OIL PRICES AND ECONOMIC STABILITY*

The Macroeconomic Impact of Oil Price Shocks on the Swedish Economy

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ABSTRACT

In simulation experiments for the Swedish economy, the impact of a future oil-price shock was measured in terms of the required stabilization policies, and the possibility of insuring against such price shocks by way of a gradually increasing oil tax was evaluated.

INTRODUCTION

The small, open Swedish economy depends on imported oil for roughly 2/3 of its use of primary energy. It is, thus, particularly vulnerable to sharp increases in the price of oil. A major concern in current Swedish energy policy is the adjustment and stabilization problems that a future oil price hike would create. This paper reports on a simulation study of these problems and of the possibility of easing them by the use of oil taxes. The emphasis is on the methodological approach which is exemplified by some numerical results.[1]

THE PROBLEMS POSED

In a policy-oriented study, the choice of a suitable measure of the macroeconomic impact of a large future oil-price hike depends on the focal problem or dominant threat posed by increased oil-prices. If the main worry is the unavoidable long-term welfare losses resulting from unfavorable terms-of-trade development, one may want to measure these losses, e.g., in terms of equivalent variations around a reference consumption path, assuming that the Swedish adjustment policies are efficiently planned and executed.[2] It may be, however, that the major perceived threat is not so much the new high level of oil prices as the abrupt and unexpected way it rises. The general experience of the two price hikes of the 70s seems to point that way.[3] In particular, many of Sweden's present difficulties, manifested by a mounting deficit

both in public budgets and in external exchange and by a shrinking and underutilized export industry, can be viewed as arising from a failure to cope with the stabilization problems caused by the oil price hikes (cf. Eliasson and Ysander, 1981). If the paramount concern is to reduce the risk of again losing control of the stabilization problems and having the economy degenerate into stagflation, then the relevant impact measure should, instead, use as a benchmark the policy adjustments required to restore balance in the economy.

We have chosen to gauge the impact, primarily in terms of the adjustments in wages and in private and/or public consumption, required to restore balance both in external exchange and in the labor market within 3 years. The task of minimizing some social loss function for stabilization policies, of the kind surveyed in e.g. Gramlich, 1979, is here avoided since targets are specified in advance and the successive solutions turn out to be unique or nearly unique within the respective policy space assumed. Instead, we concentrate on trying to register how the necessary adjustments will appear to the households and voters, thus measuring the political strains involved in coping with the stabilization task, and the corresponding risk of not coping. This criterion is then applied to the following three types of question.

How big can the impact or the policy adjustments required be and how does it vary with the kind of policies actually pursued in Sweden and abroad? How does the impact of a sudden price hike compare with that of a correspondingly large but gradual oil-price increase? How much of the impact on the Swedish economy can be directly attributed to the increased oil bill and how much is caused indirectly by repercussions on other world markets? To what extent do various possible restrictions on domestic policies, i.e., limited flexibility in fiscal and budgetary policy, affect and exacerbate the problems? One might think of the alternatives as a kind of ladder of political feasibility. On top is the first-best solution, where all countries, including Sweden, adjust smoothly and swiftly, leaving the world markets largely unperturbed. At

the bottom of the ladder is a situation where the Swedish government is not only faced with world market repercussions, but also has its hands tied by political commitments to various groups of consumers and wage earners.

The second type of question is concerned with the costs and benefits of an oil tax buffer, i.e., of anticipating an eventual future oil price hike by a gradually increasing oil tax. The third type of question, finally, deals with the effects of possible increases and of the policies of adjustment or insurance they call forth on the use of oil and other kinds of primary energy.

THE EXPERIMENTAL SET-UP

The model we have used in the simulations is a 23-sector growth model for the Swedish economy, designed for medium- and long-term policy analyses. Besides import and export functions, it incorporates various mechanisms for dynamic adjustment, such as a vintage approach to capital formation in industry, a Phillips curve-like determination of wages, domestic price-setting depending on cost and capacity utilization and on world-market prices, and a sub-model for local government taxing and spending behavior. The model was also particularly tailored to allow for both long-run and short-run energy substitution.[4]

Our choice of instruments for controlling the model economy has been guided by priorities and practice in current Swedish policy. We employ three main policy instruments: wage policy, income tax and public consumption. Wage policy means controlling the long-term growth trend of nominal wages. The income tax can be looked upon as a representative of a wide variety of tax and transfer measures. Finally, we assume full control both of central and local government expenditures. We have not included an active exchange policy among our policy instruments since it appears in the model to be a substitute rather than a complement to wage policy.

The 9 base-case simulations are listed in Table 1. Around these base-case simulations, various kinds of sensitivity analyses have been carried out.

As a measuring rod for our simulations, we have used a reference case, i.e., a standard scenario for the development of the Swedish economy in the 80s and 90s. A detailed discussion of this case and of alternative conditions and strategies for Sweden is given in Nordström-Ysander, 1980. In the reference case, the present imbalances in the Swedish economy have been eliminated by 1990, in accordance with current government policy objectives. The price of oil is assumed to increase annually by 1.5 percent relative to the price of finished goods in international trade. The coal price is assumed to adjust proportionately, although with a certain lag, to changes in the oil price.

Below the reference case and the case of a gradual oil price increase in the left-hand column of Table 1, different variations of the oil crisis scenario are listed in order of increasing adjustment problems. The oil crisis itself is modeled as a 60 percent rise in the relative oil price, occurring early in 1991. In the gradual price increase scenario (GO), the same total relative price increase is reached in 1991 by a steady rise throughout the eighties. In the first oil crisis simulation (OI), the oil price hike occurs without interrupting world trade. In the second (OS), various cyclical repercussions on other world markets are taken into account. Based on the experience of the 70s and on some experiments carried out for this purpose on the LINK model,[5] the resulting world trade cycle is modeled as a 3-year pattern led by a short-lived speculative boom in raw material and investment goods, of dominant importance still for Swedish exports, followed by a general trade slump. Over the first 4 years of the 90s the annual increase in the volume and price of world trade (excepting services) will be, on the average, multiplied by a factor of 0.6 and 1.2 respectively, compared to the reference development. To facilitate comparisons, we let, in both cases, public consumption develop as

Table 1 Nine simulations 1980-2000.

		No oil tax	Oil tax
No oil price hike		REF - The reference case	TREF - Oil tax without oil price hike
		GO - Gradual oil price increase	
Oil price hike		OI - Oil price hike without world market repercussions	
	Increasing economic and political adjustment costs	OS - Oil price hike with world market repercussions but without policy restrictions	TOS - Oil tax with oil price hike
		MW - Minus wage policy	
		MP - Minus also public consumption policy	
		MR - Minus also the possibility of lowering real wages	

in the reference case, registering the shrinking room for increased consumption in terms of private consumption.

The 3 variations MW, MP, and MR in Table 1 simulate the effect of successively taking into account restrictions on the use of economic policy instruments which, judging from the experience of the 70s, may well be perceived as binding by Swedish decision-makers. In MW, we take away the wage policy instrument, making it impossible to influence the long-term trends in nominal wage increase. This must then be compensated for by a more active use of the control of public consumption. In MP, this policy instrument is also blocked, public consumption again being prescribed to follow the reference pattern. Finally, in MR, the need for trade union support is supposed to force the government to guarantee no decline in real wages, thus increasing the unemployment needed to ensure external balance.

Two additional cases, in which an oil tax is used as a buffer against the possibility of an oil-price hike are listed in the right-hand column of Table 1. The oil tax we study has a very simple construction. It is successively stepped up during the 80s, annually adding an extra oil price increase of around 5 percent, so that by the beginning of 1991 it has raised the domestic oil price as much as the assumed size of an eventual oil price hike.

If the oil crisis materializes, the TOS-case, the tax is used as a buffer, the lifting of the tax neutralizing the raised import price. We then measure the benefits by comparing the resulting development during the 90s with the uninsured case, OS, assuming the same access to policy instruments. If the oil crisis does not come (the TREF-case), the oil tax remains and causes some retardation in growth during the following decade. The cost of the tax insurance is evaluated by comparison with the outcome in the reference case which, apart from the tax, rests on identical assumptions.

THE IMPACT OF AN OIL-PRICE SHOCK

The difference between alternative impact measures can be shown by comparing the effects of a gradual price rise (GO) with that of an oil price hike, which does not affect world markets (OI). To reach the goal of balanced external payments in 1990, in spite of a continuous deterioration of terms-of-trade in the gradual price rise case, means that private standards must increase slower while export sales are further boosted. Rising energy bills will be compounded with a sharper rise in income tax for the households but will be offset for industry by more moderate wage developments. Compared to the reference case, private consumption will be down ~7 percent by the beginning of the 90s, while the set-back in GNP during the 80s will be negligible but will increase somewhat in the 90s, when the export-drive is allowed to slacken while structural effects on industrial productivity successively matures. In terms of intertemporal consumption standards, the drawn-out sacrifice needed for a gradual adjustment in the 80s are undoubtedly greater than the sharp but short set-back experienced during a policy-contained oil price hike in the 90s. If, however, we measure instead the impact in terms of the political strains imposed by the necessary adjustments, we get a quite different picture.

The adjustments in wage and tax policy needed to accommodate the gradual price rise are rather marginal. On the other hand, the policy adjustments required to restore balance in 3 years after an oil-price shock turn out to be quite drastic. This is true even when no account is taken of possible world market repercussions, the OI-case. The high oil price must be compensated for by holding back private consumption, budget policy will have to be so tight-fisted that the level of 1990 is regained only by 1994. That parsimonious regime will be reflected in a temporary increase in unemployment. The rate of nominal wage increase drops from almost 10 percent in 1990 to about 3 percent in 1991 while the rate of inflation goes up from 6 to 9 percent, implying

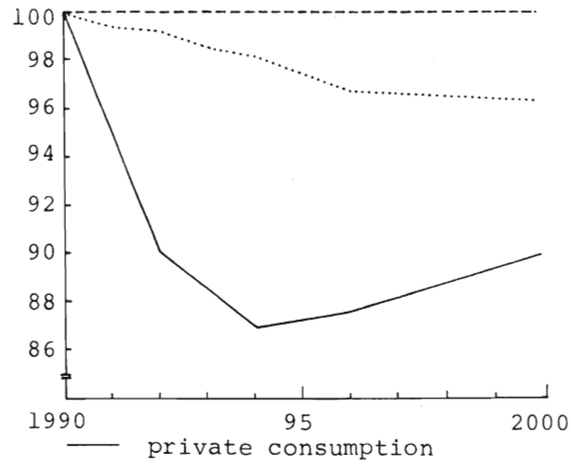
an almost 6 percent cut in real wages instead of the 3-4 percent increase of the preceding years. Balance in the external payments is reached in 1993, but continuing concern for the external payment situation will make it impossible to recover more than a small part of the relative losses in consumption before the turn of the century.

Figure 1 shows how stabilization problems are exacerbated in the more realistic case (OS'), where world market repercussions are also taken into account. To regain balance in external accounts in spite of stagnating tendencies in world trade will require even more herculean efforts in stabilization policy. There will have to be a wage freeze in 1991, and wage earners must accept an 8 percent cut in real wages that year and expect another 1 percent cut in the following year. The relative reduction in private consumption and GNP levels over the decade will be more gradual but altogether about one third larger than before. The direct effects of the primary oil price shock still dominate the picture but the simulation results show that the various problems and policy strains during the adjustment period have all grown by something like one third through the indirect effects transmitted by the world market.

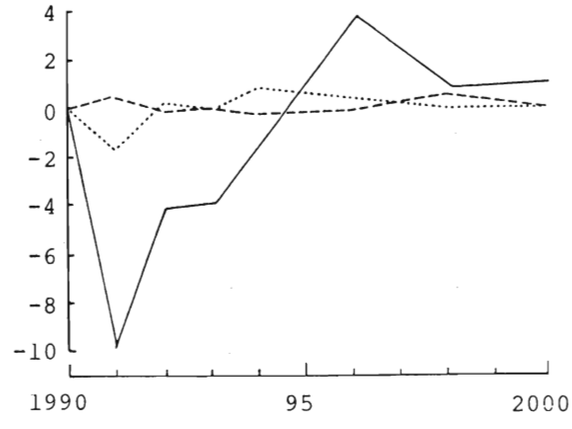
Our situation after an oil price hike becomes even worse if we climb further down the feasibility ladder introducing, successively, various restrictions limiting the policy space.

Without access to wage policy, i.e., without being able to influence long-term trends in nominal wages, the government will have to use public expenditures as a substitute instrument. If we cannot rapidly improve our competitive position, the only way to eliminate the external deficit within a few years is to save imports by substituting public for private consumption on a large scale. We can see what this means by comparing this restricted case (MW) with the case (OS), where no constraints were placed on

Figure 1 Oil-price hike with world market repercussions (OS).



—— private consumption
---- public consumption
..... GNP
REF = 100



—— change (in percent) of the nominal wage increase
---- change (in percent) of unemployment
..... change (in percent) of the external deficit/GNP
REF = 0

the policy instruments. Instead of just freezing private consumption for a couple of years, taxation must now force it down almost 10 percent below the 1990 level while, at the same time, encouraging an extremely rapid increase of public consumption at the rate of around 7 percent annually. Moreover, this policy would have to be completely reversed from 1994 onwards if we want to let private consumption regain its previous share of total consumption. A concomitant effect would be a very high rate of wage inflation in the first years after the price shock.

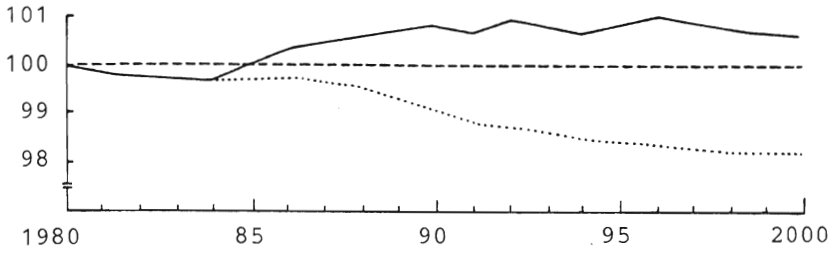
If public consumption cannot be treated in this cavalier fashion but must be left to develop according to its preset pattern in the reference case, we are left with taxation as our only available stabilization tool, the MP-case. External balance in 1993 can then only be reached at the price of an almost doubled unemployment rate in 1992-93. The further decline of private consumption in the MW-case can now be avoided -- which also means that, despite increased unemployment, GNP-development will be slightly more favorable.

If, on top of all this, we add the restriction that real wages should not be allowed to fall, we will end up with unemployment rates for 1991-93 that are as much as 3 times as high as the normal values that could be attained when there were no restrictions on stabilization policy. The fluctuations in wage increase and in inflation will, at the same time, be much larger. What these simulations illustrate is simply the fact that political limits on feasible policies or flexibility can make a difficult stabilization problem unmanageable or impossible.

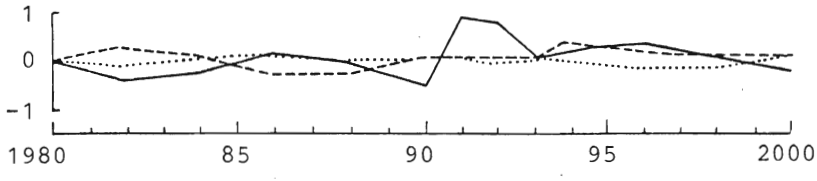
THE USE OF AN OIL TAX AS INSURANCE

The effects of introducing a gradually increased oil tax during the 80s without any oil crisis occurring are shown in Figure 2. The increased energy costs reinforce the industrial problems, increasing unemployment and shrinking the available room for private consumption increases compared to the reference case. Due to

Figure 2 Oil tax without oil price hike (TREF).

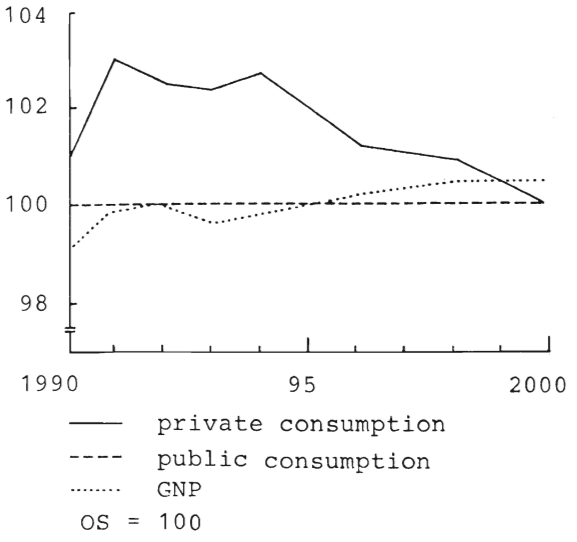


—— private consumption
---- public consumption
..... GNP
REF = 100



—— change (in percent) of the nominal wage increase
---- change (in percent) of unemployment
..... change (in percent) of the external deficit/GNP
REF = 0

Figure 3 Oil tax with oil-price hike (TOS).



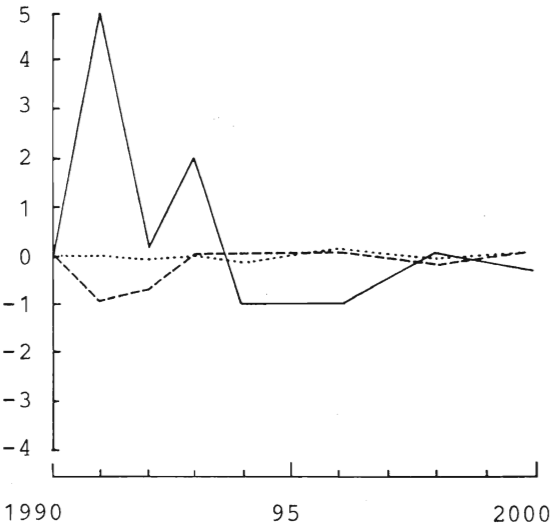


Figure 4 The use of oil and other primary energy.

the low estimated price elasticities in Swedish foreign trade, however, oil substitution turns out to make it easier to handle our balance of payment problem, even enabling us to raise our private consumption standards temporarily in the 90s a bit further than what would otherwise have been possible. We will nevertheless pay a price in the form of reduced growth in GNP and in investments, finishing the century with a somewhat smaller and less modern industrial capacity.

If the insurance costs do not seem very impressive, the benefits, in terms of reduced stabilization problems, if an oil crisis occurs, may be quite dramatic, as shown by Figure 3. Instead of asking wage earners to accept an 8 percent cut in real wages in 1991 with more sacrifices to follow, it is now enough to have them accept a very slow increase over two years. Domestic inflation rates are reduced in '91 by as much as a third, and GNP, employment and private consumption develop slightly more favorably. All this is due to the forced reductions in oil use and to the slower increase of our dependence on world markets, achieved by the oil tax in the 80s.

THE IMPACT ON ENERGY USE

The development of the use of oil and other forms of primary energy, implied by four different simulations (REF, TREF, OI and OS) is illustrated in Figure 4. We see that the stagnation of primary energy consumption is expected to continue over the 80s, due to gains from conservation, low economic growth and an ongoing shift towards less energy-intensive industrial branches. An oil tax would call forth further savings in the 80s, while an unbuffered oil-price shock would keep energy demand stagnant during the 90s.

For the use of oil, shown by the lower curve, a substantial reduction is foreseen for the 80s. Naturally, changes in the oil-

price will have even more dramatic effects here. The expected reduction in oil use in these cases is only marginally due to slow economic growth. Besides energy conservation and structural change, substitution by coal, nuclear power and indigenous fuels such as peat and wood are major contributing factors particularly in the projections with sharply rising oil-prices.

A more detailed account of the projected composition and development of the use of various forms of primary energy in terms of TWh is given in Table 2.

Table 2 **The use of primary energy 1980-2000.**

	GNP	TWh				TWh/GNP	
	Billions of Sw.cr. 1975 prices	Oil	Coal	Indigenous fuel	Total	Total	Oil
1980	322.0	297	18	40	445	1.38	0.92
1990 REF	396.8	219	43	68	456	1.15	0.55
2000	496.5	258	70	112	545	1.10	0.52
1990 TREF	393.1	162	59	76	425	1.08	0.41
2000	487.8	141	125	138	509	1.04	0.29
1990 OS	396.8	219	43	68	456	1.15	0.55
2000	481.0	175	75	122	476	0.99	0.36
1990 TOS	392.0	152	62	78	419	1.07	0.39
2000	479.0	157	85	129	475	0.99	0.33

NOTES

[1] The study has been conducted by the author and T. Nordström. Some further results are presented in Nordström-Ysander (forthcoming). The study forms part of a larger project dealing with various aspects of energy crises and economic adjustment. A preliminary report on this whole project is given in Ysander, 1981.

[2] The theoretical analysis by Svensson, 1981 and the simulation experiments by J.D. Sachs reported in Bhandari and Putnam, 1982, exemplify studies that focus on intertemporal welfare and balance-of-payment effects.

[3] Comparisons made between the effects of gradual vs. abrupt oil price increases in this and other studies (e.g., Jacobson and Thurman, 1981) also lend support to this interpretation.

[4] A detailed description of the model is given in Jansson, Nordström, and Ysander, 1982. How the impact of an oil-price hike depends on various kinds of inertia in the form of sticky prices and wages has also been studied by i.a. Giavazzi, Odekon, and Wyplosz, 1982.

[5] Cf. Sarma, 1981, whose interpretation and measurement of the impact on the Swedish economy, however, differ from ours.

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