THE REAL EXCHANGE RATE AND THE FISCAL ASPECTS OF A NATURAL RESOURCE DISCOVERY

by

Francesco GIAVAZZI*
Jeff R. SHEEN**
Charles WYPLOSZ***

N° 86 / 06

* Francesco GIAVAZZI, Università di Venezia

** Jeff R. SHEEN, University of Essex

*** Charles WYPLOSZ, INSEAD and CEPR

Director of Publication:

Charles WYPLOSZ, Associate Dean
for Research and Development

Printed by INSEAD, Fontainebleau
France

THE REAL EXCHANGE RATE

AND THE FISCAL ASPECTS OF A NATURAL RESOURCE DISCOVERY

by

Francesco Giavazzi
Università di Venezia

Jeff R. Sheen
University of Essex

Charles Wyplosz
INSEAD and CEPR

Revised Version: February 1986

An early version of this paper has been written when F. Giavazzi was at Essex. Financial support from the ESRC and INSEAD Research Budget is gratefully acknowledged.

1. Introduction

It is often the case that newly discovered resources - such as oil - are largely appropriated by the government. This paper shows that the accompanying budgetary choices have an effect on the real exchange rate, both in the short and in the long run. The discovery of a natural resource can affect the relative price on domestic and foreign goods through many channels. The "Dutch disease" literature (see for example Corden and Neary (1982), Atkinson et.al (1983), Bruno and Sachs (1982), Eastwood and Venables (1982)) concentrates on two channels: a spending effect and a reallocation effect. The spending effect originates from the increase in income and wealth associated with the new resource: higher spending leads to an excess demand for domestic non traded goods and pushes their relative excess demand for domestic non traded goods and pushes their relative price up. The reallocation effect originates from the displacement of factors of production towards the activities related to the extraction and processing of the newly discovered resource: this forces factor prices up and leads, under some conditions, to an excess demand for domestic non traded goods.

The "Dutch disease" literature points to intratemporal allocation problems. But the discovery of a natural resource, known to be exhaustible, also raises intertemporal allocation problems. The possibility that the temporary windfall associated with the resource discovery be capitalized opens another channel through which relative prices may be affected. Consider an economy in which agents derive their consumption decisions from intertemporal optimization, and assume that they can only save by purchasing foreign assets. In order to smooth their consumption path these agents will use part of the temporary resource income to build up their stock of foreign assets. In the new steady state, after the resource is exhausted, their consumption will remain higher, sustained by a higher flow of interest income from abroad. To maintain equilibrium in the current account, the new surplus in the service account will have to be matched by a corresponding deficit in the trade account; if domestic and foreign goods are imperfect substitutes this requires a real appreciation.

The example above assumes that all the income from the newly discovered resource accrues to the private sector. Often however the government appropriates the resource income and may either transfer it back to the

private sector, or use it to raise public spending, or else run down the stock of public debt. In a Ricardian world where agents fully discount future tax liabilities, the capitalization of the resource income by the private sector is unaffected by fiscal policy. If however the private sector regards public debt as net wealth, fiscal policy can affect the extent to which the resource income is capitalized.

Our purpose here is emphatically not to add to the "Dutch disease" literature. It is rather to highlight the role of fiscal policy when private agents regard public debt as net wealth. For this purpose, we consider the extreme situation in which all the revenue from the newly discovered resource is appropriated by the government. The government may use this revenue to cut taxes or raise public spending: any excess of the resource revenue over the increase in spending or the reduction in taxes will be used to retire public debt. A reduction in the stock of debt changes the portfolio composition of the private sector, and forces it to build up its holdings of other assets. Therefore, whenever the government appropriates a resource income and fiscal policy "matters" because the private sector does not discount future tax liabilities, the resource may still be capitalized if the government uses the new income to retire public debt.

The paper highlights the channels through which fiscal policy may affect the impact on the real exchange rate of a resource discovery by considering a country where domestic public debt and foreign bonds are the only two assets in the portfolio of the private sector. If the government appropriates the resource income and then simply transfers it back to the private sector (lowering taxes or raising public spending), fiscal policy will have no permanent effects on the economy. This is a direct consequence of the assumption that the private sector regards public debt as net wealth. When the government uses the resource income to retire public debt there are two channels through which fiscal policy may have a permanent effect on the real exchange rate. The first is similar to that discussed above in the example of optimizing agents. As public debt is retired, the private sector builds up its holdings of foreign assets: in the new steady state current account equilibrium requires a real appreciation. Imperfect substitutability between domestic government bonds and foreign assets works in the opposite direction: if the degree of substitutability between the two assets is very low the above result may be reversed. This happens because the private

sector does not replace public debt one for one by foreign assets so that its net wealth falls, consumption is reduced, requiring a real depreciation to restore goods market equilibrium at the full employment level.

The realization that budgetary policies matter for the real exchange rate when resource income accrues to the government is of interest for example in the case of North Sea Oil in Britain. Table 1 below confirms that a significant share of North Sea Oil income has been appropriated by the government through royalties and various taxes. It suggests that these resources have only initially been used to reduce the public debt, as the net-of-oil structural budget has recently moved into a deficit. As will be shown, this is the case where the fiscal channel studied in this paper does not produce any long run effect because oil revenues are not capitalized, so that the real exchange rate should eventually revert ceteris paribus to its initial level (for a discussion of related issues see Forsyth and Kay (1980), Atkinson et. al (1983), Bruno and Sachs (1982)).

TABLE 1: North Sea Oil and the British Budget
(data in percent of GDP)

	1971-1978 (annual average)	1979	1980	1981	1982	1983	1984
1.North Sea Oil Production	0	3.0	4.0	4.9	5.9	5.2	7.3
2.Government Oil Revenue	0	0.6	1.4	2.4	2.8	3.1	3.7
3.Inflation adjusted structural budget balance	2.0	0.6	4.0	4.4	4.5	1.5	1.8
4.Inflation-adjusted structural budget balance net of oil income (4)=(3)-(2)	2.0	0.0	2.6	2.0	1.7	-1.6	-1.9
5.Net Public Debt	54.1	49.1	48.9	48.2	47.2	49.0	49.8

Sources: Lines 1 and 2: CSO, UK Balance of Payments Statistics
Lines 3 and 5: Price and Muller (1984)

We present in section 2 a model which allows us to study both the dynamic and steady state effects of various fiscal policies following a resource discovery. In section 3, we consider the case where the government spends out his resource revenues while section 4 deals with the case where these revenues are used to eliminate the public debt. The last section presents our concluding remarks.

2. The Model

We consider an open economy which trades in goods and financial assets with the rest of the world. The country produces oil, N, and a manufactured good, y. Oil is used as an intermediate good in the production of y and the difference between the derived demand for oil and oil output represents net oil imports. Since the present paper is not designed to study the effects of an oil price shock, we assume that the terms of trade between oil and the domestic manufactured good are fixed and equal to one. The domestic manufactured good, however, is an imperfect substitute for manufactured goods produced by the rest of the world: the relative price of the two goods, the real exchange rate, is $\lambda \equiv eP^*/P$. We assume that the rest of the world is in steady state: P^* is therefore constant.

Output of the domestic manufactured good is fixed at $\bar{y}$; domestic oil consumption is therefore also fixed at $\bar{N}$. Up until time $t = 0$ all oil is imported. At time $t = 0$ a domestic supply of oil is discovered and oil immediately starts flowing: its extraction absorbs no resources, so that output of the manufactured good remains unaffected. Total domestic oil resources are known to be equal to N_T. We overlook the optimal depletion problem by assuming that oil is depleted at a constant rate n, beginning with an output level N_1. The flow of oil at time t is then equal to:

$$N_t = \begin{cases} 0 & \text{for } t < 0 \\ N_1 \exp^{-nt} & \text{for } t \geq 0 \end{cases} \tag{1}$$

To simplify the analysis we also assume that oil is exhausted in infinite time, which implies

$$N_1 = nN_T \tag{2}$$

Net oil imports N^*_t are equal to:

(3) $$N^*_t = \bar{N} - N_t$$

Initial oil output, N_1 may be larger or smaller than oil consumption N, so that we do not rule out net oil exports (i.e. $N^* < 0$).

All the income derived from oil extraction is appropriated by the government, which also consumes a fraction of the domestic manufactured good and levies lump sum taxes.[1] The government finances any excess of public expenditures over public revenue, taxes plus oil income, by issuing a domestic real bond of instantaneous maturity, b. The government budget constraint is:

(4) $$\dot{b}_t = r_t b_t + g - \tau_t - N_t$$

where r_t is the real rate of interest measured in units of the domestic manufactured good; g is government spending which falls both on domestic and foreign manufactured goods: for the time being we assume g to be exogenously fixed; τ_t and N_t are the two components of government revenue, respectively lump sum taxes and oil revenue.

Before domestic oil is discovered, the government follows a tax rule according to which lump sum taxes are adjusted to finance any change in debt service: its objective is to avoid the potential instability which arises from the flow of real interest payments on the public debt. As oil revenue starts accruing, the government has two options: use the new revenue to cut taxes, or use it to reduce the stock of public debt. In the first case the tax rule is:

(5) $$\tau^1_t = g - N_t + r_t\, b_t$$

We model the case of debt retirement assuming that the government closes the gap between the initial debt level b_o and the long run debt target $\bar{b}$ at a constant speed μ:

(6) $$\dot{b}_t = \mu\,(\bar{b} - b_t) \qquad \text{where } \dot{b} = db/dt$$

With government spending, g, exogenously fixed, (6) together with (4) require that taxes evolve according to:

$$(5') \qquad \tau^2_t = g + (n + r_t)\, b_t - N_t$$

In writing (5′) we have assumed that the long run debt target is zero, and that the speed at which debt is retired is equal to the speed at which oil is depleted, so that when domestic oil is exhausted there is no more public debt. The impact on taxes of the oil discovery depends on the difference between the value of debt outstanding and the amount of oil discovered: there will be a tax cut if $N_T > b_0$. Throughout the process of debt retirement the decline in oil revenue pushes taxes back up; but as the level of debt falls, the debt service charge also falls: this tends to keep taxes low.

Private sector spending, c, is a function of disposable income, financial wealth[2] and the real rate of interest:

$$(7) \qquad c = (1-s)\,(y - \tau) + \delta\, w - \gamma r$$

where s is the marginal propensity to save and time subscripts have been dropped. There are only two assets in the economy: domestic government bonds and claims on the rest of the world. The private sector considers all public debt as part of net wealth, so that financial wealth measured in units of the domestic manufactured good is:

$$(8) \qquad w = b + \lambda f$$

where f is the value of net claims on the rest of the world measured in units of foreign goods. As discussed in the introduction, the assumption that the private sector does not discount future tax liabilities is crucial for all the results discussed in this paper.

The exchange rate is perfectly flexible and current account surpluses and deficits are matched by changes in the stock of net foreign assets held by domestic residents. We assume that foreign residents do not hold domestic assets[3], so that balance of payments equilibrium requires:

(9) $$\lambda \dot{f} = T + \lambda r^* f - N^*$$

where $\lambda r^* f$ is the return on foreign assets measured in units of domestic manufactures and T is the non-oil trade balance defined as:

(10) $$T(c, \lambda) = m_o - m^P c - m^B g + \alpha\lambda$$

where m^P and m^B are respectively the private and public sector's marginal propensity to import. There is no foreign demand component in the trade balance equation, except for the relative price effect, because we assume that the rest of the world remains in stead state. The Marshall-Lerner condition ensures $\alpha > 0$.

Equilibrium in the domestic financial market is described by a portfolio balance equation where the yield differential between domestic and foreign assets is a function of the relative supply of the two assets:

(11) $$r - r^* - \dot{\lambda}/\lambda = \psi (b, \lambda f)$$

The yield differential between the domestic and the foreign asset is equal to the real interest rate differential adjusted for the anticipated change in the real exchange rate.

The model is closed by the assumption that prices are perfectly flexible, so that the goods market is always in equilibrium[4]:

(12) $$y = c + g + T$$

At any moment of time, goods and market equilibrium in this full employment economy determines the real interest rate and the real exchange rate. The dynamic behaviour of the economy is described by the government budget constraint (4) and by the equations which describe the path of the real exchange rate and of net foreign assets. The evolution of the stock of net foreign assets is described by the current account equation (9). With perfect foresight the path of the real exchange rate is described by equation (11). The stability of this system is studied in the Appendix.

3. Spending Away

In this section we investigate the case where the government uses its oil income to boost domestic spending. This can be done either by reducing taxes or by raising public spending. We start by considering a tax cut, i.e. the tax rule (5). With lump-sum taxes, this is equivalent to the situation where no oil revenue is appropriated by the government. It is a benchmark case against which we can contrast the role of government in absorbing oil income. Note that in this case public debt remains unaffected by the oil discovery.

It is obvious that the post-oil steady state is identical to the pre-oil situation. This is a consequence of the fact that the postulated consumption function does not incorporate the intertemporal choice discussed int the introduction so that consumers do not accumulate foreign (or domestic) assets during the oil-bonanza years. We will comment on this issue later on.

The behaviour of the economy is studied by solving the linearized version of the model shown in the appendix. The evolution of net foreign assets is described by:

$$(13)\quad F_t = f_o + A_\tau N_T \frac{e^{s_2 t} - e^{-nt}}{s_2 + n}$$

$$\text{with } A^\tau = \frac{n}{s_1 + n}\left[n + f_o \frac{\delta + \gamma\theta\psi - r^*}{\gamma} + \frac{s}{\gamma}\left(\frac{a}{1-m} + r^* f_o\right)\right] > 0$$

where $s_1 > 0$ and $s_2 < 0$ are the eigenvalues of the linearized model, and f_o, the initial value of f, is assumed to be positive. As for the real exchange rate, it is given by:

$$(14)\qquad \lambda_t = \lambda_o - a\, f_t - N_T \frac{n}{s_1+n}\left(a + \frac{1-s}{\gamma}\right) e^{-nt}$$

with $a = (r^* - s_2)/(t^* f_o + \alpha/(1-m) > 0$, and λ_o the initial value of λ

The evolution of λ and f is shown on figure 1. There is a temporary current account surplus. The real exchange rate appreciates an impact. The

ensuing gradual depreciation is reversed while the current account is still in surplus[5].

FIGURE 1 ABOUT HERE

A number of results emerge. First, the magnitude of these effects is directly proportional to the size of newly discovered resources N_T. Second, the higher the speed of depletion n the greater the size of the initial jump appreciation and the sooner the current account and the real exchange rate will change direction. Whether initially the country is a net exporter or a net importer of oil does not qualitatively affect the results. Third, the signs of A_τ in (13) and of a in (14) are positive only for f_o not "too negative". We cannot rule out the possibility for a country with a large foreign debt to actually suffer a depreciation and current account deficits in the early adjustment period[6]. Fourth, looking at A_τ in (13) we see three channels through which the current account is affected: the first term corresponds to the reduction in the oil import bill; the second term is the revaluation effect of existing net foreign debt when λ is reduced, which leads to a current account improvement (spending is reduced by $\delta + \gamma\theta\psi$, the sum of a direct wealth effect and a portfolio balance effect on r and hence spending - as λf is reduced, with b constant, r raises - while net interest payments fall proportionately to r^*); the last term corresponds to the fact that part of income from oil is saved.[7]

The case where the government uses its oil revenues to increase public spending yields similar results as those depicted on figure 1a and 1b.[8] The differences arise because the government's marginal propensity to save is zero and its marginal propensity to import may differ from that of the private sector. If its marginal propensity to import is equal to one, imports of goods exactly replace savings on oil in the trade balance and there is no current account and no real exchange rate effect ($f_t = 0$, $\lambda_t = 0$, $\forall t$). On the other hand, with identical public and private marginal propensities to import, an increase in public spending leads to more of an appreciation than a tax cut, because the larger excess demand for domestic goods requires a stronger crowding-out of foreign demand.

4. Fiscal Conservatism

In contrast to the previous section, consider the case where, instead of boosting demand, the government uses all of its oil revenues to retire the public debt. The main difference is that now, the oil discovery will have permanent (steady state) effects on the economy. With the stock of public debt being an additional dynamic variable, the study is technically more involved. Accordingly, our approach will be to first derive analytically the steady state and impact effects, and then to resort to simulations in order to study the dynamic path.

According to (5′), taxes increase as the revenue from oil declines, and decrease as the debt service charge is reduced following the retirement of debt. Thus, part of oil income is used to reduce the debt, the remainder being given back to the private sector through tax reductions.[9]

4.1 Permanent Effects of a Temporary Oil Windfall

We first study the steady state properties of the model using figure 2. The GG schedule corresponds to $\dot{\lambda} = 0$ in (11) and (12). It is the condition for both goods market equilibrium and portfolio balance. It is downward sloping because an increase in λf raises wealth and therefore spending, causing an excess demand for domestic goods and requiring a real exchange appreciation to restore equilibrium. With less than perfect substitutability, as λf increases relatively to b, portfolio balance requires r to decline which further lifts spending and steepens the slope of GG. The CA schedule corresponds to $\dot{f} = 0$ in (9) and (12) and describes the condition for current account balance when the goods market is in equilibrium. The latter condition and the trade balance equation (10) imply (ommitting the intercept):

$$T = \frac{m^P - m^G}{1 - m^P} g + \frac{\alpha}{1 - m^P} \tag{15}$$

For a given g, the trade balance is a function of λ only because goods market equilibrium will force the determinants of spending, r and w, to adjust so that $c = \bar{y} - g - T$. The important point is that wealth does not

appear in (15): the only current account effect of an increase in λf is to raise net interest payments from abroad, $r^{*}\lambda f$. To restore the current account equilibrium, we need a trade deficit, therefore an appreciation: hence the slope of CA. GG is steeper than CA as a given increase in λf creates a stronger effect on the goods market than on the current account, (a result imposed by the stability condition - see appendix) while the effect of a change of λ is the same, as it operates on both conditions through spending.

In the new steady state, b is reduced from its initial level. From (15) we know that this reduction in financial wealth leaves the CA schedule unchanged but exerts three effects on the GG schedule.[10] First is the direct wealth effect of the reduction in b: in order to correct for the ensuing excess supply of goods we need either a depreciation or an offsetting increase in λf, so that the schedule shifts up and to the right. Second is a tax effect: in the long run, with g unchanged and the budget in balance, taxes decrease by the full amount of the interest service of the former debt. This creates an excess demand for domestic goods and pushes the GG curve down and to the left. From the stability condition, we know that the first effect dominates the second: we end up in a position like G_1G_1 starting from G_0G_0, yielding a long run appreciation and an increase in f. The third and last effect on the GG schedule arises only with less than perfect substitutability between domestic and foreign assets ($\psi > 0$). With b reduced relative to λf, portfolio balance requires a decrease in the domestic interest rate r, which raises demand, and pushes the GG curve down and to the left. With a sufficient degree of imperfect substitutability, this portfolio effect, together with the tax effect, may well dominate the direct wealth effect. This is shown on figure 2 by the shift from G_0G_0 to G_2G_2. We obtain a long run depreciation and a reduction in λf.[11]

FIGURE 2 ABOUT HERE

The main result is that, in this model, a temporary oil windfall has permanent effects only if oil income is used to reduce the public debt and these effects depend only on the size of the debt reduction, not on the volume of newly discovered oil reserves. This happens even when domestic and foreign assets are perfect substitutes, in which case, unambiguously, the

exchange rate appreciates and wealth increases. As domestic residents replace, fully or partially, the retired domestic bonds by foreign assets, they generate an interest payments surplus, so that an appreciation is required to restore current account balance. Former public debt, as part of wealth, was supporting spending in excess of its interest service burden. As its elimination leads to reduced taxes, part of the additional disposable income is saved, so that goods market equilibrium necessitates that wealth grows above its initial level. If, however, domestic and foreign assets are poor substitutes, these results may be reversed as a consequence of the spending expansion generated by a strong reduction in the domestic interest rate: wealth may have to fall so as to reduce spending, and the exchange rate depreciates to make up for the reduction in net foreign interest payments.

4.2 The Impact Effect

The value $\lambda(0)$ at $t = 0$ of the real exchange rate, relative to its initial steady state level λ_o, is:

$$(16) \qquad \lambda(0) = \lambda_o + \frac{n}{s_1 + n}\left[-\frac{1-s}{\gamma}(N_T - b_o) + \frac{b_o}{\gamma}(\delta - \gamma(1-\theta)\psi - (1-s)r_o) - aN_T\right]$$

where $a > 0$ has been defined before (see (14)).

The immediate effect is ambiguous and is driven by three forces captured by the three terms in (16). The first term corresponds to the initial effect on disposable income $y^d = \bar{y} - \tau + N$, the value of which at time $t = 0$ changes by:

$$y^d(0) - y^d_o = N_1 - n\, b_o = n(N_T - b_o)$$

It increases by the initial flow of oil income $N_1 = nN_T$, net of the portion nb_0 which is used to start retiring the debt. Thus depending upon the relative values of known resources N_T and outstanding debt, disposable income may rise or decline: for example when $N_T > b_o$, spending increases creating an excess demand for domestic goods, so that the real exchange rate appreciates in order to weaken foreign demand. The second term captures the

condition which determine the long run effect on the real exchange rate (see footnote 11). Intuitively, as b is reduced, wealth and spending fall. If $\psi = 0$, this allows a (partial, at least) rebuilding of financial wealth through current account surpluses. The exchange rate depreciates in order to effect these surpluses and maintain goods market equilibrium by crowding in foreign demand. The last term represents the expected flow of oil income and the associated accumulation of foreign assets. As the first term, it corresponds to an increased demand for domestic goods and contributes to a real exchange rate appreciation.

A certain number of implications of (16) are worth noting. First $\partial \left|\lambda(0) - \lambda_o\right| / \partial n < 0$: the size of the initial effect increases with the rate of depletion of oil resources. Second, $\partial\lambda(0)/\partial N_T > 0$: the larger are oil reserves, the more likely is an appreciation on impact. Finally, $\partial\lambda(0)/\partial b_o > 0$: a larger debt reduction makes for a smaller appreciation, if not for a depreciation. This last remark allows a comparison with the benchmark case: when $b_o = 0$, all oil revenues benefit the private sector and (16) reduces to (14). Debt reduction, therefore, unambiguously reduces the size of the impact appreciation relatively to the benchmark case.

4.3 Dynamics: Simulation Study

We present here the results of simulations performed with the linearized version of the model presented in the appendix. The parameter values used for this exercise are:

$\bar{y} = 1$ $\quad g_o = 0.2$ $\quad \tau_o = 0.225$

$r_o = r^* = 0.05$ $\quad b_o = 0.5$ $\quad f_o = 0$

$c_o = 0.8$ $\quad T_o = 0$ $\quad \lambda_o = 1$

$n = 0.05$ $\quad s = 0.2$ $\quad \delta = 0.1$ $\quad \gamma = 0.8$ $\quad \theta = 0.5$

$m = 0.3$ $\quad \alpha = 0.12$ $\quad \mu = 0.05$

The values are purely illustrative and chosen so as to be plausible. Some require comment: we assume no initial net foreign asset holdings (f_o = 0) and the public debt is 50 percent of GNP $\bar{y}$ (net of oil income). The various simulation results are summarized on table 2 and discussed thereafter.

TABLE 2

Case	1	2	3	4	5	6	7	8
	Base Case : μ=n=.05 b_o=.5 N_T=1 ψ=0	μ=0.1	μ=0.025	n=0.1	N_T=2	b_o=2	ψ=0.2	Anticipated Oil Discovery in Period 5
$\lambda(0)$	0.875	0.941	0.834	0.715	0.661	1.142	0.826	0.966
$\bar{\lambda}$	0.825	0.825	0.825	0.825	0.825	0.300	1.068	0.825
r_o	0.050	0.050	0.050	0.050	0.050	0.050	0.100	0.050
r(0)	0.048	0.038	0.052	0.064	0.052	0.031	0.088	0.043
$\bar{r}$	0.050	0.050	0.050	0.050	0.050	0.050	0.073	0.050
$\bar{\lambda}\bar{f}$	0.600	0.600	0.600	0.600	0.600	2.400	-0.233	0.600
τ_o	0.225	0.225	0.225	0.225	0.225	0.300	0.250	0.225
$\tau(0)$	0.200	0.225	0.1875	0.150	0.150	0.350	0.225	0.225
$\bar{\tau}$	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200

Column 1 considers the base case where assets are perfect substitutes and taxes are reduced once and for all at time t = 0: $\tau_t = \bar{\tau}$, $\forall t \geq 0$. It is readily verified that this configuration is obtained by setting ψ = 0 and μ = n = 0.05. As shown on figure 3, the real exchange rate appreciates discretely on impact and continues to appreciate over time at a regularly decreasing rate. The current account remains in surplus throughout. The continuous exchange rate appreciation reflects a regular increase in domestic demand for domestic goods, as goods market equilibrium is

maintained through the crowding out of foreign demand. With constant taxes and the interest rate set at the parity level ($r = r^* + \dot{\lambda}/\lambda$, since we assume perfect substitutability), demand can only be growing because the acquisition of foreign assets outpaces the reduction in public bonds, with the result that financial wealth is increasing.

FIGURE 3 ABOUT HERE

a. Does it matter how fast debt is retired?

The broad objective of retiring the public debt can be achieved in a number of ways, with different consequences for the exchange rate. In this subsection we focus on the speed μ at which the debt is being reduced. For this purpose, we maintain oil resources at the level $N_T = 1$ (i.e. equal to GNP), the rate of depletion $n = 0.05$ (i.e. 5 percent of GNP) and we assume throughout perfect asset substitutability ($\psi = 0$). With these assumptions, the steady state is characterized by a real exchange rate appreciation and an increase in financial wealth. Column 2 corresponds to a faster debt retirement. With μ increased to 0.1, initially all of the oil revenues are used to buy back the debt so that taxes are unchanged, as is disposable income. While qualitatively the path of the exchange rate is similar to what is shown on figure 3, two quantitative differences are of interest. First, there is less of an initial appreciation because disposable income is unchanged. Second, as taxes are gradually brought down to their long run level, there is a continuous increase of disposable income which, added to the gains in wealth described in case 1, leads to a steeper path for the appreciating real exchange rate.

In column 3, we consider the opposite case where debt is retired more gradually so that more oil revenue is initially distributed to the pivate sector $[\tau(0) < \bar{\tau}]$ and at time $t = 0$, taxes and disposable income overshoot their long run levels. This choice of parameter values implies a hump-shaped profile for taxes (and for disposable income): as shown in figure 4, τ_t increases for $t > 0$ as oil income declines, and then decreases as debt is eliminated. The interesting result is that the implied effect of disposable income on the real exchange rate dominates the wealth effect described in

case 1 when $\tau_t = \bar{\tau}$: there is a strong initial jump appreciation which reflects the sharp cut in taxes, followed by a gradual depreciation and, finally, an appreciation in the final convergence to the steady state.

ABOUT HERE FIGURE 4

b. The Oil Factor

Accelerated depletion of oil is obtained by increasing n from 0.05 to 0.1, keeping the speed of debt retirement at $\mu = 0.05$ and total reserves at $N_T = 1$. The larger initial revenue from oil implies a strong impact increase in disposable income as taxes initially fall below their long run level (and thereafter are progressively raised). The result, shown on figure 5, is an overshooting appreciation of the exchange rate on impact, followed by a gradual depreciation as disposable income falls and goods market equilibrium is maintained through the crowding in of foreign demand.

ABOUT HERE FIGURE 5

Column 5 corresponds to the same fiscal policy and rate of oil depletion as in column 1 ($n = \mu = 0.05$), but the amount of oil discovered is now increased to twice the value of GNP ($N_T = 2$). Because the profile of the real exchange rate is similar to case 4 (figure 5), we do not present the corresponding figure. The interpretation of the data presented in table 2 is straightforward. With the same pattern of debt retirement, the extra oil income available serves to raise disposable income which prompts a strong impact appreciation. Thereafter, as oil income is reduced, taxes gradually rise to their long run level, weakening domestic demand, which explains the gradual depreciation.

c. The Size of the Public Debt

From our earlier discussion, we know (see (16)) that the impact effect on the real exchange rate is theoretically ambiguous and that a depreciation might result from a large initial debt b_o. This is the case considered in column 6 where b_o is set at 200 percent of GNP ($b_o = 2$)[12]. The result of

this simulation appears in figure 6. In the long run, with a larger overall reduction in the debt service burden, the appreciation is stronger. Note that taxes rise initially because oil income is not sufficient to pay for the cost of retiring the debt.

ABOUT HERE FIGURE 6

d. Imperfect Asset Substitutability

From (16) and the steady state formulae (see footnote 11) we can characterize the role of imperfect substitutability between domestic and foreign assets:

$$\frac{\partial\lambda(0)}{\partial\psi} = \frac{-n}{s_1 + n}\frac{b_o}{\gamma}(1-\theta) < 0$$

$$\bar{\lambda} > \lambda_o \quad \text{iff} \quad \psi > \frac{\delta - (1-s)r_o}{\gamma(1-\theta)}$$

$$\bar{w} < w_o \quad \text{iff} \quad \psi > \frac{r^* - (1-s)r_o}{\gamma}$$

Thus imperfect asset substitutability will bring about a larger initial appreciation. The reason is that domestic residents will not attempt to replace one for one domestic bonds by foreign assets, holding instead a larger proportion of foreign assets as the real domestic interest rate is reduced. Consequently, less of a current account surplus is required, hence a stronger currency, while, in the long run, wealth declines. With reduced net foreign asset holdings (relatively to the perfect substitutability case), the interest service will require a stronger trade account and therefore a long run depreciation.

The simulation results appear in figure 7. As expected the real exchange rate appreciates on impact and depreciates in the longer run as wealth declines toward its long run level, reducing spending and demand for domestic goods. The current account is in surplus early on, benefitting from oil income. As this income declines, with an overvalued exchange rate, the current account undergoes deficits. The early appreciation of the real

exchange rate corresponds to the strong domestic demand that results from declining taxes and a low interest rate.

ABOUT HERE FIGURE 7

e. Announcement Effects

The treatment of an expected resource discovery is an obvious extension of the present study. It is relatively straightforward to get an intuitive understanding of how the results would differ by considering the difference between the base case 1 (figure 3) and the case described in figure 8. All parameter values are the same. The only difference is that it is now announced in period 0 that, as of period 5, resource income will start accruing to the government and public debt will be gradually retired. The perfect foresight assumption prevents an expected jump in the real exchange rate. Asset holders, anticipating an appreciation, immediately attempt to build up the share of domestic bonds in their portfolios, which results in a jump appreciation as soon as the discovery is announced. Note that this appreciation is smaller than in case 1, and that $r = r^{*} + \dot{\lambda}/\lambda$ falls. As oil is not yet flowing, the exchange rate appreciation prompts a current account deficit which is reversed in period 5. Thereafter the model behaves similarly to what has been seen in case 1.

ABOUT HERE FIGURE 8

5. Conclusion

In a world of consumers endowed with perfect foresight and optimizing over an infinite planning horizon, the fiscal treatment of exhaustible natural resources would not matter. As discussed in the introduction, the rational consumer would want to accumulate wealth while resources are exploited, and whether this is done by the government or by the private sector, the result is exactly the same. Interesting questions though arise when we move away from what we consider as an unrealistic set of assumptions. If public debt is considered as private wealth, public

appropriation of the resource income makes a difference: in the limiting case where all resources accrue to the government, there is no direct perception of increased private wealth. Consequently, if private consumers do not optimize intertemporally, it makes a difference whether the government reduces taxes or retire its debt: in the former case, the resource income is spent while it flows, so that there exists the possibility that the temporary windfall will not be capitalized. This is what happens when the government spends its resource income directly or reduces taxes.

When on the contrary the government retires its debt, in effect it forces the myopic consumers to capitalize by acquiring the other existing assets, here net foreign asset. In that case, the temporary benefits of resource exploitation has permanent effects on the economy which resemble the theoretical case of consumers with perfect foresight and intertemporal optimization. The paper also shows that the degree of substitutability among assets matters for the precise characterization of the long run effect.

We have chosen here to go to the extreme Keynesian case of consumers spending out of current income and wealth, the latter including public debt. This has the advantage of providing results easy to contrast with the other polar case. It may also well be a realistic way of stylizing the real world. What is certainly unrealistic and requires qualification is that we have ruled out the possibility of capitalizing the resource income in the form of productive equipment.[13] This is another channel which would possibly affect the result if domestic capital and other assets are imperfect substitutes.[14]

APPENDIX

In this Appendix, we discuss the dynamic properties of the model of section 2 in the two cases studied in the paper: when oil revenue is entirely transferred to the private sector, and when it is used to run down the public debt.

We first linearize the equations which describe the path of the real exchange rate and of the stock of foreign assets, (9) and (11), around the initial steady state and the variables are now redefined as deviations from this steady state (e.g. x means $x-x_o$):

$$(9') \qquad \dot{f} : T + r^* f + \lambda r^* f_o - N^*$$

$$(11') \qquad \dot{\lambda} = r - r^* + \psi(\theta f + \theta f_o \lambda - (1-\theta)b)$$

where we have assumed that in the initial steady state the stock of foreign assets is f_o and $\lambda_o = 1$.

In equation (11′) ψ measures the degree of substitutability between domestic and foreign assets. When $\psi = 0$, domestic and foreign assets are perfect substitutes and interest rate parity holds. The parameter θ is the marginal propensity to hold foreign bonds and is a measure of capital mobility: with $\theta = 0$, at the margin, capital is immobile.

Substituting the goods market equilibrium condition (12) into (9′) and (11′) we obtain :

$$(A1) \begin{bmatrix} \dot{\lambda} \\ \dot{f} \end{bmatrix} = \begin{bmatrix} \frac{\alpha}{\gamma(1-m)} + f_o\left(\frac{\delta+r^*}{\gamma}+\psi\theta\right) & \frac{\delta+\gamma^*}{\gamma}+\psi\theta \\ \frac{\alpha}{1-m} + r^* f_o & r^* \end{bmatrix} \begin{bmatrix} \lambda \\ f \end{bmatrix} + \begin{bmatrix} \left(\frac{\delta}{\gamma}-\psi(1-\theta)\right)b + \frac{1-m^G}{\gamma(1-m)}\, g - \frac{1-s}{\gamma} + \frac{(1-s)(1-h)}{\gamma} N \\ \frac{m-m^G}{1-m}\, g + N \end{bmatrix}$$

The dynamic behaviour of the economy is described by (A1) and by the government budget constraint (4). Because of our assumption that taxes are adjusted to finance any change in debt service, the system is recursive and the path of b is independent of λ and f. With perfect foresight the real

exchange rate is a non-predetermined variable: the system described by (A1) is therefore characterized by one non-predetermined variable, λ, and one predetermined variable, f. For saddle-path stability we need the determinant of the transition matrix to be negative, which amounts to:

$$\text{(A2)} \qquad \delta + \gamma\theta\psi - sr^{*} > 0$$

For this condition to be satisfied an increase in foreign asset holdings must lead, through wealth and substitution effects, to a current account deficit, i.e. $\dot{df}/df < 0$. A sufficient condition for (A2) is $\delta > r^{*}$.

When the government transfers all oil income to the private sector, public debt remains unaffected by the oil discovery. In this case (A2) is sufficient to characterize the dynamics of the system. Setting (with no loss of generality) $b = g = \tau = 0$ (A2) may be integrated to yield equations (13) and (14) in the text.

In the case of debt retirement we first linearize the tax rule (5′) around the initial steady state:

$$\text{(A3)} \qquad \tau = (\mu + r_o)\, b + (\mu + r) b_o - N$$

where we have assumed that in the initial steady state the stock of public debt is b_o and the real interest rate r_o. The dynamics of the system is characterized by (A2) together with (A3), and by:

$$\text{(A4)} \qquad b_t = b_o\, (\exp(-nt) - 1)$$

as implied by (6). The path of the real exchange rate and of the stock of foreign assets are independent of b because of the assumption that the speed at which public debt is retired is constant and equal to n.

FOOTNOTES

1. The extreme assumption that all oil revenue accrues to the government simplifies the analysis, but all our results hold provided that some oil revenue accrues to the government.

2. We only consider financial wealth, ommitting capital as this is a no-growth economy so that the capital stock remains approximatively constant.

3. There is no major difficutly in allowing foreign holdings of domestic assets. As shown by Dale Henderson and Kenneth Rogoff (1982), all the results are preserved if expectations are rational.

4. The model is entirely written in real terms, a point which requires a brief comment. The determination of the price level would require adding to the equation which describes equilibrium in the financial market, (11), a money market equilibrium condition. If the nominal supply of money is constant and money demand is interest inelastic, the price level is also constant and the model is exactly correct. Sachs and Wyplosz (1983) show that in models of this type, allowing for money demand to be interest elastic does not modify the main results.

5. The initial appreciation is equal to $N_T(\frac{n}{s_1 + n})\ (\frac{1-s}{\gamma} + a)$ which is unambiguous. The subsequent evolution of $\lambda(t)$ is dominated first by the term $-\ a.f_t$ in (14) and then by a gradual return to the initial steady state value λ_o. Finally, it can be shown that when $\dot{f} = 0$, $\dot{\lambda} > 0$ so that the shift to depreciation occurs while f is still growing.

6. This happens when, in the model of the appendix, $\partial\dot{\lambda}/\partial\lambda < 0$ and $\partial\dot{f}/\partial\lambda < 0$. Then, while the Marshall-Lerner condition still holds ($\partial T/\partial\lambda = \alpha > 0$), a depreciation worsens the current account by increasing the debt service $r^*\lambda f$. The depreciation occurs because the extra spending that is generated from oil income needs to be reduced by the wealth effect: if f_o is sufficiently negative, a depreciation will reduce demand.

7. A similar interpretation can be provided for the jump appreciation formula in footnote 5. The first term describes an increase in domestic spending leading to an excess demand for domestic good, which requires an appreciation to crowd out foreign demand. The second term represents the expected excess demand created by the increase in wealth due to the upcoming current account surpluses.

8. Formally, setting b = t = 0 and g = hN, we have:

$$f_t = f_o + A_g\ N_T\ \frac{e^{s_2 t} - e^{-nt}}{s_2 + n}$$

with $A_g = \frac{n}{s_1 + n}\left[h\frac{1-m^G}{1-m}\left(n+\frac{f_o}{\gamma}(\delta+\gamma\theta\psi-sr^*)\right)+\left(n+\frac{f_o}{\gamma}(\delta+\gamma\theta\psi-(1-s)r^*+\frac{\alpha s}{\gamma(1-m)}\right)\right]$

$$\lambda_t = \lambda_o - a\, f_t - N_T \frac{n}{s_1 + n}\left[H + a\left(1+h\frac{m-m^G}{1-m}\right)\right] e^{-nt}$$

with $H = \left((1-s)(1-h) + \frac{1-m^G}{1-m}h\right) / \gamma > 0$

9. The process of debt retirement can be modeled in several different ways. We could keep τ constant and allow g to change instead. We could also retire debt in finite time and then absorb the remaining oil income through higher public spending, lower taxes, passing it to the private sector. Such a strategy implies a cumbersome discontinuity and is not explored.

10. The equations describing the new position of the two schedules are for $f_o = 0$:

$$\text{(GG)}\quad \frac{\alpha}{\gamma(1-m)}(\lambda-\lambda_o) + \left(\frac{\delta+r^*}{\gamma} + \theta\psi\right)\lambda f + (\delta-\gamma(1-\theta)\psi-(1-s)r_o)\frac{\bar{b}-b_o}{\gamma} = 0$$

$$\text{(CA)}\quad \frac{\alpha}{1-m}(\lambda-\lambda_o) + r^*\lambda f = 0$$

Note that we assume in fact $\bar{b} = 0$.

11. The steady state effects are (as deviations from the initial steady state):

$$d\bar{\lambda} = \frac{(1-m)r^* b_o}{\alpha}\,\frac{\delta-\gamma(1-\theta)\psi-(1-s)r_o}{\delta+\gamma\theta\psi-r^*}$$

$$d(\overline{\lambda f}) = b_o\,\frac{\delta-\gamma(1-\theta)\psi-(1-s)r_o}{\delta+\gamma\theta\psi-r^*}$$

$$d\bar{w} = b_o\,\frac{sr^*-\gamma\psi-(1-s)r_o}{\delta+\gamma\theta\psi-r^*}$$

12. Note from table 2 a certain number of changes on the parameter values. As $b_o = 0.5$ and $f_o = 0$, $\psi > 0$ implies that $r_o > r^*$. This, in turn, requires changing $\tau_o = r_o b_o + g_o$.

13. It is interesting to note that the possibility of investing North Sea Oil revenues into capital assets had been suggested in Britain in 1982 (see Financial Times, March 31, 1982, p.15).

14. If domestic and foreign capital are perfect substitutes, and if the real rate of return is determined abroad, then the stock of capital will eventually revert to its pre-discovery level: in these circumstances, our characterization of the steady state remains unchanged.

REFERENCES

Atkinson, F.J., Brooks, S.J., and Hall, G.F. (1983), "The Economic Effects of North Sea Oil", National Institute Economic Review, May, p.38-44.

Bruno, M. and Sachs, J. (1982) "Energy and Resource Allocation: a Dynamic Model of the 'Dutch Disease'", Review of Economic Studies, XLIX, p.845-859.

Corden, W.M. and Neary J.P. (1982) "Booming Sector and Industrialization in an Open Economy", Economic Journal, December, p.825-848.

Eastwood, R.K. and Venables, A.J. (1982) "The Macroeconomic Implications of a Resource Discovery in an Open Economy", Economic Journal, June, p.285-299.

Forsyth, P. and Kay, J.A. (1980) "The Economic Implications of North Sea Oil Revenues", Fiscal Studies, 1, p.1-28.

Henderson, D.W, and Rogoff, K. (1982), "Negative Net Foreign Asset Positions and Stability in a World Portfolio Balance Model", Journal of International Economics 13, August, p.85-104.

Price, R. W. and Muller, P. (1984), "Structural Budget Indicators and the Interpretation of Fiscal Policy Stance in OECD Economies", OECD Economic Studies, N° 3, Autumn, p. 27-72.

Sachs, J. and Wyplosz, C. (1983) "Real Exchange Rate Effects of Fiscal Policy", NBER Working Paper no. 1255, December.

Figure 1a: f

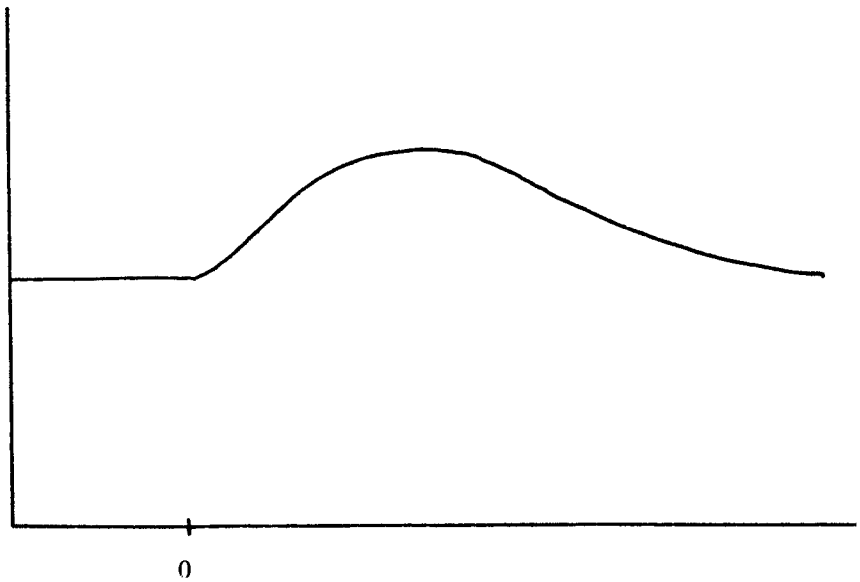


Figure 1b: λ

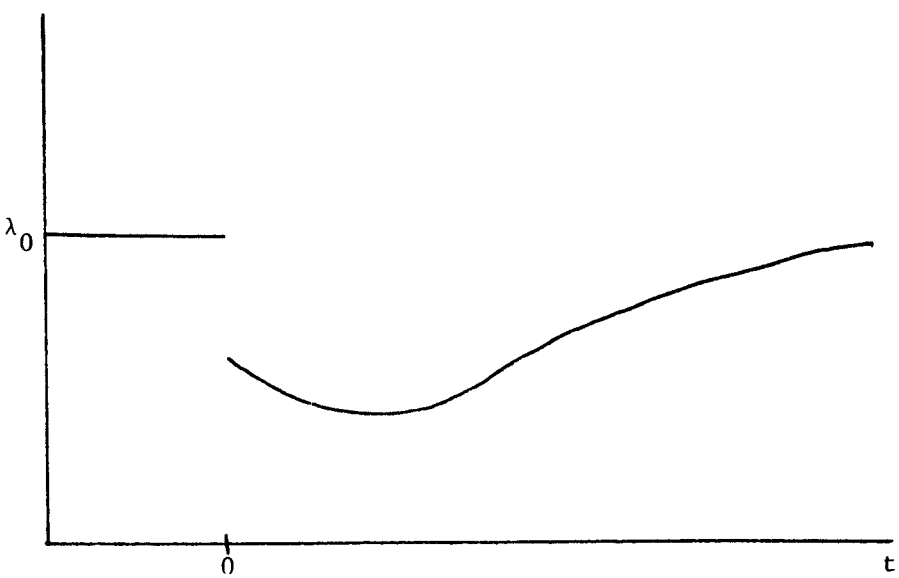


Figure 2

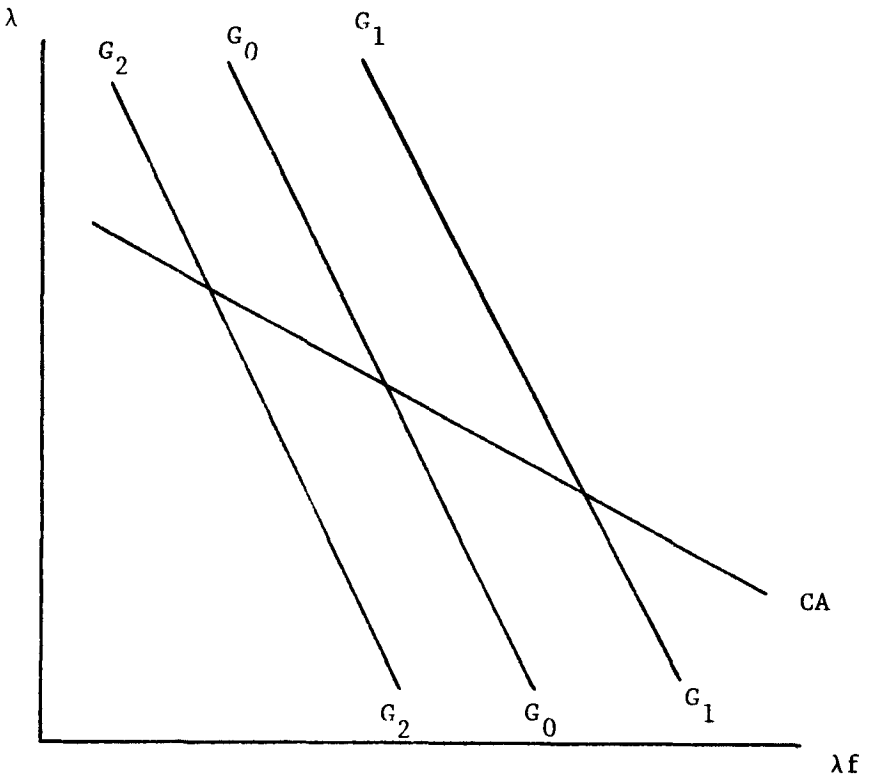


Figure 3a: λ

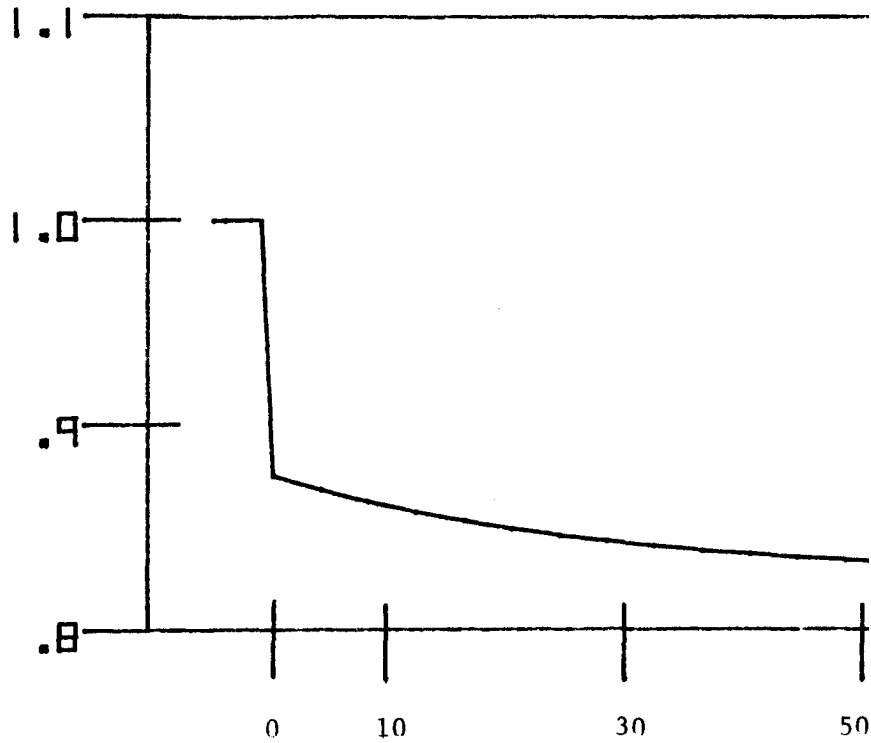


Figure 3b: f

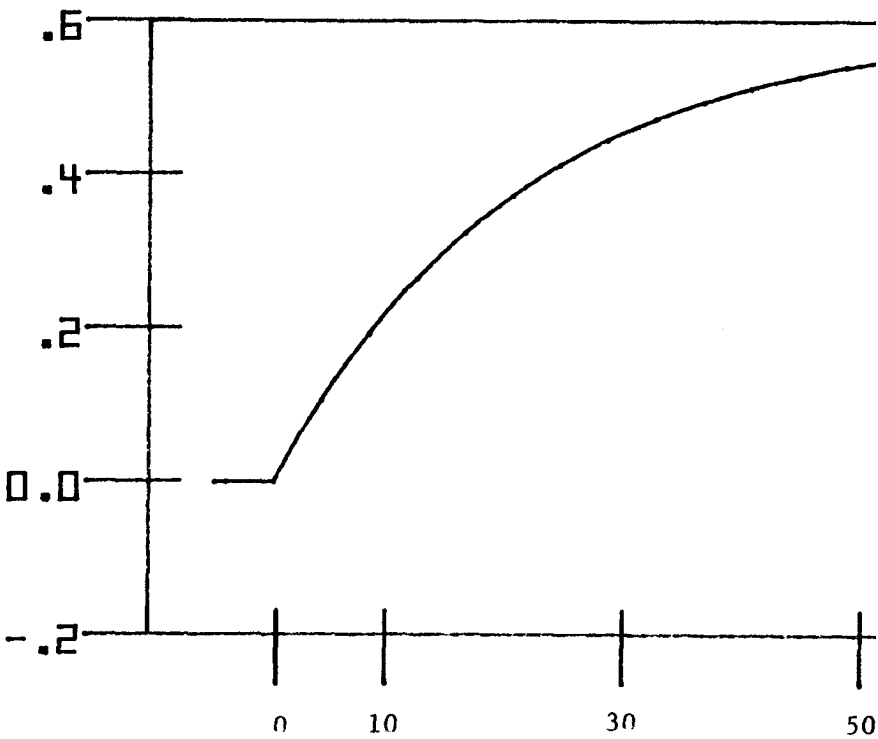


Figure 4a: λ

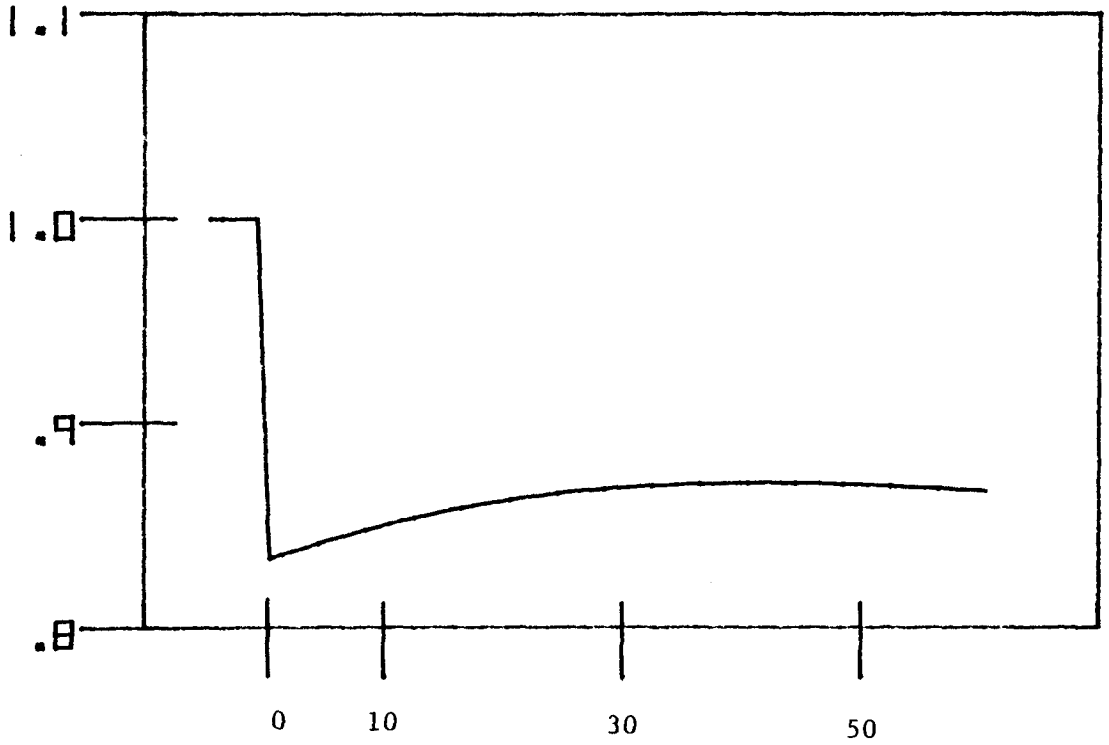


Figure 4b: τ

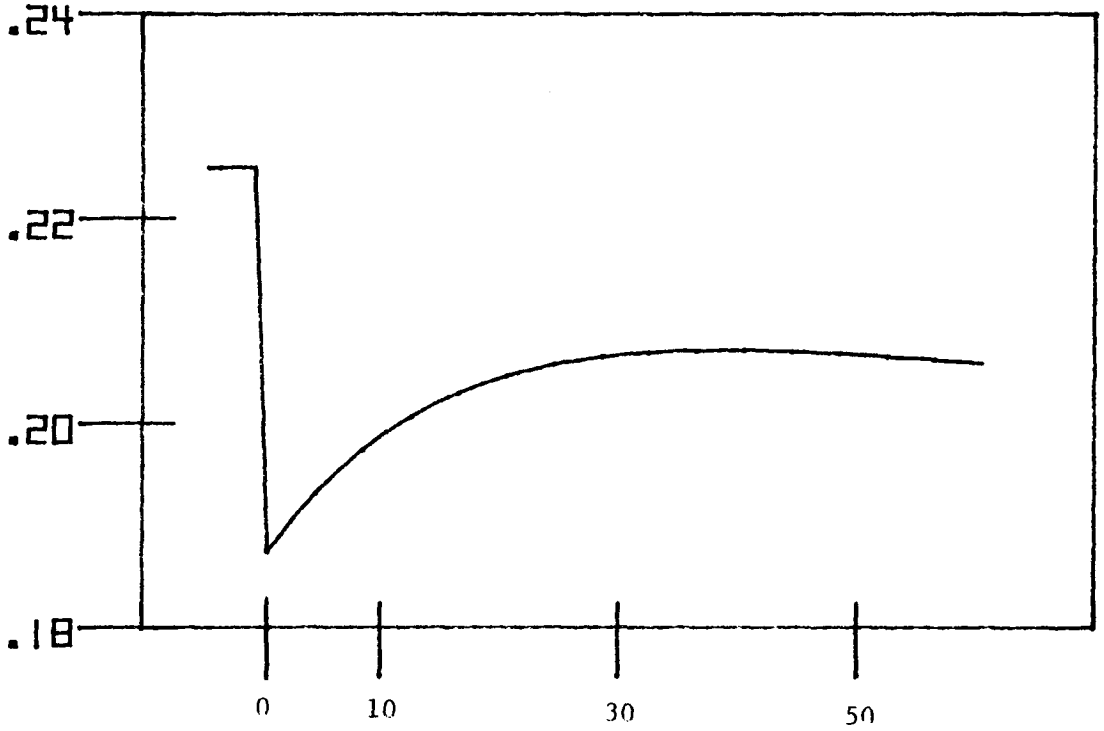


Figure 5a: λ

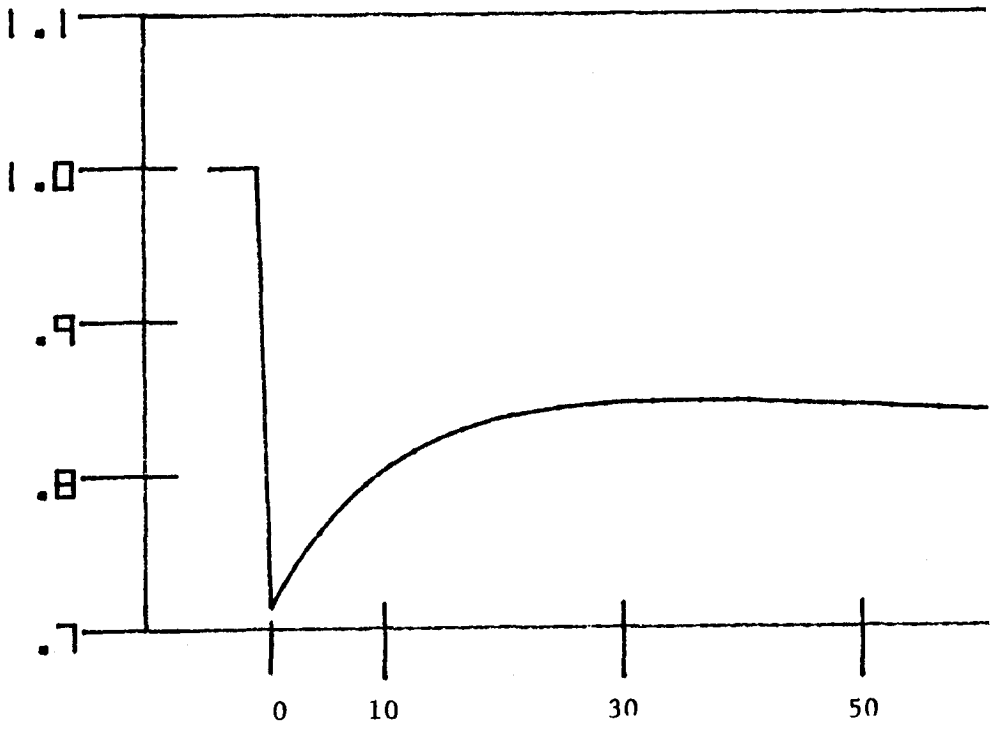


Figure 5b: τ

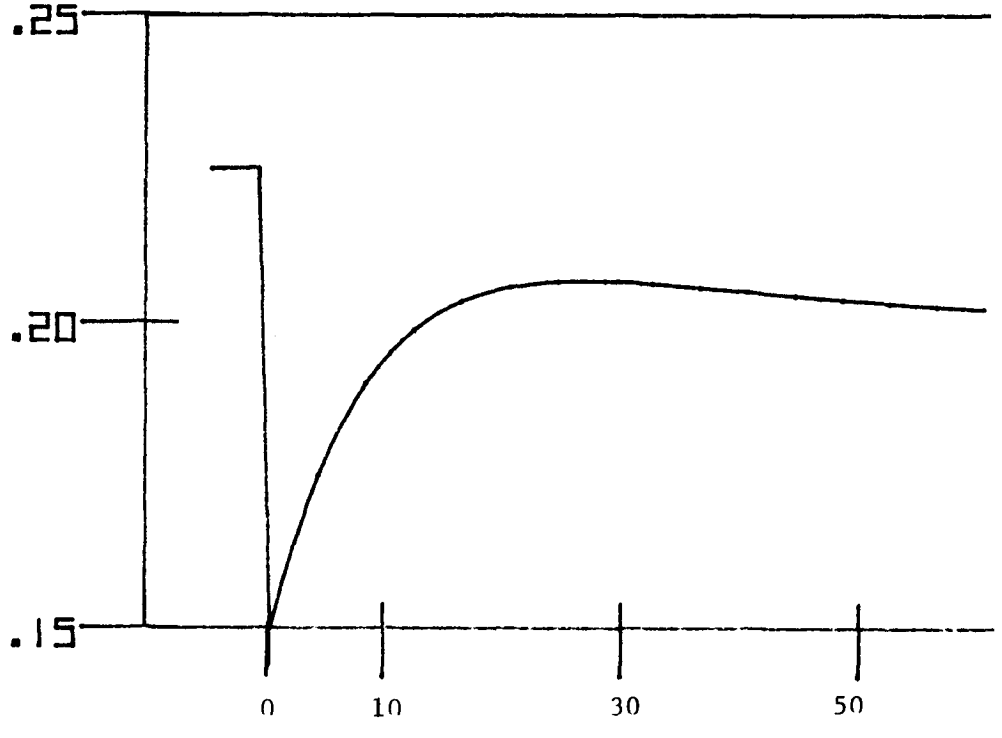


Figure 6a: λ

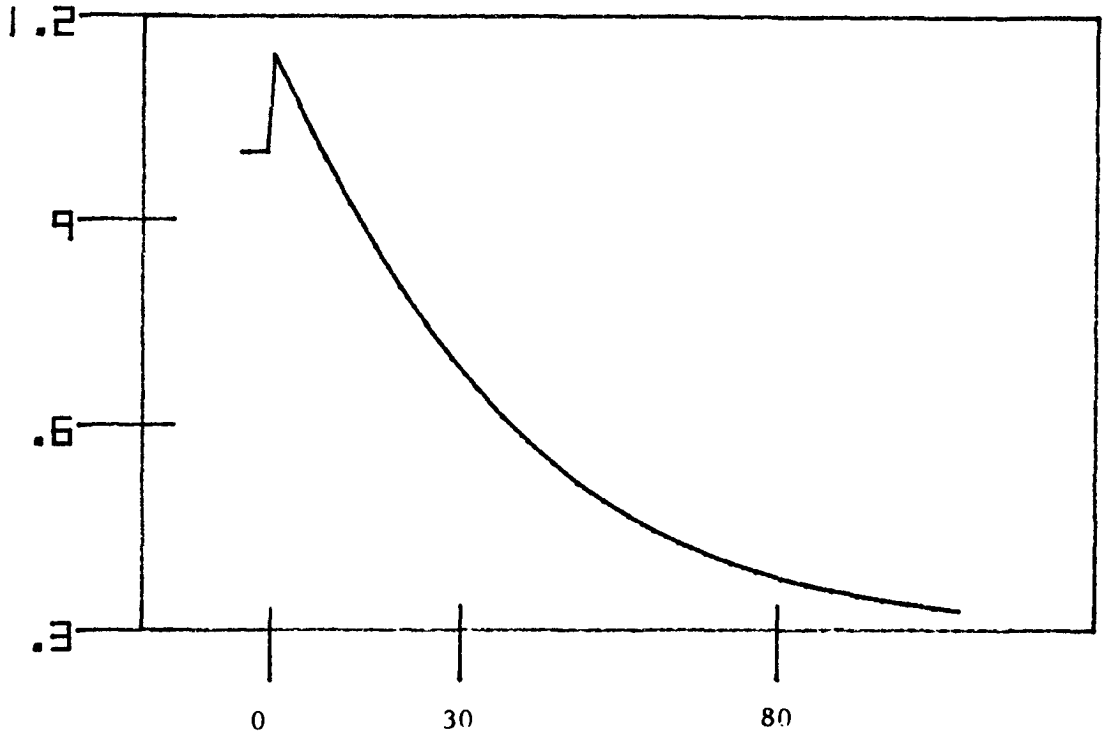


Figure 6b: τ

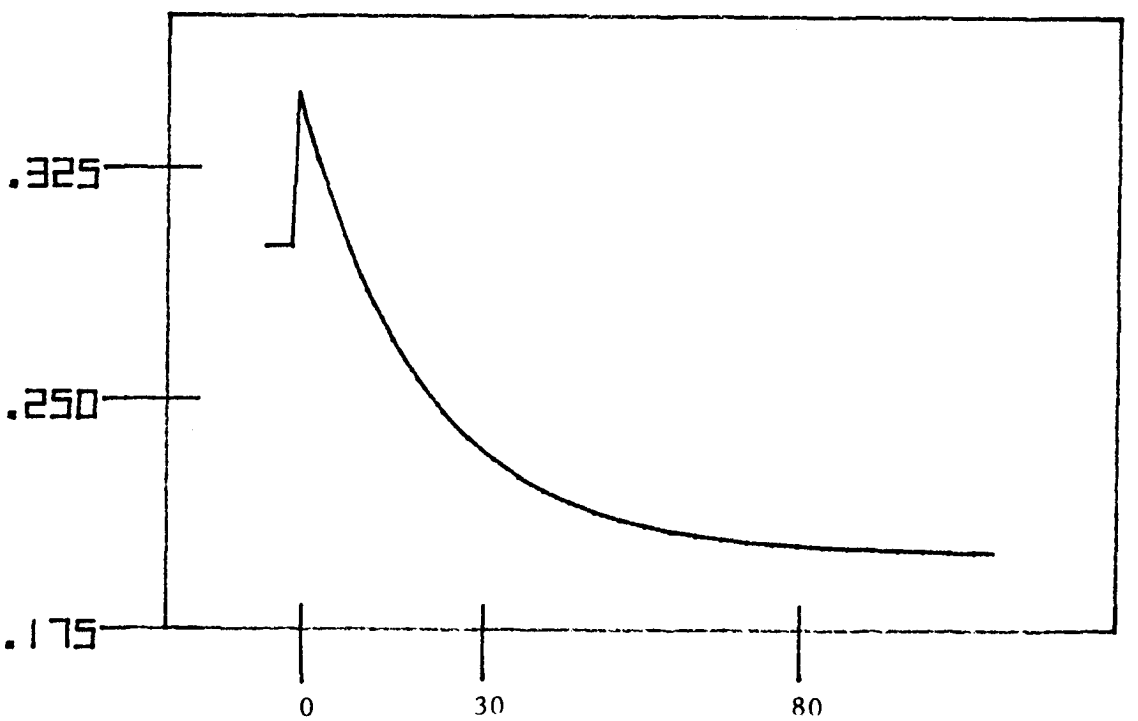


Figure 7a: λ

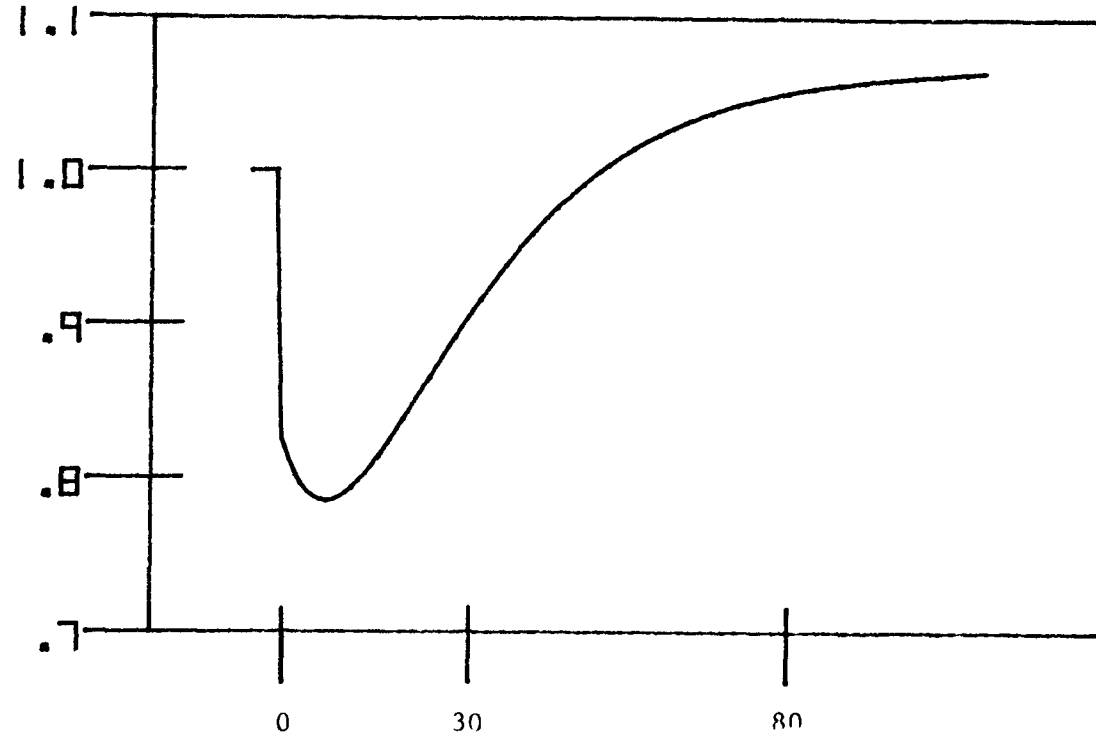


Figure 7b: f

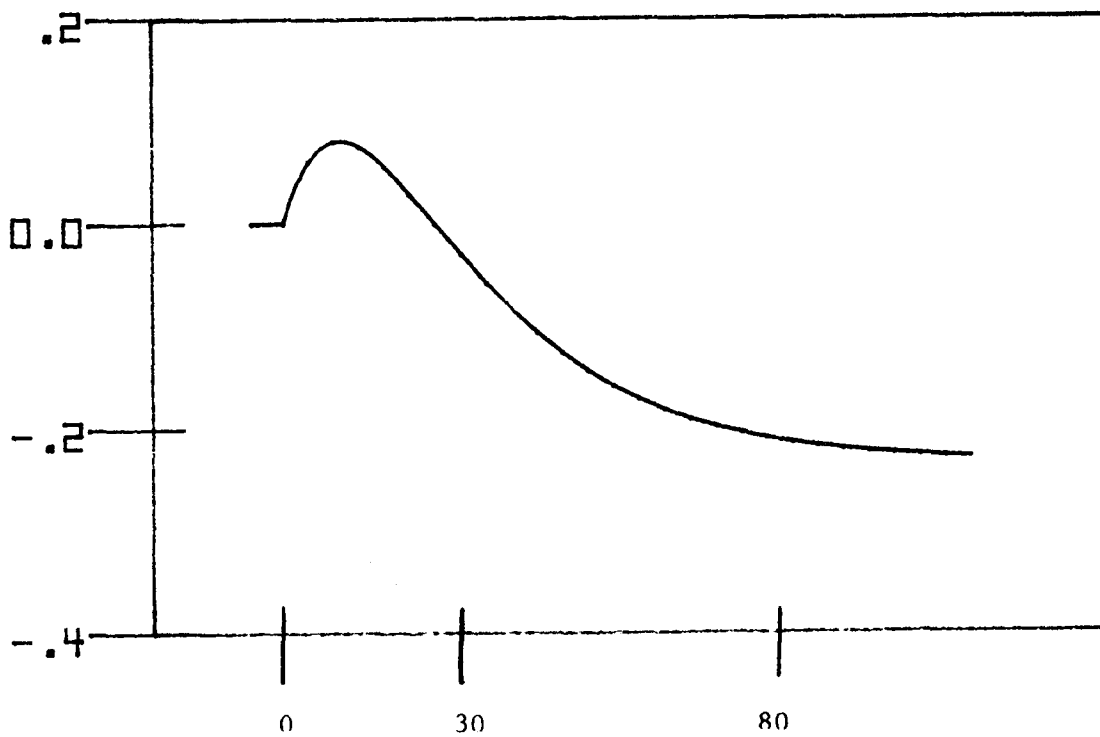


Figure 8a: λ

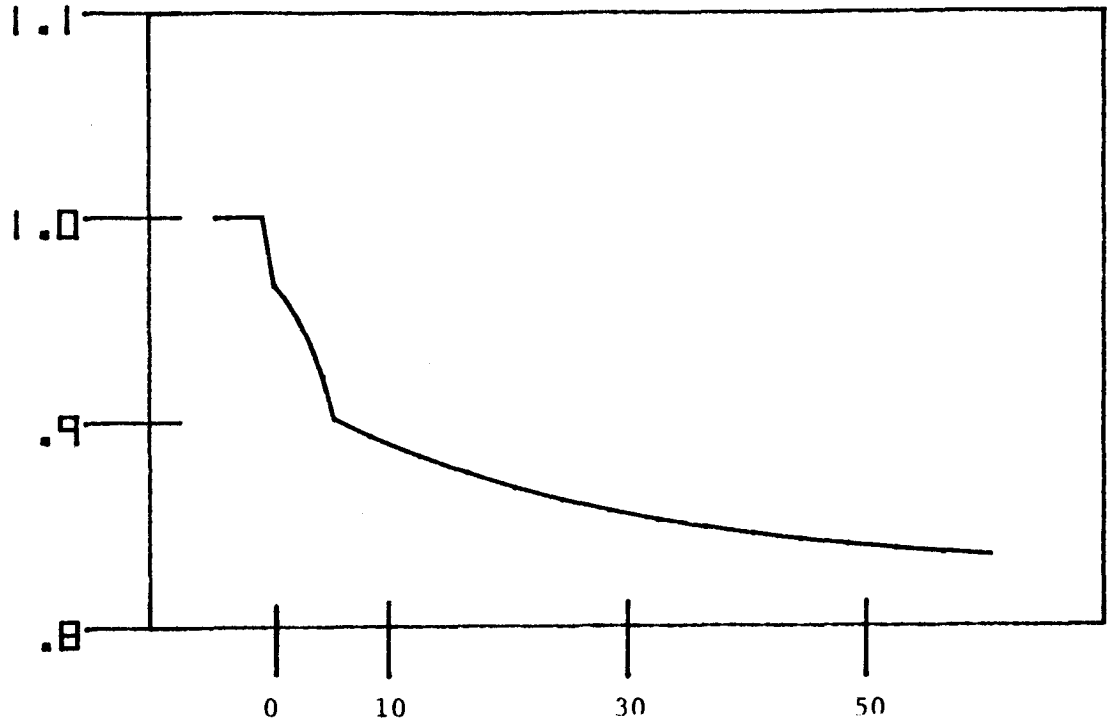
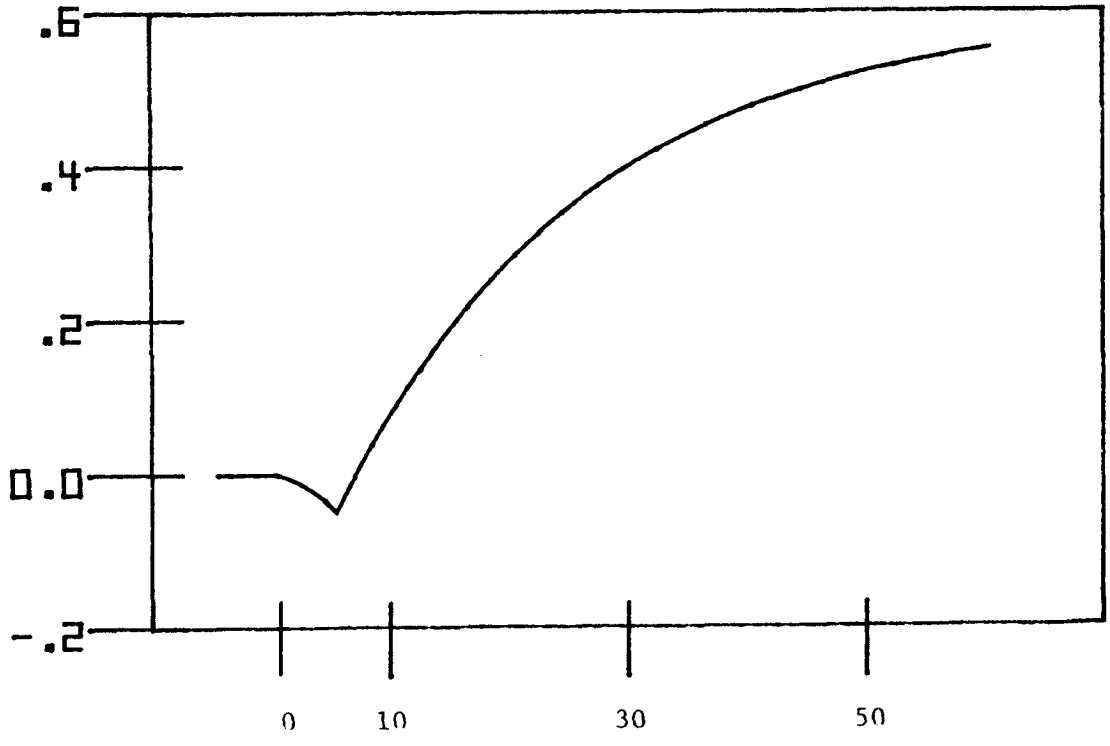


Figure 8b: f



LIST OF INSEAD RESEARCH WORKING PAPERS

80/01 "Identifying cognitive style determinants of retail patronage, by Christian PINSON, Arun K. JAIN and Naresh K. MALHOTRA, January 1980.

80/02 "Dimensions culturelles des conceptions de management - une analyse comparative internationale", par André LAURENT Février 1980.

80/03 "Cognitive style and effective communication", by Arun K. JAIN, Naresh K. MALHOTRA and Christian PINSON, Dec. 1979.

80/04 "Accomodative cognitive style differences in consumer reduction of alternatives", by Naresh K. MALHOTRA, Christian PINSON and Arun K. JAIN, October 1979.

80/05 "Stability and reliability of Part-Worth utility in conjoint analysis : a longitudinal investigation", by Arun K. JAIN, Naresh K. MALHOTRA and Christian PINSON, September 1979.

80/06 "The expected future spot exchange rate, the forward rate, and the trade balance", by Charles A. WYPLOSZ, March 1980.

80/07 "Decline and adjustment: Public intervention strategies in the European clothing industries", by José de la TORRE, July 1980.

80/08 "The uncommon market: European policies towards a crisis industry - clothing in the 1970's", by José de la TORRE and Michel BACCHETTA, May 1980.

80/09 "Stratport: a decision support system for strategic planning", by Jean-Claude LARRECHE and V. SRINIVASAN, April 1980, Revised October 1980.

80/10 "A new approach to market segmentation strategy: a banking application", by Arun K. JAIN, Christian PINSON and Naresh K. MALHOTRA, March 1980.

80/11 "The exchange and interest rate term structure under risk aversion and rational expectations", by Charles A. WYPLOSZ, Revised Version, September 1980.

80/12 "Individual cognitive differences in MDS analysis of perceptions", by Arun K. JAIN, Naresh K. MALHOTRA and Christian PINSON, July 6-12, 1980.

80/13 "STRATPORT: A Model for the evaluation and formulation of Business Portfolio Strategies", by Jean-Claude LARRECHE and V. SRINIVASAN, April 1980, Revised November 1980.

80/14 "Les styles cognitifs : une nouvelle approche de la segmentation des marchés, by Christian PINSON, Naresh K. MALHOTRA and Arun K. JAIN, Septembre 1980.

80/15 "Cognitive styles: A new approach to market segmentation", by Christian PINSON, Naresh K. MALHOTRA and Arun K. JAIN, March 1980.

81/01 "Eurobanking, open market operations and the monetary base" by Herwig LANGOHR, August 1980.

81/02 "Alternative approaches to the theory of the banking firm: a note" by Herwig LANGOHR, September 1980.

81/03 "Why does beta shift when the length of securities returns varies?" by Gabriel HAWAWINI, December 1980.

81/04 "Forward market and the cooperative firm" by Gabriel HAWAWINI, January 1981.

81/05 "On some propositions regarding the behavior of the labor-managed firm under uncertainty" by Gabriel HAWAWINI, Jan. 1981.

81/06 "Impact of the investment horizon on the association between securities' risk and return: theory and tests" by Gabriel HAWAWINI and Ashok VORA, February 1981.

81/07 "New evidence on beta stationarity and forecast for Belgian common stocks" by Gabriel A. HAWAWINI and Pierre A. MICHEL, February 1981.

81/08 "Industrial policy in the European economic community : Crisis and change", by Kenneth S. COURTIS, June 1980.

81/09 "Dogmatism as a moderator of banking behavior and attitudes", by Arun K. JAIN, Christian PINSON and Naresh K. MALHOTRA, March 1981.

81/10 "Investment horizon, diversification, and the efficiency of alternative beta forecasts", by Gabriel A. HAWAWINI and Ashok VORA, March 1981.

81/11 "Organizational Development & Change", by Claude FAUCHEUX, Gilles AMADO and André LAURENT, April 1981.

81/12 "The Pricing of Risky Assets on the Belgian Stock Market" by Gabriel HAWAWINI and Pierre A. MICHEL, May 1981.

81/13 "A Test of the Generalized Capital Asset Pricing Model" by Gabriel HAWAWINI and Ashok VORA, May 1981.

81/14 "On the History of Yield Approximations" by Gabriel HAWAWINI and Ashok VORA, May 1981.

81/15 "Pitfalls of the Global Product Structure" by William H. DAVIDSON and Philippe C. HASPESLAGH, May 1981.

81/16 "Adjusting Beta Estimates: Real Gains or Illusions?" by Gabriel A. HAWAWINI and Ashok VORA, June 1981.

81/17 "Do European Industrial Marketers Budget Differently? an International Comparison via the Advisor Model" by David WEINSTEIN and Gary L. LILIEN, June 1981.

81/18 "The Internationalisation of Manufacturing in the Automobile Industry - Some Recent Trends" by Yves L. DOZ, April 1981.

81/19 "Portfolio Planning: Use and Usefulness" by Philippe HASPESLAGH, May 1981.

81/20 "Production Decisions in the Mixed Firm" by Claude VIALLET, Octobre 1981.

81/21 "Foreign Investment and Economic Development: Conflict and Negotiation", by José de la TORRE, April 1981.

81/22 "Forecasting Country Political Risk" by José de la TORRE and David H. NECKAR, March 1981.

81/23 "The Impact of Inflation on Real Variables: A General Equilibrium Approach", by Antonio M. BORGES, November 1981.

81/24 "An Assessment of the Risk and Return of French Common Stocks", by Gabriel A. HAWAWINI, Pierre A. MICHEL and Claude J. VIALLET, November 1981.

81/25 "Mode de vie et style de vie : Quatre observations sur le fonctionnement des termes" par Jean-François BERNARD-BECHARIES et Christian PINSON.

81/26 "Simulating an Oil Shock with Sticky Prices" by Francesco GIAVAZZI, Mehmet ODEKON and Charles WYPLOSZ, November 1981.

81/27 "Decomposing the Impact of Higher Energy Prices on Long-Term Growth" by Antonio M. BORGES and Lawrence H. Goulder.

81/28 "Forecasting for Industrial Products" by David WEINSTEIN.

82/01 "Estimating and Adjusting for the Intervalling-Effect Bias in Beta" by Kalman J. COHEN, Gabriel A. HAWAWINI, Steven F. MAIER, Robert A. SCHWARTZ and David K. WHITCOMB. February 1980, Revised October 1981.

82/02 "Friction in the Trading Process and the Estimation of Systematic Risk" by Kalman J. COHEN, Gabriel A. HAWAWINI Steven F. MAIER, Robert A. SCHWARTZ and David K. WHITCOMB. November 1981.

82/03 "On the Mathematics of Macaulay's Duration: A Note" by Gabriel A. HAWAWINI. December 1981.

82/04 "Systematic Risk, the Investment Horizon, and the Market Index: an Analytical Examination" by Gabriel A. HAWAWINI and Ashok VORA, December 1981.

82/05 "Why Beta Estimates Depend upon the Measurement Interval" by Gabriel A. HAWAWINI. January 1982.

82/06 "Nationalization, Compensation and Wealth Transfer: an Empirical note about the French Experience" by Herwig LANGOHR and Claude VIALLET, 1981/1982.

82/07 "The Keynesian and Classical Determination of the Exchange Rate" by Emil-Maria CLAASSEN, May 1982.

82/08 "The Real Exchange Rate, the Current Account and the Speed of Adjustment" by Francesco GIAVAZZI and Charles WYPLOSZ, April 1982.

82/09 "Simulation: A Complementary Method for Research on Strategic Decision Making Processes" by Danielle NEES, May 1982.

82/10 "The Zero-Root Problem: Dynamic Determination of the Stationary Equilibrium in Linear Models" by Francesco GIAVAZZI and Charles WYPLOSZ, August 1982.

82/11 "The Theory of Risk Aversion and Liquidity Preference: A Geometric Exposition" by Gabriel A. HAWAWINI.

82/12 "The Effect of Production Uncertainty on the Labor-Managed Firm" by Gabriel A. HAWAWINI and Pierre A. MICHEL.

82/13 "On the Independence Between Deposit and Credit Rates" by Jean DERMINE, September 1982.

82/14 "Entrepreneurial Activities of INSEAD MBA Graduates" by Lister VICKERY, October 1982.

82/15 "Proportional VS. Logarithmic Models of Asset Pricing" by Gabriel A. HAWAWINI, July 1982.

82/16 "Capital Controls: Some Principles and the French Experience" by Emil-Maria CLAASSEN and Charles WYPLOSZ, October 1982.

82/17 "The Third World's Campaign for a new International Economic Order" by Jan MURRAY, October 1982.

82/18 "Extremity of Judgment and Personality Variables: Two Empirical Investigations" by Naresh K. MALHOTRA, Arun K. JAIN and Christian PINSON, April 1982. Revised July 1982.

82/19 "Managerial Judgment in Marketing: The Concept of Expertise" by Jean-Claude LARRECHE and Reza MOINPOUR, revised September and December 1982.

82/20 "Uncertainty and the Production Decisions of Owner-managed and Labor-managed Firms" by Gabriel HAWAWINI, September 1982.

82/21 "Inflation, Taxes and Banks'market Values" by Jean DERMINE, Janvier 1983.

82/22 "Bank Regulation and Deposit Insurance: Adequacy and Feasibility" by Jean DERMINE, February 1983 (second draft).

82/23 "Pour une étude critique du différentiel sémantique" par Christian PINSON, Avril 1982.

83/01 "Comparative Financial Structures: The Impact of Equity in Bank Portfolios" by Herwig LANGOHR, September 1983.

84/01 "A Technological Life-Cycle to the Organisational Factors Determining Gatekeeper Activities" by Arnoud DE MEYER, November 1983.

84/02 "La Politique Budgétaire et le Taux de Change Reel" par Jeffrey SACHS et Charles WYPLOSZ, Novembre 1983.

84/03 "Real Exchange Rate Effects of Fiscal Policy" by Jeffrey SACHS and Charles WYPLOSZ, December 1983.

84/04 "European Equity Markets: A Review of the Evidence on Price Behavior and Efficiency" by Gabriel HAWAWINI, February 1984

84/05 "Capital Controls and Balance of Payments Crises" by Charles WYPLOSZ, February 1984.

84/06 "An Uncertainty Model of the Professional Partnership" by Gabriel HAWAWINI, November 1983.

84/07 "The Geometry of Risk Aversion" by Gabriel HAWAWINI, October 1983.

84/08 "Risk, Return and Equilibrium of the Nyse: Update, Robustness of Results and Extensions" by Gabriel HAWAWINI, Pierre MICHEL and Claude VIALLET, December 1983.

84/09 "Industry Influence on Firm's Investment in Working Capital: Theory and Evidence" by Gabriel HAWAWINI, Claude VIALLET and Ashok VORA, January 1984.

84/10 "Impact of The Belgian Financial Reporting Act of 1976 on the Systematic Risk of Common Stocks" by Gabriel HAWAWINI and Pierre MICHEL, January 1984.

84/11 "On the Measurement of the Market Value of a Bank" by Jean DERMINE, April 1984.

84/12 "Tax Reform in Portugal: a General Equilibrium Analysis of the Introduction of a Value Added Tax" by Antonio M. BORGES December 1984.

84/13 "Integration of Information Systems in Manufacturing" by Arnoud DE MEYER and Kasra FERDOWS, December 1984.

85/01 "The Measurement of Interest Rate Risk by Financial Intermediaries" by Jean DERMINE, December 1983, revised December 1984.

85/02 "Diffusion Model for New Product Introduction in Existing Markets" by Philippe Naert and Els Gijsbrechts.

85/03 "Towards a Decision Support System for Hierarchically Allocating Marketing Resources Accross and Within Product Groups" by Philippe Naert and Els Gijsbrechts.

85/04 "Market Share Specification, Estimation and Validation: Towards reconciling seemingly divergent views" by Philippe NAERT and Marcel WEVERBERGH.

85/05 "Estimation uncertainty and Optimal Advertising Decisions" by A. AYKAC, M. CORSTJENS, D. GAUTSCHI and I. HOROWITZ. Second Draft, April 1985.

85/06 "The Shifting Paradigms of Manufacturing: Inventory, Quality and now Versatility" by Kasra FERDOWS, March 1985.

85/07 "Evolving Manufacturing Strategies in Europe, Japan and North-America" by Kasra FERDOWS, Jeffrey G. MILLER, Jinchiro NAKANE and Thomas E. VOLLMANN.

85/08 "Forecasting when Pattern Changes Occur Beyond the Historical Data" by Spyros MAKRIDAKIS and Robert CARBONE, April 1985.

85/09 "Sampling Distribution of Post-Sample Forecasting Errors" by Spyros MAKRIDAKIS and Robert CARBONE, February 1985.

85/10 "Portfolio Optimization by Financial Intermediaries in an Asset Pricing Model" by Jean DERMINE.

85/11 "Energy Demand in Portuguese Manufacturing: a Two-Stage Model" by Antonio M. BORGES and Alfredo M. PEREIRA.

85/12 "Defining a Manufacturing Strategy - A Survey of European Manufacturers" by Arnoud DE MEYER.

85/13 "Large European Manufacturers and the Management of R & D" by Arnoud DE MEYER

85/14 "The Advertising-Sales Relationship in the U.S. Cigarette Industry: a Comparison of Correlational and Causality Testing Approaches" by Ahmet AYKAC, Marcel CORSTJENS, David GAUTSCHI and Douglas MacLACHLAN.

85/15 "Organizing a Technology Jump or Overcoming the Technological Hurdle" by Arnoud DE MEYER and Roland VAN DIERDONCK.

85/16 "Commercial Bank Refinancing and Economic Stability: an Analysis of European Features" by Herwig LANGOHR and Antony M. SANTOMERO.

85/17 "Personality, Culture and Organization" by Manfred F.R. KETS DE VRIES and Danny MILLER.

85/18 "The Darker Side of Entrepreneurship" by Manfred F.R. KETS DE VRIES.

85/19 "Narcissism and Leadership: an Object Relations Perspective" by Manfred F.R. KETS DE VRIES and Dany MILLER.

85/20 "Interpreting Organizational Texts" by Manfred F.R. KETS DE VRIES and Dany MILLER.

85/21 "Nationalization, Compensation and Wealth Transfers: France 1981-1982" by Herwig M. LANGOHR and Claude VIALLET. Final Version July 1985.

85/22 "Takeover Premiums, Disclosure Regulations, and the Market for Corporate Control. A comparative analysis of public tender offers, controlling-block trades and minority buyouts in France" by Herwig M. LANGOHR and B. Espen ECKBO. July 1985.

85/23 "Barriers to Adaptation: Personal, Cultural and Organizational Perspectives" by Manfred F.R. KETS DE VRIES and Dany MILLER.

85/24 "The Art and Science of Forecasting: an Assessment and Future Directions" by Spyros MAKRIDAKIS.

85/25 "Financial Innovation and Recent Developments in the French Capital Markets" by Gabriel HAWAWINI. October 1985.

85/26 "Patterns of Competition, Strategic Group Formation and Performance: the Case of the US Pharmaceutical Industry, 1963-1982 by Karel O. COOL and Dan E. SCHENDEL. October 1985.

85/27 "European Manufacturing: a Comparative Study (1985)" by Arnoud DE MEYER.

86/01 "THE R & D / Production Interface" by Arnoud DE MEYER.

86/02 "Subjective Estimation in Integrating Communication Budget and Allocation Decisions: a Case Study" by Philippe A. NAERT, Marcel WEVERBERGH and Guido VERSWIJVEL, January 1986.

86/03 "Sponsorship and The Diffusion of Organizational Innovation: a Preliminary View" by Michael BRIMM.

86/04 "Confidence Intervals: an Empirical Investigation for the Series in the M-Competition" by Spyros MAKRIDAKIS and Michele HIBON.

86/05 "A Note on the Reduction of the Workweek" by Charles WYPLOSZ. July 1985.

EURO-ASIA CENTRE
CAMPUS INSEAD

Boulevard de Constance
77305 Fontainebleau Cedex, France
Telephone (1) 60 72 40 40 - Telex 690389F
Telecopy (1) 60 72 40 49

EAC PUBLICATIONS LIST
January 1980 - October 1985

EAC RESEARCH PAPERS

(Academic papers based on the research of EAC faculty and research staff)

n° 1 LASSERRE Philippe
A contribution to the study of entrepreneurship development in Indonesia. 1980.

n° 2 BOISOT Max and LASSERRE Philippe
The transfer of technology from European to ASEAN enterprises: strategies and practices in the chemical and pharmaceutical sectors. 1980.

n° 3 AMAKO Tetsuo
Possibilité d'un transfert à l'étranger des techniques japonaises de gestion du personnel: le cas français. 1982.

n° 4 LEHMANN Jean-Pierre
Japanese management in Germany. 1982.

n° 5 LEHMANN Jean-Pierre
La gestion japonaise en Allemagne. 1982.

n° 6 AHMAD Reyaz
Japanese investments in ASEAN. 1983.

n° 7 SCHÜTTE Hellmut
Unternehmensstrategische Aspekte der internationalen Expansion mittel ständischer Unternehmen. 1983.

n° 8 SCHÜTTE Hellmut
Wirtschaftliche Kooperation zwischen den ASEAN - Ländern und Nordrhein-Westfalen - Hemmungsfaktoren und Chancen für die deutsche wirtschaft. 1983.

n° 9 RABU Patrick
La présence française en Thaïlande. 1983.

n° 10 SPRECKLEY Bridget
South Korean chemical industry opportunities for foreign firms. 1983.

n° 11 SCHMITLIN Anne
La population active chinoise non-agricole. 1983.

n° 12 CUNNINGHAM Marc
Marketing and distribution for multinational companies in Indonesia: an overview. 1983.

n° 13 CHAPON Marie-Claude
Conditions de travail en Corée du Sud. 1984.

n° 14 ISHIYAMA Yoshihide
The political economy of liberalisation of the financial system in Japan. 1984.

n° 15 CHAPON Marie-Claude
Education in Korea. 1984.

n° 16 SCHUTTE Hellmut
Exportfreihandelszonen - schwindende Attraktivität durch neue Produktionstechnologien. 1984.

n° 17 LASSERRE Philippe
Singapour comme centre régional. L'experience d'entreprises françaises. 1985.

n° 18 Von KIRCHBACH Friedrich
Patterns of export channels to developing Asia. 1984.

n° 19 MITTER Rajan
A survey of European business in India. 1984.

n° 20 SCHMITLIN Anne
Biens de production et biens de consommation en Chine. 1984.

n° 21 SCHMITLIN Anne
Les investissements étrangers en Chine. 1985.

EAC BRIEFING PAPERS

(Short synopses by EAC faculty and research staff)

n° 1 BOISOT Max and LASSERRE Philippe
Strategies and practices of transfer of technology from European to ASEAN enterprises. 1980.

n° 2 HEADLEY Stephen
The partners of foreign investors in Indonesia: the tip of the ethnic iceberg. 1980.

n° 3 HEADLEY Stephen
Foreword to government-business relations in Indonesia. 1980.

n° 4 HEADLEY Stephen
Personnel management in Indonesia: How ?. 1980.

n° 5 HEADLEY Stephen
Can you work for Honda and remain yourself ? The cultural dimension of Indonesian management. 1980.

n° 6 CONWAY Bryony
The context of management development in Malaysia. 1980.

n° 7 CONWAY Bryony
Racial balance in management in Malaysia. 1980.

n° 8 CONWAY Bryony
Appropriate education for management in Malaysia. 1981.

n° 9 CONWAY Bryony
Foreign enterprise and management development in Malaysia. 1981.

n° 10 CONWAY Bryony
The Chinese Malaysian enterprise. 1982.

EAC REPRINTS

(Reprints of major articles published by EAC faculty and research staff)

n° 1 de BETTIGNIES Henri-Claude
Japanese organizational behaviour: a psychocultural approach. 1973.

n° 2 de BETTIGNIES Henri-Claude
The transfer of management know-how in Asia: an unlearning process. 1980.

n° 3 de BETTIGNIES Henri-Claude
Korean management in the 1980's: the international challenge. 1980.

n° 4 de BETTIGNIES Henri-Claude
La sociologie des organisations: le cas du Japon. 1980.

n° 5 de BETTIGNIES Henri-Claude
Analyse des craintes françaises. 1980.

n° 6 LASSERRE Philippe
L'Indonésie et ses potentiels. 1981.

n° 7 LASSERRE Philippe
Transferts de technologie: des mariages difficiles. 1981.

n° 8 LASSERRE Philippe
The new industrializing countries of Asia: perspectives and opportunities. 1981.

n° 9 de RUGY Jacques
Le Japon prépare ses managers de demain à l'école de l'Occident. 1981.

n° 10 AMAKO Tetsuo
Quand les entreprises japonaises intègrent la gestion américaine. 1982.

n° 11 LASSERRE Philippe
Training: key to technological transfer. 1982.

n° 12 de BETTIGNIES Henri-Claude
Can Europe survive the Pacific century ?. 1982.

n° 13 LASSERRE Philippe
Strategic planning in South-East Asia: does it work ?. 1983.

n° 14 LEHMANN Jean-Pierre
Japan and the world economy: international accountability vs national interests. 1982.

n° 15 LEHMANN Jean-Pierre
Mutual images. 1982.

n° 16 LASSERRE Philippe
Technology transfer from a business policy point of view. 1982.

n° 17 LASSERRE Philippe
Co-ordinative practices in technology transfer. 1982.

n° 18 ESMEIN Jean
Le Japon et l'Asie. 1982.

n° 19 LASSERRE Philippe et Sé-Jung YONG
La modalité de l'acquisition de technologie dans les entreprises de pays en voie de développement. 1982.

n° 20 de BETTIGNIES Henri-Claude
Stratégies japonaises: conséquences pour les firmes européennes. 1982.

n° 21 SCHUTTE Hellmut
Drehscheibe aller Auslandsaktivitäten. 1983.

n° 22 LEHMANN Jean-Pierre
International competition and the Japanese benchmarks of success: what has the West learned so far ?. 1983.

n° 23 AHMAD Reyaz
Coping with Japan: Japanese investments in ASEAN and the need for rapid change. 1983.

n° 24 de BETTIGNIES Henri-Claude
The challenge of management training in Asia. 1983.

n° 25 LASSERRE Philippe
Strategic assessment of international partnership in ASEAN countries. 1983.

n° 26 LEHMANN Jean-Pierre
Prospects for development in the current international environment - the issue of free trade vs protectionism. 1983.

n° 27 LEHMANN Jean-Pierre
Perspectives de développement dans l'environnement international actuel. La question du libre commerce contre le protectionnisme. 1983.

n° 28 CHAPON Marie-Claude
Labour conditions in South Korea - new needs, new directions. 1984.

n° 29 SCHUTTE Hellmut
Micro-electronics versus cheap labour: questionmarks behind Asia's export successes. 1984.

n° 30 de BETTIGNIES Henri-Claude
Introduction of the book, Le management est-il un art japonais?. 1984.

EAC FORUM AND CONFERENCE PAPERS

(Papers presented at the EAC's annual forum or by EAC teaching or research staff at academic conferences).

n° 1 LASSERRE Philippe
Robots and flexible manufacturing systems: their contribution to the productivity dilemna. London, 1981.

n° 2 HUGUENIN Patrick and DEBROUX Philippe
European, Japanese and American investment in ASEAN. Singapore, 1981.

n° 3 PIGOSSI Richard
American investment in ASEAN: present situation and perspectives. Singapore, 1981.

n° 4 TAMAO Toyomitsu - Edited by DEBROUX Philippe
Japan's direct investments in ASEAN - current situation and prospects. Singapore, 1981.

n° 5 LASSERRE Philippe
Euro-ASEAN transfer of technology: some experiences and their implications for training. Kuala Lumpur, 1981.

n° 6 AMAKO Tetsuo
Relations entre les structures d'entreprises et les technologies au Japon - passé et avenir. Paris, 1982.

n° 7 AMAKO Tetsuo
Transférabilité de la gestion japonaise et cercles de qualité en France. Paris, 1982.

n° 8 DURHAM Kenneth
Protectionism, trade distortion and Euro-Asian relationships. Frankfurt, 1982.

EAC DOCUMENTATION SERIES

n° 1 A bibliography on Japan
Resources of the Euro-Asia Centre and INSEAD Library.
July 1982. 108 pages.

n° 2 A bibliography on ASEAN and ASEAN countries
Resources of the Euro-Asia Centre and INSEAD Library.
February 1983. 103 pages.

n° 3 A bibliography on the People's Republic of China
Resources of the Euro-Asia Centre and INSEAD Library.
August 1982. 18 pages.

n° 4 A bibliography on Asia
Resources of the Euro-Asia Centre and INSEAD Library.
February 1982. 25 pages.

n° 5 A bibliography on South Korea, Hong Kong and Taiwan
Resources of the Euro-Asia Centre and INSEAD Library.
January 1982. 22 pages