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FOUR OBSERVATIONS ON MODERN INTERNATIONAL  
COMMERCIAL POLICY UNDER FLOATING EXCHANGE RATES

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Four Observations on Modern International Commercial  
Policy Under Floating Exchange Rates

ABSTRACT

This paper describes the essential similarity between "modern" commercial policy, with its rent-like revenues, and capital transfers. Import barriers are shown to have consequently ambiguous effects on nominal and real exchange rates. The paper also examines some important supply-side welfare costs and consequences of import barriers through their influence on current asset prices and future capital formation.

The model on which the observations are based is an aggregated fixed-endowment, full-employment, general-equilibrium model similar to those used in the pure theory of international trade, with financial capital and foreign exchange markets that are integrated in a manner consistent with the asset/portfolio-balance approach to exchange rates.

The model is empirically calibrated to reflect the U.S. and the rest of the world in the early 1980's. In this empirical stylization, U.S. import barriers are shown (i) to reduce national consumption possibilities more significantly than is usually thought to be the case; (ii) to discourage U.S. physical capital formation; and (iii) to have significant yet variable effects on exchange rates, where the variability depends on the distribution between the U.S. and the rest of the world of the rent-like revenues implicit in the import barriers. It is notable that the more favorable this distribution to the U.S. the larger is the dollar depreciation caused by import barriers.

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## INTRODUCTION

This paper makes four observations on "modern" international commercial policy under floating exchange rates. It describes the essential similarity between such commercial policy and capital transfers, and reveals its consequently ambiguous effects on nominal exchange rates, the terms of trade, and national economic welfare. It also examines some important supply-side costs and consequences of commercial policy through its influence on current asset prices and future capital formation.

The model on which the observations are based is an aggregated fixed-endowment, full-employment, general-equilibrium model similar to those used in the pure theory of international trade, with financial capital and foreign exchange markets that are integrated in a manner consistent with the asset/portfolio-balance approach to exchange rates. Its most closely related antecedents are models by Boyer (1977), Eichengreen (1980), and Djajic (1981).

In order to understand the likely magnitudes of the influences being described, the model is empirically calibrated to reflect the U.S. and the rest of the world in the early 1980's. In this empirical stylization, U.S. import barriers are shown (i) to reduce national consumption possibilities more significantly than is usually thought to be the case; (ii) to discourage U.S. physical capital formation; and (iii) to have significant yet variable effects on exchange rates, where the variability depends

on the distribution between the U.S. and the rest of the world of the rent-like revenues implicit in all import barriers.

"Modern" commercial policy is commercial policy with a prominent quantitative element, and is examined to reflect several recent trends. One is the increasing popularity of quota-based barriers (voluntary export restraints, orderly marketing agreements) and mechanistic administrative guidelines (trigger prices for steel) among those clamoring for protection. Another is the decreasing reliance that most governments place on international trade taxes for revenue purposes, leading them increasingly to be willing to restrict trade in ways that create windfall revenues for someone deemed deserving other than themselves (including occasionally foreign governments). A third and less important trend for purposes of this paper is toward rules-based commercial policies (variable levies for agricultural products, prescribed growth rates for textile and auto imports) and toward temporary safeguard relief from imports that all share in being variable yet anticipatable by the private sector.

The following are the four observations that are the focus of the work.

(1) Income transfers implicit in modern commercial policy are more intricate and less innocuous than those implicit in tariffs, export subsidies, and other tax-subsidy schemes.<sup>1</sup> Quantitative commercial policy drives a wedge between world and domestic prices, generating rent-like

revenues that can affect both private incentives and national economic welfare. Foreign producers may collect most of the implied revenues for example, from the "voluntary" export restraints that a protectionist country presses them to administer. The country discriminated against may even gain if the terms of trade turn sufficiently against the country restricting its imports. And internally capital owners may gain relative to labor if commercial policy's implicit revenues fall directly to them and if labor has little market power. (Modern commercial policy may thus have a direct effect on industrial profitability that tariffs do not have, given that their revenues are distributed in a manner closer to distributional neutrality.)

(2) Income transfers implicit in modern commercial policy create an international transfer problem. This classic problem (described briefly below) provides a revealing and realistic setting in which to examine the effects of commercial policy (a focus of pure trade theory) under floating exchange rates (a focus of international finance). International transfers are generally "effected" by adjustment of commodity and asset prices, including the exchange rate. These price/exchange-rate adjustments in turn influence real trade, including trade in assets that are claims to deferred real purchasing power. The adjustments also influence real incomes, real wealth, and even real factor endowments.

(3) Modern commercial policy can either strengthen or weaken a currency.<sup>2</sup> Neither its effect on exchange rates nor the subsequent feedback of exchange-rate adjustment onto the variables targeted for

influence by commercial policy are as straightforward as journalistic disputation, common intuition, or familiar general-equilibrium logic often suggest. The intuitive position is that protectionism strengthens a country's currency and hence "undoes itself."

[Export-related] jobs... would be lost by limiting imports.... If they [Japanese exporters] earn fewer dollars, the demand for yen goes down and the price of yen in terms of dollars also tends to go down... U.S. goods become more expensive to Japanese and they buy fewer of them, and jobs are lost in export industries. (Friedman (1981)).

A protective structure... is likely in the first instance to create an external surplus. This then requires an appreciation of the exchange rate to restore external balance. (Corden (1971, p. 105)).

The general-equilibrium position is that the exchange-rate system is a red herring in calculating the effects of commercial policy, since in the most familiar general-equilibrium models, exchange-rate changes are neutral.<sup>3</sup> In this view the exchange rate is the relative price of two assets, both of which are "veils." Therefore whatever the effects of commercial policy on exchange rates, if any, its effect on equilibrium

values of real variables is always the same. If the point is granted, it then makes about as much sense to write a paper on "Commercial Policy Under Floating Exchange Rates" as on "Commercial Policy Under Variable Tides."

(4) Modern commercial policy can either encourage or discourage aggregate capital formation. Import barriers clearly raise prices of domestic and imported output, and may either raise or reduce equity prices by which the current capital stock is valued. The ratio of physical capital's market value to its replacement cost (Tobin's "q," with commodity prices measuring replacement costs) is thus sensitive to commercial policy. Cost-of-adjustment/installation theories of physical investment (Tobin (1969), Lucas (1967), and Treadway (1969)) suggest that the long-run capital endowment and aggregate supply will rise when  $q$  rises temporarily above 1 and fall when  $q$  falls temporarily below 1, in both instances restoring its equilibrium value at 1. For reasons discussed below, import barriers can be generally presumed to be stagflationary, reducing  $q$  below 1 in some medium run, discouraging capital formation, and undermining confidence in development/takeoff strategies built around import substitution. Furthermore when this is true, then an additional welfare cost of protection in the long run is the reduced income per worker that accompanies reduced physical capital per worker.

Since the second, third, and fourth observations are less familiar

than the first, it is worth summarizing briefly their explanations. First and most simply, if modern protectionism allows foreign exporters to capture a sufficiently large share of the policy's implicit revenues, then it is possible that widespread barriers to imports will raise their f.o.b. value (tariffs never do).<sup>4</sup> This influence by itself would create additional foreign-exchange-market demand for foreign currency and depreciation of domestic currency. A given set of import barriers then becomes more effective at quelling trade under floating exchange rates than under fixed exchange rates, not less.

But this perspective is limited. It neglects the most important influence underlying this paper. A significant change in commercial policy causes a change in international asset preference as well.<sup>5</sup> The ensuing short-run exchange-rate change under floating must be consistent simultaneously with the implied changes in: (i) commodity trade; (ii) capital movements; and (iii) domestic-currency prices of globally traded assets. In the longer run it must also ultimately be consistent with the change in debt service on the new equilibrium asset positions. This is where the transfer perspective becomes important. In the short run, if barriers to imports cause a larger incipient capital-account deficit than current-account surplus, *ceteris paribus*, then domestic currency may depreciate to restore equilibrium in the foreign exchange market. And/or if barriers to imports cause excess domestic demand to hold liquid tradeable assets, and excess foreign supply,

ceteris paribus, then domestic currency may depreciate to restore global portfolio equilibrium for asset stocks.

Finally, the invariance of real equilibria to exchange rates will not be a property of the perspective taken below. Exchange-rate changes will not be neutral. They will produce capital gains and losses, not only on net international indebtedness (Boyer (1977)), but even, through substitutability, on domestic equity claims to the capital stock. This is the key to understanding how commercial policy might affect the capital endowment through temporary divergences in the ratio of capital's market value to its replacement cost. And ultimately, a portion of national income, international interest earnings or debt service, will not vary proportionately with exchange rates or the price level.<sup>6</sup>

#### AN ILLUSTRATIVE MODEL

The conclusions are illustrated by reference to a bilateral macro-economic model<sup>7</sup> with explicit foreign repercussion effects. Each country's outputs are aggregated, but can be sold at a different price abroad than at home due to the price discrimination that is implicit in quantitative commercial policy. Imports are viewed as imperfect substitutes in consumption for domestic goods.

Some familiar questions about the industry-specific motivation for commercial policy and its sectoral consequences are obviously suppressed. Yet responsiveness of excess supplies and demands to relative prices is preserved by the assumption that two differentiated products are consumed.

And in every other dimension, an effort has been made to align the model as closely as possible with familiar general-equilibrium real trade models: in the medium-term equilibrium that characterizes the model (see below), endowments of two factors of production are fixed and "fully" employed (at natural rates of unemployment and capacity utilization), current accounts are balanced, and expectations are stable. It can be easily shown that all four observations around which the paper is built would continue to apply to changes in commercial policy in a multisectoral model with differentiated exportables, importables, and nontradeables, and with industry-specific commercial policy.

The most important feature of the paper's perspective is its insistence on the exchange rate being viewed as an asset price, and its focus on some ways in which modern commercial policy might affect asset markets.<sup>9</sup>

A converse perspective deserves brief emphasis. Exchange-market flux may influence commercial policy. It can be argued that the strongest political pressure for protectionism emanates from specific sectors of the economy. Each industry views itself as having very little influence over the exchange rate. Yet they are painfully aware of the exchange rate's influence on them. Depreciation and appreciation due to asset market flux cause ebbs and flows in competitiveness, cash flow, and long-term economic viability. To the extent that there are inter-temporal and capital-market distortions that set limits to the maximum losses consistent with any firm's survival, floating exchange rates may heighten corporate, sectoral, and ultimately collective political pressure for protection, especially of a modern (quantitative) kind.

This line of thought runs counter to familiar arguments that floating exchange rates undermine balance-of-payments and aggregate-employment defenses for government trade policy:

... Flexible exchange rates eliminate the balance-of-payments motive for tariffs and should therefore facilitate further rounds of negotiations to lower trade barriers (Dudley (1981, p. 264), ascribing the view to Richard Blackhurst)

The great advantage of a floating exchange rate system was to have been that the adjustment would take place automatically through currency appreciations and depreciations, removing the need for otherwise undesirable trade and capital controls, and allowing governments to concentrate their policies on domestic economic needs. Thus if the adjustment process is working well, trade measures for balance of payments purposes are unnecessary and undesirable. (Frank, Pearson, and Riedel (1979), p. 15).

One of the major arguments for a flexible exchange rate system ... is that it makes the case for free trade clear and simple. If you have a flexible rate and you reduce tariffs, movements in the exchange rate will automatically

protect you against having any adverse balance of payments effects, and therefore you are not exporting or importing unemployment (Friedman (1969), p. 118).

These arguments notwithstanding, floating exchange rates may aggravate sectoral pressures for protection by responding flexibly to international asset trade and thereby channeling intense competitive pressure toward domestic sectors through unfavorable movements in the "real" exchange rate (relative foreign to domestic commodity prices). The point is exemplified in the late 1970's by hardpressed Swiss and German manufacturers suffering from massive portfolio shifts toward francs and marks.

We proceed to discuss the model, beginning with the allocation of nationally unique production to the two markets in which it is sold. In the medium-term perspective of most trade models, production possibilities ( $Q_i$ ) are exogenously fixed by assumptions of "full" employment and ideal capacity utilization coupled with stationary endowments of all factors of production.

$$Q_i = D_{ii} + D_{ij}; \text{ where} \quad (1.1)$$

$Q_i$  = units of output produced uniquely in country  $i$ , net of real replacement investment to hold the physical capital stock stationary;

$D_{ii}$  = domestic consumption of domestic output;

$D_{ij}$  = foreign consumption of domestic output;  $i$ 's exports to  $j$ ;  $j$ 's imports from  $i$ .

In the discussion below,  $D_{11}$  and  $D_{22}$  vary endogenously, and  $D_{12}$  and  $D_{21}$  are treated as the exogenous instruments of commercial policy. Non-quantitative trade barriers can be easily translated into their "quota equivalents." This is true even for tariffs and export subsidies, as can be seen by defining each country's income in a conventional (e.g., Johnson (1976), Boadway and Treddineck (1978), Eichengreen (1980)<sup>10</sup>) but more general way:

$$\begin{aligned}
 Y_1 &= p_{11}D_{11} & (2.1) \\
 &+ [p_{11} + \theta_1(ep_{12} - p_{11})]D_{12} \\
 &+ (1 - \theta_2)(p_{21} - ep_{22})D_{21} \\
 &+ cF;
 \end{aligned}$$

$$\begin{aligned}
 Y_2 &= p_{22}D_{22} & (2.2) \\
 &+ [p_{22} + \theta_2(p_{21}/e - p_{22})]D_{21} \\
 &+ (1 - \theta_1)(p_{12} - p_{11}/e)D_{12} \\
 &- cF/e; \text{ where}
 \end{aligned}$$

$Y_i$  = country  $i$ 's nominal income;

$p_{ij}$  = price of country  $i$ 's (unique) product in  $j$ 's market and in  $j$ 's currency;

$\theta_i$  = country  $i$ 's share of the "revenues" implied by commercial policy concerning its own exports ( $j$ 's imports), e.g., for tariffs,  $\theta_i = 0$ , for voluntary export restraints,  $\theta_i$  may approach 1;

$e$  = the exchange rate, the price of 2's currency in units of 1's currency;

$F$  = 1's net financial claim on 2; the stock of internationally-traded assets held by 1 as claims on 2; 2's net indebtedness to 1; number of such assets promising to pay  $c$  per period; where

$c$  = periodic coupon payment per unit of assets, payable in 1's currency.

For tariffs whose proceeds are redistributed as income transfers, all commercial policy revenues are collected and disbursed by the domestic government, so that the foreign country's share of such revenues,  $\theta_1$  or  $\theta_2$ , is zero. It is also zero for export subsidies financed by taxes. In these cases the first and second line of each  $Y_i$  definition add to  $p_{ii}Q_i$ , and the third line represents tariff revenues or domestic taxes to finance export subsidies.

For quantitative barriers to imports or exports, however, each country has an opportunity to claim its portion of the implied revenues (or "quota rents") that arise from the wedge that commercial policy drives between world and domestic prices. These shares no doubt vary from policy to policy, from good to good, and from time to time. It is likely that  $\theta_i$  is relatively large for commercial policies administered by the exporting country (voluntary export restraints) and smaller for those administered by the importing country (import quotas, government purchasing policy).  $\theta_i$  is also likely to be large for goods in which the exporter industry has significant market power compared to importers, for example where export sales are centralized in a national marketing board, or where they are exempt from anti-monopoly policy. Despite the clearly endogenous character of  $\theta_i$ 's, modelling their

determinants is beyond the scope of this paper, and they are treated parametrically below.<sup>11</sup>

The variable  $F$  plays an important role in explaining certain unfamiliar conclusions below.  $F$  can be more elaborately described as the internationally held portion of a broad pool of "inside" paper assets -- unsecured institutional bonds and notes, government securities, bank loans, etc. -- "inside" in the sense that they are simultaneous claims and liabilities of national residents, and enter national wealth only when held internationally. Variation in the price of  $F$  in each country creates some of the capital gains and losses that make the real consequences of commercial policy sensitive to the exchange rate, not invariant to it as in simpler general-equilibrium settings. Variation in the price of  $F$  in each country's currency ( $p_{f1}$ ,  $p_{f2}$ ) must be furthermore consistent with exchange rate variation (specifically,  $e_{p_{f2}}$  must always equal  $p_{f1}$ , a condition equivalent to perfect mobility of financial capital). In fact, one way of describing the exchange rate is as the relative price of internationally-traded paper assets in the two countries, a definition that accords well with the asset approach to exchange rates. Finally, variations in the actual and desired quantities of  $F$  as a result of commercial policy's impact on income ( $Y_i$ ) and rates of return are the counterbalance to the income transfers implicit in modern commercial policy, determining whether such transfers are under- or over-effected, and thereby determining asset prices and the direction of exchange-rate variation.

$cF$  represents periodic interest earnings on country 1's net international investment position, or alternatively, 1's balance of payments on services

account.<sup>12</sup> Since the equilibrium described by the model is stationary with respect to time, interest earnings are assumed to be entirely repatriated, not reinvested.

The behavior summarized by equations (3) and (4) further undermines the neutrality of commercial policy's impacts to exchange-rate variation and other financial flux.

$$c/p_{f1} = r_1; \quad (3.1)$$

$$c/ep_{f2} = r_2; \quad (3.2)$$

$$r_i = \alpha_i Y_i / p_{ki} K_i; \text{ where;} \quad (4.1)$$

$p_{fi}$  = the price of tradeable financial assets in  $i$ 's currency;

$c/p_{f1}, c/ep_{f2}$  = implied interest rates in country 1 and country 2 respectively;

$r_i$  = the implied rate of return on nontradeable "equities" in country  $i$ , where equities are defined as (secured) ownership claims to the nation's capital stock;

$\alpha_i$  = the elasticity of output with respect to capital in an (implicitly Cobb-Douglas) aggregate production function.

$\alpha_i Y_i$  = aggregate rental payments to capital on the assumption that capital is paid the value of its marginal product;

- $K_i$  = the capital stock in numbers of machines, or equivalently, the number of equity claims to the capital stock;
- $P_{ki}$  = the "stockmarket" price of a nontradeable equity claim in  $i$ 's currency.

Equations (3) require that rates of return on unsecured financial assets and equity claims to the capital stock be identical, making them perfectly substitutable ways of holding stores of future purchasing power. The assumption is made primarily for analytical convenience. Some substitutability can certainly be defended by reference to domestic arbitrage across alternative savings instruments.<sup>13</sup> The exchange rate has a clear relation to rates of return on equities through (3), and they in turn have a clear relation to commercial policy through the presence of income ( $Y_i$ ) in (4).<sup>14</sup>

The important point is that modern commercial policy alters domestic income distribution for all the normal reasons plus one -- it creates opportunities for income alternative to physical production.<sup>15</sup> These rent-related opportunities influence asset prices (equations (4)) and exchange rates (equations (3)), and can in turn be moderated or exaggerated by exchange-rate variation. As discussed below, these rent-related opportunities may also affect capital formation in the long run, creating a link between commercial policy, exchange rates, and growth.

The remainder of the model is more familiar, reflecting conventional assumptions about economic behavior. Equations (5) and (6) represent conventional demand equations for domestic and foreign goods:

$$P_{ii}^D P_{ji} = \beta_i (P_{ii}/P_{ji}) E_i; \text{ where} \quad (5.1)$$

$$\beta_i(\quad) = i\text{'s average propensity to import out of aggregate nominal expenditure (absorption);}$$

$$E_i = i\text{'s aggregate nominal expenditure (absorption);}$$

$$\beta_i'(\quad) > 0 \quad (<0) \text{ when import demand is own-price elastic (inelastic);}$$

$$P_{ii}^D P_{ii} = [1 - \beta_i (P_{ii}/P_{ji})] E_i. \quad (6.1)$$

Equations (7) capture an asset approach to the current account, that deficits must be financed by foreign borrowing of some sort, reflecting a willingness to draw down national wealth toward some lower desired level ( $W_{di} < W_i$ ), and that surpluses imply net foreign investment, reflecting a desire to increase wealth toward some desired level.<sup>16</sup>

$$E_i = E_i (W_{di}/W_i) Y_i; \text{ where} \quad (7.1)$$

$$W_{di}, W_i = i\text{'s desired and actual aggregate nominal wealth;}$$

$$E_i'(\quad) < 0, \text{ and } E_i(1) = 1, \text{ so that current accounts are balanced}$$

when desired and actual wealth are equal.

Equations (8) determine desired national wealth as a proportion of nominal income:<sup>16</sup>

$$W_{di} = \gamma_i Y_i. \quad (8.1)$$

Equations (9) define nominal wealth in the creditor (1) and debtor (2)

countries:

$$W_1 = L_1 + P_{k1} K_1 + P_{f1} F; \quad (9.1)$$

$$W_2 = L_2 + P_{k2} K_2 - P_{f2} F; \text{ where} \quad (9.2)$$

$$L_i = \text{country } i\text{'s stock of nominal cash balances, treated exogenously;}$$

And equations (10), in conjunction with (8) and (9),<sup>17</sup> explain aggregate portfolio demands for money and non-money assets, as well as each nation's price level:

$$L_i = L_i(r_i, W_i/P_i)Y_i; \text{ where} \quad (10.i)$$

$W_i/P_i$  = country i's real wealth, nominal wealth deflated by an index of consumables prices;

$P_i$  = the price level or cost of living, defined as  $\beta_i(p_{ji}/p_{ji}^0) + (1 - \beta_i)(p_{ii}/p_{ii}^0)$ , where a 0 superscript denotes a base-period value;<sup>18</sup>

$$\partial L_i / \partial r_i < 0; \quad \partial L_i / \partial (W_i/P_i) \cdot (W_i/P_i) / L_i > 0 \text{ and } < 1. \quad ^{19}$$

Although the presence of both income and wealth as determinants of the demand for money is unconventional in the closed-economy U.S. literature (Meltzer (1963), Brunner and Meltzer (1963), Goldfeld (1973, pp. 613 - 615), Laidler (1977, pp. 139-142)), it has considerably more precedent in the asset/portfolio-balance approach to modelling open-economies (Branson (1977, p. 72), Kouri (1977, Equations (3) and (6.1)), and Henderson (1980, Equation (4))). Two familiar equations that are implied by the behavior already spelled out are:

$$Y_1 - E_1 = p_{f1} \Delta F; \quad (11.1)$$

$$Y_2 - E_2 = -p_{f2} \Delta F; \text{ where} \quad (11.2)$$

$\Delta$  is the time difference operator over the same interval as that for which the "flow" data are measured.

## ALTERNATIVE HORIZONS

The model admits of three different horizons over which one could answer the question "what are the effects of modern commercial policy (an exogenous change in  $D_{12}$  or  $D_{21}$ ) under floating exchange rates?" This paper focusses on the second of the three alternatives because it is the horizon most frequently associated with trade-theoretic discussions of commercial policy.

(1) A short-run response would treat the capital stocks ( $K_i$ ) as exogenous, and net international indebtedness as exogenous as well on the grounds that for some sufficiently small interval of time,  $\Delta F$  (the "real" current account/capital account balance) is infinitesimal relative to  $F$  and  $p_{ki}K_i/p_{fi}$ . During the short run, desired wealth would not be equal to actual wealth, and current account/capital account imbalance would be the means by which  $W$  "chases"  $W_d$ . Asset prices,  $e$ ,  $p_{fi}$ , and  $p_{ki}$  would be completely flexible in the short run. Expectations could be made endogenous by forcing these asset prices to short-run equilibrium levels such that their subsequent rates of change during the interim between short- and medium-run equilibria (see below) would maintain equality of yields across perfectly substitutable assets (where "yields" include not only interest payments and rental payments, but also capital gains/losses).<sup>20</sup>

(2) A medium-run response could be distinguished from a short-run response by recognizing that net international indebtedness ( $F$ ) would

eventually attain a value consistent with equality of desired and actual wealth. At that point, current and capital accounts would be in balance. The capital stock might<sup>21</sup> remain exogenous during the medium run and asset prices would adjust flexibly to an equilibrium consistent with the new level of international indebtedness. Such medium-run equilibria are the ones most frequently analyzed in comparative static pure trade theory, and it generally maintains an additional assumption of stable expectations. This paper follows suit in order to stay as close as possible to the most frequently referenced literature. But a more sensible, if cumbersome, alternative would be to make expectations endogenous after the fashion of the account above, forcing asset prices to medium-run levels such that their subsequent rates of change between medium- and long-run equilibria (see below) would leave no profit for arbitrage across substitutable assets.

(3) A long-run response might<sup>21</sup> be distinguished from a medium-run response by recognizing the mechanisms in this model by which commercial policy could encourage or discourage net capital formation. In particular, if the capital stock ( $K_i$ ) represents accumulated foregone consumption of domestic goods from the past, and if it can be measured in units of domestic output, then commercial policy can create a short- and medium-run divergence between the market value of existing capital ( $p_{ki}$ ) and its replacement/acquisition cost ( $p_{ii}$ ).<sup>22</sup> The ratio of market value to replacement cost ( $p_{ki}/p_{ii}$ ) is precisely "Tobin's q." (Tobin

(1969), Lucas (1967), Treadway (1969)). Values greater than one create incentives for capital formation (larger  $K_i$ ) and expansion of aggregate supply. Values less than one create incentives for net real disinvestment (small  $K_i$ ) and contraction of aggregate supply. The long-run equilibrium position of the economy as a result of commercial policy could be calculated as the value of  $K_i$  and other variables for which  $p_{ki}/p_{ii}$  returned to 1.

Another way of distinguishing shorter and longer runs is conceivable, but is not followed here. One could define the shorter run as a period in which domestic prices are rigid ( $p_{ii}$  exogenous) and aggregate output is flexible ( $Q_i$  endogenous), and the longer run conversely as is done in the paper, with  $Q_i$  being set at a level corresponding to "natural" unemployment and excess capacity. Then shorter-run changes in  $Y_i$  would correspond closely to output/employment flux, and longer-run changes in  $Y_i$  would correspond closely to price flux. One interesting insight from such a view is that when downward price rigidity is more marked than upward price rigidity (as seems likely), then any trade policy could be largely recessionary in the country where  $Y$  falls, and largely inflationary in the country where  $Y$  rises, with global effects that net to world stagflation (the recession in the contracting country dominates the expansion in the expanding country, and the rise in prices in the latter dominates the price stability in the former.)

#### SHORT- AND MEDIUM-RUN CONCLUSIONS "IN PRINCIPLE"

Commercial policy in the model described above operates in a way

that recalls the well-established literature on the transfer question. Modern commercial policy is an income transfer mechanism among nations, with no fiscal impacts unless the government auctions off import quota rights or taxes the "windfall" revenues that accrue to importers or exporters. Quantitative restrictions on exports and imports are an even purer beggar-your-neighbor policy than taxes (which domestic residents pay in part), causing price (and perhaps output) responses that redistribute world income and alter the terms of trade in a direction that depends on who collects the implicit revenues. As with all redistributions of income internationally, there will be increased purchases of imports and stock demands for certain assets where  $Y$  rises, and the opposite where  $Y$  falls. The traditional transfer question is whether the asset trade implied by the change in the current account (i) falls short of, (ii) matches, or (iii) exceeds the explicit (financial) capital inflows to one country and outflows from the other. In historical analyses, the terms of trade of the country where  $Y$  fell were expected to adjust unfavorably, not at all, or favorably depending on whether the income transfer was "undereffected" (i), "just effected" (ii), or "overeffected" (iii). Currency depreciation/appreciation in the foreign exchange market was seen traditionally as the agent of terms-of-trade deterioration/improvement. And national economic welfare improved or declined as the terms of trade did.

International redistribution of rent-like revenues from modern commercial policy is what ties it inextricably to the transfer question.

These rent-like revenues are at the heart of a striking, although familiar conclusion.<sup>23</sup> Import barriers may not bring about a rise in a country's income. They may in fact reduce income if they award the foreign country an opportunity to collect the wedge created between world and domestic prices of its own exports. Voluntary export restraints and orderly marketing agreements, of course, often do exactly that. In this case also, import barriers make the trade balance more negative in the short run,<sup>24</sup> counter to common intuition and often counter to one of the stated purposes of the policy. Parameters that play a key role in generating this unusual conclusion, in addition to the shares of "quota rents" that each country claims from the commercial policy of the other ( $\theta_1, \theta_2$ ), are the price elasticity of demand for imports (reflected in the elasticity of  $\beta_i$  ( )), the average propensities to import ( $\beta_i$ ), and the relative sizes of the two countries (as measured by  $Y_1/eY_2$ ).<sup>25</sup>

The upshot is that in some circumstances, the most stimulative trade policy for income and the trade balance may be the dismantling of quantitative trade barriers and all manner of non-price discrimination against foreign producers. One cannot even rule this out as a parametric improbability.

The conclusion has more than macroeconomic interest. In a multi-sectoral general-equilibrium model, import barriers that are aimed at protecting output or employment in any particular sector can fail if they give foreign competitors too large a share of the implicit revenues. At the higher prices for the imported product and for its domestic

substitute, there may be less purchasing power facing domestic competitors, not more. And the sectoral trade balance may deteriorate further.

Whatever commercial policy's short-run effects on the trade balance and income, it is these variables that drive most of the others in the model. But the direction of their impact is not unambiguous. The ambiguity arises from the transfer problem. And the most important variables affected by the transfer problem are asset prices, including the exchange rate. Neither the short-run nor medium-run response of the exchange rate to commercial policy is determinately signed, as we now proceed to describe. The point and others in this section can be shown more precisely by algebraic manipulation of the equations in Appendix A.

The immediate influence of commercial policy is to raise one country's trade balance and hence income (say 1's, without loss of generality) and lower the other's. Higher income in 1 generates a demand for cash (equation (10.1)) and for acquisition of non-money assets (equation (8.1)) that forces adjustment of equities prices (in particular  $p_{k1}$ ) and of any commodities prices that are flexible (altering the price index  $P_1$ ). Equity-price adjustment may be up or down, even under stable expectations, depending on the relative strengths of extra demands for cash (downward pressure on  $p_{k1}$ ) and for non-money assets (upward pressure on  $p_{k1}$ ). Commodity-price adjustment may alter income further, although not so dramatically as to offset the rise due directly to commercial policy.

Higher income in 1 generates a "desired" capital-account deficit/

current-account surplus in order to import additional wealth (equation 7.1)) over the medium run (this effect remains despite any additional wealth created by potential capital gains on equities). But the desired current-account surplus may be greater or less than the actual current-account surplus created by the commercial policy in the first instance. This difference between desired and actual trade in assets from 1's point of view forces adjustment of the tradeable asset's price in 1's currency,  $p_{f1}$ , that can be in either direction, even under stable expectations.<sup>26</sup>

In 2, lower income generates a stock demand for less cash (equation 10.2)) and smaller desired net wealth (equation (8.2)). These force adjustment of flexible equities prices and commodities prices. There remains, however, after these adjustments, an incentive in 2 for additional indebtedness to 1 (larger  $F$ ). This can of course be realized through capital-account surpluses/current-account deficits (equation (7.2)). But the desired current-account deficit may be greater or less than the actual deficit that commercial policy has created for 2. This difference between desired and actual trade in assets from 2's point of view forces adjustment of the tradeable asset's price in 2's currency,  $p_{f2}$ , that can be in either direction.

The upshot is that the exchange rate, the relative price of internationally traded assets ( $p_{f1}/p_{f2}$ ) can be altered by commercial policy in either direction in the short run. The direction in which the exchange rate moves depends on a comparison of the actual capital movements that commercial policy causes through current account alterations to the

desired capital movements for each country that commercial policy also causes. These desired capital movements must be consistent with the income transfers (and price adjustments) that commercial policy brings about in the first place through the current account.

It is interesting that, in contrast to Boyer (1977), Djajic (1981), and many others, none of these conclusions depends qualitatively on whether a country is a creditor (as is 1) or a debtor (as is 2), as long as the debtor nation's capital stock exceeds the value of its net international indebtedness ( $p_{k2}K_2 - p_{f2}F > 0$ ). The peculiar dependence of results on net international indebtedness in many papers with a similar flavor to this one<sup>27</sup> may rest on the neglect of freely-owned, "unattached" national net worth.

The short-run effects of commercial policy on interest rates and equity yields ( $r_i$ ) can also be positive or negative, just as are the capital valuation effects imposed by adjustment of  $p_{ki}$  and  $p_{fi}$ . Since much modern commercial policy can be anticipated (see the introduction), some of these adjustments to asset prices, including exchange-rate adjustments, might actually lead the commercial policy in time. They would also be stretched out in smaller increments per period the earlier the anticipation can be formed (see, for analogy, Fischer (1979), Wilson (1979)). Since the exchange rate would then be adjusting slowly to an anticipated level that is either higher or lower than it would be without commercial policy, current-account and income deviations from trend may have the opposite sign in anticipation of commercial policy from the sign that they have subsequent to its implementation. This of course further complicates the issue of what modern com-

policy does to income and the current account. Not only do rent-like revenues matter, but so do anticipations of commercial policy.

The analogy to the transfer problem should now be even clearer. Commercial policy, like exogenous shocks to the capital account, creates a change in asset trade that must be accommodated in the short run. In both the transfer problem and commercial policy the implied income effects and their disposition for goods and asset purchases may be large enough that induced international trade in goods and assets just matches the exogenous shock to it (with the opposite sign). Or it may not, in which case pressures will be brought to bear on asset prices in each country and on the exchange rate to induce compensatory goods and asset trade.

The important conclusion for commercial policy from the transfer perspective is that exchange rate changes may not dampen any of its effects, in contrast to what is apparently most economist's intuition. There is no clear answer to whether or not commercial policy is less effective (for any purpose) or less politically appealing under floating exchange rates than under fixed.

The medium-run effects of commercial policy on the exchange rate are just as troublesome. The rate may be higher or lower than before the commercial policy.<sup>28</sup> Since, however, over time both countries approach equality of actual and desired asset holdings (equations (8)), 1's period-by-period offers to buy F (through capital-account deficits) will be gradually smaller as will 2's period-by-period offers to sell F (through capital-account surpluses).  $p_{f1}$  will fall over time and  $p_{f2}$  will rise, leading 1's "currency" to appreciate gradually relative to 2's from whatever its short-run value

would have been otherwise. While this seems closer to common intuition regarding the effect of commercial policy on the exchange rate, it is not really closer. Intuition suggests an immediate and indefinite appreciation of 1's currency from its original value. The present model suggests instead immediate appreciation or depreciation, followed by gradual appreciation over time, and culminating in a value for 1's currency that may be higher or lower than its original value.

As another implication of restoring equilibrium to stock demands for and supplies of assets, current account surpluses and deficits will vanish in the medium run. This effect alone would tend to restore national incomes toward their levels prior to commercial policy. But commercial policy will have caused country 1 to accumulate additional F claims and country 2 to incur additional F liabilities in the medium run. Country 1's earnings on these additional assets ( $c$  times the growth in F) will keep its income higher than it was prior to the commercial policy, and perhaps even higher than during the short run after the commercial policy (i.e., 1's income level could rise immediately and then gradually over time). Country 2's additional debt service payments ( $c$  times the growth in  $F/e$ ) will keep its income lower than it was prior to the commercial policy, and perhaps even lower than its immediate post-policy short-run value.

It is clear from this account that commercial policy will cause a positive medium-run change in the international services account balance for country 1, whose net international claims rise. This change persists indefinitely. And correspondingly, commercial policy will cause a negative and indefinite change in the same account for country 2, whose net international

indebtedness rises. The more interesting complement to this conclusion is that commercial policy causes the merchandise trade balance of country 1 to be more negative during and indefinitely after the medium run, and the merchandise trade balance of country 2 to be ultimately and indefinitely more positive. Commercial policy that improves the medium-term income position of a country causes the trade balance to deteriorate, and conversely. To put it somewhat loosely, one cannot be a protectionist in the medium run on both nationalist and mercantilist grounds. Or looser still, commercial policy aimed at protecting domestic producers of goods will nevertheless lead services (capital services) to have a larger share of medium term exports.

#### LONG-RUN CONCLUSIONS "IN PRINCIPLE"

When the long run is defined as above, then commercial policy has the potential also for affecting capital formation and aggregate supply. One mechanism by which it might do so is a change in "Tobin's  $q$ ," the ratio of the market price of a claim to the existing capital stock ( $p_{ki}$ ) to the market price of a replacement piece of capital ( $p_{ii}$ , assuming that output and capital are the same commodity before capital is "sealed" in place). As we have seen, import barriers can either raise or lower stock-market prices ( $p_{ki}$ ) in the short and medium runs, depending on parameter values. But their effect on domestic prices ( $p_{ii}$ ) is more predictable. Import barriers tend to raise domestic prices as frustrated import demand spills over into domestic production of substitutes. (The exceptional case where import barriers can lower  $p_{ii}$  is more likely the more price-inelastic is import

demand and/or the larger is the share of implied revenues that foreigners take (i.e., the larger is  $\theta_1, \theta_2$ .) Thus there is a presumption in this model that import barriers reduce the ratio of the market value of capital to its replacement cost. This finding is noteworthy because it suggests that import barriers can be stagflationary in their long-run effects, reducing the capital stock and aggregate supply.

This does not seem to be the place to discuss the open-economy impacts of the capital formation and destruction that commercial policy prompts during the transition from medium- to long-run equilibrium by changing asset valuation and capital-goods prices. But it is worth pointing out that the exchange rate interacts with all other asset prices in this model, in a manner described by equations (3) and (4). There is thus clear interdependence in the trajectories over time of exchange rates, equity prices, and flexible goods prices that make possible a number of alternative predictions for the long-run effects of commercial policy on exchange rates.

Finally, the distinction drawn above between medium-run and long-run consequences of commercial policy may seem at this point too sharp. The effects of commercial policy on capital formation and aggregate supply are not necessarily slower in reaching fruition than is the elimination of current-account imbalance through asset (F) trade. These adjustments may well occur simultaneously, contrary to the implied assumption of standard and familiar trade-theoretic models that current-account balance will be attained with fixed factor endowments. Any overlapping of medium-term capital-stock adjustment with medium-term current-account adjustment of

course alters the pattern of the latter, and alters also the concomitant adjustment of exchange rates and other asset prices.

#### MEDIUM-RUN CONCLUSIONS "IN PRACTICE"

The transfer aspects of modern commercial policy make many of its consequences conditional on circumstances and parameters. The important questions then become how likely some of the more anomalous consequences really are, and how quantitatively significant. To answer such questions, the model was empirically parameterized to make country 1 reflect a stylized "United States," and country 2, a stylized "rest of the world," in the late 1970's. The details of the empirical parameterization are found in Appendix B. Its implications for quantitative medium-run multipliers are summarized in Table 1. Each entry in the table is the medium-run elasticity of an endogenous variable with respect to an exogenous reduction in imports (that is, the signs of the elasticities with respect to  $D_{12}$  and  $D_{21}$  are reversed in order to capture the effects of lower  $D_{12}$  and  $D_{21}$ ). Medium-run multipliers are highlighted because they correspond to what would be obtained from adding asset markets and explicit foreign exchange transactions to the most familiar fixed-endowment, balanced-trade, general-equilibrium models of commercial policy.

Several findings are notable.

(1) There is no sign ambiguity in the way import barriers affect U.S. nominal income ( $Y_1$ ). But in the face of a fixed money stock, the quantitative impact is very small. A ten percent shrinkage of imports is calculated to increase U.S. nominal income by less than two tenths of one percent.

(2) "Real" U.S. income (consumption possibilities)<sup>29</sup> is by contrast,

Table 1

ESTIMATED MEDIUM-RUN PERCENTAGE EFFECTS OF  
A ONE PERCENT REDUCTION IN IMPORTS ( $D_{12}$ ,  $D_{21}$ )

	U.S. Imports ( $D_{21}$ )			Rest-of-World Imports ( $D_{12}$ )		
	Distribution of Rent-Like Revenues <sup>a</sup>			Distribution of Rent-Like Revenues <sup>a</sup>		
	$\theta_i = 0$	$\theta_i = 0.5$	$\theta_i = 1$	$\theta_i = 0$	$\theta_i = 0.5$	$\theta_i = 1$
Nominal Income						
- U.S. ( $Y_1$ )	0.01525	0.01514	0.01247	-0.01596	-0.01744	-0.01338
- R of W ( $Y_2$ )	-0.00213	-0.00225	-0.00491	0.00229	0.00081	0.00487
Exchange Rate (e)	1.106	1.047	-0.363	-1.139	-1.921	0.225
Net U.S. Financial Claims on R of W (F)	0.3333	0.3192	-0.0224	-0.3444	-0.5338	-0.0143
Global Interest Rates ( $r_1 = r_2$ )	0.00297	0.00281	-0.00100	-0.00306	-0.00517	0.00063
Tobin's q						
- U.S.	-0.0505	-0.0504	-0.0466	0.1287	0.1308	0.1250
- R of W	0.0337	0.0339	0.0377	-0.0081	-0.0060	-0.0118
National Consumption Possibilities <sup>b</sup>						
- U.S.	-0.1596	-0.1324	-0.1116	0.2353	0.2199	0.1172
- R of W	0.0743	0.0539	0.0357	-0.0481	-0.0574	-0.0375

<sup>a</sup>  $\theta_i = 0$  records effects when residents of the region restricting its imports collect all the implied rent-like revenues, e.g., as for a one percent reduction in imports brought about by a tariff of the appropriate size.

$\theta_i = 0.5$  records effects when residents of the region restricting its imports collect half of the implied rent-like revenues, with the remainder going to residents of the other region.

$\theta_i = 1$  records effects when residents of the region restricting its imports collect none of the implied rent-like revenues, i.e., when that region's terms of trade decline (maximally) from its import barriers because its trading partners take advantage of monopoly or political power to discriminate perfectly and charge the full price that their customers' restricted market will bear, approximated most closely by voluntary export quotas.

<sup>b</sup> Or real national economic welfare. See text and footnote 29 for calculation.

significantly reduced by import barriers, falling by as much as 1.6 percent from a ten percent reduction in imports. This figure is considerably larger than most traditional estimates of the welfare cost of U.S. trade barriers. Virtually all of its magnitude is due to increased import prices, hardly offset at all by higher nominal income in the U.S. Import prices are higher whether imports are restricted by tariffs ( $\theta_i = 0$ ) or by the most extreme voluntary export quotas ( $\theta_i = 1$ ). In the former case, dollar depreciation more than offsets lower prices for importables in foreign currency ( $p_{22}$ ) that U.S. import barriers force abroad. In the latter case, the U.S. is forced as a nation to pay foreign suppliers the full higher dollar price of imports ( $p_{21}$ ) that import barriers force domestically. It is the exchange-rate effects of commercial policy that cause the curious conclusion that the welfare cost of import barriers is greater the larger the U.S. share of their rent-like revenues.

(3) Contrary to most familiar intuition, U.S. tariffs and other import barriers can cause equilibrium dollar depreciation in the medium term. The effects are quantitatively the most dramatic in the table, with the only elasticities greater than one. In the two cases where import barriers cause dollar depreciation, the nominal income transfer from the rest of the world to the U.S. is large enough to increase U.S. portfolio demand for tradeable financial assets ( $F$ ) even though real wealth effects work to reduce it (see below). The income transfer drives up the dollar value of tradeable assets ( $p_{f1}$ ), and drives down their foreign-currency value ( $p_{f2}$ ), forcing dollar depreciation ( $e = p_{f1}/p_{f2}$ ). When, however, foreigners seize most of the rent-like revenues from U.S. commercial policy ( $\theta_i = 1$ ), the nominal income

transfer to the U.S. is smaller and is swamped by lower real wealth in the U.S. and higher real wealth abroad (see below). U.S. portfolio demand for tradeable financial assets falls, as does their dollar price. Their foreign currency price and the foreign-exchange value of the dollar rise.

(4) Equilibrium real U.S. wealth is reduced in the medium run by import barriers in exactly the same proportion as real income, given their proportionality in equations (8). Import barriers can impoverish a region not only in current purchasing power, but also in future purchasing power.

(5) Real U.S. income and wealth would be reduced even further in the long run, when account is taken of the shrinkage in the physical capital stock that import barriers cause by depressing Tobin's  $q$  -- the ratio of capital's market value to its replacement cost. To calculate these additional welfare costs of import barriers, it would be necessary to know the elasticity of the physical capital stock with respect to divergences of  $q$  from 1. A ten percent reduction in imports is calculated to reduce U.S.  $q$  by roughly half of one percent.

Many of these calculations, and many of the observations that precede them, have an unfamiliar flavor. It is worth reminding the reader therefore in closing that most of the discussion is based on the marriage of two models that are in isolation both familiar and well understood. One is the standard general-equilibrium model with which commercial policy is usually analyzed in pure trade theory (albeit without production substitution); the other is the asset-approach/portfolio-balance model of exchange rates and international asset trade. One lesson from the exercise is that we can't always predict the personality of offspring from the personalities of parents. But the most important lesson is that floating exchange rates do have serious implications for the question of what commercial policy does.

## APPENDIX A

## ALGEBRAIC MANIPULATION OF THE MEDIUM-RUN MODEL

In the medium run,  $Y_i = E_i$ , and substitution of equations (5) and (6) into either (2.1) or (2.2) yields

$$0 = -A_1 Y_1 + A_2 (eY_2) + cF; \quad (A1)$$

where

$$A_i = \theta_j \beta_i - (1-\theta_i)(1-\beta_i)(D_{ij}/D_{ii}),$$

and where  $\beta_i$  is the shorthand notation adopted here for the function  $\beta_i(p_{ii}/p_{ji})$ . Log differentiation of equation (A1) making use of equation (1) generates an equation that links the endogenous  $\hat{Y}_1$ ,  $\hat{Y}_2$ ,  $\hat{F}$ , and  $\hat{e}$  -- or, more revealingly for what follows, the endogenous  $\hat{Y}_1$ ,  $\hat{Y}_2$ ,  $\hat{F}$ , and  $(\hat{e}-\hat{F})$  -- to the exogenous  $\hat{D}_{12}$  and  $\hat{D}_{21}$ , where for any variables  $Z$ ,  $\hat{Z} \equiv dZ/Z$ .

Log differentiation of equations (10) yields equations (A2.1) and (A2.2) below, which use: the differentiated version of (9) to replace  $\hat{W}_i$ ; the differentiated version of (4) to replace  $\hat{p}_{ki}$  with  $\hat{Y}_i - \hat{r}_i$  ( $\alpha_i$  and  $K_i$  being constant); the differentiated version of (3) to replace  $\hat{p}_{f1}$  with  $-\hat{r}_1$  and  $\hat{p}_{f2}$  with  $-\hat{r}_2 - \hat{e}$ ; and the relationship  $\hat{P}_i = \hat{Y}_i + \hat{C}_i$ , where

$$\hat{C}_i = (1-\beta_i)(D_{ij}/D_{ii})\hat{D}_{ij} - \beta_i\hat{D}_{ji}.$$

The resulting equations are:

$$\begin{aligned}
 0 &= -[E_{L_1, r_1} + (\gamma_{k1} + \gamma_{f1})E_{L_1, W_1}] \hat{r}_1 & (A2.1) \\
 &+ [1 - (1 - \gamma_{k1})E_{L_1, W_1}] \hat{Y}_1 \\
 &+ [\gamma_{f1} E_{L_1, W_1}] \hat{F} \\
 &- [E_{L_1, W_1}] \hat{C}_1
 \end{aligned}$$

$$\begin{aligned}
 0 &= -[E_{L_2, r_2} + (\gamma_{k2} - \gamma_{f2})E_{L_2, W_2}] \hat{r}_2 & (A2.2) \\
 &+ [1 - (1 - \gamma_{k2})E_{L_2, W_2}] \hat{Y}_2 \\
 &+ [\gamma_{f2} E_{L_2, W_2}] (\hat{e} - \hat{F}) \\
 &- [E_{L_2, W_2}] \hat{C}_2
 \end{aligned}$$

where  $E_{Z_a, Z_b}$  stands for the absolute value of the elasticity of variable  $Z_a$  with respect to variable  $Z_b$ , and where  $\gamma_{ki}$  and  $\gamma_{fi}$  are the shares of physical capital and tradeable assets in  $i$ 's total wealth.

Since in the medium run,  $W_{di} = W_i$ , the right hand sides of equations (8) and (9) can be equated. Differentiation of the resulting equations and replacement of  $\hat{p}_{ki}$  and  $\hat{p}_{fi}$  as above generates:

$$\hat{r}_1 = -\left[\frac{1 - \gamma_{k1}}{\gamma_{k1} + \gamma_{f1}}\right] \hat{Y}_1 + \left[\frac{\gamma_{f1}}{\gamma_{k1} + \gamma_{f1}}\right] \hat{F}; \quad (A3.1)$$

$$\hat{r}_2 = -\left[\frac{1 - \gamma_{k2}}{\gamma_{k2} - \gamma_{f2}}\right] \hat{Y}_2 + \left[\frac{\gamma_{f2}}{\gamma_{k2} - \gamma_{f2}}\right] (\hat{e} - \hat{F}). \quad (A3.2)$$

These can be used to replace  $\hat{f}_1$  and  $\hat{f}_2$  on the right hand side of (A2.1) and (A2.2).

The resulting equations can be solved for  $\hat{F}$  and for  $(\hat{e} - \hat{F})$  to yield:

$$\hat{F} = [1 + \frac{\gamma_{\ell 1} E_{L_1, r_1} + \gamma_{k1} + \gamma_{f1}}{\gamma_{f1} E_{L_1, r_1}}] \hat{Y}_1 - [\frac{(\gamma_{k1} + \gamma_{f1}) E_{L_1, W_1}}{\gamma_{f1} E_{L_1, r_1}}] \hat{C}_1; \quad (A4)$$

$$(\hat{e} - \hat{F}) = [-1 + \frac{\gamma_{\ell 1} E_{L_2, r_2} + \gamma_{k2} - \gamma_{f2}}{\gamma_{f2} E_{L_2, r_2}}] \hat{Y}_2 - [\frac{(\gamma_{k2} - \gamma_{f2}) E_{L_2, W_2}}{\gamma_{f2} E_{L_2, r_2}}] \hat{C}_2; \quad (A5)$$

where  $\gamma_{\ell i}$  is the share of cash balances in  $i$ 's total wealth ( $\gamma_{\ell 1} + \gamma_{k1} + \gamma_{f1} = 1$ ;  $\gamma_{\ell 2} + \gamma_{k2} - \gamma_{f2} = 1$ ). The sum of (A4) and (A5) then yields an equation that expresses  $\hat{e}$  as a function of the endogenous  $\hat{Y}_i$ 's and the exogenous  $\hat{C}_i$ 's.

Since by equations (3) and the assumption of perfect substitutability among non-money assets (or really just a constant proportional relationship among their rates of return),  $r_1 = r_2$ , the right-hand sides of (A3.1) and (A3.2) can be equated, and (A4) and (A5) can be used to eliminate  $\hat{F}$  and  $(\hat{e} - \hat{F})$  in the resulting equation. The ultimate equation is very simple:

$$0 = \left[ \frac{1}{E_{L_1, r_1}} \right] \hat{Y}_1 \quad (A6)$$

$$- \left[ \frac{1}{E_{L_2, r_2}} \right] \hat{Y}_2$$

$$- \left[ \frac{E_{L_1, W_1}}{E_{L_1, r_1}} \right] \hat{C}_1$$

$$+ \left[ \frac{E_{L_2, W_2}}{E_{L_2, r_2}} \right] \hat{C}_2.$$

The differentiated version of (A1), and (A4), (A5), and (A6) constitute a system of 4 independent equations relating 4 endogenous unknowns --  $\hat{Y}_1$ ,  $\hat{Y}_2$ ,  $\hat{F}$ , and  $\hat{e}$  (or  $\hat{e}-\hat{F}$ ) -- to 2 exogenous import variables  $\hat{D}_{12}$  and  $\hat{D}_{21}$ . ( $\hat{A}_1$  and  $\hat{C}_1$  are solely dependent on  $\hat{D}_{12}$  and  $\hat{D}_{21}$ ). Solution of this 4x4 system would give reduced-form expressions for all the variables, but those for  $\hat{Y}_1$  and  $\hat{Y}_2$  are most useful. Once they are determined,  $\hat{F}$  can be obtained recursively using (A4) and  $\hat{e}$  can be obtained recursively using the sum of (A4) and (A5).

The reduced-form expressions for  $\hat{Y}_1$  and  $\hat{Y}_2$  are the following divided by  $\Delta$ :

$$\begin{aligned} \Delta \hat{Y}_1 = & [\gamma_{f1} \gamma_{f2} E_{L_1, r_1}] (\hat{A}_1 - \delta \hat{A}_2) & (A7.1) \\ & + [\gamma_{f2} (\gamma_{k1} + \gamma_{f1}) \\ & \quad + \delta \gamma_{f1} (\gamma_{l2} E_{L_2, r_2} + \gamma_{k2} - \gamma_{f2})] [E_{L_1, w_1}] \hat{C}_1 \\ & - [\delta \gamma_{f1} \gamma_{l2} E_{L_2, w_2} E_{L_1, r_1}] \hat{C}_2; \end{aligned}$$

$$\begin{aligned} \Delta \hat{Y}_2 = & [\gamma_{f1} \gamma_{f2} E_{L_2, r_2}] (\hat{A}_1 - \delta \hat{A}_2) & (A7.2) \\ & - [\gamma_{f2} \gamma_{l1} E_{L_1, w_1} E_{L_2, r_2}] \hat{C}_1 \\ & + [\gamma_{f2} (\gamma_{l1} E_{L_1, r_1} + \gamma_{k1} + \gamma_{f1}) \\ & \quad + \delta \gamma_{f1} (\gamma_{k2} - \gamma_{f2})] [E_{L_2, w_2}] \hat{C}_2; \end{aligned}$$

where

$$\Delta = \gamma_{f2}(\gamma_{\ell 1} E_{L_1, r_1} + \gamma_{k1} + \gamma_{f1}) + \delta \gamma_{f1}(\gamma_{\ell 2} E_{L_2, r_2} + \gamma_{k2} - \gamma_{f2});$$

$$\delta = A_2(eY_2)/[A_2(eY_2) + cF];$$

$\hat{A}_i, \hat{C}_i$  are dependent solely on  $\hat{D}_{12}$  and  $\hat{D}_{21}$  as sketched above.

Tobin's  $q$  is defined in the model as  $p_{ki}/p_{ii}$ , and the proportional change in its equilibrium value is therefore  $\hat{p}_{ki} - \hat{p}_{ii} \cdot \hat{p}_{ki}$  is equal to  $\hat{Y}_i - \hat{r}_i$  from equations (4), and an expression for  $\hat{p}_{11}$  in terms of  $\hat{Y}_1, \hat{D}_{12}$ , and  $\hat{D}_{21}$  can be obtained from equations (5) and (6). Equations (A3) and (A7) can then be employed to obtain the reduced-form expression for the change in  $q$ .

## APPENDIX B

## EMPIRICAL PARAMETERIZATION

Equation (4):

$\alpha_1$  is assumed to be equal to  $\alpha_2$  based on Kuznets (1959, p. 9 passim), and is defined as the share in national income of income from assets -- rental income, corporate profits, and net interest. For the U.S. in 1979,  $\alpha_1 = 0.1888 = (30.5 + 196.8 + 143.4)/1963.3$  (Source: Economic Report of the President, January 1981, pp. 254-255).

Equation (5):

$\beta_1$  is defined as the share of imports in national absorption.

$\beta_1 = (\text{Value of } D_{21})/E_1 = (\text{Value of } D_{21})/(\text{Gross National Product (GNP) in } 1 - \text{Value of } D_{12} + \text{Value of } D_{21}) = 0.1116 = 267.9/(2413.9 - 281.3 + 267.9)$   
(Source: Economic Report of the President, January 1981, p. 233).

$\beta_2 = (\text{Dollar value of } D_{12})/(\text{Dollar GNP in 2} - \text{Dollar value of } D_{21} + \text{Dollar value of } D_{12}) = 0.0375 = 281.3/(7486.7 - 267.9 + 281.3)$ . (The source for dollar values of  $D_{12}$  and  $D_{21}$  is the same as above; the source for the dollar value of world non-U.S. GNP is the 1981 edition of World Bank Atlas, the sum of dollar GNP at market prices for all countries listed).

$\beta_1'(\ )/D_{ji}$  is equal to the absolute value of the own-price elasticity of import demand less 1. Stern, et al. (1976, p. 15 passim) suggest -1.61 as the "best" estimate of the own-price elasticity of U.S. import demand, and -1.41 as the "best" estimate of the own-price elasticity of foreign demand for imports from the U.S. Thus  $\beta_1'(\ )/D_{21} = 0.66$ ;

$\beta_2'( )/D_{12} = 0.41$ . These estimates are crucial for parameterizing  $\hat{A}_1$  in Appendix A.

Equation (8):

$\gamma_1$  is assumed to be equal to  $\gamma_2$  based on Kuznets (1959, pp. 17-20), and is defined as the ratio of tangible assets (except military) to GNP. For the U.S. on average from 1947 to 1958,  $\gamma_1 = 3.600$  and was very stable over that entire period. (Source: Goldsmith (1962, pp. 4, 117)). The same value was assumed to hold in the late 1970's.

Equation (9):

Using  $\gamma_1 = W_1/Y_1 = \gamma_2 = W_2/Y_2 = 3.600$  from Equation (8), a value for the U.S. capital stock ( $p_{k1}K_1$ ) at the end of 1979 can be obtained from the equation  $W_1 = 3.600 Y_1 = L_1 + p_{k1}K_1 + p_{f1}F$ , and from values for  $Y_1$  (\$2,377,090 million in 1979 from the 1981 edition of World Bank Atlas), for  $L_1$  (\$389,800 million at the end of 1979 from the heading "money" in the May 1981 issue of International Financial Statistics), and for  $p_{f1}F$ , defined as the net international investment position of the United States (\$94,959 million at the end of 1979 from the August 1980 issue of the Survey of Current Business, p. 51). From this a value of U.S. wealth at the end of 1979 can be calculated (\$8,557,524 million) and U.S. wealth shares:  $\gamma_{l1} = 0.0456$ ,  $\gamma_{k1} = 0.9434$ ,  $\gamma_{f1} = 0.0111$ . Comparable wealth shares for the rest of the world can be calculated from the equation  $eW_2 = 3.600(eY_2) = eL_2 + ep_{k2}K_2 - ep_{f2}F$ , and from values for  $eY_2$  (\$7,486,653 million in 1979 from the 1981 edition of World Bank Atlas), for  $eL_2$  (\$1,834,038 million at the end of 1979 from summing the product of money stocks and current market exchange rates for all countries except the U.S. in the May 1981

issue of International Financial Statistics), and for  $ep_{f2}^F (= p_{f1}^F)$  (\$94,959 million as above). From this a dollar value of global non-U.S. wealth at the end of 1979 can be calculated (\$26,951,951 million) and global non-U.S. wealth shares:  $\gamma_{l2} = 0.0536$ ,  $\gamma_{k2} = 0.9499$ ,  $\gamma_{f2} = 0.0035$ .

Equation (10):

A reasonable consensus estimate of the absolute values of  $E_{L_1, r_1}$  and  $E_{L_2, 2}$  was taken to be 0.7 based on Laidler (1977, p. 125 passim). Estimates of  $E_{L_1, W_1}$  and  $E_{L_2, W_2}$  are much scarcer, especially in a money-demand equation like (10) that includes income as well as wealth. Goldfeld (1973, p. 614, equation (4)) provides one such estimate for the U.S., for which the medium-run counterpart is 0.118. That estimate of  $E_{L_1, W_1}$  (and, by assumption,  $E_{L_2, W_2}$ ) is also almost exactly equal to the average of two such estimates provided by Meltzer (1963, p. 240), one for a narrow definition of money and one for a broad definition of money.

Equations (A1), (A7.1), and (A7.2).

Values of  $A_i$  are necessary to obtain a value of  $\delta (= A_2 eY_2 / (A_2 eY_2 + cF))$ . Values of  $A_i$  depend on  $\theta_i$ ,  $\beta_i$ , and  $D_{ij}/D_{ii}$ . The last two are obtained from information above, and  $\theta_i$  is treated parametrically. For  $\theta_i = 0$ ,  $A_1 = -0.1172$ ,  $A_2 = -0.0357$ . For  $\theta_i = 0.5$ ,  $A_1 = -0.0028$ ,  $A_2 = 0.0009$ . For  $\theta_i = 1$ ,  $A_1 = 0.1116$ ,  $A_2 = 0.0375$ . To obtain the corresponding values of  $\delta$  for the three values of  $\theta$ ,  $A_2$  and  $eY_2$  are obtained from the data above, and  $cF$  is set equal (using equation 3.1) to  $r_1 p_{f1} F$  and thence (using equation 4.1) to  $(\alpha_1 Y_1 / p_{k1} K_1) p_{f1} F$ , establishing its value at \$5,280 million. For  $\theta_i = 0$ ,  $\delta = 1.0202$ . For  $\theta_i = 0.5$ ,  $\delta = 0.5593$ . For  $\theta_i = 1$ ,  $\delta = 0.9815$ . It is worth noting that for certain values of  $\theta_i$ ,  $\delta$  can be made to become 0 or to become infinitely large in a negative direction. In both cases, the reduced form equations have finite limits. Equations (A7.1), for example, suggest maximal values of  $\hat{Y}_1$  that are roughly three times as large as those estimated in Table 1. Not all other entries in Table 1 would be three times as large, however, since some (e.g. the effects on national consumption possibilities) are dominated by the  $\hat{C}_1$ 's, which are invariant to  $\delta$ .

## FOOTNOTES

<sup>1</sup>See Meade (1951, Chapter XXI), Mundell (1961), Tower (1973), and Eichengreen (1980) among others.

<sup>2</sup>This observation has the same flavor and emerges for some of the same reasons as Mussa's (1976, pp. 188 passim) conclusion that under fixed exchange rates, a tariff may make the balance of payments and the stock of official foreign exchange reserves either more positive or more negative. Johnson (1966) and Eichengreen (1981) also demonstrate the ambiguous effect that protection has on the exchange rate, but in a model without asset trade. What raises the possibility there is the presence of traded intermediate goods, with the resulting potential for negative (effective) protection. A recent empirical model of this sort that yields similar conclusions is that of Deardorff and Stern (1980).

<sup>3</sup>This is the way of interpreting the neglect of any monetary variables or exchange rates in standard pure-trade-theoretic approaches to commercial policy. It also seems to be what Blackhurst and Tumlin (1980, pp. 3, 13) have in mind when they remark, "The economic value of trade liberalization is not affected by increased variability of nominal exchange rates.... exchange rate fluctuations in no way reduce the importance of efforts to liberalize world trade." For a strongly dissenting

view, based on less familiar general-equilibrium models, see Chipman (1978, 1980).

<sup>4</sup>A necessary condition is that import demand be own-price inelastic, as noted by Meade (1951, pp. 279-280, 281) and Tower (1973, pp. 453).

<sup>5</sup>Boyer (1977, pp. 224-225, 228) rules out such effects explicitly. Yet there seem to be no behavioral or conceptual grounds for doing so. If there is reason to believe that commercial policy affects aggregate income and price levels significantly, and if these in turn affect aggregate asset preference significantly, then their influence cannot be neglected on any second-order-of-smallness grounds. Nor can it be neglected even when industry-specific commercial policy is analyzed in a disaggregated multi-sectoral model. Although the aggregate income/price effects of such industry-specific commercial policy may be small (even infinitesimal), they will necessarily induce similarly dimensioned small (or infinitesimal) effects on aggregate asset preference. The asset preference effects therefore can never be small relative to the income-price effects and should never be excluded. Boyer does ascribe such an exclusion to Mundell (1961) and Sohmen (1969), but it seems more exactly that they ruled out effects of commercial policy on real savings and investment (no Laursen-Metzler effects), and said nothing about asset preference.

<sup>6</sup>A natural reaction seems to be that these barriers to exchange-rate

neutrality are quantitatively small. Yet it seems difficult to argue that they are small relative to the traditional effects of commercial policy and should therefore be ignored.

<sup>7</sup>A detailed discussion of the reduced form of the model for each of its three time horizons (see below) seemed inappropriate in the text. Reduced-form equations for the most important variables are derived in Appendix A. Equations for others are implied there as well.

<sup>8</sup>See, for example, footnotes 5 and 6.

<sup>9</sup>Boyer's (1977), Eichengreen's (1980) and Djajic's (1981) models start from the same perspective. But Eichengreen applies his to tariffs only, and Boyer and Djajic apply theirs to border tax adjustments (equiproportional changes in import tariffs and export subsidies) that are equivalent to devaluation-revaluation under pegged exchange rates, except for their wealth effects. Only Djajic presents a fully symmetric bilateral model. Boyer exploits the small-country assumption instead, and Eichengreen suppresses some foreign repercussions. All obscure the way in which commercial policy creates a transfer problem. Other similarities and differences will be noted below.

<sup>10</sup>Despite mention of lump-sum transfer payments and neutral income subsidies at one point, Boyer (1977, p. 225) appears to neglect them in calculating income. This neglect is appropriate if Boyer's import tariff revenues are used to finance his export subsidies. See also Djajic (1981, p. 5).

<sup>11</sup>This discussion reveals that  $\theta_i$  could also be treated as the share of tariff revenues paid by one country to another as a result of any compensation arrangements sanctioned by the General Agreement on Tariffs and Trade.

<sup>12</sup>Boyer (1977) ignores this. Eichengreen (1980) avoids it by focusing on non-interest-bearing monetary assets only. Djajic (1981) avoids it by taxing it away domestically, and unilaterally transferring it back to the foreign country.

<sup>13</sup>The conclusions from the paper will hold without alteration if the assets are imperfect substitutes whose relative rates of return are invariant to commercial policy. Given this, or the stronger assumption of perfect substitutability, it is straightforward, although cumbersome, to allow international holdings of equities as well as non-secured financial assets.

<sup>14</sup>An earlier version of the paper allowed equations (4) to capture what might be defended as an additional characteristic of modern commercial policy: what rent-like revenues it does create are likely to be reflected in large part in profits, and distributed to owners of physical capital (equities), not to labor. This distributive concentration of the spoils of commercial policy would lead equations (4) to be rewritten as

$$r_i = [Y_i - (1 - \alpha_i)p_{ii}Q_i]/p_{ki}K_i, \quad (4'.i)$$

and would be consistent with the institutional concentration of pricing, hiring, and export decisions on owners of capital, and also with the forces that continue to press management to pay workers only the value of their marginal product. It is important in the specification to note that when foreign sales are restricted, labor's marginal product is worth  $p_{ii}$ , the domestic price of the product, since additional output must be sold domestically. Other specifications than (4) are of course plausible. One could treat parametrically the division of commercial policy's rent-like revenues between domestic labor and capital, as done with  $\theta_i$  for their international division. Or one could allocate commercial policy's rent-like revenues only to owners of existing capital, and not to those who might be induced to engage in long-run capital formation (see below) because of altered investment incentives.

<sup>15</sup>The important implication of the literature on "rent-seeking" (Krueger (1974), Bhagwati (1980), or for a context close to that of this paper, Leith (1980)) -- that "rent-seeking" uses up resources -- is avoided, however, by treating parametrically the internal and international distribution of "rents."

<sup>16</sup>Each equation is of course unaffected if each variable is made "real" through deflation by some price index.

<sup>17</sup>When the right hand sides of (8) and (9) are set equal to each other, and (10) is substituted in, the resulting equation is the implicit portfolio demand equation for non-money assets (made up of the perfectly substitutable financial assets and equities). See Appendix B.

<sup>18</sup>Because  $\beta_i$  itself is a function of  $p_{ii}/p_{ji}$ , the index does not have fixed weights.

<sup>19</sup>The demand for cash balances must be wealth inelastic (see Henderson (1980)) in order to assure stability, and also because otherwise simultaneous increases in the price level ( $P_i$ ) and nominal income ( $Y_i$ ), ceteris paribus, would cause reduced demand for cash balances, an undesirable and incredible result.

<sup>20</sup>Both Eichengreen (1980) and Djajic (1981) focus on horizons with endogenous expectations. Theirs are, in addition, rational.

<sup>21</sup>The capital stock might begin to adjust during the so-called "medium" run as well, as discussed below.

If capital represents accumulated foreign goods, as might be more typical in developing countries, then its replacement cost is  $p_{ji}$ . If two kinds of capital exist, being defined as productive stocks of the two different kinds of output in the model, then matters become more complex.

<sup>23</sup>See Meade (1951), Mundell (1961), Tower (1973), Eichengreen (1980), among others.

<sup>24</sup>The short-run movement in the trade balance is the correspondent to the short-run movement in income, of course.

<sup>25</sup>Other parameters play a role as well, principally those from portfolio behavior, in a complicated configuration. They, however, do not seem capable by themselves of generating the anomalous link between commercial policy, income, and the trade balance.

<sup>26</sup>There are feedback effects of this on flexible prices elsewhere in the system but these are ignored in the verbal summary.

<sup>27</sup>Henderson and Rogoff (1981) contains extensive references and further discussion.

<sup>28</sup>The same is true of other asset prices and rates of return. They may be made higher or lower in the medium run by commercial policy.

<sup>29</sup>Real income or consumption possibilities might also be described as real national purchasing power or welfare. It is defined as nominal income ( $Y_1$ ) deflated by a variable-weight index of the "national" cost of living:  $(1 - \beta_1)p_{11}/p_{11}^0 + \beta_1[\theta_2 p_{21}/p_{21}^0 + (1 - \theta_2)ep_{22}/e^0 p_{22}^0]$ . The national cost of living is composed of two elements: the price of domestic merchandise ( $p_{11}$ ) and the average price to the nation of imported merchandise [ $\theta_2 p_{21} + (1 - \theta_2)ep_{22}$ ], reflecting the fact that foreign suppliers capture a share  $\theta$  of the rent-like revenues from modern commercial policy.

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