Environmentally Harmful Subsidies

POLICY ISSUES AND CHALLENGES

SUBSIDY MEASUREMENT AND CLASSIFICATION: DEVELOPING A COMMON FRAMEWORK

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Introduction

Anybody wishing to analyse the broad effects of subsidies on the environment runs immediately into several problems. First, the only economy-wide data are those provided in systems of national accounts (which exist only for some countries), but the types of subsidies covered in these accounts are too narrow and relate only to gross transfers. The alternative, the various disparate compilations of subsidies to particular products, industries or sectors, which have typically been generated within distinct policy communities, are not readily comparable on account of differences in coverage and methods of calculation and classification. Moreover, because most subsidy data are compiled for other reasons, the categories into which they have been aggregated may not be appropriate for analysing their environmental effects. Finally, it may be difficult to map the subsidy data set onto information relating to environmental variables. The subsidy data may relate to a whole sector, for example, whereas the environmental unit of interest is product or technology specific.

Economists can cite totals of gross national income for different countries, or of other aggregates, with some assurance that the numbers are reasonably comparable. Not so with subsidy "totals". Within agriculture, at least, the total producer support estimate (PSE) for one commodity can be compared with a total PSE with another, owing to the fact that the estimates are produced by one and the same organisation. And economists working on subsidies to marine capture fisheries seem for the moment to have adopted the GFT (governmental financial transfers) as the default indicator. But for other products or industries, such as forestry and energy, no single dominant indicator or framework has emerged.

The reasons for these differences in subsidy accounts often have more to do with historical chance, and the prerogatives of the policy communities for which the work is done, than to intrinsic differences in the industries being analysed. This section seeks to establish to what extent the most important of the differences can be reconciled. Its basic premise is that the different approaches and frameworks *need* to be reconciled if progress is to be made in developing a more comprehensive and integrated view of the roles that subsidies play in influencing environmental outcomes, if not sustainable development in general. Such comprehensive and integrated views are needed not only to analyse the cumulative effects of subsidies, but also to reveal where they may be working at cross-purposes (Bagri, Blockhus and Vorhies, 1999).

This section is addressed in particular to the public finance economists, national accounts statisticians, and industry analysts responsible for producing and documenting subsidy accounts that serve as the primary sources of record. These include the people who produce published government budgets as well as those in academic institutions, intergovernmental organisations (IGOs) and non-governmental organisations (NGOs) who then rework the data for their own particular purposes.

It begins with a brief historical overview of how the concept of subsidy has evolved over time. As has oft been said, there is no universally accepted definition of a subsidy. That may be true, but there are certainly common themes that run through all the extant definitions. The important differences, in fact, relate more to the normative assumptions — which are not always made explicit — and the rules of thumb that practitioners use to set boundaries around their work, then to the exact wordings used to define subsidies. It would be pointless and fruitless to argue for a conceptually perfect definition. But practical criteria certainly matter. Whatever definition is used it should be implementable with the available, or expected to become available, data, and consistent with the inferences that one wants to be able to draw from the assembled information (Bruce, 1990).

After reviewing some of the main conceptual issues, the question of the subsidy accounting framework is then addressed: that is to say, the classification system and aggregate indicators that one hopes to be able to produce from it. While most subsidy accounting frameworks have been developed for purposes other than environmental analysis, some are more useful for that purpose than others. This section addresses the question of what changes in, or additions to, the frameworks may be worthwhile making to better serve the needs of environmental analysts and policy makers, while still preserving the utility of the information for understanding the effects of subsidies on trade, competition, and welfare in general. Some suggestions of an

institutional nature that the international community may wish to consider are proposed.

The evolving concept of subsidy

Perhaps no testimonial has been more often quoted to summarise the frustration researchers feel whenever they try to pin down the concept of a subsidy than that of Hendrik S. Houthakker: "My own starting point was also an attempt to define subsidies. But in the course of doing so, I came to the conclusion that the concept of a subsidy is just too elusive" (JEC, 1972). Houthakker, writing three decades ago, could have just as well been describing the situation today.

Dissimilarities in the concept, and therefore in the formal definition of subsidies, arise largely from differences in the way the term has come to be used in everyday speech and by professionals working in separate economic and legal disciplines. Lexicographers trace the common usage of the word to the late Middle Ages, when the English Parliament granted funds to the king to supplement or replace customs duties and other taxes collected by royal prerogative. This practice eventually became the means by which the power of taxation was wrested from the king and vested in Parliament (Looney, 1999). The term has evolved since then to refer to any unrequited financial assistance including, in some dictionary definitions, that provided not only by a government but also by, for example, a philanthropic institution.

The tradition of accounting for government income and disbursements also has a long tradition, tracing back at least to Sir William Petty (1691), who is credited with being the first to prepare an account of national income (which he did as an intellectual exercise). Various independent and eventually government-sponsored efforts culminated in the development of an internationally agreed System of National Accounts (SNA), first published in 1968 (United Nations, 1968). In the revised 1993 edition of the SNA, subsidies are defined as "current unrequited payments that government units, including non-resident government units, make to enterprises on the basis of the levels of their production activities or the quantities or values of the goods or services which they produce, sell or import." This definition is among the most restrictive used by economists in that it covers only budgetary payments, and only those to producers — *i.e.* it excludes a myriad of other government interventions that give rise to transfers to or from producers or consumers.

The notion of a subsidy as, essentially, the inverse of a tax, assumes implicitly that the tax system is unbiased. But no sooner did governments start applying taxes as broad instruments of policy then they found ways to provide

relief from those taxes to particular industries or sectors. In the 20th century, public-finance economists began to estimate what effects preferential tax treatment was having on government revenues, and to treat those foregone revenues as, effectively, subsidies. It did not take long for those attempting to measure monetary benefits to particular industries to combine these "tax expenditures" with normal budgetary expenditures in their calculations.[1] Other manipulations, by numerous practitioners (often those involved with the calculation of foreign subsidies, for the purpose of applying countervailing duties), led to further elaborations, augmenting the definition to include such support elements as the value of government loan guarantees or insurance liability, and government revenues foregone from not charging full costs for publicly owned assets.

Thus, through time, one can observe the gradual accretion of various types of transfers provided by governments and their agents, along with foregone revenues, to the more common notion of a subsidy as a direct government payment. Most of these additional elements are now reflected in the current definition of a subsidy given in the World Trade Organization (WTO) Agreement on Subsidies and Countervailing Measures (SCM Agreement). This agreement was signed at the end of the GATT-sponsored Uruguay Round of multilateral trade negotiations, and currently serves as the only internationally agreed definition of a subsidy (Box 1).[2]

The SCM Agreement is an instrument of international trade law, and must be understood in that context. Two exclusions from its definition stand out. The first is government-provided general infrastructure, which is not further defined in the Agreement. The term refers to government investments in such items as government-provided road networks, but not necessarily to a road built, for example, to service a remote mine or factory. The significance of this particular exclusion, and the more general distinction made between general and specific subsidies will be discussed below.

The second exclusion is price support, other than in the sense of Article XVI of the GATT 1994. Section A of this article refers to subsidies, "including any form of income or price support" and section B to export subsidies. Market-price support as the term is used by the OECD (transfers to producers provided through border protection) is thus not included, not because the GATT negotiators considered them unimportant, but because international trade law deals with tariffs and non-tariff barriers separately.

Economists as far back as Adam Smith and David Ricardo have recognised that border protection can be, and typically is, combined with subsidies to favour particular industries. The development of formal approaches

to measuring the effects of border protection was helped greatly by the conceptualisation by Max Corden (1966 and 1971) of two aggregate indicators of protection: the nominal rate of protection (NRP) and the effective rate of protection (ERP).[3] The main difference between nominal and effective rates of protection (or of assistance) is that nominal rates refer to effects on gross returns to an activity, while effective rates refer to effects on the per-unit returns on an activity's value-adding factors.

Box 1. Definition of a Subsidy in the Agreement on Subsidies and Countervailing Measures

1.1 For the purpose of this Agreement, a subsidy shall be deemed to exist if:

(a)(1) there is a financial contribution by a government or any public body within the territory of a Member (referred to in this Agreement as "government"), *i.e.* where:

(i) a government practice involves a direct transfer of funds (*e.g.* grants, loans, and equity infusion), potential direct transfers of funds or liabilities (*e.g.* loan guarantees);

(ii) government revenue that is otherwise due is foregone or not collected (*e.g.* fiscal incentives such as tax credits);[1]

(iii) a government provides goods or services other than general infrastructure, or purchases goods;

(iv) a government makes payments to a funding mechanism, or entrusts or directs a private body to carry out one or more of the type of functions illustrated in (i) to (iii) above which would normally be vested in the government and the practice, in no real sense, differs from practices normally followed by governments;

or

(a)(2) there is any form of income or price support in the sense of Article XVI of GATT 1994;

and

(b) a benefit is thereby conferred.

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1. In accordance with the provisions of Article XVI of GATT 1994 (Note to Article XVI) and the provisions of Annexes I through III of this Agreement, the exemption of an exported product from duties or taxes borne by the like product when destined for domestic consumption, or the remission of such duties or taxes in amounts not in excess of those which have accrued, shall not be deemed to be a subsidy.

Source: World Trade Organisation (1999).

Soon after the ERP was first applied to Australia, once "infamous for having perhaps the highest manufacturing tariffs in the OECD" (Anderson, 2002), the concept was expanded so as to capture in principle all forms of governmental assistance to producers. This indicator, called the effective rate of

assistance (ERA) measures the relative difference, expressed as a per cent, in the value added per unit of output with and without a given assistance structure. A companion indicator, the nominal rate of assistance (NRA) — also called the Price Adjustment Gap (PAG) after Miller (1986) — measures the percentage change in gross returns per unit of output relative to a (hypothetical) situation of no assistance.

Formally, the nominal rate of assistance to a product (NRA_i) can be expressed as: [4]

$$NRA_i = [(RD_i - PW_i)/PW_i] \times 100$$

where

PW_i = undistorted (world) price for product *i*;

RD_i = unit gross returns to producers for domestic output of product *i*.

The ERA for a product, *i*, can be expressed as:

$$ERA_i = \frac{AVA_i - UVA_i}{UVA_i} \times 100 = \frac{x_i - \sum_j a_{ij}(x_j)}{1 - \sum_j a_{ij}} \times 100 = \frac{NRA_i - AX_j}{1 - A} \times 100$$

where

a_{ij} = an input-output coefficient (in the absence of support);

A = set of input-output coefficients ($\sum a_{ij}$);

AVA_i = assisted value added per unit of output;

UVA_i = unassisted value added per unit of output;

x_j = nominal rate of assistance (NRA) on the *j*th intermediate input;

X_j = set of all net assistance on intermediate inputs, x_j.

The main limitations of the NRA and the ERA is that they require very detailed data — in the case of the ERA, input-output coefficients and information on input costs, both actual and undistorted. Accordingly, a truncated version of the NRA, the producer subsidy equivalent (PSE), was developed for use where such data were difficult to obtain. Timothy Josling (1973) was the first to apply the PSE, using it to measure support to agriculture. The PSE was then extended and refined by agricultural economists in the Directorate for Food, Agriculture and Fisheries of the OECD (1987) and the

Economic Research Service of the US Department of Agriculture (USDA/ERS, 1987). It has since been applied to measure subsidies to coal production (IEA, 1988; Steenblik and Wigley, 1990), and was eventually tried in the case of fisheries (OECD, 1993). Although not all institutionalised subsidy exercises use either the ERA or the PSE framework, there is now virtually universal agreement among economists that the concept of subsidy — or at least "support" or "assistance" — includes the effects of border protection.

These various composite measures of protection and support are measured against a counterfactual situation in which all else is equal except that the protection or support is absent; this is sometimes called the "neutral" or "positive" framework. It is also implicitly the baseline counterfactual used for most subsidy accounts. The notable exceptions can be found in current research related to transport, where some economists, cutting straight to the quick, have defined subsidies as deviations from a socially optimal ideal.

The paper by Nash *et al.* (2002), for example, identifies two totally different ways of applying that approach: the first compares total social costs with total revenues; the second considers the relationship between marginal social cost and price, and regards the failure of price to cover marginal social cost as a subsidy.[5] Among the "implicit" subsidies included in the former definition are those that arise from the failure to internalise externalities. These externalities typically relate to damage caused by air pollution, the (gross) costs to society of increases in CO_2 emissions, the economic consequences of noise pollution (such as impacts on human health and damages to buildings), and the costs of accidents not born by transport users.

Transport economists are not alone in using a normative definition of a subsidy. Since the early 1990s, an increasing number of environmental economists have mixed "conventional" subsidies with what they also refer to as "implicit" subsidies: damage to the environment and to human health caused by the activity in question. An early defence of this approach can be found in Reijnders (1990): "If one uses the wider meaning of the concept of subsidy, one may safely state that current activities are heavily subsidised by future generations of humans, third parties to the activity and other natural species." Analogously, some groups have also invoked the term "social subsidies" in reference to perceived benefits received by foreign competitors operating under labour standards that are lower than those applied to their own industries (Goode, 1998).[6]

In the first two of the above examples, uninternalised externalities generated by the economic activity in question are included in the definition of a subsidy. It is an approach that is intuitively appealing to economists

accustomed to thinking in terms of Pigouvian (*i.e.* corrective) taxes and subsidies. For many reasons, however, it is extremely difficult to reconcile with the way public finance and other practitioners, not to mention non-professionals, understand the concept of a subsidy.

Commonalties and differences in current approaches

Within the field of subsidy measurement two basic frameworks are applied: comprehensive accounting systems, as exemplified by the SNA, and sectoral subsidy accounts — *i.e.* accounts that relate to a specific product, industry or sector. For tracking government expenditure, national accounts can be very useful. Canada's SNA, for example, not only accounts for all government expenditure (including by provincial and municipal governments) but even provides details on payments to individual companies or institutions receiving CAD 100 000 or more in a given year (Public Works and Government Services Canada, 2002). For the purpose of analysing the effects of subsidies on economic performance, trade or the environment, however, the definition of a subsidy used for the purpose of national accounting is too narrow. This limitation is one major reason, in fact, behind the emergence of composite indicators of support, and of sectoral subsidy accounts. Also, national accounts report gross data and are not adjusted to take into account possible cost recovery through user charges or other recovery mechanisms (Schwartz and Clements, 1999). Nonetheless, the conceptual framework provided by the SNA provides a useful model, in as much as it embraces the entire (measured) economy and is internally consistent.

Sectoral subsidy accounts have their own sets of limitations, of course. A major one is that, by excluding non-specific subsidies, they leave out general subsidies that may affect the allocation of resources within an economy, in particular between different factors of production (land, capital and labour). A common example would be a non-targeted tax credit designed to encourage investment. The national accounts framework serves as a reminder that, ideally, the aggregation of all sectoral accounts should not leave any important gaps. This limitation, at least, can be addressed through the creation of a separate "unallocated" category of subsidies. A more important limitation is that the major subsidy measurement exercises, the ones that tend to inform policy debates, are prepared by different groups that, to varying degrees, cover different support measures and use different classification systems.[7] When arranged in chronological order (Table 1), the influence that established approaches have had on subsequent exercises can be readily observed. In addition, there would appear to be a close correlation between the adoption of a formal framework (as signalled by the use of aggregate indicators) and the establishment of a particular subsidy account series as the series of record.

Table 1. Summary characteristics of selected international sectoral subsidy accounts

Sector and Organi-sation[1]	Conti-nuity[2]	Produc-tion and/or Consump-tion	Market price support measured	Budget-ary assistance measured	Tax expenditures measured?	Aggre-gate indicators
Agriculture						
FAO	2	P	Y	some	N	PSE
OECD	A	P & C	Y	Y	Y	PSE, CSE, GSSE, TSE
Coal						
IEA	A	P	Y	Y	Y	PSE
Energy						
WRI	1	C	Y	N	N	—
World Bank	2	C	Y	N	N	—
IEA	1	C	Y	N	N	—
Fisheries						
OECD	3	P&C	N	Y	Y	—
OECD	1	P	attempted	Y	Y	—
World Bank	1	P	N	Y	Y	—
APEC	1	P	Y	Y	Y	—
OECD	A	P	[Y]	Y	Y	GFT
Forestry						
EFI	N/A	P	N	Y	Y	—
Manufacturing Industry						
OECD	[A]	P	N	Y	Y	NCG
Transport						
UNITE project	N/A	N/A	N/A	Y	Y	—

1. See sources for corresponding references.
2. Key: A = annual basis; [A] = annual basis but discontinued; N/A = not yet determined; 1 = one-off study; 2 = original and one update; 3 = original and two updates.
Sources: **Agriculture**: Josling (1973); **FAO** (1975); OECD (2002); **Coal**: IEA (2001); **Energy**: Kosmo (1987), Larson and Shaw (1992), IEA (1999); **Fisheries**: OECD (1965, 1971 and 1980), OECD (1993), Milazzo (1998), PricewaterhouseCoopers (2000), OECD (2000*b* and 2001*a*); **Forestry**: Ottitsch (2001); **Manufacturing**: OECD (1998); **Transport**: Link *et al*. (2000).

These differences can be exaggerated, of course. In fact, the various sectoral accounts also share many common features. Most, for example, tend to apply a comprehensive view of government support measures; measure transfers (as opposed, for example, to changes in welfare) within a "neutral" framework; and generally exclude support that is not specific to the product, industry or sector. The significance of these starting points, basic assumptions and accounting conventions are discussed in greater detail in the Annex.

Differences in coverage

With the exception of the various studies that have been undertaken to look at subsidies provided to energy consumers through artificially low energy prices, most sectoral subsidy accounts include budgetary payments. The main differences relate to whether separate accounts are provided for both production and consumption, and whether the accounts include estimates of market price support, tax expenditures and, where applicable, untaxed resource rent. In the following paragraphs, the significance of these omissions is noted both with respect to how they affect comparability among the accounts and whether they are likely to limit the usefulness of the accounts for the analysis of environmental effects.

Production and consumption

The OECD's PSE/CSE database for agriculture measures support to both production and consumption. Most sectoral subsidy accounts focus only on production, however. The main exceptions have been in energy, where a series of international comparative studies have only measured subsidies to consumption. This tradition, concerned in particular with the stimulating effects of low prices on consumption of fuels that produce carbon dioxide or pollutants during combustion, was started by Kosmo (1987), further developed by Larson and Shaw (1992), and continued by the International Energy Agency (IEA, 1999).

Comparing subsidy totals that differ in terms of their coverage of production and consumption gives not only an incomplete picture but also a distorted one. Notwithstanding the limitations of assigning subsidies according to their initial incidence (see Annex), distortions can be introduced into either side of a market. Looking at only one side therefore can leave out information that may be important for analysing environmental effects. Accounting for subsidies to both production and consumption helps in understanding, for example, whether a low consumer price for petroleum products is being

maintained through running down the productive capital of the domestic petroleum industry; subsidising domestic producers in order to cover their losses; or, in the case of a low-cost producer, preventing it (*e.g.* through export restrictions) from selling its product elsewhere and earning a higher price.

Market price support

Measuring the gap between the internationally traded price for a commodity, and the domestic prices received by producers for an identical commodity, has a venerable history in the trade literature, tracing back at least to the concept of the nominal rate of protection. This gap, when multiplied by the affected volume of production, yields an estimate of what in the terminology of the PSE framework is called market price support.

The measurement of market price support is inconsistently applied across the various sectoral subsidy accounts. It has been most-thoroughly explored and refined in the OECD's work on agricultural support. The IEA includes it in its subsidy accounts for coal. The IEA also applied a price-gap method for its one-off study of market transfers to consumers of fuels in non-OECD countries. Market price support has been incorporated, in principle, into the classification scheme currently used by the OECD's Fisheries Committee for governmental financial transfers to the fisheries sector. But it has not been included at all in the OECD's work on support to manufacturing industries (OECD, 1998; Lee, 2002). No internationally comparable accounts of subsidies to forestry have yet been prepared, but it is notable that the theoretical framework being used for the European Forest Institute's evaluation of "financial instruments of forest policy" (Ottitsch, 2002) seeks to measure several types of subsidy elements, including tax concessions, but not market-price support.

How important is the exclusion of market price support from some sectoral subsidy accounts? The answer to this question depends in part on the level of protection accorded the industry under examination. Recent analyses of tariff regimes following the Uruguay Round of multilateral trade negotiations show that both basic agricultural products and manufactured products using agricultural products as raw materials (*e.g.* prepared foods, hides and skins, textiles and clothing, footwear and headgear) still tend to be more heavily protected then, for example, mineral products or machinery, for which even bound tariffs tend to fall below 5% and 10%, respectively, in most OECD countries (OECD, 1999).

Admittedly, measuring market price support is easier for some products than others. It is more difficult for products that are harvested seasonally (like certain kinds of fish, and fruit), and for heterogeneous manufactured products, than for bulk commodities like crude oil or wheat. Nonetheless, practitioners working in sectors outside of energy and agriculture should not look only to what has been done in the context of subsidy accounting. As Bora *et al.* (2002) document, numerous techniques have been developed by trade economists for getting around the same kinds of problems. At the very least, applied tariffs could be used as a proxy for the price gap if no other method appears feasible.[8]

Tax expenditures

Perhaps no other subsidy element has been so controversial, and has so confounded attempts to measure it, than tax expenditures. The term itself betrays its origins in public finance economics, with its focus on government budgets. When a government provides a tax exemption, credit, deferral or other form of preferential tax treatment to an individual or group, its budget is affected in much the same way as if it had spent some of its own money. Alternative terms, which reflect more the perspective of the recipient, are "tax relief" and "tax concession".

The (opportunity) cost of tax expenditures can be measured in any one of several ways (OECD, 1996). The "revenue foregone"[9] method measures the amount by which revenues are reduced because of the tax provision. A related method, the "outlay equivalent" approach (used by the United States), measures what the cost would be to the government if it were to provide through direct spending the same monetary benefit as the tax expenditure. Both of these methods ignore possible changes in the behaviour of taxpayers in the absence of the tax expenditure. The "revenue gain" method (once used by France) attempts to account for such behavioural changes.

The majority of countries that measure tax expenditures seem to use the revenue-foregone method[10], hence it is the method that probably has been used to calculate most of the tax expenditure estimates included in the subsidy accounts reported by intergovernmental organisations, such as the OECD. Thus while most countries use the least-sophisticated of the three methods to calculate tax expenditures, in that regard at least the estimates are consistent. Inconsistencies arise nonetheless. A major problem is that great variation exists in the frequency with which countries report tax expenditures (from annually to sporadically), in the conventions used to distinguish specific from general tax relief, and in particular the provisions used to define a hypothetical benchmark

tax system, or norm. As the OECD's 1996 study on tax expenditures observed, "clearly, the norm must reflect the structural stipulations of the tax system, but as the norm tends towards the actual system, so the list of tax concessions becomes shorter and the cost of expenditures reduces".

The result is that, while there is a generally held view among subsidy analysts (*e.g.* Pieters, 2003) that tax expenditures are under-reported, their incorporation into sectoral subsidy accounts has been piecemeal at best. Generally, the practice has been to include them in cases where the information is available, even if that means that those countries towards the more transparent end of the tax-expenditure-reporting spectrum tend to have their numbers counted as subsidies whereas other countries do not. In the OECD's 1998 report on public support to industry, over 50% of respondent countries claiming to provide tax-related investment incentives were not able to provide estimates of the net cost to government of these incentives. As the authors of the study remark, "If these gaps were filled, the amounts reported to date would increase considerably" (OECD, 1998). Yet, in spite of this under-reporting, tax relief accounted for almost two-thirds of total support to industry.

Problems of consistency among countries aside, is there any reason to suspect that tax relief plays a more important role for some products or sectors than others? This is difficult to answer because of the diverse forms of tax relief offered by multiple levels of government. At the local level, agriculture and forestry often benefit from preferential property taxes levied by local governments, at least in peri-urban areas, but so do manufacturing industries in some jurisdictions. Land devoted to roads and public parking facilities are typically not charged rent or taxes (Litman, 1999). At the national level, manufacturing industries often benefit from general investment incentives provided through the tax system (OECD, 1998). Tax relief offered to the energy sector varies considerably across both countries and fuels. The US Energy Information Administration (EIA, 1999a) estimated that 60% of the subsidies provided to production of primary energy in the United States in FY 1999 were in the form of tax expenditures, mainly relief on income tax. Almost half of the value of these tax expenditures benefited just one fuel (natural gas). Primary industries (*i.e.* agriculture, capture fishing, logging, and mineral extraction) in most countries benefit from tax relief on transport fuel used in boats and off-road vehicles.

Subnational measures

A sizeable share of subsidies is granted by sub-national governments. These are the government units, states in Australia, Mexico and the United

States, provinces in Canada, départements in France, Länder in Germany, prefectures in Japan, and so forth, as well as municipal governments everywhere, that administer smaller but often sizeable territories within sovereign countries. While sub-national units often have limited scope (either because of constitutional constraints or limited budgets) to subsidise industries, they do not universally practice *laissez faire*.

Coverage of measures provided by sub-national governments varies considerably among the sectoral subsidy accounts. The OECD's producer support estimates for agricultural generally include subsidies provided by sub-national governments; its estimates of government financial transfers to fisheries do not.[11] The OECD's (1998) study on support to the manufacturing industry noted that lack of information on sub-national programmes was one of the principal limitations of the study. Despite missing data at this level for several large OECD countries, programmes administered by sub-national governments were found to account for more than half of all assistance programmes and more than 25% of the funds spent. This share could very well increase in the future as central governments delegate spending responsibilities to lower levels, increasing the importance of monitoring sub-national subsidies. For example, the share of budgetary assistance provided to the German coal industry by Länder is expected to increase from 10% in 1997 to 22% in 2005 (IEA, 2001).

Resource rents

Some writers have suggested that un-taxed rent associated with the exploitation of publicly owned or managed resources should also be included in the subsidy accounting (*e.g.* Stone, 1997 and Milazzo, 1997). In particular, this argument relates to rent generated by governments not charging private individuals or enterprises for preferential access to a natural resource, such as a tuna fishery, a stand of pine trees or a gold deposit. A paper on environmental accounting in the Philippines (Virola *et al*., 2000), for example, suggests that in that country taxes and other applicable fees are recovering only a small fraction of the rent being generated by fishing, forestry and mining. Rents can also arise in some service industries, such as when a government allocates specific electromagnetic frequencies (spectrum) to operators of telephone services.[12]

Resource rent accrues to an industry when its net revenues from exploiting the resource exceed the normal returns to factors of production. In the case of renewable resources, whether or not rents are generated depends in large part on the management regime. In open-access fisheries, for example, rents tend to become dissipated through expansion of effort (Clark, 1990). Management instruments that allow individuals to engage in profit-maximising

behaviour, such as individual quotas (transferable and non-transferable) in fisheries, and exclusive area-use rights, may move fishing effort back to a level at which rents are again generated. These rents tend to become quickly capitalised into asset values, *e.g.* the price of quota, if they are not taxed away by the government. They are generally *not* taxed, except indirectly through income tax. It is fair to say, nonetheless, that the reluctance of governments to tax a portion of the resource rent that could potentially be earned from domestic fleets is a missed opportunity. (The opportunity is less often missed when foreign fleets are provided access; often *they* are charged a fee.) If the management instruments do not create conditions for the generation of resource rent to begin with, however, it is hard to justify counting that foregone revenue as support to the industry (Steenblik and Wallis, 2001).

The issue of how to treat resource rent in subsidy accounts merits more widespread investigation. Unrecovered resource rent is mainly relevant to primary industries, which use natural resources as factors of production, and then only where those resources are considered to be within the public domain. Examples from agriculture include the right to graze livestock on public land and to withdraw water from public reservoirs. Other cases may be less apparent. A head of water flowing through a geologically stable narrow canyon represents a tremendous potential resource. When a government-owned hydroelectric utility sells cheap electricity to local customers (even if it is covering its costs), but that kilowatt-hour price is below what it could charge for the same electricity were it to sell it instead to a neighbouring utility operating more-expensive coal-fired generating plants, are those local consumers receiving a subsidy?

Differences in classification systems

Classification is the systematic arrangement of information into categories. Statisticians and analysts are naturally inclined to group subsidies into types, if only to explain succinctly what they have accounted for, and what they have not. Typologies of subsidies are typically organised around one or more of the following characteristics and dimensions:

- *target*: consumers or producers, outputs, inputs, value-adding factors (individual and collective);
- *instrument*: *e.g.* budgetary expenditure, tax expenditure, assumption of contingent liabilities,[13] market transfers, under-pricing of publicly owned or managed asset;
- *pathway of benefit*: direct, indirect, explicit, implicit; and
- *purpose*: *e.g.* regional development or energy conservation.

Subsidy accounts that have been designed with formal aggregate indicators of support in mind, such as the ERA or the PSE, tend to adopt a classification system arranged by the targeted recipient and stage of production or consumption, as these groupings are required to produce particular indicators of support. To the extent that these categories are comparable, they facilitate meaningful comparisons between countries and different sectors or products. Thus, one can observe in the IEA's accounts for coal, and the OECD's accounts for agricultural commodities, a significant shift in recent years from market-price support to other subsidy forms.

In many accounts, subsidy data are reported according to the instrument used to provide the support, either instead of by target or in addition to it. In both the OECD's subsidy PSE/CSE database for agriculture and its accounts for GFTs to marine fisheries, entries under the target categories often refer to the instrument used, but not always. In the OECD's accounts of public support to industry, subsidies are classified by both purpose and financing instrument; the latter category differentiates among grants, interest-rate subsidies, loans, loan-guarantees, injection of equity capital, tax concessions, and mixed instruments.

The European Forest Institute's data collection framework suggests a classification scheme for its correspondent researchers that differentiates between whether the measures are "direct" or "indirect" and, within these major headings, provides for the data to be organised by purpose (*e.g.* afforestation; fire-fighting and prevention).[14] The terms "direct" and "indirect" can be found in numerous other classification schemes, including those used by the OECD for fisheries, by the IEA for coal, and by the US Energy Information Administration for energy, among others. The terms themselves are of limited relevance to economic (or, by extension, environmental) impacts, though they can help explain the structure of the support system. Direct subsidies are generally those provided through targeted (cash-based) payments, loans or tax preferences (Bruce 1990; EIA, 1999b). Indirect subsidies are those that reach producers through market transactions, namely through higher prices for products or lower prices charged for input goods or services purchased from an upstream industry that is able to discount its prices because of the subsidies itself receives. An example of the latter would be a reduction in the cost of diesel fuel sold to fishing vessels as a result of subsidies to oil refiners.

The problem with using such terms as organising devices is that they have taken on widely different meanings. And no modifying adjective is more ambiguous than "implicit." To Bruce (1990), an implicit subsidy is a special category of input subsidy, generally provided in-kind by a government, at a price below its market value or insufficient to cover the costs of providing it.

Others have invested the adjective "implicit" with many more meanings (*e.g.* Legeida, 2002). Environmental economists in particular routinely speak of "implicit subsidies" when referring to the monetised value of (negative) environmental externalities generated by an activity.[15]

Finally, many sectoral subsidy accounts identify the professed purpose of the subsidy, and a few organise the data accordingly. While knowing the purpose of a programme may help in understanding the aim of government policy, it is an unreliable guide to real intent, much less hint at the subsidy's incentive effect. The euphemism "to improve the competitiveness of producers" has been invoked as a phrase to describe all manner of public policies, from retraining schemes to deficiency payments. Litman (1999) reminds us also that the widespread use of words like "improve", "enhance" and "upgrade" (instead of simply "change") in describing subsidy programmes benefiting particular sectors can indicate a policy bias in favour of one activity over others. For this reason, classification by purpose offers the least meaningful of the above typologies and, if it is the only typology used, renders different accounts non-comparable.

Differences in measurement and allocation methods

Differences in classification systems explain only part of the reason why sectoral subsidy accounts are sometimes difficult to compare. Other variability is introduced through the methods used to calculate similar subsidy elements, in the practices used to decide which types of subsidies to include in the accounts and, when they are included, where to classify them. No systematic comparison has yet been made of these methods and practices, so it is only possible here to give a general impression.

As anybody involved in producing sectoral subsidy accounts will attest, calculating market price support involves as much art as it does science. The principle of the price gap is straightforward enough: ideally, it should involve a simple arithmetic comparison between a free-market reference price and the price received by producers (or consumers) for like products. Putting theory into practice, however, often requires considerable knowledge about the nature of the available price information and of the markets for the commodities being analysed. Often, adjustments have to be made to account for quality differences between domestically produced goods and those sold on world markets. Coal and other bulk commodities, for example, are processed to a higher grade before exporting, in order to avoid paying to transport unwanted impurities. Other adjustments are sometimes made to account for transport cost differentials, or to even out short-term fluctuations in exchange rates. The extent

to which these various adjustments are made varies widely among different groups of subsidy accountants.

Another area in which practice differs considerably is the treatment of government expenditure related to infrastructure. Generally, the infrastructure in question serves one industry or sector predominantly, but not exclusively. Examples are irrigation infrastructure and harbour facilities in major fishing ports. Complicating matters, particular infrastructure projects may be self-financing overall, but involve significant cross-subsidies between groups of users (*e.g.* electricity rate-payers and irrigators served by the same combined hydroelectric/irrigation project). Some sectoral subsidy accounts simply count government investment in specific infrastructure as a subsidy to an input or value-adding factor. Others attempt to calculate optimal user charges for use of the infrastructure, and treat the difference between those charges and actual user charges as a subsidy. Perhaps because such a large proportion of government support to the sector is provided through infrastructure projects, analytical work in this area is farthest advanced in respect of irrigation and transport (Sur, Umali-Deininger and Dinar, 2002; Nash *et al*., 2002).

Finally, practices relating to the treatment of missing data and the updating of previous years' provisional estimates can affect the degree to which the totals are over- or (more usually) under-estimated. The practice followed by the OECD's Directorate for Food, Agriculture and Fisheries when subsidy data relating to a particular programme (known to still be in operation) are not available for the current year is to use the expenditure data reported for the previous year, adjusted to account for inflation, where appropriate. Other accounts, however, appear to leave the entries for those programmes blank and produce totals on the basis of incomplete data. Most accounts are revised as new or more accurate data become available, but practices differ. Revisions are particularly important for what Schwartz and Clements (1999) refer to as "consignment subsidies" — *i.e.* loans provided in respect of projects (*e.g.* new energy technologies) that are only repayable should the project turn out eventually to generate a profit. The revenue-equivalent subsidy in this case may be only the value of subsidised credit if the project proves successful, but the full value of the loan (equivalent to a grant) if it does not.

Building on common ground

The preceding section examined some of the reasons why comparing, and especially aggregating, sectoral subsidy accounts prepared by different groups must be done with great caution and be accompanied by numerous caveats. The most important differences in the accounts relate to coverage, as

these affect the total values. The ways in which the data are classified and reported tend to obscure these differences, which does nothing to discourage inappropriate comparisons being made. Developing a common reporting framework would at least address the latter problem. In addition, by highlighting the differences in coverage, a common framework would encourage researchers to fill in some of the missing information, even if those primarily responsible for the accounts do not themselves have the resources available to do so.

Do the elements for such a common framework already exist? If widespread usage is a germane criterion, then the answer is yes. Several of the sectoral subsidy accounts currently being prepared on a regular basis have been consciously guided by a formal conceptual framework — generally one designed to enable the calculation of a PSE (and sometimes a CSE) or an ERA. These frameworks in most cases were designed for reasons other than to analyse the effects of subsidies on production or consumption. That is not necessarily a bad thing. The relationship between subsidies and environmental outcomes is indirect, so there may not be any need to adopt a radically new classification scheme in order to ensure that the information can be employed by those who would measure environmental effects. Indeed, there are many obvious advantages to building on the existing frameworks, not least of which is the necessity to continue monitoring subsidies for the purpose of informing trade policy. However, there may be some additional information that needs also to be collected.

Adopting a common organising framework

Organising subsidy data into categories that can be related to the production or consumption process itself — *i.e.* whether the subsidies are targeted to value-adding factors, intermediate inputs or outputs, or whether they seek to make up a deficit in revenues — enables useful aggregate indicators to be produced. More importantly, these categories are also those identified by economists as offering the greatest explanatory value for measuring the effects of subsidies on production (or consumption) and, as influenced by environmental or natural-resource management policies, on environmental outcomes.

The main purpose served by aggregating detailed data into composite indicators is to provide information that is more readily understandable than in detailed form. No single indicator can serve equally well all purposes (Anderson, 2002).[16] Many economists consider the effective rate of assistance (ERA), however, to be the best indicator of the incentive effects of protection

and support on production. The ERA has one other virtue: the information required to construct an ERA, because it is the most comprehensive, can also be used to construct many other indicators, such as those related to the PSE.

Basically, in order to construct an ERA, one needs: *(i)* a reference (world) price; *(ii)* a domestic price received by producers; *(iii)* the volume of production; *(iv)* expenditure on intermediate inputs (or input-output coefficients); *(v)* the net effects of border measures, taxes and subsidies affecting the price of intermediate inputs; (*vi*) data on budgetary assistance to outputs; (vii) data on assistance to intermediate inputs; and (viii) data on assistance to value-adding factors (*i.e.* labour, land or other natural inputs; and capital). Calculation of a total PSE requires all of this information apart from (*iv*) expenditure on intermediate inputs, and (*v*) distortions affecting the prices of intermediate inputs.[17] The data requirements for these two items can be large, which is why the PSE has been used more often than the ERA in international subsidy accounting.

Most other sectoral subsidy accounts (an exception may be transport) could, with not too much rearrangement of the data, be fit into one of these frameworks. Table 2 shows how a generalised system of subsidy accounts might be constructed on the production side. (An analogous table for the consumption side could also be produced.) It is offered here merely as an illustrative example and is meant neither to be definitive nor comprehensive. The fact that it may not be feasible to fill in all the elements in all sectoral subsidy accounts should not itself be an argument against adopting a comprehensive model framework. The SNA, for example, can potentially accommodate a huge amount of information, but few countries report data in every area; but because its reporting conventions are common, statisticians from different countries can quickly tell what is in and what is missing.

Within the categories shown in the table, of course, one could add other sub-categories appropriate to the product or sector. For analysing environmental effects, for example, details on subsidies that encourage the use of natural resources (water, energy) in the production process are vital. It is also helpful to know not only whether subsidies are being targeted to capital equipment, but also to what kind of capital equipment they are being given.

Table 2. Generalised framework for the production side of subsidy accounts

	Variable	Units	Hypothetical example	
A	Production volume	tonnes		1 000 000
B	Value of output	USDm		100
C	Expenditure on intermediate inputs	USDm		45
D	*Value added*	USDm		55
E	Assistance to value-adding factors	USDm		5
	1. Land	USDm	1	
	2. Labour	USDm	2	
	3. Capital	USDm	2	
F	*Assisted value added = D + E*	USDm		60
G	Assistance to outputs	USDm		15
1	Market Price Support	USDm	15	
2	Payments based on outputs	USDm	0	
H	Assistance to intermediate inputs	USDm		4
I	Miscellaneous payments	USDm		1
J	Unassisted value added = F - (G + H + I)	USDm		40
K	General Services	USDm		
L	Producer Support Estimate (PSE) = E + G+ H + I	USDm		25
M	Percentage PSE = (L / ([B - G2] + [L - G1]) * 100	%		23
N	Net subsidy equivalent = F - J	USDm		20
O	Effective rate of assistance = (N / J) x 100	%		50
P	Nominal rate of assistance = (G / [B-G]) x 100	%		18

Source: OECD Secretariat.

The classification scheme contained in Table 2 covers only one characteristic of subsidies: the targeted stage in production or consumption. Ideally, to the extent that other characteristics of support policies are meaningful, subsidy accounts should be multi-dimensional, containing information on both the mechanism by which support is provided (so that analysts can measure, for example, budgetary impacts) as well as the target.[18] Given the wide availability of relational database software, there is no reason (apart from the extra effort involved) why other dimensions could not be tracked as well. The critical design requirement is that the data be organised in such a way that aggregates under either category can be produced.

Adding an extra dimension for policy parameters

In many sectors where government incentives are provided, controls are applied to limit inputs, production, harvesting of natural resources, or environmental damage or pollution. In theory, if these controls are effective, the production-stimulating effects of subsidies will be somewhat attenuated. Analysts must take such conditionality measures into account when measuring the environmental effects of subsidies to production (or consumption). They can themselves do the research necessary to identify which of the subsidies under examination are provided in combination with constraints on their production or pollution choices. Economies of scope in data-collection suggest that this value-adding activity can be done most efficiently at the stage when the subsidy accounts are compiled.[19]

Government officials themselves seem to have taken to the idea of adding this extra dimension to the classification of subsidies. In the late 1980s, in the context of its work on economic assistance, the OECD's Committee for Fisheries considered an analytical approach built around the construction of a two-dimensional "matrix" for assessing the effects of economic assistance programmes on the main variables governing the performance of the fishing industry (OECD, 1989). The "matrix approach" was revived again in 2001 by Hannesson (2001) in a report for the OECD, and by Porter (2002) in a report for the United Nations Environment Programme (UNEP). In both cases, subsidy types form one dimension, and the management regime (production constraints) or management conditions the other. Management conditions in Hannesson's matrix refer to whether or not the fishery is operating under an open-access, catch control or optimal management regime. In Porter's matrix, the effectiveness of monitoring and enforcement would also be taken into account. The matrix approach has not yet been applied empirically to fishery subsidies, as it requires information relating to individual fish stocks, whereas the currently available subsidy accounts relate only to national totals.

The essence of the matrix approach has also been applied in the classification scheme now used by the OECD to categorise subsidies to agriculture. In 1997 the OECD revamped its classification scheme in recognition of the importance of policies that seek to limit inputs or supplies. Thus, included among the various sub-categories of support to producers are payments that are conditional on limits being applied to output (*e.g.* dairy quotas), area or animal numbers (*e.g.* headage limits), or the volume of variable or fixed inputs used.

The potential applicability of the matrix approach to classifying subsidies could usefully be investigated for other sectors. With regard to forestry, for example, one could imagine including parameters relating to limits on contiguous areas that can be clear-cut. The main limitation of the approach is that it is difficult to nuance. That a subsidy is provided to dairy farmers, on the condition that they keep the density (cows per hectare) of their herds within specified limits, says nothing about whether or not the limits are within the carrying capacities of the pastures on which those contented cows graze.

Increasing the level of geographic detail

Most data on subsidies are being collected at the national level, broken down further by industry or product. While such aggregate data are useful for the purposes of trade policy, or competition policy, they are less useful for correlating with changes in the environment. The possible exception is CO_2 emissions arising from the consumption of energy, for which national territories are currently the geographic unit of interest.

To assess specific environmental effects resulting from stimulated economic activity, information at a highly local or firm-level data are ideal. The rate, at which soil erodes, for example, is influenced by a constellation of factors specific to each farm. For any given level of fishing effort applied to a stock of a certain size and species, the difference between whether it is healthy or over-exploited depends in no small measure on the dynamics of its population, non-human predation, and a large host of local factors. Air pollution from traffic varies not only according to the level and mix of emissions but also the local topography, climate and prevailing winds.

Ideals, as a rule, are difficult to attain. Subsidy data tend to be reported at the national level because so many programmes are administered at that level. One may suspect that the central authorities monitor disbursements at a more disaggregated level, but obtaining such detailed information is quite another matter. Surely, the undisputed award for effort goes to the Washington, DC

based Environmental Working Group (EWG), which showed that sometimes it is possible to obtain information down to the level of the individual recipient,[20] in their case owners of farmland. The EWG database relates only to direct, budgetary payments (*i.e.* cheques written to farmers), however, and has been built up from records of actual transactions.[21] Such records are amenable to computerised data processing — not so for tax expenditures benefiting individual recipients, computation of which requires knowledge of the recipients' overall tax status. Similarly, to estimate the values to individual consumers or producers of subsidies conferred through market transactions requires information on their purchases or sales. One can easily imagine the work that would be involved in trying to calculate the value of these subsidy elements on a farm-by-farm basis!

Unless a government is already providing comprehensive subsidy accounts down to a highly detailed geographical level, there may be a perfectly good reason why it should not: cost. For many environmental issues, resources that would otherwise be devoted to collecting and processing subsidy data could more profitably be used, for example, to conduct selected small-scale empirical studies on subsidies and their environmental effects.

Possible next steps

Subsidy accounting at the international level has made great strides over the past three decades, from being an activity largely focussed on agriculture to one that is being taken up by policy communities and experts working on energy, forestry, marine fisheries and manufacturing industries. The shift from being motivated mainly by an interest in measuring impacts of subsidies on trade, to analysing the effects of subsidies on a multitude of phenomena, but particularly environmental effects, is a more recent phenomenon. This intensifies the demands put on subsidy accounts and makes the need for achieving greater consistency among definitions, accounting methods and indicators all the more urgent.

Subsidy accounting would benefit greatly if an international consensus could be reached in these areas. It will be neither a quick nor an easy process. Attempts to achieve consensus on Systems of National Accounts (SNA) have been ongoing for almost half a century. Yet these efforts provide grounds for optimism, not pessimism. Suggested steps that could be followed to improve international subsidy accounting.

- Improve the publicly available documentation of subsidy data and methods. As long as the analyst's methods, sources and assumptions are well documented, other analysts can go back and revise the calculations

or arrange them under different classification schemes. To date, such documentation has been highly variable. The OECD's Directorate for Food, Agriculture and Fisheries has for several years published CD-ROMs containing fairly detailed tables (though still at a level above primary data) of the transfers that make up its PSEs, CSEs and TSEs, as well as information on its calculations and data sources. And a User's Guide to its producer and consumer support estimate database is freely available on the web (OECD, 2001c; Portugal, 2002). The IEA also included information on its methods and sources when it published its first estimates of PSEs for coal (IEA, 1988), but that document has long been out of print.[22]

- Allow information to circulate more freely. That means making both the detailed results of subsidy measurement activities (and not just the summary indicators) and the documentation of the data and methods, easily and inexpensively available to others. The World Wide Web has already helped immensely in the dissemination of unpublished as well as published work, but better co-ordination of these sites, or the establishment of a centralised web site (as was created by the London Group of national income accountants and statisticians, for example[23]), would greatly reduce transaction costs and improve standardisation for practitioners new to the field.

- Ensure that peer reviews cross disciplines and institutions. At the international level, peer reviews of work on subsidies have mainly taken place within the institutions responsible for producing the subsidy accounts and between them and their governing bodies, which are usually specialist committees of government representatives from sectoral ministries. Occasionally, an independent researcher, such as Hamsvoort (1994) on the early agricultural PSE work, or a non-governmental organisation, like the World Wildlife Fund (2002) on fisheries subsidies, goes to the bother of critiquing what has already been published. Yet, until recently there has not been any serious attempt to encourage scrutiny of the sectoral accounts by a wider group of experts.

- Create a more-formal network of subsidy experts. The creation of the various "city groups" of experts working to improve the SNA could also be tried as a way of building a consensus on methodology. Such a network should involve participants representing a wide spectrum of professional backgrounds, viewpoints and countries.

Work on measuring subsidies at the international level can only be as good as the raw data collected and made publicly available by governments

themselves. In this regard, parallel efforts need to be made to encourage greater transparency (and clarity) in budget documents, and greater consistency between developments at the international and national levels. Recent guidelines developed by the OECD's Working Party of Senior Budget Officials on best practices for budget transparency (OECD, 2001b), provide a useful reference tool in this regard.

Concluding remarks

At one time it may have been acceptable to consider the effects of subsidies from a partial perspective, sector-by-sector. Ministries of energy may not have been measuring subsidies in the same way as ministries of agriculture, but it hardly mattered: each knew where the trade-offs in their domains lay. Or, at least, that is how it seemed to them. The ideal of sustainable development, however, argues for taking a more integrated perspective, one that recognises the inter-connectedness of policies and their effects. Yet the fact that subsidy data currently differ so much from one sector to another confounds attempts to consider them across whole economies and allows vested interests to legitimately challenge each subsidy estimate as inconsistent with the others.

The paper has highlighted the fact that there remain important differences that may limit the degree to which economy-wide data on subsidies can be prepared from sectoral accounts. These disparities relate to coverage, systems of classification, and measurement methods. Determining where the significant differences exist is often hampered by inadequate documentation of assumptions, methods and data. Improvement of documentation would facilitate comparisons and peer review.

Adoption of a more common reporting framework, organised in such a way to enable aggregate indicators useful for monitoring to be produced, would help systematise the data collection and reporting. It is suggested that one structured around the data requirements for an Effective Rate of Assistance (ERA) could serve such a purpose, even if the available data do not currently permit the calculation of an ERA. Fitting the various sectoral accounts into a common framework would naturally expose differences in coverage more starkly, but that would be helpful, not harmful. It would also facilitate comparisons between sectoral subsidy accounts and National Accounts, if not the eventual integration of the two. Of course, consistency is a desirable end only to the extent that it does not inhibit necessary flexibility. We should not lose sight of the main value of subsidy accounts, which are the detailed data and metadata themselves.

Finally, in order to make sectoral subsidy accounts more useful for the analysis of environmental effects, some consideration may have to be given to the level of detail currently provided. Ensuring that subsidies to natural resources can be readily identified is vital. It would also be helpful to know whether subsidies are being targeted to particular types of capital equipment. Adding an extra policy dimension would make it easier for analysts to take into account any environmental-performance conditions placed on subsidy recipients. Whether it would be cost-effective to increase the level of geographic detail in the subsidy accounts is a judgement that has to be made taking into account the much greater effort involved in assigning subsidies to sub-national units and the value to be gained from correlating subsidies with localised environmental effects.

NOTES

1. One of the first was Schonfield (1969), who calculated "discriminatory subsidies and tax concessions" in Germany, based on data for 1961 derived from what he describes as "two elaborate calculations" by the [German] Ministry of Finance published in the *Bulletin* of July 1959 and the *Finanzbericht* of 1962.

2. The separate WTO Agreement on Agriculture describes international disciplines applicable to basic agricultural products. In that agreement, the word "support" is invoked much more often than "subsidy" or "subsidies"; the latter terms are used sparingly, and primarily in reference to export subsidies, which are defined as "subsidies contingent upon export performance" [Article 1(e)].

3. For a recent summary of these historical developments, see Anderson (2002).

4. These equations are from Hamsvoort (1994).

5. Economists at the Victoria Transport Policy Institute, in Canada, have reversed the hierarchy, making subsidies a subset of externalities. See Litman (1999).

6. This is a particularly unfortunate use of the term, since it has long been used in Europe as a synonym for social-welfare payments and services.

7. The notable exceptions are when single (usually government) institutions have produced sectoral accounts across their entire economies, such as Australia's Productivity Commission (and its antecedents) has been doing since the 1970s (*e.g*, Productivity Commission, 2001).

8. The problem, of course, is that tariffs are not the only policy instruments that create a wedge between domestic prices and prices on world markets.

9. The revenues here refer to those of the tax-collecting authority.

10. In a survey of national practice as of the mid-1990s, the OECD (1996: p. 14) reported that "All (fourteen of) the countries surveyed used the revenue-forgone method, probably as a result of the difficulty in computation and uncertainty in the results of estimates of behavioural responses."

11. The reasons have to do with resources available to do the work; they are not excluded by definition. Steenblik and Wallis (2001) have shown that some of this information can be obtained through budget statements available through the Internet.

12. One might immediately dismiss many services as uninteresting in terms of their effect on the environment. Yet any support that lowers the cost of mobile telephones — at least using current technology — can have tremendous consequences for waste disposal.

13. A contingent liability is an obligation taken on by a government, such as guaranteeing the repayment of a loan or playing the role of a re-insurer, for which the actual values paid out will depend on uncertain future events.

14. The EFI's list should be regarded as provisional and indicative. The final classification system that it uses for its final report may differ from this list.

15. For example, the British Government Panel on Sustainable Development's *Third Report* (1997) speaks of implicit subsidies as those "which occur where market pricing fails adequately to reflect external costs, for example those of pollution on the community as a whole."

16. The subsidy literature can give the impression that the primary objective of compiling subsidy data is to produce aggregate indicators of support. It is these indicators — the ERAs, the GFTs and the PSEs, or simply estimates of "total subsidies" — that tend to be reported in the press, and which are most familiar to those outside the policy communities from which they have sprung. Unfortunately, because of the emphasis put on aggregate indicators, misunderstandings about the level of detail that underlies them, and the degree to which their supporting frameworks can be adapted across different industries, arise all too often.

17. This statement is an oversimplification, of course. As Bora *et al.* (2002) observe, "PSEs relate assistance to the gross value of output (*i.e.* under existing intervention), whereas effective rates are based on free-trade levels of value added (or the free trade input-output ratio as shown in the formula)."

18. These two dimensions can of course be compressed into one (with one being a heading and the other a subheading).

19. That does not necessarily mean that classification of the second dimension can or should be done by the same people.

20. Any reference in this paragraph to subsidies provided to private individuals should not be interpreted as advocating disclosure of confidential data relating to

those individuals. On this matter, Principle 6 of the United Nations' Fundamental Principles of Official Statistics is quite categorical: "Individual data collected by statistical agencies for statistical comparison, whether they refer to natural or legal persons, are to be strictly confidential and used exclusively for statistical purposes."

21. There is not always a direct correlation between mailing addresses and farmed land. In their analysis of U.S. Department of Agriculture subsidy payments made between 1985 and 1995, the EWG identified over 74 000 recipients (accounting for 1.2% of the subsidies) whose cheques were sent to addresses within the city limits of New York City, Los Angeles, Chicago or one of the other top 50 US cities. See http://www.ewg.org/pub/home/Reports/Slickers/Contents.html

22. References are still being made to the original source document in the updated tables that now appear in the IEA's biennial report, *Coal Information*.

23. See http://www4.statcan.ca/citygrp/london/london.htm.

Annex

Implications of standard assumptions and conventions used in subsidy accounting

Using a "neutral" baseline counterfactual

Subsidies must be measured against some baseline, some counterfactual situation. Neil Bruce, in a conceptual study that he wrote for the OECD (Bruce, 1990), advised that subsidies should "be measured with respect to a counterfactual environment in which they do not exist, rather than as the deviation of the subsidy from its optimal value." In fact, many renderings of what that "counterfactual environment in which subsidies do not exist" might look like can be constructed.

When economists take numbers for budgetary grants and loans straight out of budget documents, and arrange them in subsidy accounts, the baseline they are implicitly using to define the subsidy is a very similar world but for one difference: the particular programme providing the subsidy does not exist. Yet the net value of such subsidies to the recipients will be to some extent offset by the increased taxes required to finance them. Adjusting subsidies to account for this effect would be impractical, and the results within the margin of error for the gross (unadjusted) subsidy. But, the theoretical point is worth bearing in mind when analysing the effects of large-scale changes in a country's pattern of taxing and spending.

Things become more complicated when one applies a price-gap method to measure transfers generated by border protection (*i.e*. market-price support), or the value to users of under-priced goods or services provided by governments. That is because one of the variables, the reference price, would likely adjust to a new equilibrium in the absence of the policy that gives rise to the price gap being measured. If the government of a country that was a large producer of wheat, for example, were suddenly to announce that henceforth all border protection and export subsidies would disappear, that countries' exports would drop in the short term and the reference price (usually the price at the border) would presumably rise.[1] The "true" value of the subsidy, to critics of the simple price-gap method to measuring market-price support, should thus be measured against the new equilibrium price, not the reference price prevailing

1. This outcome would be even more likely were all producing countries to reform their policies altogether and at once.

while the price-support policy is in place. A similar argument is often used by beneficiaries of government programs to justify "offsetting" subsidies or tariffs when overseas competitors are blamed for distorting prices in world markets.

This line of reasoning holds considerable appeal, and it cannot be faulted for being "wrong" in any economic sense. But, from a practical standpoint, it raises numerous problems. First, if it is to be followed for the calculation of market price support, then to be consistent it must also be followed in the calculation of direct payments to producers that are tied to a pre-determined target price — what in agricultural policy are referred to as "deficiency payments". That is to say, in that parallel universe in which no deficiency payments are given, production of the affected commodity would have been less, its price higher, and the required deficiency payment would have been smaller. Why stop there? Should we not also take into account the simultaneous effects of all the other subsidies that influence production and consumption levels?

Extending this logic to its inevitable end, one could make an argument for defining the counterfactual for subsidy measurement to be a world in which all subsidies, everywhere, are removed. Measuring subsidies against such a standard could only be done with the help of a computerised general equilibrium (CGE) model, and a very detailed one at that. As Bruce (1990) wrote, "Determining the hypothetical output and input prices in the economy in the absence of a government sector constitutes a major computational general equilibrium exercise, and even if this were done, the results would be subject to so much uncertainty that they would be of little interest." Granted, CGE models have advanced since 1990, but redefining subsidies as welfare effects, without going through the intermediate step of documenting the actual transfers, would sever any link they once had with observable data (such as expenditures published in budget documents) and render them irrelevant for monitoring budgetary impacts and other transfer-related purposes.

The introduction of normative criteria into the measurement of subsidies is problematic for several other reasons as well. One problem, which is particularly apropos to any discussion of potentially environmentally harmful subsidies, often manifests itself early on in the design of subsidy-measurement exercises: the temptation to divide subsidies into two broad categories: "good" and "bad". Increasingly, "bad" is defined in terms of the subsidy's presumed effect on the environment, or on the use of a natural resource, or even on sustainability. It should be readily apparent that if we are to objectively evaluate the effects of subsidies on the environment, the last thing we should want to do is define away the problem before we have even started!

Ironically, the fact that the word subsidy has more and more become a pejorative term has not helped those who would measure the thing. If a subsidy is, in popular parlance, something that is intrinsically undesirable, then, to a policy maker, characterising expenditure that provides net social gains as a subsidy risks exposing it to budgetary or other disciplines. As Shrank (2001) succinctly sums up the problem, "it leads to potentially endless diversionary discussions as to what kinds of activities are to be viewed as subsidies when the important thing is the role that these activities play in the economy." For the purposes of this paper, the word "subsidy" is regarded as a neutral term.

Specificity

Basic to the concept of a subsidy is that it is a benefit conferred by a government that favours a particular activity or subset of its populace. Indeed, after satisfying demands for state-wide public goods, such as national defence, a major justification of government intervention in the economy is redistributive. On average, of course, we are all subsidised and taxed. Subsidies attract the interest of trade lawyers and economists, environmental and resource economists included, roughly in proportion to the degree that they favour particular groups, economic activities, or products. That is because the more they are "specific" to particular beneficiaries, the more they are presumed to be affecting resource allocation in the economy.

The word "specific" is placed between inverted commas in the previous sentence because it has a particular meaning in the context of international trade law. When a granting authority decides to send all eligible taxpayers a cheque for the same amount, as the US Government did in 2001 (for USD 300), few would call it a subsidy, much less specific. From the legal perspective of the WTO Agreement on Subsidies and Countervailing Measures, when a granting authority provides subsidies that "do not favour certain enterprises over others, and which are economic in nature and horizontal in application, such as number of employees or size of enterprise" then the subsidies are considered general (and therefore "non-actionable", *i.e.* not countervailable). However, when it explicitly limits access to a subsidy to an enterprise or industry, or groups thereof — whether explicitly in legislation, or through discretionary action, such a subsidy would be considered by most trade lawyers and economists as specific.

Much the same logic is used by subsidy practitioners when deciding which subsidies to ascribe to a particular industry or product, and which to regard as general. By definition, when subsidies are targeted to specific industries there is no ambiguity. And even when they are provided to several

industries, rules of thumb can be applied to apportion the subsidies to different products. Thus, when confronted with a subsidy available to all livestock farmers, economists at the OECD will usually allocate the subsidy to different livestock products (beef, sheep meat, milk) based on either their relative values of production or livestock numbers, depending on the basis of the subsidy. In the rare cases where a subsidy is available to a significant proportion of producers in an economy, such rules of thumb become less useful, and deciding whether to attribute the subsidy to specific industries or products thus necessarily requires an element of judgement.

A slightly different notion of specificity intrudes occasionally into discussions on how to treat subsidies with significant positive spillover effects for the rest of the economy, *e.g.* subsidies to research and development. Generally, government support for primary research does not end up in detailed subsidy tables produced for agriculture, fisheries and energy. The reason for them not being there is that they are not specific, in the sense described above. However, some would argue that support to programmes that benefit the general public (or the state, if it has fiduciary responsibility over a public natural resource), more than the targeted industry, should not be counted as a subsidy. An example might be expenditure on protecting fisheries or public forests from illegal fishing or logging. This is a slippery slope: excluding government expenditure from a subsidy inventory because the public benefit exceeds the private can lead to all manner of claimed exemptions. Again, as long as it is understood that subsidy is a neutral term, the only meaning of specificity that can be made operational for subsidy measurement is one that avoids consideration of public goods spillovers.

Incidence

Subsidy accounts usually make a distinction between production and consumption. The OECD's agricultural subsidy accounts mark the dividing line at the farm gate (*i.e.* at the point at which a commodity leaves the farm), for example. The subsidies are then entered in one or the other tables according to the target group. Nothing complicated about that, one would think.

Yet this distinction is what public finance economists refer to as an institutional one, not an economic one. In the real world, subsidies move around, split up and dissipate. In a buyers' market, for example, a producer subsidy can end up enriching consumers; in a sellers' market, a consumer subsidy can do the same for producers. Wolfson (1990) provides an excellent example of the latter. In the 1970s, following the first oil crisis, the Dutch government offered a subsidy to homeowners to encourage them to install

thermopane (double-glazed) windows. The subsidy was offered at a time when producers of the windows were already operating at full capacity. What was intended as a consumer subsidy thus ended up as a windfall for producers.

In the example above, economic incidence differed from the initial-impact incidence because of poor timing. In many other cases, the onward shifting of benefits has more to do with policy design. Thus a subsidy that is paid out in proportion to the volume produced — *e.g.* a per-unit production premium — will not increase the income of the producer by the same amount as, say, a social welfare payment, because some of the money received will have to be spent on inputs used in producing the extra unit. This ratio between net income and the revenue-equivalent of a subsidy is what agricultural economists refer to its transfer efficiency.

Should subsidy accounts thus assign subsidies on the basis of their economic incidence, rather than their initial impact incidence? Generally, no. Attempting that for every subsidy would be an enormous undertaking, requiring knowledge of (ever-changing) short-run supply and demand elasticities. The results would also be subject to considerable imprecision. And it would blur the roles between subsidy accounting and analysis.

Subsidy practitioners do make exceptions to this rule, in situations wherein the initial recipient of a subsidy is merely acting as an agent for the government, and is obliged to pass on some or all of the subsidy to consumers or suppliers. An example would be when a government decides it would be quicker or less expensive to channel subsidies through an existing distribution network, as is often done to provide low-cost staple food to the urban poor. In this case, the subsidy, if it is indeed passed on as it is supposed to, should be treated as a consumer and not a producer subsidy.

Drawing boundaries around the economic unit

Subsidies are usually ascribed to particular products or industries, and much less often to particular production technologies. In national accounts, the products and industries correspond to internationally agreed classification systems.[2] In the sectoral subsidy accounts, the boundaries are not always

2. Respectively, the harmonised Classification of Products by Commodities (CPC) and the International Standard Industrial Classification (ISIC). Members of the North American Free Trade Agreement (NAFTA) use a slightly different system for industries, the North American Industry Classification System (NAICS).

specified, and are assumed to be self-evident. What is self-evident to some may not be to others, however.

Consider, for example, agriculture, the boundaries around which would seem to be pretty clear. Agriculture, or at least primary agriculture, is the sector that grows plants and animals for transformation into food, beverages, fibre, medicines and so forth. Yet there is some fuzziness around certain parts of the edges. The farming of fish resembles animal husbandry in many respects. Should it be included with agriculture, with fishing, or be treated apart? Should the growing of maize for ethanol count as agricultural production (*i.e.* defined by the productive activity) or as an energy activity (*i.e.* defined by the end product)?

The issue here is not one of correct or incorrect, but the importance of making clear to users of subsidy accounts where the boundaries lie. Without such information, those who would aggregate subsidies to different industries, sectors or products risk either leaving out a subsidy or double counting. In the second of the above examples, the situation could easily arise whereby a tax concession favouring ethanol over other motor fuels might be counted as a subsidy to maize (corn) consumption in the agricultural accounts, and as a subsidy to ethanol consumption in the energy accounts. Combining the agricultural accounts with the energy accounts without eliminating the double-counting would thus over-state the total of the two.

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