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The Implementation Costs of Agricultural Policies

PART I

Chapter 2

Policy-related Transaction Costs and Policy Choice

2.1. Background

As explained in the introduction, the question of PRTCs in policy choice arises from concerns that moving from direct market interventions to new forms of targeted and decoupled agricultural policies leads to implementation costs that might outweigh the benefits.

This chapter examines the role of PRTCs in defining the most cost-effective and efficient policy option for achieving given policy objectives. Section 2.2 provides a framework for comparing policy options in the context of policy reform that includes a move away from production-linked support towards measures that are more decoupled from commodity production and better targeted to specific policy objectives and beneficiaries. The main economic issues raised when trying to compare policies are highlighted. Scenarios illustrating them are presented. Section 2.3 considers policies that pursue correction of market failures relating to nature, environment and rural viability, while Section 2.4 considers policies with multiple objectives. Finally, agricultural policies with income objectives are considered in Section 2.5.

Because the comparison is being made in a context of policy reform, the costs of different policy alternatives are compared to the costs of pre-reform policies (*e.g.* market price support). The analysis takes as a starting point that the need for policy intervention has been established and that the objectives of the intervention is well-defined. Once specific, alternative policy measures, which are considered *ex ante* capable of achieving the objectives, have been identified, which criteria to be taken into account need to be decided in the choice of policies. These include welfare impacts, which can be affected by PRTCs and/or distributional issues. The criteria and the weight given to them can vary depending on the context, social preferences and feasibility.

Annex I.2 contains a brief discussion of marginal cost of taxation issues. Annex I.3 presents a graphical method to illustrate policy comparisons, while Annex I.4 presents comparisons carried out with alternative parameter values.

2.2. Method of comparison

This analysis extends the traditional welfare analytical framework by including PRTCs into cost-benefit analysis. It also includes monetary transfers, which are typically kept outside the analysis in traditional welfare analysis because transfers do not affect overall welfare, only its distribution. Two elements are therefore considered to guide policy choice:

1. welfare changes, including PRTCs; and
2. changes in policy transfers.

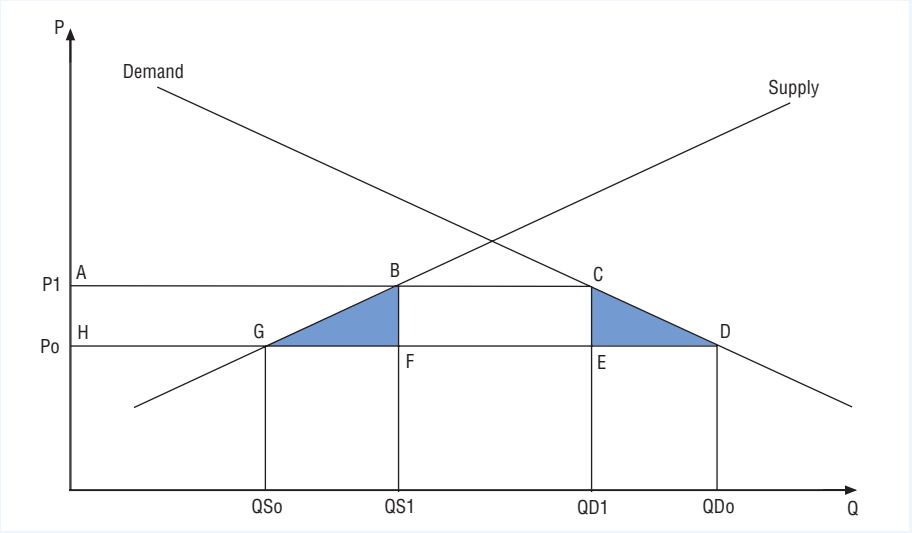
To the economist the natural way to evaluate a policy change is in terms of its effects on welfare. This concept attempts to measure in monetary terms whether the society as whole would be better off with the policy change. In general terms, the contemplated policy change would be recommended if it brings a positive net contribution to society's welfare, regardless of the distribution of costs and benefits.[1] Box 2.1 further explains the terminology used. For a

Box 2.1. **The components of welfare changes**

In a well functioning market economy, the current market price reflects the consumers' marginal willingness to pay for a commodity or service. The production of the good requires inputs (labour, intermediate inputs, energy, etc.) that must be withdrawn from the production of other goods and services. The resulting forgone production can be evaluated using the appropriate prices. If input markets are working well, the firm's variable production cost plus any fixed costs, is the appropriate measure of society's valuation of the production forgone in other sectors of the economy (Johansson, 1991).

The welfare effects of market price support measures that raise the prevailing price above its original level can be illustrated in welfare economic terms using Figure 2.1. The area under the demand schedule represents aggregate willingness to pay for the good, while the supply schedule reflects marginal cost of production. Suppose the initial price equals Po, which is the opportunity cost at which this good can be obtained by importing it. Indeed at the price Po demand exceeds supply and the country is a net importer of the good, with imports equal to QDo – QSo.

Figure 2.1. **Graphical illustration of welfare analysis**



Now consider the effect of a border tariff that raises the domestic price level to P1. Demand for the good drops while producers have an incentive to expand production following the higher price. Producer revenue increases, but variable cost also increases. Netting out both effects, **producer surplus** (the excess of revenue over variable cost) increases by the area ABGH. The new higher price causes **consumer surplus** (the area under the demand curve) to shrink by ACDH. Since the government collects tariffs its revenues increase by BCEF. The net change in welfare equals the sum of these three separate effects. In our case, the decrease in consumer surplus is partly offset by a transfer to producers in terms of an increase in producer surplus, and is partly offset by increased tariff revenues. The additional government revenue may or may not be redistributed in some way. On balance a net welfare loss occurs which in money terms equals the two shaded triangles. This so-called **deadweight loss** from taxation is an uncompensated loss in welfare and represents part of the **resource cost** to society. The triangle BFG informs us about the change in the value of production forgone in other sectors of the economy, when

Box 2.1. **The components of welfare changes** *(cont.)*

moving from the initial situation to the new price-output configuration (P1, QS1). The triangle CDE informs us about the change of the value of foregone consumption on other goods or services as a larger part of the consumer's budget has to be spent on the good under consideration.

- **Outcomes:** They are defined in this study as the results of the policy. They include intended effects with respect to policy objectives (desired outcomes), as well as associated side-effects such as non-commodity outputs and negative externalities. In this study, it is assumed that all the policy options provide the same policy outcomes.
- **Externalities:** They are costs or benefits arising from an economic activity that affect economic agents other than those engaged in the economic activity and are not reflected fully in market prices. Negative externalities are economic costs, while positive externalities are economic benefits. If the production of a good brings with it side effects that affect other parties, and these other parties care about being affected, the social value of the activity diverges from the private value. In the case of a positive externality, when other parties' utility is favourably affected, the social value of production is higher than the private cost. Conversely, in the case of a negative externality, the social value is lower than the private cost of production and it becomes desirable to restrict production to a level where the social cost equals social value at the margin. In terms of Figure 2.1 this would require the inclusion of **social marginal cost** schedules instead of the private schedules depicted (see Figure 2.3 of Box 2.4). Negative externalities of agricultural production include nitrogen and pesticide run-offs, green house gas emissions or bad smells.
- **Non-commodity outputs:** The term as used here was elaborated in the context of OECD's work on multifunctionality (OECD, 2003a, Box 1). It relates to a wide range of positive effects of agriculture whose relationship to agricultural production is described as the degree of jointness (Box 2.3). Rural viability, biodiversity and landscape have, *inter alia*, been claimed as positive effects or non-commodity outputs of agriculture. In practice, jointness may be weak or strong.
- **Additional cost of de-linkage (K):** In the context of policies that aim to correct market failures, this analysis takes account of the total cost of producing a non-commodity output separately from commodity production by adding the additional cost of producing a non-commodity output separately from commodity production (K) to the intended transfer needed to produce it jointly (Y). K is in fact equal to the total cost of producing the public good separately, minus the intended transfer (Y) needed to produce it jointly with the commodity output, using a targeted coupled policy. This difference in economic cost is assumed to be reflected in the level of transfers needed to obtain the output. K is envisaged to be measured as the difference in intended transfers between a coupled policy (joint production) and a decoupled policy (separate production). An underlying assumption for this is that with separate production it is possible to target the transfers perfectly to compensate for the costs of producing the public good. If a coupled policy transfers X (or Y), the equivalent decoupled policy will transfer X + K (or Y + K). K is positive if joint production is cheaper (in terms of intended transfers), and negative otherwise. When K is positive, it can vary from zero to infinity. Since all policy options are assumed to provide the same policy outcome, K represents the additional resources consumed while not producing anything additional to the non-commodity output. Therefore, K is regarded as a part of the resource cost.
- **PRTCs:** As the additional cost of de-linkage, PRTCs represent resources consumed and are therefore considered as a part of the resource cost.

complete evaluation of the effects of a policy change it is important to include all the relevant effects associated with the change, and to value the effects using the appropriate prices. In all cases, the welfare analysis attempts to measure in monetary terms the opportunity cost of carrying out the particular policy change (or commencing a particular project). In other words, it poses the question "what is the value of production and consumption foregone in other parts of society if we carry out the particular policy change?" In the applied version of welfare economics – traditional economic cost-benefit analysis – this translates to using border prices to value importable commodities in order to approximate society's opportunity cost of consuming that particular good. This is also the method adopted by the OECD to evaluate the market price support component of the Producer Support Estimate (PSE).

First, a series of costs and benefits that affect overall welfare are considered. They are deadweight losses on the production and consumption side (DWL), possible additional costs of de-linkage (K) due to decoupling in the context of market failures, when jointness exists (*i.e.* the extra cost of producing a non-commodity output separately from commodity production – to be added to the transfer to producers needed to produce it jointly – see OECD, 2001a and 2003a, and Box 2.1), marginal cost of taxation (MCT), the outcome of the policy (OUT) and associated changes in the value of positive and negative externalities that are not intended by the policy (ΔEXT). These elements are further defined in Box 2.1.

The move from policy i to policy j will be recommended if:

$$(DWLj + Kj + MTCj + OUTj + \Delta EXTj) - (DWLi + Ki + MCTi + OUTi + \Delta EXTi) < 0 \qquad [1]$$

The marginal cost of taxation is not considered numerically in the policy comparison (*i.e.* MTCi is not considered further). Annex I.2 contains a brief discussion on MCT issues and reports some estimates of the MCT of public funds. They vary widely by country as they depend on the composition and level of taxation.

Moreover, because the value of all costs and benefits cannot be estimated and for the sake of simplification, this analysis compares policies that are assumed to achieve the same desired outcome (*i.e.* outcome with respect to the objective set). In other words, OUTi = OUTj. The existence of positive and negative externalities (other than the one targeted by the policy) is acknowledged but not quantified given the theoretical and empirical difficulties in evaluating those effects. Thus ΔEXT is not considered further.

Second, changes in **PRTCs** associated with the policy change are taken into account. PRTCs (PRTCi) can also be measured in monetary terms, using methods described in Section 1.4. Conceptually, a complete cost-benefit evaluation of a policy change can be written as the difference of the conventional change in welfare associated with the policy change minus the change in PRTCs needed to implement the policy change. Given the assumptions retained in this analysis, policy j is now to be preferred to policy i if:

$$(DWLj + Kj + PRTCj) - (DWLi + Ki + PRTCi) < 0 \qquad [2]$$

Third, transfers within the economy are considered.[2] These transfers are not considered explicitly in traditional cost-benefit analysis (other than through their impact on the size of costs and benefits) because they do not affect overall welfare. However, they are important for society because they affect the distribution of welfare among households or sectors. They may result in inequities between households and sectors that are a concern for policy-makers and society overall. They are also a concern for policy makers, in particular in the context of sectoral policy reform, because they may cause financial waste if transfers are

greater than needed to meet the desired objective or if they leak to unintended beneficiaries (Box 2.2). It is all the more important to include unintended transfers in this context as one objective of policy reform is to obtain desired outcomes while minimising government expenditures. How much society is prepared to pay is therefore an important component of policy choice. This approach is consistent with the long established measurement of transfers to agriculture that is undertaken in the form of the OECD's Producer Support Estimate (PSE) and Consumer Support Estimate (CSE). These estimates track transfers from consumers in the form of market price support calculations and from taxpayers in the form of direct budgetary payments to farmers. Both are considered as legitimate elements to be accounted for in the costs of policies. This analysis therefore also includes transfers in the comparative equations that are used to evaluate policy alternatives.

Box 2.2. **Targeting concept**

- **Intended transfers:** They are the transfers to agricultural producers that are needed to produce the desired outcome, and only those transfers.
- **Unintended transfers:** They are transfers to agricultural producers that do not produce the desired outcome, either because they go to unintended recipients, or because they are higher than needed to produce the desired outcome. In other words, they are not necessary to achieve policy objectives, but exist because the policy is not well targeted or tailored.[1]
- **Targeting**[2] requires well defined objectives that allow the elements to receive support (population, area or outcomes) to be clearly identified and the level of support required to be specific to the objectives. This also means the policy is tailored, *i.e.* provides only the amount of transfers needed to obtain the outcome, a notion often associated with good targeting. As a result of good targeting and tailoring, transfers needed to achieve objectives are expected to be lower than transfers from broad-based policies. This assumes, of course, that targeting is technically possible.
- **Targeting ratio:** This is the ratio between the transfers needed to meet the objective (using a targeted policy: Y) and the transfers from a broad-based policy (X) that achieves the same objective.

1. It should be noted that targeting may not always be technically feasible and/or may raise equity concerns. One example of the latter is when payments are made to farmers to change their production practices and thus produce additional non-commodity outputs, but farmers who already produce the non-commodity output do not receive any payment for doing so.
2. The notion of targeting is being further elaborated as part of the OECD programme of work and budget for 2005-06. The project seeks to draw lessons on best practices for effective targeting.

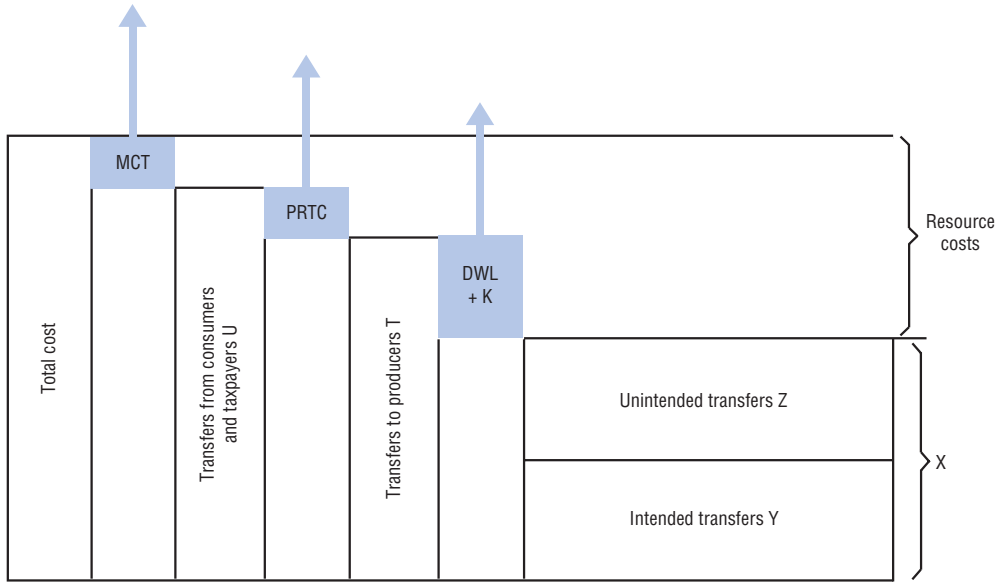
Agricultural policy traditionally delivered transfers to farmers through broad-based measures such as market price support or output payments and a significant share of transfers to the sector are still delivered in this way (OECD, 2005c). In recent years there has been a move towards area or animal payments. This type of measure is often also broad-based in the sense that all cropland, all land or all animals receive the payment, although increasingly, there are restrictions on the number of hectares or animals to receive support. If the objective of the policy is to raise the income of farmers to some minimum level, a broad policy such as price support or a commodity-specific payment will generate transfers to producers who already have the minimum income. To the extent that this happens the transfers are unintended. Other examples of unintended transfers would be area payments for the maintenance of farming in places where farming would be viable without it; or payments for the adoption of

production practices favourable to biodiversity in areas where the desired level of biodiversity is already achieved. On the other hand, a targeted payment, as opposed to a broad based measure, will reach only those farmers who need it – in the case of a minimum income goal – or only those farmers who increase supply – in the case of a positive externality. These concepts of unintended transfers and of targeting are explained more formally in Box 2.2.

It follows therefore that transfers aimed at producers (*T*) can be broken down as follows (Figure 2.2):

1. intended transfers (Y) that reach intended beneficiaries and only provide the amount necessary to obtain the desired outcome (Box 2.2);
2. unintended transfers (Z) that are not needed to produce the desired outcome (Box 2.2);
3. deadweight losses (DWL) (Box 2.1); and
4. additional costs of de-linkage (K) (Box 2.1).

Figure 2.2. **Relationships between economic resources and transfers**



The size of the different blocks does not reflect the size of the different elements.
MCT: Marginal cost of taxation; DWL: Deadweight losses; K: Additional cost of de-linkage.
Transfers from a targeted policy are Y, while transfers from a broad based policy are X = Y + Z.
Source: OECD Secretariat.

A broad-based, coupled policy will transfer T = Y + Z + DWL, with producers receiving X = Y + Z (Figure 2.2). A targeted, decoupled policy will only transfer the amount necessary to obtain the desired outcome and there will be no unintended transfer and no deadweight losses (T = Y or T = Y + K).

The relationship between the economic resources needed to pursue a given objective and the transfers received by farmers, given the various costs incurred, is illustrated in Figure 2.2. If the policy involves budgetary expenditures, there is a cost to the economy in raising taxes (the marginal cost of taxation, MTC) so the economic cost is higher than transfers from consumers and taxpayers. Those are then partly used to fund administrative costs (PRTCs) and the remaining transfers from consumers and taxpayers are aimed at producers (T). Some transfers then do not reach farmers because of

deadweight losses (DWL).[3] Transfers received by farmers are finally divided into intended transfers (Y) that generate the desired outcome, and unintended transfers (Z) that occur either because recipients do not generate the desired output or do so above the level needed (*e.g.* in an area where it is not needed).

So far, it has been established that two elements should be retained in order to compare the costs of different policies that are assumed to bring about the same outcome in terms of the objective sought. These are resource (or welfare) costs, composed of deadweight losses, the additional costs of de-linkage and PRTCs, and (intended and unintended) transfers. Welfare elements relate to economic efficiency, while transfers relate to distribution. Policy-makers may wish to consider these aspects separately, as illustrated in Figure I.3.1.

In Figure I.3.1, resource costs are represented on the X-Axis and unintended transfers on the Y-Axis. Policy O is inferior to Policy A while Policy B is inferior to Policy O. However, we cannot say whether any policy falling in the grey areas is inferior or superior to Policy O. When the choice is indeterminate, policy-makers might want to weigh the two types of costs.[4] While they might wish to give different weights to the two types of costs or to any of the individual costs, benefits and transfers,[5] this analysis assumes a dollar of welfare gain is equivalent to a dollar of welfare loss or to a dollar of transfer, whoever is affected. This assumption is made in the absence of any plausible alternative. The move from policy i to policy j then depends on whether:

$$(DWLj + Kj + PRTCj + Yj + Zj) - (DWLi + Ki + PRTCi + Yi + Zi) < 0 \quad [3]$$

Where DWLi are the deadweight losses, Ki the additional cost of de-linkage, PRTCi the policy-related transaction costs, Yi intended transfers and Zi unintended transfers of policy i.

This simplified comparative approach is more practical than a standard welfare maximisation approach, where all non-commodity outputs and negative externalities generated by the different options would have to be valued simultaneously. Essentially the approach is a cost-effectiveness analysis, which takes the outcome as given and ranks policies according to the total cost needed to achieve the outcome. This method is preferred, both because the nature of the changes in many of the variables (positive and negative externalities) and their value are not known, but also because the change in the level of transfers is a legitimate and potentially important element in policy choice, reflecting decisions about who should pay and how much. The alternative method chosen here allows policy options to be compared, taking account both of transfers and those economic costs that are measurable.[6]

2.3. Application to policies aiming to correct market failures

This section looks at how the different cost elements vary with different policy options, in the case of a policy intervention that is designed to deal with a market failure. Possible examples of market failure could relate to the provision of landscape or of biodiversity. The different policies considered include market price support, and payments with different combinations of full or no targeting and decoupling. Payments are either fully coupled or fully decoupled, and/or perfectly targeted or untargeted. In reality, there are few examples of fully decoupled policies as any policy based on farm resources is likely to have some impact on farm production (OECD, 2001f). Similarly, examples of perfectly targeted policies are rare.

Jointness

The necessity to compare policy options that range from market price support – a broad-based policy – to a targeted, decoupled instrument, derives from the work on multifunctionality. It relates to the debate concerning the degree of jointness – the nature of the link between commodity production and the non-commodity outputs of agriculture (Some technical definitions of jointness are given in Box 2.3). If agricultural production is strongly related to the desired non-commodity outputs – if production of the non-commodity output is strongly correlated with increases in production of the commodity – a case can be made for a broad-based policy that encourages commodity production in order to produce the desired non-commodity output. If, on the other hand, jointness is weak, the case for decoupled and targeted policy instruments is more likely to prevail. This is the underlying policy choice that the following paragraphs illustrate.

Box 2.3. **Jointness and related concepts**

- **Jointness:** Joint production refers to situations where a firm produces two or more outputs that are interlinked so that an increase or decrease of the supply of one output affects the levels of the others. Three reasons for jointness are frequently distinguishes: 1) technical interdependencies in the production process (*e.g.* crop production and nutrient leaching); 2) non-allocable inputs (*e.g.* sheep raising producing mutton and wool; production systems and associated landscape); and/or 3) allocable inputs that are fixed at the firm level such as farmland and labour (OECD, 2001a, Box I.5). Joint outputs of agriculture vary from private to public goods, and include goods with various degrees of public good characteristics. Similarly, they display various degrees of jointness with commodity production, depending on the extent to which the share of the various joint outputs can be modified.
- **Economies of scope:** They are possible cost savings due to joint production. Economies of scope arise if something inherent in the production process makes it cheaper to provide two or more outputs jointly rather than separately.
- **Jointness and deadweight losses:** When transfers are used to produce a non-commodity output jointly with the commodity output, the net change in producer and consumer surplus is partially or totally offset in the welfare equation by the value of the non-commodity output generated. However, deadweight losses used for the additional commodity production are retained in equation [3] because the output side (*i.e.* the value of the desired non-commodity output) cancels out on both sides of the equation as all policies are assumed to have the same outcome. Moreover, when the non-commodity output can be produced either jointly or separately, the resource used in the case of joint production leads to additional commodity production that is not needed, while this could be avoided if a decoupled policy was adopted. The deadweight losses are therefore attributed to the commodity output, and therefore to the coupled policy.

Not all comparisons are possible or meaningful. Coupled and decoupled options can be compared only when both joint and separate production are technically feasible. If no separate provision is possible, the decoupled option will not meet the criteria of achieving the same outcome. Moreover, there are cases where the choice is obvious and does not require a detailed analysis. For example, if the total transfers needed to produce the desired outcomes with a targeted policy are higher than transfers from a broad-based policy that generates the same outcomes, the latter is to be preferred, as PRTCs are also likely to be lower.

In other cases, the choice is not immediately obvious, as the desired outcome can be obtained using either a policy coupled to commodity production (market price support or coupled payment) or a policy that is not linked to commodity production (decoupled payment) if jointness is not perfect and de-linkage feasible.[7] For example, flood control can be pursued by raising the rice price, paying for hectares of terraced paddy field or building a dam. Both support to grazing livestock, pastures, or hedges can contribute to biodiversity improvements if appropriate conditions are attached. Obtaining the desired outcome separately from commodity production may be more expensive. This is the case if there are economies of scope, *i.e.* if the production of the non-commodity outputs jointly with the commodity output is cheaper than separate production (Box 2.3). Conversely, there will be a benefit if separate production is cheaper.

Cost comparison

Price support results in deadweight losses (welfare triangles) and world price distortion. The same deadweight losses (excluding the consumer welfare triangle and with somewhat smaller world price distortions) are found with coupled payments. With perfectly decoupled payments, deadweight losses are zero. Total deadweight losses from policy i (DWLi) are equal to per unit deadweight losses (dwli) multiplied by the total transfer.[8] PRTCs per unit of transfers[9] are labelled tci and total PRTCs PRTCi for policy i. As in equation [3] and Figure 2.2, the intended transfer, achievable through a well targeted policy, is Y, while the actual transfer, resulting from an untargeted policy, is X, with X > Y (Z = X – Y are unintended transfers). For decoupled policies, the additional cost of de-linkage (K) is added. The additional costs of de-linkage per unit of transfer (X or Y) are labelled ki and the total additional costs of de-linkage Ki for policy i.

Table 2.1 allows for a formal comparison of cost elements. Policies can be compared two by two for all costs retained in equation [3], *i.e.* resource costs (deadweight losses, additional cost of de-linkage and PRTCs) and transfers.

Table 2.1. **Market failure: Comparison of costs by policy type**

For a given outcome	Price support (tariff only)	Price support (complex trade and domestic measures)	Untargeted coupled payment (*e.g.* output payment)	Untargeted decoupled payment (*e.g.* pay. based on historical entitlement)	Targeted coupled payment (*e.g.* limited output payment)	Targeted decoupled payment (*e.g.* targeted payment per meter of hedge)	Policy with no transfer (*e.g.* regulation)
Policy *i*	1	2	3	4	5	6	7
Intended and unintended transfers Xi	X	X	X	X	Y	Y	0
of which: unintended transfers Zi	Z	Z	Z	Z	0	0	0
Total additional cost of de-linkage Ki	0	0	0	k4*X	0	k6 * Y	0
Total deadweight losses DWLi[1]	dwl1 * X	dwl2 * X	dwl3 * X	0	dwl5 * Y	0	DWL7
Total PRTCs PRTCi	tc1 * X	tc2 * X	tc3 * X	tc4 * (X + k4 * X)	tc5 * Y	tc6 * (Y + k6 * Y)	PRTC7
Transfers to producers Ti	X + dwl1 * X	X + dwl2 * X	X + dwl3 * X	X + k4 * X	Y + dwl5 * Y	Y + k6 * Y	DWL7
Total cost for consumers and taxpayers Ui	X + dwl1 * X + tc1 * X	X + dwl2 * X + tc2 * X	X + dwl3 * X + tc3 * X	X + k4 * X + tc4 * (X + k4 * X)	Y + dwl5 * Y + tc5 * Y	Y + k6 * Y + tc6 * (Y + k6 * Y)	DWL7 + PRTC7

X = transfers from an untargeted policy (X = Y + Z). Y = transfers from a targeted policy; Z = transfers to unintended beneficiaries because of lack of targeting.

1. Ki are the additional cost of de-linkage per unit of transfers; k4 = k6.
2. DWLi are deadweight losses per unit of transfers; dwl1 = dwl2 > dwl3 = dwl5.

Source: OECD Secretariat.

Box 2.4. **Main assumptions on parameters retained to illustrate the comparison**

- **PRTCs:** Plausible assumptions on PRTCs as a percentage of transfers are made, based on estimates found in the literature and the case studies. The unit PRTCs used are those presented in the middle column of Table 2.2.

Table 2.2. **Plausible range of PRTCs as a percentage of transfers by policy type**

Policy	Minimum	Base value	Maximum
MPS tariff only	0.25	0.5	1
MPS other measures	0.44	10	12
Untargeted, coupled payment	1	3	7
Untargeted, decoupled payment	1	3	7
Targeted, coupled payment	2.5	25	50
Targeted, decoupled payment	5	50	110

Source: Secretariat's assumptions based on Tables I.1.2 to I.1.19 and Table 1.3.

- **Deadweight losses:** Table 2.3 contains examples of deadweight losses per unit of transfer for the schematic measures considered. The deadweight losses per unit of transfer associated with MPS and output payments were estimated using the PEM crop model (OECD, 2001c) for different types of crop policies. This estimation refers to resources used to produce commodity outputs. It does not take account of positive and negative externalities other than the ones targeted by the policy.

Table 2.3. **Plausible base values of impacts by support measure Welfare gain or loss per unit of transfer**

For a given outcome	Price support[1]	Targeted or untargeted coupled payment (*e.g.* output payment)[2]	Targeted or untargeted decoupled payment (*e.g.* income payment)[3]
Tax payers	–0.56	–1.31	–1
Consumers	–0.44	0.31	0
Farm households			1
– Land	0.26	0.27	
– Other farm owned	0.14	0.15	
Input suppliers	0.26	0.27	0
Resource costs	–0.34	–0.31	0
Income transfer efficiency ratio[4]	0.27	0.285	1

These numbers are illustrative.
1. Derived from simulating a 5% increase in market price support for wheat in the European Union.
2. Derived from simulating a 5% increase in output payments for wheat in the European Union.
3. Assuming total decoupling.
4. Assuming farmers own 50% of the land they farm.

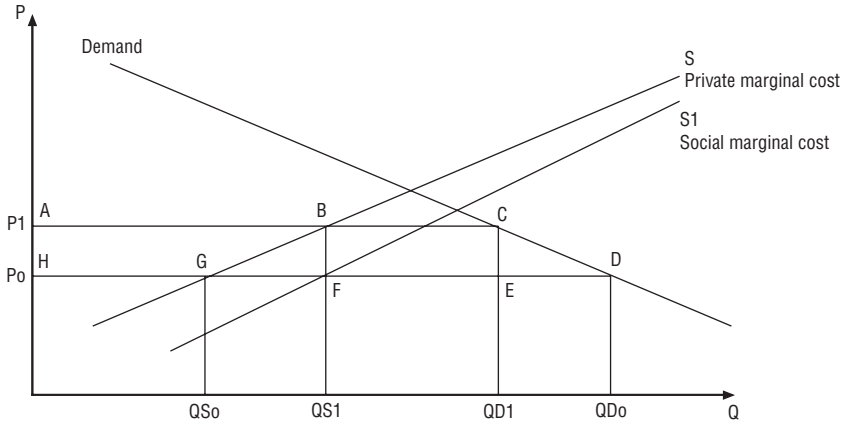
Source: OECD (2001c), adapted from Table A1.12.

When a coupled, targeted policy is used to correct a market failure in the provision of a positive externality (case of perfect jointness and of separate production not possible), the producer price is raised from Po to P1 in order to reach the social optimum (QS1 in Figure 2.3) and there is no deadweight loss on the production side. If an output payment is used, there is no deadweight loss either on the demand side, but with price support, the deadweight losses remain on the demand side. In addition, if a broad-based policy is implemented, unintended transfers from lack of targeting (*i.e.* generating a positive externality

Box 2.4. **Main assumptions on parameters retained to illustrate the comparison** *(cont.)*

in places where it is not needed) continue to generate deadweight losses on the production side, even though these are smaller. As explained in Box 2.3, if jointness is imperfect and if separate production is possible, deadweight losses on the production side of targeted and untargeted, coupled policies are attributed to commodity production and continue to be taken into account.

Figure 2.3. **Graphical illustration of deadweight losses in the case of joint production**



- **Additional cost of delinkage:** We have no information about the value of such costs. For convenience, they are expressed in the illustrative examples as a proportion of transfers (X or Y), with three alternative assumptions. The additional cost of de-linkage is either 0, 20% or 50% of transfers.
- **Targeting ratios:** The estimation of gains from targeting requires structural or regional information. For illustrative, pedagogical purposes, various assumptions are made on the required degree of targeting to achieve the objective.

Numerical examples of the formulas presented in Table 2.1 are presented in Figures I.4.1 and I.4.2. The three examples illustrated in these figures correspond to different situations from strong to weak jointness and from widespread to limited incidence of market failure. These examples are purely illustrative and do not reflect real-life situations. In fact, OECD work on multifunctionality has shown that many non-commodity outputs of agriculture are "specific to a particular site, locality or region" and that "it is not very common for them to be associated with all agricultural production in a country or all land in agricultural production" (OECD, 2003a, p. 70). In these cases, targeting ratios would be low. Non-commodity outputs display various degrees of jointness, which can often be modified by changing production practices. More efforts should be pursued to evaluate potential economies of scope and costs of de-linkage. In particular, the illustrative comparison in this analysis would benefit from improved assumptions on the additional

cost of de-linkage. The OECD is contributing to better understanding and measurement of jointness with the organisation of a Workshop on 30 November-1 December 2006.

There are various ways in which the parameters of the policy choices being faced can be presented. For example, for a range of targeting ratios, and a range of PRTCs as a percentage of transfers (%PRTCs) for a "reference" policy, it is possible to estimate the level of the %PRTC of an alternative policy, above which the alternative will prove more costly. This is done in Table 2.4 where a targeted decoupled policy (for example a payment for the maintenance of the agricultural landscape) is compared to the "reference" untargeted, coupled policy (for example, a price support granted with the same objective in mind). In this illustration the same base level of deadweight losses due to the coupled nature of the policy is used as in previous examples. Thus, if the %PRTC of price support is 1, the %PRTC of the targeted, decoupled option could be as high as 1 250 (at a targeting ratio of 0.1) and 50 (at a targeting ratio of 0.9), for the alternative measure still to be preferred. Similarly, if the %PRTC of price support is 50, the targeted, decoupled option is still preferable at a %PRTC of 1 740 (if the targeting ratio is 0.1) and 104, (if it is 0.9). This exercise is repeated for alternative pairings of policy options and presented in detail in Tables I.4.1 and I.4.2, where the impact of variations in the level of deadweight losses associated with the different options is also shown.

Table 2.4. **Market failure: The choice between a targeted, decoupled policy (6) and an untargeted, coupled policy (1) given assumptions on %PRTCs and targeting ratios**

Maximum value of %PRTC (tc6) for the targeted option to be lower cost (%) (illustrative purpose only)

Targeting ratio (Y + K)/X			Base assumption on the deadweight losses of the untargeted, coupled policy (dwl1 = 0.34)								
PRTC of the untargeted, coupled policy as a % of transfers (tc1)	0.1	0.2	0.25	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
1	1 250	575	440	350	238	170	125	93	69	50	35
5	1 290	595	456	363	248	178	132	99	74	54	39
10	1 340	620	476	380	260	188	140	106	80	60	44
20	1 440	670	516	413	285	208	157	120	93	71	54
40	1 640	770	596	480	335	248	190	149	118	93	74
50	1 740	820	636	513	360	268	207	163	130	104	84

[tc6 * (Y + K) = X – Y – K + tc1 * X + dwl1 * x], thus tc6 in % = 100 * {[1 + tc1/100 + dwl1]/[(Y + K)/X] – 1}.
X = transfers from an untargeted policy; Y = transfers from a targeted policy; K = additional cost of de linkage.
Source: Based on formulas in Table 2.1.

Calculations such as those could be undertaken systematically for real case policies and would permit policy makers to identify where key trade-offs occur. For example, a government faced with a choice between an output payment and a regional area payment, having at its disposal enough information to estimate the targeting ratio and the relative levels of PRTCs, and assuming that the deadweight losses associated with the regional payment would be lower, would be able to make an informed choice in favour of the lower cost policy.

2.4. Application to policies with multiple objectives

In the context of multifunctionality, the issue of PRTCs was raised in terms of the choice between a multiple objective policy that supports commodity production in order to obtain

non-commodity outputs, and several policies that would address individually each of the non-commodity outputs. In the comparative analysis presented above, policies are compared two by two. Similar comparative tables could also be developed to compare the combined cost of several individual policies and the cost of one policy with multiple objectives.

A broad-based policy pursuing two objectives can be compared with two targeted policies aiming each at only one of the objectives. For example, support to grazing livestock may generate a landscape amenity and employment on the farm. This type of coupled support can be compared to a regional area payment to keep land open, with production not required, combined with measures to promote employment from rural tourism. Let's assume that the broad-based policy generates deadweight losses of 34% of transfers, and that changes in other positive and negative externalities caused by the policy are offsetting. Transfers are X0. If PRTCs of tc0 are attributed to the first objective, there is no PRTC for the second objective. The first targeted policy transfers X1 (including the additional cost of de-linkage K1) with unit PRTCs of tc1, while the second targeted policy transfers X2 (including the additional cost of de-linkage K2), with unit PRTCs of tc2. Both targeted policies are decoupled from commodity production and have deadweight losses per unit of transfer of zero. In this context the sum of transfers from the two targeted policies (X1 + X2) should be equal or lower than the transfers from the broad-based policies (X0) to justify the choice of the targeted policies. Two targeted policies (1 and 2) are to be preferred to one broad-based policy (o) if:

$$DWL1 + DWL2 + K1 + K2 + PRTC1 + PRTC2 + X1 + X2 < DWLo + Ko + PRTCo + Xo$$

with

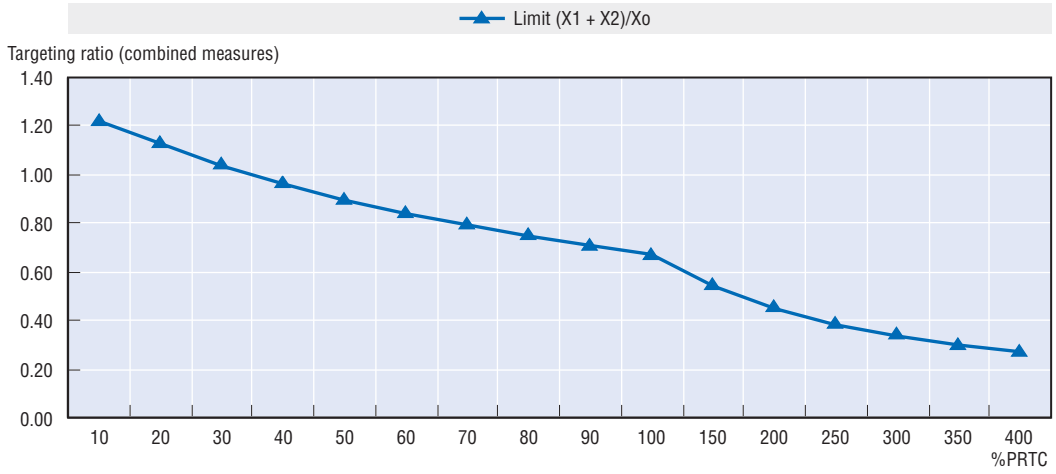
$$X1 + X2 < Xo.$$

Many combinations of degree of targeting and unit PRTCs are possible. To illustrate the trade-off between targeting and PRTCs, Table I.4.3 uses various combinations of these parameters and compares total transfers, total deadweight losses and total PRTCs of the two options. It shows that as long as the unit PRTCs of the two targeted measures are within the range of 20-30%, which can be the case according to the literature, they are to be preferred whatever the targeting ratios, as long as total transfers of the two targeted options are lower than these of the broad-based policy. Moreover, when the savings in transfers from targeting are over 25% [(X1 + X2)/X0 < 75%], the combination of targeted policies is most likely to be the lower cost option, even if the PRTCs account for a relatively large share of transfers (up to 50%). However, when the PRTCs of two targeted measures are relatively high (*e.g.* over 50%), a coupled, broad-based option with low PRTCs might be preferred if the targeting ratio is high. Figure 2.4 shows the minimum degree of targeting necessary for the targeted options to have lower costs relative to the unit PRTCs of the targeted policies (assumed to be equal).

With a multiple objective policy, additional factors should, however, be considered. First, the desired outcome of a broad production linked policy compared to a targeted policy will be the same only if there is perfect jointness between the commodity output and all the non-commodity outputs. A broad-based measure, however, is likely to cause more changes in other positive and negative externalities than a targeted measure. Second, it is likely that the combined PRTCs of policies implemented using the same delivery network and same database are less than if each policy was implemented alone. Third, monitoring and evaluation costs of a multiple objective policy will be higher than

Figure 2.4. **Market failure: Trade-off between targeting ratio and unit PRTCs based on different hypothetical combinations of key parameters**

Minimum ratio (X1 + X2)/X0 for the targeted option to have lower costs (illustrative purpose only)



those of a single objective policy but will not necessarily be higher than when several instruments are used in pursuit of several objectives, because several outcomes have to be assessed. Finally, the cost of evaluating the existence and degree of jointness is likely to be high. Another difficulty is that the presence of positive and negative externalities modifies the optimum solution and the amount of deadweight losses per unit of transfers. As a result, the change in deadweight losses when moving from a coupled policy to a decoupled policy is even more difficult to estimate as the shadow prices of all positive and negative externalities need to be evaluated.

2.5. Application to policies with income objectives

In this section, it is assumed that the purpose of the policy intervention is to ensure that all farmers reach a specific minimum income level. The same range of policy interventions is compared using the same methods as in the sections dealing with market failure, but with one major difference. When a coupled policy (*i.e.* an intervention that stimulates production) is used to increase income there are significant leakages to others who may be input suppliers or landowners who do not themselves farm the land. It follows that the transfer that is needed (for example in the form of higher prices paid by consumers) will be greater than the benefit to the farmer in terms of increased net income. A further layer of unintended transfers – those that leak out of the sector – must therefore be taken into account when comparing coupled and decoupled policies whose aim is to increase the income of farmers. For example a general finding is that 4 dollars of market price support will increase net farm income by approximately 1 dollar (OECD, 2001c, 2003b). For the comparisons that follow, the implication is that for farmers to receive an income boost of X through price support, the initial transfer may need to be as much as four times greater. This concept of income transfer efficiency is explained more formally in Box 2.5.

Estimates of the transfer efficiency per unit of transfer of various policies are derived from previous OECD work (OECD, 2001c) and presented in Table 2.3 of Box 2.4. The income transfer efficiency of market price support is estimated to be 27%, *i.e.* that 27% of transfers end up as additional net farm income (X = 0.27 * T), remuneration of labour and land) and

Box 2.5. **Income transfer efficiency concepts**

- **Income transfer efficiency** measures the efficiency of policies at transferring income to farmers (OECD, 2003b). When a policy is coupled to commodity production (*i.e.* it has an impact on production), producers purchase/rent additional variable inputs and land to increase production. As a result, some of the policy transfers are transmitted to input suppliers and non-farming landowners.
- **The income transfer efficiency ratio** is the share of transfers to producers that is retained as increased income. If one dollar of transfer to producers results in an increase of 25 cents in income, income transfer efficiency is a quarter. The more coupled the policy is, the higher its impact on production, the higher the additional land and other inputs paid for and the deadweight losses, the higher the share of transfers that leaks outside the agricultural sector and, thus, the lower the income transfer efficiency ratio.
- Transfers used to acquire additional inputs and land (from non-farming landowners) are **unintended transfers** if the objective is to transfer income to farmers as they do not contribute to the outcome. They leak outside the agricultural sector and benefit input suppliers and non farming landowners, who are not the target of the policy (unintended beneficiaries). Therefore, when the objective of the policy is to transfer income to farmers, they need to be taken into account in addition to resource costs and unintended transfers within the agricultural sector already mentioned. When the objective of the policy is not to transfer income to farmers but to obtain non-commodity outputs, the fact that part of the transfer leaks from the agricultural sector is not an issue if it is used to obtain the desired outcome. Income transfer efficiency is therefore not considered other than in examples relating to income support.

thus almost three quarters goes to unintended beneficiaries outside the sector such as non-farming landowners (nfl = 13%) and input suppliers (is = 26%) or are lost because of distortions in the allocation of resources (dwl = 34%). In equation form:

$T = DWL + NFL + IS + X$ or

$T = dwl * T + nfl * T + is * T + X$

It follows that $X = T * (1 – dwl – nfl – is)$ and $T = X/(1 – dwl – nlf – is)$

if $dwl = 0.34$, $nfl = 0.13$ and $is = 0.26$ as in the case of price support, then

$T = X/(1 – 0.34 – 0.13 – 0.26) = X/0.27$

This means that for transfer X to reach producers, transfers from coupled payments need to be equal to $T = X/0.27$. In the case of a decoupled payment that is not linked to land, transfer efficiency is 100%.

The derivation of total initial transfers by type of measure is presented in Table 2.5. Table 2.6 then compares unintended transfers, deadweight losses and total PRTCs for the different measures considered.

Figure 2.5 illustrates the difference between total costs of different policy options. All decoupled options prove less costly than coupled instruments, reflecting the significance of both the leakages and the deadweight losses associated with this type of policy. A targeted decoupled policy is the least-cost solution but even an untargeted, decoupled measure is significantly less costly than any coupled option.

Table 2.5. **Derivation of the total transfer necessary to increase income by Y using assumptions on key parameters**

Illustrative purpose only

For a given outcome (*e.g.* minimum income level)	Price support	Untargeted coupled payment (*e.g.* output payment)	Untargeted decoupled payment[2] (*e.g.* pay. based on historical entitlement)	Targeted coupled payment (*e.g.* limited output payment)	Targeted decoupled payment (*e.g.* targeted income payment)
Policy i	1	2	3	4	5
Transferred income to farmers Xi	X = 0.27 * T1	X = 0.285 * T2	X = T3	Y = 0.285 * T4	Y = T5
Deadweight losses DWLi	0.34 * T1	0.31 * T2	0	0.31 * T4	0
Unintended transfers from leakages to landowners and input suppliers Wi	(1 – 0.27 – 0.34) * T1	(1 – 0.285 – 0.31) * T2	0	(1 – 0.285 – 0.31) * T4	0
Original transfers Ti[1]	T1 = X/0.27	T2 = X/0.285	T3 = X	T4 = Y/0.285	T5 = Y

X = transfers from an untargeted policy; Y = transfers from a targeted policy; Z = transfers to unintended beneficiaries because of lack of targeting; W = transfers to unintended beneficiaries because of transfer inefficiency.
1. X = r * T implies T = X/a with "r" being the transfer efficiency ratio. T is also equal to Y + Z + W + DWL.
Source: OECD Secretariat.

Table 2.6. **Income support: Comparison of costs by policy type, using assumptions on key parameters**

Illustrative purpose only

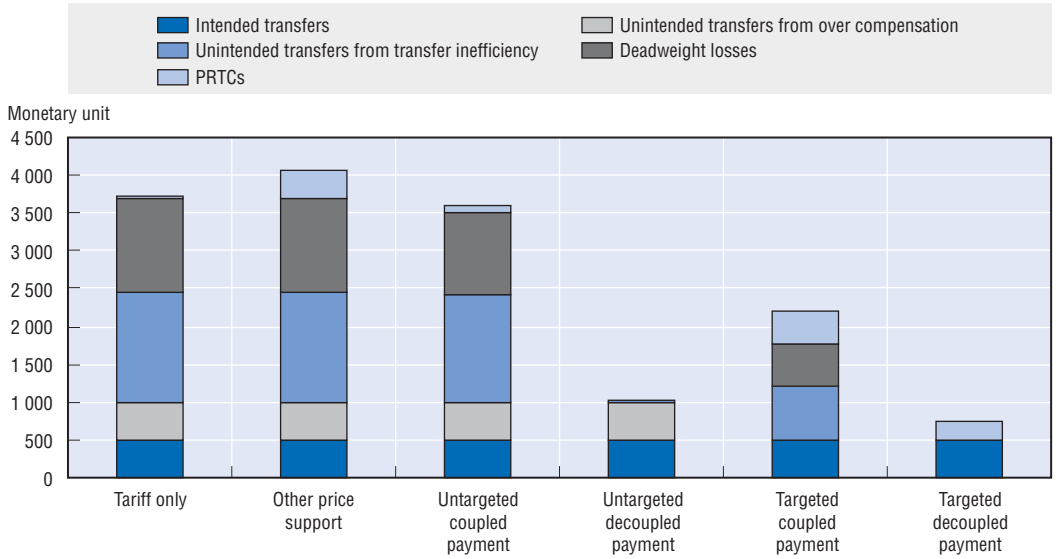
For a given outcome (*e.g.* minimum income level)	Price support	Untargeted coupled payment (*e.g.* output payment)	Untargeted decoupled payment[1] (*e.g.* pay. based on historical entitlement)	Targeted coupled payment (*e.g.* limited output payment)	Targeted decoupled payment (*e.g.* targeted income payment)
Policy i	1	2	3	4	5
Transfers Ti	X/0.27	X/0.285	X	Y/0.285	Y
Unintended transfers					
– Within the sector (from lack of targeting) Zi	Z	Z	Z	0	0
– Leakages to other sectors (transfer efficiency losses) Wi	0.39 * X/0.27	0.405 * X/0.285	0	0.405 * Y/0.285	0
Total deadweight losses DWLi	0.34 * X/0.27	0.31 * X/0.285	0	0.31 * Y/0.285	0
Total PRTCs PRTCi	tc1 * X/0.27	tc2 * X/0.285	tc3 * X	tc4 * Y/0.285	tc5 * Y

Y = transfers from a targeted policy; Z = transfers to unintended beneficiaries because of lack of targeting. W = transfers to unintended beneficiaries because of transfer inefficiency. T = Y + Z + W + DWL.
1. Deadweight losses and transfer efficiency ratios of Table 2.2.
Source: OECD Secretariat.

The comparisons to date are rather stylised in nature. Box 2.6 presents a set of calculations where the targeting ratio has been derived from actual structural and income data. A similar exercise could be carried out with respect to any policy objective. For example in the case of an area payment aimed at landscape preservation, the targeting ratio would relate to the share of the total agricultural area where it is desired to preserve the particular landscape value and where, to do so, a policy intervention is needed.

Figure 2.5. **Income support: Comparison of costs by policy type: illustration with a targeting ratio of 0.5, given assumptions on key parameters**

Illustrative purpose only



Source: Secretariat's calculations based on formulas in Table 2.6, unit PRTCs of the middle column of Table 2.2 and deadweight losses and transfer efficiency ratios of Table 2.3.

Box 2.6. **Numerical example of income targeting**

Income support is a widespread objective in OECD countries but most support is delivered in ways that are linked to production and goes to larger farms, often the richest ones (OECD, 2003b). Such support is therefore very inequitable and cost-inefficient in providing a safety-net to low-income households. Payments targeted to low-income households and triggered by income falling below a certain limit would be more efficient.[1, 2] A targeted programme would allow savings as only those with an income lower than some defined objective level would receive support and would also improve income distribution and equity. Based on structural information, the amount of targeted transfers that would bring low incomes to the objective level can be estimated. It can then be compared to the amount that would achieve the same result for the lowest income group, using market price support. The ratio between the two estimates is the targeting ratio.

Data for average support, farm income and farm household income per farm or household, by quartiles based on gross sales, are used in this exercise.[3] In Table 2.7, the amount of additional transfers needed to bring the average household income of all four quartiles to the level of urban household income is estimated, first for a targeted measure that only compensates the farm household groups under the objective limit, second for a MPS measure that would bring the lowest quartile at parity level with urban households and would be distributed as current MPS. The top quartile that in the first case would not need additional transfers receives over 40% of all transfers in the second case and all transfers are four times what they would have been with targeting. In this illustrative example, the resulting degree of targeting of a measure that precisely targets low-income household groups is 25%. Total costs are presented in Table 2.8 and Figure 2.6.

Box 2.6. **Numerical example of income targeting** *(cont.)*

Table 2.7. **Estimation of additional support to reach income parity using quartiles based on gross sales**

Quartiles (Qi)	1	2	3	4	All farms	Total Sum (Qi * Ni)
	Average per farm ('000 won)					Billion won
Number of farms (Ni)	300 553	300 553	300 553	300 553	1 202 212	
Total output	9 859	14 913	21 211	32 519	19 710	
Direct payments	177	185	193	260	197	245
MPS	6 992	10 658	15 045	22 679	13 940	16 643
Farm income	1 099	5 146	8 353	14 934	8 048	8 876
Farm housed income (FHIi)	5 021	13 508	20 921	38 542	20 223	23 441
Additional support to reach parity with urban households (UHI = 28 643 000 won in 2000)						
Targeted support (UHI – FHIi)	23 622	15 135	7 722	n.a.	11 620	13 969
MPS as currently distributed	23 622	36 007	50 828	76 619	46 769	56 226
Distributional losses						42 257

n.a.: not applicable as FHI > UHI.
1. Additional MPS in Qi = Current MPS in Qi * Additional MPS in Q1/Current MPS in Q1 (average per farm).
Source: OECD structural data for Korea in 2000.

Table 2.8. **Application to income policy comparison**

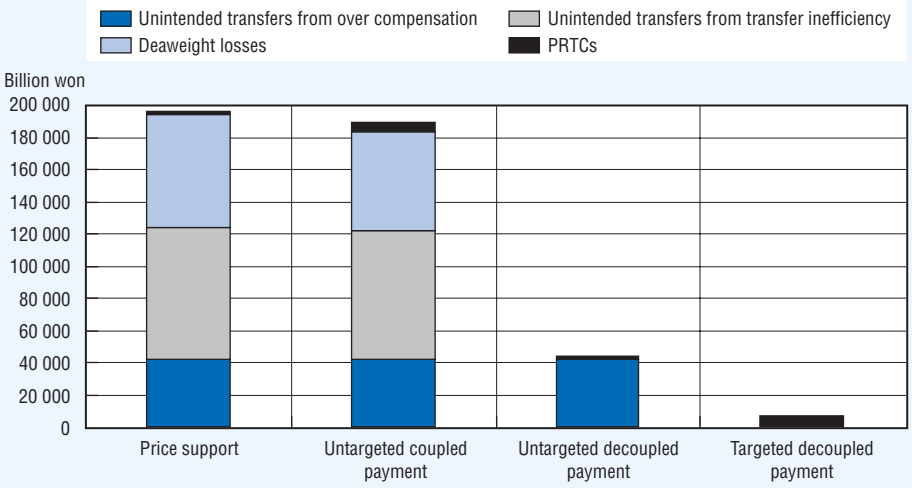
For given outcomes (*e.g.* minimum income level)	Price support	Untargeted coupled payment	Untargeted decoupled payment	Targeted coupled payment	Targeted decoupled payment	Policy with no transfer
Transfers	208 245	197 284	56 226	49 015	13 969	0
Unintended transfers	123 472	122 157	42 257	19 851	0	0
– Within the sector (from lack of targeting)	42 257	42 257	42 257	0	0	0
– From transfer inefficiency	81 215	79 900	0	19 851	0	0
Deadweight losses	70 803	61 158	0	15 195	0	0
PRTCs	2 082	5 919	1 687	12 254	6 985	0

Source: Formulas from Table 2.6, parameters from Tables 2.2, 2.3 and 2.7.

1. USDA (2000) for example compares the cost of alternative safety-net programmes targeting farm households that fall below a certain income criteria with the cost of current programmes. It finds that, even when alternatives have a higher total cost, the distribution of payments is markedly different as they benefit poor households.
2. They could be agriculture-specific or managed through the general safety-net, in which case marginal PRTCs would be lower.
3. Korean data for 2000 are used for the purely illustrative purpose of comparing policies that aim to bring farm household income to parity with income of other households. The choice of data is quite arbitrary and does not reflect any stated objective of the Korean government.

Box 2.6. **Numerical example of income targeting** *(cont.)*

Figure 2.6. **Comparison of total costs by policy type: Graphical illustration of income policy**



Source: Table 2.8.

Notes

1. In practice one usually refers implicitly to the Kaldor compensation criterion. In its simplified form this states that a policy change is commendable if it is potentially possible for the winners to compensate the losers. For small policy interventions that do not affect relative prices, a practical corollary is that a policy move is welfare enhancing if national income increases (Varian, 1992).
2. For the sake of simplification, no attempt is made to value outcomes in this analysis, which compares policies with the same outcome. Transfers are considered because the context is one of policy reform under financial constraints. In no case are transfers considered as a measurement of outcomes. They are a means to obtain the desired outcome. In the case of income policies, the level of transfers can be higher than the increase in farm income because of transfer inefficiency. The level of transfers is also generally different from the value of non-commodity output production and negative externalities, as there is no market where they could be equalised. Even with targeted and tailored policies, the transfer is usually not calculated as the value of the outcome, but rather the actual cost of achieving the desired result.
3. When valuing the different costs of a policy, care should be taken to avoid double-counting deadweight losses.
4. See Chapter 6, OECD (2003a).
5. While in conventional cost-benefit analysis, all welfare gains and losses are given the same weight, it is possible to use different weights to take account of distributional issues. For example, losses to poor households could be given a higher weight than losses to rich households to reflect equity concerns. The problem is to find the appropriate weights, as discussed in Chapter 15 of OECD (2006a).
6. A modelling approach developed as part of the cause and effect project carried out under the umbrella of the Joint Working Party on agriculture and the environment uses a welfare maximisation function to analyse policy choices in the case of agri-environmental measures. The structure of the model is described in Lankoski and Ollikainen (2003).
7. This means that the non-commodity output can be supplied independently from commodity production.
8. While the marginal deadweight losses vary along the supply curve, the unit deadweight losses considered here are an average over a given price equivalent range.
9. They could be expressed per hectare covered in the case of a land-based measure, with the same reasoning.

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