International Journal of Business and Economics, 2003, Vol. 2, No. 2, 97-108

Trade in Goods and Trade in Assets

André Burgstaller
Department of Economics, *Barnard College*, *Columbia University*, *U.S.A*.

Cem Karayalçin*
Department of Economics, *Florida International University*, *U.S.A*.

Abstract

A two-good, two-country intertemporal general equilibrium model of pure exchange is presented, in which whatever causes intratemporal trade also causes intertemporal trade, so that simple textbook separability fails. The framework allows financial market phenomena such as international yield arbitrage, portfolio composition shifts, and capital-flow-financed current account deficits to interact dynamically with the real phenomena of pure exchange.

Key words: intratemporal trade, intertemporal trade

JEL classification: F3

1. Introduction

In the past decade, a new policy consensus regarding the liberalization of the external sector has been emerging. According to the new view, opening a country's financial markets to the outside world, that is, allowing unrestricted trade in equities, bonds and other assets, is no less important than, and must be implemented simultaneously with, unrestricted trade in goods. This contrasts with the traditional view on the sequencing of external sector reforms, which stresses freeing transactions on current account and deemphasizes capital account convertibility (as in the IMF Articles of Agreement). The East-Asian crisis has led to a revival of the traditional view, now associated with strong scepticism about the additional benefits to be had from unrestricted trade in assets beyond those generated by free trade in goods and services (see Bhagwati (1998), Rodrik (1998), and Stiglitz (2002).

It is well known that the traditional view possesses an analytical counterpart in textbook trade theory: namely, the idea that the causes and consequences of intertemporal trade (trade in assets) are analytically separable from the causes and consequences of intratemporal trade (trade in goods). Our point of departure is to

Received October 1, 2003, revised October 9, 2003, accepted October 9, 2003.
*Correspondence to: Department of Economics, Florida International University, Miami, Florida, 33199, U. S. A., Fax: (305) 348-1524. Email: karayalc@fiu.edu.

recall, by contrast, that such separability derives from strong simplifying assumptions, as a glance at the Arrow-Debreu futures market economy (with its generalized interdependence of intra- and intertemporal prices) makes clear immediately. In other words, the presumption from general equilibrium theory must be that the case for free trade is one and indivisible. Arguments to the contrary will have to rest on violations of the theory's fundamental assumptions (for instance, regarding information distribution), on nonuniqueness of equilibria, or on special dynamic considerations--and will have to show why the case for free trade in assets is thereby impugned, yet that for free trade in goods remains unscathed.

Our purpose here is simpler and twofold: first, to provide a simple two-good, two-country intertemporal general equilibrium model of pure exchange in which whatever causes intratemporal trade also causes intertemporal trade, so that simple textbook separability fails; and second, to do so within a framework that allows financial market phenomena at the center of macroeconomic debates, such as international interest rate parity, speculative portfolio composition shifts, and capital-flow-financed current account deficits, to interact dynamically with the real phenomena of pure exchange.

To achieve the paper's first purpose we abandon the textbook assumption of fixed rates of time preference, replacing it by a particularly tractable form of endogenous time preference due to Epstein and Hynes (1983). Time preference endogeneity does not need much defense: Ever since Irving Fisher's 1907 explication of the concept in terms of modern consumer theory, it has been understood that the rate of time preference must be expected to be variable, either increasing or decreasing in wealth and intertemporal utility. For our result what is essential is that time preference not be constant (or, more precisely, exogenous); the assumption that it is increasing we merely adopt from well-known dynamic considerations.

The result of the paper, that whatever causes intratemporal trade must also cause intertemporal trade, follows simply. Consider two autarkic stationary-state exchange economies, possessing identical intertemporal preferences (consumption impatience) but differing endowment structures and/or intratemporal preferences. It follows that both (i) their autarkic relative prices and (ii) their autarkic levels of wealth and intertemporal utility must differ. The former difference will give rise to an incentive for intratemporal trade. As to the latter, the wealthier economy will exhibit higher time preference and thus a higher autarkic interest rate, sufficient to create an incentive for intertemporal trade.

The paper's result is developed within an infinite-horizon, two-good model of pure exchange that possesses the following asset-theoretic structure. Each infinitely-lived agent is an owner of a portfolio of titles to ownership ("equities"); these represent claims to exogenously given sources ("fountains") of perishable goods ("milk" and "honey"), whose flows accrue to him period after period ad infinitum. Equities are transacted in asset markets, of which there are two functionally distinct types: a stock market and a capital (or loanable-funds) market. The role of the stock market is to guarantee, via arbitrage, point-in-time *uniformity* of expected yields across given stocks of equities. The capital market helps to determine the equilibrium *level* of the uniform equity yield, that is, the equilibrium real interest rate balancing flows of desired accumulation of equity with flows of desired decumulation.

To illustrate the interaction between intra- and intertemporal trade we consider the model's response to a regime switch from autarky to free international trade. This shows that a proper gains-from-asset-trade argument has two parts. First, upon cessation of autarky countries seek instantaneous asset trades (portfolio reallocations) motivated by international equity yield differentials, a sufficient condition for which is the presence of an incentive to trade goods intratemporally. Second, given the yield uniformity established by these portfolio reallocations, a unique perfect-foresight -equilibrium trajectory of the world interest rate becomes available that balances international borrowing and lending (equity decumulation and accumulation across countries) and, for each country, raises prospective welfare above that obtaining in the absence of intertemporal trade. The ensuing capital flows will be shown to link unequally wealthy and, hence, unequally future-oriented economies, whose fundamental reason to engage in such asset trades is the presence of a static comparative advantage and a consequent incentive to trade goods.

The remainder of the paper is divided into two sections. Section 2 examines the temporary equilibrium, dynamics, and stationary state of an autarkic infinite-horizon exchange economy with endogenous time preference. Following a corresponding analysis of a two-country world that freely trades in goods and equities, section 3 discusses the consequences through time of an unanticipated regime switch from autarky to free trade.

2. Autarky

It is instructive to begin with the conventional static Walras-Marshall-Meade exchange economy, static here being taken to mean that households receive endowments, trade, consume and survive for a single period only. Consider a competitive economy consisting of a large number of identical utility-maximizing households each of which receives a one-time exogenous endowment of milk, Q^M , and honey, Q^H . Suppose their utility function is logarithmic and Cobb-Douglas,

$$U = \ln\left[(C^H)^\gamma (C^M)^{1-\gamma}\right] > 0. \tag{1}$$

By Walras's law, for the economy to be in equilibrium it is sufficient that one of its two goods markets clear, say,

$$Z^H \equiv Q^H - \gamma Y / p = 0\,,\; Y \equiv Q^M + pQ^H\,, \tag{2}$$

where Z^H is the aggregate excess supply of honey, Y endowment income, p the relative price of honey (milk is the numéraire), and where the number of households has been normalized to one. (2) yields the equilibrium price

$$p = \frac{\gamma}{1-\gamma}\tilde{Q}\,,\ \tilde{Q} \equiv \frac{Q^M}{Q^H}\,, \tag{3}$$

which is a function of preferences γ and relative endowments $\tilde{Q}$.

Next consider the same economy, but now placed in unbounded time. Households are infinitely-lived, have perfect foresight, and receive endowments of instantaneously perishable milk and honey at the exogenous flow-rates Q^M and Q^H per unit of time. It may, for concreteness, be supposed that the Q^i flow forth from a fixed number of non-produced, imperishable milk and honey fountains T^M, T^H,

$$Q^i = q^i T^i\,,\ q^i > 0\ \ (i{=}M, H) \tag{4}$$

where q^i is the constant output flow of a type-i fountain. Suppose, furthermore, that to each fountain is attached an equity which can be purchased and sold in the stock market. If the prevailing stock market prices are p^i,

$$W \equiv p^M T^M + p^H T^H\,, \tag{5}$$

will be the value of the representative household's portfolio of financial assets.

For a household to be satisfied with the current composition of its portfolio, each of the assets that constitute it must carry the same expected yield. Thus, the arbitrage (stock-market-clearing) condition

$$\rho^M \equiv \frac{\gamma^M}{p^M} + \hat{p}^M = \frac{\gamma^H}{p^H} + \hat{p}^H \equiv \rho^H\,, \tag{6}$$

must be satisfied at all points in time, where ρ^i and $\hat{p}^i = \dot{p}^i / p^i$ denote the expected yield and the expected percent capital gain on an i-type equity. The shadow rentals γ^i on fountains of milk and honey are determined from the zero-pure-profit conditions $r^M = q^M$, $r^H = pq^H$. It is useful to rewrite (6) as

$$\chi(\pi, p^M, p; \hat{\pi}) \equiv \rho^M - \rho^H \equiv \frac{1}{p^M}(q^M - \frac{pq^H}{\pi}) - \hat{\pi} = 0\,,\ \pi \equiv \frac{p^H}{\rho^M}\,, \tag{6.1}$$

where $\chi(\bullet)$ is a yield-differential function. By the perfect-foresight assumption, expected and actual capital gains will coincide, except on impact of an unanticipated perturbation.

We next turn to the representative household's problem of maximizing lifetime welfare and opt for the utility functional

$$J = \int_0^\infty -\exp\left[-\int_0^t U(\tau)\ d\tau\right] dt < 0, \tag{7}$$

where U is given by (1), now interpreted as a felicity (instantaneous utility) function. (7) was suggested by Epstein and Hynes (1983), who show that it yields the variable momentary rate of time preference

$$\Omega\left[\psi(t)\right] = U(t)\left\{1 - \frac{\psi(t) + \left[U(t)\right]^{-1}}{\psi(t)}\right\} = -1/\psi(t)\,,\ \psi(t) \equiv J\left[\Gamma(t)\right], \tag{8}$$

where $\psi(t)$ equals the value $J\left[\Gamma(t)\right]$ of an optimal stream of future consumption $\Gamma(t)$ starting at t. When the consumption path is globally constant, as in long-run equilibrium, $J\left[\Gamma(t)\right] = -1/U(\overline{C}^H, \overline{C}^M)$ and the rate of time preference reduces to

$$\Omega(\overline{\psi}) = U(\overline{C}^H, \overline{C}^M) = V(\overline{p}, \overline{E})\,, \tag{9}$$

where V(p,E) is the indirect felicity function corresponding to $U(C^H, C^M)$ and E denotes consumption spending.

The equation governing the dynamics of maximum utility is obtained by differentiating (7). This yields, after a change in the lower limit of integration from 0 to t,

$$\dot{\psi} = 1 + U(C^H, C^M)\psi\ . \tag{10}$$

The household is bound by the constraint that its discounted lifetime expenditure be no greater than its initial wealth ω (0)>0,

$$\int_0^\infty e(t)\exp\left[-\int_0^t \rho(\tau)d\tau\right]dt \leq \omega(0)\,,\ e \equiv E/T^H\,,\ \omega = W/T^H\ . \tag{11}$$

The solution of the maximization problem yields

$$\dot{e} = \left[\rho - \Omega(\psi)\right]e\,,\ c^M = (1-\gamma)e\,,\ c^H = \gamma e/p \tag{12}$$

as dynamics of optimal consumption and as the demands for the two goods.

We next consider the economy's temporary equilibrium. Unlike in the static version of the exchange economy, three flow-market-clearing conditions (for the capital market and for the two goods markets) must be fulfilled; given stock-market clearing, two of these are independent. We choose to focus on equilibrium in the markets for milk and honey,

$$z^M \equiv q^M x - (1-\gamma)e = 0\,,\ z^H \equiv q^H - \gamma e/p = 0\,,\ x \equiv T^M/T^H\,, \tag{13}$$

which are two independent equations that recursively solve for the invariant temporary-equilibrium value of consumption

$$\overline{e} = q^M x/(1-\gamma) = \overline{y} \equiv Q^H(\tilde{Q} + \overline{p})/T^H\,, \tag{14}$$

and for a corresponding price of honey $\overline{p}$ identical to static equilibrium price (3). The invariance of consumption at static endowment income evidently implies that $\dot{e} = 0$ at all times in (12), so that in autarkic temporary equilibrium the rate of interest is locked into the rate of time preference.

It is now straightforward to show that the three-dimensional dynamic system comprised of (10) and the two arbitrage-generated motions (6), (6.1) of p^M and π possesses three repeated eigenvalues equaling $\bar{\Omega} > 0$ which, since the system's state variables p^M, π, and ψ are all nonpredetermined, gives rise to a degenerate saddle point. The stationary-state-equilibrium values of p^M, π, and ψ are given by, respectively,

$$\bar{p}^M = \frac{q^M}{\bar{\rho}}, \; \bar{\pi} = \frac{\gamma}{1-\gamma} x \tag{15}$$

$$\bar{V}(\gamma, \tilde{Q}, Q^H) = \bar{\Omega} = \bar{\rho} = -\frac{1}{\bar{\psi}}, \; \bar{V}_1 = -\ln \tilde{Q} \gtrless 0 \tag{16}$$

$$\text{as } \tilde{Q} \equiv \frac{Q^M}{Q^H} \gtrless 1, \; \bar{V}_i > 0 \;\; (i = 2,3).$$

3. Free Trade

Suppose the world consists of two economies with a structure as just outlined. Under what circumstances will they have an incentive to trade with each other? How will the free-trade stationary state compare with the autarkic one? What traverse path will connect the two? We address these issues in the present section by considering the consequences of an unanticipated regime switch from autarky to free trade in both goods and equities. Though this will require a complete characterization of the integrated world economy, equation (16) by itself already allows us to make two basic points. First, whenever there is intratemporal trade (a sufficient condition for which is that the autarkic relative price p differ across countries) there will as well have to be intertemporal trade, due to an autarkic interest rate that also differs across countries. This may be seen by focusing on a stationary state and noting that the determinants γ, $\tilde{Q}$ of the relative price $\bar{p}$ [(3)] constitute two of the three determinants of the level of utility income $\bar{V}(\gamma, \tilde{Q}, Q^H)$ and, thus, of the rate of interest $\bar{\rho}$. It follows that differences in $\bar{p}(\gamma, \tilde{Q})$ across countries must, ceteris paribus, be accompanied by differences in autarkic interest rates $\bar{\rho}(\gamma, \tilde{Q}, Q^H)$. Second, unlike intratemporal trade, which is due to cross-country differences in $\bar{p}(\gamma, \tilde{Q})$ alone, intertemporal trade may in addition be occasioned by international differences in per-capita income levels Y. To see this we again focus on a stationary state and, recalling $Y \equiv Q^M + pQ^H = \bar{Y}(\gamma, \tilde{Q}, Q^H)$, note from (16) that even when intratemporal trade fails to emerge (due to internationally identical preference (γ) and relative endowment ($\tilde{Q}$) parameters) intertemporal trade will occur, provided there exist differences in absolute endowment levels Q^i and consequent differences in per-capita income($\bar{Y}$), wealth $(\bar{Y}/\bar{\rho})$, and utility $(\bar{V})$ levels. The reason is that wealthier endowment economies tend to have higher autarkic rates of time preference and interest than poorer ones.

3.1 The Integrated World Economy

The two characteristics of temporary equilibrium under free trade are, first, uniformity of expected yields across all assets, that is, international capital mobility or, equivalently, world stock market equilibrium, and, second, equilibrium in world output markets and in the world capital market.

Existing stocks of equity will be willingly held if and only if they carry globally equal expected yields, $\rho^M = \rho^H = \rho^{M*} = \rho^{H*}$ [compare (6)]. That is, the arbitrage condition

$$\frac{q^M}{p^M} + \hat{p}^M = \frac{pq^H}{p^H} + \hat{p}^H = \frac{q^{M*}}{p^{M*}} + \hat{p}^{M*} = \frac{pq^{H*}}{p^{H*}} + \hat{P}^{H*}, \tag{17}$$

must hold at each point in time, ensuring zero stock excess demand in the world stock market.

Given internationa*l capital mobility* (17), a world real rate of interest ρ is defined. This gives rise to the possibility of international *capital flows*, which are equilibrium changes over time in international investment positions. National wealth thus becomes

$$W \equiv p^M T^M + p^H T^H + F\,,\; W^* \equiv p^{M*} T^{M*} + p^{H*} T^{H*} - F \tag{18}$$

$$F \equiv \begin{cases} f(p^{M*}T^{M*} + p^{H*}T^{H*}) & \text{for } F > 0 \\ f(p^M T^M + p^H T^H) & \text{for } F < 0 \\ 0 & \text{for } F = 0 \end{cases},$$

where $F(\equiv -F^*)$ is the home country's net international investment position ($\equiv$ under autarky) and where $0 \le |f| \le 1$ is the fraction of the trading partner's real capital stock owned by home $(f > 0)$ or foreign $(f < 0)$ households.

We now turn to the second requirement for the world economy to be in temporary equilibrium: The two world output markets (one for milk and one for honey) and the world market for capital must clear. As in the autarkic economy, only two of these flow-equilibrium conditions will be independent, given (17). It is helpful to enforce output market clearing; world capital market equilibrium then obtains identically and yields the rate of equilibrium capital flows (the current account balance). Equilibrium in the world market for milk and honey requires [compare (13)]

$$z^M \equiv q^M x + q^{M*} x^* \beta - (1-\gamma)e - (1-\gamma^*)e^* = 0,\; \beta \equiv \frac{T^{H*}}{T^H} \tag{19}$$

$$z^H \equiv q^H + q^{H*}\beta - \gamma e / p - \gamma^* e^* / p = 0\,. \tag{20}$$

World capital market obtains when world saving net of capital gains is zero. Consequently, domestic saving must match foreign dissaving or, from the definition of *f* in (18),

$$\dot{f} = \left\{ q^M \left[(x+\pi) + f\theta\beta(x^* + \pi^*) \right] - e - p^M \dot{\pi} - p^M f\beta \left[\theta\dot{\pi}^* + (x^* + \pi^*)\dot{\theta} \right] \right\} / \xi \qquad (21)$$

$$\xi \equiv \left[\theta\beta p^M (x^* + \pi^*) \right], \ \theta \equiv \frac{p^{M*}}{p^M}.$$

Given yield equality (17), whenever output market equilibrium (19), (20) obtains, equation (21) will hold as an identity and provide the home country's equilibrium surplus on current account.

That the world economy's temporary equilibrium is now closed may be checked as follows. Consider the system's dynamical laws: (21) and the laws governing consumption spending ((12) and its foreign counterpart), lifetime utility ((10) and its foreign counterpart), and asset prices under (17),

$$\dot{\pi} = (1/p^M)\left[\pi q^M - p(e)q^H \right], \dot{\theta} = (1/p^M)\left[\theta q^M - q^{M*} \right], \dot{p}^M = P^M(\rho - \frac{q^M}{p^M}). \qquad (22)$$

For given f and expectations $\hat{\psi}^{(*)}$, $\hat{e}$, $\hat{\pi}^{(*)}$, $\hat{\theta}$, $\hat{p}^M$, this eight-equation system uniquely solves for the temporary-equilibrium values of the eight endogenous variables ψ, ψ^*, e, π, π^*, θ, p^M and $\dot{f}$ (thus, for p, e^*, the momentary rates of time preference Ω, Ω^*, and the rate of interest ρ).

The evolution through time of temporary equilibrium follows from the system of differential equations just outlined by appeal to the perfect-foresight postulate. It is a straightforward exercise to show that seven positive and one negative eigenvalues are involved, which, given the single predetermined variable f, renders the dynamic system saddle-path stable.

It remains to discuss the closure and properties of the stationary state. To see that it is closed, first note that (12) and its foreign analogue imply $\Omega(\psi) = \rho = \Omega^*(\psi^*)$ or, from (8), $\psi = \psi^*$. Second, $\dot{\psi} = \dot{\psi}^* = 0$ therefore yield $-1/\psi = U(e) = U^*(e)$, which allows us to solve for $\overline{e}$, thus for $\overline{\psi}^{(*)}$, consequently for $\overline{\rho}$ and, from (22), for $\overline{p}^{M(*)} = q^{M*}/\overline{\Omega}(\overline{\psi})$ and for $\overline{p}(\overline{e})$, consequently for $\overline{\pi}^{(*)} = \overline{p}(\overline{e})q^{H(*)}/q^{M(*)}$ using (22). Third, $\dot{\theta} = 0$ implies $\overline{\theta} = q^{M*}/q^M$, again from (22). Finally, given $\overline{e}$, $\overline{\pi}^{(*)}$, $\overline{\theta}$ and setting $\dot{f} = \dot{\pi}^{(*)} = \dot{\theta} = 0$ yields $\overline{f}$ from (21).

The properties of the stationary state are grasped most easily by focusing on the following three of its characteristics. First, consumption must be unchanging in each country and equal to national income,

$$\overline{e}(\overline{p}, \overline{f}) = (q^M x + \overline{p}q^H) + \overline{f}(q^{M*}x^* + \overline{p}q^{H*}), \overline{e}^*(\overline{p}, \overline{f}) = (1-\overline{f})(q^{M*}x^* + \overline{p}q^{H*}). \qquad (23)$$

Second, as we have seen, constancy of consumption implies $\overline{\Omega} = \overline{\rho} = \overline{\Omega}^*$, so that stationary-state levels of utility must coincide internationally; we accordingly have, from (9) and using (23),

$$\Gamma(\overline{p}, \overline{f}) \equiv \overline{V}(\overline{p}, \overline{e}) - \overline{V}^*(\overline{p}, \overline{e}) \equiv \kappa + (\gamma^* - \gamma)\ln \overline{p} + \ln \overline{e}(\overline{p}, \overline{f}) - \ln \overline{e}^*(\overline{p}, \overline{f}) = 0 \qquad (24)$$

$$\kappa \equiv (1-\gamma)\ln(1-\gamma) + \gamma \ln \gamma - (1-\gamma^*)\ln(1-\gamma^*) - \gamma^* \ln \gamma^* \gtrless 0,$$

which defines a functional relationship $\Gamma(\bar{p},\bar{f})=0$ between $\bar{p}$ and $\bar{f}$. Third, goods markets must clear [(19), (20)]. This is easily seen to imply, again from (23),

$$\bar{p}=\tilde{p}\left[\bar{e},\bar{e}^{*}(\bar{e})\right]=p\left[\bar{e}(\bar{p},\bar{f})\right]\equiv\bar{p}(\bar{f}), \tag{25}$$

which provides another connection between $\bar{p}$ and $\bar{f}$, namely the well-known relationship between the equilibrium terms of trade $\bar{p}$ and a transfer $\bar{f}>0$ from the foreign to the domestic economy.

The properties of stationary-state system (24), (25) in $\bar{p}$ and $\bar{f}$ are now straightforward, if we focus on the parameter configurations (*a*) and (*b*):

(a) $\gamma=\gamma^{*}$, all other parameters taking arbitrary configurations

Here (19), (20) and (23) indicate that $\bar{p}$ in (25) is independent of $\bar{f}$ since, in the terminology of the transfer problem, the sum of the marginal propensities to import [$\gamma+(1-\gamma^{*})$ *or* $(1-\gamma)+\gamma^{*}$] is unity. Thus $\bar{f}$ can be solved for recursively from $\bar{e}(\bar{f})=\bar{e}^{*}(\bar{f})$, as implied by (24). The following three conclusions are immediate. First, under internationally identical relative endowments $\tilde{Q}=\tilde{Q}^{*}$ there will be no intratemporal trade since the autarkic *p* is the same in both economies; provided absolute endowment and, thus, wealth levels differ, intertemporal trade will nonetheless take place. Second, differences between the relative endowment parameters $\tilde{Q}^{(*)}$ give rise to both intratemporal and intertemporal trade, the extent of the latter being easily shown to depend on the difference in absolute endowment levels between countries. Third, any autarkic wealth superiority afforded by large absolute endowments will invariably be dissipated in a borrowing-financed consumption binge along the traverse path, sufficient to ensure internationally uniform welfare levels in the free-trade stationary state.

(b) $\gamma\neq\gamma^{*}$, all other parameters being identical across countries

In this case $\bar{p}$ varies with $\bar{f}$, the sign of $\bar{p}'$ depending on the criterion for a transfer to give rise to a secondary terms-of-trade burden. The import of configuration (b) is as follows. Assume a hypothetical long-run situation characterized by free trade and internationally uniform consumption levels $\bar{e}'=\bar{e}^{*'}$; consequently, $\bar{f}=0$. If, for given relative endowments $\tilde{Q}\equiv q^{M}x=q^{M*}x^{*}\equiv\tilde{Q}^{*}$ in (23), intratemporal taste differences $\gamma^{*}-\gamma$ are such as to yield the welfare differential $\Gamma(\bar{p},\bar{f})\equiv\tilde{\Gamma}(\bar{f})=\tilde{\Gamma}(0)\equiv(\bar{V}-\bar{V}^{*})_{\bar{e}'=\bar{e}^{*'}}<0$ (>0) in (24), it must be true that in the stationary-state *equilibrium* we will find $\bar{e}>\bar{e}^{*}$ ($\bar{e}<\bar{e}^{*}$), thus $\bar{f}>0$ ($\bar{f}<0$). Since long-run time preference $\bar{\Omega}^{(*)}$ equals long-run utility $\bar{V}^{(*)}$, this may be restated as

$$(\bar{\Omega}^{*}-\bar{\Omega})_{\bar{e}'=\bar{e}^{*'}}\gtrless 0\Rightarrow\bar{f}\gtrless 0 \tag{26}$$

If we allow "high foreign time preference" to mean $(\bar{\Omega}^{*}-\bar{\Omega})_{\bar{e}'=\bar{e}^{*'}}>0$, the high-time-preference country will be the stationary-state debtor. We conclude that under $\gamma^{*}\neq\gamma$ the introduction of free trade gives rise not just to intratemporal trade (since autarkic relative prices will differ, except by fluke), but also to intertemporal trade (since autarkic interest rates will also differ).

3.2 Dynamics of an Unanticipated Switch from Autarky to Free Trade

We now put our apparatus to work by considering an unexpected regime switch from autarky to free trade in both goods and equities. Among the many permutations of cross-country parameter differences available, we focus on two subsets of the configurations (a) and (b) just discussed. These are, respectively:

(I) $\gamma = \gamma^*$, $\tilde{Q} = \tilde{Q}^*$, $Q^H < Q^{H*}$

(II) $\gamma < \gamma^*$, $\tilde{Q} = \tilde{Q}^*$, $Q^H = Q^{H*}$

(I) Pure Intertemporal Trade

At the instant t=0 at which output flows, equity stocks, and equity flows become internationally tradable, this is what happens.

From (3), the two countries' autarkic goods prices coincide, $\overline{p}_A = \overline{p}_A^*$. The possibility to internationally trade contemporaneous flows of milk and honey therefore is unused at t=0 - and remains so throughout the subsequent adjustment period (given the independence of p from f in the instance). Though equality and invariance in the goods prices $p^{(*)}$ implies invariance in the relative equity prices $\pi^{(*)}$, the same is not true for equity prices measured relative to numéraire, $p^{i(*)}$.

To see this, recall that, unlike goods prices, national equity yields in existence a moment before trade opens do differ, $\overline{\rho}_A^* > \overline{\rho}_A$, reflecting the uniform percentage difference in endowment levels $Q^i < Q^{i*}$, thus in representative-agent welfare levels $\overline{V} < \overline{V}^*$ and time preference rates $\overline{\Omega}_A < \overline{\Omega}_A^*$ [(16)]. At the instant the two national stock markets fuse, the world equity market is, therefore, faced with an incipient stock disequilibrium, as domestic households attempt to sell off domestic in exchange for higher-yielding foreign equity. The consequence is a drop in the price of domestic and a jump in that of foreign equity sufficient to drive national asset yields into equality.

Though international capital mobility (world stock market equilibrium) instantaneously unifies equity yields worldwide, it cannot by itself determine the *equilibrium* level of the resultant world real rate of interest. That level will depend on the degree to which domestic and foreign households, though content with the *composition* of their portfolios, are eager to change the latters' *size*. This in turn depends on the terms proffered by the world capital market relative to prevailing rates of national time preference; any terms ρ (0) between Ω (0) and Ω^* (0) will elicit desired wealth-level changes. That interest rate ρ (0) will be the t=0 - equilibrium rate at which (i) the aggregate desired change in world wealth is zero, and (ii) households' expectations about future asset prices, lifetime utilities, and consumption levels are not falsified. Since, under our assumptions, $\overline{f} > 0$ and since motions are monotonic, we will observe at the t=0 - equilibrium interest rate a capital flow from the domestic to the foreign economy; it finances the foreign current account deficit triggered by the jump (drop) in foreign (domestic) absorption $e^*(e)$ at t=0. Subsequently, these spending changes are reversed, for in the long run the current account must balance and the foreign trade account be in surplus. In particular, e continually increases from its depressed level at t=0 and will move above $\overline{e}_A$ at some point $t = t'$, ensuring $\overline{e} > \overline{e}_A$ (as made possible by $\overline{f} > 0$ and the long-run foreign service account deficit this implies).

Finally, *why* if given the chance do countries find it profitable to engage in intertemporal trade with each other? A corresponding gains-from-trade argument has two distinct parts. First, at t=0 countries seek asset trades motivated by international yield differentials and the unexploited arbitrage profits these imply. Second, *given* the yield uniformity thus established, a unique perfect-foresight, capital-market-clearing path $\{\rho(t)\}_{t=0}^{\infty}$ of the common world interest rate $\rho(t)$ exists for which

$$\psi(0) > \overline{\psi}_A,\ \psi^*(0) > \overline{\psi}_A^*, \tag{27}$$

so that, on trade opening, countries find it more advantageous to engage in international borrowing and lending than to remain autarkic at the interest rates $\overline{\rho}_A$ and $\overline{\rho}_A^* > \overline{\rho}_A$.

(II) Joint Inter- and Intratemporal Trade

The following are notable differences vis-a-vis (I). First, since $\gamma^* > \gamma$ renders autarkic goods prices different $(\overline{p}_A^* > \overline{p}_A)$, an incentive for intratemporal trade now exists. By contemporaneously exporting honey and importing milk, the domestic economy can reap the Walras-Marshall-Meade static gains from trade at t=0 as well as at each subsequent instant $(p(t) > \overline{p}_A, t \in [0,\infty))$. The same is true, mutatis mutandis, for the foreign economy. Second, $\gamma^* \neq \gamma$ creates an incentive for *inter*temporal trade. It does so by rendering the autarkic welfare levels $\overline{V}_A^{(*)}(\gamma^{(*)}, \tilde{Q}, Q^H)$ in (16), thus autarkic interest rates $\overline{\rho}_A^{(*)}$, different despite internationally identical endowments $\tilde{Q} = \tilde{Q}^*$, $Q^i = Q^{i*}$ (i=H, M; in what follows we assume $\tilde{Q} = \tilde{Q}^* < 1$ which, since $\gamma < \gamma^*$, implies $\overline{\rho}_A < \overline{\rho}_A^*$). Third, $\gamma^* \neq \gamma$ now opens a channel for intertemporal trade to influence the terms p at which *intra*temporal trade takes place. This reflects the fact that *p* no longer depends on just γ and $\tilde{Q}$: by means of the forward-looking variable *e*, it also hinges on the path of the real interest rate, thus on asset prices, asset quantities, and their global distribution *f*.

The specifics of adjustment to the regime switch under consideration are easily derived. At t=0, goods arbitrage establishes a uniform price of honey, whose temporary-equilibrium value $\overline{p}_A < p(0) < \overline{p}_A^*$ depends on the forward-looking consumption levels *e*(0), $e^*[e(0)]$. As indicated, $\overline{\rho}_A < \overline{\rho}_A^*$, so that the requirement for yield uniformity tends, as earlier under (I), to induce a drop and a jump, respectively, in domestic and foreign numéraire asset prices $p^{i(*)}$.

The behavior of domestic and foreign consumption qualitatively coincides with that obtained under (I). What does differ between the two cases is the repercussions of that consumption behavior on the terms of trade. As the reallocation $\dot{f} > 0$ of world wealth proceeds, the weight in total world spending $e + e^*$ of the milk-loving domestic economy continuously rises, while that of the honey-loving foreign economy declines. A progressive fall in the relative price of honey, that is, a progressive (but incomplete) reversal in the domestic economy's initial terms-of-trade improvement, is the consequence.

References

Bhagwati, J., (1998), "The Capital Myth: The Difference between Trade in Widgets and Dollars," *Foreign Affairs*, 77, 7-12.

Epstein, L. and A. Hynes, (1983), "The Rate of Time Preference and Dynamic Economic Analysis," *Journal of Political Economy*, 91, 611-635.

Rodrik, D., (1998), "Who needs Capital Account Convertibility?" in S. Fischer et al., eds., *Should the IMF Pursue Capital-Account Convertibility? Essay in International Finance, no. 207*, Princeton University.

Stiglitz, J., (2002), *Globalization and its Discontents*, W. W. Norton, New York.