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Abstract

The Heckscher-Ohlin model is incorporated into the overlapping generations framework of Blanchard (1985), and the effects of a terms of trade change on the current account are studied. As financial wealth is insurable, the rate of discount for future income from capital is smaller than the rate of discount for future labour income. Thus, factor intensities play an important role in the current account dynamics. The size of the rate of time preference plays an important role as well, as agents work throughout their lives.

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Introduction

Persson and Svensson (1985), and Matsuyama (1988) have recently used Diamond (1965) type overlapping generations (OLG) models in order to investigate the effects of a terms of trade change on the current account of a small open economy. In particular, Matsuyama (1988) incorporates the Heckscher-Ohlin model into Diamond's OLG framework and shows that the effect of a terms of trade change on the current account depends only on the relative factor intensities of the goods produced. This paper incorporates the Heckscher-Ohlin model into the overlapping generations framework of Blanchard (1985), which is in continuous time, and shows that the results obtained by Persson and Svensson (1985) and Matsuyama (1988) are very sensitive to the restrictive nature of Diamond's OLG framework, in which agents live for only two periods and work only in the first period of their lives.

Obstfeld (1982) was the first to use an intertemporal optimising framework in order to investigate the effect of a terms ot trade deterioration on the country's current account. He uses an exchange model in which preferences are represented by an infinitely lived agent, and shows that in such a framework a terms of trade deterioration will lead to a current account surplus. Svensson and Razin (1983) show that Obstfeld's result comes about because in the framework that he uses a steady state exists only if the rate of time preference is assumed to be increasing in welfare.

Persson and Svensson (1985), and Matsuyama (1988), on the other hand, employ Diamond (1965) type overlapping generations (OLG) frameworks in order to determine the effect of a terms of trade deterioration on the country's current account. In these OLG models agents live for two periods only. They can work only in the first period of their lives, which means that they are savers by construction. This, in turn, means that, qualitatively, the effect of a terms of trade deterioration will be independent of the size of the rate of time preference. Also in these models total savings in the economy in each period is given by the savings of the young, who are the wage earners. Thus if the terms of trade change increases the wage rate, aggregate savings will rise. Matsuyama (1988), in particular, puts the Heckscher-Ohlin model into such an OLG framework. In his framework, if both goods are produced then the effect of a terms of trade change on the wage rate depends only on the relative factor intensities of the goods produced. Moreover, by the Stolper-Samuelson (1941) effect, if after the terms of trade deterioraton the wage rate rises, then the return to capital must fall, which reduces investment at home, reinforcing the current account improvement brought about by the increased savings of the young. However, note that if there is a fall in the return to capital, then the value of titles to capital will also fall. This will mean that the wealth of agents holding these titles will fall, reducing their current expenditures and increasing their savings. This wealth effect plays an important role in the determination of the effect of a terms of trade change on the current account in the present framework, but it is absent in the models of Persson and Svensson (1985) and Matsuyama (1988), because in their models the old in each period are holding the titles to capital, while their savings decisions do not have any effect on the country's current account. This, then, means that changes in the wealth of these agents which is brought about by a terms of trade change will not have any effect on the current account.

Thus, the Diamond type OLG framework appears to be very restrictive for studying the effects of a terms of trade change on the current account. Therefore, in this paper we incorporate the Heckscher-Ohlin model into the overlapping generations framework of Blanchard (1985), and investigate the current account dynamics of such an economy. The model is in continuous time and at any instant a cohort is born. Agents face a constant probability of death throughout their lives. There are life insurance companies which take over agents' wealth (positive or negative) upon their death in return for a fee. In the model the effect of a change in the terms of trade on the current account can be decomposed into two components: an income effect, whose sign depends on the the size of the rate of time preference relative to the rate of interest; and a wealth effect, whose sign depends on the relative factor intensities of the goods produced.

First consider the income effect of an increase in the price of importables on the current account. As both goods are produced, the price increase will increase the value of gross domestic product. Then, provided that all domestic capital is owned by domestic residents and if the rate of discount for discounting future income from capital is the same as the rate of discount for discounting future labour income, then by this income effect total savings at home will rise, and thus the current account will improve if the rate of time preference is less than the rate of interest; and conversely if the rate of time preference is greater than the rate of interest.

The wealth effect comes about because the rate of discount for discounting future labour income is different from the rate of discount for discounting future income from capital. The reason for this discrepancy is as follows. Because wealth held in the form of titles to capital are insurable, the rate of discount for discounting future returns to capital is equal to the rate of interest. This is in contrast to the rate of discount for discounting future labour incomes, which is the rate of interest plus the probability of death. As the rate of discount for the returns to capital is not equal to the rate of discount for labour income, the effect of a permanent change in the terms of trade on total wealth in the economy will depend on the relative factor intensities of the goods produced. In particular, if the change in the terms of trade shifts income from capital to labour then for any given level of national income agents will feel wealthier, and their desired expenditures out of a given level of national income will be higher. This effect, whereby changes in the distribution of income between labour and capital changes total wealth for a given level of domestic income, we choose to call the wealth effect. Clearly, this wealth effect gives an important role to the relative factor intensities of the goods produced in determining the effect of a change in the terms of trade on the country's current account.

In a recent paper, Matsuyama (1987) combines the OLG framework of Blanchard with Hayashi's (1982) model concerning the adjustment of the capital stock, and looks at the response of the current account to an increase in the price of an imported intermediate input. Matsuyama's (1987) motivation for using Blanchard's framework is different from ours. His purpose is to allow the horizons of the saving decisions of the households to be different from the length of time required for the capital stock to adjust. Blanchard's framework is suited for his purpose, because in that framework by changing the probability of death faced by agents he can change their planning horizons. In this paper, on the other hand, we look at the effect of an increase in the price of a final importable good on the current account. Also, our paper is the first to incorporate the Heckscher-Ohlin model into Blanchard's framework. Our results contrast with the results that emerge from the incorporation of the Heckscher-Ohlin model into Diamond's OLG framework.

The paper is organised as follows. The model is presented in Section II. The economy's adjustment to a terms of trade change is discussed in Section III. Some concluding remarks are made in Section IV.

II. The Model

The model is a two good two factor variant of Blanchard's (1985) model. Time is continuous, and at any instant a large cohort, whose size is normalised to π, is born. π is the constant probability of death that agents face throughout their lives. As π is constant, the expected remaining life of an agent of any age is given by $\int_0^\infty te^{-\pi t}\,dt = \pi^{-1}$, and a cohort born at time zero has a size, as of time t, of $\pi e^{-\pi t}$. Thus, the size of the population at any time t is $\int_{-\infty}^{t} \pi e^{-\pi(t-s)}\,ds = 1$.

We assume that there is no bequest motive and that negative bequests are prohibited. As large numbers of agents are born at any instant, it is reasonable to assume that there will be life insurance companies which will contract to take over agents' wealth (positive or negative) upon their death in return for a fee. Perfect competition and free entry will ensure that the life insurance contracts that are offered are fair. As agents leave no human wealth on their death, this means that agents with non-human wealth a(t) at time t will contract to recieve $\pi a(t)$ if they do not die, and to pay a(t) if they die.

We assume that agents are endowed with L units of labour, which they supply throughout their lives. As we have normalised the size of the population to unity, the supply of labour in the economy at any moment in time is L. We assume that the economy is also endowed with K units of capital.

There are two perishable goods in the model, produced using labour and capital. The country exports the numeraire good. At any time t the outputs of these goods (denoted by $x_1(t)$ and $x_2(t)$) and the inputs (L and K) are related by a transformation curve $G(x_1(t), x_2(t), L, K) = 0$. G(.) is assumed to be strictly quasi-convex in (L,K) and in $(x_1(t), x_2(t))$. Also both industries are assumed to experience constant returns to scale, so that $G(\lambda x_1(t), \lambda x_2(t), \lambda L, \lambda K) = 0 \;\forall\; \lambda > 0$.

There are two alternative means of transferring purchasing power over time. There are internationally traded bonds whose price is fixed at unity in terms of the numeraire good, and which have a fixed rate of return of r^*. There are also titles to fixed factors. We assume that the titles to fixed factors are not internationally traded, but that agents can issue bonds and sell them abroad if they wish.

Let q(t) be the price of a title to a unit of capital at time t, and $r_K(t)$ the return to capital at time t. Then, as bonds and titles to capital are perfect substitutes, the arbitrage condition

$$\dot{q}(t) = r^* q(t) - r_K(t) \tag{1}$$

ensures that agents cannot make profits or losses by selling their titles to capital, investing the proceeds in bonds, and using the returns on the bonds to rebuy the titles an instant later.

(1) then implies that $\int_t^\infty \dot{q}(v)\, e^{-\int_t^v r^* d\mu} dv = \int_t^\infty [r^* q(v) - r_K(v)]\, e^{-\int_t^v r^* d\mu} dv$, which gives

$$q(t) = \int_t^\infty r_K(v)\, e^{-\int_t^v r^* d\mu}\, dv. \tag{2}$$

Thus, wealth held in the form of titles to capital is equal to the stream of future incomes from capital discounted at the market rate of interest. As we shall see, however, the rate of discount for discounting future labour income is equal to the rate of interest plus the probability of death. This discrepancy between the rate of discount for discounting future incmes from capital and the rate of discount for discounting future labour income gives the relative factor intensities of the goods produced an important role in determining the effect of a change in the terms of trade on the country's current account.

Let $C_1(s,v)$ and $C_2(s,v)$ denote the consumptions of goods 1 and 2 of an agent born at time s, as of time v. Then, if we assume that the instantaneous utility function is logarithmic, the agent's objective function at time t will be

$$E_t\left[\int_t^{\infty}[\alpha \log C_1(s,v) + (1-\alpha)\log C_2(s,v)]e^{\theta(t-v)}\,dv\right], \quad \theta \geq 0.$$

With constant π, this reduces to

$$\int_t^{\infty}[\alpha \log C_1(s,v) + (1-\alpha)\log C_2(s,v)]e^{(\pi+\theta)(t-v)}\,dv. \tag{3}$$

Now let a(s,t) be the total financial wealth of the same individual at time t, b(s,t) his net bond holdings, and k(s,t) the number of his titles to capital. Then we will have $a(s,t) = b(s,t) + q(t)\,k(s,t)$ and the dynamic budget constraint of the agent will be

$$\begin{aligned}\dot{a}(s,t) = \pi[b(s,t) + q(t)\,k(s,t)] + \dot{q}(t)\,k(s,t) + r^{*}\,b(s,t) + r_K(t)\,k(s,t) + w(t)\,L \\ - p(t)\,C_1(s,t) - C_2(s,t),\end{aligned} \tag{4}$$

which is obtained as follows. If the agent has b(s,t) number of bonds and titles to k(s,t) units of capital then he will recieve $\pi[b(s,t) + q(t)\,k(s,t)]$ from the insurance company, an interest of $r^{*}\,b(s,t)$ on his bonds, and $r_K(t)\,k(s,t)$ on his capital. He will also have a labour income of w(t)L, and capital gains of $\dot{q}(t)\,k(s,t)$. Thus his income in period t will be $\pi[b(s,t) + q(t)\,k(s,t)] + \dot{q}(t)\,k(s,t) + r^{*}\,b(s,t) + r_K(t)\,k(s,t) + w(t)\,L$. The change in his wealth at time t will then be this income less his expenditure at time t $(p(t)C_1(s,t) + C_2(s,t))$, which is given by the right hand side of (4).

In addition to (4), the agent has to satisfy the transversality condition

$$\lim_{v\to\infty} e^{-\int_t^v (r^{*}+\pi)d\mu}a(s,v) = 0, \tag{5}$$

which ensures that he does not go on borrowing without bound.

If we use (1) and the fact that $a(s,t) = b(s,t) + q(t)\,k(s,t)$, then we can write (4) as

$$\dot{a}(s,t) = (r^* + \pi)\, a(s,t) + w(t)\, L - p(t)\, C_1(s,t) - C_2(s,t). \quad (6)$$

(5) and (6) then imply that we can write the agent's budget constraint as

$$\int_t^{\infty} [p(v)\, C_1(s,v) + C_2(s,v)] e^{-\int_t^{\infty}(r^* + \pi)d\mu} dv = h(s,t) + a(s,t), \quad (7)$$

where h(s,t) is the agent's human wealth at time t and is given by

$$h(s,t) = \int_t^{\infty} w(v)L\, e^{-\int_t^{v}(r^* + \pi)d\mu} dv.$$

Thus, human wealth is the present value of future labour incomes, discounted at the rate of interest plus the probability of death. This is in contrast to the discount rate used for calculating the present value of incomes from capital, which is the market interest rate alone. This discrepancy gives us the wealth effect.

The agent's problem then is to maximise (3) subject to (7) by choosing an optimal sequence of consumption levels. This optimisation problem could be done in two stages. In the first stage the agent decides how much of each good to consume at any given time t for a given level of expenditure, z(s,t). In the second stage he decides how to spread his total wealth on consumption over his lifetime.

From the first stage of the agent's problem we can obtain the indirect utility function V[p(t), z(s,t)]. As the instantaneous utility function is logarithmic, this indirect utility function is given by

$$V[p(t), z(s,t)] = \Omega - \alpha \log\, p(t) + \log\, z(s,t), \quad (8)$$

where $\Omega = \alpha \log \alpha + (1-\alpha) \log (1-\alpha)$. The second stage of the agent's problem could then be written as

$$\max_{z(s,v)} \int_t^{\infty} [\Omega + \alpha \log p(v) + \log z(s,v)]\, e^{-\int_t^v (\pi+\theta) d\mu} dv$$
$$\text{s.t.} \int_t^{\infty} z(s,v) e^{-\int_t^v (r^* + \pi) d\mu} dv = h(s,t) + a(s,t).$$

It is then easy to show that this programme gives

$$z(s,t) = (\pi + \theta)[a(s,t) + h(s,t)]. \tag{9}$$

In order to get the aggregate expenditure in the economy, $Z(t)$, multiply (9) by the size of the cohort born at time s (that is, by $\pi e^{\pi(t-s)}$), and integrate over s to get

$$Z(t) = (\pi + \theta)[A(t) + H(t)], \tag{10}$$

where $A(t) \left(= \int_{-\infty}^{t} a(s,t)\, \pi\, e^{\pi(t-s)} ds \right)$ and $H(t) \left(= \int_{-\infty}^{t} h(s,t)\, \pi\, e^{\pi(t-s)} ds \right)$ represent aggregate financial and human wealth at time t, respectively. Note that $A(t) = B(t) + q(t) K$, where $B(t)$ is the net foreign asset position of the economy. Moreover,

$$\dot{A}(t) = \pi\, a(t,t) - \pi\, A(t) + \int_{-\infty}^{t} \dot{a}(s,t)\, \pi\, e^{\pi(t-s)} ds, \tag{11}$$

where $\pi a(t,t)$ is the financial wealth of the newly born, which is equal to zero, $\pi A(t)$ is the wealth of those who die, and $\int_{-\infty}^{t} \dot{a}(s,t)\, \pi\, e^{\pi(t-s)} ds$ is the change in the financial wealth of those who stay alive.

Using (4) in (11), we get

$$\dot{A}(t) = r^* B(t) + r_K(t) K + w(t) L + \dot{q}(t) K - Z(t). \tag{12}$$

Now note that $\dot{A}(t) = \dot{B}(t) + \dot{q}(t)\,K$, which means that (12) can be written as

$$\begin{aligned}\dot{B}(t) &= r^{*}B(t) + r_{K}(t)\,K + w(t)\,L - Z(t) \\ &= r^{*}B(t) + g(p(t),K,L) - Z(t),\end{aligned} \tag{13}$$

where g(p(t),L,K) is the country's GDP function. Thus, the economy accumulates bonds if national income ($r^{*}B(t) + g(p(t),K,L)$) is greater than aggregate expenditure (Z(t)).

Also note that the evolution of aggregate human wealth is given by

$$\begin{aligned}\dot{H}(t) &= \frac{d}{dt}\left[\int_{-\infty}^{t}\left[\int_{t}^{\infty} w(v)L\,e^{-\int_{t}^{v}(r^{*}+\pi)d\mu}dv\right]\pi e^{\pi(s-t)}ds\right] \\ &= -\,w(t)\,L + (r^{*} + \pi)H(t).\end{aligned} \tag{14}$$

Now, from (10) we have

$$\dot{Z}(t) = (\pi + \theta)\left[\dot{A}(t) + \dot{H}(t)\right]. \tag{15}$$

Thus, substituting for $\dot{A}(t)$ and $\dot{H}(t)$ from (12) and (14) into (15) and using (1), we can show that

$$\dot{Z}(t) = (r^{*} - \theta)Z(t) - \pi(\pi + \theta)[B(t) + q(t)K]. \tag{16}$$

Equations (13) and (16) then give us the two dynamic equations in Z and B and the corresponding phase diagrams in Figure 1. As agents' planning horizons are finite, the rate of time preference does not have to be increasing in welfare for a steady state equilibrium to exist. We assume that θ is constant. In Figure 1 the $\dot{B}(t) = 0$ locus is upward sloping. The $\dot{Z}(t) = 0$ locus is upward sloping if $r^{*} > \theta$ and downward sloping if $r^{*} < \theta$. The model is saddle point stable if $(r^{*} - \theta)r^{*} < \pi(\theta + \pi)$. The saddle paths in Figure 1 are upward sloping.

As will be shown in the next section, the steady state level of the net foreign asset position of the country will depend crucially on the proportion of the country's domestic income earned by capital, and also on the value of the rate of time preference relative to the rate of interest.

In this model insurance companies insure non-human wealth, which means that a shift in income from labour to capital will make agents feel wealthier, increasing their expenditures out of a given level of domestic income, and thus reducing the country's net foreign asset position. We call this the wealth effect. Besides this wealth effect, if the rate of time preference is less than the rate of interest agents will tend to save for future consumption; and they will tend to borrow if the rate of time preference is greater than the rate of interest. The steady state net foreign asset position of the country will be determined by these two effects.

To find the steady state levels of expenditure ($\tilde{Z}$) and the net foreign asset position of the economy ($\tilde{B}$), set $\dot{B} = 0$ in (13) and $\dot{Z} = 0$ in (16) and solve these two equations for B and Z to get

$$\tilde{B} = \frac{\pi(\pi + \theta)}{\Delta} qK - \frac{(r^* - \theta)}{\Delta} g, \tag{17}$$

and

$$\tilde{Z} = \frac{(\pi + \theta)\pi r^*}{\Delta} qK - \frac{\pi(\pi + \theta)}{\Delta} g, \tag{18}$$

where $\Delta = (r^* - \theta)r^* - \pi(\theta + \pi)$, which is negative for stability. The first terms on the right hand sides of (17) and (18) represent the influence of the wealth effect on $\tilde{B}$ and $\tilde{Z}$, while the second terms represent the influence of the income effect.

In Figure 1(a), we illustrate the steady state equilibrium of the country when $r^* < \theta$. From (17) if $r^* < \theta$ then both the wealth effect and the income effect tend to bring about a negative net foreign asset position for the economy in the steady state. In this case agents tend to be borrowers not only because the rate of interest is lower than the rate of time preference, but also because all home capital is owned domestically, which, by the wealth effect, tends to further increase current expenditure above current domestic income. In the steady state, therefore, the country will have a negative net foreign asset position.

On the other hand, if $r^* > \theta$ then agents will tend to be savers. From (17) we can see that this does not necessarily mean that the country's net foreign asset position will be positive in the steady state. The reason for this is as follows. By the wealth effect, the country's current expenditure out of a given level of domestic income will rise if income is shifted from labour to capital. It turns out that if capital income forms a large enough proportion of domestic income then the country will have a negative net foreign asset position in the steady state, even though the rate of time preference is less than the rate of interest. This is shown in Figure 1(b), where the vertical intercept of the $\dot{Z} = 0$ locus, whose height is determined by the size of income from domestic capital, lies above the vertical intercept of the $\dot{B} = 0$ locus, whose height is determined by the size of the country's gross domestic product. Nevertheless, note that if income from domestic capital forms a small enough proportion of total domestic income the country will have a positive net foreign asset position in the steady state.

Before turning to the current account adjustment of the economy in response to a terms of trade change, we note from (17) that if $r^* = \theta$ then the steady state level of the country's net foreign asset position will depend only on qK. In this case if the change in the terms of trade increases the return to capital, and, hence, qK, then the country's net foreign asset position in the steady state will worsen, which means that during the adjustment period to the new steady state the country should be running a current account deficit. Conversely, if the change in the terms of trade reduces the return to capital then the country will run a current account surplus in the adjustment path to the new steady state. Thus, in this case the effect of a terms of trade change on the country's current account will depend only on the relative factor intensities of the goods produced, which is Matsuyama's result. However, the mechanism by which this result comes about in the present framework is quite different from Matsuyama's. In the present framework, if $r^* = \theta$, and if the rate of discount for discounting future labour income is the same as the rate of discount for discounting future income from capital, then the country's net foreign asset position in the steady state will be zero, and will remain zero regardless of the effect of the change in the terms of trade on the return to capital: it is not zero and it is affected by changes in the return to capital because the rate of discount for income from capital is smaller than the rate of discount for labour income. If the change in the terms of trade shifts income from labour to capital then agents will feel wealthier and, therefore, spend more out of a given level of national income, worsening the country's steady state net foreign asset position. In Matsuyama's model, however, the mechanism through which factor intensities affect the current account is quite different. In that model only the savings decision of the wage earners affects the current account. Thus, if the change in the terms of trade increases wage income then the country's current account will improve.

III. Current account adjustment to a terms of trade change

In this section I consider the effects of an unanticipated permanent increase in p on the country's current account. The total effect of the increase in p could be decomposed into two components: an income effect, whose effect on the current account depends on the the size of the rate of time preference relative to the rate of interest; and a wealth effect, whose effect depends on the relative factor intensities of the goods produced.

First consider the income effect of an increase in p. As both goods are produced, the price increase will raise the value of gross domestic product. Then, by the income effect, if all domestic capital is owned by domestic residents and if the rate of discount for discounting future income from capital is the same as the rate of discount for discounting future labour income, then expenditure will rise by more than income and the current account will deteriorate if the rate of time preference is greater than the rate of interest, and conversely if the rate of time preference is less than the rate of interest.

In order to analyse the income effect in isolation, suppose that insurance companies insure only that part of wealth which is held in bonds. Also, suppose that when agents die the government takes over their titles to capital and returns them to the economy in a non-distortionary fashion. Then, as wealth held in the form of bonds is insurable while wealth held in the form of titles to capital is not, the arbitrage condition (1) is replaced by

$$\dot{q}(t) = r^{*}q(t) + \pi q(t) - r_K(t), \tag{19}$$

where $\pi q(t)$ on the right hand side represents the amount that agents will recieve from the insurance companies if they hold q(t) units of bonds rather than a unit of capital. (19) then implies that $\int_t^{\infty}\dot{q}(v)\, e^{-\int_t^v (r^* + \pi)\, d\mu} dv = \int_t^{\infty}[r^* q(v) + \pi q(v) - r_K(v)]\, e^{-\int_t^v (r^* + \pi)\, d\mu} dv$, which gives

$$q(t) = \int_t^{\infty} r_K(v)\, e^{-\int_t^v (r^* + \pi) d\mu}\, dv. \tag{20}$$

From (20), we can see that when wealth held in the form of titles to capital is not insurable then future incomes from capital are discounted by the rate of interest plus the probability of death, which is the same as the discount rate for discounting future labour income. It is then very easy to show that $\dot{B}(t)$ is still given by (13), while $\dot{Z}(t)$ is given by

$$\dot{Z}(t) = (r^* - \theta)Z(t) - \pi(\pi + \theta)B(t). \tag{21}$$

Thus, in this case the $\dot{Z} = 0$ locus will pass through the origin, as drawn in Figure 2. Note that in this case an increase in p will leave the $\dot{Z} = 0$ locus unaffected, but it will shift the $\dot{B} = 0$ locus up by g_p, as before. In Figure 2 we show the case where $r^* < \theta$. After the increase in p the equilibrium shifts from E_0 to E_1 and then the economy moves along the stable arm to the long run equilibrium E_2. As the rate of time preference is greater than the rate of interest, after the price increase current expenditure rises by more than current income and the economy decumulates bonds during the adjustment period. Now, if r^* is greater than θ, then the $\dot{Z} = 0$ locus will be upward sloping. In that case after the price increase expenditure rises by less than income. Thus, the economy will accumulate bonds during the adjustment period.

The wealth effect will be operative if the rate of discount for discounting future labour income is different from the rate of discount for discounting future income from capital. The reason for this discrepancy is that insurance companies in the model contract to take over agents' financial wealth on their death and in return for this they pay those agents who stay alive an amount which is equal to their non-human wealth times the probability of death, assuming that the insurance contract is fair, which will be the case if there is perfect competition and free entry in the insurance industry. This insurance then means that the effective rate of discount for discounting future income from capital will be equal to r^*, which can also be seen from (2). In contrast, the rate of discount for discounting future labour income is the rate of interest plus the probability of death- that is, $r^* + \pi$. This means that any shift in income from labour to capital will, for the same gross domestic product, make agents feel wealthier, increasing their expenditures, and worsening the current account. Clearly, this wealth effect implies that the relative factor intensities of the goods produced will play an important role in determining the effects of a term of trade change on the country's current account.

The operation of the wealth effect is illustrated in Figure 3. In the Figure we consider two economies with the same gross domestic product. Their $\dot{B} = 0$ loci, therefore, are the same. The ratio of capital to labour income in country 1 is larger than in country 2. Thus, the $\dot{Z} = 0$ locus of country 1, which is denoted by $\dot{Z}_1 = 0$ lies below the $\dot{Z} = 0$ locus of country 2, denoted by $\dot{Z}_2 = 0$, if $r^* < \theta$, as shown in the Figure. Note, however, that, if r^* were greater than θ, then the $\dot{Z}_1 = 0$ locus would lie above the $\dot{Z}_2 = 0$. In either case, country 1, which has the higher ratio of capital to labour income in its domestic poduct will have a worse net foreign asset position and smaller expenditure in the steady state equilibrium. The reason for this is that because of life insurance plans future capital income streams are valued more highly than future labour incomes. So, in country 1 agents tend to spend more off steady state, decumulating bonds and thus reducing the steady state level of national income.

A change in p will have an income effect, as it will change the value of gross domestic product. It will also have a wealth effect in so far as it shifts income from one factor of production towards the other. The size of the rate of time preference relative to the rate of interest determines the direction in which the income effect will affect the current account, while the relative factor intensities of the goods produced determine the direction in which the wealth effect will affect the current account. Thus, both relative factor intensities and the size of the rate of time preference play important roles in determining the effect of a change in the terms of trade on the country's current account.

First consider the case where $r^* < \theta$. Suppose the import good is capital intensive. Then the increase in p will increase the return to capital. This will shift the $\dot{Z} = 0$ locus in Figure 4(a) down by $\frac{\pi(\pi + \theta)}{(\theta - r^*)} \frac{g_{Kp}K}{r^*}$. The price increase will shift the $\dot{B} = 0$ locus up by g_p. In the short run, the equilibrium will shift from E_0 to E_1 and the country will move along the stable path towards the new long run equilibrium at E_2. In this case, as the rate of time preference is greater than the rate of interest, by the income effect the increase in national income brought about by the increase in p will lead agents to increase their expenditures by more than the increase in their incomes. Moreover, as the import good is capital intensive, the price increase will shift income towards capital, which, by the wealth effect, will tend to increase current expenditure. Thus, both the income effect and the wealth effect tend to increase current expenditure above current income after the price increase, causing a current account deficit. The net foreign asset position of the country in the steady state will be worsened. Aggregate expenditure in the steady state could be higher or lower than before.

Now suppose that r^* is still less than θ but that the import good is relatively labour intensive. Then g_{Kp} will be negative and the $\dot{Z} = 0$ locus will shift up. In this case the price increase will shift income from capital to labour. Thus, the wealth effect of the price increase will tend to reduce current expenditure. If after the price change agents feel wealthier then they will increase their expenditures. The current account will improve if this increase in expenditure is smaller than the increase in domestic income. On the other hand, if the increase in expenditure is greater than the increase in domestic income, then the current account worsens. Note that the shift in income from capital to labour could be so large that after the price increase aggregate wealth (i.e., human wealth plus non-human wealth) falls, even though national income rises. Figure 4(b) shows this interesting paradoxical case. In this case after the price increase aggregate expenditure falls and the economy accumulates bonds during the adjustment period. Expenditure in the new steady state is higher than in the original equilibrium, as domestic income is higher and the the country's net foreign asset position is improved.

Now consider the case in which $r^* > \theta$. Again, after the price increase national income rises. As the rate of time preference is less than the rate of interest, the income effect of this price increase is to raise current expenditure by less than the increase in current income. If the import good is relatively capital intensive then the wealth effect would also tend to increase expenditure. If the combined wealth and income effects increase expenditure by more than the increase in current national income, then the country's current account will worsen; otherwise, the current account will improve.

Finally, consider the case in which $r^* > \theta$ and in which the import good is labour intensive. In this case the wealth effect tends to reduce current aggregate expenditure. This, together with the fact that the income effect tends to increase current expenditure by less than the increase in domestic income, means that in this case the current account unambiguously improves, and the economy accumulates bonds during the adjustment period to the new steady state. In the new steady state expenditure will be higher. However, in the short run expenditure may fall if as a result of the shift in income from capital to labour aggregate wealth falls.

IV. Conclusions

In this paper we incorporated the Heckscher-Ohlin model into the overlapping generation framework of Blanchard (1985) and considered the response of the current account to a terms of trade change. It was shown that this response could be decomposed into a wealth effect and an income effect. The sign of the income effect depended on the size of the rate of time preference relative to the rate of interest. The wealth effect was operative because income from capital was insurable, while income from labour was not. For this reason shifts in income from one factor to the other affected aggregate expenditure out of a given level of domestic income. This gave the relative factor intensities of the goods produced an important role in determining the effect of a change in the terms of trade on the current account.

Thus, both relative factor intensities and the size of the rate of time preference played important roles in determinig the effect of a terms of trade change on the current account. This is in contrast to the results of Matsuyama (1988) and Obstfeld (1982). In Matsuyama's model the effect of a terms of trade change on the current account depended only on the relative factor intensities, while in Obstfeld's model the result depended only on the assumption he had to make about the rate of time preference.

The model could be extended by allowing the capital stock to adjust when the terms of trade change, and by allowing labour leisure choice. Adjustment of the capital stock should be allowed for in a manner similar to that in Matsuyama (1988), which preserves the Heckscher-Ohlin properties of the model in the long run. As the distribution of income between labour and capital plays an important role in determining the level of aggregate expenditure out of a given level of domestic income, it would be interesting to see the results which will emerge from such an extension.

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FIGURE 1 (a)

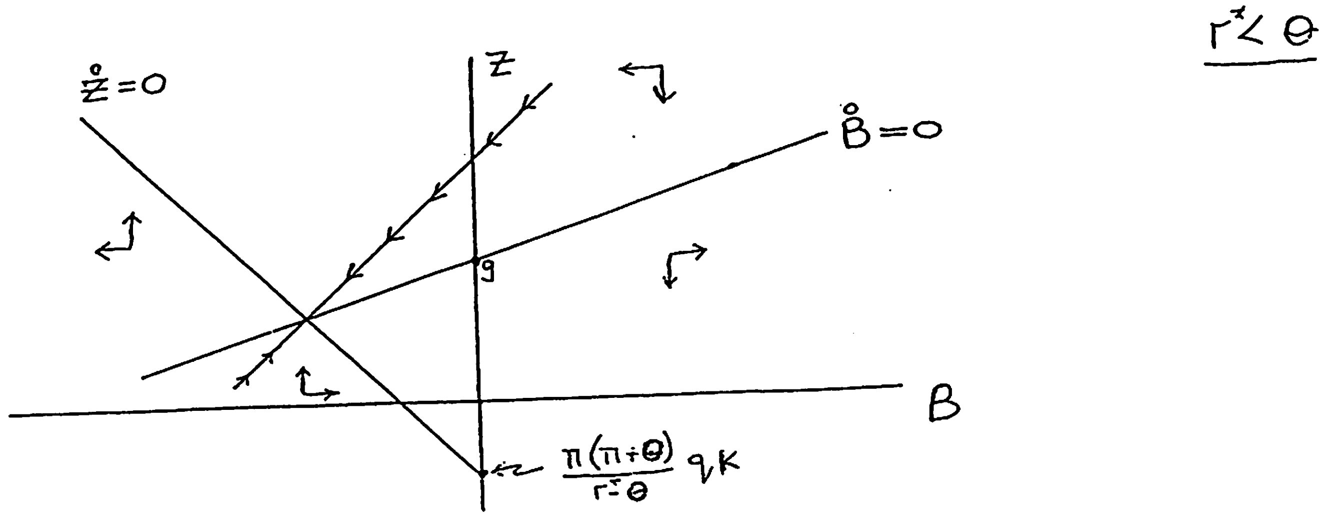

FIGURE 1 (b)

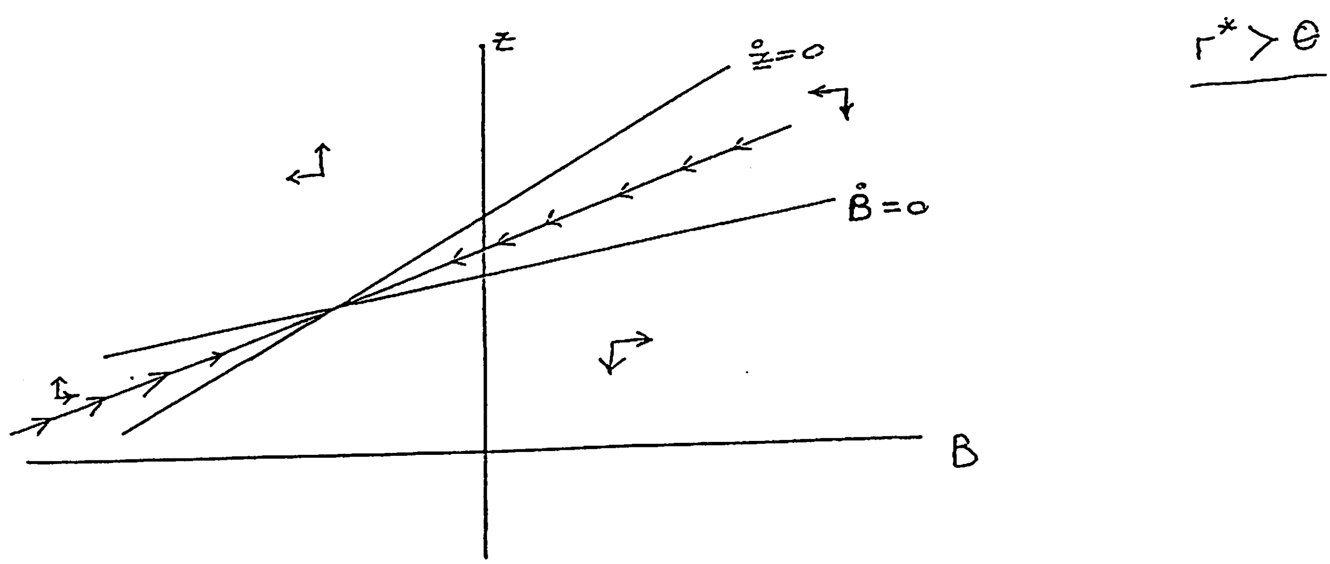

FIGURE 2

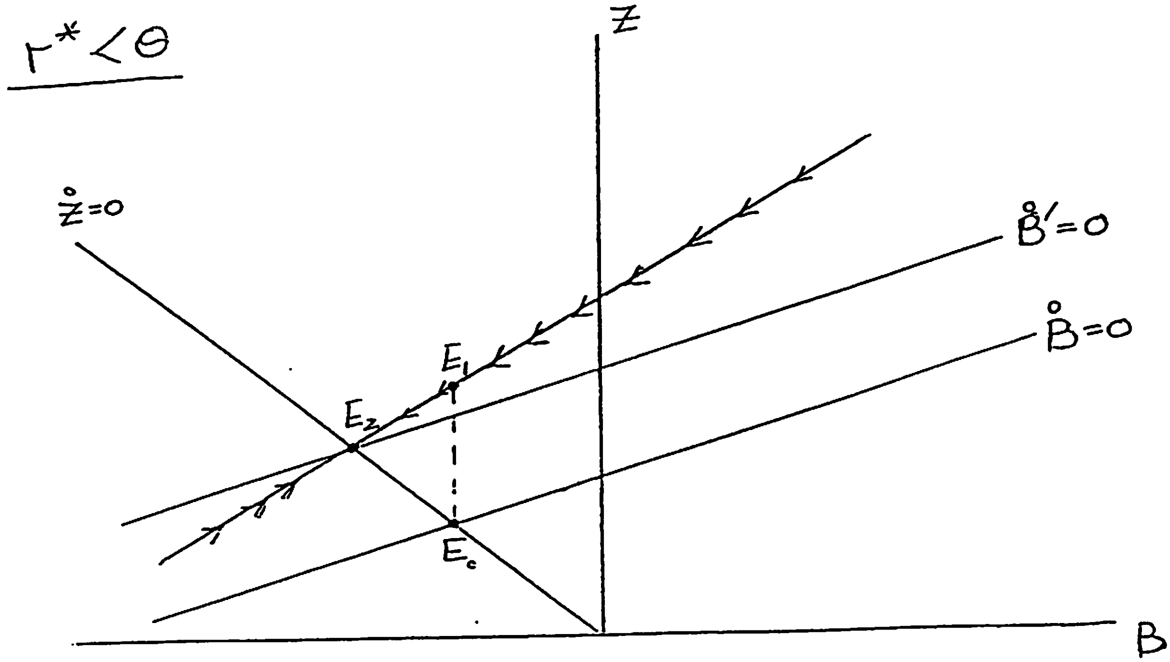

FIGURE 3

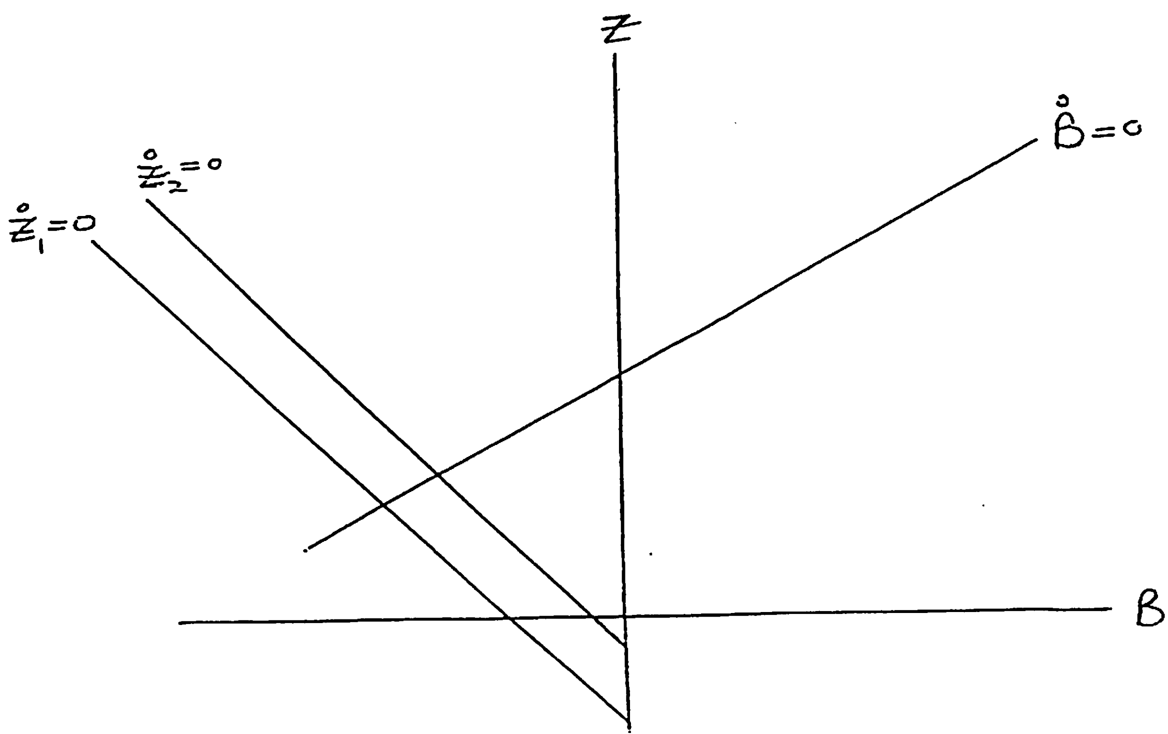

FIGURE 4 (a)

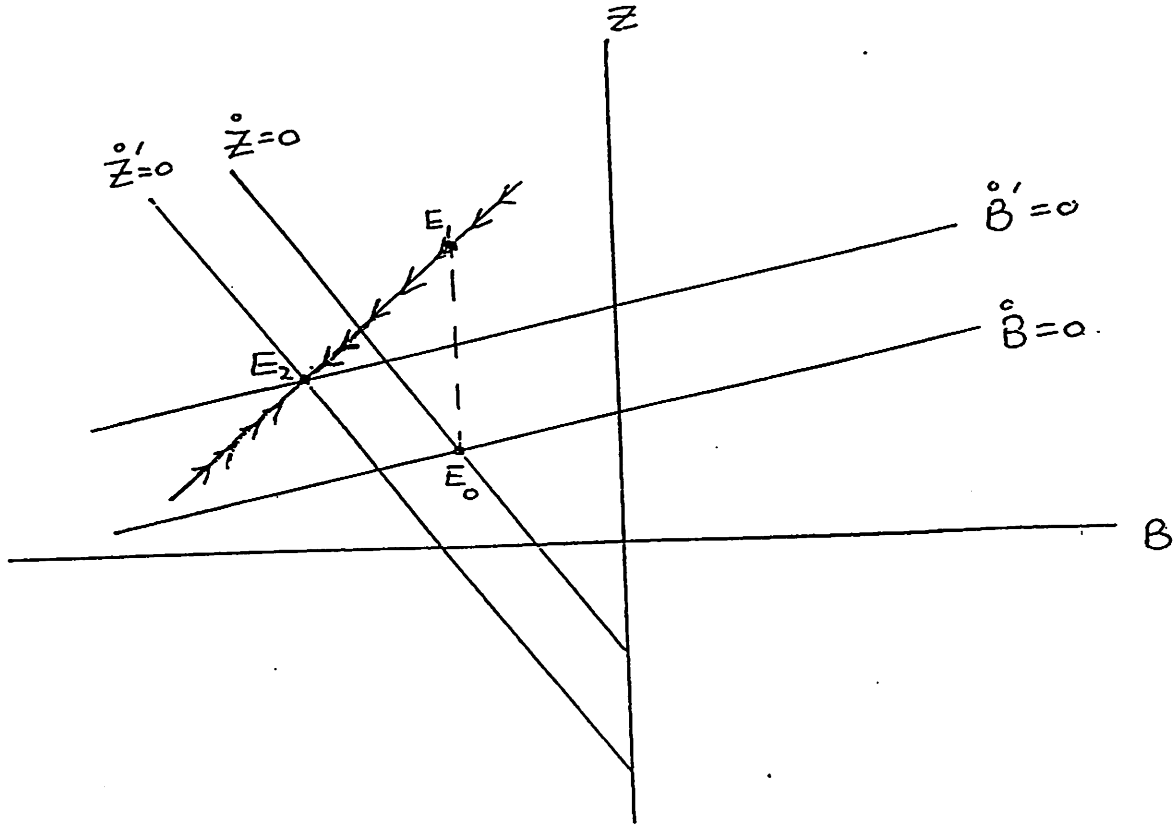

FIGURE 4 (b)