	(−1.62)	(2.09)	(−0.16)	(−0.38)	(1.33)
GGRW	2.74	2.70	3.89	2.88	2.40	5.46	5.73	2.62	3.48	3.67	0.97
	(4.52)	(4.41)	(6.13)	(4.63)	(5.49)	(5.03)	(5.32)	(4.60)	(2.98)	(3.30)	(1.21)
R	0.01	0.02	−0.01	0.02	−0.08	−0.03	−0.16	−1.26	0.25	0.22	−0.05
	(0.16)	(0.21)	(−0.17)	(0.25)	(−1.38)	(−0.08)	(−0.37)	(−4.81)	(0.52)	(0.46)	(−0.15)
FDP	0.70	0.77	0.55	0.71	0.05	0.47	0.58	−0.35	0.97	0.94	0.35
	(7.87)	(7.98)	(5.87)	(7.33)	(0.44)	(2.88)	(3.87)	(−2.54)	(6.27)	(6.49)	(2.23)
POLI	9.25	6.07				9.65			1.74		
	(6.98)	(3.37)				(1.58)			(0.59)		
ODM		−1.64		−2.57							
		(−3.26)		(−6.03)							
ADM		−0.44		0.25							
		(−0.67)		(0.39)							
NOC	37	37	37	37	37	15	15	15	14	14	14
NOB	259	259	259	259	259	144	144	144	84	84	84
ADJ-RSQ	0.38	0.40	0.26	0.38	0.77	0.24	0.23	0.82	0.48	0.48	0.83

TABLE 9.

Estimation Results: Relationship between the Savings Rate and Top 20% of the Population's Income Share

Dependent Variable: *NSRP* (Gross Private Savings Rate)

	COMPLETE SAMPLE					OECD COUNTRIES			ASIAN COUNTRIES		
IND.VAR.	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
CONSTANT	−164.77	−154.85	−157.12	−133.62	-	−171.51	−163.35	-	−147.03	−175.83	-
	(−8.74)	(−7.56)	(−7.91)	(−6.95)		(−4.34)	(−4.97)		(−3.82)	(−4.66)	
TOP20	−0.77	−0.73	−0.43	−0.79	0.42	−0.78	−0.95	1.01	−0.46	−0.34	0.89
	(−1.82)	(−1.75)	(−0.98)	(−1.87)	(0.50)	(−0.78)	(−1.08)	(1.00)	(−0.60)	(−0.44)	(0.70)
GGRW	0.76	1.23	1.42	1.16	1.51	3.74	3.80	1.02	1.00	0.43	0.51
	(1.09)	(1.74)	(1.97)	(1.63)	(2.97)	(3.50)	(3.62)	(1.45)	(0.93)	(0.40)	(0.53)
R	0.13	0.09	0.10	0.08	−0.05	0.39	0.36	−0.52	−0.28	−0.07	0.19
	(1.64)	(1.12)	(1.15)	(1.05)	(−0.77)	(0.89)	(0.84)	(−1.60)	(−0.66)	(−0.16)	(0.44)
FDP	0.72	0.91	0.64	0.86	0.20	0.87	0.89	−0.13	0.93	0.98	0.46
	(7.82)	(8.98)	(6.64)	(8.53)	(1.55)	(5.35)	(6.08)	(−0.75)	(6.98)	(7.20)	(2.44)
POLI	7.93	5.77				2.24			−6.26		
	(5.19)	(2.73)				(0.37)			(−2.31)		
ODM		−2.04		−2.79							
		(−3.87)		(−6.14)							
ADM		−2.05		−1.33							
		(−2.84)		(−1.95)							
NOC	31	31	31	31	31	15	15	15	11	11	11
NOB	227	227	227	227	227	144	144	144	65	65	65
ADJ-RSQ	0.30	0.35	0.22	0.33	0.71	0.29	0.29	0.73	0.57	0.54	0.72

It is also interesting to note that our empirical estimation on the relationship between the income share of the rich and the savings rate does not in general support the classical Kaldor hypothesis: that a larger income share for the rich increases the aggregate savings rate. To some degree, we have found some evidence for something just the opposite: a larger income share for the rich lowers the private savings rate.

APPENDIX: DATA DESCRIPTION AND SOURCES

Variable	**Source**
(1) Gross domestic savings rate (SR)	World Bank, National Account, various issues.
(2) Gross national savings rate (NSR)	IMF, World Economic Outlook, various issues.
(3) Domestic private savings rate (NSRP)	IMF, World Economic Outlook, various issues.
(4) Gini coefficients (GINI)	Deininger and Squire (1996).
(5) Per capita GDP growth (GGRW)	World Bank, Social Indicators, various issues.
(6) Real interest rate R	Defined as: R = nominal interest rate − inflation rate
(7) Nominal interest rate	IMF, International Financial Statistics, various issues.
(8) Inflation rate	IMF, International Financial Statistics, various issues.
(9) Financial depth (FINDP)	M2 and GDP from: IMF, Government Finance Statistics and International Financial Statistics, various issues.
(10) Civil liberty (POLI)	Gastil, "Freedom in the World," various issues; Barro and Lee, (1994).

REFERENCES

Aghevli, B., Boughton, J.M., Montiel, P.J., Villanueva, D., and G. Woglom, 1990, The role of national saving in the world economy: Recent trends and prospects. IMF Occasional Paper 67, Washington, D.C., International Monetary Fund.

Alesina, A. and D. Rodrik, 1994, Distributive politics and economic growth. *The Quarterly Journal of Economics* **109**, 465-490.

Barro, Robert J. and J-W. Lee, 1994, Data Set for a Panel of 138 Countries.

Carroll, C.D., Rhee, B.-K and C. Rhee, 1994, Are there cultural effects on saving? Some cross-sectional evidence. *The Quarterly Journal of Economics* **109**, 685-700.

Deaton, A., 1992, Understanding Consumption, Oxford: Clarendon Press.

Deininger, K., and L. Squire, 1996, A new data set on income distribution. *World Bank Economic Review* **10**, 565-591.

Della Valle, P. and N. Oguchi, 1976, Distribution, the aggregate consumption function, and the level of economic development: Some cross-country results. *Journal of Political Economy* **84**, 1325-34.

Edwards, S., 1995, Why are saving rates so different across countries?: An international comparative analysis. NBER working paper #5097.

International Monetary Fund (IMF), *World Economic Outlook*, various issues.

Kaldor, N., 1957, A model of economic growth. *Economic Journal* **67**, 591-624.

Kessler, D., Perelman, S., and P. Pestieau, 1993, Savings behavior in 17 OECD countries. *Review of Income and Wealth* **39**, 37-49.

Lewis, W.A., 1954, Economic development with unlimited supplies of labor. *The Manchester School* **22**, 139-191.

Li, H., Squire, L., and H. Zou, 1998, Explaining international and intertemporal variations in income inequality. *Economic Journal* **108**, 26-43.

Li, H., and H. Zou, 1998, Income inequality id not harmful for growth: theory and Evidence. *Review of Development Economics* **2**, 318-334.

Li, H., Xie, D., and H. Zou, 2000, Dynamics of income distribution. *Canadian Journal of Economics* **33**, 937-961.

Li, H., Xu, C. L., and H. Zou, Corruption, income distribution, and growth. *Economics and Politics* **12**, 155-182.

Lovell, M., 1975, The collective allocation of commodities in a democratic society. *Public Choice* **24**, 71-92.

Maddison, A., 1992, A long-run perspective on saving. *The Scandinavian Journal of Economics* **94**, 181-196.

Masson, P.R., Bayoumi, T., and H. Samiei, 1995, Saving behavior in industrial and developing countries, IMF working paper.

Musgrove, P., 1980, Income distribution and the aggregate consumption function. *Journal of Political Economy* **88**, 504-525.

Pasinetti, L., 1962, Rate of profit and income distribution in relation to the rate of economic growth. *Review of Economic Studies* **29**, 267-279.

Perroti, R., 1993, Political equilibrium, income distribution and growth. *Review of Economic Studies* **60**, 755-776.

Persson, T. and G. Tabellini, 1994, Is inequality harmful for growth? *The American Economic Review* **84**, 600-621.

Sahota, G., 1993, Saving and distribution. In: *The Economics of Saving*. J.H. Gapinski (ed.) Boston: Kluwer Academic Publishers, pp 193-231.

Shafer, J.R., Elmeskov, J., and W. Tease, 1992, Saving trends and measurement issues. *The Scandinavian Journal of Economics* **94**, 155-175.

World Bank, *Social Indicators*. various issues.

World Bank, *National Accounts*. various issues.