The subsequent section considers the categories of support in the order presented in the table. The exposition is proportionate to the volume of support and the novelty of the policy. Familiar coupled policies get brief review, reserving the bulk of attention for decoupled payments. Not included in the OECD typology, but addressed here, are bio-fuel and bio-energy policies. These are considered last. The analytical framework employed follows that of OECD (2001), which is in the analytical tradition initiated by Floyd (1965) and elaborated by Gardner (1987). This market-level approach identifies the initial incidence of a policy, whether in the product or factor market, and examines how initial changes in relative prices induce changes in outputs and factor employment. Policies decoupled from output and factor markets require a different analytical framework; the relevant unit of analysis is the recipient household: thus the section on decoupled support starts with a discussion of household-level models.

2.3 The distortionary impact of OECD agricultural policies

Support based on commodity output

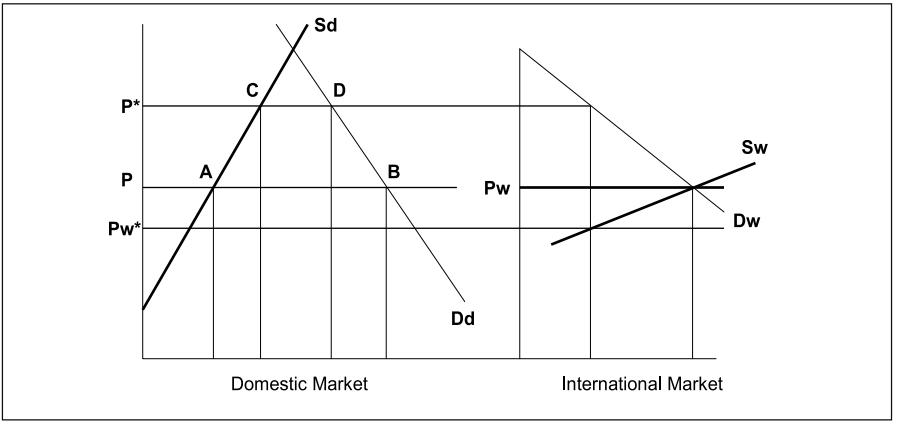
Support based on commodity output is the primary means of producer support in the OECD. The OECD typology distinguishes between market price support and payments based on output.

Market price support encompasses any intervention that creates a market price differential between the domestic market price and the border price for a given commodity, allowing for transportation and quality differences. Tariffs are the predominant form of border measure in the OECD. Import licenses, import bans, quotas and tariff-rate quotas are also employed as are exports taxes, export controls or bans and export subsidies. Domestic price support measures include intervention purchases, administered prices and domestic production and marketing quotas. Border measures and domestic price support measures operate through markets; the market price is raised or lowered for both producers and consumers of the affected commodity.

Figure 2.2 illustrates market price support by tariff. With no tariff the domestic price, P, equals the world price, Pw; and B-A units are imported. A tariff of P*-Pw is imposed to increase the domestic market price to P*. This increases domestic production from point A to point C. The higher domestic price reduces domestic consumption from point B to point D. Thus imports are reduced to D-C units. If the importing country is a "small country" in the international trade sense, changes in its imports are too trivial to influence the international market: the world price, Pw, is unchanged. A large country can influence international prices; the reduction in imports reduces the world price to Pw*. To sustain the same domestic price, P*, a

large country must impose a higher tariff (P*-Pw*) than a small country to offset the decline in the world price.

FIGURE 2.2
Market price support by tariff



Payments based on output do not directly influence prices paid by consumers. An output-based payment is usually paid directly to the producer from public funds. Most output-based payments involve a normative or target price; when market prices fall below the normative price output-based payments are generated to compensate (wholly or partially) for the short-fall.

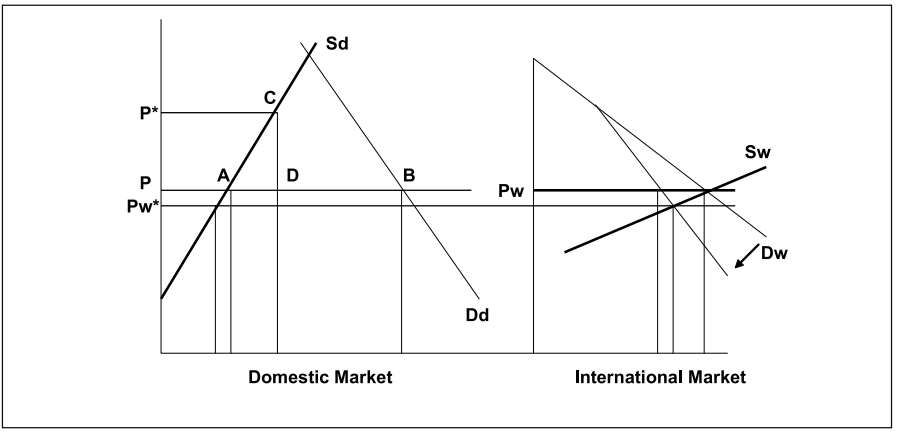
Figure 2.3 illustrates market price support by means of output-based payments. Paying producers P*-P per unit of output induces an increase in production from point A to point C. Consumer prices are not directly influenced; consumption is unchanged at point B[5]. However, the increase in domestic production displaces imports: imports decline from B-A units to B-D units. For a small country, this reduction in imports has no influence on international prices. For a large country, the international price is reduced to Pw*. The decline in the world price from Pw to Pw* results in a marginal increase in imports. It also forces the domestic government to increase output-based payments from P*-P to P*-Pw* if the target price of P* is to be sustained - as in a deficiency payment scheme.

Comparing the two illustrations and focusing on the large-country effects, it is evident that to achieve the same level of producer price support – at support price P* – a tariff causes more trade distortion than an output-based payment. Both

[5] Direct payments necessitate taxes, reducing disposable income and thus consumer demand. However, the effect on demand for a particular commodity is typically infinitesimal. General equilibrium analysis is required to gauge the impact.

policies increase domestic production, but the tariff, in addition, reduces domestic consumption. Thus the tariff causes a larger reduction in imports and a larger decline in the world price of the commodity.

FIGURE 2.3
Output-based payments, no tariff



The economic analysis of this form of producer support is non-controversial. There is an extensive literature on the topic and a general consensus about their costs, market effects and welfare or distribution impact. One variant that merits mention is output-based payments that are contingent on producers reducing the area that would otherwise be planted to the supported commodity or contingent on limiting output. Such conditions are usually imposed to reduce the budgetary outlay. Because these conditions usually result in a smaller increase in domestic production than in their absence they also reduce the trade-distortion effects. In terms of the previous figure, production is inhibited from expanding to C; the domestic supply curve is steepened beyond point A and the import demand curve rotates rightward commensurately.

Export subsidies belong or are directly related to output-based support, although they do not formally appear in the OECD rubric. Export subsidies are usually the by-product of domestic price support policies. A government or state marketing organization is sometimes obligated to purchase commodities deemed surplus to the domestic market; such purchases maintain the domestic market price at or above the normative minimum. If there is insufficient domestic demand or lack of other means of domestic disposal (military, prisons, low-income channels), then the accumulated stocks are often sold on the international market. To operate effectively, the commodity being subsidized must be prevented from being re-imported to the

exporting country. The difference between the purchase price P* and the world price Pw* (assuming a large country) is the unit export subsidy. Surplus stocks are also donated as food aid. After excessive use in 1980s, OECD recourse to export subsidies and foreign surplus disposal is now relatively minor. The Uruguay Round placed limits on the allowable level of export subsidies. At issue in the Doha Round is a ban on export subsidies.

Payments based on input use

OECD distinguishes between three kinds of input-based payments and, in addition, notes whether input constraints are imposed. Table 2.6 shows the amount of support for each.

TABLE 2.6
Payments based on Input Use, $ Billions 2005-07

Payments based on input use (total)	29.8
Based on variable input use	11.7
Based on fixed capital formation	9.9
Based on on-farm services	8.1

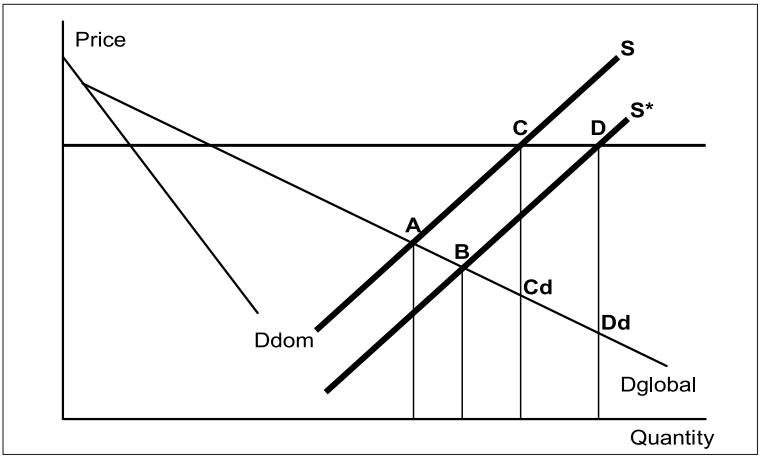
Payments based on input use were found by OECD (2001) to have the largest relative production- and trade-distorting impact of all kinds of producer support. This is not an entirely intuitive result. But consider the logic. There is an equivalence of input and output subsidies. A one-percent output-based subsidy has the same production effect as a one-percent subsidy on all inputs used to produce a commodity. In the OECD model there are two inputs, land and a second factor composed of all non-land inputs. The supply of land is relatively inelastic and the production distortion coefficient for current area (land) payments is about 0.40, considerably less than one. This means that the production distortion coefficient for non-land inputs must be greater than one. Otherwise, the weighted[6] sum of the two factor distortions would not sum to one, as required by the equivalence of input and output subsidies.

Input subsidies are often observed in conjunction with market price support or output-based payments. Figure 2.4 contrasts the production effect of an input subsidy with and without market price support, in this case output-price support. It shows a large, exporting country. Point A represents market equilibrium without input or output support policies. Point C is equilibrium for production with output-based price support – assume a target-price, deficiency payment scheme:

[6] Weighted by factor shares. The factor share of land is about 0.2. Multiplying by the illustrative distortion coefficient, 0.4, gives 0.08. This implies that the production distortion coefficient for purchased inputs must be about 1.15 = 0.92/.80 = (1-.08)/(1-.20) See Gardner (1987): 109-112.

consumption (domestic and export) equilibrium is at point Cd. A per-unit subsidy on input use causes a downward shift in the industry supply curve from S to S*. The production effect of the input subsidy alone is the horizontal difference B-A; with output-based price support the production effect is larger: D-C. The D-global demand curve includes the consumption of domestic consumers; the difference cannot be attributed to consumption changes. Rather, the deficiency payment effectively insulates domestic producers from changes in the market price of the commodity, domestic or international. The increase in production results in consumption equilibrium at point Dd. For a given elasticity of demand, an input subsidy combined with output price support causes a greater reduction in consumption prices than an input subsidy alone.

FIGURE 2.4
Input subsidy with and without market price support



A variety of inputs are subsidized within the OECD. Fuel, energy, freight, fertilizer, pesticide, and water, among others are considered as variable inputs. Crop insurance is sometimes included in this category; however, some kinds of crop insurance are categorized as output-based support[7]. The on-farm services category includes veterinary services, extension services, and pest and disease control. Certain preferential tax rates or rebates and subsidized loans (for example, for young farmers or for certain structures or improvements) fall into the fixed capital formation category; as do more traditional forms of investment – incentives for machinery purchase, livestock improvement, soil improvement.

[7] OECD (2009) provides an overview of risk-related policy measures for agriculture.

Payments based on current area, animal numbers, receipts, income

Payments based on current area and current animal numbers (headage payments) are a form of input subsidy and can be visualized in terms of the previous figure (inputs). Area payments result in a downward shift in the supply curve, however, because the supply of land is relatively inelastic, the vertical displacement of the supply curve results in a smaller increase in output than an equivalent subsidy for non-land inputs, the supply of which is more elastic. Because such payments tend to be a fixed amount per unit; the effective subsidy varies inversely with the productive quality of the underlying land or animal. The European Union accounts for the bulk of OECD current area payments and a high proportion of EU area payments involve input constraints, which limit the potential output response; moreover, these payments are not crop-specific; the fixed payment to planted area has the same monetary value for a range of crops. Cahill (1997) presents evidence that set-aside and other land use restrictions rendered some EU area payments decoupled: they negated the incentive to expand output. Sckokai and Anton (2005), examining a later period, find that EU area payments encourage an increase in area but also a decrease in yield, as greater land use substitutes for non-land inputs. Combined, the output response is less than the effect of price support, usually less than half the magnitude. Finally, the ultimate incidence of area payments depends on whether the recipient is the landowner, a cash tenant, or share tenant. EU headage payments involve restrictions on the number of eligible animals and other input constraints, reducing the incentives to expand herds and yields.

TABLE 2.7:
Payments based on current A/An/R/I, $ Billions, 2007

Payments based current A/An/R/I (total)	27.7
On Area (A) or Animal Numbers (An)	23.9
With input constraints	[18.3]
On Receipts (R) or Income (I)	3.8

As with input subsidies, if area-based or animal number based payments are combined with market price support (and no auxiliary restrictions on input or output) then whatever portion of the payment realized by the producer as a reduction in the cost of production is not transmitted to domestic consumers: consumers do not benefit because domestic prices do not fall. Rather, the incremental output is valued at or above the support price. In the absence of market price support, the increment in output reduces the domestic consumer price and encourages increased domestic consumption.

Payments based on non-current area, animal numbers, receipts, income - production required

This form of policy accounts for a small share of OECD agricultural support, less than one percent, or $US 1.5 billion. It is exists in a handful of countries (Canada, Iceland, Mexico, Norway, and Switzerland) for a variety of purposes. The most common form is support paid on the basis on non-current animal numbers. In some cases there is a limit to the number of animals per payment recipient and the limit is lower than most herd sizes. Thus the payment provides no marginal incentive, in terms of animal numbers, and this makes the payment effectively non-current. However, Canada and Norway report payments on the basis of non-current receipts, and Norway also reports payments for cultural landscape under this rubric.

This diversity challenges generalization. But, to the extent that one is required to continue to own dairy cows, for example, if the payment is based on non-current dairy animals, then there is a risk of some subsidization of dairy production proportionate to the ratio of non-current to current animal numbers.

Decoupled payments - payments based on non-current area, animal numbers, receipts, income - production not required

Payments in this category of support are commonly called decoupled payments. The distinction is that these payments are based on past, non-current, characteristics of the recipient or the recipient's farm operation. Decoupled payments are, by design and definition, not contingent on producing agricultural output or employing factors in agricultural production; nor are they contingent on receipts, income, or current prices. The payments are financial transfers to individuals; such payments do not provide a direct incentive to produce a particular output or, indeed, any output; similarly there is no direct incentive to employ any productive factors.

Decoupled payments cannot be directly represented in the analytical models of the Floyd-Gardner tradition because their initial incidence is not on product prices or on factor prices, rather the initial incidence is on household income and wealth. The challenge for agricultural policy analysts is to identify whether and how an increase in household income or wealth influences the household's agricultural commodity production decisions.

Box 2.1 provides a brief chronology of decoupling in OECD countries. Decoupled policies appear absurd when taken out of context. Why would governments transfer public funds to selected recipients and require, apparently, nothing in return? This would be an appropriate question if decoupled payments were initiated in the absence of pre-existing agricultural support. In fact, decoupled payments *always* replace other support policies: they are a means of compensation for the reduction or termination of other forms of support; they provide a potential exit

Box 2.1
A brief chronology of decoupling

In agricultural policy discourse the idea of decoupling antedates the term decoupling; the term came into common usage during the Uruguay Round negotiations. We note major policy innovations in the direction of decoupling. Baffes and de Gorter (2005) discuss the pre-history of decoupling and provide a richer chronology.

The MacSharry reforms of 1992 initiated a gradual reduction in commodity price support within the EU. Price support reductions were compensated by direct payments based on area or animal numbers, contingent on production and set-aside requirements. Effective in 2006, these direct payments were consolidated into Single Farm Payments (SFP). EU member states have some discretion over how SFPs are administered. In general, the payments are fixed and not contingent on commodity production and therefore qualify as decoupled.

Mexico in 1994 initiated PROCAMPO, a set of programs designed to facilitate farm household adjustment to NAFTA, the North American Free Trade Agreement. One PROCAMPO program is a fixed, decoupled income transfer based on area planted to nine basic crops in the three-year base period ending 1993. The payments did not require current production and were paid for 15 years; the final payments were disbursed in 2008.

In the United States, the 1996 Freedom to Farm Act introduced fixed, direct payments, not contingent on commodity production. These AMT (Agricultural Market Transition) payments accounted for a modest share of U.S. producer support; price-contingent and output-based support remain more important than decoupled support. The 2002 Farm Security Act converted part of the fixed payments into variable, price-contingent (counter-cyclical) payments. The 2008 Food, Conservation, and Energy Act maintained both fixed and variable direct payments, expanding the latter.

Switzerland introduced direct payments in 1993. Somewhat like the EU, Switzerland has reduced market price support (although from much higher levels) and made non-product specific payments based on area or animal numbers. In June 1996, a referendum amended the Swiss constitution; it allows direct payments for specifically defined public services provided by agriculture, subject to environmental compliance. In principle, these services do not necessarily involve commodity production, but facilitate ecological stewardship and the generation of other multifunctional amenities. [Federal Office for Agriculture, 2004]

from agricultural support. Decoupled payments can have a limited lifespan, such as PROCAMPO in Mexico, but this is the exception. The U.S. and EU decoupled payments have been open-ended; the payment flow is relatively secure until the next farm act or CAP reform. Thus, the transition period of compensation payments could be prolonged indefinitely.

Does decoupled imply non-distorting?

The assertion that decoupled payments are truly decoupled—that they have no production effect—was, and is, viewed skeptically. The literature on decoupling emerged around efforts to identify causal channels that could link decoupled payments to commodity output decisions and to find evidence to reject the hypothesis that the causal coefficient equals zero.

Researchers have made significant progress in meeting the challenge of decoupling. Many empirical studies reject the hypothesis that decoupled payments have zero production effect. However, the non-zero effects tend to be small and often insignificant – statistically and economically. This was to be expected. Consider the problem in terms of orders of magnitude. First, decoupled payments represent a relatively small increase in the recipient household's wealth, between 0.1% and 10%. Second the causal channel linking the income or wealth effect of a decoupled payment to output can be collapsed into an elasticity or coefficient, the value of which is less than 1.0 and typically less than 0.1. The product of the wealth effect and the causal coefficient yields a total effect often less than 0.01 and certainly less than 0.10[8]. In contrast to output-based and input-based support, which can be characterized as first-order effects, the lengthy causal chain linking decoupled payments to output results in second-order or third-order or an even higher-order effects.

Because U.S. decoupled payments have been paid since 1997 most empirical studies have been U.S.-based where payments are low relative to recipient household income and wealth. It is an open empirical question whether the small effects observed to date will remain small as the ratio of payments to income/wealth increases. EU Single Farm Payment studies are likely to answer this question as well as allow an examination of a more diverse set of farm household responses.

Decoupled payments, as currently defined in the WTO Agreement on Agriculture, are exempted from domestic support reduction commitments. If one accepts the

[8] Two excellent literature surveys, Abler and Blandford (2005) and Bhaskar and Beghin (2007), include annexes that present, in tabular form, the impact coefficients of decoupled payments. These coefficients are usually expressed in reduced form – as the elasticity of output or area with respect to the value of decoupled payment. The values do not exceed 0.10. The household approach, adopted here, suggests expressing the impact as the product of two effects: 1) the impact of payments on household income or wealth and 2) the income or wealth effect on household decisions regarding time/effort allocation, investment allocation, risk-bearing, and farm production activities.

proposition that a decoupled payment must have a strictly zero production effect; then the logical corollary is that a non-zero production effect implies the "so-called decoupled" payment is coupled. This line of reasoning suggests that a positive finding of non-zero effects could have immense political implications: decoupled payments could be re-classified as coupled and counted toward domestic support reduction commitments. The abstracts, introductions and conclusions of many decoupling studies are expansive about the implications of their theoretical or empirical findings for the classification of "so-called decoupled" support. But the text of the Agreement on Agriculture (Box 2.2) is not binary at zero: the fundamental requirement is "that they have no, or at most minimal, trade-distorting effects or effects on production."

The phrase "or at most minimal" has not been assigned an empirical value, and it is unlikely that a WTO dispute settlement panel or appellate body will set an empirical upper bound for the distortion rate allowed for exempt decoupled support. Law is categorical: it classifies policy based on its rules and administration, not on its realized effects. It is the form of support that matters. The dispute settlement process is designed to avoid having to judge among competing econometric estimates of some behavioral parameter, such as an elasticity. For example, part of WTO dispute DS267, United States: Subsidies on Upland Cotton, concerns restrictions on planting fruits and vegetables on area eligible for otherwise decoupled support payments. The issue was not empirical: the question was not whether the restrictions are effectively binding and influence planting decisions or even about the magnitude of the production effect. The issue was categorical: Are there restrictions on planting? If there are restrictions, then the otherwise decoupled payments are *per se* distorting. This is the test implied in Annex 2, paragraph 6(b) of the Agreement on Agriculture.

As in the development of competition law, empirical studies of the effect of policies can influence subsequent law or agreements. Preponderant evidence that a particular policy attribute is non-distorting could lead to its removal from the set of *per se* distorting practices. The converse also holds: empirical research could result in additions to the set of *per se* distorting policies. The logic of the Agreement on Agriculture (Annex 2) is to define as decoupled and minimally trade distorting those support policies that embody attributes that plausibly ensure minimal production- and trade-distorting effects: such policies are *per se* minimally trade distorting. This logic is consistent with the order-of-magnitude argument presented earlier. Policy attributes that pose a risk of inducing first-order production effects are proscribed; attributes that plausibly ensure only small, higher-order production effects are exempt from reduction commitments.

Analysis and discussion of decoupling and of decoupled payments often shifts between WTO-legal arguments and economic arguments. The two are frequently conflated: it is important to keep them distinct. The distinction advanced in this

Box 2.2

WTO Agreement on Agriculture, provisions related to decoupled payments

Annex 2: Domestic Support – The Basis for Exemption from The Reduction Commitments back to top

1. Domestic support measures for which exemption from the reduction commitments is claimed shall meet the fundamental requirement that they have no, or at most minimal, trade-distorting effects or effects on production. Accordingly, all measures for which exemption is claimed shall conform to the following basic criteria:
(a) the support in question shall be provided through a publicly-funded government programme (including government revenue foregone) not involving transfers from consumers; and,
(b) the support in question shall not have the effect of providing price support to producers;
plus policy-specific criteria and conditions as set out below.
…
6. Decoupled income support

(a) Eligibility for such payments shall be determined by clearly-defined criteria such as income, status as a producer or landowner, factor use or production level in a defined and fixed base period.
(b) The amount of such payments in any given year shall not be related to, or based on, the type or volume of production (including livestock units) undertaken by the producer in any year after the base period.
(c) The amount of such payments in any given year shall not be related to, or based on, the prices, domestic or international, applying to any production undertaken in any year after the base period.
(d) The amount of such payments in any given year shall not be related to, or based on, the factors of production employed in any year after the base period.
(e) No production shall be required in order to receive such payments.

paper is that the WTO definition of decoupling is categorical and economic analysis of decoupling is empirical[9]. Support is decoupled, in WTO-terms, if it conforms to the primary administrative requirements specified in the Agreement on Agriculture. Economists, in contrast, are interested in how support payments influence recipient behavior and decision making: this is an empirical matter. Coefficients representing

[9] The author emphasizes this distinction to clarify empirical and normative/legal arguments. WTO Dispute Settlement Body deliberations are not exclusively categorical, empirical evidence can matter, but categorical distinctions frame the arguments and predominate.

area and yield responses to decoupled support are required for simulation and forecasting. Economists are characteristically more concerned with what policies do than what policies are called. That these coefficients are sometimes called the "degree of coupling" or "coupling factor" risks conflating legal and economic arguments.

Core problems in the economics of decoupling

The research program on the economics of decoupled payments is sufficiently advanced that a few core questions or problems are evident. We suggest a typology of questions; it has two dimensions as illustrated in Table 2.8. There is a household/market dimension and a normative/positive dimension. These are not crisp dichotomies, as studies often embody both elements.

TABLE 2.8
Typology of decoupling research objectives

	Market models	Household models
Positive Problems	Calibrate "coupling" parameters for simulation and forecasting	Identify causal channels; estimate differential household responses
Normative Problems	Policy design; best practices; Targeting; Regulatory reform (Agreement on Agriculture)	

The household/market dichotomy appears obvious: the unit of analysis is either the household, using household or farm-level models and observations, or the unit of analysis is the market (commodity and factor market) – this includes representative farm models. This dichotomy corresponds to the distinction between agent optimization and market equilibrium. In this paper we emphasize household models that examine a wider range of household allocation decisions than just crop area allocation. This means considering time allocation, life-cycle influences, and off-farm income, assets and investments. Most decoupling studies use pseudo-household models. These are variants of the farm production optimization problem central to agricultural economics: maximize profit by allocating land and inputs given technology, input and output prices, and some resource constraints. This basic model is often recast as a household utility maximization problem, but the household's choice set is limited to how to allocate land among crops. These are not household models: they are models of commodity production units and such models may not be adequate for examining farm household responses to decoupled policies. May is used deliberately in the previous sentence: it may be the case that most farm households can be adequately represented as commodity production units. This is an empirical question; one that can only be answered by examining whether household models identify otherwise obscured causal relationships.

At the market or national level it is necessary to find parameter values to represent decoupled policies for simulation and forecasting purposes. Estimating an equation with acreage on the left-hand side and decoupled payments as one of several variables on the right-hand side is a reasonable way to find a degree-of-coupling parameter. It does not identify how or why decoupled payments are correlated with area, yields, or output; it only estimates whether there is a correlation and its magnitude. Gohin (2006:416ff) notes that major simulation models differ widely in the value assigned to this coupling parameter: FAPRI uses 0.0; AGLINK 0.14; GOLD 0.5; and CAPRI 1.0. Since this parameter is bounded between zero and one, there appears to be ample opportunity for some convergence in these values[10].

Household models are the best means available for understanding how and why decoupled payments influence commodity production and for understanding whether and how different kinds of households have different responses to decoupled payments: this is the positive household research agenda for the analysis of decoupled payments. The results of household research also inform the normative analytic agenda. Normative in this context means addressing questions of policy design: what characteristics must a decoupled policy have to ensure minimal production-distortion and trade-distortion effects? Answers to this question have implications for WTO negotiations and policy reform. The exemption allowed to minimally-distorting decoupled payments in the Agreement on Agriculture provides an incentive to satisfice in policy design. Ideally, policies could be distortion-weighted similar to the Basel II Accord on risk-weighting assets for determining capital adequacy for financial institutions. In practice such systems are difficult to administer and enforce. Setting the question of incentives for marginal reductions in distortion aside, the research agenda should be able to identify a set of best practices, or better practices that could make minimally-distorting policies even less distorting.

The positive household research agenda is also necessary for informing the design of targeted policies. As commodity policy (market price support and output-based support) comes under increased scrutiny – fiscal and WTO-related – there is a corresponding movement toward targeting payments to narrow objectives with greater public legitimacy; for example, to households on the basis of need and disadvantage or for the production of environmental amenities and landscape stewardship. This transformation requires extensive micro-level information for efficient administration and monitoring.

Household models and decoupled support

Because decoupled payments are a different kind of policy instrument than output-based and input-based support policies they require a different method of

[10] Bureau and Gohin (2008) provide a lucid analytic exposition of the "coupling factor" in area and yield response models. Balkhausen et al. (2008) provide a survey of simulations of CAP decoupling.

analysis. What is required is a model of the optimization problem of the decoupled-payment recipient's household. The household model needs to encompass the household's time allocation decisions, its consumption decisions and its savings and investment allocation decisions. The commodity production optimization problem is one of several optimization problems faced by and coordinated by the household; agricultural production is not necessarily the most important of the household's activities or its primary source of income. In fact, the recipient household may own farmland entitled to decoupled payments but lease its use to a farm operator; it may have no direct involvement in commodity production.

The first incidence of a decoupled payment is to increase the recipient's income or wealth. How does an increase in wealth influence a household's time, consumption and asset allocation decisions? The answers are considerably more complicated than the comparative statics of models of the Floyd-Gardner variety where the signs of the coefficients are almost always known. Farm profit or production functions have fewer degrees of freedom than the multi-period utility optimization problem of the household; moreover, there fewer relevant independent variables. For example, the age of the farm operator is not likely to influence the adjustment of factor use to a change in relative factor prices. But operator age is very likely to influence household savings-consumption decisions and asset allocations given an exogenous increase in wealth – Deaton (1992), Gollier (2001) Campbell and Viceira (2002).

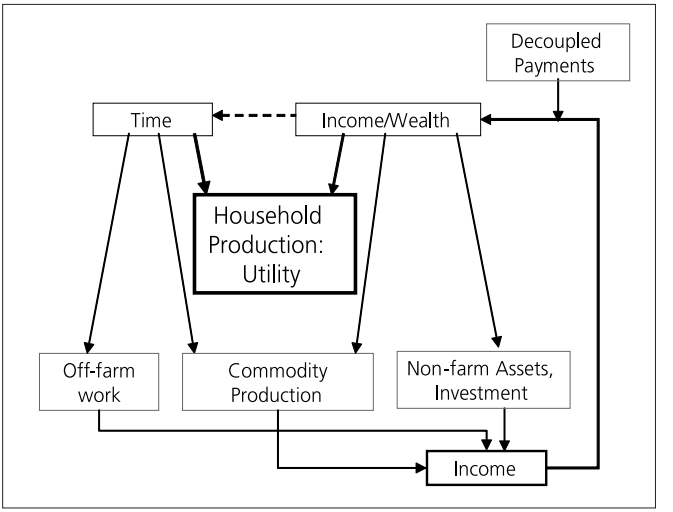
The paradigm-shifting insight of the economic theory of the household is the concept of household production. The household is not viewed as a consumption unit, rather it purchases goods and services from outside the household as inputs for household production. Household members combine their time with purchased inputs to create utility-generating activities. Preparing and consuming a family meal mixes household time and material inputs. Reproducing and raising children is the canonical example of household production: the outputs, children, are ends in themselves – sources of utility; they are not a means to increasing household income.

The objective of the household is the maximization of utility over its life-cycle. Utility is produced with time and money, or what can be purchased with income. Household production is the large bold rectangle in the center of figure 2.5: all other household activities are inputs into household production; there are no arrows leading out of the household production rectangle.

In a farm household the allocation of household time is between household production and market activity; market activity is divided between on-farm work (commodity production) and off-farm work. Both are sources of income. The allocation of household income is between current expenditure for household production and market investment – this includes inputs and investments for commodity production and off-farm investments (life insurance, residential property,

retirement, non-farm businesses). In this framework, decoupled payments are just another source of income, effectively equivalent to dividend income from a stock portfolio and as fungible. There is no reason to believe that decoupled payments are earn-marked for commodity production[11].

FIGURE 2.5
Household model



From the perspective of agricultural policy analysis, the full household, life-cyclical optimization problem presents multiple opportunities for fixed decoupled payments to "leak out" of farming. Indeed, if the household were at an optimal allocation before the injection of decoupled payments, one would expect the subsequent rebalancing to distribute a proportion of the increment in wealth from farm to non-farm investments. Taking time allocation first: the increment in wealth can be absorbed in greater leisure (or less time devoted to remunerative activities), in a reallocation of time to less remunerative, but more fulfilling activities or even in human capital accumulation through training or education. Second, consumption: It can be employed to increase current consumption or for the purchase of durable consumption technology. Third, savings and investment: The increment could be neutrally allocated across asset classes in proportion to existing portfolio shares[12].

[11] Whitaker and Effland (2009) and Whitaker (2009) find that farm households employ psychological accounting: they treat farm income differently than non-farm income although the two are perfectly fungible. They also find that decoupled payments are treated more like non-farm income than farm income while output-based support is treated as farm income.

[12] This corresponds to Constant Relative Risk Aversion (CRRA) – that the proportion of one's portfolio devoted to a specific risk class remains constant despite changes in wealth.

Or, analogous to normal and inferior goods, some asset shares may be increasing and others decreasing in wealth. Finally, it is possible to observe discrete or lumpy investments. The increment in wealth may shift the household across a threshold and facilitate a major structural re-allocation of household wealth and effort – for example, retirement, change of primary occupation, liquidation of a major asset. Thus the increment in wealth could be used to expand farming operations or to exit the sector. These effects are difficult to determine deductively.

The contemporary economic model of the household is a synthesis of several distinct research programs. The allocation of time by and within the household finds its origins in the work of Reid (1934), later formalized in Becker (1965). Formalization of the savings-consumption problem of the household can be attributed to Friedman (1957), Modigliani and Ando (1957) and Yaari (1965) with the life-cycle savings hypothesis, the permanent income hypothesis, and the origins of the bequest motive. The investment allocation of the household emerges in the work of Merton (1969, 1971) which builds on the seminal contributions of Markowitz (1952), Arrow (1953/65), and Tobin (1958).

The pioneering work of Reid (1934) was based largely on studies of time allocation on farm households. Becker's (1965) neo-classical formalization of the problem diffused rapidly; first to the study of household fertility decisions – Becker 1981, Schultz 1975 – and to the analysis of agricultural households in developing countries, for which Singh, Squire and Strauss (1986) is the key reference; Taylor and Adelman (2003) is a recent survey. The model integrates time allocation with consumption activities and production activities. The farm household presents a challenge because the distinction between consumption (including leisure) activities and production activities is not as distinct as for salary or wage-earning urban households.

In a recent survey of positive household finance – of how households actually allocate their financial assets – Campbell (2006: 1554) notes that observed household portfolio allocations are often difficult to reconcile with normative household finance, what theory suggests or predicts households should or will do. He notes two challenges. "First, positive household finance requires high-quality data that are hard to obtain. Second, normative household finance requires significant extensions of textbook financial theory."

Household data

Availability of appropriate, high-quality data is the usual binding constraint in empirical economics. As Leontief (1971, 1982) argues, empirical economic research too rarely employs primary data; it typically relies on secondary data, often government statistics collected for reasons unrelated to the economic hypothesis in question. The development of experimental economics has attempted to address

the Leontief challenge, but its application is limited—experiments are expensive and, as they involve human subjects, involve ethical, legal and regulatory restrictions.

There are several major survey research programs in OECD countries examining individual and household income dynamics. The best are panel surveys; they track respondents through a series of consistent periodic surveys. They allow the construction of consistent life-cycle profiles and facilitate causal inference. (McGonagle and Schoeni 2006, McNeil and Lamas 1989). More common are cross-sectional surveys; these usually involve random (stratified) sampling from a population. Periodic cross-sectional surveys allow one to make plausible inferences about changes in the characteristics of the underlying population, and even some sub-strata of the population. But individual and household effects cannot be observed. Because farm households constitute a very small share of total households in most OECD countries, national-level household surveys do not provide a very large sample of farm households and this limits the scope of statistical inference.

Agricultural economists have developed specialized surveys to study farm management and production decisions at the farm household level. These can be very informative but their emphasis, understandably, is on the commodity production activities of the farm. Coverage of off-farm time allocation, off-farm investment and life-cycle and estate planning are often not considered or are not addressed in detail. The profession is well-aware of the data challenge. Offutt (2002), in a presidential address to the American Agricultural Economics Association, argues that agricultural policy analysis will become increasingly dependent on household-based models, particularly because the locus of intervention is shifting from commodity markets to household characteristics and local environmental externalities and amenities[13]. Precision in targeting requires precision in data, measurement and monitoring. [See Moreddu and Poppe (2004) on farm households and Moreddu (2007) on targeting agricultural policies.]

Household models and wealth effects

Wealth effects are difficult to study because there is no uniform method of measuring wealth. Juster et al. (1999) show how the two primary U.S. data sources, the Panel Study of Income Dynamics (PSID) and the Survey of Consumer Finances (SCF) differ considerably in the measurement of household wealth. The differences vary among classes of asset. Second, wealth effects appear to differ by asset class. Juster et al. (2005), using PSID data, find that an increase in wealth from appreciation of equities results in a greater increase in consumption than an increase in real estate or business asset values. There is an active debate about whether the consumption increase correlated with appreciation of real estate

[13] See also the proceedings of the Workshop on the Farm Household-Firm Unit: its importance in agriculture and implications for statistics, April 2002. http://household.aers.psu.edu/Default.htm