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*Tariffs and Welfare in an Imperfectly Competitive Overlapping Generations Model*

**Partha Sen**

**Working Paper No. 46**

Centre for Development Economics
Delhi School of Economics
Delhi 110 007 INDIA
Tel: 7257005, 7257533-35
Fax: 7257159
E-mail: office@cdedse.ernet.in

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**ABSTRACT**

The effects of a tariff is analyzed in a two-sector model in an uncertain lifetimes framework. One of the sectors is monopolistically competitive. It is shown that while a tariff leads to a consumption boom and possibly a current account surplus, its welfare effects depend on whether the homogeneous good or the differentiated good is exported by the small open economy. The paper provides a link between the models of the "new" trade theory and those of New-Keynesian Macroeconomics.

## 1. INTRODUCTION

As macroeconomic activity slowed down in the OECD countries in the 1980's compared to the levels of the pre-1970's oil-price shocks, there has been an increasing clamour for restrictions on trade. Trade restrictions, it is argued, would prevent jobs being exported and hence would improve the domestic country's welfare.

This period also witnessed an intellectual revolution in trade theory. Models of imperfect competition were constructed where potentially trade restrictions could raise welfare above the free trade levels. In competitive models of trade such trade restrictions make no sense.Unfortunately the conditions under which trade restrictions raise welfare are very model specific and/or require amounts of information which are not readily available to policy makers. On political economy grounds, trade theorists continue to argue for free trade.

About the same time, in macroeconomics non-competitive models began to appear which sought to explain the behaviour of the macroeconomic variables in the OECD countries. These non-competitive or New-Keynesian models provided an alternative paradigm to the dominant competitive market-clearing Real Business Cycles view of macreconomics. In these models as in the new trade theory models there is a potential role for the government intervention. Such intervention could raise welfare levels above the <u>laissez-faire</u> levels. These models are applicable in a large number of situations--see the collection in Mankiw and Romer (1991); and the surveys by Matsuyama (1993),Dixon (1994) and Dixon and Rankin (1994). Most of the earlier models in this genre were static but more recently many dynamic models have appeared (e.g., Startz (1990), Gali (1994), Chaterji and Cooper (1993) , Fender and Yip (1994) and Obstfeld and Rogoff (1995)).

In this paper, I set up an uncertain-lifetimes overlapping generations model a la Blanchard (1985) and Weil (1989) (see

Buiter (1988) for a very good description of this class of models). This framework has proved very useful in the analyses of a variety of policy shocks. One good reason for adopting this framework is that it does not entail equating the exogenously given world interest rate to the constant rate of time preference. In any case, the infinitely lived consumer model emerges as a special case of this model. In this model I introduce a sector which is imperfectly competitive. This allows me to ask the question whether tariffs could be welfare-improving. The main finding of this paper is that the while the broad macroeconomic effects are consistent with what the protectionist lobby predicts--it leads to a consumption boom and possibly current account surpluses--the welfare effects depend on the pattern of trade. If the output of the imperfectly competitive sector is non-traded then a tariff does improve the welfare of the small open economy On the other hand if it is the competitively produced good which is non-traded then a tariff is welfare-reducing.

The effects of tariffs and other commercial policy have been analyzed in a large number of trade models (see Helpman and Krugman (1989) and Helpman (1990) for surveys). The effects of these policies in competitive intertemporal optimizing models has been analyzed by a number of authors (see e.g., Sen and Turnovsky (1989), Engel and Kletzer (1990), Turnovsky (1991) and Fender and Yip (1989)). Of these Engel and Kletzer (1990) analyze tariffs in an uncertain lifetimes framework , while the rest have an infinitely-lived consumer.

Fender and Yip (1995), in a two-country model similar to Obstfeld and Rogoff (1995), examine the effects of a tariff in a monopolistically competitive model with labour-leisure choice and price stickiness. My model, on the other hand, is a real model which I use to integrate insights from trade theory with a dynamic macroeconomic model. Hence my analysis should be interpreted as a medium run model complementing theirs.

The paper is organized as follows. Section 2 sets out the model. Section 3 looks at its dynamic structure, Section 4 then looks at the effects of a tariff. Some concluding comments are offered in Section 5.

## 2. THE MODEL

Before turning to the detailed specification of the model, I present a brief outline of it. The model has four sectors *viz.* the households, the firms, the government and the rest of the world. At any instant there exist many households born at different times. They consume two goods - a homogenous good produced under conditions of constant return to scale and a differentiated good produced under increasing returns to scale. The increasing returns which are internal to the firm arise from the presence of fixed costs. There are two factors of production labour and capital. The factor and the homogeneous goods markets are competitive while market for the differentiated good is monopolistically competitive. The individuals hold two assets in their portfolios - capital and a foreign interest-bearing asset. The economy takes all foreign variables (i.e., the interest rate, the number of brands produced and foreign prices) as given.

Households are identical in every respect except the time of their births and deaths[1]. They are born without any financial wealth i.e., they are not linked altruistically to any other household alive at the time of their birth. Each household sells one unit of labour in each period of its life. All of them also face an identical, birth-independent probability of death (denoted by $\pi$). In the aggregate there is no uncertainty and a proportion $\pi$ of the population dies each period. The birth rate is also assumed to be $\pi$, so that there is no net growth in the

[1] As is by well-known births, not deaths, is the crucial ingredient for the absence of Ricardian equivalence (see Weil (1989)). Since I am really not interested insteady state growth a constant population is helpful in economizing on notation. This is achieved by setting the death rate equal to the death rate.

population. Each agent buys insurance from competitive insurance firms, who supply these at actuarially fair rates, and get a return (make a payment) $\pi$ on their financial wealth if it is positive (if it is negative). The insurance company inherits the household's financial wealth or labilities on its death.

### 2.1 The Households

A representative household of vintage $v$ (i.e., one which was born on date $v$) faces a constant probability of death ($\pi$), at each instant. It maximizes at time t its lifetime expected utility i.e.,

$$\int_t^{\infty} \log u(\tau,v) \exp.(-(\beta+\pi)(\tau-t)).d\tau \qquad (1)$$

subject to

$$\dot{A}(t,v) = (r+\pi).A(t,v) + \lambda(t) + w(t) - P(t).X(t,v) - y(t,v) \qquad (2)$$

where

$$u(\tau,v) = X(\tau,v)^{\alpha}.y(\tau,v)^{1-\alpha} \qquad (3)$$

and $X(\tau,v)$ is the (aggregate of) consumption of the differentiated good (P is the associated price index (defined below), $y(\tau,v)$ is the consumption of the homogeneous good and $A(\tau,v)$ is the financial wealth at time $\tau$ of a person born in period v, $\beta$ is the rate of time preference and $\lambda$ the lump-sum transfers received by the household, r the world rate of interest and w the wage rate. The variables not indexed by v are independent of the date of birth.

In addition the household has an initial condition on financial wealth.

$$A(t,v) \equiv \tilde{A}(t,v) \text{ for } t > v \qquad (4)$$
$$\equiv 0 \qquad \text{for } t = v$$

and a transversality condition

$$\lim_{\tau \to \infty} \exp.[-(r+\pi)\tau].\ A(\tau) \geq 0 \qquad (5)$$

This gives rise to the following path for consumption

$$C(t,v) = (\pi + \beta).[A(t,v) + H(t)] \qquad (6)$$

and $$\dot{C}(t,v) = C(t,v).(r - \beta) \qquad (7)$$

where $$H(t) \equiv \int_t^{\infty} [w(\tau) + \lambda(\tau)].\exp.(-(r+\pi)\tau).d\tau \qquad (8)$$

and $$C(t,v) \equiv P(t).\ X(t,v) + y(t,v) \qquad (9a)$$

$$P(t).X(t,v) = \alpha.C(t,v) \qquad (9b)$$

$$y(t,v) = (1-\alpha).C(t,v) \qquad (9c)$$

Equation (6) is the consumption function, equation (7) is the Euler equation and equations(8) and (9a) the definitions of human wealth and nominal expenditure respectively. In (9b) and (9c) we have the shares of the two goods in expenditure.

Now given X from equation (9), the consumer allocates this over the various brands of the differentiated good available at time t i.e., to maximize (suppressing the time indices to avoid cluttering up the notation)

$$X = \left(\sum_i m_i^b + \sum_j m^{*b}_j\right)^{\frac{1}{b}} \qquad i=1,..,n \qquad j=1,..,n^* \qquad (10)$$

$$b \equiv 1 - \frac{1}{\sigma} \qquad \sigma > 1$$

subject to

$$\sum_i p_i m_i + \sum_j p_j^* m_j^* = P.X \qquad i = 1,..,n \; j=1,..,n^* \qquad (11)$$

where $P^{(1-\sigma)} \equiv (\sum_i p_i^{1-\sigma} + \sum_j p^{*1-\sigma}_j) \qquad i = 1,..,n \qquad j=1,..,n^* \qquad (12)$

where $m_i(m^*_j)$ is the amount of the $i^{th}(j^{th})$ brand consumed whose price is $p_i(p^*_j)$ and $\sigma$ is the elasticity of substitution between the various brands of X (which below is also the elasticity of demand facing a brand producer). The $i^{th}(j^{th})$ brands of the differentiated good are produced domestically (imported).

This gives rise to the following demand functions

$$m_i = C.(p_i/P)^{-\sigma} \qquad i = 1,...,n \qquad (13)$$

$$m^*_j = C.(p^*_j/P)^{-\sigma} \qquad j = 1,...,n^* \qquad (14)$$

Since we shall be concerned with a symmetric equilibrium where all domestic (foreign) brands are priced equally and the demand for all domestic (foreign) brands is the same we shall drop the subscripts.

Finally, financial wealth of a domestic resident consists of two assets - foreign assets (N) and his/her ownership of capital(K).

$$A(t,v) \equiv N(t,v) + K(t,v) \qquad (15)$$

Aggregating over all the households of different vintages we get

$$C(t) = (\pi + \beta).\{H(t) + A(t)\} \qquad (16)$$

$$\dot{C}(t) = C(t).(r-\beta) - \pi(\pi + \beta).A(t) \qquad (17)$$

where a variable without the vintage index v indicates its aggregate. In (16) we have normalized the size of the population to unity.

The last term on the right-hand side of (16) is by now very familiar from these models. It arises from the fact that the new-born without any financial wealth. There are $\pi$ of them and from (15) they would have consumed a proportion $(\pi + \beta)$ of financial wealth if they had any.

## 2.2 The Firms

There are two goods produced by the economy - the homogeneous good and the differentiated good. These are produced by the two factors of production--labour and capital. Physical capital is mobile internationally and there are no costs of installation. In equilibrium capital and the traded bond must yield the same rate of return in terms of the numeraire. We can assume, without loss of generality, that all capital is domestically-owned and any additional input requirement of capital is met by instantaneously trading N for K (see Obstfeld (1989) for a similar assumption).

The homogeneous good, which is the numeraire, is produced under competitive conditions using capital and labour. The marginal cost equal to price equation is given by

$$a_{ky} \cdot r + a_{ly} \cdot w = 1 \qquad (18)$$

where $a_{ij}$ is the amount of the input i used in the "production" of "sector" j(i = k,l and j = y (and x, F below)). The wage rate is w and the rental rate on capital is r.

There are two types of costs that a firm has to incur in production in producing the differentiated good. The first is the variable cost and the other the fixed cost. We can think of these being produced in different "sectors"- the x-sector producing the variable cost component and the F-sector producing the fixed cost component. The output of a brand is given by x. The marginal cost component is produced by a constant returns to scale technology using capital and labour

$$a_{kx}.r + a_{lx}.w = e \tag{19}$$

In (19) e is the marginal cost of production.

This industry is monopolistically competitive and therefore price of a brand is mark-up on variable costs.

$$p = \sigma(\sigma-1)^{-1}.e \tag{20}$$

We assume that entry drives profits down to zero within the period-- the large group case. This implies that $(1/\sigma)$ of total revenue would go towards covering fixed costs, F (since $(1-(1/\sigma))$ goes to cover marginal cost).

$$\sigma^{-1}(p.x) = F \tag{21}$$

F is also produced by the two factors by a linear homogeneous technology

$$a_{lF}.w + a_{kF}.r = F \tag{22}$$

Note that there are no intertemporal decisions involved in production. The firms in question solve a static problem at each moment in time. The fixed cost is like an (recurring) overhead cost and not a sunk cost.

We substitute for F from (20) in (19) and for e from (21) in (22). Then we have in (18), (19) and (22) three equations in four unknowns--w,p,x and r[2]. Of these r is given, so these

[2] Equivalently equations (18) to (22) determine five unknowns w,e,p,F and x given r.

equations fix the values of w, p and x. i,e,. given our production structure, factor prices are given as are the output per firm and the price per brand in the domestic differentiated goods sector. The only variable which will alter the size of this sector is the number of brands produced domestically.

## 2.3 The Government

The role of the government is very simple. It levies a tariff of s per cent on the import of foreign brands--in the initial equilibrium $s \equiv 0$. It then rebates the proceeds in a lump-sum fashion to individuals so that its budget is always in balance. We shall look at an experiment where s is constant at zero except for a one time permanent increase.

$$s.n^{*}.p^{*}.m^{*}(t) = \lambda(t) \tag{23}$$

## Market Clearing

Equations (24) and (25) give the factor market clearing condition for the two factor markets

$$a_{ly}.Y + a_{lx}.nx + a_{lF}.n = 1 \tag{24}$$

$$a_{ky}.Y + a_{kx}.nx + a_{kF}.n = K \tag{25}$$

Equation (24) and (25) are respectively the labour and the capital market clearing condition. The output of the homogeneous good is denoted by Y and nx is the output of the differentiated good (we have normalized the total employment to unity).

In rates of change we have from (24) and (25)

$$\delta_{ly}.\hat{Y} + (1-\delta_{ly}).\hat{n} = 0 \tag{26}$$

$$\delta_{ky}.\hat{Y} + (1-\delta_{ky}).\hat{n} = \hat{K} \tag{27}$$

where $\delta_{ij}$ is the share of the $j^{th}$ sector in the total employment of the $i^{th}$ factor and for any variable z, $\hat{z} \equiv dlogz$ .

Note that in totally differentiating equations (24) and (25), we do not have to worry about terms involving factor prices, the elasticities of sustitution in production etc., because of the constancy of factor prices.

We assume that the homogeneous good is the relatively labour-intensive good. So we have $a_{ky} / a_{ly} < k$ or $\delta_{ky} < \delta_{ly}$[3].

We thus have (the Rybczinski effects)

$$\hat{Y} / \hat{K} = -(1-\delta_{ly})/\Omega < 0 \tag{28}$$

$$\hat{n} / \hat{K} = \delta_{ly} / \Omega > 0 \tag{29}$$

$$\Omega \equiv \delta_{ly} - \delta_{ky} > 0 \tag{30}$$

Below we shall find that equilibrium is disturbed by either a change in n or Y. Equations (28) to (30) tell us that in any equilibrium Y and n move in opposite directions while n and K move together.

## 3. DYNAMICS AND STEADY STATE

Equation (17) gives us one of the differential equations governing the dynamics of the economy. It is reproduced as equation (31) below.

$$\dot{C} = (r - \beta)C - \pi(\pi + \beta).A \tag{31}$$

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[3] Note that we have three different production "lines" with different capital intensities. This assumtion in words says that that the capital-lalabour ratio in Y is greater than the economy's average.

The other differential equation governing the movement of the economy over time is given by the wealth accumulation equation

$$\dot{A} = rA + w + \lambda - C \tag{32}$$

The current account equation can be derived from (32). Recall that the economy's net claims against the rest of the world is N. The time derivative of this is the difference between the economy's GNP and total expenditure $(C + \dot{K})$. Or

$$\dot{A}-\dot{K} \equiv \dot{N} = rN + Y + npx + \lambda - C - \dot{K}$$

Recognizing that all value added in production accrues to domestic factors of production , we get (32).

Linearizing the pair of differential equations (31) and (32) around the steady state we have (a steady state value is denoted by an overbar)

$$\begin{bmatrix} \dot{C} \\ \dot{A} \end{bmatrix} = \begin{bmatrix} (r-\beta) & -\pi(\pi+\beta) \\ -1 & r \end{bmatrix} \begin{bmatrix} C-\bar{C} \\ A-\bar{A} \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} \lambda \tag{33a}$$

For saddle-point stability we require the determinant of the coefficient matrix (call it D) in (33a) to be negative. We assume that this is indeed the case i.e., $D = r.(r-\beta) - \pi.(\pi+\beta) < 0$.

Barring expected future shocks and temporary shocks, the economy is always on the saddle-path. Along this path the two variables evolve according to

$$A(t) = \bar{A} + (A_0 - \bar{A}).\exp.(\zeta t) \tag{33b}$$

$$C(t) = \bar{C} + \Phi.(K_0 - \bar{K}).\exp.(\zeta t) \tag{33c}$$

where $\zeta$ is the stable root, $[1, \Phi]'$ is the (column) eigen-vector associated with it and $\Phi = (r - \beta - \zeta) / \pi(\pi + \beta) > 0$. This implies that along the saddle-path C and K move together.

By setting $\dot{A} = \dot{C} = 0$ in (31) and (32) we can obtain the steady state values of A and C (given by point E in figure 1).

Note that from equation (31) we have $\bar{C} = \pi(\pi + \beta)\bar{A}/(r - \beta)$. If $r > \beta$ then $\bar{A}$ positive and if $r < \beta$, $\bar{A}$ is negative (see Obstfeld (1989) and Buiter (1988) for a discussion). We shall assume, mainly for expositional purposes, in this paper $\bar{A}$ is positive, i.e., the economy does not have foreign debt which is greater than the value of its ownership of the domestic capital stock.

The behaviour of the dynamics of the linearized system for $r > \beta$ is portrayed in figure 1. Both the $\dot{A} = 0$ and the $\dot{C} = 0$ loci are upward-sloping but the $\dot{A} = 0$ line is flatter than the $\dot{C} = 0$ line.

## 4. A TARIFF ON THE IMPORTED BRANDS

We first analyze the effect of a tariff on the two dynamic variables of interest--C and A. I then turn to the welfare analysis of a tariff. Here we find that consistent with the basic dynamic story we have very different welfare implications depending on which of the two goods is non-traded.

### 4.1 The Steady-State Effects on C and A

$$(r - \beta)\bar{C} = \pi(\pi + \beta)\bar{A} \tag{34}$$

$$r\bar{A} + w + \bar{\lambda}(s) = \bar{C} \tag{35}$$

Note in equation (35), w is time invariant but $\lambda$ is not. For a given value of s, $\lambda$ is endogenous. We know that $\lambda$ is positive for a non-prohibitive tariff and $\bar{\lambda}$ is its steady-state value.

Given our assumptions that $r > \beta$ and $D < 0$, we have

$d\bar{C}/ds > 0$ and $d\bar{A}/ds > 0$.[4]

The intuition for these should be obvious. An increase in $\lambda$ from its initial value of zero implies a rise in the human wealth of the society. This is because only the living get transfers from the government and the claim on these dies with the individual (see Engel and Kletzer (1990) for other possible ways of rebating tariff revenues). This would raise consumption given the financial wealth of individuals --see equation (16) above. But with a higher level of consumption financial wealth rises if $r > \beta$. Therefore in the new steady state $\bar{A}$ rises.

**4.2 Dynamics**

For $r > \beta$, the $\dot{A} = 0$ line shifts up in Figure 2 with no change in the $\dot{C} = 0$ line and the new steady state is to the north-east of the original one (at point $E_1$)[5]. If the imposition of the tariff was unanticipated and is expected to be permanent then at the moment of the imposition of the tariff, A is given. C however jumps up to put the economy on the new stable arm (point $E_{01}$ in Figure 2). Along the adjustment path C and A rise together . Saving and consumption move together along the stable arm.

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[4] The steady state effects are

$$d\log\bar{A}/ds = d\log\bar{C}/ds = \alpha(1-\gamma)\bar{C}/w$$

where $\alpha$ is the share of differentiated goods in consumption and $(1-\gamma)$ is the share of the foreign brands in PX. The first equality follows from (34) and the second from (35).

[5] For $r < \beta$ the new equilibrium would be to the north-west and for $r = \beta$ it would be vertically above the old one.In the new case long run equilibrium is attained instantaneously.

### 4.3 Welfare

An increase in the tariff rate from an initial value of zero causes GNP and expenditure to go up in the new steady state as well as along the adjustment path. But what about welfare? I look at two cases. The first where the domestic brands of the differentiated good are non-traded (as in e.g., Venables (1982)) and the homogeneous good is traded--the inter-industry trade case. The second case is the intra-industry trade case, with the the homogeneous good being non-traded.

#### (a) Inter-industry Trade

Here the momentary equilbrium consists of equations (24), (25) and (36) below.

From equation (13) we have

$$x = m = C.(p/P)^{-\sigma} \tag{36}$$

Equation (36) implies (with p fixed)

$$\hat{C} = (-\sigma).\hat{P} \tag{37}$$

Equation (12) with symmetry and tariffs becomes

$$P^{(1-\sigma)} \equiv [np^{1-\sigma} + n^{*}(p^{*}(1+s))^{1-\sigma}] \tag{38}$$

From (37) and (38) we have

$$\hat{n} = \gamma^{-1}.((\sigma-1)/\sigma).\hat{C} + \gamma^{-1}.(\sigma-1).(1-\gamma).ds \tag{39}$$

where $\gamma$ (resp. $(1-\gamma)$) is the share of domestic (resp. foreign) brands in PX.

Equation (39) tells us that a tariff increases the number of domestic brands by making the foreign brands relatively expensive (because $0 < \gamma < 1$ and $\sigma > 1$) and by increasing C. From equation (37) we also know that for $\hat{C} > 0$, P has to fall. This implies that the effect of entry in the domestic differentiated goods industry on P outweighs the initial effect of s on P. This implies that along the adjustment path, the consumption real rate of interest, $r-\alpha\dot{P}$, is higher than its steady state value, r.

The steady state welfare

$$\bar{V} \equiv \alpha\log\,(\alpha\bar{C}/\bar{P}) + (1-\alpha)\log\,(1-\alpha)\bar{C}$$

$$= \varepsilon-\alpha\log\bar{P} + \log\bar{C} \tag{40}$$

where $\varepsilon$ is a constant.

$$d\bar{V}/ds = -\alpha(d\log\bar{P}/ds) + (d\log\bar{C}/ds) > 0 \tag{41}$$

(Note that the sign of $d\bar{V}/ds$ is the same as that of a real income change in the usual welfare calculations.)

From equations (24) and (25), we have $\hat{Y} < 0$ and $\hat{K} > 0$.

Along the adjustment path also everywhere C(t) is higher and hence (from equation (37)) P(t) is lower than would have been the case without the tariff. Therefore along the entire adjustment path V(t) is higher. We usually need to be careful here because the aggregate is made up of different cohorts. But in the shock examined here this does not pose a problem. This is because the variables that alter welfare are aggregative variables--$\lambda(t)$, C(t) and P(t). Hence the change in welfare is age independent.

In this case--with inter-industry trade--tariffs cause a Pareto-improvement for the economy. The increase in the size of the monopolistically competitive sector whose size was "too small" from a social perspective because of pricing above marginal cost, outweighs the static costs of distortion, much in the same way as in a static trade model--see Helpman and Krugman (1989), and Helpman (1990) for a discussion of this.

In this case the effect on the current account is uncertain. Across steady states the capital stock <u>could be</u> higher than the rise in wealth i.e., $d\bar{A}<d\bar{K}$[6]. Also on impact since C undershoots its long run value it implies that K also undershoots its long run value and there is a continuing investment along the path to the new steady state.

**(b) Intra-industry trade**

In this case the homogeneous good becomes non-traded and imports of the foreign brands must be paid for by exporting the domestic brands.

$$Y = (1-\alpha).C \qquad (42)$$

$$\text{or} \quad \hat{Y} = \hat{C} \qquad (43)$$

Now the effect of the tariff on the domestic production works entirely through its effect on C. From (43), (24) and (25) we have $\hat{n} < 0$ and $\hat{K} < 0$. Hence $\hat{P} > 0$. As in a static model the transfer just compensates the consumer for the rise in the price of the foreign brands due to the imposition of the tariff. So in the steady state the ultimate effect on welfare is due to the rise in P(t) due to a fall in n(t). From equation (40) above

$$\bar{V} = \varepsilon - \alpha \log\bar{P} + \log\bar{C}$$

and hence

$$d\bar{V}/ds = -\alpha\gamma(d\log\bar{n}/ds) < 0 \qquad (44)$$

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[6] The effect on $\bar{N}$ is given by the following expression

$$d\log N/ds = (1-\gamma)\,[\alpha C W^{-1}(1-\mu\Omega(\sigma-1)+\delta_{1y}^{-1}) - \mu\sigma]$$

Along the adjustment path, however, expenditure is less than the rebated tariff revenue (since a part of the latter is saved --in figure 2 the stable arm lies below the $\dot{A}=0$ line), so as $n$ falls this increases the welfare loss due to the tariffs. Also along the adjustment path, the consumption real rate of interest, $r-\alpha\dot{P}$, is lower than its steady state value, r.

The intuition behind the intra-industry case is as follows. The rise in human wealth due to the current and expected future rebated tariff revenues raises expenditures of all the cohorts. Demand is diverted away from the now relatively expensive foreign brands towards the relatively cheaper goods--the homogeneous good and the domestic brands of the differentiated good. Now comes the difference between the inter-industry and the intra-industry cases. In the latter case the additional demand for the non-traded homogeneous good can be met only by domestic production. Resources move into its production causing the number of domestic brands to fall and as does the capital stock. The capital stock falls because the relatively labour-intensive sector has expanded at constant factor prices.

In this case the current account is in surplus along the adjustment path since $\dot{A}$ is positive and $\dot{K}$ is negative[7].

## 5. CONCLUSIONS

I looked at the effect of a tariff in a monopolistically competitive overlapping generations model. The broad macroeconomic effects of a tariff are not unexpected. It gives rise to a rise in expenditure while the economy accumulates assets by saving. What is unexpected is that this broad macroeconomic co-movement is consistent with increased variety choice, capital inflows and a rise in welfare as well as the decreases in these. The crucial determinant of whether welfare goes up or down is the nature of the non-traded good. As

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[7] This is again because as C rises along the adjustment path, K falls continuously.

expenditures rise there is increased demand for the non-traded good and production has to increase to meet this. Thus when the domestic brands are non-traded, we have an investment boom and a rise in welfare. The opposite is true when the homogeneous good is non-traded.

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