THE GLOBAL VELOCITY CURVE 1952-1982

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ABSTRACT

This paper provides evidence and an explanation for an empirical regularity in the income velocity of money. Based on a cross country comparison in the post World War II period of 84 countries arrayed from very low to very high per capita income, velocity displays a U shaped pattern. This observed cross country pattern is very similar to one observed in an earlier study by the authors for a number of advanced countries for over a century.

The U-shaped pattern of velocity behavior is explained by an approach which stresses the influence of institutional factors. On a secular basis the downward trend in velocity is due to a process of monetization while the upward trend is explained by financial development. On a cross country basis industrialized countries with well developed financial systems should generally display a rising trend in velocity while poor countries at an earlier stage of economics growth should as a rule have falling trends. Velocity in economies "in between" should exhibit a fairly flat pattern with a weak positive or negative trend.

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I. Introduction

In this paper we provide evidence and an explanation for an empirical regularity in the income velocity of money. Based on a cross country comparison in the post World II period of 84 countries arrayed from very low to very high per capita income, velocity displays a U shaped pattern. This observed cross country pattern is very similar to one observed in an earlier study by the authors for a number of advanced countries based on a century of data.

The income velocity of money for a number of advanced countries displays a U shaped pattern over the past century,[1] declining from the late nineteenth century to between the first and second quarters of the twentieth century when it begins a secular rise. This pattern can be clearly seen in Figure 1 which shows the behavior of velocity for two advanced countries--the U.S. and Sweden.

The central determinants of the decline in velocity stressed in the literature are permanent income (Friedman and Schwartz (1963)[2] interest rates (including the own rate of return on money), (Latane 1954, Klein 1973), monetization and the spread of commercial banking (Tobin 1965) and improved quality of money (Klein 1977). The key determinants of its rise include: technological improvements in the payments process (Fisher, 1911, Garvey, 1959 and Garvey and Blyn 1970, Clower 1969, Townsend 1983) and the development of money substitutes (Gurley and Shaw 1961). No single theory can explain both the secular decline and rise of velocity.

In our previous work, Jonung (1978), Bordo and Jonung (1981) Jonung (1983), Bordo and Jonung (1987) building on the work of Knut Wicksell (1934, 1936), we explain the secular behavior of velocity by stressing the influence of institutional factors. According to our approach, the downward trend in velocity is due to a process of monetization. This process encompasses two interrelated forces, (a) the spread of the money economy, and (b) the spread of commercial banking. The upward trend is explained by financial sophistication and improved economic security and stability. By financial sophistication is meant both the emergence of money substitutes and the development of methods of economizing on cash balances. The rubric of improved economic security and stability encompasses many aspects of the modern welfare state as well as stabilization policies.

According to our approach, velocity is influenced by both sets of institutional variables at the same time, but the monetization effect will first dominate causing velocity to fall. Later the influence of financial development and improved stability will be stronger than the monetization process causing velocity to rise. The relative strength of these two sets of forces will determine the dating of the turning point of velocity. Finally, these institutional factors should be regarded as additional explanatory variables to the standard determinants of velocity--real income or a measure of wealth and interest rates. We thus view our approach as complementary to the traditional approach stressing developments usually ignored in money demand studies.

In our previous work, Bordo and Jonung (1981) and Bordo and Jonung (1987) Ch. 4, we tested our approach to the long-run behavior of velocity using

annual data for approximately one hundred years for five countries: the United States, Canada, the United Kingdom, Sweden and Norway. For each country we develop empirical counterparts for the institutional variables discussed above. We then add these variables to a standard regression of velocity on interest rates and permanent income.

Our results show that inclusion of the institutional variables significantly improve a benchmark regression of velocity on permanent income, interest rates and cycle variable for every country. In addition, in the majority of cases the institutional variables are of the correct sign and significant with the sole exception of our measure of economic security and stability. Finally, we found that introduction of institutional variables lowers the permanent income elasticity of the demand for money for each of the five countries. We conclude that the use of permanent income in earlier studies masks the influence of the institutional factors that have not been explicitly dealt with in earlier studies.

In this paper we provide additional evidence for our approach by investigating the global behavior of velocity in the post-World War II period since statistics are available for this period or parts of it for practically all countries in the world with the exception of the East European economies.

Our explanation suggests that the income velocity of money should behave differently across countries depending on the stage of financial development. Industrialized countries with well-developed financial systems should generally display a rising trend in velocity while poor countries at an earlier stage of economic growth should as a rule have falling trends. Velocity in economies

"in between" should exhibit a fairly flat pattern with a weak positive or negative trend. Consequently testing this view, we should find a global U-shaped velocity curve where the falling section represents financially less developed economies, the turnaround section middle-income economies and the rising section rich, highly industralized countries.

Section 2 discusses the data used. Section 3 discusses the patterns expected. Section 4 constructs the U shaped global velocity curve. Section 5 presents an alternative piece of evidence for the global velocity curve based on a pooled cross section time series regression. Section 6 makes comparisons of our study with other studies. Finally Section 7 is a brief conclusion.

2. The Data

To construct a global velocity curve we use data for more than 80 countries from the early 1950's to the early 1980's. We are well aware that such data may in many cases be of dubious quality, however, no reason exists for a systematic bias in the data.

The International Financial Statistics is used to calculate two measures of velocity, one for a narrow measure of money (V1) and one for a broad measure (quasi-money)(V2). In order to limit the number of countries studied, all countries with a population of less than 2.5 million inhabitants in 1975 have been excluded. Likewise, countries for which less than nine consecutive observations of velocity exist are not included in the sample. Following these guidelines, the behavior of velocity, both V1 and V2, in a total of 84 countries is examined.

3. Patterns Expected

The institutional approach suggests that this cross-section data base should give rise to a U-shaped pattern when countries are ordered by stages of economic and financial development. An early stage would represent the monetization process and the rise of the monetary economy at the expense of barter. A later stage would stand for financial sophistication when money substitutes are developed and economic stability is improved.

It is difficult to construct a few simple measures of these developments for all countries studied. For this reason we have chosen real per capita income as a proxy measure of the stage of financial development.

We adopt the grouping of the world economies suggested by the World Bank in the World Development Report 1983. The following four major groups of countries are isolated in this report: (1) industrial market economies with an average GNP per capita of $11,120 in 1981. (2) upper middle-income economies with an average GNP per capita of $2,490 in 1981, (3) lower middle-income economies with an average GNP per capita of $850, and (4) low-income economies. The individual countries included in these four groups are displayed in Table 1. As seen from the table the four groups are of roughly equal size. There are 19 industrialized countries, 19 upper middle-income economies, 27 lower middle-income and 19 low-income countries, altogether 84 countries.

The World Bank grouping also includes two other groups: East European nonmarket economies (eight countries) and high-income oil exporters (four countries). These are excluded as separate entities as no velocity series are available from the East European countries (except for Rumania for a

very short period). Of the oil exporting countries only Libya and Saudi
Arabia fulfill the restrictions placed on the selection of countries. These
two economies are placed among upper middle-income countries.

We would expect to find for the countries in Table 1 a picture similar
to that shown in Chart 2. This chart gives a schematic picture of the behavior
of velocity for the narrow and the broad definition of the money stock suggested
by our approach and our previous research using longitudinal data. Both
V1 and V2 displays a U-shaped pattern, but the V1 curve has an earlier turning
point than the V2 curve. This reflects substitution of interest-bearing
time deposits for demand deposits with financial development. We thus have
three phases in the stylized chart; the first phase when both V1 and V2 decline,
the second phase when V1 rises while V2 continues to fall and finally, the
third phase, when both velocity curves rise.

4. The Global Velocity Curve

The secular picture is examined using simple regression estimates of
the following form:

(1) $V = a + bt$, where t stands for time.

Velocity is thus regressed on time as the independent variable. We
expect b (the time trend of velocity) to be negative for low-income countries
and positive for high-income countries and to be close to zero and/or at
least of smaller absolute magnitude for middle-income than for the richest
and poorest economies. We also expect the b coefficient to be different
for V1 and V2 as shown in Chart 2.

Table 2 shows regressions for the four country groupings mentioned above as well as several other groupings to be discussed below.[3]   The aggregate velocity curve is calculated as the average of individual country velocity curves.[4] The coefficient b for V1 is positive for the rich and the upper middle-income economies and negative for the poor economies and the lower middle-income countries - a result consistent with our approach. The regressions for V2 reveal that the b coefficient is negative for all groups of countries. The coefficient becomes gradually smaller in absolute value as real income increases.

A comparison with the stylized curves in Chart 2, suggest that the V1 and V2 curves have passed through the first and second phase but not fully reached the third phase, when both curves display an upward trend.

The trends calculated in Table 2 for the four country groups are displayed in Charts 3-6 together with the actual behavior of velocity. These charts reveal that a linear trend follows actual velocity fairly closely. Experiments with non-linear trends did not offer any advantages. The velocity curve for the poor countries in Chart 6 does not start until 1957 as most poor countries did not achieve nation status until the 1960's.

A comparison with the stylized curves in Chart 1, suggests that the V1 and V2 curves have passed through the first and second phase but not fully reached the third phase, when both curves display an upward trend.

The four charts 3-6 are then combined, using a common scale for velocity, into one in Chart 7 to construct the global curve. Table 3 classifies all countries used to construct the global curve by phases of secular velocity

behavior. According to our hypothesis, as illustrated in chart 2, V1 and
V2 should each pass through three phases: the first phase when both V1 and
V2 are falling; the second phase when V1 is rising while V2 continues to
fall; and finally, the third phase, when both velocity curves are rising.
In Table 3, the 84 countries in our sample are grouped into three phases
based on the signs of the regression coefficient b of equation (1) calculated
in Appendix 1. In accordance with our hypothesis low income and lower middle
income countries dominate the first phase, middle income countries dominate
the second phase and rich countries dominate the third phase.

As can be clearly seen in Chart 7 the V1 curve has a U shaped pattern.
The velocity curve for the broader money stock measure, however, continues
to be downward sloping for all four groups of economies, albeit at a "slower"
rate. Chart 7 also shows that the level of the velocity curves for the rich
and the upper middle-income groups is lower than for the two other groups.

Two groups of countries did not fit into our classification scheme by
levels of per capita income: within the rich country group--Germany, Italy
and Japan; within the upper middle income country group--five high inflation
countries.[5]

First, within the group of rich economies underlying Chart 3, all except
Germany, Italy and Japan display falling trends in V1. The common trend
behavior for these three countries are estimated in equation 5 in Table 2.
This pattern is also shown by the common velocity curves calculated for these
three countries in Chart 8.

We do not have a simple explanation of this trend for Germany, Italy and Japan. One explanation (or part of it) would emphasize the financial effects of World War II on these countries being "losers". The War could have temporarily set the financial system "backwards" compared to the rest of the rich countries, e.g. the destruction of the national currencies and/or national debt in each of these countries, the decartelization of the banking system in Germany and Japan. Thus, we would expect velocity to start rising in the future following the standard pattern of the rich countries. Also, the commercial banking system in these three countries has played a more important role in financing industry and government than in many other countries. Thus, the supply of money substitutes in the form of bonds and stocks has been comparatively less in these countries. This would help to explain why velocity has not exhibited the rising trend of other advanced countries. However, the velocity curve (V1) in Germany is almost horizontal while V2 falls which may indicate that V1 will start rising in the near future in that country.

Separating Germany, Italy and Japan from the rest of the set of rich industrialized economies gives rise to a more pronounced upward trend in V1 and a flat V2 curve, thus moving this group of countries closer to the third phase of Chart 2. See also regression (5) in Table 2.

Second within the upper middle income group, five countries: Israel; Uruguay; Chile; Argentina and Brazil; had positive trends greatly in excess of the average value for the group as can be seen from regression (2) in Table 2.

The annual average growth rates of V1 are 5.3, 2.0, 5.7, 6.7, and 3.5 percent, respectively, compared to an average of 1.0 per cent for the whole group in Table 2.

The strong positive trend of V1 for these five countries is most likely due to their extremely high and rising rates of inflation. The rate of inflation should properly be regarded as an opportunity cost of holding money. As it rises, the public reduces its holding of money - in particular currency and non-interest bearing deposits - which dominate the narrow money stock definition underlying the V1 concept.[6]

To highlight the role of high and rising inflation rates, countries with average inflation rates above 20 per cent per year for the period are singled out into one group consisting of the five above-mentioned countries; Israel, Uruguay, Chile, Argentina and Brazil.[7] The average velocity curve as well as its time trend is calculated for them. See regression (7) in Table 2 and Chart 9. This chart shows that V1 has a sharp upward trend; V1 rises for the group from a level of 4 to a level of 13 from 1952 to 1982. V2, however, remains fairly flat. This result likely reflects interest payments on time deposits that partially compensate for high rates of inflation raising the demand for interest bearing time deposits relative to noninterest bearing demand deposits. Chart 10 displays the global velocity curve excluding the high inflation economies. This gives rise to a sharp difference in the behavior of V1 for the middle income economies seen in Chart 3. Excluding high inflation countries, the trend of V1 falls instead of rises. The trend of V2, however, is not greatly affected. Thus the turnaround point of the global V1 curve

is "pushed forward" to occur "between" upper middle-income and rich industrialized economies. Judging from Chart 9, the velocity curves of lower middle-income and upper middle-income countries are now quite similar.

5. Pooled Regression Results

An alternative piece of evidence for the U shaped global velocity curve is to run a pooled cross section time series regression. Since we do not have consistent measures of the institutional variables used in our earlier studies for all the countries examined here we adopt real per capita income as a very rough measure of financial development. We run the regression of the form shown in Equation (2). This equation is expressed as a quadratic function to capture the postulated U-shaped velocity curve. A log-linear form is adopted to avoid problems of heteroscedasticity.

$$(2) \quad \sum_{t=1}^{N} \sum_{i=1}^{I} \log v_{it} = \sum_{t=1}^{N} \sum_{i=1}^{I} b_{0it} + \sum_{t=1}^{N} \sum_{i=1}^{I} b_{1it} \log(Y/N)_{it}$$

$$+ \sum_{t=1}^{N} \sum_{i=1}^{I} b_{2it} (\log(Y/N)_{it})^2 + \sum_{t=1}^{N} \sum_{i=1}^{I} b_{3it} P_{it}$$

$$+ \sum_{i=1}^{I} D_i + \sum_{t=1}^{N} \sum_{i=1}^{I} u_{it}$$

$$t = 1, \ldots N, \ i = 1 \ldots I$$

where log stands for the natural logarithm, v_{it} is velocity for country i in year t, $(Y/N)_{it}$ is per capita real income for country i in year t measured in U. S. dollars, P_{it} is the rate of inaltion for country i in year t defined

as the first difference of the log of the price level. D_i is a one-zero dummy for country i. According to our hypothesis, for both V1 and V2, b_1 should be negative, b_2 and b_3 positive. Furthermore, our hypothesis postulates that b_1 should be larger in absolute value for V2 than for V1.

Regressions of equations (2) over the period 1952-82 for 74 countries for which a complete data set exists are presented in Table 4.[8] Results for both V1 and V2 are included. Results are shown using OLS and to account for the presence of severe autocorrelation, adjusted with the Cochrane Orcutt procedure.

The results for both V1 and V2 using OLS conform to the predictions of our hypothesis. All three independent variables have the postulated signs and are statistically significant. When the data are corrected for the severe autocorrelation observed using OLS, our hypothesis is also well confirmed for both V1 and V2. Finally, the larger (in absolute value) coefficient of per capita income in the V2 than in the V1 regressions (using OLS) conforms with our hypothetical description of the two curves in Chart 2 that V2 should decline more than V1 through much of the range.

The presence of severe autocorrelation in the OLS regression may reflect the omission of important explanatory variables. This would not be surprising since we use per capita income as a measure of all the different aspects of financial development. The Cochrane-Orcutt adjustment does not account for such an omission. Consequently, we regard the evidence from the charts as more informative than the regressions for the presence of a global velocity curve.[9, 10]

6. Comparisons with Other Studies

Several other cross-country studies of velocity behavior have used IFS-data, see e.g. Ezekiel and Adekunle (1964) Melitz and Corea (1970), Driscoll and Lahiri (1982) and Townsend (1983). However, to our knowledge no study uses such a long time period or as a complete a sample as we do here. Adekunle and Ezekiel examined 37 countries for the period 1950-64, Melitiz and Corea examined 17 countries for the period 1952-1967 and Driscoll and Lahiri (1982) studied 12 countries for the period 1952-1967.

The results of each of these studies are consistent with our approach in a number of respects. Adenkunle and Ezekiel found for their sample of countries that both V1 and V2 generally declined with the level of per capita income, however, they detected some evidence for rising V at very high levels of economic development.

Melitz and Corea demonstrated that the pattern of velocity across countries is closely related to the level of per capita income, following a U shaped pattern. Driscoll and Lahiri showed that the relative size of the agricultural sector is positively related to velocity across countries, consistent with the results in Bordo and Jonung (1981). Finally, Townsend (1983), using Raymond Goldsmith's data (1982) showed that the pattern of velocity across countries is positively related to the ratio of private credit to GNP, where GNP is a proxy measure of financial development; a result also consistent with our approach.[11]

7. Conclusion

Our approach suggests that velocity should be falling at the early stages of economic development and rising at later stages. Using a world-wide sample

of 84 countries for the period 1952-1982, we find strong support for our explanation. We believe that we are able to detect a global U-shaped velocity curve similar to the long run velocity curves found in our earlier work. Thus we regard the empirical evidence presented here - based on a data set and on test procedures complementary to our long-run time series evidence -- as additional evidence in favor of our institutional explanation.

Footnotes

*Professor of Economics, University of South Carolina and Research Associate, National Bureau of Economic Research, Docent in Economics, Lund University. For helpful comments and suggestions we would like to thank participants of the workshops at the University of Arizona, UCLA, University of South Carolina and Lund University. Able research assistance was provided by Ingemar Dahlstrand and Alvaro Aguiar.

[1]Bordo and Jonung (1987) shows such a pattern for the United States, Canada, United Kingdom, Sweden, Norway, Denmark, Finland, Holland, France and Australia. Also see Capie and Wood (1986), Saint Marc (1984) and the literature surveyed in Bordo (1986).

[2]Friedman and Schwartz's explanation for the observed decline in velocity (V2) in the U. S. from 1867 to just after World War II, based on Friedman's (1959) estimate of the permanent income elasticity of the demand for real cash balances of 1.8, was that money can be regarded as a luxury good. Subsequently, Friedman and Schwartz (1982) also regard the secular fall in velocity as due to growing financial sophistication.

[3]Appendix 1 shows calculations of velocity trends for each of the 84 countries and Appendix 2 shows the individual velocity curves.

[4]For the calculation procedure see the Notes to Table 2.

[5]Within the upper middle income group, excluding high inflation countries, V1 rises only in Saudi Arabia, South Africa, Portugal, Malaysia and Iraq. V2 falls or is flat for all countries.

In the lower middle income group, Vl has an upward trend in three out of 27 economies (Dominican Republic, Philippines and Thailand), a flat trend in 9 cases and a downward trend in the remaining countries. V2 is flat or falling in all cases.

Finally in the low income Group, Vl as well as V2 falls fairly sharply in a large number of countries, in particular in African states such as Togo, Sudan, Tanzania, Upper Volta and Ethiopia. Only two countries actually display an upward trend in Vl, namely Sri Lanka and India. All other countries have a downward or flat trend in both Vl and V2.

[6]Laidler (1985) summarizes evidence for money demand studies for high inflation countries. These studies show a strong influence from inflation (expected inflation) upon the demand for money and thus on velocity in a manner shown by Chart 9 and Table 2.

[7]An inspection of the velocity curves of individual countries in Appendix 2 reveals that periods of high and rising inflation rates tend to be associated with rising velocity (Vl).

[8]The countries omitted from the original sample of 84 due to lack of data are: Algeria, Argentina, Ivory Coast, Nicaragua, Senegal, Togo, Sudan, Madagascar, Upper Volta and Burundi.

[9]The inclusion of separate dummy variables for each year to capture time specific shifts in addition to the country dummies in the global velocity curve produced results almost identical to these of Table 4 as did those in regressions including a time trend as a separate independent variable.

[10]Converting per capita income for each country into U. S. dollars using official exchange rates from the IFS data, as we did, may induce considerable bias. Such a conversion assumes that the basket of goods consumed in each country is identical to that of the U. S. Less developed countries tend to consume a basket of goods more heavily weighted towards nontraded services than do advanced countries. Thus converting per capita income of the less developed country into the currency units of a more advanced country will bias its measured income downwards. See Belassa (1964). The use of purchasing power adjusted exchange rates as in Kravis, Heston and Summers (1978), may help solve this problem. Considering the crude character of our proxy variable for financial development in equation (2), i.e., real per capita income, we did not attempt this procedure.

[11]Other studies examining velocity across countries include Doblin (1951), Fleetwood-Jucker (1958), Kaufman and Latta (1966) and Perlman (1970).

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Chart 1.   The Income Veloctiy of Money for the
United States and Sweden
1870-1972

——— USA

- - - - SWE
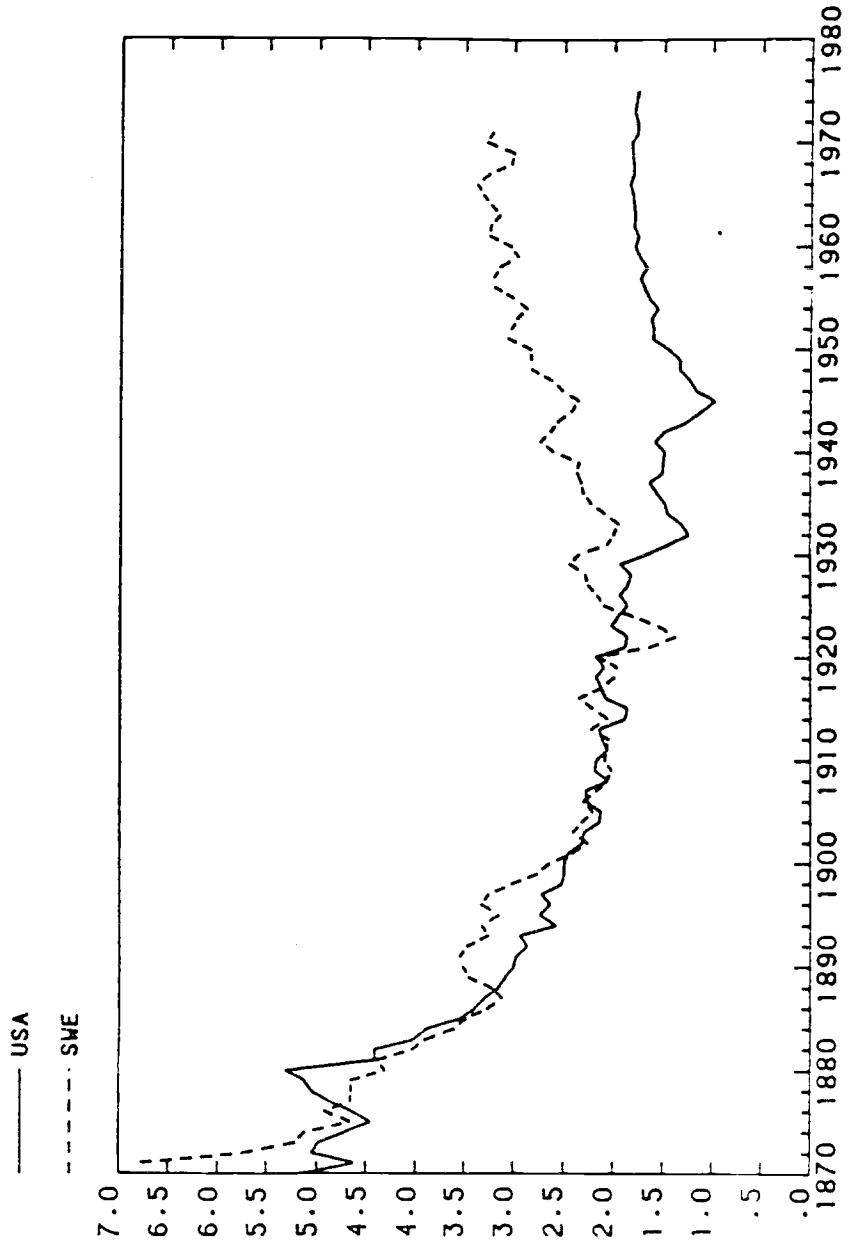
Chart 2

Stylized Long-Run Patterns of V1 and V2.

Level of Velocity (y-axis), Stages of Economic Developemnt (x-axis). Curves labeled V1 and V2 across Phase I, Phase II, and Phase III.
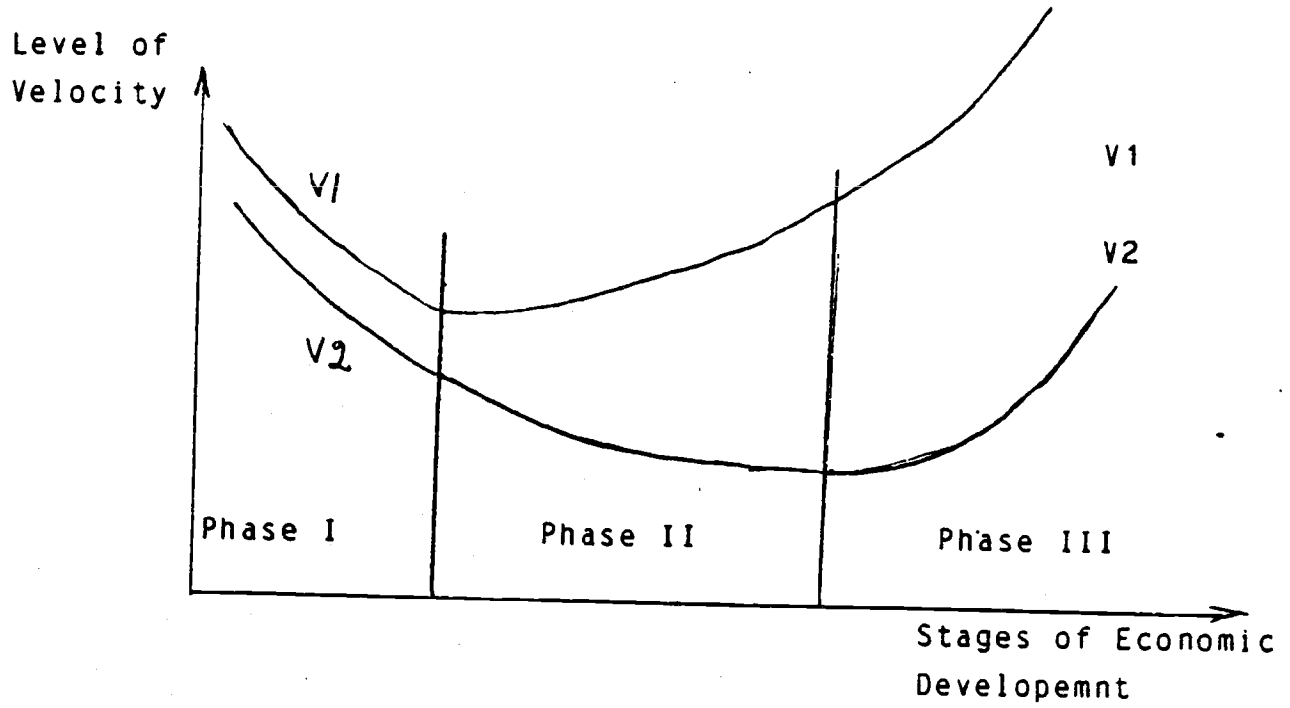
Chart 3

The Income Velocity of Money of Industrial Market Economies.
V1 upper solid line and V2 lower solid line, trend values dashed
line.
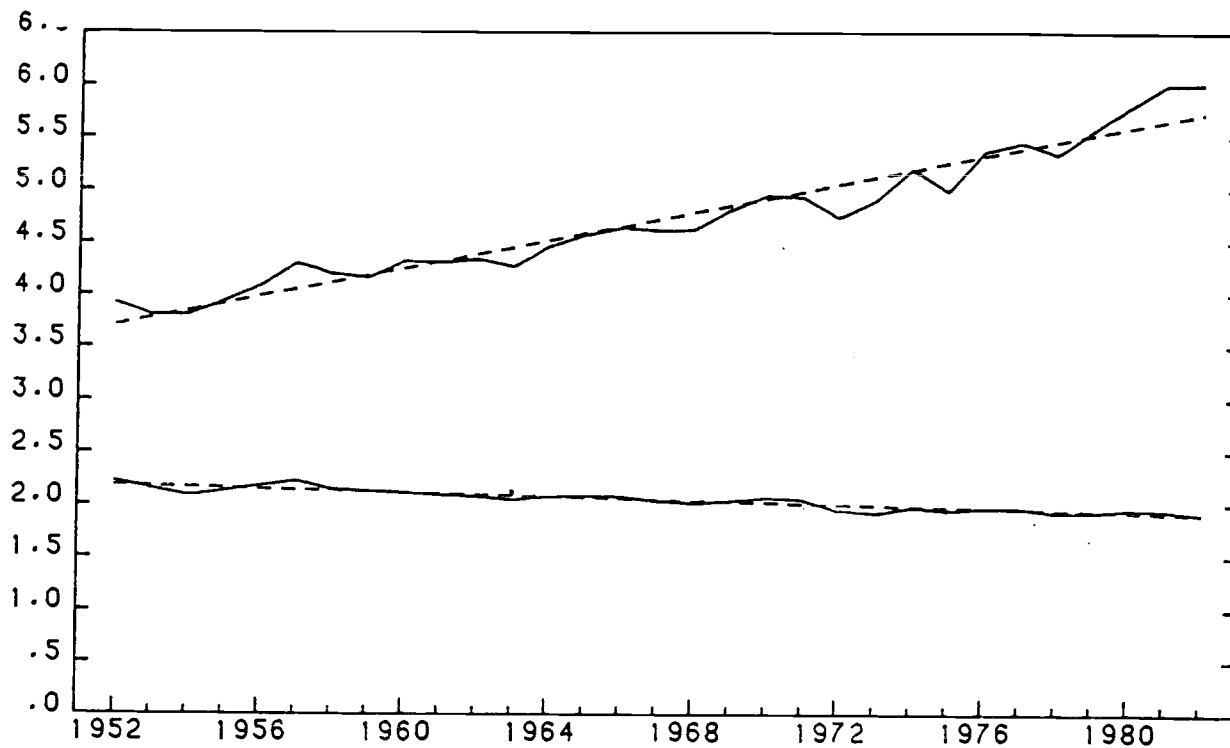
Chart 4

The Income Velocity of Money of Upper Middle-Income Economies.
V1 upper solid line and V2 lower solid line, trend values dashed
line.
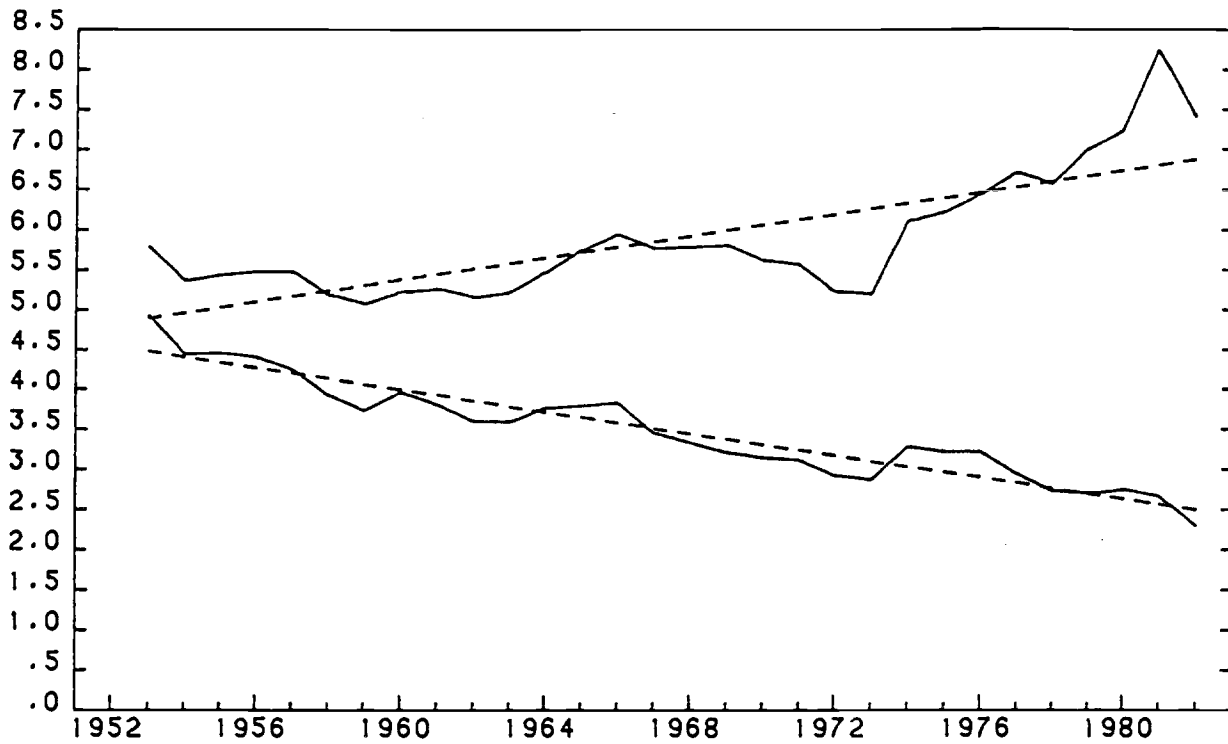
Notes: See Table   1 for the countries covered.
          See Table   2 for the trend of velocity.

Chart 5

The Income Velocity of Money of Lower Middle-Income Economies.
V1 upper solid line and V2 lower solid line, trend values dashed
line.
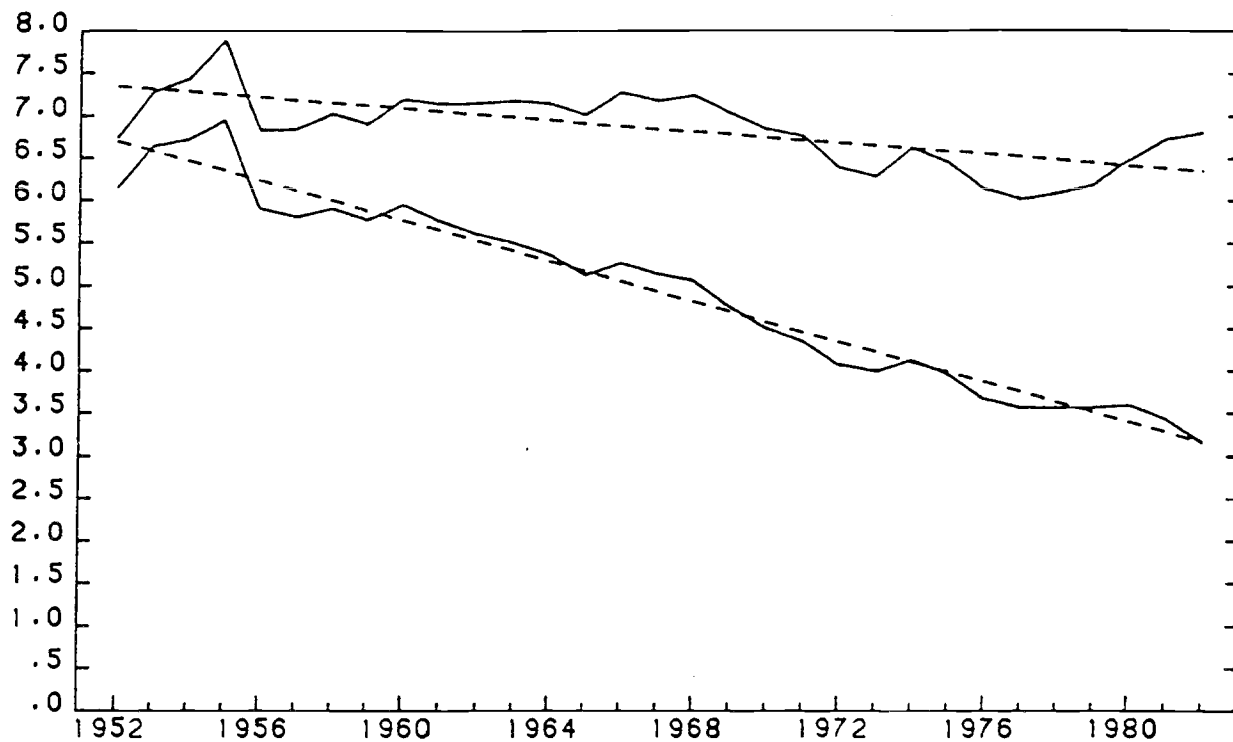
Chart 6

The Income Velocity of Money of Low-Income Economies.
V1 upper solid line and V2 lower solid line, trend values dashed
line.
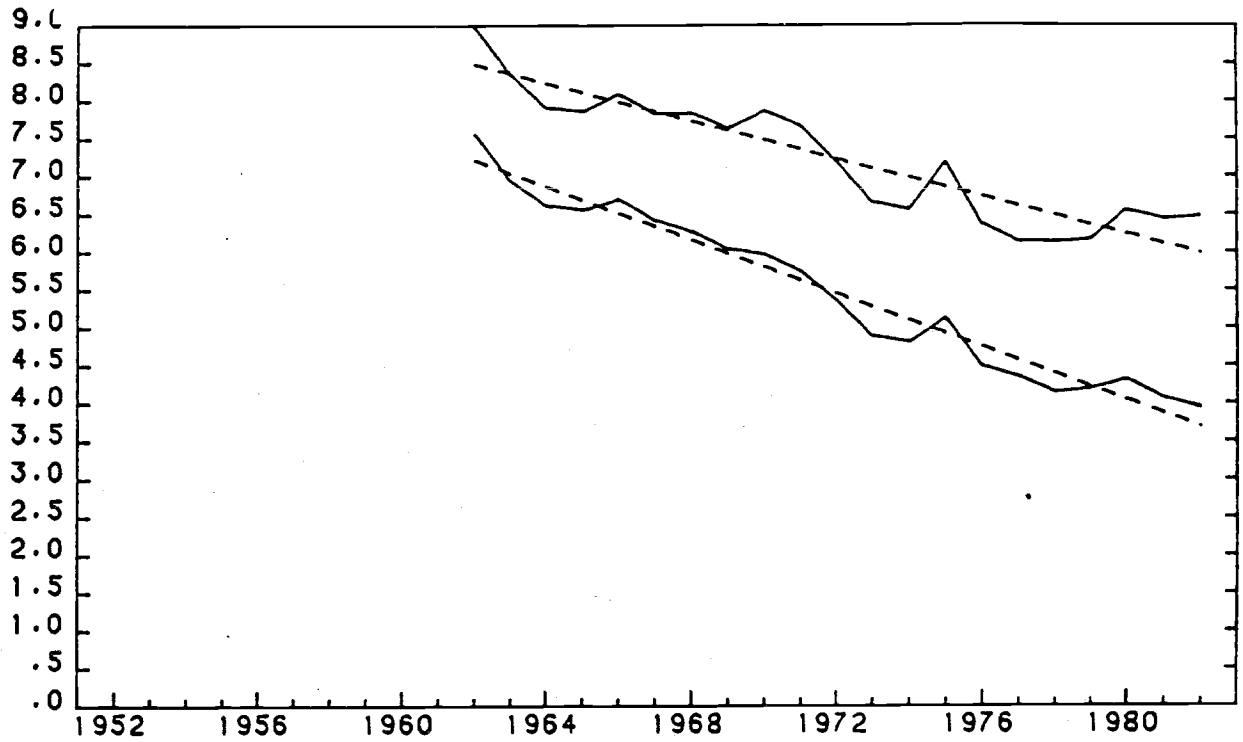
Notes: See Table   1 for the countries covered.
         See Table   2 for the trend of velocity.

Chart 7

The Global Velocity Curve (86 countries).
V1 upper solid line and V2 lower solid line, trend values dashed line.

| Low income economies | Lower middle income economies | Upper middle income economies | Industrial market economies |
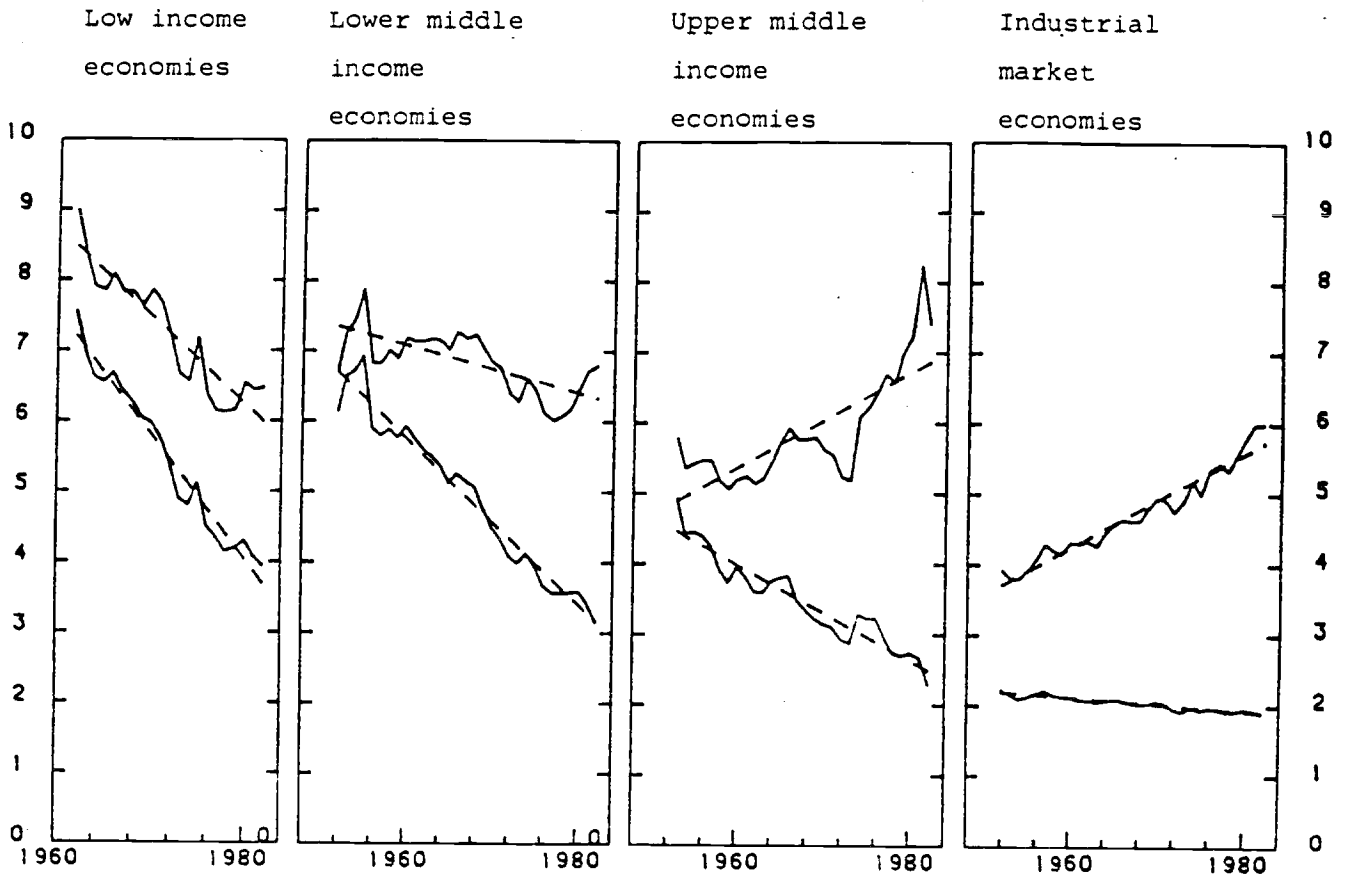
Notes: See Table 1 for the countries covered.
        See Table 2 for the trend of velocity.

Chart 8

The Income Velocity of Money of Germany, Italy and Japan.
V1 upper solid line and V2 lower solid line, trend values dashed
line.
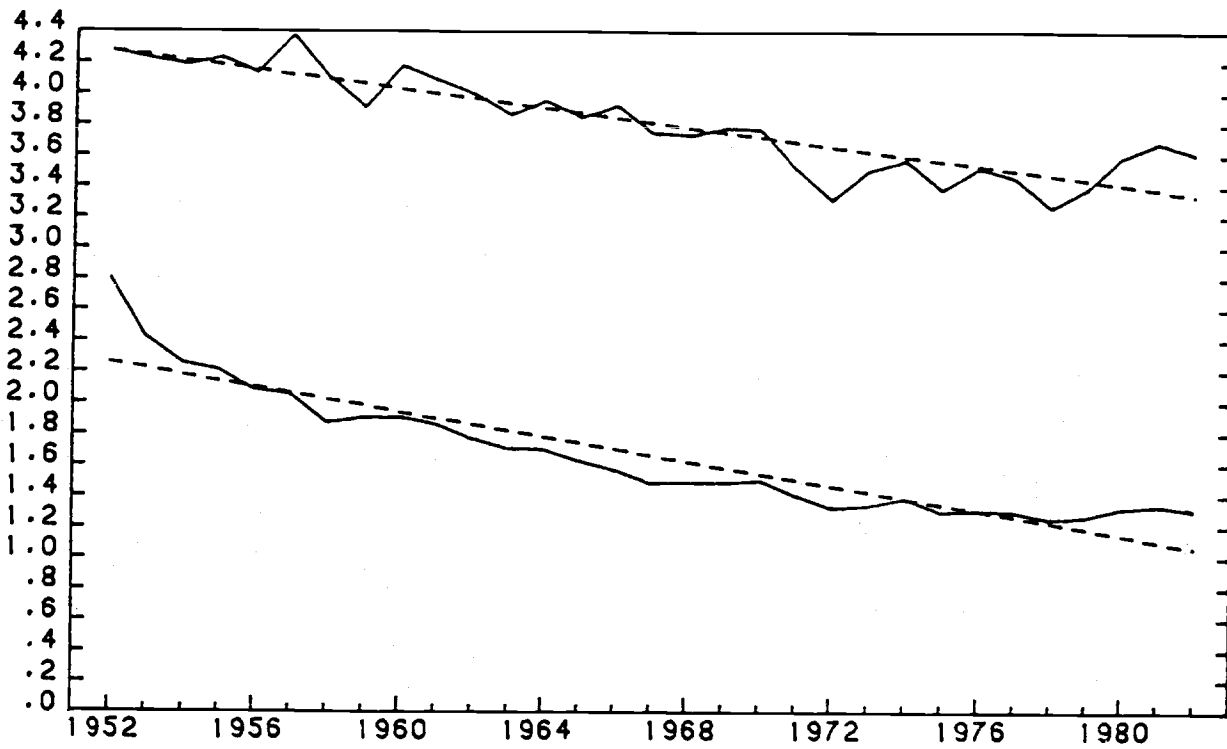
Notes: See Table .2 for the trend of velocity.

Chart 9

The Income Velocity of Money of High Inflation Economies
(Israel, Uruguay, Chile, Argentina and Brazil).
V1 upper solid line and V2 lower solid line, trend values dashed
line.
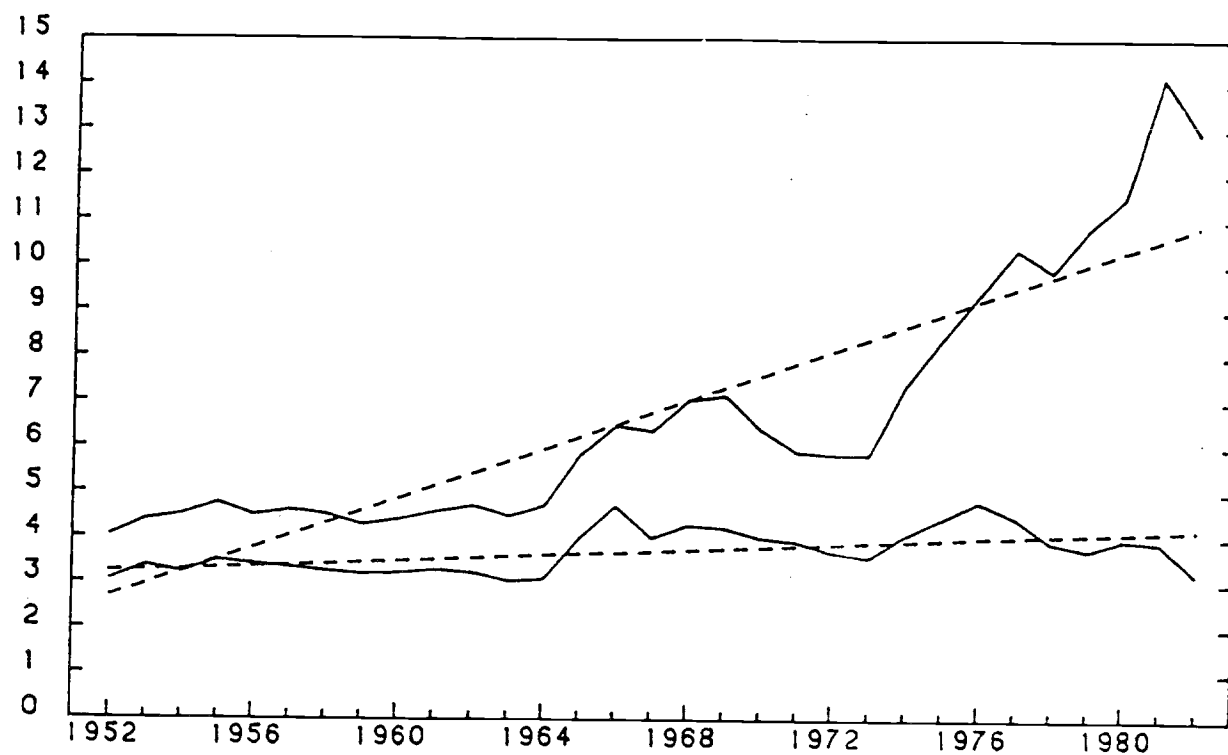
Notes: See Table 2 for the trend of velocity.

Chart 10

The Global Velocity Curve excluding High Inflation Economies
(i.e. Israel, Uruguay, Chile, Argentina and Brazil).
V1 upper solid line and V2 lower solid line, trend values dashed
line.

Low income   Lower middle   Upper middle   Industrial
economies   income   income   market economics
                  economies   economies
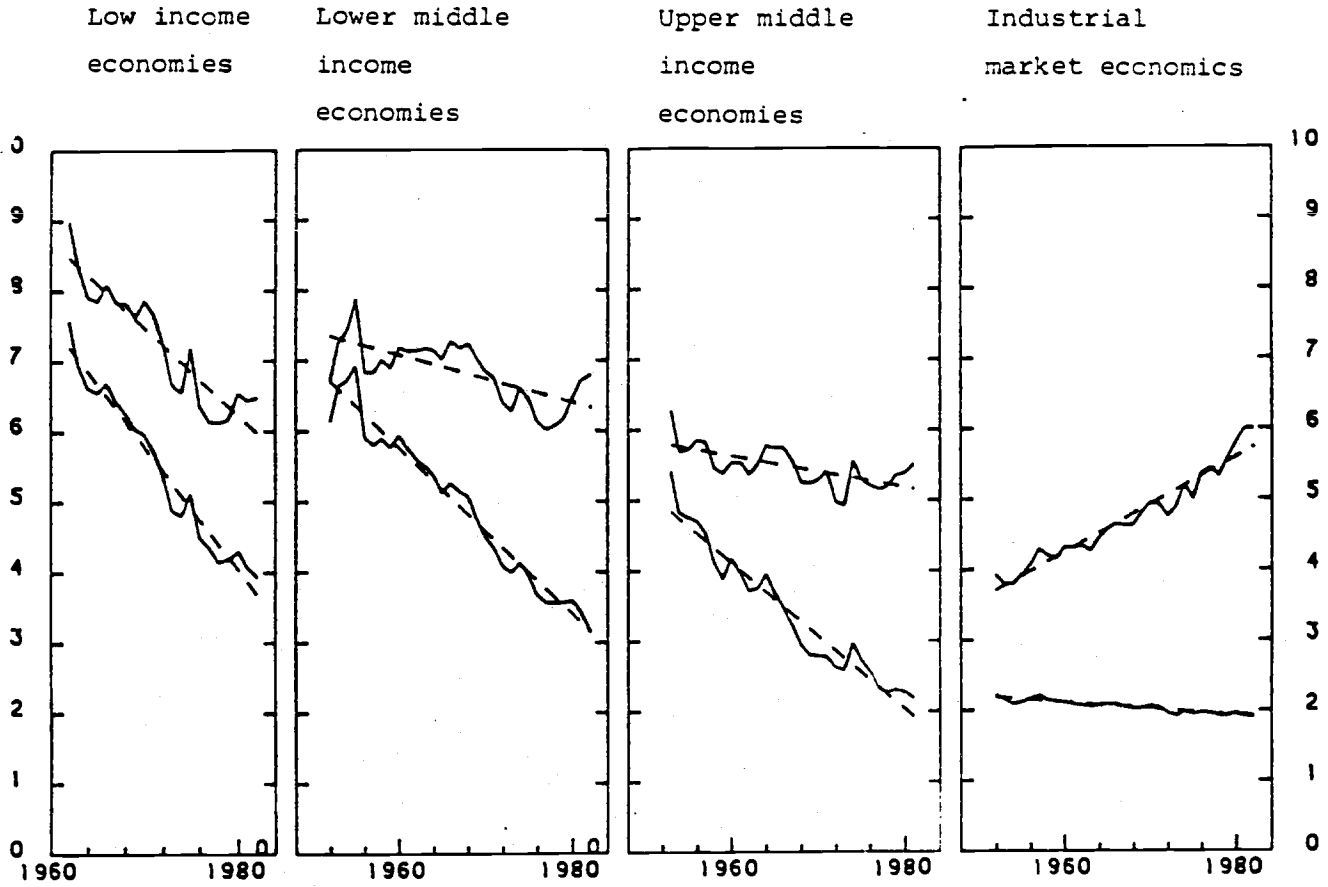
Notes: See Table   1 for the countries covered.
        See Table   2 for the trend of velocity.

Table   1. Country Groupings by Levels of Economic Development
           (Within each group countries are ranked according to
           real per capita income in 1981 U.S. dollars starting
           with the country with the highest income.)

Group   Countries

Industrial market Switzerland, Sweden, Norway, Germany, Denmark,
(rich) economies United States, France, Belgium, Netherlands,
($11,120/p.c.)   Canada, Australia, Finland, Austria, Japan,
                  United Kingdom, New Zealand, Italy, Spain and Ireland.

Upper middle-   Saudi Arabia, Libya, Singapore, Israel, Greece,
income economies Venezuela, Uruguay, Yugoslavia, South Africa,
($2,490/p.c.)   Chile, Argentina, Portugal, Mexico, Brazil,
                  Algeria, Malaysia, Iraq, Iran and Korea.

Lower middle-   Paraguay, Jordan, Syrian Arab Rep., Turkey, Costa
income economies Rica, Tunisia, Colombia, Dominican Republic, Ivory
($850/p.c.)   Coast, Jamaica, Ecuador, Peru, Guatemala, Nigeria,
                  Nicaragua, Morocco, Philippines, Thailand, El
                  Salvador, Egypt, Zambia, Honduras, Bolivia,
                  Indonesia, Yemen Arab Rep., Senegal and Kenya.

Low-income   Ghana, Togo, Sudan, Pakistan, Madagascar, Sierra
economies   Leone, Sri Lanka, Haiti, Tanzania, India, Upper
($270/p.c.)   Volta, Burundi, Uganda, Zaire, Malawi, Burma, Nepal,
                  Ethiopia and Bangladesh.

Source: Table 1 in World Development Report 1983, Washington 1983

Notes: Countries are excluded if their population was under 2.5
         million in 1975 and if they lacked data on velocity for
         for 9 years or more.

         Saudi Arabia and Libya are included among upper middle-
         income economies although they are included among high-
         income oil exporters in the World Development Report.

         The GNP per capita estimates refer to all countries within
         each group, respectively. They are not representative for the
         countries shown in the table as lack of data reduces the
         selection of economies. However, the GNP per capita
         estimates give a rough indication of the global spread
         of incomes.

Table 2. Velocity Behavior for Country Groupings. Regression equation V = a+bt where t stands for time. t-statistics in parentheses.

Country Group	Period	Regression estimates			Growth of Velocity	
		b	R^2	D.W.		
(1)	(2)	(3)	(4)	(5)	(6)	
1. Industrial market (rich) economies	V1: 1952-82	.067 (21.7)	.940	.871	1.4	
	V2: 1952-82	-.009 (-13.2)	.853	1.305	-0.5	
2. Upper middle-income economies	V1: 1953-82	.068 (6.4)	.575	.487	0.8	
	V2: 1953-82	-.068 (-16.1)	.900	.894	-2.6	
3. Lower middle-income economies	V1: 1952-83	-.034 (-5.2)	.462	.863	0.0	
	V2: 1952-83	-.118 (-26.0)	.957	1.270	-2.2	
4. Low-income economies	V1: 1962-82	-.125 (-10.2)	.840	1.091	-1.6	
	V2: 1962-82	-.176 (-21.8)	.960	1.178	-3.3	
5. Germany, Italy, Japan	V1: 1952-82	-.031 (-10.9)	.797	1.100	-0.6	
	V2: 1952-82	-.040 (-12.9)	.847	.328	-2.6	
6. Industrial market economies excl. Group 5	V1: 1952-82	.086 (26.2)	.958	.854	1.7	
	V2: 1952-82	-.004 (-4.0)	.341	.857	-0.2	
7. High inflation countries	V1: 1952-82	.273 (10.2)	.774	.317	3.8	
	V2: 1952-82	.032 (3.7)	.301	.740	0.2	
8. Upper middle-income excl. Group 7	V1: 1953-81	-.022 (-4.6)	.413	1.146	-0.5	
	V2: 1953-81	-.104 (-20.2)	.936	.760	-3.2	

Notes: The group specific velocity curve used for calculating the table is derived in the following way. The mean level of velocity within each country group is calculated for the first year for a base year which is the maximum number of observations (countries) is available. For the other years the arithmetic means of the annual first differences are calculated. Going forward from the base year, these values are successively added to the mean level as calculated above. Going backward from the base year, the values are successively subtracted. In this manner, we construct the common velocity curve for the whole period. The procedure is halted when more than one third of the maximum number of countries have dropped out of the sample. (This occurs in 1962 for the low-income countries).

Table 3.   Countries grouped by Phases of Secular Behavior of
           Velocity.

           During phase I the income velocity of M1(V1)
           as well as of M2(V2) displays a negative secular trend,
           during phase II V1 is rising while V2 is falling. During
           phase III both V1 and V2 are rising - see Chart 6:1.

Phases (1)	Group of countries (2)	Countries (3)
Phase I: (Both V1 and V2 falling)	Rich countries:	Germany, Japan, Italy.
	Upper middle-income:	Libya, Singapore, Greece, Venezuela, Yugoslavia, Algeria, Iran, Korea.
	Lower middle-income:	Paraguay, Jordan, Syria, Costa Rica, Tunisia, Ivory Cost, Jamaica, Ecuador, Peru, Nigeria, Morocco, El Salvador, Zambia, Honduras, Bolivia, Indonesia, Yemen A.R., Senegal, Kenya.
	Low-income:	Ghana, Togo, Sudan, Pakistan, Madagascar, Sierra Leone, Haiti, Tanzania, Upper Volta, Burundi, Burma, Nepal, Ethiopia, Bangladesh.
Phase II: (V1 rising and V2 falling)	Rich countries:	Norway, France, Netherlands, Finland, Spain.
	Upper middle-income:	Israel, Uruguay, South Africa, Chile, Argentina, Portugal, Mexico, Malaysia Iraq.
	Lower middle-income:	Turkey, Colombia, Dominican Rep., Guatemala, Nicaragua, Philippines, Thailand, Egypt.
	Low-income:	Sri Lanka, India, Zaire, Malawi.
Phase III: (Both V1 and V2 rising)	Rich countries:	Switzerland, Sweden, Denmark, USA, Belgium, Canada, Australia, Austria United Kingdom, New Zealand, Ireland.
	Upper middle-income:	Saudi Arabia, Brazil.
	Lower middle-income:	..
	Low-income:	Uganda.

Sources: See Table   1 for the grouping of countries according to per
capita income.
Notes: The classification of individual countries into phases is
based on the sign of the regression coefficient b in Table 6.2.
For a few countries the velocity curve, either V1 or V2, has been
horizontal. In these border cases the sign of the regression
coefficient has determined the grouping of phase, although the
regression coefficient is not significantly different from zero.

Table 4.   The Global Velocity Function: Pooled Regressions, 74 Countries 1952-1982

Dependent Variable	Type of Regression	Coefficients of independent variables (t values in brackets)				R²	SEE	DW
		Constant	log Y/N	(log Y/N)²	$\hat{\rho}$			
1. log V1	OLS Dummies	(53.81)* (13.20)*	-1.168 (-10.74)*	.081 (11.19)*	.002 (6.01)*	.8550	.0328	.59
2. log V1	C - O Dummies	.046 (2.66)*	-.768 (-4.30)*	.058 (4.66)*	.001 (3.32)*	.9380	.0085	1.87
3. log V2	OLS Dummies	8.155 (19.30)*	-1.405 (-12.46)*	.066 (8.84)*	.001 (2.85)*	.888	.0353	.54
4. log V2	C - O Dummies	.161 (4.91)*	-.469 (-2.61)*	.024 (1.91)**	.001 (3.60)*	.9036	.0080	1.80

Notes:

* statistically significant at the 5% level

** statistically significant at the 10% level.

The inflation rate $\hat{p}$ = Δlog P_t, is multiplied by 100.

The correction for serial correlation is the one step ahead
     Cochrane-Orcutt technique, Kmenta (1971) pp. 512-514.

The Global Trend Behavior of Velocity, 84 countries.
Regression equation $V = a + bt$ where t stands for time, $t = 0$ for 1950. Annual growth in velocity (column (6)) is calculated as the compounded growth rate. t-statistics in parenthesis.

Country (GNP/p.c. 1981 $)	Period	Regression estimates			Growth of V
		b	R2	D.W.	
(1)	(2)	(3)	(4)	(5)	(6)
1. SWITZERLAND					
($17,340)	V1: 1952-82	.026 (7.22)	.643	.920	1.5
	V2: -"-	.001 (.42)	.006	.810	-.2
2. SWEDEN					
($14,870)	V1: 1952-82	.068 (8.13)	.695	.869	.1
	V2: -"-	.004 (2.42)	.168	1.000	-.2
3. NORWAY					
($14,060)	V1: 1952-82	.060 (7.33)	.650	.455	1.8
	V2: -"-	-.001 (-.43)	.006	.432	.3
4. GERMANY					
($13,450)	V1: 1952-82	-.005 (-.94)	.030	1.680	-.2
	V2: -"-	-.052 (-12.21)	.837	.322	-2.7
5. DENMARK					
($13,120)	V1: 1952-82	.024 (6.04)	.557	1.187	.5
	V2: -"-	.009 (6.16)	.566	1.151	.4
6. USA					
($12,820)	V1: 1952-82	.126 (29.24)	.967	.339	2.9
	V2: -"-	.024 (12.03)	.817	.808	1.0
7. FRANCE					
($12,190)	V1: 1952-82	.028 (4.36)	.413	.301	.6
	V2: -"-	-.047 (-14.87)	.391	.598	-1.8
8. BELGIUM					
($11,920)	V1: 1952-82	.074 (17.00)	.909	.435	2.2

	V2:	-"-	.001 (1.00)	.033	1.323	0.1

9. NETHERLANDS

($11,790)	V1: 1952-82	.073 (19.40)	.929	1.595	1.9
	V2: -"-	-.019 (-9.24)	.746	.641	-.8

10. CANADA

($11,400)	V1: 1952-82	.082 (4.18)	.376	.346	1.8
	V2: -"-	.030 (-9.80)	.768	.562	-1.1

11. AUSTRALIA

($11.080)	V1: 1952-82	.188 (35.23)	.977	1.543	3.9
	V2: -"-	.025 (17.50)	.913	.946	1.6

12. FINLAND

($10,680)	V1: 1952-82	.100 (5.33)	.495	.655	.7
	V2: -"-	-.013 (-4.93)	.456	.705	-1.1

13. AUSTRIA

($10,210)	V1: 1952-82	.076 (9.34)	.757	.897	1.5
	V2: -"-	-.062 (-19.30)	.930	.495	-3.3

14. JAPAN

($10,080)	V1: 1952-82	-.026 (-541)	.510	.768	-.4
	V2; -"-	-.020 (-9.88)	.777	1.569	-1.8

15. UNITED KINGDOM

($9,110)	V1:1952-82	.135 (31.17)	.971	1.709	2.9
	V2: -"-	.023 (4.59)	.421	.424	1.0

16. NEW ZEALAND

($7,700)	V1: 1952-82	.209 (18.54)	.925	.593	3.9
	V2: -"-	.044 (3.95)	.358	.227	1.5

17. ITALY

($6,960)	V1: 1952-82	-.064 (-12.27)	.843	.259	-1.5
	V2: -"-	-.041 (-13.99)	.875	.229	-2.1

18. SPAIN

($5,640)	V1: 1952-82	.016 (3.79)	.347	.384	.6
	V2: -"-	-.029 (-12.66)	.856	.298	-1.3

19. IRELAND
    ($5,230)   V1: 1952-82   .080 (7.89)   .682   .247   1.9
                  V2:   -"-   .013 (8.46)   .711   .896   0.7

20. SAUDI ARABIA
    ($12,600)   V1: 1952-82   .058 (.88)   .043   1.195   .9
                  V2:   -"-   .022 (.46)   .012   1.099   -.4

21. LIBYA
    ($8,450)   V1: 1960-78   -.206 (-5.20)   .614   .572   -3.2
                  V2:   -"-   -.164 (-5.66)   .653   .572   -3.5

22. SINGAPORE
    ($5,240)   V1: 1968-81   -.007 (-.45)   .016   1.694   -0.1
                  V2:   -"-   -.010 (-1.60)   .175   .844   -1.3

23. ISRAEL
    ($5,160)   V1: 1952-82   .311 (5.16)   .478   .161   5.3
                  V2:   -"-   -.108 (23.94)   .952   .691   -4.0

24. GREECE
    ($4,420)   V1: 1952-82   -.145 (-7.11)   .643   .160   -2.4
                  V2:   -"-   -.174 (-8.83)   .736   .121   -5.9

25. VENEZUELA
    ($4,220)   V1: 1952-82   -.057 (-3.16)   .256   .369   -.9
                  V2:   -"-   -.091 (-9.64)   .762   .670   -2.7

26. URUGUAY
    ($2,820)   V1: 1955-82   .194 (7.36)   .676   1.147   2.0
                  V2:   -"-   -.000 (-.01)   .000   .470   -3.2

27. YUGOSLAVIA
    ($2,790)   V1: 1960-81   -.001 (-0.5)   .000   .494   .3
                  V2:   -"-   -.033 (-7.59)   .743   1.148   -1.9

28. SOUTH AFRICA
    ($2,770)   V1: 1952-82   .110 (11.85)   .829   .528   2.0
                  V2:   -"-   -.015 (-4.37)   .397   .622   -.1

29. CHILE

($2,560)   V1: 1964-82   .496 (3.95)   .479   .702   5.7

V2:   -"-   -.067 (-1.09)   .065   .782   -.8

30. ARGENTINA

($2,560)   V1: 1965-81   .366 (3.59)   .518 1.016   6.7

V2:   -"-   -.023 (-.68)   .037 1.664   -.9

31. PORTUGAL

($2,520)   V1: 1952-80   .021 (5.45)   .534   .554   1.1

V2: 1953-80   .024 (-11.66) .840   .406   -1.7

32. MEXICO

(2,250)   V1: 1952-81   .014 (1.50)   .075   .849   .4

V2: 1952-81 -.090 (-4.87)   .459   .325   -2.7

33. BRAZIL

($2,220)   V1: 1952-81   .181 (10.27)   .790   .442   3.5

V2:   "-"   .153 (12.37)   .845   .772   3.4

34. ALGERIA

($2,140)   V1: 1964-81 -.057 (-3.89)   .486   .472   -2.6

V2:   -"-   -.060 (-4.02)   .503   .415   -3.1

35. MALAYSIA

($1,840)   V1: 1955-82   .020 (1.33)   .064   .422   0.8

V2:   -"- -.073 (-8.38)   .730   .385   -2.4

36. IRAQ

(n.a.)   V1: 1953-76   .033 (2.15)   .173 1.242   .5

V2:   -"-   -.008 (-.69)   .021 1.119   -.3

37. IRAN

(n.a.)   V1: 1959-80 -.092 (-2.09)   .195   .847   -4.4

V2:   -"-   -.151 (-7.71)   .768   .830   -6.1

38. KOREA

($1,700)   V1: 1953-82 -.159 (.4.53)   .423   .869   -2.3

V2:   -"-   -.366 (11.37)   .822   .636   -6.0

39. PARAGUAY

($1,630)   V1: 1952-82   -.018 (-.60)   .012   .695   1.6
            V2:   -"-   -.217 (-8.35)   .706   .415   -1.5

40. JORDAN

($1,620)   V1: 1959-82   -.106 (-5.81)   .605   .341   -2.7
            V2:   -"-   -.104 (-8.95)   .784   .372   -4.5

41. SYRIAN A.R.

($1,570)   V1: 1963-81   -.086 (-10.10) .857   1.497   -2.3
            V2:   -"-   -.086 (-11.43) .885   1.640   -2.5

42. TURKEY

($1,540)   V1: 1952-82   .013 (.92)   .028   .336   .5
            V2:   -"-   -.035 (-3.70)   .321   .595   -1.4

43. COSTA RICA

($1,430)   V1: 1952-80   -.034 (-3.93)   .364   1.263   -0.3
            V2:   -"-   -.104 (-10.29) .797   .628   -2.9

44. TUNISIA

($1,420)   V1: 1960-78   -.001 (-.12)   .001   1.683   -.4
            V2:   -"-   -.057 (-9.41)   .839   .973   -2.5

45. COLOMBIA

($1,380)   V1: 1952-81   .009 (.77)   .021   .414   .3
            V2:   -"-   -.026 (-3.60)   .316   1.225   -1.1

46. DOMINICAN REP.

($1,260)   V1: 1952-80   .084 (4.80)   .461   1.767   1.1
            V2:   -"-   -.064 (-3.85)   .354   1.246   -.7

47. IVORY COST

($1.200)   V1: 1962-78   -.111 (-12.40) .911   1.362   -1.8
            V2:   -"-   -.147 (-19.80) .963   2.025   -3.4

48. JAMAICA

($1,180)   V1: 1953-82   -.082 (-4.73)   .450   1.041   -0.7
            V2:   -"-   -.089 (-10.11) .785   .772   -2.8

49. ECUADOR
    ($1,180)   V1: 1952-82   -.133 (-14.87) .884   .824   -1.5
                 V2:   -"-   -.105 (-14.35) .876   .647   -1.8

50. PERU
    ($1,170)   V1: 1952-82   -.064 (-2.78) .210   .328   .6
                 V2:   -"-   -.027 (-4.49) .411   .821   -.9

51. GUATEMALA
    ($1,140)   V1: 1952-81   .015 (.97)   .033   .802   .1
                 V2:   -"-   -.181 (-16.30) .905   .605   -2.7

52. NIGERIA
    ($870)   V1: 1952-81   -.110 (-3.73) .332   .431   -2.1
                 V2:   -"-   -.167 (-11.18) .817   .775   -3.4

53. NICARAGUA
    ($860)   V1: 1960-78   .004 (.11)   .001   .925   .2
                 V2:   -"-   -.157 (-5.48) .639   .859   -2.1

54. MOROCCO
    ($860)   V1: 1958-82   -.039 (-8.74) .769   .795   -1.2
                 V2:   -"-   -.049 (-9.54) .799   .551   -1.8

55. PHILIPPINES
    ($790)   V1: 1952-82   .171 (11.06) .808   .786   2.2
                 V2:   -"-   -.030 (-3.00) .237   .428   -1.1

56. THAILAND
    ($70)   V1: 1952-82   .151 (11.50) .820   .424   1.8
                 V2:   -"-   -.102 (-24.79) .955   .529   -3.0

57. EL SALVADOR
    ($650)   V1: 1952-82   -.014 (-.75)   .019   .301   -0.5
                 V2:   -"-   -.111 (-21.83) .943   .951   -2.7

58. EGYPT
    ($650)   V1: 1952-82   .004 (.65)   .014   .615   .5
                 V2:   -"-   -.027 (-4.55) .417   .327   -1.7

59. ZAMBIA
    ($600)   V1: 1965-82   -.156 (-5.10) .619 1.623   -3.5
                V2:   -"-   -.158 (-6.60) .731   .945   -5.3

60. HONDURAS
    ($600)   V1: 1952-82   -.068 (-3.63) .312   .531   -.7
                V2:   -"-   -.166 (-12.56) .845   .552   -2.7

61. BOLIVIA
    ($600)   V1: 1952-79) -.365 (-3.96) .376   .707   -1.2
                V2:   -"-   -.461 (-5.61) .548   .809   -2.6

62. INDONESIA
    ($530)   V1: 1965-82   -.411 (-4.15) .519   .804   -.6
                V2:   -"-   -.562 (-5.37) .643   .772   -3.6

63. YEMEN A.R.
    ($460)   V1: 1973-82   -.250 (-2.89) .510   .514   -8.6
                V2:   -"-   -.211 (-2.93) .518   .508   -8.8

64. SENEGAL
    ($430)   V1: 1962-81   -.141 (-3.39) .389   .355   -.7
                V2:   -"-   -.193 (-4.58) .539   .321   -2.0

65. KENYA
    ($420)   V1: 1966-82   -.063 (-2.40) .278   .749   -1.3
                V2:   -"-   -.071 (-5.04) .629   .806   -2.1

66. GHANA
    ($400)   V1: 1955-78   -.083 (-3.87) .405   .860   -1.1
                V2:   -"-   -.115 (-9.13) .791 1.079   -1.6

67. TOGO
    ($380)   V1: 1962-81   -.312 (-11.56) .881 1.603   -5.3
                V2:   -"-   -.358 (-16.27) .936 1.603   -6.5

68. SUDAN
    ($380)   V1: 1956-78   -.271 (-14.35) .907   .720   -3.6
                V2:   -"-   -.289 (-11.91) .871   .679   -4.2

69. PAKISTAN

    ($350)   V1: 1960-82 -.118 (-4.85) .528   .774   -1.3

                  V2:   -"-   -.119 (-6.83) .690   .691   -2.4

70. MADAGASCAR

    ($330)   V1: 1962-79 -.052 (-3.20) .405 1.006   -1.5

                  V2:   -"-   -.099 (-8.80) .838 1..151   -2.7

71. SIERRA LEONE

    ($320)   V1: 1964-81 -.223 (-5.30) .637 1.658   -1.0

                  V2:   -"-   -.223 (-9.17) .840 1.740   -2.7

72. SRI LANKA

    ($300)   V1: 1952-82   .087 (6.53)   .595   .724   1.6

                  V2:   -"-   .032 (-3.99) .354   .738   -1.2

73. HAITI

    ($300)   V1: 1966-82 -.447 (-8.60) .831 1.472   -4.6

                  V2:   -"-   -.502 (-12.14) .908   .616   -7.3

74. TANZANIA

    ($280)   V1: 1966-81 -.174 (-5.69) .698 1.101   -5.2

                  V2:   -"-   -.164 (-7.20) .787   .957   -5.9

75. INDIA

    ($260)   V1: 1952-81   .021 (2.94)   .236 1.245   .4

                  V2:.   -"-   -.061 (-7.84) .687   .450   -2.2

76. UPPER VOLTA

    ($240)   V1: 1965-79 -.294 (-4.2)   .598 1.148   -1.6

                  V2:   -"-   -.382 (-5.83) .739 1.060   -3.5

77. BURUNDI

    ($230)   V1: 1964-82 -.165 (-3.84) .464 1.678   -.9

                  V2:.   -"-   -.167 (-4.18) .507 1.743   -1.2

78. UGANDA

    ($220)   V1: 1966-78 -.001 (-.01)   .000   .975   2.4

                  V2:   -"-   .062 (.90)   .068 1.006   3.4

79. ZAIRE

    ($210)   V1: 1963-82   .025 (.72)   .028 1.382   -.3

                  V2:   -"-   -.006 (-.22)   .003 1.221   -.9

80. MALAWI

    ($200)   V1: 1965-82   .046 (.90)   .049   .612   .8

                  V2:   -"-   -.124 (-4.88) .598   .676   -2.0

81. BURMA

    ($190)   V1: 1952-82   -.033 (-1.61) .082   .370   -1.8

                  V2:   -"-   -.053 (-3.07) .245   .396   -2.7

82. NEPAL

    ($150)   V1: 1958-82   -.652 (-6.96) .678   .428   -5.1

                  V2:   -"-   -.757 (10.39) .824   .417   -7.8

83. ETHIOPIA

    ($140)   V1: 1961-82   -.295 (-9.45) .817   .553   -3.8

                  V2:   -"-   -.280 (-19.77) .951   .889   -4.5

84. BANGLADESH

    ($140)   V1: 1974-82   -.437 (-1.59) .265 2.121   .3

                  V2:   -"-   -.364 (-2.56) .483 2.315   -3.0

Appendix 2

Velocity curves of 84 countries
in the post World War II period.
V1-straight line
V2-dashed line

Source: See Table 1

13 AUSTRIA   14 JAPAN
15 UNITED KINGDOM   16 NEW ZEALAND
17 ITALY   18 SPAIN
19 IRELAND   20 SAUDI ARABIA
21 LIBYA   22 SINGAPORE
23 ISRAEL   24 GREECE

25 VENEZUELA
26 URUGUAY
27 YUGOSLAVIA
28 SOUTH AFRICA
29 CHILE
30 ARGENTINA
31 PORTUGAL
32 MEXICO
33 BRAZIL
34 ALGERIA
35 MALAYSIA
36 IRAQ

37 IRAN, I.R. OF

38 KOREA

39 PARAGUAY

40 JORDAN

41 SYRIAN ARAB REP.

42 TURKEY

43 COSTA RICA

44 TUNISIA

45 COLOMBIA

46 DOMINICAN REPUBLIC

47 IVORY COAST

48 JAMAICA

49 ECUADOR

50 PERU

51 GUATEMALA

52 NIGERIA

53 NICARAGUA

54 MOROCCO

55 PHILIPPINES

56 THAILAND

57 EL SALVADOR

58 EGYPT

59 ZAMBIA

60 HONDURAS

61 BOLIVIA

62 INDONESIA

63 YEMEN ARAB REP.

64 SENEGAL

65 KENYA

66 GHANA

67 TOGO

68 SUDAN

69 PAKISTAN

70 MADAGASCAR

71 SIERRA LEONE

72 SRI LANKA

73 HAITI
74 TANZANIA
75 INDIA
76 UPPER VOLTA
77 BURUNDI
78 UGANDA
79 ZAIRE
80 MALAWI
81 BURMA
82 NEPAL
83 ETHIOPIA
84 BANGLADESH