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A MODEL OF THE IMPACT OF INCOME DISTRIBUTION ON ECONOMIC GROWTH AND FLUCTUATIONS

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INTRODUCTION

In recent years the economy has experienced slower growth, which has been a major concern to economists, politicians, and others. Several factors have contributed to this sluggish growth. The foremost cited by economists are: slower growth of the labor force due to the recent baby bust, a lower saving rate and less capital formation, and lower labor productivity growth. More recently, the end of the cold war with the resulting defense cuts, and the inability of the federal government to stimulate the economy due to the rise of the deficit and the national debt, have added to growth problems.

Another possible factor contributing to economic stagnation is recent changes in the distribution of income, or income inequality. According to the most recent Census Bureau report, from 1967 to 1974 both the number of Americans living in poverty and the rate of poverty declined. However, from 1974 to 1992 both of these measures rose. In 1992 the number of poor people rose for the third year in a row, to 36.9 million, or 14.5 percent of the population.[1] Poverty rates persisted slightly above 20 percent for people under 18, and slightly above 10 percent for those above 64. In 1992, the latest year for which data are available, the average income of the top five percent of American (those who make an average of $145,000 a year) rose by $3,500. In that year, "the rich got richer," but the poor and the middle classes stayed the same.

Economists use the Gini coefficient as a measure of income inequality.[2] Figure 1 shows the Gini index for 1967 to 1990. The index increased from 0.399 in 1967 to 0.402 in 1977, a change that was not considered statistically significant. Thereafter, the index increased to 0.414 in 1983, and by 1990 it was 0.428. Thus, income inequality has increased for the whole period, and more in the latest period.[3]

The link between income inequality on one hand and business cycles and economic activity on the other has been investigated by different economists. The purpose of this study are as follows: First, to introduce a new macro model of the economy with a predetermined (exogenous) income-distribution factor and an acceleration component combined with borrowing and debt functions to explain the behavior of business cycles and economic growth. The model does not incorporate other demand-side factors, and behavior of costs and supply-side forces over the cycle. In addition, the model excludes international shocks, the monetary sector, prices, interest rates, and their changes. While it is possible to include these shocks and variables, their exclusion simplifies the model and focuses on income distribution, its effect on the economy, and its paths over time. Changes in these variables can cause the adjustment and reduction of the magnitude of the cycles. They can also be the cause of the cycles.

The second purpose of the study is to simulate the model and explain the impact of income distribution on dynamics and growth of the economy. The findings of the simulation of the model suggest that a distribution of income which is more favorable to lower-income groups, who have a higher propensity to consume, can result in higher economic growth.

Before the introduction of the model, the literature on business cycles is discussed. While a complete description and evaluation of all the theories is beyond the scope of this article, a general brief and some of the most relevant theories are outlined. Specifically, theories relating income distribution and debt to cycles are summarized.

REVIEW OF LITERATURE

Economic fluctuations, or business cycles, can be defined as periodic swings in aggregate economic activity which do not explode or expire. Opinions about the nature and causes of business cycles are quite broad and diverse, and sometimes controversial. However, their formulation and models are abstract, in large part speculative, and cannot be empirically tested. Thus, there is a gap between theories on one hand and empirical and applied work on the other. This may have prevented or slowed progress toward a unified theory.[4]

Business cycle theories deal with the interaction and interdependence of: (a) endogenous variables, which are the inherent forces of the economy and its internal propagation in a dynamic set which can bring about swings in economic activities, and/or (b) exogenous force(s), which are outside erratic disturbances, or systematic shocks and impulses.

Theories of business cycles can be classified into three categories: (1) demand side, which focuses on changes in spending as the cause of the cycle, (2) supply side, which focus on costs factors, and (3) demand-supply side, which incorporates both elements of spending and of costs. The first two have their limitations because each only deals with one side of the economy. In more complex models which incorporate both demand and supply side factors, often the end result is not very clear.

On the demand side, the lack of consumer demand, variations of investment, and other components of aggregate demand, have been cited by many economists as causes of business cycles. Those theories which focus on lack of consumer demand are called consumption or underconsumption theories. Such theories go back to Adam Smith and were emphasized by Malthus, Marx (1967), John Maynard Keynes (1936), Paul Sweezy (1942), Alvin Hansen (1951), and later scholars. One version of underconsumption theory argues that, over the upturn of the cycle, consumption lags behind the absorptive capacity of investment. Insufficient consumption, in turn, is caused by wage income lagging behind other income, especially profit income. Underconsumption, it is argued, causes incomes to fall as the downturn phase begins.

Over the contraction phase of the cycle, underconsumption theory argues, profit income falls faster than wage income. Subsequently, saving declines more rapidly than consumption and income, and investment declines due to excess productive capacity. This continues until excess capital is eliminated by depreciation, and general capital is required to meet current consumption. New investment increases income and consumption as income is transferred from the low-consumption group of profit recipients to the high-consumption group of laborers. This is the beginning of the upturn.

Howard Sherman (1976) showed that the data on the saving-income ratio of all postwar cycles, including the Great Depression, follow the same pattern; wages rise and fall proportionately less than aggregate income, while profits fluctuate more than the total income. John Clark pointed out, "in a time of great activity, wages and salaries constitute a smaller fraction of increased national income than in a time of depression." (1951, p. 155).

Aggregate data show that real income, real wages and profits, and real consumption all rise in the expansion and all decline in the contraction. However, the ratio of profits to wages rises over the first three of four stages of the expansion and declines over the fourth stage of the expansion. This decline is regarded as the leading factor that contributes to the downswing. In the contraction, that ratio continues to decline over the first three of four stages of the downswing, and turns upward over the last stage.[5]

Keynes' absolute income hypothesis, which was in line with underconsumption theory, was challenged by the failure of its early postwar forecasts. It was replaced by the permanent income hypothesis, and life cycle hypothesis. Simon Kuznets' (1946) extensive work contributed to the rejection of the orthodox Keynesian absolute income hypothesis. The rejection of the absolute-income hypothesis only proved that, over the long run the ratio of saving to income remains stable. But actual data shows that over the cycles this ratio has been counter cyclical, i.e., the saving-income ratio declines during the expansions and increases during the contraction phases of the cycles.

Different economists studying this pattern of the saving-income ratio over the cycle have different explanations. Furthermore, the setback of the Keynes absolute-income hypothesis was taken as the negation of the factual behavior and pattern of the saving-income ratio over the cycles. However, for most part, the explanation of this pattern has been overlooked.

Recent studies by Campbell (1982), and Campbell and Mankiw (1989) for time-series data

claim that saving rates tend to rise when recessions are approaching and to fall before booms. These authors concluded that higher saving rates can help forecast future recessions and lower saving rates should help forecast future booms. However, an alternative interpretation is that high saving rates cause recessions, and low saving rates cause booms, which is consistent with the underconsumption theory of cycles.

In sum, the underconsumption theory of stagnation and cycles argues that the wage share of income falls during the expansion, causing a slow-down in consumption by wage earners, who have a relatively high propensity to consume. This itself, combined with lower investment and the fall of profits at the end of the expansion, results in the downturn. The opposite happens during the contraction. The major weakness of underconsumption theory is that it leaves out the cyclical behavior of costs of production, money and prices.

Other underconsumption theories based on the impact of inequality of income between the rich and the working poor on the economy has been investigated and explained as due to at least four initial causes. All of the theories in this category argue that during the expansions the income share of labor declines, and the share of non-labor rises, causing consumption to decline. One theory, called the "wage lag hypothesis," (Sweezy, 1944, 1966, Baran and Sweezy, 1966 and Foster, 1987), suggests that wages lag behind in the early phase, and catch up during the last phase of the expansion. The second theory in this category, as hypothesized by Steindl (1952) and by Weisskopf (1979), is the "overhead labor theory," which places emphasis on a lower labor share due to lower overhead costs during the early stages of the expansion, and a higher labor share due to higher overhead costs in the later phase of the expansion. The third in this group of income distribution theories, which is hypothesized by Marx (1967), Buddy and Crotty (1975), and Gordon, Weisskopf and Bowles (1987), is the concept of "reserve army," which focuses on changes in the bargaining positions and militancy of labor during the cycle. Finally, the "utilization-unemployment" hypothesis argues that, in addition to the changes in output and capacity utilization, labor share is influenced by unemployment.

Some economists have investigated only supply-side factors, such as costs of production, the production process, excess consumption, and over investment, rather than the problem of effective demand as the cause of the cycles. On the conservative side, tax increases and tax cuts as costs of production have been regarded as causes of changes in the business cycle. Monetarists emphasize the role of money, credit, interest rates, and financial structures. More recently, "real business cycle" theories of technological and supply-side shocks have been regarded as the cause of changes in the rate of growth of the economy and swings. A less conservative supply-side economist, Mitchel (1941) is concerned with concentration in the economy. On the radical side is Marx's (1967) theory of long-run stagnation, with his ideas about the "organic composition of capital", and the "reserve army of unemployed."

Other economists have combined demand-side and cost and supply-side factors into one integrated theory of cycles. Since the two broad forces of demand and supply both influence and squeeze profits, these theories are called "nutcracker" theories of the cycle. Such theories have been developed by Marx (1967), Keynes (1936), Mitchell (1941), Kalecki (1968), and later scholars. Kalecki's is a dynamic setting, which is more advanced and has an investment function depending on changes of profit and changes of capital. In his model he incorporates the labor share as a factor influencing consumer demand, and supply side costs, such as raw material prices and other costs. His approach is a short-run disequilibrium and not like the equilibrium approach of neoclassical economists.

The question of debt as a contributory factor which is interrelated and consistent with the underconsumption and income distribution theories of business cycles and financial crises was investigated in different forms by classical thinkers like Thorstein Veblen (1904), Marx (1967, 1977), Irving Fisher (1933), and by more contemporary ones such as Wesley Mitchell (1941) and Hyman Minsky (1964, 1977). Both Veblen and Marx linked the size and extension of debt to the decline of the rate of profit during the expansion phase of the business cycles. While Veblen argued that a decline in profit results in the "liquidation of debt," Marx said that "credit suddenly ceases" as the rate of profit declines, which brings financial crises and the downturn of the cycle. Marx also emphasized the disparity of the purchasing power between classes.

Mitchell, like Veblen and Marx, recognized the growth of short-term debt during the expansion and pointed out that the liquidation of credit put pressure on corporations to switch their goals from profit-making to survival. Using different aggregate time-series, Mitchell found general patterns of movement for

several aggregate variables. These patterns are still accurate and helpful for predicting changes in the economy.

The growth of debt over the expansion phase of the cycle could be the effect rather than the cause of the cycles. It is possible that the original cause is inequality of income rather than the debt itself. In this context, the role of debt for the most part may be to postpone the downturn, but not to eliminate it. The model of this study includes both distribution of income and debt.

THE MODEL

Consider an economy in which the monetary sector, price level, and interest rates are given, and the focus is on the real sector. The level of production in each period can be described by the following deterministic equation.[6]

$$Y_t = Y_{t-1}(1+g) + k(E_{t-1} - Y_{t-1}). \quad (1)$$

According to equation (1), the supply side of the domestic economy, Y_t, can potentially grow at a rate of g percent due to technological advancement and growth of resources and the labor force. The level of output, Y_t, is also subject to the shortfall of earlier period expenditure, E_{t-1}, from domestic income, Y_{t-1}, by a coefficient, k.

The level of aggregate output, Y_t, is divided into p groups each receiving α_p fraction of income as presented by equation (2).

$$Y_t = \alpha_1 Y_t + \alpha_2 Y_t + \ldots \alpha_p Y_t = Y_t \sum \alpha_p. \quad (2)$$

However, to simplify, the model assumes that the level of total output (income), Y_t, is distributed into two classes, savers and borrowers, by the fraction of α and $(1-\alpha)$ respectively, and presented by equations (3) and (4).

$$Y_{st} = \alpha Y_t, \quad (3)$$

$$Y_{Bt} = (1-\alpha) Y_t. \quad (4)$$

Here, Y_{st} and Y_{Bt} represent the output shares of saving (high income) and borrowing (low income) classes respectively.

It is further assumed that in each period savers lend borrowers the sum of D_t based on the past income of the latter, $Y_{B(t-1)}$, and a coefficient of δ as follows

$$D_t = \delta Y_{B(t-1)}, \quad (5)$$

and by substituting equation (4) in (5) we get

$$D_t = \delta Y_{B(t-1)} = \delta (1-\alpha) Y_{t-1}, \quad (6)$$

which presents the debt, D_t, in terms of national income.

At each period the stock of debt, TD_t, can be derived by the sum of the past debts as presented by equation (7).

$$TD_t = \sum D_t. \quad (7)$$

Substituting equation (6) in (7) we get

$$TD_t = \sum D_t = \delta \sum Y_{B(t-1)} = \delta (1-\alpha) \sum Y_{t-1}. \quad (8)$$

Debt service, DS_t, is arranged and paid in each period by the interest rate of r times the stock of debt in the earlier period, $TD_{(t-1)}$, as presented by equation (9).

$$DS_t = r\, TD_{(t-1)}. \quad (9)$$

The government sector has tax revenue of T_t, expenditure of G_t, with an annual balanced budget. There are two different average tax rates of R_S and R_B for savers and borrowers respectively. Thus,

$$T_t = G_t = R_S Y_{st} + R_B Y_{BT}, \quad (10)$$

and substituting equations (3) and (4) in (10) and factoring out Y_t we get

$$T_t = G_t = Y_t \{\alpha R_S + (1-\alpha) R_B\}. \quad (11)$$

The levels of consumption of these two groups of savers and borrowers, C_{st} and C_{Bt}, are equal to their propensity to consume of β_S and β_B, multiplied by their incomes after taxes and adjusted for current debt and debt service payments respectively, and are presented by equations (12) and (13).

$$C_{st} = \beta_S \{Y_{st}(1-R_S) - D_t + r\, TD_{(t-1)}\}, \quad (12)$$

$$C_{Bt} = \beta_B \{Y_{Bt}(1-R_S) - r\, TD_{(t-1)}\} + D_t. \quad (13)$$

Note that current debt is subtracted in equation (12) and is added to the borrowers' consumption in equation (13). On the other hand, debt service, a payment from the borrowers to the savers, is added to the savers and subtracted from the borrowers' income.[7]

Total consumption, C_t, as the sum of consumption by these two groups, and total saving as the difference between income, Y_t, and consumption Ct, and government spending G_t, or taxes, T_t can be shown as follows

$$C_t = C_{st} + C_{Bt}, \quad (14)$$

$$S_t = Y_t - C_t - G_t \quad (15)$$

The investment sector has a fixed component of I_0, and an accelerator component with the coefficient of m times the difference of past outputs, Y_{t-1} and Y_{t-2}, as shown in equation (16).

$$I_t = I_0 + m\,[Y_{t-1} - Y_{t-2}]. \quad (16)$$

The level of expenditure is total domestic spending $C_t + I_t + G_t$ plus net exports (current account balance), which can be positive (trade surplus) or negative (trade deficit), as presented by equation (17).

$$E_t = C_t + I_t + G_t + X_{nt.} \quad (17)$$

The foreign sector in the model, X_{nt}, is considered as a buffer to match the level of domestic income, Y_t, with the level of domestic expenditure, E_t. The difference between domestic absorption ($C_t + I_t + G_t$) and domestic income, Y_t, represents net exports, X_{nt}, which is shown in equation (17). If domestic expenditure, E_t, exceeds (shortens) domestic output, Y_t, the current account would have a deficit (surplus) and the capital account would have a surplus (deficit).

Finally, dynamic equilibrium of the model is represented by equality of total expenditure, E_t, in equation (17) with total output, Y_t, in equation (1) as follows

$$Y_t = E_t. \quad (18)$$

SOLUTION OF THE MODEL

The dynamics of the model is the solution of simultaneous difference equations of (1) and (3) to (18). The resulted solution of the output path, Y_t, is a non-homogeneous linear difference equation of the third order in the form of

$$A_0\,Y_{t+3} + A_1\,Y_{t+2} + A_2 Y_{t+1} + A_3\,Y_t = C, \quad (19)$$

with constant coefficients of A_0, A_1, A_2, A_3, and constant term C, where

$$A_0 = \beta_S\,\alpha\,(1\text{-}t_S) + \beta_B\,(1\text{-}\alpha)\,(1\text{-}t_B) + m\,\beta_S\,\alpha\,(1\text{-}t_S) + m\,\beta_B\,(1\text{-}\alpha)\,(1\text{-}t_B) + \alpha\,t_S + (1\text{-}\alpha)\,t_B.$$

$$A_1 = \beta_S\,r\,\delta\,(1\text{-}\alpha) - \beta_S\,\delta\,(1\text{-}\alpha) - m\,\beta_B\,r\,\delta\,(1\text{-}\alpha) + \delta\,(1\text{-}\alpha) + m\,\beta_S\,r\,\delta\,(1\text{-}\alpha) - m\,\beta_S\,r\,\delta\,(1\text{-}\alpha) - m\,\beta_S\,r\,\delta\,(1\text{-}\alpha) + m\,\delta\,(1\text{-}\alpha) + m\,\beta_S\,\alpha\,(1\text{-}t_S) - m\,\beta_B\,(1\text{-}\alpha)\,(1\text{-}t_B) - (1\text{+}g) - k\,\beta_S\,\alpha\,(1\text{-}t_S) - k\,\beta_B\,(1\text{-}\alpha)\,(1\text{-}t_B) - k\,m\,\beta_S\,\alpha\,(1\text{-}t_S) - k\,m\,\beta_B\,(1\text{-}\alpha)\,(1\text{-}t_B) - k\,\alpha\,t_S - k\,(1\text{-}\alpha)\,t_B + k.$$

$$A_2 = \beta_B\,r\,\delta\,(1\text{-}\alpha) - \beta_B\,r\,\delta\,(1\text{-}\alpha) + m\,\beta_S\,r\,\delta\,(1\text{-}\alpha) - m\,\beta_B\,r\,\delta\,(1\text{-}\alpha) - m\,\beta_S\,r\,\delta\,(1\text{-}\alpha) - m\,\beta_S\,r\,\delta\,(1\text{-}\alpha) - m\,\beta_B\,r\,\delta\,(1\text{-}\alpha) + m\,\delta\,(1\text{-}\alpha) - k\,\beta_S\,r\,\delta\,(1\text{-}\alpha) + k\,\beta_S\,\delta\,(1\text{-}\alpha) + k\,\beta_B\,r\,\delta\,(1\text{-}\alpha) - k\,\delta\,(\text{-}\alpha) - k\,m\,\beta_S\,r\,\delta\,(1\text{-}\alpha) + k\,m\,\beta_S\,\delta\,(1\text{-}\alpha) + k\,m\,\beta_B\,r\,\delta\,(1\text{-}\alpha) - k\,m\,\delta\,(1\text{-}\alpha) + k\,m\,\beta_S\,\alpha\,(1\text{-}t_S) + k\,m\,\beta_S\,r\,\delta\,(1\text{-}\alpha) - k\,m\,\beta_B\,(1\text{-}\alpha)\,(1\text{-}t_B).$$

$$A_3 = -\,k\,m\,\beta_S\,\delta\,(1\text{-}\alpha) + k\,m\,\delta\,(1\text{-}\alpha), \text{ and}$$

$$C = k\,I_0 + X_{n(t-1)} - I_0 - X_{nt.}$$

The stationary intertemporal equilibrium depends on the values of A_0, A_1, A_2, A_3, which subsequently depends on the values of parameters α, β_S, β_B, t_S, t_B, δ, r, m, k, and I_0.

The convergence or divergence of the model can be determined by the Schur theorem, which says that the time path converges if and only if every root of the characteristic equation is less than one. That is, the time path converges if and only if all of the following determinants Det 1, Det 2, and Det 3 are positive. That is, the dynamic path of the output, Y_t converges if and only if

$$\text{Det 1} = \begin{vmatrix} A_0 & A_3 \\ A_3 & A_0 \end{vmatrix} > 0,$$

$$\text{Det 2} = \begin{vmatrix} A_0 & 0 & A_3 & A_2 \\ A_1 & A_0 & 0 & A_3 \\ A_3 & 0 & A_0 & A_1 \\ A_2 & A_3 & 0 & A_0 \end{vmatrix} > 0,$$

$$\text{Det 3} = \begin{vmatrix} A_0 & 0 & 0 & A_3 & A_2 & A_1 \\ A_1 & A_0 & 0 & 0 & A_3 & A_2 \\ A_2 & A_1 & A_0 & 0 & 0 & A_3 \\ A_3 & 0 & 0 & A_0 & A_1 & A_2 \\ A_2 & A_3 & 0 & 0 & A_0 & A_1 \\ A_1 & A_2 & A_3 & 0 & 0 & A_0 \end{vmatrix} > 0,$$

otherwise the time path diverges.

SIMULATION AND THE RESULTS

The model can follow various dynamics for its endogenous variables, including the level of income Y_t, over time. It can follow an explosive (divergence) or non-explosive (convergence) path, with or without oscillations, all depending on the values of the parameters. A high value of k coefficient for the production adjust in equation (1) and/or acceleration coefficient, m, in equation (16) can result in an explosive path for output.

Because of the limitation of resources, price expectations, and other market adjustments, for most parts the values of k and m in equations (1) and (16), are maintained within the non-explosive range. Furthermore, these and other parameters are held constant. Given these parameters, different values for the coefficient of income distribution, α, for two values of β_S (0.85 and 0.75) are simulated to observe and compare the dynamic path of output.[8]

Figure 2 presents and compares the simulation of the model formation income, Y_t, with the income-distribution coefficient (α) of 0.1 to 0.9 and β_S =0.85. According to this graph, as the income distribution changes in favor of the higher propensity consumer class (a lower α) the level and the growth of income increases.[9]

Similarly, Figure 3 compares the simulated results of national income, for α of 0.1 to 0.9 with β_S = 0.75. Again, a lower α coefficient followed a higher level and higher growth of output. For both magnitudes of β_S (Figures 2 and 3) the lowest (highest) α resulted in the highest (lowest) growth of national income. One difference is that the overall level of income is lower for β_S = 0.75 than for β_S = 0.85. Another difference is the timing of the swing, which started early for β_S = 0.75 than for β_S = 0.85.[10] As can be seen in Figure 3, when the income distribution parameter α decreases from 0.9 to 0.4 the model moves towards a larger swings, yet not explosive. But, for α = 0.3, α = 0.2, and α = 0.1 it becomes explosive.

The model was simulated further with the actual Gini coefficients of 1970, 1980, and 1990 as proxy for the income distribution coefficient (α). The results are shown in Figures 4 and 5 for β_S = 0.85, and β_S = 0.75 respectively (β_S = .99 in both cases). These two graphs confirm the findings and conclusions of Figures 2 and 3, and suggest that a lower (higher) Gini coefficient causes higher (lower) economic growth, although the difference is not significant, because the size of the difference of the Gini coefficient is not significant.

In sum, the simulation of the model, with its parameter settings, suggests the followings: First, a fairly high propensity to consume for both groups of savers and borrower (like $\beta_S = \beta_B$ = .9), other parameters held constant, results in higher growth without any swing in the economy. Second, a distribution of income in favor of higher propensity consumers can result in higher (lower) economic growth.[11] This finding is consistent with the underconsumption theory of business cycles and growth. Third, a distribution of income which is in favor of higher propensity consumers results in larger (smaller) swings and instability in the economy. These findings are based only on the influence of income distribution, and exclude other supply and/or demand shocks, and changes in money, prices, and interest rates.[12]

The resulting determinants of Det 1, Det 2, and Det 3 for two sets of β_S and nine values of α of 0.1 to 0.9 are shown in Table 1. The values of determinants confirm the dynamic paths of Figures 2 and 3. In both cases of β_S = 0.85 and β_S = 0.75, a low α of 0.1 to 0.3 resulted in negative Det 2, and thus the divergence (explosion) of the output path. A high value of α of 0.4 to 0.9 resulted in all of Det 1, Det 2, and Det 3 being positive and therefore following the convergence path. The difference of the swings for these two magnitudes of β_S is a matter of timing. With a higher β_S the economic downturn occurred in a later period than with a lower β_S. This can be seen by comparing Figure 2 with Figure 3.

SUMMARY AND POLICY IMPLICATIONS

A review of the literature on business cycle theories suggests that there is not a consensus, nor is there a general theory explaining the causes or remedies of the problem of economic fluctuation. This article presents a different dynamic Keynesian model that includes income inequality and debt functions, assuming the monetary sector, prices and interest rates constant, and focusing on the real sectors of the economy.

The dynamic path of the model's simulation suggests that a distribution of income which favors higher propensity consumers can cause a higher rate of economic growth. These findings are consistent with underconsumption theories of business cycles. In addition, the simulation of the model suggests that a distribution of income which favors higher propensity consumers results in larger swings in the economy.

The policy implication of this study is that more income equality in favor of higher propensity consumers can result in higher growth. However, more income equality in favor of higher propensity consumers adds to the magnitude of swings in the model. These finds do not exclude the influence of other traditional supply and/or demand shocks as causes of growth and instability of output and employment. Furthermore, this study did not incorporate policy costs, if any, promoting a more equal distribution of income to achieve higher growth.

Figure 1

Income Inequality Measured by Gini Index

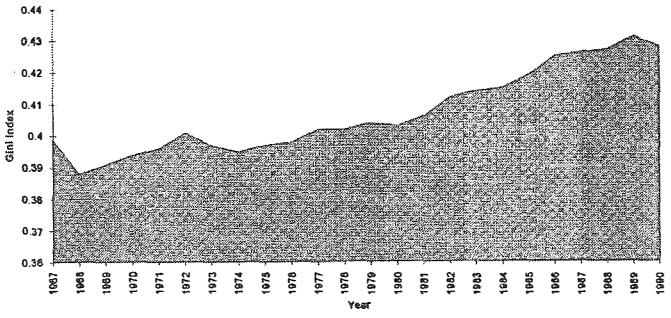

Figure 2

Simulation of the Model for Savers MPC=.85, Borrowers MPC=.99, and Income Share of 0.1 to 0.9

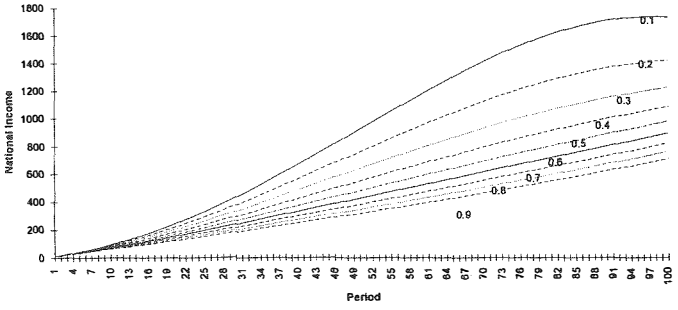

Figure 3

Simulation of the Model for Savers MPC=.75, Borrowers MPC=.99, and Income Share of 0.1 to 0.9

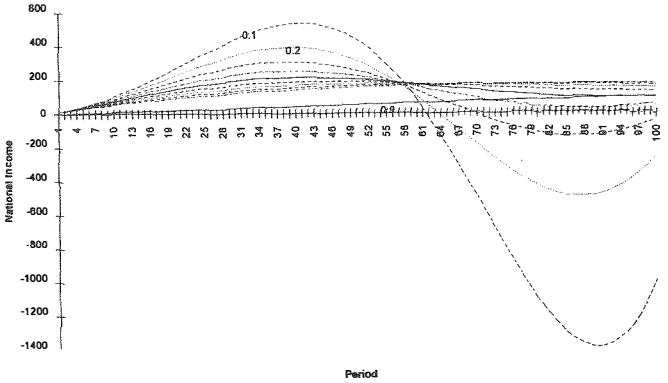

Figure 4

Simulation with Path of the Gini Coefficients, Borrowers MPC=.99, and Savers MPC=.85

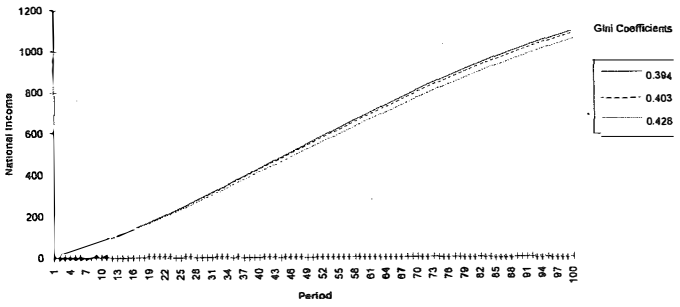

Figure 5

Simulation with Path of the Gini Coefficients, Borrowers MPC = 0.99, and Savers MPC = 0.75

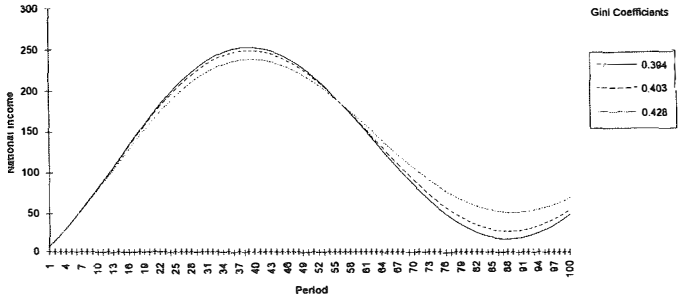

Table 1

Values of the Determinants
for Different α and Their Time Paths *

	α	Det 1	Det 2	Det 3	Diverge/ Converge
B_S = 0.85:					
	0.1	2.695	-7.32	1100	Diverge
	0.2	2.644	-4.27	1117	Diverge
	0.3	2.588	1.69	1028	Diverge
	0.4	2.525	0.43	935.1	Converge
	0.5	2.456	2.11	837.8	Converge
	0.6	2.380	3.34	737.3	Converge
	0.7	2.299	4.14	634.4	Converge
	0.8	2.211	4.51	529.9	Converge
	0.9	2.117	4.45	424.4	Converge
B_S = 0.75:					
	0.1	2.691	-5.29	1034	Diverge
	0.2	2.593	-2.97	956.5	Diverge
	0.3	2.491	1.03	874.3	Diverge
	0.4	2.386	0.56	788.5	Converge
	0.5	2.279	1.79	699.6	Converge
	0.6	2.167	2.66	608.7	Converge
	0.7	2.053	3.20	516.3	Converge
	0.8	1.935	3.39	423.4	Converge
	0.9	1.814	3.26	330.6	Converge

*Constant Parameters: $Y_0 = 10$ $t_S = 0.4$ $k = 0.4$ $g = 4\%$ $B_B = 0.99$
$I_0 = 10$ $t_B = 0.2$ $m = 0.1$ $r = 10\%$ $\delta = 0.9$

NOTES

[1] The poverty threshold for one person in 1992 was $7,143, and for a family of four was $14,335.

[2] The Gini coefficient is a ratio of the area between the 45-degree line and the Lorenz curve to the area between the 45-degree line and the axes. That is, it is the ratio of the deviation of actual distribution from equal distribution of income to equal distribution of income.

[3] The results of regressing Gini coefficient (GC) on time (T) for 1967 to 1990 (24 observations) are as follows:

$$GC = -3.0217 + 0.00173\,T$$

$$(11.61)\ (3\ 13.2)$$

Adjusted R-Squared =0.88.

Where 't' statistic are in parentheses. Accordingly, from 1967 to 1990 income inequality has increased, and that increase is statistically significant, as the sign of time (T) is positive with significant 't' ratio.

[4] For a summary discussion on this gap, see Mankiw (1990).

[5] See Sherman (1976), p. 61.

[6] That does not exclude stochastic disturbances in the economy; for our purpose, and to simplify the model, the focus is only on deterministic variables.

[7] It is assumed that the borrowers pay their debt principals, but others in that class borrow to their limit, over time. Therefore, in the model the debt payments, equal to new and additional borrowings, are excluded.

[8] Some of the parameters of the model are close to actual. However, given β_B=.99, a higher β_S resulted in higher growth, with no explosive path. The higher income growth (lower) scenarios are those with higher (lower) propensity to consume for those with higher share of the output.

[9] This pattern should be due to higher propensity to consume of the borrowers than that of the savers. As Figure 2 suggests, from periods 1 to 100, total output and wealth creation are higher with a lower α, so that

$$\int Y(\alpha = 0.1)\,dt > \int Y(\alpha = 0.2)\,dt \ldots > \int Y(\alpha = 0.9)\,dt.$$

[10] The earlier timing of the swing for $\beta_S = 0.75$ should be due to a lower propensity to consume by the savers, which causes spending lags behind income and deadened adjustment.

[11] This finding is consistent with underconsumption or Keynesian theories in the short-run, but not necessarily in the longer run. In the long-run with the economy close to full capacity that conclusion may be reversed. That is, in the long-run and only in the long-run with full-employment economy, a distribution of income in favor of lower propensity consumers, and up to some optimal point, results in a higher economic growth.

[12] The implication of money and monetary policy could be an expansion (contraction) of credit and spending which can push (lower) the growth of the economy to a higher (lower) gear during the upturn and reduces (increases the contraction during the downturn. That is monetary sector and monetary policy can result in stability as well as instability, depending on the timing and the direction of policy. Furthermore, the role of money, prices, interest rates, and their changes in the adjustment and stabilization (of swings) are important which are not considered in the model.

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