**FAO Trade Policy Technical Notes on issues
related to the WTO negotiations on Agriculture**

No. 5   Domestic Support: trade related issues and the empirical evidence

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Contents

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1   What are the issues?

This Technical Note[1] seeks to address two central questions relating to negotiations towards further disciplines on domestic support measures: (i) what are the characteristics of domestic support measures that cause such measures to have a potentially trade distortionary effect? and (ii) will further WTO disciplines on domestic support measures be effective in reducing levels of trade distorting support?

To provide context, the Note begins by summarizing how domestic support measures are currently disciplined within the Uruguay Round Agreement on Agriculture (UR AoA) and discusses the effectiveness of these disciplines. It then highlights the most significant aspects of the August 2004 Framework Agreement in terms of the potential for further disciplines on the use of domestic support.

The limited available empirical and theoretical evidence relating to the question of whether so-called "decoupled" payments are indeed minimally trade distorting is then examined. On the basis of this review, a hierarchy of categories of support measures that has been developed by OECD, ranking policy types in terms of their trade distortiveness, is assessed for its robustness under a range of criteria. A cautionary finding is that the detail of the design of such programmes, and in particular, the combination of domestic support policies used, is fundamental to their impact and hence their ranking.

In order to design domestic support measures that are truly decoupled from production, it is necessary to understand the mechanisms through which decoupling may affect production decisions. These commonly noted – but unfortunately little analysed – mechanisms include the impact of "decoupled" payments on fixed costs, on risk reduction and wealth effects, policy reversals leading to expectations of the amount of, and the criteria for, decoupled support, and imperfect input markets. This Technical Note provides a succinct account of these mechanisms.

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[1] This technical note has benefited from discussions at an informal expert consultation on domestic support held at FAO in August 2004, which focused on analytical and empirical work on issues regarding domestic support of relevance to the ongoing WTO negotiations.

The note then turns to consider the extent to which disciplines on domestic support are likely to be effective, given the way in which domestic support measures are currently treated within the WTO. It concludes by discussing how insights from existing studies can be used to inform the analysis of the implications of current negotiations relating to changes to the disciplines placed on domestic support measures and by highlighting aspects requiring further research.

2   How are domestic support measures disciplined in the WTO?

Current WTO disciplines on domestic policy use the concept of the Total Aggregate Measurement of Support (AMS), as a basis for quantifying, and negotiating reductions in, support. The main components of AMS are: i) market price support as measured by the gap between a fixed world reference price and the domestic administered price (which may not be the same as the domestic market price) at a particular point in time; and ii) budgetary expenditures (See Box 6 later in this Note for a fuller discussion of the AMS).

There are, however, a number of substantive exemptions made to the range of support policies which countries are obliged to include in their AMS calculations, as summarised in Box 1.

Box 1: Policies exempt from reduction commitments

Green Box Policies

Expenditures incurred in a given policy intervention can be excluded from the AMS calculation, and hence from reduction commitments, if the policy is deemed to have not more than "minimally" distorting effects on trade or production. The AoA stipulates that the support provided by the policy concerned must involve public finance rather than transfers from consumers, and must not involve price support to producers. Currently included in this box are: programmes that provide services or benefits to agriculture, but which do not involve direct payments to producers or processors, such as research programmes; pest and disease-control measures; public stockholding for food security purposes and domestic food aid policies; and direct payments to producers where they are not related to the type, volume or prices of production, or the employment of factors of production undertaken by the producer. The latter include "decoupled" income support; income insurance and income safety-net programmes, and structural adjustment aids provided through producer retirement and resource retirement schemes.

Blue Box Policies

The Blue Box provision currently exempts direct payments made in conjunction with production limiting programmes. This is of direct relevance to support policies in certain developed countries, such as the European Union's set aside programmes. These policies are not implemented by many WTO members but are important for some of them. In the August 1 2004 Framework Agreement, the definition of Blue Box policies was changed to include payment limiting programmes.

de minimis provision

> Where the AMS for a particular product, or for non-product specific support, constituted less than 5 percent[2] of the total value of production of a specific commodity (product specific) and/or 5% of the value of total production (non-product specific) respectively, the *de minimis* clause exempts that support from the calculation of the Total AMS. It is worth emphasising that Amber box policies not exceeding 5% of the value of agricultural production can be deducted twice under the *de minimis* clause, once for product specific AMS and once for non product specific AMS.
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> *Source: WTO (2004)*

How might the disciplines on domestic support be re-shaped in the current round?

The August WTO Framework Agreement provides some guidance as to how disciplines over the use of domestic support measures might be re-shaped by the current negotiations. The Agreement states that the final bound Total AMS will be substantially reduced using a tiered approach, implying that countries with higher Total AMS will be required to make greater cuts. In addition, the product specific AMS will be capped.

The Agreement also proposed the addition of a criterion for the Blue Box, which will be extended to include both direct payments under production limiting programmes *and* direct payments that do not require production if such payments are based on fixed and unchanging bases and yields; or livestock payments made on a fixed and unchanging number of head; and such payments are made on 85% or less of a fixed and unchanging base level of production. It is also agreed that Blue Box support will not exceed 5% of a country's average total value of agricultural production during an historical period, to be established in the negotiations. This ceiling will apply to any actual *or potential* Blue Box user from the beginning of the implementation period. In cases where a Member already has a large percentage of its trade-distorting support in the Blue Box, some flexibility will be provided.

The Framework Agreement states that Green Box criteria will be reviewed and clarified with a view to ensuring that measures have no, or at most minimal, trade-distorting effects or effects on production. Such a review and clarification "will need to ensure that the basic concepts, principles and effectiveness of the Green Box remain and take due account of non-trade concerns".

To move forward in the negotiations, it is clear that the issue as to what measures fall within which category is central. The two key sources of guidance for this are economic analysis of support policies and WTO dispute panel rulings. There is a growing body of economic literature on this subject which will be discussed below. On the second source, the most significant is the recent panel report on cotton dispute, as summarised in Box 2.

> **Box 2: Guidance from WTO panel rulings**
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> Some guidance as to the types of domestic support policies that may be assumed to have distortionary effects on trade is provided in the 2004 WTO panel ruling on support to US Upland Cotton production. The ruling, upheld following an appeal by the US, states that some components of the domestic support programme used by the United States, namely the marketing loan programmes and counter-cyclical payments, in addition to Step 2 payments,

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[2] 10% for developing countries

were found to cause significant suppression of cotton prices in the world market. However, it found that other components of the programme, namely direct payments such as the production flexibility contract payments, and crop insurance payments did not cause significant price suppression, although the production flexibility contract payments and direct payments were found to be inconsistent with the Green Box criteria because producers receiving these payments were excluded from growing other crops, such as fruit and vegetables.

Although listed as discrete policies above, the importance of considering combined effect of different policies in the programme of support is explained later in this technical note.

Source: WTO (2004a)

In the following section, the characteristics of support measures that are most likely, from a theoretical point of view, to increase the likelihood of them being production, and, therefore, potentially trade distorting are examined.

3   Evidence on the trade distortiveness of domestic support policies

In theory, all domestic support policies are to some extent production, and hence potentially trade distorting. The shift towards greater use of "decoupled payments"[3], either where the AMS has been seen to be potentially binding and/or where other forces are at play to reduce amber box support, has been associated with a shift towards mechanisms of support that are perceived to be less trade distorting than the existing policies. But is this association borne out by fact?

Since empirical evidence as to the trade distortiveness of decoupled payments is limited as they have not been in operation for long – only after the 1992 CAP reform in the case of the EU and after the 1996 farm bill in the case of the U.S., defining the degree of distortion is highly problematic (Ogg and van Kooten, 2004). Given the difficulty in estimating quantitatively, the degree to which a policy measure is trade distorting under a given policy and institutional environment, in order to motivate the discussion, an initial hierarchy of broad policy types is next set out and then various aspects of policy design are considered in terms of the impact that they might have on the hierarchy.

A hierarchy of trade distortiveness

The OECD has made substantive contributions to the literature on decoupling, both in terms of the development of conceptual frameworks and in empirical analysis of the degree of decoupling of various support measures (OECD 2001, 2004).[4] The analytical framework that has been used by the OECD is the Policy Evaluation Matrix (PEM), which permits the simulation of likely production and trade impacts of various stylized hypothetical policy measures. In order to account for the degree of uncertainty about the parameter values used in the model, a sensitivity analysis was undertaken in the simulation exercise. For each of 500 samples, a complete set of factor substitution and supply elasticities for each crop and country

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[3]The strict definition of decoupled subsidies is when payments are fixed and guaranteed and thus not influenced by ex post realisations of market conditions. Payments have to be financed by taxpayers and based on clearly defined criteria e.g. income status, factor use or production level (World Bank, 2003).
[4] Note that the analysis of risk issues is not amenable to PSE standardization. Conversion to a price/money metric requires assumptions on risk preferences, availability of state-contingent markets, etc (OECD (2004).

in the PEM model was randomly drawn from the uniform distributions of these parameters. Two policy simulations were conducted on each sample, one to determine the effect of market price support and one to determine the effect of an equivalent payment through the alternative policy.

The results of the simulations were then used to develop a rough hierarchy of policy types in terms of their production distortive nature, relative to the effects of market price support (MPS). The production impact for policy "*g*" is calculated as the additional production per unit of expenditure on the support mechanism. A production ratio[5] is then constructed to determine the production impact of each unit of expenditure on policy *g* relative to the production impact of the same expenditure on a policy of market price support.

$$ProductionImpact(g) = \frac{AdditionalProduction(g)}{AdditionalSupport(g)}$$

$$ProductionRatio(g) = \frac{ProductionImpact(g)}{ProductionImpact(MPS)}$$

Figure 1 shows the results of the simulation exercise in terms of trade impacts. A ratio of less than unity implies that the policy is more decoupled than a market support policy. A value of 1.59 implies an impact per unit of expenditure that is 59% higher than that caused by the same level of expenditure on MPS. Input support has a higher distortive nature than market price support because a greater proportion of input costs are reduced per unit of expenditure than the proportion by which the output price is increased by the same level of expenditure.

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[5] See OECD (2001) and OECD (2001a) for a fuller discussion of the derivation of the production ratios.

Figure 1: Distribution of estimated trade impacts of different policy types (sensitivity analysis with PEM model – 500 simulations)
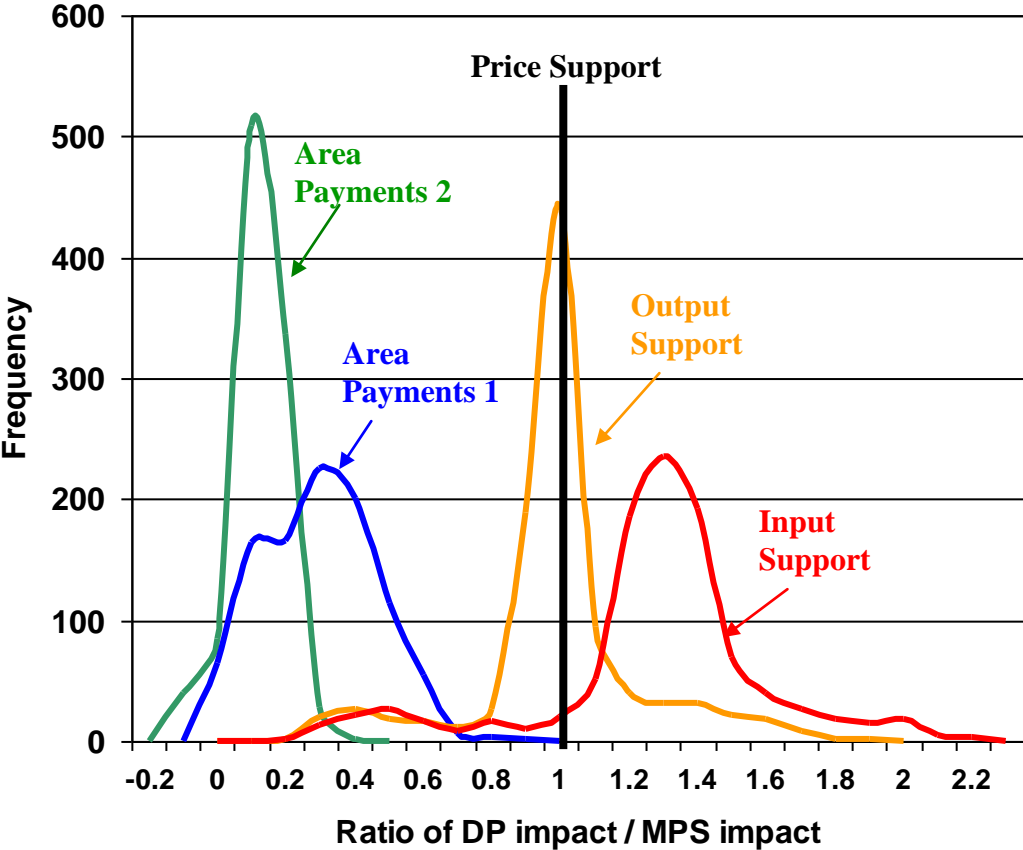
Source: Anton (2004)
Notes: Area payment 1 = payments based on area planted provided only to the main crop; Area payment 2 = payments based on area planted and provided to all crops.

How robust is the hierarchy?

The hierarchy reproduced in Figure 1 is based on the price effects of the different policies, that is, how the expenditures on policies affect the relative prices of inputs or outputs and how this in turn is projected to impact production levels. However, there are a number of non-price effects that could potentially affect the hierarchy. These include the effect of policies on the level of risk facing producers, the incentives and constraints to taking resources out of production, the design of a policy, namely its ease of enforcement and its propensity to change, and importantly, the effect of individual policy instruments when implemented in combination with other policy instruments.

Attempting to quantify the impact of a measure that does not work through the price effect is problematic. A number of existing studies have, however attempted to determine the significance of non-price effects: risk (wealth and insurance), exit from production, policy design, compliance and enforcement, updating, and the effects of combinations of policies and programme size.

The insights from these studies, whilst not providing a direct estimate of the magnitude of non price effects, can provide some guidance as to the attributes of policy measures likely to result in trade distortion.

Risk

Risk affects decisions as to how much of a resource to allocate to production (land allocation decisions and input use intensity decisions), and through wealth effects. Risk reduction acts as a form of insurance which affects the distribution of possible prices facing the producer, essentially, truncating the lower end of the price distribution and ensuring that producers cannot receive returns below a certain level. With reduced levels of risk, producers are prepared to invest more resources in the production of crops for which the uncertainty in relation to future price, revenue and or yields would otherwise be greater (Hennessy, 2004).

A number of studies have attempted to determine the effect of measures that either directly, or indirectly, reduce risk on production levels. Hennessy (2004) categorizes the approaches taken to include:

- The use of aggregate data and the framework of expected utility analysis in order to investigate the allocation and wealth effects of the policies. The effect on intensity, i.e. the level of input/investment per unit area, and the insurance effects are however, not well addressed in such studies.
- Simulation analysis given an estimated production function to investigate the intensity, wealth, and insurance effect. These studies do not address allocation effects.
- Dual analysis with allocation and wealth effects, but with no analysis of intensity effects
- Regression analysis based on annual data which only analyze allocation effects.

The OECD PEM analysis has been extended to incorporate the risk effects, for each policy type, in addition to the price effects. The OECD's Producer Support Estimate (PSE) (see Box 6) provides a measure of the level of transfers to producers, but does not capture the support provided through reduced risk since it focuses on relative price effects where used to compare the degree of impact of different groups of programmes. Therefore, OECD have considered the PSE over a number of years and examined the context within which support has been provided in an attempt to determine the reduction of risk from different components. They find that where risk effects are important, incorporating both price and non price effects changes the degree of distortiveness but not the overall ranking of trade distortive policies (see Table 1, which introduces the risk premium attributable to the policy). Although the ordering does not change, the measures move closer to unity for policies with production ratios of less than unity on the basis of price effects alone. This is because decoupled payments are more transfer efficient, in other words, they have larger non price effects relative to price effects than does market price support (MPS). In the table above, for example, 0.36 increases to 0.45 due to the risk reducing nature of area payments in several countries.

Table 1: Incorporating risk effects into the hierarchy

Components of the PSE measure	Production Ratios: Price Effects only	Production Ratios: Price and Risk Effects
Payments on inputs	1.59	
Payments on output of main crop	1.21	2.16
Market price support	1.00	1.00
Payments based on area of main crop	0.36	0.45
Payments based on area of all crops	0.2/0.02*	
Payments based on historical entitlements	0.13	0.18

Source: OECD (2004)   *without/with quantitative constraints (no sensitivity analysis)

Although partial in their coverage of non-price effects, most analyses reach a general consensus that wealth effects are modest, especially regarding intensity of resource use, but that insurance effects, and effects regarding area allocation can be larger.

de Gorter (2004) notes that since the combination of wealth and insurance effects can exceed the subsidy effect of a policy, it could be argued that risk intervention has been treated far too lightly in the negotiations to date. In a situation where the relative price effect is small because support is not directly linked to production, the risk effect can be very important.

Crop insurance

If insurance payments across crops are not identical, then crop insurance schemes can distort relative incentives for the production of different crops. Even if they are the same across crops they will still be production distorting in the sense that aggregate production will rise[6]. However, due to moral hazard, the production intensity effects of a crop insurance subsidy can have a negative impact on production (Babcock and Hennessy 1996, Goodwin and Smith 1995). The effects of crop and revenue insurance are not product specific and therefore, the absolute subsidies differ by product depending on their relative net return. Higher subsidy equivalents are therefore likely to go to riskier production (Young and Westcott 2000). The effect is similar to a fixed payment conditional on farming, in that it may keep some marginal land in production.

Data needs

To generate a better understanding of risk effects, whole farm studies with information on non-farm income sources and available risk markets are needed. Analysts would benefit from greater access to EU household-level databases. Data are also needed to estimate production functions. Here, FADN data alone are deemed to be inadequate. Attempting to work back to price impacts through FAPRI-type models (discussed below) would also be useful, but aggregation efforts will be difficult.

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[6] It should be noted that while US crop insurance measures have never been put in the Green Box, disaster insurance has. The rationale has been that the latter are calculated on a quantity basis and disbursed after the event and therefore their level is not incorporated in production planning decisions.

Exit

Do shifts from coupled to decoupled payments really affect whether marginal areas are taken out of (or brought into) production?

There is considerable uncertainty over what happens to marginal areas when decoupled payments are implemented. The effects of reduced levels of risk can be very different in the short run as opposed to the long run. Whilst most studies consider the short run, wealth effects can have lasting long-term effects.

Studies investigating the effects of decoupling often focus on the impact of policies on net return. However, it is possible that a situation could arise where decoupling does not impact the average net revenue facing all producers but could impact the distribution of net revenue if such policies result in a reallocation of support away from larger more efficient, to smaller more marginal farms. This could result in returns to the latter set of farmers increasing relative to that of the larger farms, land remaining in production, and possibly more marginal land being drawn into production as the net revenue of these smaller producers increases.

There is also a debate as to whether the focus of attention should be at the individual farm level or at the aggregate commodity level. On the one hand, the heterogeneity of farmers is stressed as being important and that it will be the decisions of marginal farmers that affect overall production levels. One study that takes these aspects into account (Chau and de Gorter, 2001) concludes that with exit decisions allowed, decoupled payments could have large trade distorting effects, because the transfers lower fixed costs and as such cross subsidize production of crops other than those for which the compensatory payments are meant, as land is kept in agricultural use.

Another related issue is that while producers can exit farming, the land that they farm, and which has few uses other than agricultural production, continues to stay in production, being transferred to other producers. Evidence suggests that the number of farmers in the OECD countries is falling, but that the level of resources committed to farming is not. It is also notable that production levels in the OECD continue to increase despite the greater use of "decoupled" support.

The focus should therefore be at the individual commodity level. For instance, at the margin do resources stay in the production of beef with a shift to decoupling or are they reallocated to wheat, for example? The analysis also needs to address the issue of resources with asset specificity to the product, possibly including human capital, although the importance of this may be restricted to certain specialized units or crops, and on the extent to which land is suited to certain crops. For this type of analysis, land allocation models are required.

Policy design

One difficulty in ranking policy categories with respect to their trade distortiveness is that in effect, the actual impact will depend not only on the type of policy in place, but on the way in which it is designed and the way in which it is enforced or implemented in practice. Impact is often highly policy-specific and so it is difficult to know in advance how this affects the ranking of measures as regards the degree of decoupling.

Enforcement

Enforcement costs also need to be incorporated into the analysis. Non compliance is often addressed by conditions attached to the receipt of payments, for example the violation of production quota limits or the misrepresentation of the level of production (output subsidies), or by the parameters that payments are based on (decoupled payments) (Giakannas, 2004). Whilst the economic consequences of non-compliance are highly policy-specific, they can increase the transfer efficiency of output subsidies and decrease *the* transfer efficiency of production quotas and decoupled payments. However, output subsidies will never be more transfer efficient than decoupled payments, since it is only necessary to check up on decoupled policies once, for example, where the historical area is declared.

Expectations of future assistance and updating of base payment parameters

Policies that generate expectations about payments in future years or which allow the updating of base periods are, by definition, not decoupled. When producers develop expectations of future assistance, based on past experience, when market conditions are adverse, their current production decisions are affected. Similarly, when producers know that they will be allowed to update base period parameters, e.g. areas, yields, production etc., their current production decisions will be affected. In this case, they will strive to maintain or augment current areas, yields and production in expectation of higher payments in the future. Such policies become production coupled through a number of channels, including fewer exits and/or increased entry to farming, increased area of existing farms, and increased farming on marginal lands. Both the phenomena noted here are not just theoretical facts but have actually been observed in some countries, and so act against the spirit, if not of the letter, of the AoA.

The effects of updating programme base areas and yields on farmer incentives can be investigated by determining how farmer expectations of an update are formed and adjusted. Models can incorporate how much a farmer's current planting of a crop affects expectations of future payments for that crop relative to relevant alternative crops. There are no empirical estimates of this relationship available yet, but the impact is bounded in its effect relative to a pure output related payment, by 0.0 and 1.0 and it is unlikely that either the lower or upper bound applies, as demonstrated in Box 3.

Box 3: An example of the implications of base updating for the degree of decoupling

Assume that a farmer places a zero probability of any update for the next 4 years and a 60% probability on an update 5 years from now with a 20% weight on this year's planting, and the next update 5 years after that. If the program has a 90% chance of remaining in place, the conditional t+5 payment is 90% of current payment, and the interest rate is 5%, then the payments are 42% coupled. That is, under this set of expectations a payment has 42% as large an effect on planted acres as a payment tied directly to current planted acres.

Source: Sumner (2004)

Imperfect input markets

One other reason why even "fully decoupled" support policies could affect farmers' investment decisions is the existence of imperfect input markets. When input markets are imperfect – that is when there are constraints facing producers in capital and labour markets – investment decisions are affected by direct payments. For example, where credit constraints have prevented farmers from investing optimally on their farm, the availability of direct payments allow banks to make loans that they otherwise would not, thus slowing exits and increasing investment in production capacity.

Combinations of measures

Another issue when considering the distortive nature of a policy is the effect of the policy set as a whole, rather than the effect of the individual policy. Analysts generally hold that the impact on production could be very different when a combination of policies work together, from that resulting from individual policies separately. However, little empirical work exists on how individual farmers react to different types of payments when all effects are taken into account.

One illustration of this view is the case of the US support programmes. Figure 2 plots net returns against market prices for maize based on a stochastic simulation exercise (Westhoff, 2004)) involving 500 possible outcomes calibrated to the year 2005/06. Over the range of market prices from \$2.3/bushel to \$5/bushel, the expected positive relationship between output price and net return is observed. However, where higher yields result in lower market prices, net returns do not fall because other components of support come into play, pushing up the net returns to a proportionally greater extent the lower the market price.

Figure 3 demonstrates how the different policy components come into play at different market prices. For example, where an increase in yields results in a decrease in the market price:
- The returns from the crop insurance increase as the market price falls.
- Direct payments which do not require production are based either on base acreage established before 1996, or updated based on the 1998 to 2001 planted area and do not vary with the market price.
- By contrast, the counter-cyclical payments (CCPs) are made when the domestic average price over the season falls below a trigger level (where the trigger level is the target price minus the direct payment rate) but the payments increase as the price falls only until the price falls to, or below, the loan rate. Therefore the CCP can never exceed the target price minus the direct payment rate minus the loan rate, no matter how low the market price is. The CCP has the same program rules as direct payments, in that no production is required on the base area and producers cannot develop land for non-agricultural commercial use or plant fruits or vegetables on payment acres.
- The Loan Deficiency Program payments are available on levels of current production. The producer takes out a loan and repays it at the lower of the loan rate plus interest or a "posted county price" . The posted county price is tied to a terminal price and is very different in different countries, as is the loan rate. For cotton and rice, an "adjusted world price" replaces the posted county price and both that price and the loan rate are identical across counties. (Westhoff, 2004).

Figure 2: Net returns to US corn production at different market prices (stochastic simulation)
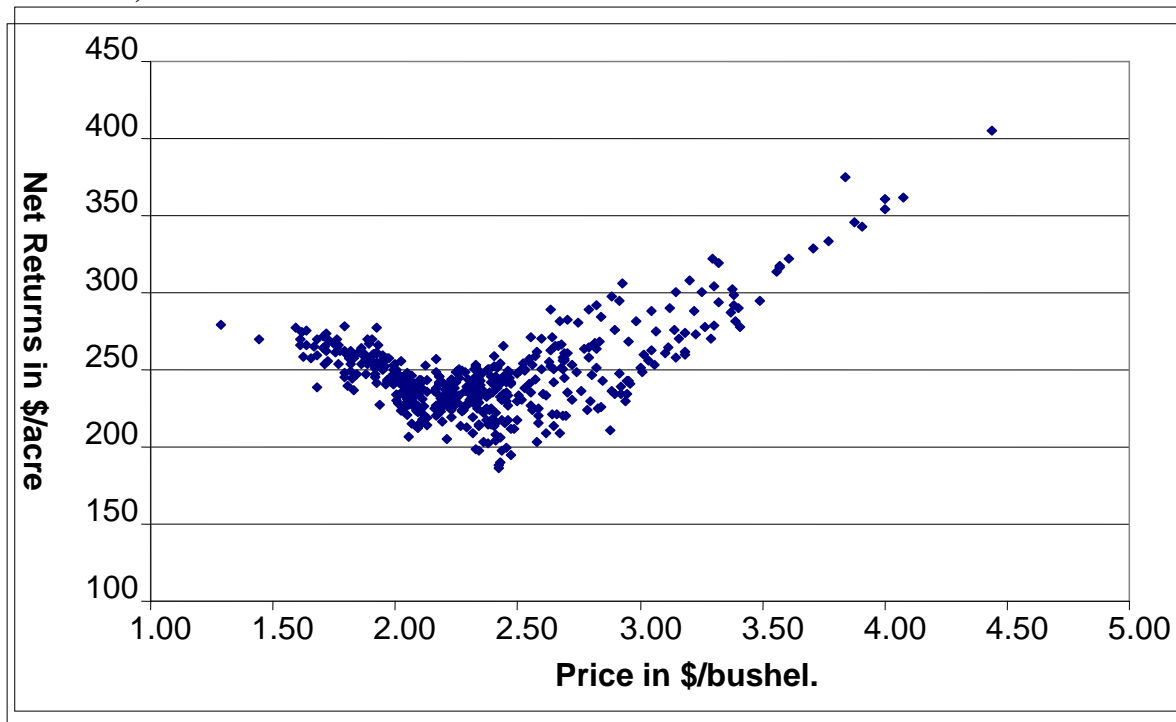
Source: Westhoff (2004)

Figure 3: Importance of different components of US support at different levels of market price.
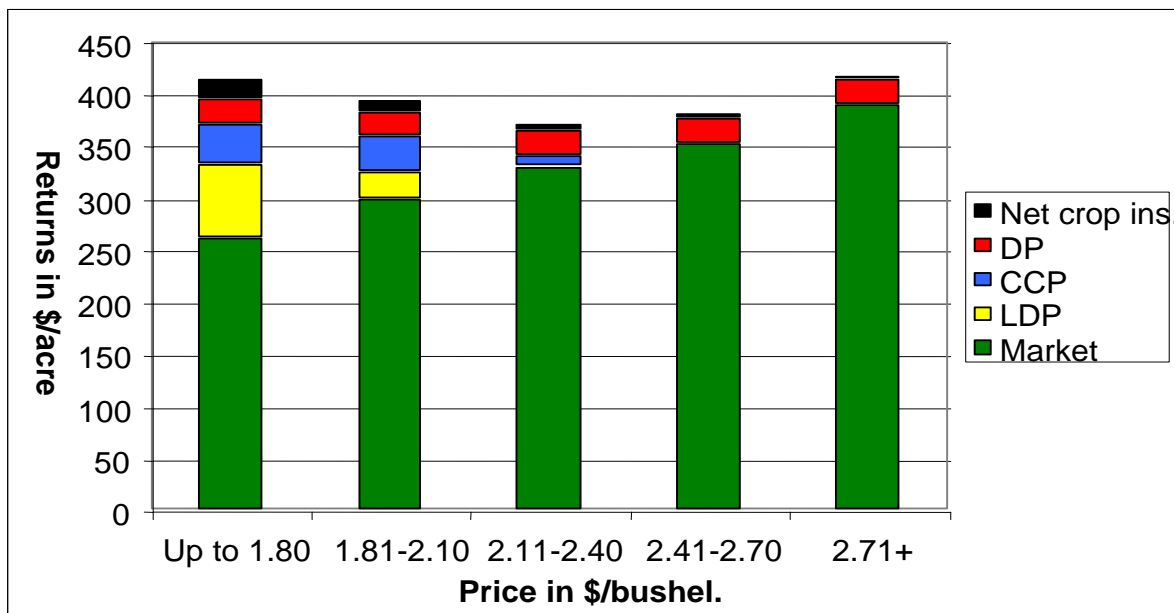
Source: Westhoff (2004). DP = Direct payments; CCP = Counter-cyclical payments; LDP = Loan deficiency payments; Market = market price

4 Incorporating assumptions about decoupling into modeling studies

Studies on the impact of policy changes are heavily influenced by the choice of elasticities representing the responsiveness of supply to a change in price incentives. As the review of the literature above showed, for a correct determination of the impact of policy reforms on the level of production and trade, these elasticities need to incorporate the likely effects of non price parameters, which include the choice of risk aversion parameters, external risk management opportunities, and exit decisions.

There is a large gap between what is demonstrated by theoretical studies, and what is known from empirical analysis, and therefore what is actually available in terms of useable elasticities for adoption in trade models. As a result, among the three pillars of the AoA, modeling the impact of domestic support policies (other than market price support) is the least advanced. Faced with this situation, analysts have taken recourse to one or more of three approaches in assigning particular values to these elasticities: i) estimates based on historical (generally time series) data; ii) estimates based on qualitative assessments; and iii) estimates developed synthetically. Of these, the third approach seems to be gaining popularity for practical reasons and is discussed below at some length.

(i) Estimates based on historical statistics

The typical standard approach that an economist takes (or would like to take) in obtaining elasticities is to estimate them econometrically on the basis of historical data on payments and levels of production. Two main limitations have been noted in this approach. First, domestic support programmes of the "decoupled" type have not been in operation for long, e.g. only after the 1992 CAP reform in the case of the EU and after the 1996 farm bill in the case of the US. As a result, there are not enough data points, and therefore the required degrees of freedom, to compute unbiased estimates of elasticities using econometric methods. Second, even if such data were available, the use of the elasticities estimated from past statistics for simulating the effects of new programmes may be questioned. For example, the single farm payment programme under the reformed EU CAP may affect production in a very different manner than the payment system of the 1992 CAP. When policy design and implementation mechanisms change, farmers' expectations about the impact of the programmes on their net returns also change, thus affecting the reliability of the estimated supply response parameters under the new conditions.

(ii) Estimates based on qualitative information

An alternative approach is to obtain farmers' opinions on how a given policy has affected or is likely to affect their decisions on resource allocation, crop choices and production. It is reported that the USDA has taken an initiative to survey farmers in an attempt to understand the impact of the various farm programmes.

(iii) Synthetically developed elasticities

Given the lack of econometrically estimated elasticities, as well as their lack of reliability for simulating the effects of new farm programmes, some analysts have been experimenting with synthetically determined elasticities that are based on a combination of available estimates, other analyses of farm programmes and expert judgement. In order to provide a flavour of what has been done, recent approaches/applications are discussed in the Boxes 4 and 5.

Box 4: University of Missouri's FAPRI model

FAPRI have experimented with various options in developing supply response systems that take into account the degree of decoupling of various subsidy programmes. The approach taken in the case of the US domestic support measures is roughly as follows. For each region of the U.S., mixed estimation methods were used to estimate total area elasticities, where total area devoted to major crops (area planted for grains, oilseeds, and cotton) is a function of a weighted average of expected net returns from the market and the loan programme plus 25 percent of "less coupled" payments (production flexibility contract payments and market loss assistance payments for the 1997-2001 period, and counter-cyclical payments (CCPs) and direct payments (DPs) for the projection period). These total area elasticities with respect to expected net returns are generally found to be small, and the weighted average for the U.S. is only 0.06. A matrix of own- and cross-effects is also constructed consistent with the estimated total area elasticity. While the parameters are synthetic, the estimations are done systematically, for example, imposing constraints from production theory.

Less coupled payments come into play in two ways. First, they have a non-commodity specific effect on total area. Since the total area elasticities are small and the direct and CCP payments are multiplied by 0.25, this results in a very small effect. Second, 25 percent of the CCP is also included in the expected net return for individual commodities. The logic is that CCPs have a commodity-specific price risk reduction effect, and the 2002 Farm Act updating of programme bases and yields for CCPs may mean they have been more effective than a more purely decoupled payment. In total, then, $1 of DPs has 25 percent of the effect on production as would a $1 increase in market returns, and $1 of CCPs has 50 percent of the effect (25 percent crop-specific, 25 percent non-crop specific). The contribution of various payments to total net returns obviously depends on market prices. For example, when market prices are slightly above the loan rate, loan program benefits will be small and CCPs will be at less than their maximum levels. Notice that the degree of coupling of the various programs is in essence assumed, and depends on the interpretation of the various programs by the analysts.

Box 5: Sumner's approach to modelling the impact of cotton subsidies

Sumner (2003) provides one of the most detailed studies analysing the consequences of the removal of US domestic subsidies to cotton. He treats various components of U.S. cotton subsidies differently and assesses their separate impacts on price and production. In his model, planted area is determined by expected net revenue multiplied by a linear supply coefficient. The expected net revenue per acre is defined as follows:

$$\text{Expected Net Revenue} = \text{Expected } [(\text{Market Price*Yield}) + (\text{MLB*Yield}) + (b_{pfc}\text{PFC} + b_{dp}\text{DP})) + (b_{mla}\text{MLA} + b_{ccp}\text{CCP}) + \text{CIS} - \text{Cost per acre}]$$

where, besides market price and yield, MLB is marketing loan benefits (which includes both loan deficiency payments and marketing loan gains); PFC is production flexibility contract payments (which applied during the period 1999-2001) and direct payments (DP) which apply during 2002 to 2007; MLA is market loss assistance payments (which applied during the period 1999-2001) and counter-cyclical payments (CCP) (which apply during 2002 to 2007); and CIS is the crop insurance subsidy.

A reduction in the expected amount of any of the four production subsidies affects planted acres and hence U.S. cotton production through the impact on expected net revenue per acre. The various b_i coefficients are intended to measure the impact on cotton net returns per acre of a given form of subsidy, relative to the impact of a simple market price change, and as such they measure the degree of coupling of the various payment types. A value of b=0 would imply that a particular payment has no impact on market returns, and hence is fully decoupled, while a value of b equal to 1 signifies that this type of payment is fully reflected in producer per acre returns, and hence is fully coupled. For instance, b_{pfc} and b_{dp} measure the impacts on net cotton return revenue per acre of PFC payments and DP relative to the impacts of market price changes. The same holds for the other forms of subsidies, namely marketing loan benefit and crop insurance subsidy. Sumner concludes that the production impact of the PFC is less than that of the DPs but that both have a positive, although less than unity, impact relative to market price support. There is no conclusive evidence for specifying the magnitudes of b_{pfc} and b_{dp} precisely, as no comprehensive statistical evidence has been produced – part of the problem being that there is little time-series data available for an econometric analysis. In other words one has to essentially assume the values of the b's. The paper discusses in detail the contributions of these payments to the per-acre net revenue and the magnitude of these coefficients.[7]

Sumner states that for the PFC impacts, a value of b_{pfc} between 0.15 and 0.4 seems appropriate, considering various channels of influence discussed in his paper, but uses the lower value of $b_{pfc} = 0.15$ for his simulations. For reasons discussed in the paper, the impact of direct payments on expected net revenue is assumed to be larger than that on the PFC payments. A range of 0.25 to 0.5 was considered appropriate, but he uses the lower bound value of $b_{dp} = 0.25$. The MLA payments are assumed to have larger production incentive than PFC payments and DPs (the MLA payments were notified to the WTO as Amber Box payments), but Sumner – to be on the conservative side - assumes a value of $b_{mla} = 0.25$. He also assumed a value of $b_{ccp} = 0.40$ for CCP payments although these were deemed to be almost as trade-distorting as loan payments. No adjustment was made for crop insurance (CIS), thus assuming that these payments are fully coupled.

Source: Sumner (2004)

In summary, while a considerable number of theoretical and analytical studies are available on the extent of production and trade distortive effects of various forms of subsidies, there are very few studies that have actually measured the coefficients in a manner that global trade modellers can use. In large part, this is because there is insufficient time-series data available. The examples in Boxes 4 and 5 suggest that modellers will need to assume values for the degree of coupling for some time to come.

Other model features

In analyzing and interpreting model-based results, it should be borne in mind that there are other aspects that can have an influence. Drawing upon a review of existing studies (not necessarily incorporating decoupled measures) of the impact of CAP reforms, Heckelei (2004) notes that the model structure (partial versus general equilibrium, comparative static versus recursive dynamic approach) need not necessarily affect the results significantly. Similarly, it does not seem to be important as to whether parameters are econometrically

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[7] Sumner's model also incorporates other subsidies, namely Step-2 programmes that affect both mill demands for US cotton in the US itself and world demand for the US cotton.

estimated or synthetically derived. However, two aspects can make a significant difference: (a) the baselines used for projections, against which the impacts of reforms are compared are vital and even comparative static results are not invariant to baseline projections, and (b) the level of differentiation with respect to crops and at the regional level can have significant implications for the results.

5 Will further disciplines be binding?

The discussions above are predicated on the assumption that the shift towards Green and Blue box categories of support occurs as a result of countries attempting to avoid constraints on their ability to support their producers as a result of further disciplines on non-exempt support measures. However, it has been recently argued by a number of commentators (de Gorter (2004), Berthelot (2004)) that at current levels, Amber box support measures are unlikely to be affected even if Aggregate Measure of Support (AMS) ceilings are cut significantly. The way in which support is measured in the context of the WTO agreement is a key reason for this. There are a number of limitations to the use of AMS, namely the way in which support is measured and the coverage of the measure, which raise questions as to whether the AMS is a more appropriate measure of domestic support than other measures of support, as explained in detail in Box 6.

Box 6: Measures of support: AMS vs PSE

Different indicators have been developed as measures of support to producers. The two most widely cited are the WTO's Aggregate Measure of Support (AMS) and the OECD's PSE. Although there are broad similarities in terms of the approaches taken, there are a number of methodological differences as discussed below. It is also important to bear in mind the reasons for which the alternatives were developed. The AMS is the basis for a legal commitment to reduce domestic support in the WTO Agreement on Agriculture, whereas the purpose of the PSE is to monitor and evaluate progress in agricultural policy reform.

The main components of AMS are: i) market price support as measured by the gap between a fixed world reference price and the domestic administered price (which may not be the same as the current domestic market price); and ii) the level of budgetary expenditures on domestic support policies that are considered to be trade distorting.

The OECD's Producer Support Estimate (PSE) indicates the annual monetary transfers to farmers from policy measures that (a) maintain a difference between domestic prices and prices at the country's border (market price support); and (b) provide payments to farmers, based on criteria such as the quantity of a commodity produced, the amount of inputs used, the number of animals kept, the area farmed, or the revenue or income received by farmers (see annex Table A1 for a full classification).

Like the AMS, the PSE includes a price gap as well as the level of budgetary expenditures by governments, but the key distinctions are that:

(a) The market price support in the PSE is measured at the farm gate level using actual producer and border prices for commodities in a given year, whereas in the AMS market price

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support is calculated by the difference between the domestic <u>administered</u> support price and a world reference price fixed in terms of an historical base period (1986-1988)[8].

(b) the PSE covers all transfers to farmers from agricultural policies, whereas the AMS, as discussed in Box 1 above, covers only domestic policies in the Amber box, and excludes production-limiting policies (Blue box), policies that are minimally trade distorting (Green box) and a *de minimis* level of trade distorting policies.

The result is that trends in the two indicators since 1986-88 are quite different. Whilst the AMS has fallen significantly, the PSE has remained relatively stable.

Figure 4: Continued high levels of support to farmers in OECD countries - Evolution of the AMS and PSE
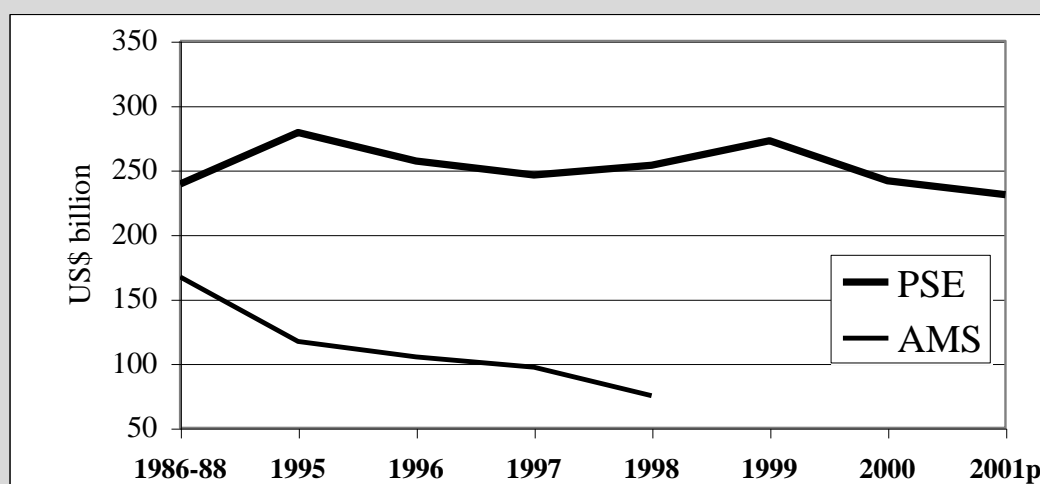
Source: Adapted from OECD (2004) Agricultural Support: How is it Measured and What does it Mean? Policy Brief June 2004 http://www.oecd.org/dataoecd/63/8/32035391.pdf

In the EU for example, the intervention price is purely an administrative accounting price. If the market price is greater than the intervention price and this in turn is greater than the world reference price, then the difference between the intervention price and the world reference price is the AMS. It is therefore possible to cut the intervention price and reduce the AMS without any effect on the level of support to producers. For example, if the administered price is $100/t, the world reference price is $60/t, but the domestic price is $120/t as a result of border protection, the gap between $100/t and $60/t, i.e. $40/t is used to calculate the AMS. The actual domestic price, supported by border protection, plays no part in this calculation (de Gorter, 2004).

In other words, the AMS is not based on current actual domestic and world prices and is therefore a misleading estimate of current levels of support. If the world price falls, and actual level support increases as a result, the AMS is unaffected because the administered price remains unchanged. Equally problematic, the AMS can be reduced without reducing support to producers, simply be altering the intervention price (which as demonstrated in the example, will not necessarily affect the domestic producer price). In the EU, for example, the

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[8] During the base period, world commodity prices were particularly low, and hence support relative to the intervention price was accordingly high, providing countries with a high bound AMS from which to cut.

intervention price for beef was significantly reduced in 2002, reducing the overall AMS by Euro 11.9 billion. In Japan, a similar policy change in the rice intervention price resulted in a significant cut in its AMS.

A further difficulty arises in that the price gap component results from the incidence of border protection, not as a result of domestic support policies. This component of the AMS is financed by the consumer and as such it should not be counted as domestic support. AMS should be defined as only that support that is financed by the taxpayer, in other words, the budgetary expenditure on support. Consumer financed payments should be omitted from the calculation to avoid double counting with border support. By way of reference, levels of support, as measured by the PSE, which are greater than the value of the ceiling AMS in all selected countries, are significantly reduced when the support provided through border support is subtracted.

Consumer financed payments are large in comparison to taxpayer financed transfers in many countries with AMS reduction commitments as demonstrated in Table 2. With the implementation of current reforms to the CAP, intervention prices in the EU will be close to world reference prices, implying a much lower AMS for targeted commodities such as cereals, (although it will still be high for some commodities including dairy). The EU will be well within the ceiling AMS and further cuts in AMS will be likely to have little effect on the EU's ability to use trade distorting support. Similarly, in the Republic of Korea, rice support is consumer financed and there is no production enhancement as a result of domestic support measures over and above the support provided through border protection (de Gorter, 2004).

It is possible that even an agreement to reduce AMS significantly will not be binding on the main users of Amber box policies, given the way that domestic support is currently measured. For example, de Gorter argues that the 20% downpayment included in the August Framework Agreement will not be binding. The level of support to which this downpayment refers, is the sum of the current AMS ceiling plus the permitted *de minimis*, which is defined as 10% of the value of production, plus the larger of the actual blue box expenditure or the blue box cap (i.e. 5% of the value of production).

de Gorter calculates that in the EU, the final bound total AMS (ie the AMS ceiling plus the 10% of the value of production for the *de minimis* plus current blue box expenditure) is equal to US$ 120.186 billion, while the actual AMS (ie the AMS ceiling plus actual de minimis plus actual blue box expenditure) is calculated at US$ 72.691 billion. Therefore a 20% cut in the total final bound AMS would give a new ceiling of US$ 96.149 billion, well above the current level of support (as measured by actual AMS) and allowing flexibility for increased use of Amber box support rather than further discipline. Similar results are calculated for the other QUAD countries.

Table 2: Measures of Domestic Support

	OECD's Measures		WTO's Measures of Domestic support										
	PSE	PSE minus border support	Green Box	Blue Box	Product Specific Domestic Support			Non-Product Specific[7]	AMS				
					Taxpayer Financed[2]	Consumer Financed[3]	de $minimis$ [6]		Ceiling	Notified			de $minimis$ as % of AMS
			-------exempt-------				--------exempt--------				% of ceiling	% cons. financed[8]	
	$ million		$ million		$ million	$ million	$ million		$ million	$ million			
EU	115,470	75,333	21,261	21,114	2,539	48,526	18.6	310	74,102	51,084	68.9	95.0	0.64
USA	54,433	21,597	30,591[4,5]	-	10,970	5,921	29.1	7,406	19,899	16,862	84.7	35.1	44.1
Japan	53,991	49,070	23,664	817	1,223	5,459	91.7	196	36,461	6,588	18.1	82.9	4.4
Korea	18,308	17,555	4,591	-	61	1,313	68.7	341	1,578	1,306	82.8	100.5	31.4
Mexico[1]	4,166	2,666	575	-	44	455	-	-	3,614	500	13.8	91.0	0
Canada	3,709	2,094	1,177	-	450	296	114	628	3,016	632	21	46.8	117.4

[1] Year is 1998.

[2] Refers to non-exempt direct payments.

[3] Refers to price gap.

[4] US also has $33,050 million in Green Box for Domestic Food Aid

[5] Includes $5,471 million in product specific support

[6] Includes both consumer and taxpayer financed and is exempt.

[7] All values are below de $mimimis$ levels and therefore exempt.

[8] double counting with over- or underestimated support, depending where actual world and domestic market prices are relative to world reference and domestic support prices.

Source: De Gorter (2004) based on OECD and country notifications to the WTO.

6   Concluding remarks

The insights generated from the review of existing conceptual, theoretical and empirical analyses of the impact of different types of domestic support payments allow a number of issues to be highlighted in the context of the on-going negotiations:

   (a) criteria for the categorization of policies as exempt from reduction, particularly those being classified as decoupled, require *effective* review and clarification.
   (b) mechanisms to allow the reallocation of support across the different categories or boxes need to be established in a way that does not prevent the shift towards less trade distorting support, but which prohibits re-instrumentation of support to allow exemption of policies that are, in effect, trade distorting.
   (c) further disciplines on domestic support may have no effect on levels of trade distorting support because of the way in which levels of support are currently measured.

(a) Tightening the green box

The preceding discussion provides a strong rationale for a systematic review of the criteria that policies must meet in order for their inclusion in the green box, and hence their exemption from reduction commitments.

Categorizing individual policies is difficult, but features of policies that are likely to be more decoupled than others include:
   * no possibility of base updates
   * all relevant land uses allowed
   * limited risk effect
   * payment programmes that are transitory and for adjustment purposes only

However, given the difficulty of disciplining domestic support through further cuts in the AMS (see point c below), there is a danger that tightening the criteria for the inclusion of measures in the Green box could discourage the shift towards more decoupled (even if not fully decoupled) support, making further reductions in more trade distorting support doubly difficult.

(b) Shifting between boxes

Is the shifting of certain policies from one box to another justified during the negotiations and indeed, after the negotiations? Countries should have the ability to make minor amendments in relation to policies without an extensive review of these changes by WTO Members. However, there should still be a basic mechanism of review to ensure that the policy is still consistent with the original box.

For a more significant policy change, early notification of the policy change and its potential impact in a manner that mirrors the SPS agreement, allowing WTO Members the opportunity to raise objections should be encouraged. It is noted that the August Framework Agreement does call for speedier notification.

To facilitate decisions related to shifts of support between boxes, the ranking of policies in terms of a hierarchy of trade distortiveness is useful. In developing the hierarchy, it is the features of policy that matter and these features (e.g. updating of bases) should be used to

determine criteria for classifying policies as Amber box, Blue box or Green box. For example, any component of a programme placed in the Green box that adds new crops or updates should be reclassified as Amber box support.

As analyses are refined and "decoupled" payments are found to have a positive production effect over a certain threshold, there needs to be a mechanism in place for the reclassification of such payments as Amber box.

(c) Measuring the level of domestic support

Section 5 of this technical note cautions that reductions in, and/or further disciplines in, the use of domestic support are likely to be based upon a measure of support that is problematic for a number of reasons, namely the methodology of its calculation, its susceptibility to changes in border policies, and its narrow policy coverage. As a result of these limitations, countries are likely to have significant, and possibly greater, flexibility in the way in which they are able to use domestic support measures in the context of a negotiated agreement.

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Annex Table 1: Classification of subsidies included in the OECD Producer Support Estimate

A		**Market price support**
	a	Based on unlimited output
	b	Based on limited output
	c	Price Levies
	d	Excess Feed Cost
B		**Payments based on output**
	a	Based on unlimited output
	b	Based on limited output
C		**Payments based on area planted or animal numbers**
	a	Based on unlimited area planted or animal numbers
	b	Based on limited area planted or animal numbers
D		**Payments based on historical entitlements**
	a	Based on historical plantings, animal numbers, or production
	b	Based on historical support programmes
E		**Payments based on input use**
	a	Based on use of variable inputs
	b	Based on use of on-farm services
	c	Based on use of fixed inputs
F		**Payments based on input constraints**
	a	Based on constraints on variable inputs
	b	Based on constraints on fixed inputs
	c	Based on constraints on a set of inputs
G		**Payments based on overall farming income**
	a	Based on farm income level
	b	Based on established minimum income
H		**Miscellaneous payments**
	a	National payments
	b	Sub-national payments

Source: OECD, *Agricultural Policies in OECD Countries: Monitoring and Evaluation 2000* (Paris: OECD, 2000) p. 143.