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How to Determine the Reach of a Socially Optimal Energy Policy?

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Abstract

The energy sector has since long been a popular playground for political interventions. In market oriented economies like the OECD countries, such policy actions are warranted only to rectify existing market failures. The present paper analyzes the goals and instruments of energy policy and finds that actual policy action has had a much wider reach than can be motivated by the rational pursuit of social utility. The politicians have assumed that they possess better foresight, and behave more rationally than market actors. In many cases the policies have had a hidden agenda to promote small interest groups rather than to contribute to the utility of society at large. The OECD economies would have been better off with much less ambitious energy policy efforts.

Keywords: **Energy Policy – Market failure – Political failure – Optimal Policy Reach**

Most OECD countries represent variations of the market economy system. The choice of the market as a fundamental institution is no coincidence. It is based on an extended set of social experiences in the course of history, where limitations of state power along with relatively freely functioning markets have convincingly proved their superiority in terms of economic growth and welfare creation over any known alternatives for the organization of economies (North, 1993; Rosenberg och Birdzell, 2002).

Despite this basic choice, politicians exhibit a constant desire to intervene in the functioning of markets, and the energy sector has regularly constituted a particularly attractive political playground. At least since the first oil crisis in the early 1970s, elaborate energy policies have been operated with gusto in most of the OECD countries, with highly dubious consequences for welfare levels. I have recently had an opportunity to review the energy policies of Sweden in some detail (Radetzki, 2004). My conclusion in that study is that these policies have had little impact in terms of achievement of the professed goals, but that they have carried very substantial costs to society. I conclude that Sweden would have been much better off with more modest policy efforts in this field.

I believe that the insights gained in the study on Sweden have a bearing far beyond that country's borders. Hence the present paper, which leans heavily on the Swedish work. In what follows, there is a strong focus on the principles, which are of general significance.

A basic postulate applicable to all market economies is that the need for public intervention is weak or completely absent as long as markets function as intended. In a market that operates without major flaws, the market forces will assure balance between supply and demand at a level where the marginal cost of output corresponds to the marginal utility of consumers, and where both equal the market price. Economic analysis demonstrates that markets maximize social utility where these conditions apply. The motives for public intervention arise only in the event of market failures, where the market forces are unable to achieve this state of affairs (Inman, 1987, p 650).

What has been said above has full applicability to the energy market. A rational energy policy that has the aim of yielding social utility must start from the assumption that the unregulated energy market fails in the above task. The aim of policy will then be to try to rectify the failure.

Social utility is defined in this context as positive contributions (of policy) to society's welfare levels. The purpose of a useful energy policy is then to raise society's welfare to levels above those that

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would be attained in the absence of public intervention. Some may find such a policy goal a bit simplistic. Those critics suggest that energy policy should aim not only at correcting market failures, but to contribute to other political goals, e.g. in terms of income or wealth distribution or in strengthening the national identity.

In what follows, I limit my analysis to the more simplistic goal. In my view, distributional issues are better handled within the realm of social and tax policies, while nation building efforts belong more naturally to defense policy. An energy policy with very wide goals is hard to review. Furthermore, such policy carries serious risks for political failures from which both the energy sector and the economy at large will suffer.

With this as my starting point, the prime purpose of the paper is to define the bases, the content and the reach of a rational energy policy that benefits society. The discourse proceeds as follows. Section 1 defines different kinds of market failures, both the ones that are widely accepted as failures, and other events where failure of markets is clearly in doubt. The section also discusses the cost to society where market fail to perform as intended. In section 2, I discuss alternative policy instruments that are commonly used to rectify the failures of energy markets. Section 3 relates failures to instruments to identify suitable combinations for a purposeful policy effort. On the basis of these analyses, section 4 tries to define the limitations of a useful energy policy's reach.

1. MARKET FAILURES IN THE ENERGY SECTOR

The perception of the prevalence and severity of market failures is in considerable masure ideological, which explains its variations over time. In the 1960s there was a firm belief in the usefulness of public intervention to correct the deep flaws of the market system (Arrow, 1963). By the 1990s, these views had undergone a considerable change (Lindbeck, 1995). Polititians and economists now looked much more optimistically on the ability of markets to deliver social utility, with an ensuing restrained scope for useful public regulation. This change in perception applies not only to the energy sector but to society at large.

Failures indubitably exist in the energy markets, and they provide a clear case for public intervention. I list below some uncontroversial examples, and go on with more doubtful cases which have been used as motivations for policy measures.

Especially in a *static perspective*, the **absence of competition** in a market can yield results that limit social utility. Producers with market power will tend to restrain supply and push up price to a level above marginal cost. This will suppress the utility of those who demand the good, compared with what would apply in a competitive market. Furthermore, producers with market power regularly prevent new actors from entering the market, thereby perpetuating the market failure. Social welfare would clearly improve, with a rise in supply, implemented either through expansion by the established producers or by the contributions of new actors, if competitive conditions are enforced.

The existence of **external costs** regularly results in socially undesirable consequences in the market. External costs are defined as the unwanted consequences of production or consumption which impact on society at large, without directly affecting the producers or consumers of the good under consideration. Detrimental effects on health due to emissions for which the producer takes no responsibility provide an example. If, for instance, the costs and supply curve of an energy producer fall below those of society as a whole because he does not take the full social costs into account, the consequence will be an excessive level of the market determined production and consumption when viewed from society's point of view. Social welfare would clearly increase if instead the socially determined supply curve directed production levels. External costs are at the center of the broad relationship between energy policy and environmental policy.

A related failure has a *dynamic character*. Unregulated market forces sometimes cannot bring about the establishment of new markets, while in other cases such establishment is seriously delayed, depite the high social benefit that such new markets would yield. In the energy sector, this failure commonly occurs in activities that depend on widespread infrastructural networks – supply of electricity or natural gas are two examples. In contrast to the static market failure due to absent competition, the risks and consequences of this dynamic failure would tend to be less common in cases where one or a few producers with market power dominate supply.

Two circumstances can cause this dynamic market failure. The *first* is the **infant industry argument** in the economists' jargon. The establishment of the new activity (the network for the distribution of electricity or gas in our case) will fail

because it requires investments that are larger and more long term than what individual private actors can cope with. The inability of the market to handle such investments is particularly apparent when the supply side is dominated by many small actors. The inability will be less accentuated, or may not emerge at all when there is at least one dominant actor with sufficient resources a his disposal. Temporary public involvements through provision of subsidies or direct investments can be required to initiate the necessary action. As soon as the initial threshold has been overcome, the infant industry argument loses its validity, and the market actors can manage the new activity without public assistance.

The infant industry argument has been debated by academic economists for more than 100 years. The sceptics argue that no public intervention is needed for inherently viable activities, because market actors have access to virtually limitless investment resources in financial markets, while forward markets and long term contract can secure future sales and profits. The sceptics point to forest firms in northern territories with investment cycles of 50 years or more, that have traditionally managed their business on purely commercial terms. Those who argue in favour of support to infant industries underline that markets seldom function so smoothly in practice as the sceptics allege.

Many bizarre ventures have undoubtedly been supported at different times on the premise that they would soon become commercially viable. But other instances suggest that initial temporary public support may be crucial for the startup of socially beneficial ventures. It is indubitable that state intervention has greatly speeded up the spread of electricity and the telephone. State involvement has also been crucial for the establishment of nuclear power and the aircraft producer Airbus whose primary social benefit has been to prevent the emergence of a global monopoly in civil aircraft production. It is not possible to discard the infant industry argument off-hand as a motive for public policy in the energy sector.

The *second* reason behind the difficulty faced by private market actors when they try to establish costly networks in the energy sector must cause a dilemma to the policy makers. The networks for electricity and gas are characterized by falling marginal cost as the activity expands. The actor first into the game will then benefit from his cost advantage vis-à-vis newcomers, to hinder competitors from entering the market. This is the classical case of a **natural monopoly**. The single owner of the network can use the market power afforded by the monopoly, to appropriate most or all of the social utility of his venture by overpricing those who need to transport electricity or gas through his network. The prospects for doing so may in fact have been a crucial precondition for undertaking the network investment in the first place.

The authorities responsible for assuring that markets function in socially beneficial ways, regularly intervene against natural monopolies, either through regulation that assures third party access to the networks at competitive rather than monopolistic prices, or by transferring the network into public ownership. Such political action will undoubtedly be beneficial to society, at least in a static perspective, where the natural monopoly already exists. But the dynamic utility can be questioned, for the risk of price regulation or nationalization will reduce the willingness of private actors to get involved in activities where natural monopolies are likely to arise, so that such activities are severely deterred or do not come into being at all.

A precondition for perfectly functioning markets assumes that the market actors exhibit **rational behavior**, based on **complete information**. It the real world, such conditions are never fully satisfied. Incomplete information is seen as a cause for several purported market failures. The two examples which follow see the failure to be the consequence of either or both of the above conditions not being satisfied.

The first has to do with **supply security**. Energy products are in the main, basic necessities with a low price elasticity of demand. When supply is disturbed, the price will rise sharply, with hardship to all users, and particularly to the ones forced to cut their consumption. In a well functioning market, the suppliers should have a self-interest in assuring against such disturbances, for instance through forward contracts, long term supply arrangements with the producers and through direct ownership positions in the raw material sources, or by moving part of the disturbance risk to the insurance markets. Ideally, the cost of such measures should correspond to the additional revenue reaped from sales during the supply crisis when prices are high. Incomplete information makes it impossible to foresee the frequency and severity of supply disturbances. In addition, the market actors on the supply side are accused of

irrational economic behaviour on the basis of information that is available. The essence of the market failure would then be that the marginal cost of measures assuring supply during crisis periods is lower than the marginal harm to social utility of the crisis. In popular debate, this argument has unreasonably focused on the imported supply flows which the domestic market actors find hard to control. But it should be clear that domestic sources of supply, too, can be afflicted by disturbances that are hard to control. The extended coal strike in the UK in the mid-1980s is an illustrative example.

The second example refers to **resource depletion**. A dominant part of world energy consumption is based on depletable fossil fuels. The purported market failure would be caused in this case by the myopia of market actors who do not perceive the increasing scarcity of the depletable materials. The market prices will then be lower than they should have been if depletion were fully considered, because they do not take future scarcity into account. The present generation overconsumes the depletable resource, to the disadvantage of future generations which will experience a faster and stronger price increase than they would if scarcity were fully considered today. Political action to save depletable fuels and to promote renewable fuels can be motivated if one views depletion as a threat to future supply. The problem of resource depletion will be less accentuated in an unregulated market economy where suppliers are few and have market power, because their monopolistic supply management will tend to render a higher price today and a lower one tomorrow. In this sense, monopoly can be said to promote sustainability.

In my view, resource depletion, but to some extent also supply security constitute dubious arguments in support of public intervention in the energy market. The underlying premise behind such interventions is that the authorities have access to better information than private actors, and that their ability to act in an economically rational manner is superior to that of private energy firms and consumers. This premise is questionable and remains to be proved.

There are two reasons why I am less categorical in discarding the supply security motivation for energy policy. The first is that the supply security argument requires measures related to insurance, and that the energy suppliers' unwillingness or inability to take sufficient action may be due to the non-existence of relevant insurance markets which could assume the risks. In this situation it may be appropriate for the public authorities to act as "insurer of last resort", just as they do in other circumstances characterized by the absence of insurance markets (Radetzki and Radetzki, 2000). The second reason is that supply crises have in fact occurred in energy markets, while physical depletion has so far never caused problems to supply.

Finally, there are "market failures" not primarily caused by the market forces in the energy sector, but by distortions due to public regulation in other fiels and with other goals. Where energy imports weigh heavily in foreign trade, the authorities may erroneously regard a deep **current account deficit** as an energy market failure, which should be rectified by import controls. Deficits in the current account, however, are typically caused by regulation of the exchange rate, and their rectification requires macroeconomic measures, including the removal of the distorting regulation of foreign exchange, and not intervention in specific commodity markets.

2. THE INSTRUMENTS OF ENERGY POLICY

There are no perfectly functioning markets, and impatient politicians, supported by the critics of the market system, can always find reason for public action. In many cases, the market failures are alleged rather than real, while in others their harmful consequences are insignificant, and provide little justification for public action. Sometimes, however, the markets clearly fail in their function, with damaging consequence for society. In such circumstances, there is clear-cut case for policy. But while this may be so, it is necessary to undertline that public intervention oftentimes leads to "political failures" whose consequences are no less detrimental than the market failures they were intended to rectify (Stigler, 1962; Peltzman, 1976).

The politician primarily concerned with welfare levels must take into account the cost of policy intervention, and the risk for costly policy failure, when public action is under consideration. To minimize both, utmost care is required in selecting the area for intervention, and the instruments to be used. Political action in the energy field is often prompted by other considerations than the desire to improve the functioning of the energy market and to improve social welfare. Measures launched under the guise of energy policy have often a

hidden agenda, e.g. to benefit some specific interest group, and so to gain its votes in coming elections.

The instruments commonly used in implementing energy policy can be categorized in different ways. My list begins with public ownership, continues with pure quantitative interventions, then proceeds to discuss measures that impact directly on prices and costs, and ends the list with two relatively new policy tools that set quantitative objectives which are attained with the help of prices and/or costs. I briefly discuss how the instruments function to attain the desired energy goals, and consider the social costs of each instrument, for instance in terms of distortions both of the regulated market and beyond.

When the markets don't function satisfactorily, the authorities can implement shifts in desired directions by assuming partial or complete **public ownership of the suppliers**. In the extreme case, the entire supply can be controlled by a public monopoly with a wide freedom of action. If exploitative private monopoly prevails, the public ownership position can be used to suppress the price directly, or to reduce the price indirectly by strengthening competition. If the private industry damages the environment, the public owner can limit such damage through efforts to develop new environment friendly technology which reduces the sector's external costs. The publicly owned actor is typically less dependent than private firms on immediate return on invested capital, and hence may find it easier to launch ventures which yield profit or benefit only in the long run.

These arguments certainly apply in theory. In practice public monopolies have often been used to exploit consumers for the benefit of the public budget. While such practice may be socially more useful than private monopolistic exploitation, the customers of the monopoly may not always fully perceive the difference.

The shortcomings of publicly owned enterprises have been discussed at length in the academic literature. These shortcomings are less a consequence of who is the owner, and more of the complex and unclear goals that publicly owned firms are set to pursue (Radetzki, 1985), since this affords considerable freedom to management to pursue policies that benefit itself rather than the firm or society at large. State owned firms have not been prominent in development of technology or protection of the environment. Their efficiency is often sub-standard. Hence, even where public ownership positions contribute to the energy policy goals, there is a policy cost in terms of less efficient use of the resources at the disposal of these firms.

Before their decision to become owner, the authorities ought to weigh the benefit of attaining some of he energy policy ambitions on the one hand, against the added cost of less efficient resource use, on the other. The outcome of this weighing of highly uncertain numbers is strongly influenced by the underlying ideology. In the 1960s and 1970s there was a strong belief in the state as entrepreneur, and state ownership became common in all "commanding height" sectors in many OECD countries. The energy industries certainly belonged to this category. Since the 1980s, disillusion has characterized the view of the state as entrepreneur, and widespread privatizations have taken place.

Flexibility is a key advantage of market oriented systems. Consumers can be ranked in accordance to the value they reap from consumption, and scarce supply will be allocated only to those who value their utility higher than the market price. This ranking will reduce the loss of utility, for only those who assign a low value to consumption, will be left without supply[1]. Competition between producers will favour the ones who can deliver at the lowest costs and prices. No other known economic system can yield a comparable efficiency in handling scarce resources, in the energy sector or elsewhere.

The flexibility of the market system ceases to function when **pure quantitative interventions** with no regard to market forces are employed as policy tools. The most dramatic among such quantitative measure is a **total prohibition** of production or consumption. Such prohibition can be motivated when the external costs are deemed to be so devastating that they cannot possibly be countered by alternative tools, e.g. taxation. This has apparently been the case behind the total prohibition of nuclear power in Italy, and the decisions of its premature dismantling in Germany and Sweden. Total prohibition can sometimes be limited geographically, for instance because emissions from energy production are seen as particularly harmful in densely populated areas. Less severe quantitative measures can involve **production quotas** for firms, stipulating a maximum for output, or a maximum rate of expansion. The quantitative measures can also involve a prohibition of certain **production methods** but not others, or technical standard require-

ments, for instance on scrubbers. Energy policy can also involve **legislation** that permit the authorities to grant or refuse **investment concessions**, dependent on the choice of technology or location

Underlying the quantitative measures are political goals, for instance concerning harmful emissions. The pure quantitative measures are seldom if ever cost effective instruments for reaching the desirable goals. Production quotas imposed on individual firms do not take difference between these firms in terms of cost levels or cost structures into account. Requirements to adopt specific production technologies tend to delay the emergence of new environment saving techniques. Most purely quantitative policy tools tend to conserve the industry structure, and complicate the entry of newcomers with novel and superior environmental solutions. Quantitative policy instruments in the form of **technically neutral emission limits** or **broadly defined technical standards** that leave a wide scope for the energy suppliers to determine how the requirements should be reached, will involve lesser distortions to the functions of the market. More than 30 years of experience with environmental and energy policies have resulted in a reevaluation of policy tools. Modern policy makes lesser use of pure quantitative measures, and relies more on market oriented instruments (Ellerman, 1999).

Policy actions to **influence costs and prices** have since long constituted standard procedures in energy policy. Subsidies and taxes imposed in different forms and for various purposes are undoubtedly the most common energy policy instruments in this category. In distinction from the purely quantitative measures which determine quantities straightforwardly, the main impact of subsidies and taxes is on prices and only indirectly on quantities, the latter being shaped by market forces.

The motive to extend **subsidies** to a specific energy source can be its limited external costs in comparison with alternative sources. The infant industry argument can sometimes motivate subsidization of a new energy form that policy makers find attractive. Subsidies can support investments or the operating costs in the new installations. Investment support will generally have more sustainable effects, for once the plant has been built, it will be economical to operate as long as the price exceeds variable costs. Investment support is often provided for research and development. The effects of such support will be permanent, if the research reduces the cost of supply. Subsidization of operating costs will create incentives to higher capacity utilization, but these incentives will disappear if support is discontinued.

A socially optimal subsidy whose purpose is to neutralize the difference between external costs among alternative energy forms must be based on careful assessments of these costs. Such assessments are complicated and yield uncertain results (Sundqvist, 2002). If the external costs of fossil fuels are exaggerated, policy will tend to provide excessive support to alternative fuels. The supply of alternatives will then expand more than is warranted by a correct social evaluation, and the burden of this excess will fall on the tax payers. Alternatively, the consequence could be that the produces of alternative energy being subsidized will feel less cost pressure, so that the support is partly consumed by *organizational slack*. Energetic politicians often introduce subsidy systems on a hunch without any assessments of external costs at all. The result of such thoughtless policy action can well be worse to society than if markets had been left to their own without any policy intervention.

Just like any other economic sector, the energy sector is subject to standard taxation. Parts of energy demand, i.e. that relating to electricity and to transport fuels, is characterized by low price elasticity in the short- and medium-term. This makes the demand for such energy products a relatively stable tax base, which attracts high tax impositions on fiscal grounds. The present paper is not concerned with fiscal taxes. Instead, the focus is on taxes whose purpose is to rectify real or imagined market failures.

Taxation, like subsidies is a standard instrument to handle the distortions caused by external costs. For instance, if the energy producers generate harmful emissions, it is possible for society to compensate itself for this harm through a tax on the production that corresponds to the marginal cost of the harm. Where the damage occurs in consumption, it may be more appropriate to impose the tax on the consumers. If internalization of external effects is the motive of the taxation measure, it is essential that the tax is structured to correspond to these effects. A tax to compensate society for CO_2-emissions must take account of the lesser carbon intensity of natural gas, compared to coal and oil. The difficulty and reluctance of policy makers to assess the size of external costs applies equally to the tax instrument as it does to subsidies. The tax can alternatively have the objective to

reduce the use of imports (supply security argument) or depletable materials (resource depletion argument). A tax on such materials will raise their prices and reduce demand, as intended. Assessments of the social utility of lesser import dependence or greater share of renewables (if any at all) are even more complicated than estimation of external costs.

A further tool of energy policy is **price regulation**. The purpose could be to reduce monopolistic exploitation or to stabilize prices. Price regulation is a socially dubious tool to achieve the latter end. Fluctuating market prices provide strong signals to producers and consumers about the need to restore balance in the market by adjusting volumes. Market imbalances that caused the fluctuation in the first place will be accentuated if the price is not permitted to play this role. Regulation of prices was an important factor behind the severity of California's energy crisis in the late 1990s.

Tradable emission rights and **green certificates trading** are relatively new additions to the arsenal of energy policy tools. A system of emissions trading has the purpose of reducing emissions to a level determined by the authorities. Such trade in SO_2-emissions has been in operation in the US for some years, and experiments are underway in Europe for trading CO_2-emissions. Trading in green certificates related to "green electricity" is being introduced in some European countries, to secure a predetermined proportion of electricity from sources favored by the policy maker.

These new and relatively untried policy tools combine quantitative interventions, with a free play of market forces. They are quantitative because the policy makers decide on the volume of emissions or the share of favored electricity sources. This affords an advantage compared with taxes, where the quantitative results cannot be determined beforehand. But the possibility to trade is a guarantee that the reduction of emissions takes place where it is cheapest, or the green electricity is generated at the lowest possible cost. Practical experiences from the US and many simulation studies indicate that the policy goals can be attained at only a fraction of the costs that would have been incurred with pure quantitative tools, for instance where all actors were required to reduce emissions at the same proportional rate.

Both instruments aim at suppressing external costs through a reduction of activities which generate such costs. But, as noted, the assessment of such costs is highly complicated. The optimal energy policy ought to equalize the marginal benefit of external cost avoidance with the marginal cost of policy measures to reduce the harm. In the absence of laborious assessment efforts, one can possibly assert that the quantitative decisions in the use of the new tools go in the right direction from society's point of view. At the same time, it is painfully clear that the application of these tools leaves a wide scope for arbitrariness.

3. AN APPROPRIATE COMBINATION OF INSTRUMENTS AND GOALS

A standard rule in economic policy analysis is that goals are attained most efficiently if each instrument is assigned to one specific goal only. In contrast, a common practice among policy makers is to use an instrument in an attempt to reach several goals simultaneously. For instance, green certificates are favored by politicians in many quarters, because they are believed to contribute valuably not only to reduced emissions, but also to the goals of depletion and supply security. This practice reduces the cost effectiveness of policy.

The obverse also holds. Policy will be cost effective only when only a sole instrument is employed to reach a desired goal. Cost effectiveness will be lost if several instruments are used simultaneously for a particular goal attainment. CO_2-emissions are cost effectively constrained with the help of emissions trading. The policy will be less efficient if this trade applies only to a part of the emissions, while the remaining parts are held back with he help of taxation. Furthermore, if the trading system covers all emissions, it is unclear how and why green certificates will contribute to the climate policy goal.

As noted earlier, the cost to society from energy market failures is hard to measure, but in many cases it is sufficiently evident and serious to warrant public policy action. The ideal policy should be pursued to the depth where its marginal utility to society equals zero, but no further. It is a reasonable premise that this marginal utility falls with the depth of policy. Deep policy will involve correction of insignificant failures, while the distortions and costs of policy measures will increase with rising ambitions. The difficulties to measure the cost of market failures suggest policy caution, to avoid territories where the net utility of policy becomes negative.

Monopolistic market power and external costs, are two uncontroversial reasons for policy efforts[2]. Market forces do not automatically rectify such

failures. The infant industry argument too, can sometimes motivate policy action. The question is which tools should be used to tackle the problems at least cost in each case.

General competition policy should be the primary tool to counter **market power**. Sometimes, however, additional measures addressing the specific energy sector problems may be required to improve the competitive conditions in the energy market. Public ownership appears as an appropriate tool for this purpose (note, however that governments sometimes wish to exercise monopoly power to strengthen the public budget), but price regulation is a feasible instrument too. Public ownership has gone out of fashion since the 1980s, but it is interesting to note that the widespread privatizations in Europe, relating to energy and other sectors, have often excepted the natural monopolies of network industries. In the US, private power producers have dominated their markets through geographical concessions, and price regulation has commonly been used to prevent excessive pricing. The experiences of this US system are not entirely positive. The regulation has been costly. It has undermined the producers' cost controls and has weakened the incentives for technological innovation, while its ability to assure favorable prices to consumers is in doubt (Stigler, 1962; Peltzer, 1976).

External costs are best countered in energy policy efforts through taxes or emissions trading and green certificates, the latter favoring energy sources with low external costs. Public ownership is also a possible tool, since the state may find it easier than private firms to accept lower profits in exchange for broader social utility goals.

The desire to promote **infant industries** could be accomplished with the help of public ownership, or subsidies or green certificates. It should be noted, however, that infant industry support is a controversial issue, and that such support is prompted for dubious objectives in many cases.

I have argued above against **supply security** and **depletion** as arguments in favour of policy efforts. These arguments are usually based on the belief that the market actors have inadequate information and foresight, and that the superior insights of the authorities make it possible to rectify existing market failures on these counts. It is not possible to prove, either theoretically or empirically that the state is in fact better endowed in these respects. For reasons specified above, I nevertheless distinguish between the security of supply argument as uncertain, while that related to depletion as doubtful.

The authorities' intervention to improve supply security could be accomplished through public ownership of firms especially assigned the responsibility for this task, combined with obligatory rules or economic incentives applying to private firms to institute measures that improve supply security.

A **current account** imbalance is a clearly doubtful justification for energy policy action. The current account is a macroeconomic variable, and its imbalance should be handled with the help of macroeconomic tools like exchange rate and monetary policy, and not by interventions in individual commodity markets.

Table 1 summarizes the discussions of this paper by listing the main energy policy objectives and policy instruments. It also assesses the relevance of the goals and the usefulness of the different instruments in terms of their cost efficiency from society's point of view. Finally, the cells in the table provide an evaluation of the appropriateness of different combinations of goals and instruments in policy execution, grading such combinations as providing a strong motive (three stars), some motive (two stars) and only a weak motive (one star) for undertaking policy. The strong motives for policy are quite limited in number. It must be underlined that the content of the table has a subjective flavour, reflecting my own perceptions and values. The reader must decide whether he has been convinced by the analyses and arguments on which the content of the table is based.

When scrutinizing the table, the reader should note than it subsumes impartial political decision makers, who work for the interests of society as a whole, and not for limited interest groups, and who act rationally to maximize social utility. It is also essential to keep in mind that there is no basis for the common belief that governments and public bodies have access to superior information and a better foresight than private actors in the market.

4. THE LIMITED REACH OF A SOCIALLY USEFUL ENERGY POLICY

In a market oriented economy the role of policy is to rectify market failures, and nothing else. Two cases of market failure have been identified with a clear-cut and useful role for policy intervention. In one additional case, policy may have a valuable impact, even though it is uncertain whether the

Table 1. Energy policy: Reasons for intervention and instruments

Reasons for intervention	Instruments / Cost Efficiency for society / Relevance	Public ownership	Investment concessions	Technical standards	Total prohibition	Other quantitative tools	Subsidies	Taxes	Price regulation	Emissions trading	Certificate trading
		Medium	Medium	Medium	Uncertain	Low	Medium	Medium	Low	High	High
Absent competition	High	xxx	xx	–	–	x	–	–	xxx	–	–
External costs	High	x	xx	xx	x	x	–	xxx	–	xxx	–
Infant industry	High/uncertain	xxx	x	xx	–	–	xxx	–	–	–	xxx
Supply security	Uncertain	xx	xx	x	x	xx	xx	x	–	–	x
Resource depletion	Doubtful	x	–	x	x	x	x	x	–	–	x
Current account	Doubtful	x	x	x	–	–	x	x	–	–	x

xxx = strong motive for energy policy. xx = some motive for energy policy. x = weak motive for energy policy.– = not relevant.

case really represents a market failure. In the remaining cases under consideration it is hard to identify a tenable motivation for policy efforts.

Energy policy can avail of a broad arsenal of instruments with different levels of social cost efficiency. Since the use of all instruments involve costly distortions of the market function, a rational policy must give careful consideration to the choice of tools for each type of market failure, to minimize the costs of intervention.

Market power and monopolistic prices provide a clear case of market failure. Energy policy should be introduced only when general competition policy is unable to rectify this failure. Public ownership and, possibly, price regulation, are the appropriate tools to come to grips with this case.

The prevalence of external costs constitutes another unambiguous case for policy intervention, with taxes and emissions trading as appropriate instruments. The calibration of policy is quite complex, since assessment of external costs yields results within a very wide range (Sundqvist, 2002). The uncertainties in this regard provide a wide scope for arbitrariness, and the policy maker can choose values within a broad range, to fit his preconceptions. Policy measures must be formulated with considerable caution to avoid socially uneconomic exaggerations.

The infant industry argument for public support to activities which because of their size or long term nature reap insufficient support from market actors, is only partially acknowledged by economic analysis. To the extent that this argument is included in the set of goals to be supported by energy policy, the appropriate instruments comprise public ownership, subsidies, and trade with properly structures green certificates.

The supply security argument can possibly be included among the goals of energy policy, not because the state has superior foresight, but only because the state can act as the insurer of last resort to whom the supply security risk can be transferred in the absence of appropriately developed insurance markets.

This ends the reach of a socially useful energy policy, for the relevance of resource depletion and a distorted current account for launching policy measures is doubtful.

The justifiable energy policy is thus limited to a few objectives with the use of only a few policy tools. As is apparent from the table, the clear-cut cases for policy (cells with three stars marked in bold) are few in numbers. Furthermore, with the

difficulties to measure external costs (probably the most important reason to launch public interventions), any energy policy efforts should be cautiously applied to avoid exaggerations. Energy policy ambitions beyond this reach risk to result in marginal social costs that are much higher than the policy benefits. And yet, policy makers in many countries tend to pursue programs that spread over most of the cells in the above table.

The analysis of the reach of a socially useful energy policy has assumed that the policy executors focus their attention to the energy sector, and act rationally and impartially. This is an heroic assumption. The risk and cost of political failure must be juxtaposed against the market failure, for the policy makers are not infallible. In practice they often design their actions to support limited interest groups, or act irrationally, for instance by deciding that strategic stocks should be increased, rather than reduced in periods of supply crises, thereby augmenting the supply problems. The partial and irrational behaviour of policy makers decreases the scope of useful policy action even further.

Notes

1. Or the ones with low income levels. However, as argued above, distributional issues should be handled by social policy or taxation, not by energy policy.
2. Note however the earlier argument that a dominant market actor can facilitate the establishment of infant industries and ameliorate the threat of resource depletion.

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