Stabilization Policy in an Open Economy

Torben M. Andersen* and Steinar Holden †

June 2001

Abstract

The scope for an active demand management policy is considered for a small open economy. Business cycle fluctuations generated by supply and demand shocks are shown to imply welfare losses when agents are risk averse and the capital market incomplete. Public demand for non-tradeables has real effects and there is a welfare case for pursuing a demand management policy which stabilizes consumption. It is argued that this type of stabilization can be attained via automatic stabilizers based on nominal budgeting rules.

Acknowledgement *Comments made by Pierre-Yves Henin, Asbjørn Rødseth and an anonymous referee are gratefully acknowledged.*

Keywords: Stabililization policy, fiscal policy, aggregate risk, social insurance.

JEL: E32, E63, F41.

*Department of Economics, University of Aarhus, 8000 Aarhus, Denmark and CEPR. E-mail: tandersen@econ.au.dk

†Department of Economics, University of Oslo, Box 1095 Blindern, 0317 Oslo, Norway. E-mail: steinar.holden@econ.uio.no; homepage:http://www.uio.no/~sholden

1 Introduction

For more than a decade, reducing public budget deficits has been the overriding concern for fiscal policy analysis, and other issues have been devoted little attention. Yet in the last few years budget deficits have been reduced significantly in many industrialized economies, and while long-term issues related to pensions and demographic trends are still a matter of deep concern, more attention can again be given to the short-run effects of fiscal policy. However, much of the existing economic literature on fiscal policy is based on rather restrictive models that do not apply to the recent advances made in the macroeconomics literature[1]. In particular a significant achievement of the recent development in the open macroeconomics literature is the formulation of explicit intertemporal models (see eg Obstfeld and Rogoff (1996) for an introduction and references). Very little is, however, known about the policy implications of these models. One exception is that it is often argued that the explicit intertemporal interpretation of the current account in terms of the underlying savings and investment decisions makes it misleading to have the current account or the trade balance as an intermediary target for economic policy making (see eg Corden (1991) and Razin (1993)).

The aim of this paper is to consider the implications of business cycle fluctuations generated by supply or demand shocks in a small open economy. When agents are risk averse and capital markets incomplete, there is a welfare loss from the risks created by business cycle fluctuations. We show that demand management policy in the form of public demand for non-tradeables affects the real allocation. In particular there exists a demand management policy which can stabilize the tradeable sector and thereby consumption and thus lead to welfare improvements both when business cycle fluctuations are created by demand and supply shocks. The welfare case for this policy can be interpreted in the sense that it provides implicit or social insurance which mitigates the consequences of market failures precluding perfect consumption smoothing for households. Finally, we discuss whether simple forms of demand management policies can contribute

[1] Important exceptions include Giavazzi and Pagano (1990), Baxter and King (1993) and Dixon and Lawler (1996).

to an appropriate stabilization, and we show that this can be accomplished via automatic stabilizers built into the public budget via nominal budget rules.

Specifically the present paper is based on a two-sector model for a small open economy, with one sector producing a tradeable and the other a non-tradeable. There is perfect capital mobility but the available set of assets does not allow perfect diversification of the shocks inducing business cycle fluctuations. Since households are risk averse, it follows that there is a welfare loss due to fluctuations in consumption. In the present setting changes in public demand affect the equilibrium via two routes. First, via the implied change in taxes and its effect on disposable income and secondly via a change in the relative demand for tradeables and non-tradeables and thereby the terms of trade.

An obvious objection to the topic of our paper is that stabilization should be the aim of monetary policy, and not of fiscal policy. We do not object to the view that monetary policy instruments should be used to stabilize the economy. However, for countries pursuing a fixed exchange rate policy (like all EMU countries) there is no autonomy in monetary policy. Moreover, even for countries with a floating exchange rate, recent experiences of the UK and New Zealand show that an active monetary policy may not prevent considerable imbalances between tradeables and non-tradeables sectors (See King (2000) and Brash (2001)). In contrast, as will be apparent from our analysis, fiscal policy may have a stabilizing effect on the sectoral distribution of the economy, as it may be targeted directly towards one of the sectors. This suggests that for stabilization purposes, fiscal policy should be seen as a complement to monetary policy rather than an alternative (cf Røisland and Torvik, 1999).

The model builds on two strong assumptions so as to facilitate the interpretation of the results. Ricardian Equivalence prevails implying that the case for an active stabilization policy does not follow from better access to capital markets for the public sector than for the private sector[2]. In the same vein the model is real without any nominal rigidities to highlight that nominal adjustment failures are not necessary for demand management polices to have beneficial effects.

The paper is organized as follows: The model is set up in section 2, and section

[2]For an analysis of the role for an active policy in the case where Ricardian Equivalence does not hold see Andersen and Dogonowski (1999).

3 analyses the determinants of national wealth. The case of supply (productivity) shocks is considered in section 4, and demand (preference) shocks are considered in section 5. Section 6 considers the problems on how to implement this type of policy, and section 7 offers a few concluding remarks.

2 A Two-Sector Model with an Incomplete Capital Market

Consider a non-monetary open two-sector economy with one sector producing a non-tradeable and the other a tradeable with prices (in domestic currency) given exogenously from the world market[3].

Households

There are H households possessing a given amount of labour ($\overline{L}$) which is supplied inelastically (see Appendix C for generalisations). Households own the firms and are entitled to the flow of profits. The horizon is infinite and the aim is to maximize expected utility implying that the representative household aims at maximizing

$$V_t = E_t \left[\sum_{j=0}^{\infty} (1+\rho)^{-j} U(b_{t+j}) \right]$$

where ρ is the subjective rate of time preference, U is the instantaneous utility function defined as

$$U(b_{t+j}) = b_{t+j} - \frac{k}{2} (b_{t+j})^2 \qquad k > 0$$

where b is a composite index of consumption of non-tradeables (c_{t+j}) and tradeables ($\overline{c}_{t+j}$), ie

$$b_{t+j} = \frac{1}{a} (c_{t+j})^{\alpha} (\overline{c}_{t+j})^{1-\alpha} \qquad 0 < \alpha < 1 \qquad a \equiv \alpha^{\alpha} (1-\alpha)^{1-\alpha}$$

Note that the strict concavity of the utility function involves risk-aversion wrt fluctuations in the consumption bundle.

[3]The model is related to Obstfeld and Rogoff (1995, 1996), Glick and Rogoff (1995) and Razin (1993), but differs by focusing on fiscal policy.

The optimal consumption decision can most easily be found by first considering how the household maximizes the value of the composite consumption bundle for given nominal expenditures S_{t+j} in period $t+j$,

$$S_{t+j} = P_{t+j}c_{t+j} + \overline{P}_{t+j}\overline{c}_{t+j}$$

where P_{t+j} $\left(\overline{P}_{t+j}\right)$ is the price of non-tradeables (tradeables). With Cobb-Douglas preferences it follows straightforwardly that optimal consumption implies

$$c_{t+j} = \alpha \frac{S_{t+j}}{P_{t+j}}$$

$$\overline{c}_{t+j} = (1-\alpha)\frac{S_{t+j}}{\overline{P}_{t+j}}$$

The indirect utility of the consumption bundle can be written

$$b_{t+j} = \frac{S_{t+j}}{Q_{t+j}}$$

where Q is the consumer price index defined as

$$Q_t \equiv (P_t)^{\alpha}\left(\overline{P}_t\right)^{1-a}$$

The intertemporal budget constraint reads

$$\sum_{j=0}^{\infty}\prod_{k=0}^{j}(1+r_{t+k})^{-1} S_{t+j} \leq \sum_{j=0}^{\infty}\prod_{k=0}^{j}(1+r_{t+k})^{-1} I_{t+j} + F_t$$

where I is the after-tax nominal income $\left(\equiv P_t y_t + \overline{P}_t\overline{y}_t - T_t\right)$, r_{t+k} the nominal interest rate, T_t a lump-sum tax, and F nominal non-human wealth at the start of period t.

Assumptions concerning capital markets are crucial in the present context. Although there are now few restrictions on capital mobility among industrialized countries it is well established that international capital markets do not achieve sufficient risk diversification relative to the benchmark case of complete capital markets (see Lewis (1999) for an excellent survey). Empirical evidence documents a so-called "home bias" implying that domestic consumption is more closely correlated with domestic income than predicted by models assuming complete capital markets. To capture this situation in a manageable way we assume that there is a perfect international capital market in a real bond, but equities are not traded internationally. The first part of this ensures that we allow capital markets a potentially strong role for risk diversification, although the second ensures that a "home bias" exists, since the risk associated with variations in production (income) cannot be fully diversified via the international capital market. With this incompleteness in capital markets it is of interest to analyse how aggregate risk affects households and the scope it leaves for an active stabilization policy.

Specifically the internationally traded bond offers a rate of return specified in terms of the consumption bundle, ie

$$\frac{(1+r_{t+1})\,Q_t}{Q_{t+1}} = 1+\delta$$

Furthermore, we assume that the objective and subjective discount rates are equal, ie $\delta = \rho$. It is well-known that it is necessary to impose this latter condition in the case of a small open economy to prevent that the country accumulates or decumulates foreign debt forever, see eg Blanchard and Fischer (1989). These assumptions imply that the real rate of return is constant; that is, the real rate of return on the bond is riskless.

The budget constraint can now be written in real terms as

$$\sum_{j=0}^{\infty} (1+\delta)^{-j}\, b_{t+j} \leq \sum_{j=0}^{\infty} (1+\delta)^{-j}\, i_{t+j} + f_t$$

where $i_t \equiv I_t/Q_t$ and $f_t = F_t/Q_t$.

It is convenient to define

$$A_t \equiv \sum_{j=0}^{\infty} (1+\delta)^{-j}\, E_t i_{t+j} + f_t \tag{1}$$

as the household's total (human and non-human) wealth. As is standard in these models, the intertemporal utility maximization has a simple solution

$$b_t = \frac{\delta}{1+\delta} A_t \tag{2}$$

with the associated non-ponzi game condition

$$\lim_{T\to\infty} (1+\delta)^{-T}\, f_{t+T} = 0$$

The household consumes the real return of its total wealth each year, and the well-known random walk property holds for consumption, ie

$$E_t b_{t+1} = b_t$$

and likewise for wealth

$$E_t A_{t+1} = A_t$$

We find that the demands can be written

$$c_t = \alpha \frac{\delta}{1+\delta} A_t \frac{Q_t}{P_t} \tag{3}$$

$$\overline{c}_t = (1-\alpha) \frac{\delta}{1+\delta} A_t \frac{Q_t}{\overline{P}_t} \tag{4}$$

Firms
Let $N = N^{nt} \cup N^t$ denote the set of firms in the economy. A firm n is either producing non-tradeable ($j \in N^{nt}$) or tradeable ($j \in N^t$) products.

All firms are price and wage takers producing subject to the same production technology

$$y_t = \frac{1}{\beta} \eta_t \left(l_t\right)^{\beta} \qquad 0 < \beta < 1$$

where labour is the only input and η_t is a productivity parameter. From profit maximization, we find labour demand for a representative firm to be

$$l_t^j = l\left(\eta_t, \frac{P_t^j}{W_t}\right) \equiv \left(\eta_t \frac{P_t^j}{W_t}\right)^{\frac{1}{1-\beta}} \tag{5}$$

and output supply is

$$y_t^j = y\left(\eta_t, \frac{P_t^j}{W_t}\right) \equiv \frac{1}{\beta} \eta_t^{\frac{1}{1-\beta}} \left(\frac{P_t^j}{W_t}\right)^{\frac{\beta}{1-\beta}} \tag{6}$$

where $P_t^n = P_t$ if $j \in N^{nt}$ and $P_t^n = \overline{P}_t$ if $j \in N^t$.

Wage Determination

Assume that the labour market is competitive in which case the equilibrium wage follows from the market clearing condition

$$\overline{L} = N^t l\left(\eta_t, \frac{\overline{P}_t}{W_t}\right) + N^{nt} l\left(\eta_t, \frac{P_t}{W_t}\right)$$

and the equilibrium wage can be written

$$W_t = W(\overline{P}_t, P_t, \eta_t) \tag{7}$$

where homogeneity properties imply

$$\lambda W_t = W(\overline{\lambda P}_t, \lambda P_t, \eta_t) \qquad for \quad any \quad \lambda > 0$$

Using the wage equation (7), we can write the supply of non-tradeables and tradeables

$$y_t = s\left(\overline{P}_t, P_t, \eta_t\right) \quad \frac{\partial s}{\partial \overline{P}_t} < 0, \ \frac{\partial s}{\partial P_t} > 0; \quad \frac{\partial s}{\partial \eta_t} > 0 \tag{8}$$

$$\overline{y}_t = \overline{s}\left(\overline{P}_t, P_t, \eta_t\right) \quad \frac{\partial \overline{s}}{\partial \overline{P}_t} > 0, \ \frac{\partial \overline{s}}{\partial P_t} < 0; \quad \frac{\partial \overline{s}}{\partial \eta_t} > 0 \tag{9}$$

Note that an increase in the price of non-tradeables (P_t) increases the supply of non-tradeables and decreases the supply of tradeables. The intuition is that an increase in the price of non-tradeables induces an increase in the nominal wage rate. Since the wage rises less than proportionately to the increase in the price of non-tradeables, the product real wage falls and supply increases in the NT-sector. The T-sector faces prices determined in the world market, and the wage increase induced by higher prices of non-tradeables thus leads to a higher product real wage in this sector and therefore output supply falls. This interdependence between the two sectors will be crucial to the results derived in the following.

While the assumption of inelastic labour supply to a first approximation matches empirical evidence reasonably well, it has the implication that income taxation involves no distortions (lump-sum taxes cf below). Note that the qualitative results of this paper do not rely on the particular assumptions made on the labour market structure. Appendix C shows that the same qualitative results hold in a model with endogenous labour supply and income taxation. In the same vein Appendix C also shows that the results hold if the labour market is imperfectly competitive. Hence, the results reported below do not depend on the specific assumptions made concerning the labour market.

Government

The government demands non-tradeables g_t and tradeables $\overline{g}_t$ and finances this by lump-sum taxes T_t. As the model is set up, Ricardian Equivalence prevails. Hence, it is the level of public expenditure which matters, not whether it is financed by lump-sum taxes today or in the future. We assume that initially public wealth is zero, and without loss of generality we choose the simple procedure of assuming that the budget is balanced in any period, ie

$$P_t g_t + \overline{P}_t \overline{g}_t = T_t \tag{10}$$

It is noted that public demand is assumed not to affect household utility. This assumption is made to focus on the pure demand effects of public demand. Without loss of generality we can simplify by setting $\overline{g} = 0$, that is, public demand for tradeables is assumed to be state independent[4].

Equilibrium Conditions

Equilibrium in the non-tradeables market requires

$$y_t = c_t + g_t \tag{11}$$

and the trade balance is given by

$$tb_t = \overline{y}_t - \overline{c}_t \tag{12}$$

It is noted that combining household and government budget constraints and using the equilibrium condition for the non-tradeables market, we get

$$\sum_{j=0}^{\infty} (1+\delta)^{-j}\, tb_{t+j} + f_t = 0 \tag{13}$$

[4]The distinction between tradeables and non-tradeables is not sharp. However, public demand tends to be biased towards non-tradeables since it is concentrated on service or employment intensive activities like education, health care etc. See Andersen and Holden (1998) for the effects of public demand for tradeables.

Finally, it is noted that the model has a well-defined steady state, defined by the deterministic values of (1), (3), (4), (7), (10), (11), (8), (9), (12), and (13) (see Andersen and Holden (1998) for a discussion of the properties of the steady state equilibrium).

3 National Wealth and Consumption Risk

National wealth (A_t) is a crucial determinant of aggregate demand, cf (3) and (4), and therefore it is important for the equilibrium level of activity. It turns out that national wealth can be written in a very simple way by using that national wealth (or more precisely, the total wealth of all households including expected future labour income, recall that public wealth is zero) is defined as

$$A_t \equiv E_t \sum_{j=0}^{\infty} (1+\delta)^{-j} \, i_{t+j} + f_t \tag{14}$$

where f is initial non-human wealth and

$$i_{t+j} \equiv \frac{P_{t+j} y_{t+j} + \overline{P}_{t+j} \overline{y}_{t+j} - T_{t+j}}{Q_{t+j}}$$

Using the government budget constraint (10) and the equilibrium condition for the non-tradeables market, we get

$$i_{t+j} = \frac{P_{t+j}}{Q_{t+j}} C_{t+j} + \frac{y_{t+j}}{Q_{t+j}} \tag{15}$$

Inserting the consumption function (3) and using that $E_t A_{t+j} = A_t > 0$, we find from (14) that

$$A_t = \frac{1}{1-\alpha} \left[E_t \sum_{j=0}^{\infty} (1+\delta)^{-j} \left(\frac{\overline{P}_{t+j} \overline{y}_{t+j}}{Q_{t+j}} \right) + f_t \right] \tag{16}$$

This shows that total wealth can be written as a multiplum of the net income generated in the tradeables sector plus initial net wealth. The multiplier is seen to depend on the consumption share of non-tradeables, the higher its share (α), the higher the multiplier.

The expression (16) can thus be given an interpretation similar to the standard Keynesian multiplier from the income expenditure model. A share (α) of the income generated in the tradeables sector is spent on non-tradeables goods which in turn creates income in this sector. However, in contrast to the traditional Keynesian model, the supply side of the economy (as given by (7), (8) and (9)) entails that there is a negative relationship between output in the two sectors.

The important point here is that (16) in combination with (2) allows us to identify the key variable causing risk in private consumption, since

Proposition 1 *Risk in the private consumption bundle* (b) *arises from variability in the real income generated in the tradeables sector* $\left(\frac{\overline{Py}}{Q}\right)$.

This points out that the aggregate risk relevant for the risk in private consumption depends only on the risk in real income generated in the tradeables sector. Variability in the real income generated in the tradeable sector will in turn depend on shocks affecting this sector including supply (productivity) and demand (preference) shocks, cf below. Since agents are averse to risk there is a potential role for an active stabilization policy to the extent that it can affect the risk profile of real income generated in the tradeables sector. To address this issue we consider a supply shock in the form of productivity shocks, and a demand shock in the form of a preference shock.

4 Productivity Shocks

Let us now consider the case where the productivity parameter η varies. The complicated structure of the model implies that we have to make a choice between obtaining analytical solutions via a linearization of the model or by taking resort to numerical simulations. As argued forcefully by Campbell (1994), the former method has the advantage of shedding more light on the mechanisms behind the results and it is therefore chosen here.

Denote by ε_t the deviation in η_t from its long-run value. We assume that deviations are serially uncorrelated and unanticipated

$$E_t \varepsilon_{t+j} = 0 \quad \forall\, j > 0$$

Using (4), the equilibrium conditions for the non-tradeables can be written

$$\frac{P_t y_t}{Q_t} = \alpha \frac{\delta}{1+\delta} A_t + \frac{P_t g_t}{Q_t} \tag{17}$$

Denote by rx_t the real measure of a variable x_t defined as $rx_t = \frac{P_t x_t}{Q_t}$, and let a $\widetilde{}$ denote deviations from steady state values. In the following we normalize by setting $\overline{P}_t = 1$.

Assume that public demand for non-tradeables is set according to the rule

$$\widetilde{rg}_t = \kappa\varepsilon_t \tag{18}$$

where κ is the stabilization parameter chosen by the government. The rule is ad hoc in the sense that it does not follow from an optimization problem, but is chosen to illustrate that contingencies in public demand can change the risk profile for aggregate income and consumption. Different interpretations of the fiscal rule are discussed at length in section 6. It turns out that the simple rule is actually able to achieve complete stabilization of aggregate consumption since

Proposition 2 *(i) The equilibrium price of non-tradeables in the linearized model evolves as*

$$\widetilde{P}_t = \tau_0\widetilde{A}_t + \tau_1\varepsilon_t \quad ; \tag{19}$$

where

$$\begin{aligned} \tau_0 &> 0, \qquad \frac{\partial\tau_0}{\partial\kappa} = 0, \\ \tau_1 &< 0 \;\; for\ \kappa = 0, \qquad \frac{\partial\tau_1}{\partial\kappa} > 0 \end{aligned}$$

(ii) There exists a choice of the stabilization parameter $\kappa^* > 0$ that ensures perfect stabilization, ie

$$\widetilde{ri}_t = \widetilde{A}_t = \widetilde{b}_t = \left(\widetilde{tb_t/Q_t}\right) = 0 \qquad for \;\; \kappa = \kappa^* > 0$$

Proof, see Appendix A.

Part (i) shows how the price on non-tradeables on impact depends on the shock variable ε (which follows a white noise process), and that the adjustment displays persistence through the wealth variable A. The latter variable captures the propagation mechanism induced by intertemporal consumption smoothing. Higher wealth raises the demand for non-tradeables, thus increasing the relative price of non-tradeables. Note that $\widetilde{A}_t$ follows a random walk, ie $E_t\widetilde{A}_{t+1} = \widetilde{A}_t$. In general the temporary productivity shock thus has a persistent effect on the price of non-tradeables and therefore on output in the two sectors.

The stabilization parameter κ does not affect the persistency parameter, as $\frac{\partial \tau_0}{\partial \kappa} = 0$; this is as should be expected since variation in public demand under a balanced budget has no direct bearing on the intertemporal consumption profile, but only works by changing the structure of demand within a single period.

In the case of a passive policy ($\kappa = 0$) we have $\tau_1 < 0$, that is, productivity shocks induce variation in the (relative) price of non-tradeables, wealth and therefore consumption. The expected direction of these changes is ex-ante zero (= the expected value of the shock), but it leaves risk which affects risk averse households adversely, ie

$$Var\left(\widetilde{b}_t\right) > 0$$

Accordingly, business cycle fluctuations are associated with welfare losses since households are risk averse. The result that $\frac{\partial \tau_1}{\partial \kappa} > 0$ implies that the equilibrium distribution of prices and thus output depends on the stabilization parameter; this property is exploited in part (ii).

Part (ii) of Proposition 2 shows that by an appropriate choice of the stabilization parameter κ, it is possible to insulate the income generated in the T-sector from productivity shocks. It follows that aggregate wealth can be stabilized and therefore fluctuations in consumption can be eliminated (cf (3) and (4)), ie the steady state level of consumption can be attained in all periods. Since households are risk averse, implying aversion to fluctuations in the consumption bundle b, setting the stabilization parameter at κ^*, thus stabilizing consumption, increases welfare. This policy can thus be justified on welfare grounds[5].

Part (ii) also implies that the optimal policy (that stabilizes consumption), also stabilizes the real trade balance $\left(\widetilde{tb_t/Q_t}\right) = 0$. Hence, even in a fully specified

[5] It might be argued that this stabilization is achieved at the cost of volatility in public consumption to which agents may also be risk averse. In a more general setting, households' utility depends on both private and public consumption, and presumably households dislike variation in both. However, it is obvious that it would never be optimal to adopt the corner solution where private consumption absorbs all risk. Hence, the qualitative insights of the analysis would stand.

intertemporal model there is a case for using the trade balance as an intermediary target in economic policy making. An important caveat to this conclusion arises from the fact that we have abstracted from real capital in the model. In a more complete model, persistent productivity shocks would affect the return on investments, inducing variations in the trade balance.

Note that the policy rule only specifies the optimal degree of variation in public demand for non-tradeables and not the optimal level[6]. It is worth pointing out that variation in public demand for non-tradeables is sufficient to stabilize consumption; therefore there is no loss in generality when disregarding public demand for tradeables.

The fact that $\kappa = \kappa^* > 0$ implies that a positive productivity shock is met by an increase in public demand for non-tradeables. In other words, public demand is increased when output is high due to a positive productivity shock. The effect of public demand goes through the wage and price setting so the government dampens output in the tradeable sector by raising public demand of non-tradeables. Under a positive productivity shock, public demand must rise so that the price of non-tradeables increases sufficiently to counteract the direct effect of the productivity shock. To obtain complete stability of the income from the T-sector, the indirect effect associated with wage changes arising from changes in the price of non-tradeables must balance the direct productivity effect.

The optimal policy has a Keynesian flavour in the sense that if a shock causes supply of NT-goods to exceed demand at the initial price level (in the present model caused by a positive productivity shock), public demand should be increased, and oppositely if demand comes to exceed supply. On the other hand, it is a non-Keynesian feature that the optimal policy is geared to consumption rather than activity. The optimal fiscal policy is thus in sharp contrast to the traditional Keynesian recipe of raising public demand in recessions when output is low. One should, however, not put too much emphasis on the conflicting policy prescriptions; it should be no surprise that traditional Keynesian demand management is not suitable to deal with shocks to the supply side of the economy. Moreover, the optimal policy is here defined on welfare terms (consumption)

[6] In general market imperfections do also have implications for the optimal level, cf eg Andersen (1999).

rather than on stabilization of activity (employment).

5 Demand Shocks

The simplest way to introduce demand shocks consistent with the underlying intertemporal consumption model is to assume that in each period there is a shock to households' preferences regarding their choice of tradeable vs non-tradeable consumption[7]. More precisely, we assume that there are transitory and unanticipated shocks to the preference parameter α, so that $\alpha_t = \alpha + u_t$, where u_t is the random shock which is uncorrelated over time and has an expected value of zero[8]. The optimal demand of the household now reads

$$\frac{P_t c_t}{Q_t} = (\alpha + u_t) \frac{\delta}{1+\delta} A_t \tag{20}$$

$$\frac{\overline{c}_t}{Q_t} = (1 - \alpha - u_t) \frac{\delta}{1+\delta} A_t$$

The definition of b is changed accordingly, which implies that the relation $b_t = \frac{\delta}{1+\delta} A_t$ still holds and that there is risk aversion with respect to variations in b.

As in section 4, we shall solve for a rational expectations equilibrium. To focus on the effect of demand shocks, we neglect productivity shocks in this section.

The government real demand for non-tradeables follows a contingent rule

$$\widetilde{rg}_t = \omega_t u_t$$

where ω_t is an exogenous stabilization parameter. We allow the parameter to be state dependent; we will return to that shortly.

Proposition 3 *(i) The equilibrium price of non-tradeables evolves as*

$$\widetilde{P}_t = \tau_2 \widetilde{A}_t + \tau_3 (A_t) u_t$$

[7]See Thomas (1995) for an anaysis of fiscal policy in a setting with an incomplete market structure and shocks to preferences.

[8]The support of u_t is $[-\alpha, 1-\alpha]$

where

$$\tau_2 > 0\,; \qquad \frac{\partial \tau_2}{\partial \omega_t} = 0;$$

$$\tau_3 > 0\, for\ \omega = 0; \qquad \frac{\partial \tau_3}{\partial \omega_t} > 0$$

(ii) There exists a choice of the stabilization parameter ω

$$\omega_t = \omega_t^* = \frac{\delta}{1+\delta} A_t$$

that ensures perfect stabilization

$$\tau_3 = \widetilde{rt}_t = \widetilde{A}_t = 0$$

Proof, see Appendix B.

As in the case with productivity shocks, increased wealth A has a persistent positive effect on the price of non-tradeables. Not surprisingly, a shift in household preferences towards non-tradeables also has a positive impact on the price of non-tradeables (given that the stabilization policy is not too active, that is, given $\omega < \omega^*$). By adjusting public demand for non-tradeables in the opposite way of the change in household demand, setting $\omega_t = \omega_t^* > 0$, the preference shock has no effect on total demand for non-tradeables and hence equilibrium prices are unaffected. As in the case with productivity shock, a policy that stabilizes wealth and consumption at their steady state levels increases households' welfare. Note that when there is shock to the preferences, the stabilization parameter which ensures perfect stabilization is state dependent, that is, it must depend on A_t because the effect on private demand of a given shock to preferences u_t depends on A_t.

6 Policy Implications

In the previous sections we have analysed the optimal fiscal policy which stabilizes income from the T-sector so as to stabilize households' wealth and consumption. Under productivity fluctuations public demand for non-tradeables is used to affect the wage level via the price of non-tradeables. If a positive productivity shock takes place, raising income in the T-sector, public demand for non-tradeables should be increased so as to raise the price of non-tradeables, inducing a rise in wages that dampens the increase in the income in the T-sector. If there is a shock to private demand for non-tradeables, optimal fiscal policy involves an offsetting change in public demand for non-tradeables, so that the price of non-tradeables is kept constant. Thus destabilizing price impulses to the wages is avoided.

In practice, it would be difficult to implement the optimal fiscal policy. First, the government has incomplete information both with respect to the structure of the economy and the nature of the shocks. Second, there are often considerable time lags in the implementation of the fiscal policy. Third, fiscal policy is also influenced by other concerns. In this section we thus consider how the optimal policy compares with types of policies that are more likely to be pursued. Automatic budget reactions is a way to overcome some of the above-mentioned problems and thereby to implement an active stabilization policy. We shall consider both real and nominal automatic budget rules.

Consider first a real automatic budget rule where the public real demand for non-tradeables is negatively correlated with the level of activity in the economy. It is easily seen that such automatic budget rules work in the opposite direction of optimal fiscal policy under productivity fluctuations. If a positive productivity shock takes place, output increases. Automatic stabilization would imply a reduction in public demand, while as shown above the optimal fiscal policy requires an increase in public demand for non-tradeables. But as observed above, it is not surprising that Keynesian policies are not in general suitable to deal with shocks to the supply side of the economy.

Automatic budget rules work better under demand shocks. If a positive demand shock takes place, output and prices increase in the NT-sector. Optimal fiscal policy requires a reduction in public demand for non-tradeables, and this is also ensured via the effect of automatic stabilization. Automatic variations in public sector real demands for non-tradeables thus work differently to shock originating on the supply and the demand side. Accordingly, it is difficult to design simple automatic reactions of public real demand for non-tradeables which will be stabilizing to all types of shocks.

Automatic budget rules in real-world economies mainly arise from the fact that tax revenues and expenditures on transfers are cyclically dependent. From a stabilization perspective, the point is to affect the intertemporal demand structure, increase demand in some periods and reduce demand in others. However, in our model, where Ricardian Equivalence prevails, most of these measures do not have the prescribed effect. As households optimize as to their choice of consumption over time, the timing of taxes or transfers is not relevant. However, if one modifies our model by assuming that one part of the population is liquidity constrained, (eg the unemployed), transfers to this part of the population paid for by taxes on the whole population, would affect the intertemporal demand structure. Such an effect would correspond to variation in public demand in the present model. Expenditure on active labour market policies (which usually varies over the cycle) often consists of a large component of demand from domestic producers of various services, as well as public employment, and will thus mainly involve demand for non-tradeables.

There is, however, a type of automatic budget rule which will address the stabilization problem adequately, namely nominal budget rules where a change in the price leads to an offsetting change in real expenditure so that nominal expenditure is constant.[9] A nominal budgeting procedure specifying eg that total nominal outlays on the non-tradeables should be G_t implies that real demand is given by

$$g_t = \frac{G_t}{P_t}.$$

In real terms, public demand is thus

$$rg_t = \frac{G_t}{Q_t}$$

and hence

$$\frac{\partial \left(G_t / Q_t \right)}{\partial Q_t} = -\frac{G_t}{Q_t^2} < 0$$

[9]For an analysis of the implications of cash limits for public sector wage determination, see Holmlund (1997). Bar-Ilan and Zanello (1994) show in an ad hoc macromodel that the government by its choice of nominal budgeting procedure (degree of indexation) in general can offset whatever rigidity of the contractual wage there exists in the economy. This result holds as long as stabilization is ensured by stabilizing the real wage rate.

That is, real demand goes down when prices increase and vice versa. This ensures that public demand for non-tradeables changes in the direction implied by the optimal stabilization policy in the case of both productivity and preference shocks. The reason why this works in the right direction to both supply and demand shocks is that the transmission mechanism from the non-tradeable to the tradeable sector runs via the price of non-tradeables. A nominal budget rule for government demand for non-tradeables tends to stabilize prices of non-tradeables. It is worth stressing that the case for a nominal budget rule arises even in a non-monetary setting.

The intuition here is that a nominal budget rule involves lower real public demand of non-tradeables when prices of non-tradeables are high (and vice versa), thus stabilizing prices of non-tradeables. Stabilization of prices of non-tradeables then works by stabilizing the income from the tradeables sector, and thus also private consumption via stabilization of the real product wage in the tradeables sector. This demonstrates that it is possible to design practically implementable automatic budget rules which work adequately to both supply and demand shocks.

7 Concluding Remarks

In this paper we have investigated to what extent the fiscal policy can be used to stabilize an open economy under various types of shocks. This is an issue of considerable importance from a policy point of view, yet it has not received much attention in recent research. The main results within our model are as follows. Fiscal policy can be used to stabilize the economy both under supply (productivity) and demand (preferences) shocks. Given an incomplete capital market precluding diversification of income risks and risk averse agents, there is a welfare case for such a policy. An active demand management policy can thus mitigate the implications of capital market imperfections and in this way provide implicit or social insurance. In the specific cases considered here there exists a simple policy intervention which can stabilize consumption perfectly and therefore maximize welfare.

The optimal policy involves stabilization of the real trade balance. This conclusion should not be pushed too far; as shown in models incorporating real capital, productivity shocks that affect the return to investments should be allowed to affect the trade balance (eg Obstfeld and Rogoff, 1995a). The appropriate interpretation of our paper is that, under some circumstances, the effect of productivity and demand shocks on the trade balance that arises via consumption behaviour should be neutralized under optimal policy.

Under productivity shocks, the optimal fiscal policy is in sharp contrast to the Keynesian prescription, since public demand should be increased when output is high, owing to a positive productivity shock. However, under demand shocks the traditional Keynesian strategy prevails: public demand for non-traded goods should be increased in periods with low output in the non-tradeable sector. One reason for the difference in the appropriate policy response relative to the traditional Keynesian view-point lies in the fact that our policy is based on a welfare measure calling for stabilization of consumption rather than the traditional Keynesian objective of stabilization of aggregate activity.

In practice, incomplete information makes it difficult to implement the optimal fiscal policy. Thus, we also investigate to what extent automatic budgeting reactions are in accordance with the optimal fiscal policy. We find that automatic budget rules where public real demand is counter cyclical have a stabilizing (and thus welfare improving) effect under demand shocks, whereas the effect is destabilizing under supply shocks. Nominal budget rules, specifying a certain level of nominal outlay on public demand for non-tradeables have, however, a stabilizing effect both under productivity and demand shocks. This suggests that existing automatic budget responses working primarily via real demands may be inappropriate and that there are gains to be reaped by changing to nominal budget rules.

Does policy activism directed towards stabilizing consumption have any quantitative importance? Lucas (1987) argues that the gains are small, whereas Storesletten et.al (2000) argue that the gains can be substantial when risk diversification is important. The important point of the present analysis is that policy can affect consumption risk and thereby improve welfare when agents are risk averse and capital markets incomplete. The present model is, however, too stylized to yield a reliable reference point for evaluating the potential welfare gains from an active stabilization policy, in part because the model has been specified such that employment variability does not have welfare consequences. Since this type of risk is likely to be at least as important in practice as consumption risk, the case for an active stabilization policy would probably be much larger than suggested by the present analysis. However, the results reported by Lewis (1999) suggest that the welfare consequences of insufficient risk diversification are non-trivial, and an important point of the present analysis is that an active stabilization policy may repair the consequences of market incompleteness.

Our analysis only covers temporary shocks. As is apparent from the massive economic growth that many countries have experienced over the last century, there are also important permanent productivity shocks. In our model, permanent productivity shocks will move the economy towards a new steady state. However, in an important benchmark case, where public demand is adjusted in proportion to the productivity shock, the equilibrium relative price of non-tradeables will be the same in the new steady state solution as the old (neglecting any effects from the transition). Thus, nominal budget rules will be robust to permanent productivity shocks in this case. A more extensive exploration of the consequences of different kinds of shocks remains a topic for future research.

In an increasing number of countries, the monetary policy is used actively with the aim of stabilizing the economy. However, in some countries, most notably the UK and New Zealand, there have been considerable imbalances between the tradeables and the non-tradeables sectors. In this perspective our finding that fiscal policy, even nominal budget rules, may have a stabilizing effect that can be targeted directly towards one of the sectors, seems to be of considerable interest.

Appendix A: Proof of Proposition 2

Part (i). We shall solve for a rational expectations equilibrium. Define the real value of income generated in the NT-sector as

$$rn_t = \frac{P_t y_t}{Q_t} \tag{21}$$

and similarly for the T-sector (price normalized to one)

$$rt_t = \frac{\overline{y}_t}{Q_t} \tag{22}$$

We use that

$$y_t = s(P_t, \eta_t)$$

and make the following linearization of (21) and (22) around the initial steady state solution (which depends on the initial values of A_0 and f_0)

$$\widetilde{rn}_t = \gamma_0 \widetilde{P}_t + \gamma_1 \varepsilon_t \tag{23}$$

$$\widetilde{rt}_t = -\rho_0 \widetilde{P}_t + \rho_1 \varepsilon_t \tag{24}$$

where a $\widetilde{}$ denotes that the variable is measured in deviations from its steady state value. The parameters $\gamma_0, \gamma_1, \rho_0$ and ρ_1 are strictly positive in line with the analysis of the supply behaviour, cf (8) and (9).

Substituting out for (23), (3) and (18) in (17), the equilibrium condition for the non-tradeables market, with variables measured in deviations from their steady state values, reads

$$\gamma_0 \widetilde{P}_t + \gamma_1 \varepsilon_t = \frac{\alpha\delta}{1+\delta} \widetilde{A}_t + \kappa \varepsilon_t$$

Solving for $\widetilde{P}$, we obtain

$$\widetilde{P}_t = \tau_0 \widetilde{A}_t + \tau_1 \varepsilon_t$$

where

$$\tau_0 = \frac{\alpha\delta}{\gamma_0 (1+\delta)} > 0$$

$$\tau_1 = \frac{\kappa - \gamma_1}{\gamma_0} \gtrless 0 \, (< 0 \; for \; \kappa = 0)$$

The parameter τ_0 is greater than zero because higher wealth increases demand, and thus also the price of non-tradeables. The sign of τ_1 is in general ambiguous as it depends on both the supply effect and the response of public demand to the productivity shock, it is negative unless public demand is very responsive to productivity shocks. The derivatives of τ_0 and τ_1 with respect to κ are immediate.

Part (ii). Substituting out for (19) and τ_1 in (24) and rearranging, shows that $\kappa = \kappa^* \equiv \frac{\rho_1}{\rho_0}\gamma_0 + \gamma_1$ implies $\widetilde{rt}_t = 0$. We want to show that this leads to stabilization of net-wealth ($\widetilde{A}_t = 0$) and therefore consumption ($\widetilde{b}_t$).

From (2) we have

$$\widetilde{b}_t = \frac{\delta}{1+\delta} \widetilde{A}_t \tag{25}$$

and from the budget constraint

$$\widetilde{f}_{t+1} = (1+\delta) \left(\widetilde{f}_t + \widetilde{i}_t - \widetilde{b}_t \right) \tag{26}$$

From (16) we have

$$\widetilde{A}_t = \frac{1}{1-\alpha} \left[E_t \sum_{j=0}^{\infty} (1+\delta)^{-j} \left(\widetilde{rt}_t \right) + \widetilde{f}_t \right] \tag{27}$$

and from (15)

$$\widetilde{i}_t = \alpha \frac{\delta}{1+\delta} \widetilde{A}_t + \widetilde{rt}_t \tag{28}$$

As $\widetilde{f}_t$ is predetermined in (27), $\widetilde{rt}_t = 0$ implies that $\widetilde{A}_t = 0$. Substituting out recursively in (25), (28) and (26), we see that there is a solution where $\widetilde{A}_t = \widetilde{f}_t = \widetilde{b}_t = 0$.

Observe that $tb_t/Q_t = rt_t - (1-\alpha)\frac{\rho}{1+\rho}A_t$ and hence $\left(\widetilde{tb_t/Q_t}\right) = \widetilde{rt}_t - (1-\alpha)\frac{\rho}{1+\rho}\widetilde{A}_t$ and since the optimal policy implies $\widetilde{rt}_t = \widetilde{A}_t = 0$, it follows that $\left(\widetilde{tb_t/Q_t}\right) = 0$.

Appendix B: Proof of Proposition 3

(i) Following the same solution method as in the proof of Proposition 2, we have the following linearization around the steady state of the real income generated in the two sectors.

$$\widetilde{rn}_t = \gamma_2 \widetilde{P}_t$$

$$\widetilde{rt}_t = -\rho_2 \widetilde{P}_t$$

It follows from (20) that

$$\widetilde{rc}_t = \alpha \frac{\delta}{1+\delta}\widetilde{A}_t + \frac{\delta}{1+\delta}A_t u_t$$

Substituting out in the equilibrium condition for the non-tradeables goods, the equilibrium price is determined as

$$\omega_t u_t + \alpha \frac{\delta}{1+\delta}\widetilde{A}_t + \frac{\delta}{1+\delta}A_t u_t = \gamma_2 \widetilde{P}_t$$

which yields

$$\widetilde{P}_t = \tau_2 \widetilde{A}_t + \tau_3 (A_t) u_t$$

where

$$\tau_2 = \frac{1}{\gamma_2}\alpha\frac{\delta}{1+\delta}$$

$$\tau_3 (A_t) = \frac{1}{\gamma_2}\left(\omega_t - \frac{\delta}{1+\delta}A_t\right)$$

(ii) For

$$\omega_t = \omega_t^* = \frac{\delta}{1+\delta}A_t$$

we have $\tau_3 (A_t) = 0$.

In this case we have

$$\widetilde{rt}_t = -\rho_2 \tau_2 \widetilde{A}_t$$

As above, we make linearizations around steady state values

$$\widetilde{A}_t = \frac{1}{1-\alpha}\left[\sum_{j=0}^{\infty} E_t \left(1+\delta\right)^j \widetilde{rt}_t + \widetilde{f}_t\right]$$

$$\widetilde{f}_t = \alpha \frac{\delta}{1+\delta}\widetilde{A}_t + \widetilde{rt}_t$$

$$\widetilde{f}_{t+1} = (1+\delta)\left(\widetilde{f}_t + \widetilde{i}_t - \widetilde{b}_t\right)$$

$$\widetilde{b}_t = \frac{\delta}{1+\delta}\widetilde{A}_t$$

Inspection of the five equations above show that when $\omega_t = \omega_t^*$, there is a solution where $\widetilde{rt}_t = \widetilde{A}_t = \widetilde{b}_t = \widetilde{f}_t = 0$, even when $u_t \neq 0$.

Appendix C: Alternative Labour Market Models

This appendix shows that the model can be changed to allow for endogenous labour supply, imperfectly competitive labour markets and income taxation, and still yield a wage equation qualitatively similar to (7). This underlines that the specific assumptions concerning the labour market are not crucial to the results of the paper which rely on incomplete capital markets.

Perfect competition and endogenous labour supply

Consider a generalization of the model such that labour supply is endogenous and public expenses are financed by a proportional income tax.

The household utility function is assumed to read

$$V_t = E_t \left[\sum_{j=0}^{\infty} (1+\rho)^{-j} U\left(b_{t+j}\right) - \theta \frac{1}{1+\mu} L_{t+j}{}^{1+\mu} \right] \quad \mu > 0$$

and the intertemporal budget constraint is

$$\sum_{j=0}^{\infty} (1+\delta)^{-j} b_{t+j} \leq \sum_{j=0}^{\infty} (1+\delta)^{-j} (1-\tau_{t+j}) i_{t+j} + f_t$$

where τ_{t+j} is the income tax rate. The optimal consumption path is unchanged from above, and the labour supply decision is determined by the following first order condition

$$\theta L_t^{-\mu} = (1-kb_t) \frac{(1-\tau_t)W_t}{Q_t}$$

Hence, the labour supply relation can be written by the following implicit function

$$L_t = L(\frac{W_t}{Q_t}, \tau_t, A_t)$$

where the relation between b and A has been used. The equilibrium wage can now be written

$$W_t = W(\overline{P}_t, P_t, \tau_t, A_t)$$

The supply function for non-tradeables will in this case read

$$y_t = s(\overline{P}_t, P_t, \eta_t, \tau_t, A_t)$$

Using that the public budget constraint reads

$$P_t g_t = \tau_t i_t$$

it follows that supply of non-tradeables can be written

$$y_t = s'(\overline{P}_t, P_t, \eta_t, g_t, A_t) \qquad \frac{\partial s'}{\partial P} > 0, \frac{\partial s'}{\partial \eta} > 0, \frac{\partial s'}{\partial g} < 0, \frac{\partial s'}{\partial A} < 0$$

the partial derivatives says that an increase in the price of non-tradeables increases supply, the same applies to a productivity improvement. An increase in public consumption lowers supply via the induced wage increase, and an increase in wealth lowers supply since the via the wealth effect in labour supply.

Using that (16) also holds under a proportional income tax, it is now straightforward to use the same technique as in appendix A. This yields the following equilibrium condition for the non-tradeables market

$$\gamma_0 \widetilde{P}_t + \gamma_1 \varepsilon_t - \gamma_2 \kappa \varepsilon_t - \gamma_3 \widetilde{A}_t = \frac{\alpha \delta}{1+\delta} \widetilde{A}_t + \kappa \varepsilon_t$$

This will yield a solution of the same form as the one considered in Appendix A, and the same steps can be made, although the precise calculations become somewhat more complicated.

Imperfect competition

Instead of assuming a competitive labour market, let us consider an imperfectly competitive labour market in which individual labour supply is inelastic, but unions determine wages. Specifically, assume that to each firm there is associated $M \equiv H/N$ households/workers, and they are all organized in firm-specific unions (for simplicity, N also denotes the number of firms). The unions are assumed to have the power to set the wage rate (the monopoly union assumption of Dunlop, 1944), while employment is determined unilaterally by each firm after the wage is set.

The assumption that wages are set by monopoly unions is not motivated on the grounds that this is particularly "realistic" (although powerful unions are a fact of life in several European countries). What we want to capture is that real wages are rigid; in spite of involuntary unemployment, real wages are not bid down to clear the labour market. A similar feature could be derived in models based on efficiency wages or rent-sharing. However, the particular assumption that we adopt has the convenient feature that the real wage is independent of the rate of unemployment, and thus constant over the cycle (which is not inconsistent with empirical evidence, see eg Romer, 1996, p. 216). This feature simplifies the analysis considerably. Moreover, it also allows for direct conclusions on welfare effects.

Among unions there is a self-financing unemployment benefit system covering the whole economy, which provides each household with a real benefit d (exogenous) if unemployed. The unemployment benefits are financed by lump-sum contributions by all union members (= households) in the economy. As there are many firms and unions in the economy, the impact of the employment level in one firm on total costs of unemployment benefits is negligible, so each union will treat the financing of benefits as exogenous in the wage-setting[10].

Each union n is assumed to set the wage so as to maximize the sum of real labour income and unemployment benefit (d) after taxes, ie

$$W_t^n = \arg\max \left\{ L_t^n \frac{(1-\tau_t)W_t^n}{Q_t} + (M - L_t^n)(1-\tau_t)\, d \right\}$$

subject to the labour demand function (5).[11] The solution to the maximization problem is that the real wage is set as a mark-up (m) on real unemployment benefits, where the mark-up depends on the elasticity of labour demand $(1-\beta)^{-1}$:

$$W_t/Q_t = \phi \quad where \ \ \phi = md \quad ; \quad m \equiv \frac{1}{\beta} \tag{29}$$

Thus, each union has an after tax real wage target (ϕ) defined as a constant mark-up over unemployment benefits. Furthermore, as households' utility is not influenced by the rate of unemployment per se, it is only disposable real income

[10] Thus, a wage rise involves a negative external effect on other unions, which will lead to too high wages in aggregate, cf Jackman (1990). This will, however, not be the focus here.

[11] A possible rationalization of this assumption is as follows. Each union sets the wage so as to maximize the expected lifetime utility of a representative member. As the households are risk averse, expected utility maximization involves an even sharing of income among the households in the union. (Thus, unions transfer income among its members.) As there is no disutility of labour, utility maximization is equivalent to maximizing the sum of labour income and unemployment benefits in each period.

that matters. This sharpens the focus on the possible benefits of income stabilization policies. It follows straightforwardly that the wage can be written

$$W_{t+j} = W(\overline{P}_{t+j}, P_{t+j})$$

and the supply function for non-tradeables output reads

$$y_t = s(\overline{P}_t, P_t, \eta_t)$$

and the solution procedure used above can be applied in this case too.

References

Andersen, T.M., 1999, Demand Management in an Open Economy with Structural Unemployment, Working Paper, Department of Economics, University of Aarhus.

Andersen, T.M. and R.R. Dogonowski, 1997, EMU and Budget Norms, in Hughes Hallett, Hutchison and Hougaard Jensen (eds), Aspects of Monetary Integration, Cambridge University Press, (to appear).

Andersen, T.M. and S. Holden, 1998, Business Cycles and Fiscal Policy in an Open Economy, Working Paper 1998-5, Department of Economics, University of Aarhus.

Bar-Ilan, A. and A. Zanetto, 1994, Nominal Budgeting as a Stabilization Role - The Optimal Degree of Indexation of Public Spending, European Economic Review, 38, 69-86.

Baxter, M. and R.G. King, 1993, Fiscal Policy in General Equilibrium, American Economic Review, 83, 159-192.

Baxter, M., and R.G. King, 1993, Fiscal Policy in General Equilibrium, American Economic Review, 83, 159-192.

Blanchard, O. and S. Fischer, 1989, Lectures on Macroeconomics, MIT Press, Cambridge, Massachusetts.

Brash, D.T., 2001, Speech 30 March 2001, www.rbnz.govt.nz/speeches/0102706.html

Campbell, J.Y., 1994, Inspecting the mechanism. An Analytical approach to the stochastic growth model, Journal of Monetary Economics, 33, 463-506.

Corden, M., 1991, Does the Current Account Matter? The Old View and the New, Economic Papers, 10, 1-19.

Dixon, H. and P. Lawler, 1996, Imperfect Competition and the Fiscal Multiplier, Scandinavian Journal of Economics, 98, 219-231.

Dunlop, J.T., 1944, Wage Determination under Trade Unions, MacMillan, New York.

Giavazzi, F. and M. Pagano, 1990, Can Severe Fiscal Adjustment be Expansionary, NBER Macroeconomics Annual.

Glick, R. and K. Rogoff, 1995, Global vs. Country-Specific Productivity Shocks and the Current Account, Journal of Monetary Economics, 35, 159-192.

Holmlund, Bertil, 1997, Macroeconomic Implications of Cash Limits in the Public Sector, Economica, 64, 49-62.

Jackman R., 1990, Wage Formation in the Nordic Countries Viewed from an International Perspective. In L. Calmfors (ed.), Wage Formation and Macroeconomic Policy in the Nordic Countries, Oxford University Press.

King, M., 2000, Speech March 29th, 2000, www.bankofengland.co.uk/speeches/speech78.htm

Lewis, K.K., 1999, Trying to Explain Home Bias in Equities and Consumption, Journal of Economic Literature, XXXVII, 571-608.

Lucas, R., 1987, Models of the Business Cycle, Basil Blackwell.

Obstfeld, M. and K. Rogoff, 1995a, The Intertemporal Approach to the Current Account, Handbook of International Economics, Vol. III, North-Holland.

Obstfeld, M. and K. Rogoff, 1995b, Exchange Rate Dynamics Redux, Journal of Political Economy, 103, 624-660.

Obstfeld, M. and K. Rogoff, 1996, Foundations of International Macroeconomics, The MIT Press.

Razin, A., 1993, The Dynamic-Optimization Approach to the Current Account: Theory and Evidence, CEPR Discussion Paper 797.

Romer, D., 1996, Advanced Macroeconomics, McGraw Hill.

Røisland, Ø and R. Torvik (1999). Inflation targeting and the policy mix. Mimeo, Norges Bank, Oslo, Norway.

Storesletten, K., C.I. Telmer and A. Yaron, 2000, The Welfare Cost of Business Cycle Revisited: Finite Lives and Cyclical Variations in: Idiosyncratic Risk, NBER Working paper 8040.

Thomas, C.P., 1995, The Role of Fiscal Policy in an Incomplete Market Framework, Review of Economic Studies, 62, 449-68.