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INTERNATIONAL DIVERSIFICATION OF SOCIAL AND PRIVATE RISK:
THE U.S. AND JAPAN

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This paper concerns the gains from international trade in risky assets, with an application to the United States and Japan. I examine the role of international financial markets in diversifying the risks associated with the aggregate consumption opportunities of a nation (social risk) and the risks related to individual agents' consumption opportunities (private risk). The main empirical result is that international portfolio diversification between the United States and Japan leads to small reductions in social risk but large reductions in some private risks, especially for corporate profits.

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This paper concerns the gains from international trade in risky assets, with an application to the United States and Japan. I examine the role of international financial markets in diversifying social and private risks. As defined by Brainard and Dolbear (1971), social risk is the risk associated with the aggregate consumption opportunities of a nation and private risk is the risk related to individual agents' consumption opportunities. If financial markets were complete in an Arrow-Debreu sense, then all idiosyncratic private risk would be diversifiable, and social risk would be the only risk that matters. In practice, however, many assets are not traded either domestically or internationally, so that much of private risk cannot be directly diversified. In this paper I provide an empirical analysis of the extent to which international trade in risky assets can make financial markets more complete, thereby complementing recent theoretical work such as that of Svensson (1988a) and Cole (1988).[1]

The United States and Japan were chosen for a case study because of the political and media attention surrounding their bilateral economic relations. There is a popular view in the United States that international trade with Japan in both goods and assets is detrimental to U.S. national welfare. While much of the controversy has centered on trade in goods, Japanese investments in the United States have received increasing publicity. It is therefore important to assess the welfare effects of trade in financial assets for the United States and Japan.[2]

Two of the economic functions of financial markets are the separation of saving and investment and the distribution of risk.[3] There are two corresponding reasons for international trade in capital assets: intertemporal trade and international portfolio diversification. Intertemporal trade is associated with a one-way or net flow of capital in or out of a particular country, which is equal to the current account of the balance of payments of that country, since the balance of payments must sum to zero. From the familiar national income accounting identity, the current-account balance in turn can be seen as the difference between national saving and domestic investment. This perspective is consistent with the view that current-account imbalances are the result of intertemporal optimization: they enable countries with high autarky real interest rates to

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[1] I ignore the possibility that there may be social costs associated with international diversification of private risks that are not borne by the individual investor. This is connected to the problem of capital flight in developing countries, where international portfolio diversification may not always be in the national interest. For example, private access to international financial markets may limit the government's tax and macroeconomic policies. Cuddington (1986) and Alesina and Tabellini (1989) analyze some of the causes and social costs of capital flight.

[2] See Frankel (1988) for an overview of the factors determining the flow of capital from Japan to the United States.

[3] There are of course other functions, notably the provision of liquidity. For a thorough discussion see Tobin (1972), Chapters 1 and 2.

borrow from countries with lower real interest rates. Intertemporal trade enhances welfare by allowing countries to smooth consumption and by equalizing the marginal productivity of capital internationally.[4] International portfolio diversification is associated with two-way or gross capital flows. If asset returns are less than perfectly correlated across countries, agents in different countries can gain from holding claims on each other. In addition to portfolio diversification, there are other reasons for the growth of two-way capital flows, such as the role of international financial intermediation in lowering transaction costs,[5] but these will not be considered in this study.

Hamada and Iwata (1985, 1989) have analyzed the net capital flows of the U.S. and Japan, i.e., the U.S. current-account deficits and Japanese surpluses, in the 1980s. Their conclusion is that these net capital flows can be broadly understood as the outcome of differences in saving patterns between the United States and Japan. In fact, their work suggests that the real question is not why the current-account flows have been so large, but rather why they have been so small.[6] Here the focus is on the gains from trade via risk-sharing or intratemporal trade rather than from intertemporal trade, although the two are not completely separable as explained below. The distinction between the welfare effects of net and gross capital flows suggests an analogy to the real trade literature. Krugman (1981) has pointed out that intraindustry trade in differentiated products is less likely to be politically controversial than Heckscher-Ohlin interindustry trade because there are little or no adverse distributional effects associated with intraindustry trade. To some extent the same argument can be made about international portfolio diversification relative to intertemporal trade because it is not associated with politically disruptive trade imbalances, which differentially affect traded and non-traded goods sectors.

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[4]The assumption that countries can be viewed as representative rational individuals should be treated with caution, however. One can argue that the U.S. current-account deficits in the 1980s reflected a socially irrational bias towards the present induced by government dissaving. Even if this is so, however, the U.S. current-account deficits may still be beneficial--given the size of the U.S. fiscal deficit--by allowing U.S. agents to smooth consumption. On the other hand, the availability of foreign capital may have alleviated the financing constraint on the U.S. government, thereby prolonging the fiscal deficits.

[5]Golub (forthcoming 1990) discusses some conceptual issues related to gross capital flows, and provides empirical evidence on the magnitude of gross and net capital flows for OECD countries.

[6]This is related to the Feldstein and Horioka (1980) paradox that differences in national savings rates are mostly reflected in differences in national investment rates rather than current-account imbalances despite the seemingly high degree of capital mobility in the world economy. For discussion of the paradox and further results see Obstfeld (1986), Frankel (1989) or Golub (1990).

There have been numerous studies attempting to document the gains from international diversification, using the observed returns from securities markets.[7] These studies are subject to two main limitations. First, the reliance on *ex post* observed returns on foreign securities can be questioned because the behavior of returns is strongly influenced by exchange-rate fluctuations, which have proven very difficult to model and understand.[8] Even at the domestic level, the derivation of optimal portfolios deduced from the past behavior of security returns is of questionable validity. In their classic paper on the stock market Tobin and Brainard (1977) cautioned against the use of such "bootstrap" models of asset prices. They pointed out that a number of factors besides the underlying characteristics of the incomes that securities are claims to may affect observed security prices in the short run. These factors include changes in investor preferences, changes in discount rates, and speculative fads or bubbles.[9] This observation led Tobin and Brainard (1977) and Tobin (1984) to propose a "fundamentals" approach, which seeks to determine the properties of assets by examining the real factors underlying stock market prices, notably corporate earnings. Some recent applications of arbitrage pricing theory to the stock market are similar to this fundamentals approach (Chen, Roll, and Ross, 1986). Tobin and Brainard's warning against bootstrap asset-pricing models is doubly applicable for international investment, where we must reckon with fluctuations in exchange rates as well as in domestic asset prices. The second limitation of previous empirical studies is that they have concentrated exclusively on assets traded in securities markets, and ignored the important role of non-traded assets such as human capital. For example, the empirical literature has ignored the question of whether risk associated with non-traded assets can be hedged more completely with foreign tradable assets than with domestic tradable assets.

The "fundamentals" analysis of the scope for diversification of risk between the U.S. and Japan is inspired by Brainard and Dolbear's (1971) innovative analysis of the role of financial markets in diversifying consumption risks. In this regard, Brainard and Dolbear anticipated the literature on the consumption capital asset pricing model, and they provided an interesting empirical attempt to measure the extent of risk in the U.S. economy. Brainard and Dolbear's analysis is also more realistic than many subsequent empirical consumption capital asset pricing models in that they consider a wider spectrum of assets than corporate securities, and they distinguish between private

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[7]Grubel (1968) and Levy and Sarnat (1970) were early empirical studies. See Adler and Dumas (1983) for a comprehensive survey.

[8]Meese (1990) provides a survey of the state of knowledge about exchange-rate determination.

[9]Shiller (1989) contains detailed evidence in support of the argument that stock prices are driven by irrational speculative behavior in the short run.

and social risks, thereby emphasizing the importance of non-traded assets, which is ignored in models focussing on aggregate consumption.[10]

The paper is organized as follows. Section I examines the magnitude of trade in assets for the U.S. and Japan. Section II reviews the theoretical case for the gains from trade in assets as presented in the recent models of Svensson (1988a) and Cole (1988). In Section III I calculate the relevant variances and covariances and analyze the scope for gains from international portfolio diversification. The conclusion summarizes the results.

I. Net and Gross Trade in Foreign Assets for the United States and Japan

Tables 1 and 2 provide information on the outstanding gross and net external assets and liabilities for the United States and Japan in the 1980s.[11] Table 1 reveals the magnitude of gross and net international trade in all assets. Two tendencies are apparent: gross positions are increasing but in a skewed fashion reflecting the well-known net debtor status of the U.S. and net creditor position of Japan. The tendency for two-way positions to increase is particularly clear for Japan, as shown by the rise in both international assets and liabilities relative to the domestic capital stock (the numbers in parentheses). These ratios should be regarded as rough indicators because of differences in valuation and coverage of the numerator and the denominator. Foreign assets and liabilities are a mix of market values (for financial assets) and book values (for direct investment) while the capital stock is measured at replacement cost. In addition, the capital stock does not include land and other non-reproducible assets. Also, as noted in a footnote to Table 1, the Japanese capital stock is partially estimated because of the unavailability of directly comparable measures of U.S. and Japanese capital stocks. The bilateral U.S.-Japan relationship mirrors these overall patterns.[12] Relative to the size of domestic capital stocks, however, both gross and net flows remain small. The world capital market is very far from a perfectly pooled equilibrium,

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[10]See Breeden (1979) for a presentation of the consumption capital asset pricing model and Wheatley (1988) and Obstfeld (1989) for empirical applications to international finance. As Breeden points out, his model is consistent with the existence of non-traded assets, because the prices of traded assets will be a function of aggregate consumption alone. However, Breeden provides no discussion of the pricing of non-traded assets, or how their existence influences optimal portfolio behavior. See Svensson (1988b) for a theoretical treatment of optimal portfolios with non-traded assets.

[11]For additional information on the magnitude and evolution of international capital flows see Kuroyanagi and Hamada (1989) and Golub (1990).

[12]It is interesting that in 1988 the U.S. owned roughly the same small share of the Japanese net capital stock (2.4 per cent) as Japan owned of the U.S. capital stock (2.2 per cent), despite the popular fears that the Japanese are buying all of America.

unlike in Lucas' (1982) influential theoretical model; this divergence is documented and discussed in more detail in Golub (1990).

Table 2 provides more detail on the direct investment component of the international investment position of the U.S.[13] The same tendencies noted in Table 1 are evident, even at a rather fine level of disaggregation. That is, in addition to the rise in U.S foreign liabilities relative to assets, in many subsectors a clear tendency for increasing two-way holdings emerges.[14] At the end of 1988, the overall U.S. net position in direct investment was roughly balanced, although the bilateral net position with Japan was negative. The largest sectoral U.S. net debts vis-a-vis Japan are in the service sectors. This may be due to the well-known barriers to entry into the Japanese distribution system and the complementarities between Japanese investment in finance and distribution in the U.S. and the rising Japanese exports into the U.S. Table 2 focuses on trade in real assets since the emphasis in the paper is on the diversification of riskiness of claims to factors of production. Real assets include corporate equities and direct investment.[15] Under some circumstances, however, nominal assets can be close substitutes for real assets. For example, nominal assets such as bonds may have real returns that are closely correlated with equity returns if central banks peg money supplies. In this case, productivity shocks will lead to procyclical movements in nominal and real interest rates through their effects on the demand for money.[16] Under these conditions, two-way trade in nominal assets will serve the same economic function as two-way trade in real assets.

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[13]As is well known, direct investment may be severely understated by the reported positions because they are at book rather than market values. It is sometimes conjectured that the U.S. net international position is more favorable than the reported position for this reason. The change in the net U.S. external position, however, is not in doubt.

[14]These figures are nominal book values, as noted in the previous footnote. Deflation to convert to real terms would impart a downward bias since the book values are not adjusted for changes in market values or replacement costs, and therefore do not increase with inflation.

[15]Direct investment is often thought to be motivated by considerations of market structure and strategy rather than portfolio diversification. See Caves (1982) for a survey of the industrial organization perspective on direct investment. The financial and strategic perspectives are not inconsistent, however. For example, Japanese automakers may invest in plants in the United States to hedge the risks associated with U.S. commercial policy and Japanese labor market conditions. In any case, the motivation of any individual act of foreign investment is not crucial for the analysis of this paper. Here I am concerned with the degree to which such investment acts as a risk-sharing device irrespective of the initial reason for the investment.

[16]See Svensson (1989) for a model in which nominal assets may be perfect substitutes for real assets. There may also be legal, institutional, and locational factors that make home bonds closer substitutes for domestic equities than foreign equities.

II. Models of International Trade in Financial Assets

Svensson (1988a) and Cole (1988) have recently provided simple and insightful models of international trade in assets in the spirit of the consumption capital asset pricing model. Their analyses encompass both inter- and intratemporal aspects and provide a clear understanding of the gains from trade. I will use condensed versions of these models to motivate my empirical analysis.

A. Svensson's Model

Svensson explicitly draws on the literature on international trade in goods, in particular the concept of comparative advantage, to analyze the pattern of trade in risky assets. His approach is to derive autarky relative prices of assets and then infer the pattern of trade from the principle of comparative advantage. Autarky asset prices in turn are determined by a consumption capital asset pricing model in an Arrow-Debreu state preference framework. Svensson is able to analyze trade in "any arbitrary set of assets, complete or incomplete" (p. 376). In particular he considers Arrow-Debreu securities, sure indexed bonds, and equities. This is similar to the menu of assets considered nearly twenty years earlier by Brainard and Dolbear (1971).[17] The model is entirely real, so nominal assets are not considered.[18]

Svensson considers a two-period two-country model, where the period is indexed by a superscript, and a * denotes the foreign country. There are J assets and one perishable good. Exogenous output is y; y^1 is deterministic and y^2 is stochastic. The state of the world is characterized by $s = (y^2, y^{*2})$.

Assets are purchased in the first period and pay off in the second period. Let q_j be the price of asset j in terms of period 1 goods and R_j be the gross real return on asset j in period 2 goods, which in general is uncertain and state-dependent. A sure bond is defined as an asset that pays one unit of the good in each state of nature.[19] Let the sure bond be indexed by j=0.

(1a) $R_0 = 1.$

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[17]Svensson's model can be loosely regarded as a two-country version of Brainard and Dolbear (1971). Brainard and Dolbear did not use an explicit intertemporal setup, although they note in an unpublished footnote that their model can easily be extended to intertemporal analysis. Svensson did not consider factors of production as contingent commodities, as Brainard and Dolbear did, as he assumed a "fruit-tree" type of economy.

[18]Svensson (1989) extends his framework to encompass trade in nominal assets by using cash-in-advance constraints and considering alternative monetary policies.

[19]For a sure bond to be possible, the traded assets must span the states of nature, so that a riskless mutual fund of these assets can be formed. See Brainard and Dolbear (1971) for further discussion.

The return on equities is proportional to domestic output. Letting j=h and j=f denote the home and foreign equities respectively,

(1b) $\qquad R_h = y^2 \qquad$ and $\qquad R_f = y*^2.$

The utility functions for both countries are of the form

(2) $\qquad U(c^1) + \beta E[U(c^2)],$

where β is a subjective discount factor, which may differ between countries.

Home country net imports of goods are m, and home net imports of asset j are z_j. Consumption after trade is given by

(3a) $\qquad c^1 = y^1 + m$

(3b) $\qquad c^2 = y^2 + \sum_j R_j z_j,$

subject to the balance of payments constraint that the current and capital accounts sum to zero,

(3) $\qquad m + \sum_j q_j z_j = 0.$

Autarky Asset Prices. The first order condition, from the utility function (2), yields home autarky asset prices[20]

(4) $\qquad q_j = \dfrac{\beta E[U_c(y^2) R_j]}{U_c(y^1)} ,$

where U_c denotes the marginal utility of consumption. In particular, for the sure bond, the real interest rate r can be implicitly defined by

(5) $\qquad q_0 = \dfrac{1}{1+r} = \dfrac{\beta E[U_c(y^2)]}{U_c(y^1)} .$

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[20]Under autarky, consumption must equal output for the representative agent, so $c^1 = y^1$ and $c^2 = y^2$.

Svensson defines the autarky risk of asset j as

(6) $$\Pi_j = \frac{-\text{cov}[U_c(y^2), R_j]}{E[U_c(y^2)]} .$$

Risk is a function of the correlation of the asset return with the marginal utility of consumption in period 2. For some utility functions, e.g., those with constant absolute risk aversion (γ) and joint normal distribution of returns and period 2 output, (6) reduces to

(6a) $$\Pi_j = \gamma\text{cov}[y^2, R_j],$$

which is easier to implement empirically than (6).

Noting that $E[U_c(y^2)R_j] = E[U_c(y^2)].E[R_j] + \text{cov}[U_c(y^2), R_j]$ in equation (4), and substituting in equations (5) and (6), we get the fundamental relationship for autarky asset prices.

(7) $$q_j = \frac{E[R_j] - \Pi_j}{1+r} .$$

Autarky asset prices depend on the economy-wide real interest rate and the risk factors.

<u>Comparative Advantage and Trade</u>. Comparative advantage is determined by differences in autarky asset prices. The home country will tend to import assets whose home autarky prices exceed foreign autarky asset prices:

(8) $$\sum_j (q_j - q^*_j)z_j > 0.$$

We can now examine the sources of comparative advantage, namely differences in autarky real interest rates and risk. High autarky home real interest rates imply low domestic asset prices and a general tendency to export assets, i.e., to run a current-account deficit (m > 0). This is the net capital flow or intertemporal component of asset trade. High relative autarky real interest rates, in turn, reflect either a high discount rate on future consumption ($\beta < \beta^*$), or low relative first - period output $(\frac{y^{1*}}{E(y^{2*})} > \frac{y^1}{E(y^2)})$.

Risk characteristics are the source of two-way or gross capital flows. To focus exclusively on risk, assume that real interest rates, coefficients of absolute risk aversion, and variances of second-period output are the same in the two countries, i.e., $r = r^*$, $\gamma = \gamma^*$, and $\sigma_h^2 = \text{var}(y^2) =$

$var(y*^2) = \sigma_f{}^2$. Under these conditions, trade in assets will be determined entirely by autarky risk measures. In particular, suppose that equities are the only traded assets and assume that the conditions required for equation (6a) hold. We can immediately see that there will be two-way trade in equities. The pre-trade risk factors on the home and foreign equities are respectively, for the home consumer, Π_h, Π_f, and for the foreign consumer $\Pi*_h$, $\Pi*_f$,

(9a) $\qquad \Pi_h = \Pi*_f = \gamma cov(y^2, y^2) = \gamma\sigma_h{}^2 = \gamma\sigma_f{}^2,$

(9b) $\qquad \Pi_f = \Pi*_h = \gamma cov(y^2, y*^2) = \gamma\rho_{hf}\sigma_h\sigma_f = \gamma\rho_{hf}\sigma_f{}^2.$

Since $\rho_{hf} \le 1$ we have $\Pi_h \ge \Pi*_h$ and $\Pi_f \le \Pi*_f$.

Thus, from equation (7) the home country will have a low autarky price of the home equity and a high autarky price of the foreign equity, and the law of comparative advantage implies that the home country will import the foreign equity and export the domestic equity. In fact, in this special case, a perfectly pooled equilibrium will obtain as posited by Lucas (1982). The intuition is simple. Unless foreign and domestic outputs are perfectly positively correlated, risk can be reduced by pooling claims on output. The relaxation of the assumptions of a representative agent and homogeneous national output, which imply that all individuals within a nation have perfectly correlated and identical outputs, may weaken this result by making domestic diversification possible. This is an empirical question, which is investigated below: to what extent can intersectoral diversification make international diversification redundant?

B. Non-Traded Assets.

Cole (1988) presents a theoretical analysis of inter- and intratemporal trade in assets in a model with production, and two types of factor income, non-traded labor income and profits, which can be traded internationally via "residual securities," i.e., equities.[21] Cole shows that international diversification of equity holdings is in the interest of the home country when

(10) $\qquad$ $cov(\lambda, \pi) < cov(\lambda, \pi*),$

where λ is the domestic marginal utility of income and π and $\pi*$ are the domestic and foreign profits. A similar condition holds for the foreign country. It is likely that under portfolio autarky,

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[21] Svensson (1988b) also considers a non-traded asset in a general stochastic setting and derives the optimal portfolio shares of traded assets. This portfolio has three components: the mean-variance or tangency portfolio, the hedging portfolio for the state variable, and the hedging portfolio for the non-traded income.

inequality (10) will hold for two reasons. 1) Domestic profits are part of domestic income so there is a tendency for high profits to be associated automatically with high national income and hence low marginal utility of income, so that $cov(\lambda, \pi)$ will tend to be low. The importance of this effect depends on the share of profits in national income. 2) Domestic productivity shocks may cause positive correlation of domestic profits and labor incomes, although Cole shows that this effect depends also on endogenous labor supply decisions. International diversification is welfare-enhancing up to the point where the two sides of (10) are equal. Cole points out that if domestic labor incomes are more positively correlated with domestic profits than with foreign profits, optimal international asset exchange is greater than perfect pooling, i.e., domestic residents should hold portfolios that are biased toward foreign equities.

Here I provide a simple illustration of optimal diversification with non-traded assets. Suppose that wealth W consists of a non-tradable asset such as human capital (N), and of non-human wealth T, which can be invested in marketable domestic and foreign equities (H and F respectively). Therefore we have, for any individual or group, in either country:

(11) $\qquad W = N + T = N + H + F.$

Let $t = T/W$, the share of non-human wealth, and $h = H/T$, the share of non-human wealth invested in home equities. I assume that N is fixed and that the individual's portfolio decision is limited to the allocation of his or her non-human wealth T between the two equities.[22] That is, t is an exogenous parameter while h is the decision variable. Let the rate of return on non-tradable income be y, and the rate of return on the two equities be r_h and r_f, all of which are stochastic. Total income per unit of time I is given by

(12) $\qquad I = y.N + r_h.H + r_f.F.$

Dividing both sides by W and normalizing W to 1 we can rewrite (12) as

(12a) $\qquad I = (1-t).y + t.[h.r_h + (1-h).r_f].$

To focus on portfolio diversification, I assume that the two equities' expected returns have been equalized by intertemporal trade, so that the objective is to minimize the variance of income. We therefore seek the portfolio composition that minimizes the variance of I. Let $\sigma_y, \sigma_h, \sigma_f$ be

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[22]See Cole (1988) for the case where labor supply is endogenous.

the standard deviations of the incomes from human wealth and the two equities, respectively, and let ρ denote correlation coefficients. By computing the variance of I in terms of its components, taking the partial derivative with respect to h, and setting the resulting expression equal to zero, we obtain the minimum-variance portfolio $\hat{h}$, $1- \hat{h}$:

$$(13) \qquad \hat{h} = \frac{(1-t)\sigma_y(\sigma_f\rho_{yf} - \sigma_h\rho_{yh}) + t\sigma_f(\sigma_f - \sigma_h\rho_{hf})}{t(\sigma_h^2 + \sigma_f^2 - 2\sigma_h\sigma_f\rho_{hf})} .$$

In the special case where $\sigma_h = \sigma_f$ and $\rho_{hf} = 0$, equation (13) becomes

$$(13a) \qquad \hat{h} = \frac{(1-t)\sigma_y}{2t\sigma_h}(\rho_{yf} - \rho_{yh}) + \frac{1}{2} .$$

In words, the minimum-variance portfolio share of domestic equities $\hat{h}$ decreases with the correlation of non-traded income with the home equity (ρ_{yh}) and rises with the correlation of non-traded income with the foreign equity (ρ_{yf}), as in Cole (1988). The importance of this effect depends on the share of non-traded wealth (1-t). In the special case corresponding to equation (13a) we get a perfectly pooled equilibrium ($\hat{h} = 1 - \hat{h} = 1/2$) when $\rho_{yf} - \rho_{yh} = 0$ or t = 1. When $\rho_{yf} - \rho_{yh} < 0$, there is a bias towards foreign equities.

C. Structural Determinants of Risk

In the models reviewed above gains from portfolio diversification depend on the covariance of asset returns. In the "fundamentals approach" assets are thought of as claims to factors of production. The central question then is: what determines the variance-covariance structure of factor incomes between two countries, say the U.S. and Japan?

To address this issue, consider a neoclassical two-good two-factor world, with the two factors being labor and capital, and the two goods being cloth (labor-intensive) and machines (capital-intensive). Initially make all the assumptions of the standard Heckscher-Ohlin-Samuelson model except the one that technologies are identical.[23] For expositional purposes, suppose that Japan is relatively abundant in capital and that factor supplies are non-stochastic and in fixed supply. We can then imagine two types of shocks: technology shocks to U.S. and Japanese production functions, and shifts in world demand patterns between cloth and machines. The comparative static effects of these shocks are presented in Table 3.

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[23] Thus the framework is that of the classic article by Findlay and Grubert (1959) on technological change in the neoclassical international trade model.

A favorable factor-neutral technology shock to the U.S. export good cloth will have two offsetting effects on U.S. real national income: the rise in output versus the deterioration of the terms of trade. At unchanged terms of trade and incomplete specialization, Findlay and Grubert (1959) show that U.S. real wages will rise and real capital rental rates will fall. If, however, the terms-of-trade deterioration is large, these results for the U.S. can be reversed. This shock has unambiguous effects on Japanese incomes. Real Japanese national income will rise because of the terms of trade improvement. Given unchanged technology and incomplete specialization in Japan, the Stolper-Samuelson theorem states that the fall in the relative price of cloth will raise the real income of Japanese capital-owners and lower the real incomes of Japanese workers. Other technology shocks can be analyzed in a similar manner. A rise in the world demand for cloth relative to machines is shown in the fourth column of Table 3. The U.S. terms of trade improve, and the Stolper-Samuelson theorem again reveals the effects on factor incomes in the two countries.

The simple neoclassical framework can be extended in a variety of directions, some of which are illustrated in Table 3. For example, if cloth and machines are differentiated products such that Japanese goods are imperfect substitutes for U.S. goods, one can consider intra-industry trade. Under the additional assumption that each country has a higher marginal propensity to consume home goods, national demand shocks will affect the terms of trade as shown. A rise in world demand for U.S. relative to Japanese goods, occasioned for example by an increase in U.S. relative to Japanese wealth, will tend to raise all real factor incomes in the U.S. by raising the prices of both U.S. cloth and U.S. machines relative to their Japanese counterparts, and thereby improving U.S. terms of trade. Another extension is to add oil as an imported intermediate input. Assuming that both the U.S. and Japan are net oil importers and that there are no asymmetric complementarities between oil and the two factors labor and capital, the results shown in the third column of Table 3 would obtain from a world-wide decline in oil prices. Other shocks can also be considered as one moves away from the assumptions of the standard neoclassical model. If factor markets are characterized by imperfections such as wage rigidity, shocks may emanate from changes in union power, minimum wages, and macroeconomic policies. Labor market distortions may interact with other shocks to induce patterns other than those depicted in Table 3. For example, with real wage rigidity an oil price rise may lead to a sharp decline in profitability.

Knowing the effects of alternative types of shocks, such as those shown in Table 3, and the joint probability distribution of those shocks, one could infer the *ex ante* covariance structure of factor incomes. In practice this is a difficult task and will not be attempted here, but the classification of shocks in Table 3 can be helpful in interpreting the empirical results reported below.

Cole and Obstfeld (1989) have argued that the limited degree of actual international diversification may reflect the small benefit it offers. Diversification may be redundant because endogenous terms-of-trade fluctuations tend to pool the risks associated with country-specific productivity shocks. If the home country experiences a favorable productivity shock, the associated increase in domestic output will depress the home terms of trade, dampening or even offsetting the rise in home relative to foreign real income. This argument can be readily tested by examining the correlation between output and the terms of trade, although Cole and Obstfeld do not present any such tests. In the U.S.-Japan case there is no support for their hypothesis: the correlation between the bilateral real exchange rate and the log of the ratio of U.S. to Japanese real net national outputs is strongly positive, not negative as conjectured by Cole and Obstfeld.[24] This finding may reflect the fact that Cole and Obstfeld confined their analysis to productivity shocks in a world of complete specialization and full price flexibility; they ignored demand-side and oil-price shocks such as those discussed above.[25]

III. Empirical Findings

A. Methods and Data

The approach here is adapted from Brainard and Dolbear (1971), who viewed claims to factor incomes as assets and calculated the variance-covariance matrix of these incomes to determine the possibility for reducing private and social risk in the U.S. The scope for risk reduction by pooling risks internationally is assessed here by examining covariances between real factor incomes both within and across nations. The question is whether internationalization increases the completeness of financial markets.

Data were obtained from OECD National Accounts on net national income and its components for the U.S. and Japan over the 1970-1987 period. The disaggregation is by type of factor and by sector. Factor incomes are classified as compensation of employees and operating surplus.[26] For economy-wide data, operating surplus is further decomposed into corporate and

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[24]For non-adjusted outputs, the correlation is +0.60 and for detrended outputs the correlation is +0.34. The real exchange rate is defined as the US GNP deflator divided by the dollar value of the Japanese GNP deflator.

[25]Cole and Obstfeld do recognize the importance of their complete specialization assumption but provide no discussion of other types of shocks.

[26] The OECD defines operating surplus as "gross output of producers values less the sum of intermediate consumption, compensation of employees, consumption of fixed capital and indirect taxes net of subsidies." Operating surplus is thus close but not identical to capital income since it includes entrepreneurial and land income.

non-corporate, but this disaggregation is not available by sector. Operating surplus is close but not identical to capital income since it includes entrepreneurial and land income. The sectors of the economy considered here are agriculture, total manufacturing, textiles, chemicals, base metals, fabricated metals and machinery, construction, wholesale trade, and finance. I used this sectoral approach because, as Table 2 shows, there is two-way asset trade at a similar level of disaggregation and sectoral incomes may carry undiversified private risk due to the absence of domestic markets for pooling risks of labor income.

All U.S. and Japanese data were deflated by the respective GNP deflator and sector-specific employment. It might have been preferable to deflate operating surplus by capital stock, but sector-specific capital stock data are not available in the OECD National Accounts.

Even after deflating real incomes by employment, it appeared that the data were non-stationary with a general upward trend in all series. The analysis of non-stationary macroeconomic time series is the subject of current controversies.[27] In view of the difficulty of determining whether the general rise over time of macroeconomic variables is due to deterministic or stochastic trends, two approaches to stationarity were attempted: detrending and differencing. Detrending is appropriate if shocks are transitory fluctuations around a deterministic trend, while differencing is appropriate if shocks are permanent, for example if the stochastic process in question is a random walk with drift. First, all the major components of national income for each country were detrended. The sectoral data were then detrended using the economy-wide trends. For example, compensation of employees in U.S. textiles was detrended by using the trend rate of growth of compensation of employees for the aggregate U.S. economy. It may be surprising that operating surplus exhibited a trend, as one would expect that profit rates are stationary. This may reflect several influences. Capital stocks grew relative to labor employment, but as noted above, I used employment to deflate operating surplus because of the unavailability of sector-specific capital stock data. Also, operating surplus contains entrepreneurial and land income.[28]

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[27]Many macroeconomists have come to believe that macroeconomic variables are characterized by stochastic rather than deterministic trends, which implies that first-differencing rather than detrending is the appropriate method of adjusting for non-stationarity. See Stock and Watson (1988) for a survey of this research. Recently, however, Perron (1989) has shown that standard statistical tests may fail to reject unit roots for series with deterministic trends when there are infrequent changes in the means of the distribution. In view of the slowdown of productivity growth throughout the world beginning about 1970, detrending over the sample period 1970-1988 may be a reasonable approach. Also, Sims (1988, p.465) argues that "there is no justification for preliminary differencing or application of cointegration transformations in the belief that these steps are necessary to allow use of the usual statistical tests" and calls for a Bayesian approach instead. Such a Bayesian perspective is certainly consistent with a one-time change in trend productivity growth around 1970. Phillips (1990), however, takes issue with Sims.

[28]The computed trends were as follows, in annual percentage growth rates: US compensation of employees (0.7%), US corporate operating surplus (1.5%), US noncorporate operating surplus (1.9%), Japanese compensation of employees (5.0%), Japanese corporate operating surplus (1.6%),

If variables have stochastic trends or "unit roots," differencing is appropriate. But year-to-year changes in income are probably not the risk that concern most people, since they are more likely to care about the levels of or sustained changes in incomes. Hence, yearly first differences may not be very informative for the purposes of this paper. I therefore tried overlapping three-year differences, as well as yearly first differences.

More formally, we can characterize the two approaches as follows. If macroeconomic variables follow deterministic trends, then the time series of the logarithms of foreign and domestic incomes (y_t, y_t^*) can be written as a function of time t and a stationary stochastic process z_t,

(14a) $y_t = a + bt + z_t$

(14b) $y^*_t = a^* + b^*t + z^*_t.$

We then calculate our risk measure $\Pi_{y,y^*} = \text{cov}(z_t, z^*_t)$.[29] Alternatively, if y_t and y^*_t have stochastic trends and $w_{t,n}$ and $w^*_{t,n}$ are stationary processes, taking n-year differences gives,

(15a) $y_t = c + y_{t-n} + w_{t,n}$

(15b) $y^*_t = c^* + y^*_{t-n} + w^*_{t,n},$

and our risk measure is $\Pi_{y,y^*} = \text{cov}(w_{t,n}, w^*_{t,n})$.

Perhaps more realistic than either equations (14) or (15) is the view proposed by Perron (1989, p. 1387) whereby macroeconomic variables fluctuate around a deterministic trend for extended periods but with infrequent structural changes in the trend. The assumption of a stable trend over the 1970-1987 sample period, however, accords with Perron's findings and with conventional wisdom, as noted earlier.[30]

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and Japanese non-corporate operating surplus (0.0%). It is interesting to note that the corporate operating surpluses had nearly identical trends in the two countries, which is consistent with corporate profits being tradable assets.

[29]In general z_t and w_t will not be white noise, so one could attempt to extract the white noise shocks through ARIMA models. But since we are interested in the covariances of incomes across countries rather than their autocovariances, this approach seems unnecessary here.

[30]Perron proposes the following model: $y_t = n_t + z_t$, $n_t = a_t + b_t t$. There are two kinds of uncertainty for y_t: fluctuations around a trend n_t, and fluctuations in the parameters of that trend (a_t, b_t). In this paper, analysis is confined to the former. A limitation of this approach is that the greatest social risks may be associated with those infrequent structural changes rather than with fluctuations around stable trends. It would be interesting to examine the correlations of structural breaks across countries. Unfortunately, the infrequent occurrences of such structural breaks renders statistical analysis difficult.

B. Calculations of Income Correlations and Volatility

In this section correlations and measures of volatility of factor incomes are presented for the 1970-1987 sample period. The correlations will then be used in the following section to compute optimal "fundamental" portfolios. I am therefore using *ex post* observations to infer the statistical properties of the various time series. It would be preferable to know the *ex ante* covariance structure of incomes, but such information is of course unavailable.

The results for both detrended and differenced variables are shown in Table 4 for broad aggregate components of net national income of the two countries: Part A shows detrended results while B shows the results using three-year differences. It is reassuring that the two alternative methods of inducing stationarity do not yield very different structures of covariances and variability. In many cases, the correlations are nearly identical, and in the remainder they are quite similar.[31] Some partial exceptions are the correlations of U.S. corporate operating surplus with Japanese corporate and non-corporate operating surpluses. Note, however, that for detrending and differencing the correlations of U.S. and Japanese corporate incomes are quite low (-.22 and .22 respectively), which is important for the computation of optimal portfolios carried out below. The standard deviation of each variable is on the diagonal of Table 4, divided by the respective mean in the case of detrending.

The degree of social risk, as measured by the variability of national income, is quite small (.03 for the U.S. and .02 for Japan for deviations around trend) while there is a large but much less than unitary correlation between the two countries' national incomes. These two facts suggest that international diversification could reduce social risk even if domestic financial markets were complete, but the gains would be limited. This calculation may understate social risk by using actual yearly employment rather than trend employment to divide factor incomes since using actual employment effectively disregards social risk associated with fluctuations in total employment. Dividing by trend rather than actual employment, however, does not dramatically raise social risk. U.S. social risk rises to .04 and Japanese social risk is barely affected. In other words, during the sample period most of U.S. and Japanese social risk was attributable to fluctuations in factor incomes per person employed rather than to variations in total employment.

There is substantially more variation in private risk between the two countries, especially that associated with non-labor incomes, which is relevant in view of the absence of complete markets. Japanese corporate income is twice as volatile as U.S. corporate income, a fact which is important

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[31]One year differences were also tried, and again the structure of covariances was quite similar to the detrended covariances.

for understanding the optimally-diversified portfolios discussed below. On the other hand, U.S. non-corporate business income is much more variable than its Japanese counterpart.

Tables 5 and and 6 provide information on the risk associated with particular industries. Here I have used detrending to induce stationarity because some of the sectoral operating surpluses are negative, which renders percentage changes or logarithms meaningless. Table 5A indicates that most U.S. industries' net incomes are quite highly correlated with aggregate U.S. income and less so with Japanese national income. This suggests potential U.S. benefits from international diversification, over and above those available from intersectoral diversification. The two exceptions are agriculture and base metals manufacturing. The table also shows that some U.S. sectoral incomes are closely correlated with their counterparts in Japan, notably agriculture and services. U.S. manufacturing, with the exception of base metals, exhibits a low correlation with Japanese manufacturing, perhaps reflecting competition between U.S. and Japanese industries in the world market. Table 5B indicates that Japanese sectoral incomes are on average slightly more positively correlated with aggregate U.S. income than aggregate Japanese national income. This surprising result may reflect the importance of the U.S. market for Japanese industry. This interpretation is consistent with the exception of agriculture, which has been highly protected in Japan and therefore more insulated from international influences.

Table 6 presents the same type of information as Table 5 except that it focuses on non-labor incomes (operating surplus). Here the benefits of international relative to domestic diversification are apparent in the form of the low and sometimes negative correlations between the two countries, corroborating the results reported in Table 4. United States sectoral operating surpluses are for the most part quite highly correlated with aggregate U.S. operating surplus and in most cases negatively correlated with aggregate Japanese operating surplus. In the case of Japan the results are more mixed, but the average correlation of Japanese sectoral surpluses with Japanese aggregate operating surplus is greater than with U.S. operating surplus. Also note the high coefficients of variation for operating surplus, which imply that the gains from both international and intersectoral diversification are likely to be substantial.

C. Analysis and Discussion

In the following discussion I assume that claims to the income of the corporate sector are the only tradable assets, domestically and internationally. These claims take the form of corporate equities. Certainly, claims to labor, small business, and professional income are much less liquid than claims to corporate earnings traded on organized equity markets. Non-tradable labor and non-corporate business income can, however, be hedged through holdings of corporate equities. The question then is whether foreign corporate income or domestic corporate income is a better hedge against risk of non-traded income.

A cursory look at Table 4 suggests there is scope for reducing private risk through international portfolio diversification for both countries' corporate sectors and U.S. labor income. For the 1970-1987 sample period U.S. labor incomes are more correlated with domestic corporate profits than foreign corporate profits, especially when the data are detrended. This is not so for Japan, however. There is a strong negative correlation between Japanese labor incomes and Japanese corporate profits, which indicates that domestic corporate equities could be an excellent hedge for Japanese workers. On the other hand, as noted above, Japanese corporate income is twice as variable as U.S. corporate income. No strong international diversification motive for the non-corporate business sector is evident either for the U.S. or Japan, as these incomes are more highly correlated with foreign corporate incomes than with domestic corporate incomes. On the other hand, clear gains from international diversification for corporate income appear. Using detrended data, U.S. and Japanese profits are actually negatively correlated, while the calculations with three-year differences show a small positive correlation. Tables 5 and 6, as noted above, also indicate that there is scope for reducing risk of sector-specific income through international diversification over and above that available from intersectoral diversification, especially for the United States.

It may be of interest to speculate on the nature of the shocks that underlie the correlations in Tables 4-6. The positive correlation among the components of U.S. income, across both sectors and factors, suggests that aggregate demand shocks, perhaps arising from macroeconomic policies, were important. The negative correlation between Japanese corporate and labor incomes may be due to sector-specific technology or demand shocks, as analyzed above (see Table 3). This hypothesis is also consistent with the low correlation of Japanese sectoral incomes with Japanese national income. The reactions to oil price shocks may also be important. The positive correlation between U.S. and Japanese aggregate national incomes is consistent with the impact of oil shocks. The nature of labor-market adjustments to oil shocks may also help explain the Japanese patterns.[32]

Tables 4-6 can be used to calculate minimum variance portfolios of US and Japanese equities using equation (13), which is repeated here for convenience.

$$(13) \qquad \hat{h} = \frac{(1-t)\sigma_y(\sigma_f \rho_{yf} - \sigma_h \rho_{yh}) + t\sigma_f(\sigma_f - \sigma_h \rho_{hf})}{t(\sigma_h^2 + \sigma_f^2 - 2\sigma_h \sigma_f \rho_{hf})}.$$

[32]See Bruno and Sachs (1985) for a comparative study of the OECD responses to the macroeconomic shocks of the 1970s. In Japan, the first oil-price shock led to increases in real product wages and a sharp fall in profits while the second oil shock was accommodated by a fall in real product wages and stable profits.

Suppose that there are three types of agents corresponding to each of the three types of income in Table 4: workers, small businesses, and capitalists, whose main assets are respectively their holdings of human capital, non-corporate capital, and corporate capital. Workers and small businesses may hold some corporate equities. Table 4 contains all the pertinent information for the calculations except the ratios of tradable (non-human) wealth to total wealth t. In choosing values for t, I assumed that the value of workers' tradable assets relative to the capitalized value of their expected labor income is low. For the non-corporate sector (small business) this ratio is assumed to be higher, but still no greater than 0.5. All corporate assets are assumed to be tradable. For labor and non-corporate business two alternative values of t were used to illustrate the sensitivity of the minimum-variance portfolios to these assumptions.

Table 7 reports the minimum-variance portfolios for various agents based on the statistical properties of both the detrended and three-year differenced factor incomes reported in Table 4. Because of the similarity of the data in Tables 4A and 4B, the minimum variance portfolios in the cases of detrending and differencing in Tables 7A and 7B are also very similar. The results in Table 7 confirm that international diversification can reduce risk for U.S. labor and for both countries' capitalists. Perhaps more suprisingly, the minimum-variance portfolio for Japanese small businesses includes a large share of U.S. equities, which rises as their tradable wealth increases. Japanese equities are better hedges for Japanese non-corporate income than U.S. equities, but the variability of Japanese equities is higher. For Japanese labor income, the superior hedging properties of Japanese equities and the assumption that workers have small holdings of tradable assets ensures that Japanese workers hold more than 100 per cent of their wealth in Japanese equities, i.e., they would sell U.S. equities short if this were feasible, to minimize risk. Similarly, U.S. small business would minimize risk by short-selling Japanese equities, which reflects both the low correlation of U.S. non-corporate income with U.S. corporate earnings and the low variability of U.S. corporate income.

Under the assumption that corporate income is fully tradable, the minimum-variance portfolios for U.S. and Japanese investors are identical. The high share of U.S. equities in the minimum-variance portfolio is due to its lower variability. Nevertheless, both equities are held because of the low correlation between U.S. and Japanese income.

These calculations are meant to be suggestive rather than conclusive. I focus on only two countries and a limited period in time. But the computation of optimal pooling of assets between the U.S. and Japan does bring out the factors that determine the gains from international portfolio diversification.

Lucas' (1982) perfectly pooled equilibrium seems to be a reasonable first approximation to the minimum-variance portfolio for corporate incomes. U.S. labor, Japanese labor, and Japanese

non-corporate business can also lower risk by holding foreign assets, to a degree which varies with the assumed ratios of human to non-human wealth. The low correlation of corporate incomes observed in Tables 4 and 6 imply that in the absence of transactions costs, which have been ignored in this analysis, we should observe far more international pooling of risks between the U.S. and Japan than that reported in Tables 1 and 2 and in Golub (1990). It was argued above that Cole and Obstfeld's (1989) hypothesis that terms-of-trade fluctuations may obviate the gains from asset trade appears unsupported, at least for the United States and Japan. Cole and Obstfeld considered only technology shocks, but other kinds of shocks appear to have been important in the U.S.-Japan case. The bilateral terms of trade and relative output exhibit a strong positive correlation rather than the negative correlation assumed by Cole and Obstfeld. It would be desirable to examine the sensitivity of these findings to the choice of countries and time periods.

Given the case for gains from two-way trade in assets suggested by the results in this paper, why does actual international portfolio diversification fall so far short of perfect pooling? The limited magnitude of two-way trade in financial assets may reflect subtle political, psychological, and institutional barriers to trade that are often ignored in theoretical analyses. As Tobin (1982, p. 120) has noted,

> Home currency preference is probably due less to mean-variance calculus than to other dimensions of asset choice. Among these are that (1) information is more complete and less costly for home currency assets; (2) transactions costs, including not only costs of purchases and sales and currency conversions but also tax and legal complications, actual and contingent, are higher for foreign assets; and (3) foreign investments by institutions and intermediaries--savings banks, mutual funds, trusts,and pension funds--are legally restricted.

These remarks about home currency preferences also apply to geographical and political preferences. Indeed, there is evidence that equity markets remain partially segmented by differential transactions costs.[33] The gradual increase in the extent of international portfolio diversification in recent years, discussed in Section I, is consistent with the liberalization of government barriers to international capital flows and reductions in transactions costs.

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[33] The New York Times (Jonathan Fuerbringer, "Beware These A.D.R. Pitfalls," April 29, 1990, p. F15) reports that American Depository Receipts, "one of the easiest ways for Americans to invest in foreign stock markets," are subject to substantial transactions and informational costs. The article cites the example of Makita Electric, which "closed at $78.3 a share at home, but its A.D.R. was quoted by Nomura Securities at $79.25," and notes that "investors can have trouble selling [A.D.R.s] or getting information on the company whose stock they represent."

Conclusions

Two-way or gross capital flows increased markedly in the 1980s, although international portfolio diversification remains well short of perfect pooling for the United States and Japan. In this paper I have examined the fundamental sources of gains from international portfolio diversification, with an application to the U.S. and Japan. The fundamentals here consist of the variability of national income (social risk) and its components (private risk). The argument for using a "fundamentals" approach as opposed to the traditional method of looking directly at the covariances of asset prices is that the latter may be difficult to interpret if asset demands are not stable in the short run. In the long run, asset prices surely reflect fundamental factors, but they may be dominated in the short run by changes in discount rates, fads, and speculative bubbles, particularly in the case of exchange rates. The approach of this paper also has the advantage, relative to the usual consumption capital asset pricing models, that it emphasizes the distinction between social and private risk, which may be important when financial markets are incomplete. Fluctuations in aggregate consumption may be uninformative about the risks faced by individuals when claims to labor, professional, and small business incomes are not tradable. If so, the relevant question is the extent to which international trading in financial assets, particularly corporate equities, provides an indirect means of hedging private risks.

The results reported in Tables 4-6 are consistent with international diversification leading to small reductions in social risk but large reductions in some private risks, especially for corporate earnings. Corporate earnings are quite variable and characterized by low or negative correlation between the United States and Japan over the 1970-1987 sample period. This demonstration of the gains from international portfolio diversification, along with the reduction in transactions and information costs made possible by new technologies and liberalization of capital controls, may help to explain the rising two-way trade in capital assets, documented in Section I and in Golub (1990). Despite this tendency towards greater internationalization, the small size of foreign assets and liabilities relative to domestic asset stocks indicates that there are remaining institutional or psychological barriers to international investment.

The theoretical and empirical arguments presented in this paper support the view that two-way capital flows are a source of mutual gain, providing additional evidence against the popular view that international trade in both goods and assets is a manifestation of a power struggle between the United States and Japan. In this sense the paper complements the work of Hamada and Iwata (1985, 1989), which shows that the U.S. current-account deficits and Japanese surpluses of the 1980s can be fully understood as reflecting differences in intertemporal choices rather than predatory behavior. Both intertemporal trade and international portfolio diversification are important for understanding the pattern of capital flows between the United States and Japan.

Future empirical research should extend the fundamentals approach to international portfolio diversification to other countries and time periods. Increasing the number of countries would enable computation of global minimum-variance portfolios derived from *ex post* fundamentals, analogous to the optimal portfolios obtained by using *ex post* observed security returns. Further research should also attempt to uncover the underlying sources of the covariance matrix of incomes, i.e., the nature and effects of the technology, demand, and input-price shocks. A factor-analytic approach might be useful if the appropriate factors can be identified and measured. Candidates include oil prices, world economic output, changes in the structure of international trade and production, taxation, and commercial policies.

It would be interesting to apply the analytical framework of this paper to the problem of capital flight in developing countries. I have ignored the possibility that there may be social costs associated with international diversification of private risks that are not borne by the individual investor. In the case of developed countries, tax evasion and secrecy are probably not the main reasons for international diversification, but they may be in developing countries characterized by high income inequality and acute social conflicts, as in Latin America. If so, the reduction in private risks afforded by unrestricted freedom of capital movements may raise social risk in Latin America. Such an assessment requires a close analysis of the costs and benefits of international capital mobility in a setting that captures the particular institutional and political environment of Latin America. By contrast, for the reasons analyzed in this paper, long-term international portfolio diversification between developed countries such as the U.S. and Japan is very likely to reduce both private and social risk.

References

Adler, Michael, and Bernard Dumas, "International Portfolio Choice and Corporation Finance: A Survey," Journal of Finance, June 1983, 38, 925-984.

Alesina, Alberto, and Guido Tabellini, "External Debt, Capital Flight and Political Risk," Journal of International Economics, November 1989, 27, 199-220.

Brainard, William C. and F. T. Dolbear, "Social Risk and Financial Markets," American Economic Review, May 1971, 61, 360-370.

Breeden, Douglas T., "An Intertemporal Asset Pricing Model with Stochastic Consumption and Investment Opportunities," Journal of Financial Economics, September 1979, 7, 265-296.

Bruno, Michael and Jeffrey D.Sachs, The Economics of Worldwide Stagflation, Cambridge: Harvard University Press, 1985.

Caves, Richard E., Multinational Corporations and Economic Analysis, Cambridge: Cambridge University Press, 1982.

Chen, Nai-Fu, Richard Roll, and Stephen A. Ross, "Economic Forces and the Stock Market," Journal of Business, July 1986, 59, 383-403.

Cole, Harold L., "Financial Structure and International Trade," International Economic Review, May 1988, 29, 237-259.

Cole, Harold L. and Maurice Obstfeld, "Commodity Trade and International Risk Sharing: How Much Do Financial Markets Matter," NBER Working Paper No. 3027, July 1989.

Cuddington, John T., Capital Flight: Estimates, Issues, and Explanations, Princeton Studies in International Finance No. 58, December 1986.

Feldstein, Martin and Charles Horioka, "Domestic Saving and International Capital Flows," Economic Journal, June 1980, 90, 314-329.

Findlay Ronald and Harry Grubert, "Factor Intensities, Technological Progress, and the Terms of Trade," Oxford Economic Papers, March 1959, 11, 111-121.

Frankel, Jeffrey A., "Factors Determining the Flow of Capital from Japan to the United States," University of California, Berkeley Working Paper 8872, April 1988.

Frankel, Jeffrey A., "Quantifying International Capital Mobility in the 1980s," NBER Working Paper No. 2856, February 1989.

Golub, Stephen S., "International Capital Mobility: Net Versus Gross Stocks and Flows, Journal of International Money and Finance, 1990, forthcoming.

Goldsmith, Raymond, Comparative National Balance Sheets, Chicago: University of Chicago Press, 1985.

Grubel, Herbert G. "Internationally Diversified Portfolios: Welfare Gains and Capital Flows," American Economic Review, December 1968, 58, 1299-1314.

Hamada, Koichi and Kazumasa Iwata, "The Significance of Different Saving Ratios for the Current Account: the U.S.-Japan Case," mimeo, Yale University, October 1985.

Hamada, Koichi and Kazumasa Iwata, "On the International Pattern of Capital Ownership at the Turn of the Twenty-First Century," European Economic Review, May 1989, 33: 1055-1079.

Krugman, Paul R., "Intraindustry Specialization and the Gains from Trade," Journal of Political Economy, October 1981, 89: 959-973.

Kuroyanagi, Masaaki and Koichi Hamada, "Towards the Estimation of the World Asset and Debt Matrix," mimeo, Yale University, November 1989.

Levy, Haim, and Marshall Sarnat, "International Diversification of Investment Portfolios, American Economic Review, September 1970, 60, 668-675.

Lucas, Robert E., Jr., "Interest Rates and Currency Prices in a Two-Country World," Journal of Monetary Economics, November 1982, 10, 335-359.

Meese, Richard, "Currency Fluctuations in the Post-Bretton Woods Era," Journal of Economic Perspectives, Winter 1990, 4, 117-134.

Perron, Pierre, "The Great Crash, the Oil Price Shock and the Unit Root Hypothesis, Econometrica, November 1989, 57, 1361-1401.

Phillips, Peter C.B., "To Criticize the Critics: An Objective Bayesian Analysis of Stochastic Trends," Cowles Foundation Discussion Paper No. 950, Yale University, July 1990.

Obstfeld, Maurice, "Capital Mobility in the World Economy: Theory and Measurement," in Carnegie Conference Series on Public Policy, 1986, 24, 55-103.

Obstfeld, Maurice, "How Integrated are World Capital Markets? Some New Tests," in Debt, Stabilization and Development: Essays in Memory of Carlos Diaz-Alejandro, edited by Guillermo A. Calvo et al. Oxford: Basil Blackwell, 1989.

Shiller, Robert, Market Volatility, Cambridge: MIT Press, 1989.

Sims, Christopher A., "Bayesian Scepticism on Unit Root Econometrics," Journal of Economic Dynamics and Control, June/September 1988, 12, 463-474.

Stock, James H. and and Mark W. Watson, "Variable Trends in Economic Time Series," Journal of Economic Perspectives, Summer 1988, 2, 147-174.

Svensson, Lars E. O., "Trade in Risky Assets," American Economic Review, June 1988, 78, 375-394. (a)

Svensson, Lars E. O.,"Portfolio Choice and Asset Pricing with Non-Traded Assets," NBER Working Paper No. 2774, November 1988. (b)

Svensson Lars E.O., "Trade in Nominal Assets," Journal of International Economics, January-February 1989, 26, 1-28.

Tobin, James, National Wealth and Individual Wealth, mimeo, Yale University, 1972.

Tobin, James, "The State of Exchange-Rate Theory: Some Skeptical Observations," The International Monetary System Under Flexible Exchange Rates: Essays in Honor of Robert Triffin, edited by Richard Cooper *et al* , Cambridge: Ballinger, 1982.

Tobin, James, "A Mean-Variance Approach to Fundamental Valuations," Journal of Portfolio Management, Fall 1984.

Tobin, James and William C. Brainard, "Asset Markets and the Cost of Capital," in Economic Progress, Private Values and Public Policy: Essays in Honor of William Fellner, edited by Richard Nelson and Bela Balassa, Amsterdam: North-Holland, 1977.

Wheatley, Simon, "Some Tests of International Equity Market Integration," Journal of Financial Economics, July 1988 21, 177-212.

Table 1

Outstanding Foreign Assets and Liabilities: the U.S. and Japan
($ billion and percentage of respective capital stocks)

United States[a]

| | 1981 | | | 1988 | |
Assets	Liabilities	Net	Assets	Liabilities	Net
719.6	578.7	140.9	1253.6	1786.2	-532.5
(8.0%)	(6.5%)	(1.5%)	(9.7%)	(13.8%)	(-4.1%)

Japan[a]

| | 1981 | | | 1988 | |
Assets	Liabilities	Net	Assets	Liabilities	Net
209.3	198.3	11.0	1469.0	1178.0	292.0
(4.7%)	(4.4%)	(0.3%)	(22.6%)	(18.1%)	(4.4%)

Bilateral U.S. Position Vis-A-Vis Japan[b]

| | 1981 | | | 1988 | |
Assets	Liabilities	Net	Assets	Liabilities	Net
44.7	43.4	1.2	156.3	284.8	-125.8
(1.0%)	(0.5%)	–	(2.4%)	(2.2%)	--

[a]Numbers in parentheses express magnitudes as percentage of the domestic net capital stock (fixed reproducible tangible wealth). Japanese capital stock taken to be .50 of U.S. capital stock, based on relative GNP ratio times capital-output ratio from Goldsmith (1985, Table 16).

[b]The numbers in parentheses are U.S. assets divided by Japanese capital stock, and U.S. liabilities divided by the U.S. capital stock.

Sources: Survey of Current Business, various issues, and OECD Financial Statistics, Part II, various issues.

Table 2

Stock of United States Foreign Direct Investment
(Total and Selected Components, $ billion)

Vis-a-Vis All Countries

| Sector | 1980 | | | 1988 | | |
	Assets	Liabil.	Net	Assets	Liabil.	Net
Total	215.6	89.8	125.8	326.9	328.8	-1.9
Manufacturing	89.2	29.5	59.7	133.8	121.5	12.3
Chemicals	18.9	8.5	10.4	30.5	34.1	-3.6
Primary Metals	6.3	4.3	2.0	7.8	12.5	-4.7
Machinery	23.4	4.6	18.8	36.1	20.0	16.1
Wholesale Trade	25.8	17.7	8.1	34.4	39.8	-5.4
Banking	7.3	N.A.	N.A.	16.1	14.6	1.5
Finance[a]	27.9	17.9[b]	17.3[b]	60.6	48.7	11.9
Corporate Stocks	19.1	64.5	-45.4	62.7	198.4	-135.7

Vis-a-Vis Japan

| Sector | 1980 | | | 1988 | | |
	Assets	Liabil.	Net	Assets	Liabil.	Net
Total	6.2	6.9	-0.7	16.9	53.5	-36.6
Manufacturing	2.9	1.1	1.8	7.9	12.2	-4.3
Chemicals	0.7	0.3	0.4	2.4	1.1	1.3
Primary Metals	0.1	0.3	-0.2	0.2	2.3	-2.1
Machinery	1.3	0.3	1.0	3.5	2.5	1.0
Wholesale Trade	1.1	4.1	-3.0	3.5	18.4	-14.9
Banking	N.A.	N.A.	N.A.	0.3	3.9	-3.6
Finance[a]	0.2[b]	1.4[b]	-1.2[b]	1.3	12.9	-11.6

[a] Includes real estate and insurance, excludes banking except where noted.

[b] Includes banking.

Source: Survey of Current Business, August 1989 and August 1982.

Table 3

Determinants of the Covariance of Real Incomes:
Effects of Technology, Input Price, and Demand Shocks[a]

	Technology		Input Price	Demand	
	U.S. Cloth	U.S. Machines	Oil Price Decline	Cloth/ Machines	U.S. Goods/ Japan Goods[e]
U.S. Total Income	?[b]	+	+	+	+
U.S. Labor Income	?[b]	?[c]	+?[d]	+	+
U.S. Capital Income	?[b]	?[c]	+?[d]	-	+
Japan Tot. Income	+	?[c]	+	-	-
Japan Lab. Income	-	+	+?[d]	+	-
Japan Cap. Income	+	-	+?[d]	-	-

[a]Assumptions: U.S. is labor-abundant and cloth is labor-intensive; both countries are incompletely specialized.

[b]The effects of a positive productivity shock in cloth depends on the extent of the endogenous worsening of the U.S. terms of trade, which in turn depends on the world price elasticity of demand for cloth and the share of U.S. output in world total output. If the elasticity of demand is high and the U.S. share low, U.S. total income will rise as will U.S. labor income. U.S. capital income will fall if the U.S. produces both goods. With inelastic demands, all of the above may be reversed.

[c]Considerations similar to note b apply, except that now U.S. terms of trade improve.

[d]The effects of oil-price shocks on factor incomes depend on the rigidity of wages and the technological relationship between oil, labor, and capital.

[e]Under the assumption that U.S. and Japanese goods are imperfect substitutes.

Table 4

Correlation Coefficients and Coefficients of Variation
of Factor Incomes Between the U.S. and Japan[a,b]

A. Detrended Data[c]

	U.S. Net Nat'l Income	Japan Net Nat'l Income
U.S. Net National Income	.03	
Japan Net National Income	.44	.02

	US Labor Compens.	US Corp Op. Surplus	US Noncorp Op. Surplus	JA Labor Compens	JA Corp Op. Surplus	JA Noncor Op. Surpl
US Labor	.02					
US Corp	.50	.08				
US Non-corp	.70	.09	.14			
JA Labor	.17	.48	-.38	.05		
JA Corp	.19	-.22	.70	-.83	.16	
JA Non-corp	.57	.37	.01	.60	-.41	.06
Share of Home Net Nat'l Income	.79	.11	.10	.57	.17	.26

B. Three-Year Differences[d]

	U.S. Net Nat'l Income	Japan Net Nat'l Income
U.S. Net National Income	.04	
Japan Net National Income	.47	.03

	US Labor Compens.	US Corp Op. Surplus	US Noncorp Op. Surplus	JA Labor Compens	JA Corp Op. Surplus	JA Noncor Op. Surpl.
US Labor	.02					
US Corp	.47	.13				
US Non-corp	.63	.25	.17			
JA Labor	-.02	.13	-.30	.07		
JA Corp	.39	.22	.64	-.71	.20	
JA Non-corp	.49	-.01	-.04	.37	-.17	.08

a. All the data have been deflated by the GNP deflator and total persons employed.
b. Net national income = labor compensation + operating surplus of corporate firms + operating surplus of unincorporated firms.
c. Coefficient of variation on the diagonal.
d. Standard deviation on the diagonal.
Source: OECD National Accounts and author's computations.

Table 5

National Income By Sector

A. Correlation of U.S. income by sector with U.S. and Japanese aggregate national income, and Japanese income by sector
(Detrended)

U.S. Sector	Coefficient of Variation	Correlation with Aggregate U.S. National Income	Correlation with Aggregate Japanese National Income	Correlation with Japanese Sector Income
Agriculture	.13	.40	.65	.50
Manufacturing	.03	.57	.33	-.10
Textiles	.03	.70	-.05	.23
Chemicals	.07	.06	-.03	.25
Base Metals	.13	.19	.36	.44
Fabricated Metals	.05	.60	.31	.22
Construction	.07	.84	.23	.32
Wholesale Trade	.06	.68	.37	.80
Finance	.07	.56	.05	.89
Average Correlation		.51	.25	.39

B. Correlation of Japanese income by sector with total U.S. and Japanese aggregate national income
(Detrended)

Japanese. Sector	Coefficient of Variation	Correlation with Aggregate Japanese Net National Income	Correlation with Aggregate U.S. Net National Income
Agriculture	.14	.64	.43
Manufacturing	.04	.31	.42
Textiles	.05	.36	.36
Chemicals	.19	-.22	.39
Base Metals	.14	.36	.28
Fabricated Metals	.07	.18	.09
Construction	.08	.35	.34
Wholesale Trade	.10	.53	.65
Finance	.08	.37	.51
Average Correlation		.32	.38

Source: OECD National Accounts and author's computations.

Table 6

Operating Surplus By Sector

A. Correlation of U.S. operating surplus by sector
with U.S. and Japanese aggregate corporate operating surplus,
and Japanese operating surplus by sector
(Detrended)

U.S. Sector	Coefficient of Variation	Correlation with Aggregate U.S. Operating Surplus	Correlation with Aggregate Japanese Operating Surplus	Correlation with Japanese Sector Op Sur.
Agriculture	.20	.38	-.08	.62
Manufacturing	.20	.87	-.27	-.33
Textiles	.14	-.01	.19	-.20
Chemicals	.23	.06	.06	.33
Base Metals	1.38	.48	-.27	.30
Fabricated Metals	.45	.87	-.27	.22
Construction	.15	.14	.54	-.51
Wholesale Trade	.14	.66	-.23	.56
Finance	.16	.51	-.17	-.20
Average Correlation		.44	-.06	.09

B. Correlation of Japanese operating surplus by sector with
total U.S. and Japanese aggregate corporate operating surplus
(Detrended)

Japanese. Sector	Coefficient of Variation	Correlation with Aggregate Japanese Operating Surplus	Correlation with Aggregate U.S. Operating Surplus
Agriculture	.14	-.64	.53
Manufacturing	.10	.52	-.10
Textiles	.20	-.14	-.18
Chemicals	.39	.65	-.17
Base Metals	.27	.31	-.05
Fabricated Metals	.20	.06	.10
Construction	.22	-.42	.39
Wholesale Trade	.22	.36	.10
Finance	.05	.52	-.22
Average Correlation		.14	.04

Source: OECD National Accounts and author's computations.

Table 7

Minimum Variance Portfolios:

Optimal Shares of U.S.and Japanese Equities in Portfolios of U.S. and Japanese Agents

	High Human Wealth[a]			Low Human Wealth[b]	

A. Detrended Data

	US. Equity	Jap. Equity		U.S. Equity	Jap. Equity
U.S. Labor	0.73	0.27		0.75	0.25
US Non-Corp.	1.66	-0.66		1.14	-0.14
Japan Labor	-0.15	1.15		0.41	0.59
Japan Non-Corp.	0.40	0.60		0.60	0.40
U.S. Corporate[c]	0.76	0.24		0.76	0.24
Japan Corporate[c]	0.76	0.24		0.76	0.24

B. Three-Year Differences

	US. Equity	Jap. Equity		U.S. Equity	Jap. Equity
U.S. Labor	0.78	0.22		0.76	0.24
US Non-Corp.	1.58	-0.58		1.10	-0.10
Japan Labor	-0.22	1.22		0.39	0.41
Japan Non-Corp.	0.62	0.38		0.69	0.31
U.S. Corporate[c]	0.75	0.25		0.75	0.25
Japan Corporate[c]	0.75	0.25		0.75	0.25

[a]Human wealth as a share of total wealth = 0.8 for labor and 0.7 for non-corporate sectors.
[b]Human wealth as a share of total wealth = 0.6 for labor and 0.5 for non-corporate sectors.
[c]All wealth non-human (tradable).

Source: Table 4 and author's computations.