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REAL-FINANCIAL LINKAGES AMONG OPEN ECONOMIES

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ABSTRACT

This paper integrates the contributions to a forthcoming volume of the same title by the authors. The volume analyzes and empirically examines linkages between the real and financial variables that themselves link open economies-- "linkage" thus has a double meaning. Two types of linkages are discussed. Structural linkages describe differences across economies and among sectors in market structure (competitive/oligopolistic), productivity growth, and openness to trade. Inter-temporal linkages describe differences across economies and over time or circumstance in saving preferences and capital formation, government budgets, portfolio shares of "inside" and "outside" assets, and openness to mobile financial flows. Structural linkages are important chiefly for explaining sustained divergences in national competitiveness as measured by purchasing-power-parity norms. Inter-temporal linkages also account for them, as well as for sustained divergences in current and capital-account positions, geographical growth rates, and national incomes of residents.

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A. International Economics, Real and Financial

A familiar separation persists in international economic analysis. There are two camps. "Real" international economics, also called "international trade," examines cross-border transactions in current goods and services. "International finance" examines cross-border transactions in "capital" -- claims on the future. Typical real and financial international economists converse only superficially and develop little appreciation for each other's problems. Real-side scholars find closest kinship with colleagues in applied microeconomics, industrial organization, and public economics. Financial-side scholars find closest kinship with colleagues in macroeconomics, money and banking, and portfolio analysis. There are, of course, notable outliers such as W. M. Corden and Robert Mundell, and the giants of earlier generations have comfortably inhabited both camps (Gottfried Haberler, Harry Johnson, Fritz Machlup, and others). Yet today there is a chasm between international trade and international finance that is quite broad and quite deep.

The aim of this volume (Arndt and Richardson (1987)) is to begin filling in the chasm, in the hope of stimulating research that will some day span it. To do that, the chapters focus on linkages between the real and financial variables that themselves link open economies. Thus the word "linkage" has a double meaning throughout.

The aim of this introduction is to draw the volume together, identifying overlapping and unique contributions of each chapter to the common theme. Sections B, C, and D describe in more detail the typical separation between real and financial analysis. Typical analysis notwithstanding, real-financial

linkages among open economies spring from two fundamental sources: structural (or inter-sectoral) differences among economies and temporal (or inter-temporal) differences among them. Some of the more important structural differences are described in sections E and F, which integrate contributions from chapters by Krugman (1986), Marston (1986), and Kravis and Lipsey (1986). Temporal differences, which can also be conceived as circumstantial differences in a world of uncertainty, are discussed in section G, which integrates contributions from chapters by Hutchison and Pigott (1986), Hamada and Horiuchi (1986), and De Grauwe and de Bellefroid (1986). Structural and temporal differences are examined together in Section H.

B. How the Typical Twain Do Not Meet

The separation described above can also be called a dichotomy of interest. Real-side international economics is concerned with the way cross-border transactions affect an economy's trade patterns, production structure, and factor markets. Financial-side international economics is concerned with the way cross-border transactions affect an economy's exchange rates, interest rates, and financial markets. Typical treatments of these concerns are almost completely independent of each other.

The typical pure analytic approaches to "real" international trade make exchange rates, interest rates, and capital movements irrelevant. Such financial variables are ignored or taken for granted in the most familiar general-equilibrium models. Exchange rates are ignored because they are assumed to be the relative price of two moneys, both of which are "veils" that have no real effects. Money does not matter, and neither do exchange rates. They are all neutral. Interest rates do not matter because they are essentially intertemporal prices, with only second-order-of-small effects on inter-sectoral prices and relative factor prices. Financial capital movements may matter in a "long run" long enough for them to influence an economy's endowment of productive capital. But its endowment (stock) is often taken to be so large relative to its annual, even decennial, increments that changes in the increments can be ignored as infinitesimal. International trade in productive capital (or labor) may also be ignored if commodity trade eliminates the wage-rental incentives for factors to become mobile across borders (Mundell (1957)). And since international transfers of financial purchasing power must be reversed sometime if national budget balance is to be maintained, familiar general-equilibrium models insist that long-run equilibria feature no capital-account (or current-account) imbalance.

The typical pure analytic approaches to international finance make the sectoral structure of production and comparative advantage irrelevant. Sectoral structure is ignored in familiar macroeconomic approaches because demands for (and supplies of) financial assets are assumed to depend on aggregate real income and wealth, not on their sectoral source, and on inter-temporal prices reflected in earnings and interest rates, not on inter-sectoral prices. Asset stocks in turn determine capital movements, exchange rates, and, in pegged exchange-rate regimes, official intervention. Devaluation and revaluation in such regimes may have temporary differential impacts on sectoral outputs, prices, and employment. But sectoral structure is usually irrelevant for calculating the long-run effects of these parity changes. Even non-tradeables prices move to match the equilibrium shift in tradeables prices from the parity change, given price flexibility and inter-sectoral factor mobility.

C. Difference in Focus on Different Relative Prices

All international economics is concerned with "foreign relative prices relative to domestic relative prices" -- a double relative in every sense, and a mouthful, too. But the relative prices being compared across borders differ between international trade and international finance. The dichotomy of interest between the sub-areas can be clarified by describing the different relative prices that occupy each, and by discussing when one set of relative prices can be assumed independent of another. The description will also be useful in summarizing several of the chapters that follow in this volume.

We can conceive P and P* to be indexes of prices denominated in the currencies of a domestic and foreign economy, respectively. Each index is a function of two vectors, one of tradeables prices (p_t), and other of non-tradeables prices (p_n). Each vector contains many elements, each representing the price of a given sector's homogeneous product.

(1)

$$P \equiv f(p_t, p_n); \quad \begin{bmatrix} p_t \\ p_n \end{bmatrix} \equiv \begin{bmatrix} \cdot \\ \cdot \\ \cdot \\ p_{ti} \\ \cdot \\ \cdot \\ \cdot \\ p_{nk} \\ \cdot \\ \cdot \\ \cdot \end{bmatrix} \qquad P^* \equiv f^*(p_t^*, p_n^*); \quad \begin{bmatrix} p_t^* \\ p_n^* \end{bmatrix} \equiv \begin{bmatrix} \cdot \\ \cdot \\ \cdot^* \\ p_{ti} \\ \cdot \\ \cdot \\ \cdot^* \\ p_{nk} \\ \cdot \\ \cdot \\ \cdot \end{bmatrix}$$

Typical pure analytic approaches to "real" international trade are concerned with relative inter-sectoral prices -- that is, relative prices within the vector p relative to those within the vector p^*. The ratios of the ratios

$$\frac{p_{ti}}{p_{tj}} \Big/ \frac{p^*_{ti}}{p^*_{tj}} \qquad \text{for all } i \neq j$$

determine each economy's comparative advantage, production structure, exports, imports, and implicit factor demands. Although p's are expressed in domestic currency and p*'s in foreign currency, exchange rates do not directly influence the relative price comparisons above, and are ignored in "real" analysis. Also ignored are expected and actual inflation and interest rates, which have to do with the rate of change of prices between periods 0 and 1. It is not these rates of change that concern typical "real" analysis. Its concern is the international comparison of the relative prices for period 0, and then the same comparison independently for period 1. Comparative advantage may indeed change between the periods -- but if so, the reason will have been differential rates of change among sectoral prices, not their common rate of change (i.e., not general inflation).

Typical pure analytic approaches to international finance are concerned with relative inter-temporal prices, for example P_1/P_0 relative to P_1^*/P_0^*, using subscripts 0 and 1 to denote time. The ratios of the ratios

$$\frac{P_1}{P_0} / \frac{P_1^*}{P_0^*} \text{ , for all lengths of interval between 0 and 1,}$$

influence the economies' relative interest rates, and in turn the exchange rate and capital movements between them. Ratios formed from the sectoral prices that are components of each price index, such as p_{ti}/p_{tj} above, have no particular implication for the value of P or P*, and are ignored in international finance. Also ignored are international differences in the sectoral composition of production, themselves the consequences of relative intersectoral prices. Financial assets that are issued by various sectors of the economy, as well as those issued by the government, are typically assumed to lose much of their sectoral identity as integrated capital markets "size up"

their market value. The mechanism by which they are homogenized is competitive financial arbitrage, motivated by the desire of lenders to maximize their future returns, and of borrowers to minimize their future debt burdens. When asset markets are well integrated within each economy in this way, the sectoral composition of production and balance sheets is irrelevant to the concerns of international finance.

D. "Laws of One Price" and Purchasing-Power-Parity

All this notwithstanding, the dichotomization of international trade and finance has never been absolute. Some real-financial linkages have always been implicit, and a few have received significant attention, especially those relating to the "law of one price" and "purchasing power parity." These venerable linkages play important roles in several of the chapters in this volume, and need elaboration.

The first step in the elaboration is to describe equilibrium price structures in open economies. One of the chief conclusions of "real" analysis is that unencumbered, perfectly competitive trade in goods and services will make the relative price of tradeable i to tradeable j the same in every trading economy. In special circumstances, furthermore, the relative prices of some non-tradeables k and l may be equated across economies -- not, obviously, because they are traded, but because their producers employ the same primary factors as do tradeables producers, and must pay competitive rates for those factors.[1] Relative factor prices themselves may become equated across economies, as perhaps the most important example of how global tradeables markets may implicitly "globalize" even non-tradeables markets.

Typical "real" analysis has implications for price levels as well as relative prices. The same unencumbered, perfectly competitive forces of trade will bring about price-level equalization for any tradeable good:

$$p_{ti} = ep^{*}_{ti}, \quad \text{for all } i,$$

where the exchange rate e is the domestic currency price of foreign currency. This equation is called the "law of one price," and would come close to holding

for indexes of tradeables prices: $P_t \approx eP^*_t$ (where P_t, P^*_t represent indexes of tradeable goods alone). The "law of one price" might hold even for some non-tradeable goods too, for the reasons described above. That is why economists presume that general price indexes ought to vary similarly across economies:

P_t should vary quite closely with eP^*_t.

P should vary somewhat closely with eP*.

These co-variations are called "purchasing-power-parity" (PPP) relationships. The accuracy of each is enhanced by the accuracy of the component laws of one price, and by similiarity between the domestic and foreign weights implicit in the price-index functions f and f^*. The accuracy of the second (general) PPP relationship will be further enhanced by any tendency of non-tradeables prices to track tradeables prices due to internal competition over primary factors.

Laws of one price describe prices of homogeneous goods taken one by one. PPP relationships describe aggregations of those prices. Although laws of one price generally contribute to the accuracy of PPP relationships, they are neither sufficient nor necessary. One could see perfect validity of laws of one price and failure of PPP because of international differences in the weights that sensible aggregation suggests. One could imagine conversely that PPP relationships were reasonably accurate, but that laws of one price did not describe cross-boundary prices well for certain sub-sets of sectors.

PPP relationships are used often to specify a norm for exchange rates: e "should" vary closely with P_t/P^*_t, or even P/P*. Such use illustrates one of the simplest, oldest, and most important types of real-financial linkage: the relative price of two nations' money, a financial asset, should bear some pre-

dictable relationship to relative aggregates of their prices for current goods and services.

Of course, trade barriers, international transport costs, and other encumbrances interfere with "laws" of one price, and with PPP as a consequence. Yet such barriers are often roughly proportional to prices (as, for example, an ad valorem tariff). In that case, these price relationships will be observable in rates of change over time, albeit not in levels. These are usually called "relative" as opposed to "absolute" versions of the price relationships. The relative version of the law of one price is

$$\%\Delta p_{ti} = \%\Delta(ep^*_{ti}) \approx \%\Delta e + \%\Delta p^*_{ti},$$

(recognizing that the percentage change in the product of two variables is approximately equal to the sum of their percentage changes). And the "relative" versions of PPP are

$$\%\Delta P_t \approx \%\Delta(eP^*_t) \approx \%\Delta e + \%\Delta P^*_t$$

$$\%\Delta P \approx \%\Delta(eP^*) \approx \%\Delta e + \%\Delta P^*,$$

From these relations comes one of the most popular norms on which to forecast exchange rate trends: they ought to be related fairly closely to international differences in inflation rates ($\%\Delta P - \%\Delta P^*$).

These price relationships and their implicit real-financial linkages can be depicted in Figure 1. Quadrants 1 and 3 summarize PPP tendencies that arise within each period from competitive cross-border trade in goods, as studied by "real" international-trade analysts. Quadrants 2 and 4 imply the inter-temporal transition relationships between exchange rates and inflation rates (and also, implicitly, rates of interest) that are studied by inter-

national financial analysts. For example, when the foreign rate of inflation is zero and the domestic rate positive, then the P_1/P_0 locus in quadrant 2 is displaced below the 45° line, unlike the P^*_1/P^*_0 locus in quadrant 4 that coincides with the 45° line. This displacement brings forth a mirror-image clockwise rotation of the "PPP cone" in quadrant 3 such that the future exchange rate is consistent with differential inflation rates (and possibly with corresponding nominal interest-rate differentials between economies). The PPP relationships are drawn as cones of approximation to reflect the fact that P and P* include non-tradeables and other products for which the law of one price should not be expected to hold tightly. Thus the actual exchange rates e_0 and e_1 may not be exactly equal to PPP norms $\bar{e}_0$ and $\bar{e}_1$. But if the relative version of PPP holds, then any future divergence measured by the angle α_1 ought to be equal to the current divergence, measured by α_0 ($\alpha_1 = \alpha_0$).

From these price relationships also come various measures of a nation's "international competitiveness." Sectoral competitiveness is often measured by the change in p_{ti}/ep^*_{ti} since some "normal" base period, that is by $(\%\Delta p_{ti} - \%\Delta p^*_{ti} - \%\Delta e)$. National competitiveness is often measured by the change in P_t/eP^*_t or P/eP* since some "normal" base period, and even sometimes by the change in a ratio of non-tradeables prices -- where wages and occasionally other factor costs are taken to be the principal components of non-tradeables indexes.

National competitiveness measures are frequently called "real exchange rates"; negative changes are described as "real depreciation," signifying improved competitiveness, positive changes as "real appreciation," signifying reduced competitiveness.

International competitiveness is currently an important and controversial topic in analysis, policy, and interpretation. Recent movements in real exchange rates have been larger, more enduring, and more divergent among economies than either history or analysis had suggested. Older views and experience were that an economy's international competitiveness might rise and fall over medium-term periods, but would on average, over a decade or so, approximate the norm dictated by PPP. Ebbs and flows of competitive "advantage" would appear random over time and across economies.

Events of the past ten years have undermined this confidence, especially the appearance of persistent, marked competitive advantage[2] for Japan and competitive disadvantage for the United States. Trade-policy conflict has escalated as these divergences have been reflected in persistent, marked trade-balance surpluses for Japan and deficits for the United States.

One of the most important questions for international economics today is what explains the persistence and size of divergences from laws of one price and purchasing-power-parity norms. A number of the contributions to this volume provide the beginnings of an answer.

E. Explaining International Competitiveness: Predictable Divergences from Laws of One Price and PPP

Three of the chapters devote explicit attention to international competitiveness, and others, implicit attention. All measure competitiveness as a sustained divergence from the law of one price or from PPP. All contribute something new to the established literature along these lines on real-financial linkage. Yet each asks a unique question, and methodologies and aggregation differ among them. Even their terminology is distinct.

Krugman (1986) asks how imperfectly competitive market structure conditions the way exchange rates change international competitiveness at the industry level. Algebraically, he explores how the comparative-equilibrium derivative

$$\frac{d(p_{ti}/ep^{*}_{ti})}{de}$$

is altered by the presence of monopolistic price discrimination and oligopoly, (among other things). The derivative itself reflects a classic issue in real-financial linkage: how an exchange-rate change that is exogenous from the viewpoint of firms in an industry "passes through" into its prices at home and abroad. The exchange-rate change in the denominator of the derivative is obviously "financial"; the relative-price measure of industry competitiveness in the numerator is obviously "real."

Under perfect competition and the law of one price, the derivative and the real-financial linkage are zero. Krugman shows how imperfect competition, however, makes the derivative non-zero and establishes potential for indefinite divergences from the law of one price. He calls such divergences "pricing to market," because of the incentives for imperfectly competitive firms to maintain historical pricing in each distinct market despite an exchange-rate shock.

Exchange rates in these cases do influence relative prices, international competitiveness, and by implication, comparative advantage, too. Imperfectly competitive market structure is a mechanism for real-financial linkage.

Marston (1986) asks how differential productivity growth among sectors (among other things) affects different measures of U.S. competitiveness relative to Japan. He is particularly interested in comparative-equilibrium derivatives such as

$$\frac{d\left[\frac{P/eP^*}{P_t/eP_t^*}\right]}{d\left[\frac{G}{G_t}\right]},$$

where G_t and G stand respectively for productivity growth in the tradeables sector and the overall economy (both tradeables and non-tradeables). Marston calls the bracketed term in the numerator a relative real exchange rate, because it is a ratio of two alternative measures of international competitiveness. One of his major contributions is to show how large such derivatives are -- which is also to show how divergent are alternative measures of international competitiveness when an economy's sectoral growth patterns differ radically from each other. This is very important because ratios such as P/P* and P_t/P_t^* are used to set exchange-rate (e) norms. Alternative exchange-rate norms obviously diverge greatly from each other when sectoral trends do. It would be very hard then to write sensible rules for internationally coordinated monetary policy or exchange-market intervention aimed at damping e fluctuations, as recommended by some plans for international monetary reform.[3] Disparate e norms would stand

like multiple targets at an archery contest, some commending themselves to one country and others to others.

Like Marston, Kravis and Lipsey (1986) illustrate an international linkage from real economic structure to a "financial" variable. They ask how an economy's international competitiveness is affected by its: (1) per capita income, (2) sectoral structure (between t and n goods), and (3) openness to trade. Using regressions run cross-sectionally over 25 countries for various time periods, they calculate

$$\frac{d(P/eP^*)}{dZ_j} \quad \text{and} \quad \frac{d(P_t/eP_t^*)}{dZ_j}, \quad \frac{d(P_n/eP_n^*)}{dZ_j}$$

where P_n, P_n^* denote indexes of non-tradeables prices, and Z_j (j=1,2,3) stands for their three structural determinants of measured competitiveness. They use the United States as a standard against which to compare other countries, normalizing U.S. prices (P*) to be 1.00, and then calling the 25 calculated P/e's each nation's "price level" (implicitly relative to the United States). If purchasing-power-parity held, every nation's price level would clearly be 1.00, too. Kravis and Lipsey show instead that divergences from 1.00 are very large, very persistent over time, and reasonably well explained (across economies) by international structural differences.

Furthermore, as detailed below, chapters by Hutchison-Pigott (1986) and Hamada-Horiuchi (1986) describe implicitly how fiscal policy and capital controls have impacts on a nation's international competitiveness and its distance from any PPP norms.

F. The Influence of Tradeables/Non-tradeables Structure on Exchange Rates and Price Levels

Differences across economies in inter-sectoral trends are one of the fundamental sources of real-financial linkage. They are emphasized in both the Marston (1986) chapter and that by Kravis and Lipsey (1986), and have a modest analytical and empirical history (Balassa (1964), others). Among the most important implications of this work is that exchange rates, although a "financial" variable are influenced significantly by relative product prices.

These linkages can be detailed usefully in Figure 2, a familiar diagram that depicts production possibilities and preference contours for a small open economy. The assumption of smallness, made here for convenience only, implies that trends in the world prices of the economy's exportables and importables are exogenous. If the trends are also identical, then exportables and importables can be properly aggregated into tradeables, and units of either can be measured along the vertical axis. Other assumptions made for convenience are that preferences are homothetic and that the point P, C lies directly below the point P', C'.

This sort of real-financial linkage can be illustrated first across economies, in the fashion of Kravis and Lipsey, and then over time, in the fashion of Marston. Suppose that two economies differ in their real structure in the following way. One has an across-the-board technological advantage that by world standards is especially large in tradeable goods. The other has a less marked absolute and differential advantage. Or to make the point more graphic, suppose that the second economy is a laggard across-the-board in productivity, and especially backward in tradeables. The first economy will, of course, tend to have above-average per capita income, and the second, below

average. The production possibilities curve of the rich economy can be taken to be $Q'_tQ'_n$ and that of the poor economy Q_tQ_n.[4] "Equilibrium" production and consumption for the rich economy in typical analyses can be identified with point P', C', and for the poor economy with point P, C. These are equilibrium points in the sense that each economy's single-period aggregate budget is balanced -- aggregate spending during the period is exactly equal to aggregate income during the period. The value of national production (P) is equal to the value of national consumption (C). Each economy's trade must thus be balanced, with commodity exports equal in value to commodity imports.

When we consider inter-temporal trade below, we will abandon this definition of equilibrium as overly rigid and unrealistic. But it is quite typical. And it leads directly to the conclusion that the relative price of tradeables to non-tradeables is lower in the rich economy than the poor one. That is,

$$(2) \qquad \frac{P'_t}{P'_n} < \frac{P_t}{P_n} .$$

This much is familiar. It is all "real" analysis. Less familiar is its implication for financial variables, such as the national "price levels" that Kravis and Lipsey emphasize. These are defined as P'/e' and P/e, where $P' = f'(P'_t,P'_n)$ and $P = f(P_t,P_n)$ as in (1). Since these index functions ought sensibly to be homogeneous of degree one in all prices, they can be rewritten as

$$(3) \qquad P'/e' = f'(P'_t/e', P'_n/e') \text{ and } P/e = f(P_t/e, P_n/e)$$

Because each of these two economies faces the same exogenous world prices of tradeables, laws of one price suggest that P^*_t will be equal to both P'_t/e'

and P_t/e. Using these equalities, (3) can be rewritten as (4)

(4) $\quad P'/e' = f'(P^*_t, P'_n/e')$ and $P/e = f(P^*_t, P_n/e)$.

and (2) can be rewritten as (5)

(5) $\quad \frac{e'}{P'_n} < \frac{e}{P_n}$.

Then substituting (5) into (4), it is clear that the national price level will be higher in the first (rich) economy than in the second (that is, $P'/e' > P/e$) -- as long as the price indexes f' and f are sufficiently similar.

To summarize, the cross-country real-financial linkage illustrated here is that economies with strong productivity advantage by world standards in tradeables relative to non-tradeables will have higher price levels than naive purchasing-power-parity norms suggest. Economies with relatively weak productivity advantage in tradeables relative to non-tradeables will have lower price levels than naive PPP norms suggest. These latter economies are often presumed to be poor and the former rich, a presumption based on productivity in non-tradeables sectors being similar world-wide.

A similar real-financial link over time is illustrated by Marston. His analysis can be summarized in Figure 2 by assuming that Q_tQ_n and $Q'_tQ'_n$ both represent Japanese production-possibilities curves, the first in the 1970s and the second in the 1980s. Their difference illustrates Japanese productivity growth that was especially rapid in tradeables over this period compared to the (undiagrammed) rest of the world (specifically the United States in Marston's analysis). Each of the equations above has its analog in Marston's analysis over time. The analog to (2) implies that prices of tra-

deables relative to non-tradeables had to fall faster over this period in Japan than in the United States to maintain balanced trade (national spending equal to national income). The analog to (5) shows two financial mechanisms by which this real change might have taken place: Japanese e might have fallen, that is, the yen might have appreciated, or Japanese non-tradeables prices (P_n) might have risen. The analog to (4) shows that if either had happened sufficiently, Japanese prices overall would have risen relative to the U.S. price level. Or, using Marston's terminology, real exchange rates based on general price indexes would have shown yen appreciation from 1973 to 1983.

Marston shows in fact that general measures of the yen's real value hardly changed at all over this period. As a result, "equilibrium" real-financial linkage could not be attained. Linkage still existed, but took on a character typically thought to imply disequilibrium. The sense in which it does can be illustrated in Figure 2. Because neither e nor P_n moved sufficiently from 1973 to 1983, Japan's price of tradeables relative to non-tradeables remained unduly high. This had consequences. Consumption of tradeables relative to non-tradeables was discouraged, including consumption of imports. Production of tradeables relative to non-tradeables was encouraged, including production for export. Japanese consumption in the 1980s was better depicted by the point C" than C', Japanese production by P" instead of P'. The implied gap between national income and national spending is precisely the distance C"P" measured in units of tradeables, and is identically the Japanese trade surplus (more exactly its growth over the period). Instead of generating a rise in the Japanese price level relative to the world, the unusually strong Japanese productivity growth in tradeables generated a Japanese trade surplus. It may furthermore last a long time. Some of Kravis and Lipsey's regressions toward the end of their

chapter suggest trade-balance effects of price-level misalignments that stretch over the ensuing decade!

It is next appropriate to address the issue of whether Marston's illustration is necessarily a disequilibrium real-financial linkage. The next section shows that is is not necessarily so if economies are allowed to trade inter-temporally, that is, to finance or "save" single-period differences between national spending and national income. In allowing for such inter-temporal trade, additional mechanisms for real-financial linkage appear.

G. The Influence of Inter-Temporal Considerations on Real-Financial Linkage

Differences across economies in inter-temporal preferences and in capabilities for inter-temporal transformation are a second fundamental source of real-financial linkage. They are emphasized in the Hutchison-Pigott and Hamada-Horiuchi chapters (1986), and are behind the scenes of the Marston chapter.

They are also emphasized in a chapter by Stockman (1986), yet with added generality. What economists often mean by inter-temporal trade is contingent trade -- trade across uncertain circumstances, not necessarily across time. For example, if persons are currently employed, they may decide to consume less than they earn, trading away current consumption in order to increase consumption if they become unemployed. There is no need to analyze their contingent decisionmaking inter-temporally. The circumstantial problem and the inter-temporal problem have exactly the same structure. Financial markets facilitate not only inter-temporal transactions but transactions under uncertainty, too.

Thus what we describe here as inter-temporal linkages could also be conceived as circumstantial linkages, those caused by uncertainty. It is from this perspective that De Grauwe and de Bellefroid (1986) analyze the effect of exchange-rate variability on a very long-run, decade-spanning measure of international-trade volume. They are not surprised to find a significant negative correlation between variability and volume because they recognize the inadequacies (even non-existence) of financial markets for hedging risk over decade-long horizons. They thus illustrate one of Stockman's key conclusions:

a spectrum of financial markets is often necessary to support any particular "real" transaction; in the absence of the right financial markets, the real transaction may not take place.

Real-financial linkages from inter-temporal differences across economies can be detailed usefully in Figure 3. $Q_f Q_c$ represents an economy's production-possibilities curve between "current" goods and "future" goods, (both assumed homogeneous and tradeable. If the economy is closed to international transactions, then the vertical axis is typically considered also to measure capital goods output -- produced increments to the economy's endowment (stock) of productive capital -- which are the way a closed economy's claims on future goods can be increased (or maintained, when there is depreciation). For convenience it is assumed that national preferences are homothetic (less defensible than sometimes because of the presence of a pre-existing background stock of claims on the future, implied by the interrupted vertical axis below the origin labelled 100).

Inter-temporal linkages identified by both Hamada-Horiuchi and by Hutchison-Pigott can be described in this diagram. Hamada-Horiuchi focus on preferences, in particular, on financial liberalization given differences between economies in inter-temporal preferences. Hutchison-Pigott focus on availability of unique financial instruments, in particular, on differences between economies in "production" rates of government securities through fiscal policies that create budget deficits.

(i) Financial Liberalization and Differences in Preferences. Japan's national saving rate is high by world standards, and for purposes of reference, we might suppose that the Japanese economy is closed not only by capital controls but to trade as well. Then Japan's equilibrium could be described by point P_J, C_J on the preference contour through that point. Real interest

rates, reflected in the slope of the tangent line, would be low. If the rest of the world has a lower saving rate but is otherwise identical to Japan (for convenience, and let us call it the United States) then its equilibrium could be described by point P_U, C_U. Real interest rates would be higher than in Japan.

Liberalization of commodity trade alone between the two economies would add a very simple real-financial linkage. But most economists would consider this strictly a "real" experiment. Each economy would produce at P'. Japan would consume at C'_J, importing $S'_J C'_J$ of capital goods and exporting $S'_J P'$ of consumer goods. The U.S. would consume at C'_U, with the mirror-image trade pattern. Trade would be balanced; there would be no trade surpluses or deficits or international capital movements as usually defined. Real interest rates would be higher in Japan and lower in the U.S. than they were before trade. As a result, Japan's current consumption would decline and her purchases of investment goods would increase, with an increased growth rate of her capital stock and gross national product (GNP) being the result. U.S. effects would be opposite: current consumption would rise, and investment and growth would decline (though U.S. welfare would rise). With these effects the two economies could not remain identical in periods subsequent to the one depicted. The production possibilities curve for Japan would shift outward faster than that for the U.S.

Removing capital controls and liberalizing international financial trade could change the picture still further. This is what Japan did in the late 1970s and early 1980s, as Hamada and Horiuchi discuss. The principal change is that the allocations among nations of the world's capital stock and its wealth can be independent of each other.[5] A simple way to describe the change is to assume that what additionally could be traded freely was ownership

certificates to the productive capital stock -- pieces of paper that entitle the owner to the income of a machine whether it is in his/her backyard or far away. Now if newly produced machines do not differ from existing machines, then some of Japan's excess demand for claims on future goods might be satisfied by Japanese purchases of ownership certificates, not by physical shipment of the capital goods themselves. U.S. exports of capital goods may in fact decline. It is cheaper, among other things, to transport pieces of paper than machines! A U.S. deficit on commodity trade could develop, offset of course by a U.S. surplus in exchanges of financial assets. In fact, a stable, recurrent Japanese demand each period for U.S. financial assets would cause the U.S. dollar to appreciate to a stable higher level in real terms, thus generating the sustained trade deficit and making the U.S. appear "uncompetitive." The requisite exchanges of goods for paper could continue indefinitely at stationary levels each period among growing economies like those pictured.

Debt service and investment income are other important aspects of intertemporal real-financial linkage that can be introduced in this simple scenario. To do this, it is helpful to discuss one of an infinity of equilibria (an infinity due to the assumption that financial ownership certificates and physical machines are perfect substitutes in trade). In the equilibrium that we examine each economy would produce at P'. Japan would consume at C'_J, importing $S'_JC'_J$ of <u>ownership claims</u> to U.S. capital (not the machines themselves) and exporting S'_JP' of consumer goods. The U.S. would would consume at C'_U, with the mirror-image trade pattern. Commodity trade would no longer be balanced as it was before financial liberalization. Japan would have a current-account <u>surplus</u> equal to S'_JP' (or $S'_JC'_J$ in value) and a capital-account deficit of the same size. The U.S. would have mirror-image

imbalances of the same size -- a current-account deficit and capital-account surplus. If Japan plowed back the periodic earnings on its U.S.-domiciled capital into future purchases of such capital, then there would be no international investment income or debt service. Current-account imbalances would be identical in size to trade imbalances.

In this case, the Japanese-owned capital stock would be growing at $Q'_JC'_J$ per period, just as it was before financial liberalization. But the Japanese-domiciled share of this increment would be growing at only $Q'_JS'_J$; $S'_JC'_J$ would represent "net foreign investment" in the U.S. by Japan. The growth rate of the capital stock in geographical Japan would be lower than previously, as would the growth rate of Japanese GNP. In fact, Japanese growth rates would be identical to those of the geographical U.S. in this equilibrium (because $Q'_JS'_J$ is equal to Q'_UP'). The geographical economies would remain identical in periods subsequent to the one depicted. But Japanese residents would own a larger and larger share of the growing U.S. capital stock as time went on, with corresponding claims over a larger and larger share of U.S. GNP. (Note that although U.S. residents' ownership shares would fall, their claims over future goods would still be rising at $Q'_US'_U$ per period.)

Debt service and investment income then become a natural aspect of intertemporal linkage as Japan reaches the point of wanting to repatriate earnings on its U.S.-domiciled capital rather than reinvesting them. A simple way to represent that development in the diagram is to assume that $S'_JT'_J$ of repatriation is carried out in machinery, Japan's importable. This repatriation causes a decline in the Japanese trade surplus (U.S. trade deficit) and other adjustments in international balances and real exchange rates that are summarized in Table 1. It also causes the two geographical economies to begin growing apart

Table 1

DIFFERING INTER-TEMPORAL PREFERENCES:
FINANCIAL LIBERALIZATION,
DEBT SERVICE, INTERNATIONAL
BALANCES, AND REAL EXCHANGE RATES

	No Financial Liberalization	Financial Liberalization.... ...without repatriation	...with repatriation
Trade Balances[2]	Zero	J: $S'_JC'_J$, surplus U: S'_UP', deficit	J: $T'_JC'_J$, surplus U: T'_UP', deficit
Investment Income/ Debt Service[2]	Zero	Zero	J: $S'_JT'_J$, income U: $S'_UT'_U$, service
Current-Account Balances[2]	Zero	<— J: $S'_JC'_J$, surplus —> <— U: S'_UP', deficit —>	
Capital-Account Balances[2]	Zero	<— J: $S'_JC'_J$, deficit —> <— U: S'_UP', surplus —>	
Real Exchange Rates	"Normal"	Highest (lowest) real value of dollar (yen)	High (low) real value of dollar (yen)

[1]Japan (J) is assumed in the table to have a higher national saving rate than the rest of the world, represented by the U.S. (U).

[2]Measured in units of capital goods.

again, losing their identical character, with Japan's investment and GNP growth exceeding that of the geographical U.S.

(ii) Budget Deficits and Differences in "Production" Rates of Government Securities. Suppose that we introduce a further difference across the economies by allowing the U.S. government to run (and increase) a budget deficit financed by issues of new Treasury securities every period, precisely the situation analyzed by Hutchison and Pigott. If the U.S. were a completely closed economy, nothing might change from introducing this feature. The Treasury securities might be considered "inside," not "outside" assets; some U.S. residents and generations would "owe" them to other U.S. residents and generations. In this extreme case (Ricardian equivalence) there would be no real change in the U.S. production possibilities curve in Figure 3, nor therefore in capabilities for transforming present goods into claims on future goods. Nor, of course, would there be any burden of the public debt.

But in the open-economy setting, matters are quite different, whatever one believes about the burden of the debt and Ricardian equivalence. From Japan's point of view, U.S. Treasury securities are clearly "outside" assets, purchases of which would represent increased Japanese capability to consume future goods. Japan may even see them as perfect substitutes for ownership certificates to the U.S. capital stock, taking account of risk, liquidity, and all aspects of financial assets. From the point of view of Japanese decision-making, the increased U.S. government budget deficits and the increased issue of new Treasury securities every period shift the U.S. production-possibilities curve vertically by exactly the increased deficit/issue. The U.S. produces wonderful Treasury securities every year and

equally wonderful capital goods! There is of course not necessarily any real shift from the U.S. point of view, but that is irrelevant for what concerns us.

One of Hutchison's and Pigott's important points is a difference in inter-temporal transformation opportunities. Even a perceived shift in Japan's ability to use external trade to transform present goods into claims on future goods establishes a real-financial linkage. To show the motive for such trade in its starkest simplicity, assume that U.S. and Japanese inter-temporal preferences were identical after all, and depicted by the preference contours through point P_J,C_J. Then because from a Japanese perspective U.S. Treasury securities are outside assets, and because the perceived U.S. production-possibilities curve has been shifted vertically, Japan will also perceive higher potential real interest rates at P''_U,C''_U than at P_J,C_J, as reflected in the steeper tangent price line. Japanese residents (unlike U.S. residents) will be prepared to bid for assets at prices between those implied by the two tangents. Trade will be thereby encouraged in which Japan exports consumer goods to the U.S. in return for Treasury securities (as well as assets and capital goods that may be perfect substitutes for the Treasury securities). The U.S. will incur a trade-account deficit and probably debt-service obligations, offset by a capital-account surplus, plus other consequences discussed by Hutchison and Pigott.

A purist might object to this real-financial linkage by observing that the <u>world</u> production possibilities curve that could be constructed from Figure 3's true U.S. and Japanese curves would be unaffected by any issue of government securities. That observation is correct, but focuses only on production of real goods. It neglects "production" of financial assets, which is an

equally important element of generalized supply in this perspective, and especially important when the asset is "inside" to some agents and "outside" to others. Real-financial linkage follows directly. It arises in an open economy for precisely the same reason that it would arise in a closed economy with "distribution effects" caused by two groups of agents, one that considers government securities to be net wealth, and one that does not.

H. Structural and Inter-Temporal Linkages Jointly Considered

Combining the inter-temporal and structural perspectives on real-financial linkage is valuable for its suggestive richness. It also allows fuller reference to the Hutchison-Pigott (1986) chapter and to familiar macroeconomic linkages that are de-emphasized in this volume.

Every economy in reality has an array of differentiated current goods and assets (claims on future goods). It has proved helpful above to recognize this very simply in the distinction between tradeable and non-tradeable current goods. Now it is helpful to conceive symmetrically of tradeable and non-tradeable assets, identifying the first with government securities and ownership claims to capital goods, and identifying the second with money. It is also helpful to conceive of wealth owners holding a portfolio of tradeable assets and "their own" (but not the other) non-tradeable money, just as current-goods consumers buy tradeables and "their own" non-tradeable (but not the other).

General equilibrium in this conception includes stock equilibrium in all asset markets, characterized in ways that are captured in monetary, portfolio-balance, and stock-adjustment models of international finance. Figure 4 summarizes what is familiar from these models and draws out their implications for real-financial linkages along with Figure 5.

In Figure 4, asset-market equilibrium is described in quadrant 1, where schedules HH and FF describe pairs of (nominal) interest rates (r) and exchange rates (e) that make portfolio managers content to hold the existing

stock supplies of (non-tradeable) money and (tradeable) foreign securities. At the interest and exchange rate common to both schedules, the stock supply of domestic securities must be willingly held, too, because existing wealth is constrained to be held in either money, domestic securities, or perfectly substitutable foreign securities. Conditions for equilibrium can be written

$$H/P = L(y, v, r)$$

$$eF/P = F(y, v, r)$$

where H and F stand for existing nominal stocks of money and foreign securities in an economy's portfolio, and P is an index of prices of current tradeables and non-tradeables as in equations (1).

The real demand for money varies directly with real income (y) and real wealth (v),[6] and inversely with the domestic rate of interest on tradeable securities (r). The real demand for foreign securities varies inversely with real income and the domestic rate of interest and directly with real wealth. The foreign rate of interest can be treated exogenously and ignored if for convenience we focus on a small economy.

The FF curve in Figure 4 is negatively sloped because a rise in e (appreciation of foreign currency) creates an excess supply of foreign securities, requiring a fall in the domestic rate of interest to correct it.[7] The HH curve is positively sloped because a rise in e creates an excess demand for domestic money which must be offset by a rise in the domestic rate of interest.

The real sector is typically linked to this financial sector by an equilibrium condition equating supplies of and demands for domestically produced current goods in the open economy:

$$T(P_t/eP^*_t, y, y^*) + D = S(y, r) - I(r),$$

where any excess of private real saving (S) over investment (I) is either invested abroad, creating a real trade surplus (positive T) to match the negative balance on capital account, or absorbed by government budget deficits (D). The trade balance is usually assumed to be directly related to foreign real income, and inversely to domestic real income and the real exchange rate. Private saving is usually assumed to be directly related to income and the interest rate, and private investment inversely to the interest rate. This equilibrium condition yields an "IS curve" depicted in quadrant 2 of Figure 4, and an aggregate demand curve in quadrant 3. When factor markets are free of distortions (factor-price rigidities, money illusion, etc.) so that the economy operates on its production possibilities curve in Figure 3, then the aggregate supply curve in Figure 4 can be taken to be vertical.[8] The distance $\bar{O}y$ in Figure 4 in fact corresponds to distances like OP in Figure 3. Furthermore the "IS curve" in Figure 4 is precisely the demand curve generated by the preference map of Figure 3, and distances corresponding to T, D, S, and I can be found in Figure 3.

With this framework we can see more clearly the contributions of Hamada-Horiuchi and Hutchison-Pigott (1986). Hamada and Horiuchi discuss the linkage effects of Japanese regulation and deregulation of the use of yen assets as transactions media (H behavior) and as stores of value (F behavior). Hutchison and Pigott discuss the linkage effects of government budget deficits (D), controlling implicitly for whether they are financed by money creation (H behavior) or securities issue (F-equivalent behavior). Given a value of D, of course, this choice of whether to finance it by money creation or securities issue is equivalent to the choice of some open market exchange (operation) of

money for securities. This kind of open market exchange is easy to analyze in our framework in order to introduce the importance of tradeables/non-tradeables structure in questions of real-financial linkage.

To that end, consider monetary expansion by way of an open market purchase of domestic securities. This increases H and shifts the HH curve down in quadrant one of Figure 4, initially bringing down the rate of interest and depreciating the domestic currency. These developments stimulate domestic demand and shift expenditure from foreign to home goods, as indicated by the shift in aggregate demand. Because the aggregate supply curve is vertical, though, the monetary expansion leaves real income unaffected. In the new equilibrium, the nominal exchange rate and the price level rise in proportion to the change in money supply.

The rise in domestic prices restores the original values of H/P and e/P, and shifts the HH and FF curves up, returning the interest rate to its original level. The new equilibrium is characterized by neutrality, with real variables remaining unaffected while prices and the nominal exchange rate rise in proportion to the rise in the money stock. Linkage is absent.

Structural differentiation of the real economy does not alter this. Linkage will still be absent. Distinguishing between tradeables and non-tradeables makes no difference to the neutrality conclusion. We can demonstrate this in Figure 5, where the price of tradeables relative to non-tradeables (P_t/P_n) is measured vertically. In the right-hand panel, the demand for tradeables is a negative function of the relative price and a positive function of overall expenditure, while supply is a positive function of relative price. In the left panel, the demand curve for non-tradeables slopes up from right to left and the supply curve slopes down from right to left to reflect the fact that the

relative price of non-tradeables falls as we move up along the price axis. (These supply and demand curves could in fact be derived directly from Figure 2 by rotating a price line respectively around the production possibilities curve and the indifference curve that is tangent to it.)

The initial equilibrium in Figure 5 shows both markets to be cleared at relative price $(P_t/P_n)_o$ and thus reflects the familiar constraint in pure trade theory that the market for non-tradeables must clear and that trade must be balanced. Monetary expansion causes the initial depreciation of domestic currency from e_o to e_1 in Figure 4 to raise P_t (incipiently) in Figure 5 if the law of one price holds. But a rise in the price ratio creates excess demand in nontradeables as well as a trade surplus. For small economies, it is clear that, in the absence of shifts in demand or supply, the original price ratio is the only equilibrium relative price. Hence the excess demand in the non-tradeables sector serves to raise the price of non-tradeables, ensuring that its movement keeps pace with the nominal depreciation. In this situation we will observe the law of one price not only for tradeables but for non-tradeables as well. The rise in P_n in turn feeds back to the financial sector by raising the price level, shifting HH and FF up. In the new equilibrium, P_t, P_n, E and P will have all risen proportionately, while real variables remain the same.

During the adjustment process, any decline in the rate of interest that increases aggregate expenditure has the effect of shifting out the D_t and D_n curves, thereby adding to the disequilibrium in the non-tradeables sector, while reducing the trade surplus. That same transitional decline in the interest rate can, however, also cause both the exchange rate and tradeables prices to "overshoot" their ultimate equilibrium values (Dornbusch (1976), Kouri (1976)).

The importance of e, P_t overshooting for our purposes is that their variance over time might be greater than the variance of P_n, non-tradeables prices. This difference in variance might be expected especially in an economy with floating exchange rates and monetary "shocks" that dominate real "shocks." This in turn might explain the withdrawal of risk-averse resource owners from tradeables sectors and the reduction in trade volumes under floating exchange rates that De Grauwe and de Bellefroid seem to detect. Thus real-financial linkages that are absent in comparisons of equilibria that feature neutrality may nevertheless be present during adjustment periods or under uncertainty. Stockman's paper describes why we should not be surprised by this conclusion.

Hutchison's and Pigott's securities-financed fiscal expansion gives structural differentiation an even stronger role. Consider first an increase in government expenditure (and D) in which the entirety goes to purchase non-tradeables. The demand for non-tradeables shifts to D_n^1 in Figure 5, creating an excess demand at the initial relative price and requiring a fall in the relative price of tradeables if equilibrium in non-tradeables is to be restored.

The needed decline in the price ratio can be achieved by currency appreciation and/or a nominal price rise in non-tradeables. The fall in the relative price of tradeables is needed to liberate resources for use in non-tradeables production and to crowd out private demand for non-tradeables. As price falls in tradeables, increased private consumption of tradeables is met by imports. Hence, the budget deficit and the rise in public demand for non-tradeables leads directly to a trade deficit, matched of course by a capital-account surplus that represents the sale abroad of a portion of each

period's additional issue of government securities. What happens to internal relative prices, and relative production and consumption of the two types of goods, is in fact completely analogous to the discussion of Kravis-Lipsey's and Marston's work in Section F above. There, however, the impetus comes from supply-side shocks, whereas in Hutchison and Pigott, the impetus is from the demand side.

In the financial sector, the fiscal expansion raises the stock of domestic securities, the effect of which depends to some extent upon whether domestic money and securities are considered part of domestic wealth or whether foreign ("outside") securities are the only financial asset representing wealth. There exists considerable disagreement on this issue, as implied in Section G, but we will assume that wealth is increased at least somewhat. The rise in wealth shifts the HH and FF curves upward, hence raising the rate of interest. The IS curve in quadrant 2 of Figure 4 would also shift up in response to the fiscal expansion.

Given fixed aggregate supply (albeit change in its composition) and a fixed money stock, the overall price level P will tend to move directly with velocity, which rises due to the higher interest rate. Although it seems possible that prices of both tradeables and non-tradeables rise due to the fiscal expansion, P_n must rise more than P_t in order to bring about the required decline in equilibrium P_t/P_n. And the nominal exchange rate e must fall in this case enough to bring about the real appreciation (higher P_t/eP_t^*) that is required to generate the trade-balance deficit required. (We assume the economy is too small to affect P_t^*.)

The preceding illustrates a set of linkages between the real and financial sides of the economy due to fiscal policy. It also provides a useful insight into the efficacy of exchange market intervention.

Suppose that the authorities were dissatisfied with the required appreciation (lower e) and they attempted through exchange market intervention to reverse it. Suppose further that this was accomplished by official purchases of foreign securities added to reserves which shift the FF curve up in the first panel of Figure 4, bringing about the nominal rise in e, at least as far as the financial side of the economy is concerned. The depreciation would push up the price ratio in Figure 5 and create excess demand in the non-tradeables sector while reducing the trade deficit. This outcome cannot be sustained, however, for the relative price must fall again to restore equilibrium in non-tradeables. The ensuing rise in the price of non-tradeables would have secondary effects in the financial sector, pushing the two curves up. The upshot of the intervention policy would be a depreciation of the dollar in nominal terms, but no change in the price ratio, nor in the real exchange rate, and hence no improvement in the trade balance.

Exchange market intervention of the type discussed is a nominal or financial policy, while the trade balance deficit is a real phenomenon. Intervention fails to budge the trade balance because it has no effect on the domestic relative price.

The discussion above assumes that the fiscal policy increases purchases of non-tradeables. If by contrast, the increased government expenditure were to fall entirely on traded goods, represented by a shift in the D_t curve to D_t^1, the initial real side effect is a trade balance deficit at the original relative price $(P_t/P_n)_o$. Meanwhile, the financial sector repercussions are as before. The price relative cannot change, however, since that would break equilibrium in the non-tradeables sector. Thus, the nominal exchange rate and the price of non-tradeables must rise (or fall) together, preserving the price

relative, while the trade balance moves into deficit by an amount equal to the increase in government spending. The real exchange rate remains unaffected.

The clear lesson is that the real-financial linkages from fiscal policy are ambiguous! They depend not only on the type of differentiated asset that the government uses to finance its budget deficit, but also on the type of differentiated goods that it buys. Nominal and real exchange rates, relative prices, and several other variables ought to respond differently to fiscal policy in different economies, depending on these considerations. Therefore it is no surprise, and is in fact an important contribution, that Hutchison and Pigott find different configurations of quantitative effects for different countries in their sample.

END NOTES

[1]This prediction depends on a conception of non-tradeables as comparable goods from economy to economy, only perhaps facing prohibitive transport costs, for example, personal services such as hair styling, shoeshines, and dry cleaning. To apply the prediction to unique national non-tradeables, for example, judicial services, would be nonsense because factor requirements will obviously be themselves unique to each economy.

[2]"Competitive advantage," measured say by $\%\Delta(P_{ti}/eP^*_{ti})$, is obviously a quite different concept than "comparative advantage, measured by $(p_{ti}/p_{tj})/(p^*_{ti}/p^*_{tj})$. The two concepts are often confused.

[3]See, for example, for discussion and references, Goldstein (1984).

[4]In interpreting the two production-possibilities curves as belonging to two economies, we are adopting the conception that one economy's non-tradeables are comparable to the other's, and measuring both along the same horizontal axis -- see note 1.

[5]This particular wording is Charles Pigott's.

[6]Real wealth can be visualized in Figure 3 as the vertical distance between the points C and the horizontal axis market 0.

[7]The presence of at least one asset with a nominally fixed face value, of which money is the best example, is necessary for this conclusion.

[8]Real-financial linkages in open economies with factor-market distortions are the meat of many open-economy macroeconomic models, and receive little attention in this volume because of their familiarity. One might think of open-economy macroeconomics and this volume as describing real-financial linkages respectively on and below the production possibilities curve of Figures 2 and 3 or on and to the left of the vertical aggregate supply curve of Figure 4.

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FIGURE 1

PRICES ACROSS BORDERS AND TIME

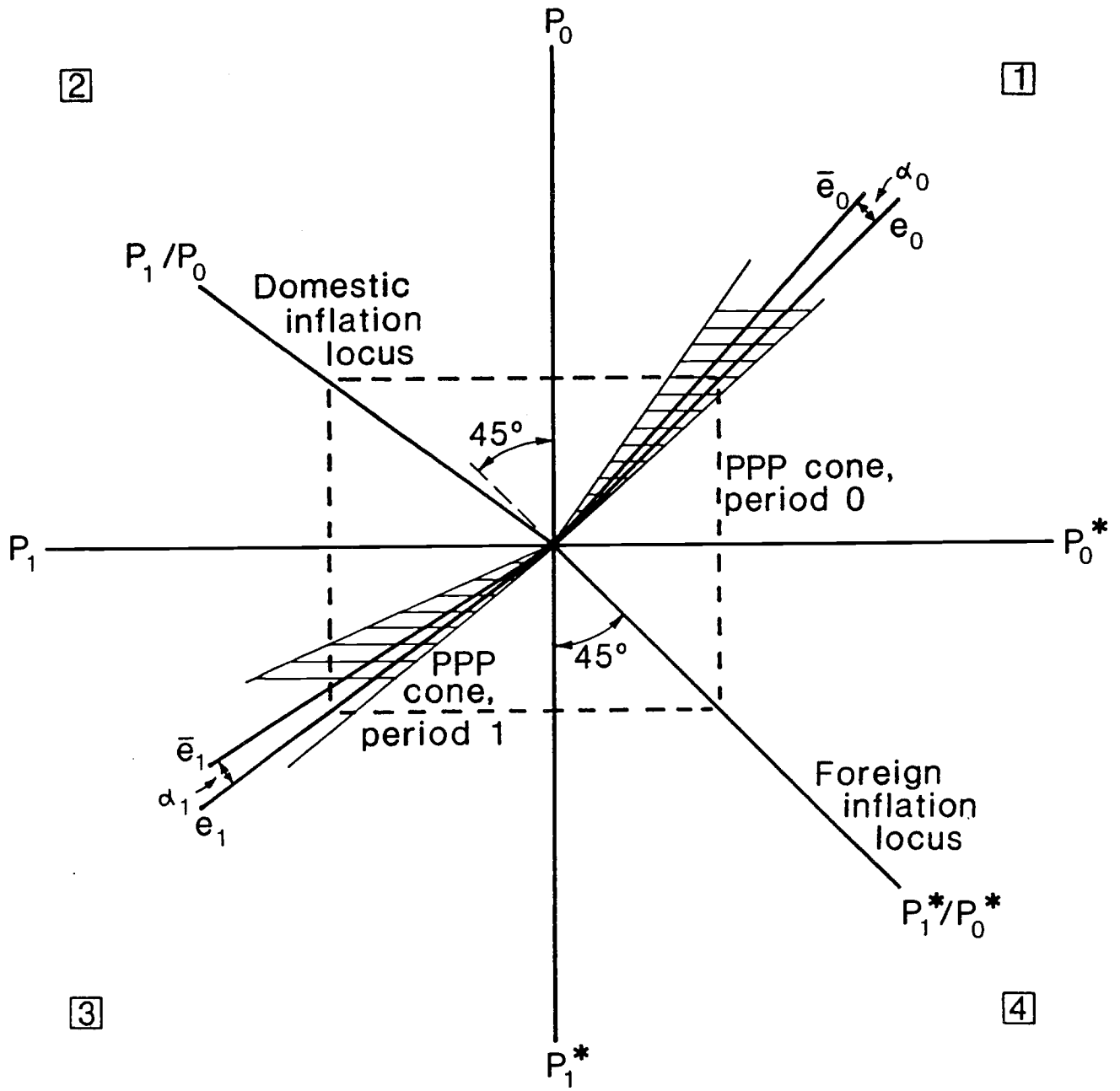

FIGURE 2

RELATIVE TRADEABLES/NON-TRADEABLES STRUCTURE

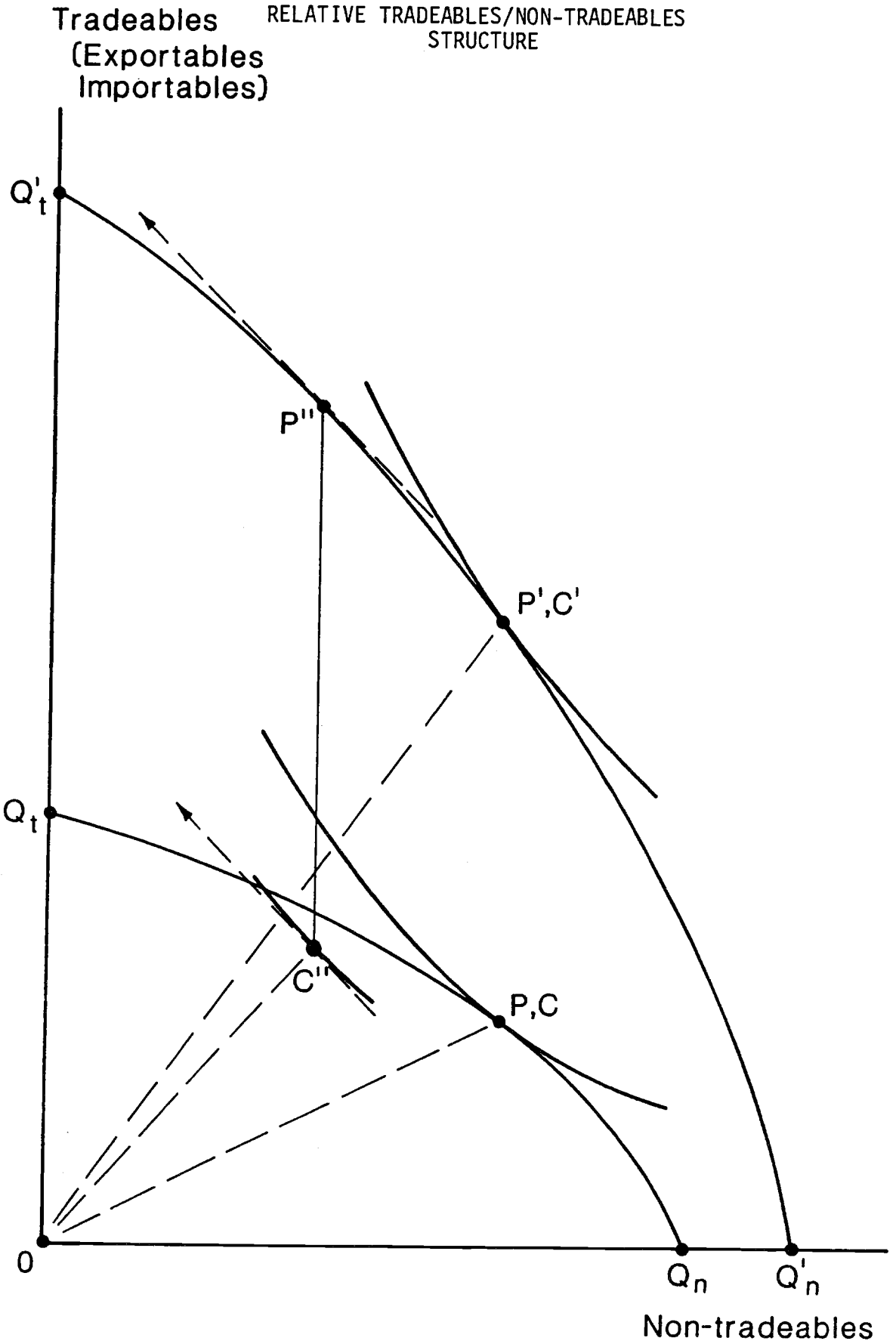

FIGURE 3

INTER-TEMPORAL TRADE

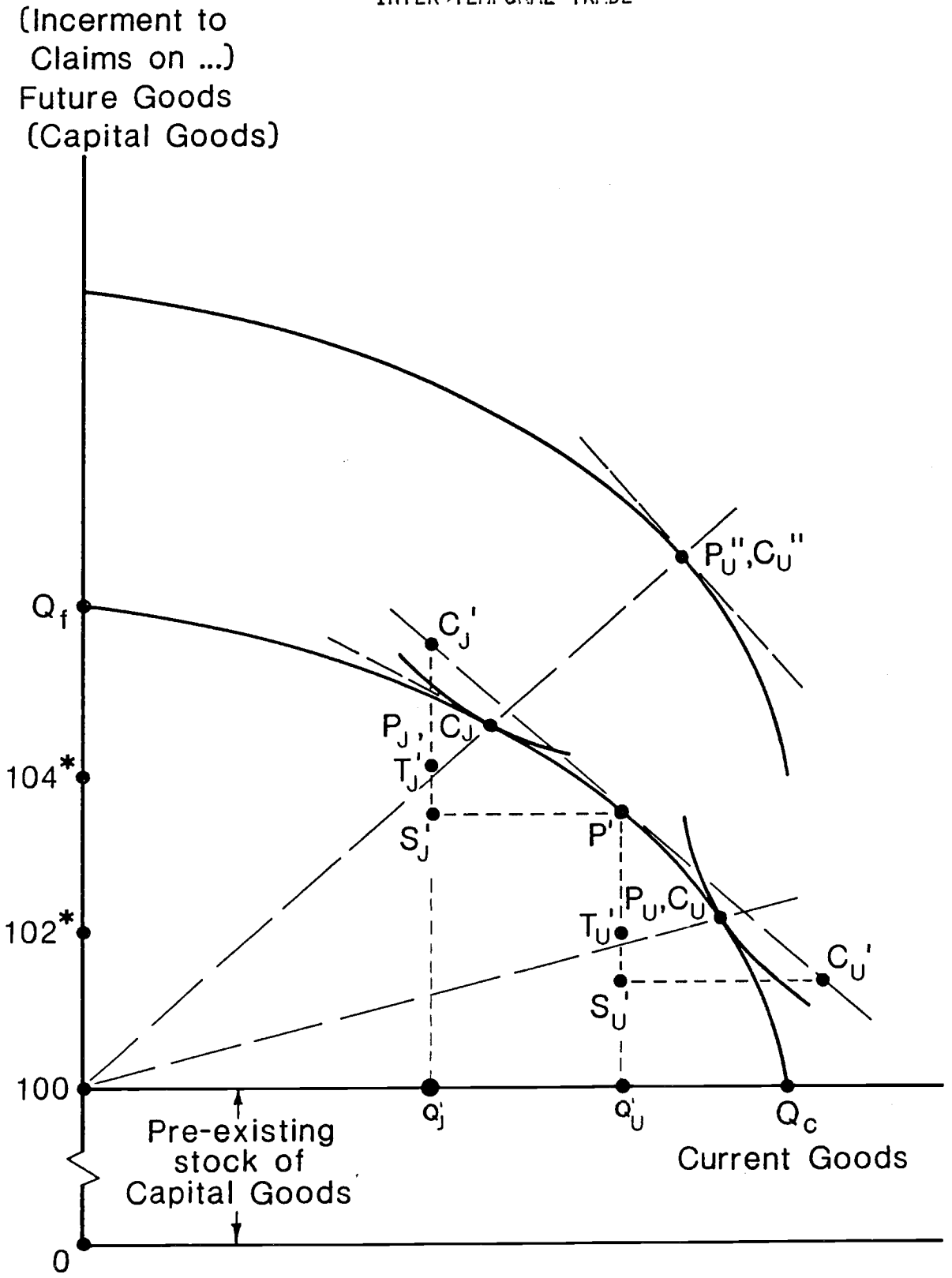

FIGURE 4

A FAMILIAR REAL-FINANCIAL MODEL

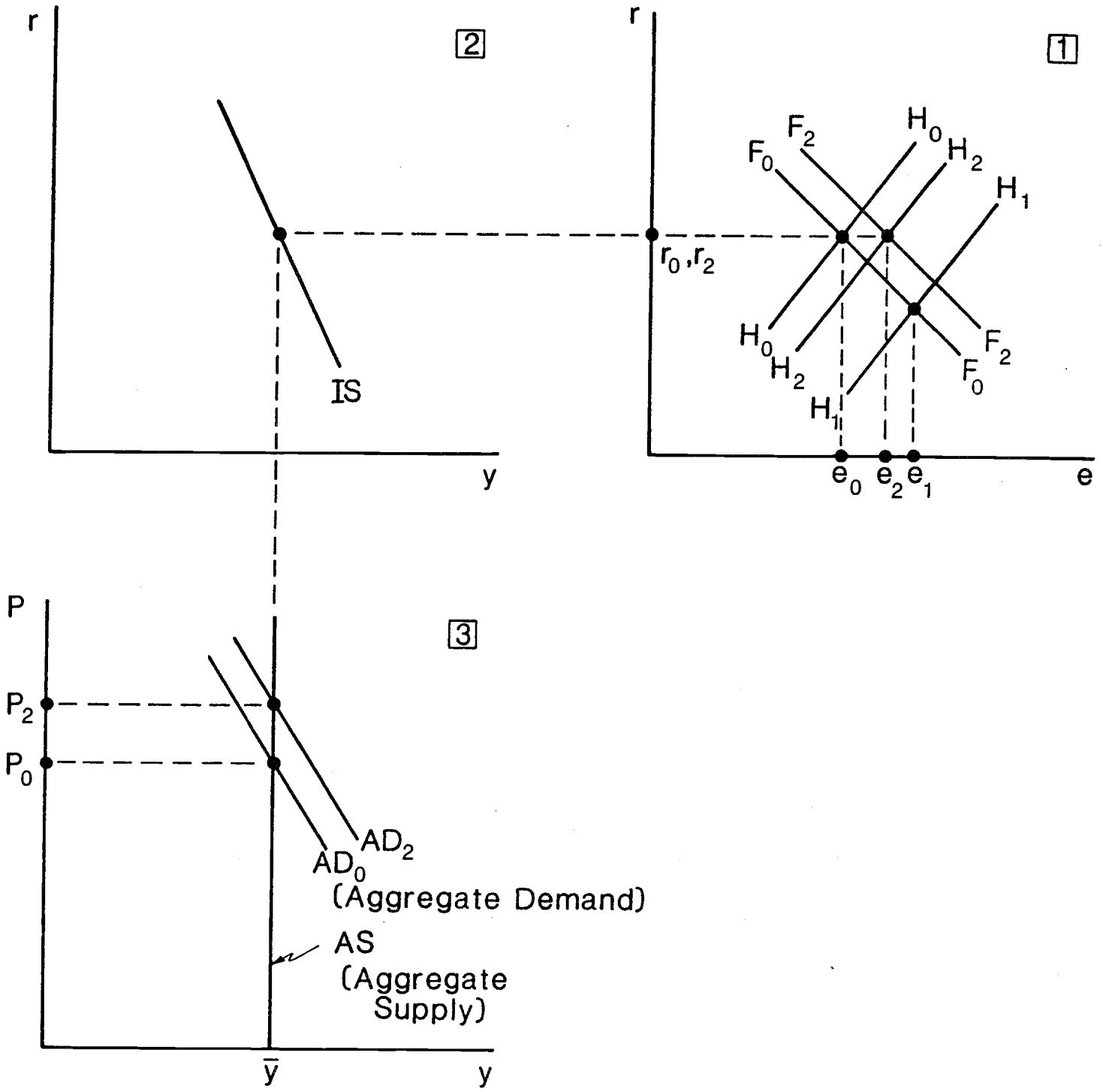

FIGURE 5

STRUCTURAL DISAGGREGATION UNDERLYING
THE FAMILIAR REAL-FINANCIAL MODEL