(pre-2006) is a direct effect of wealth or indirect via the credit channel - Aron, Muellerbauer and Murphy (2006) provide a good summary of the debate. Thaler's (1985) concept of mental accounting, that people mentally segregate funds that economists and accountants would view as perfectly fungible, has gained sufficient empirical support to be accepted as a stylized fact. Goodwin and Mishra (2005) find that U.S. farmers report (in the 2003 ARMS) that they use about two-thirds of decoupled payment receipts for farm operations and about one-third for home (non-farm) use. But these magnitudes do not correspond with observed increases in farm budgets. Households may be reallocating funds from farm to home operations in other household accounts, fully or partially offsetting the inflow of payments reported as allocated to farm operations.

Our discussion of decoupling research builds on earlier critical literature surveys – Burfisher and Hopkins (2003), Abler and Blandford (2005), Bhaskar and Beghin (2007) – which have identified the primary causal channels between wealth effects and farm production decisions. These are the effect of changes in household income/wealth on: 1) Time allocation and 2) Money, the allocation of household financial resources because of changes in a) credit and credit-worthiness and b) risk aversion and risk bearing. Because U.S. and EU decoupled payments are linked to land they are not pure financial transfers; therefore we examine briefly studies of the impact of decoupled payments on the markets for land ownership and land rental.

Time allocation channel: Labor/leisure, on/off farm

The economic theory of the allocation of time predicts that time will be allocated so that its marginal utility is equalized across activities. The opportunity cost of an hour of leisure, at the margin, equals the individual's marginal wage rate; and, if an individual works multiple jobs, work time will be allocated to equate marginal wages (adjusted for the relative disutility of effort). A coupled payment, for example an output-based payment, increases the unit value of the output and the value of the marginal product of its inputs, including farm labor. Thus coupled support provides an incentive to adjust the allocation of time toward on-farm work and away from either leisure or off-farm work. Decoupled support, in theory, does not directly influence relative output or input prices and therefore provides no direct incentive to reallocate time (no substitution effect). Because decoupled support increases the recipient household's wealth and current income, a wealth or income effect may induce time reallocation.

The standard prediction is that greater wealth is likely to result in more time allocated to leisure. Imbens et al. (2001) provide an empirically clean and concrete example. They analyze the work and savings-consumption responses of lottery winners and provide a review of research on similar "natural experiments." Lottery earnings are a form of decoupled payment, stochastically contingent only on

having purchased a lottery ticket and not contingent on current employment or consumption. The lottery winnings studied are paid over a 20-year period, and the analysis uses a discounted life-time utility model. Lottery winners increase time allocated to leisure: post-winning labor earnings decline about 11 percent; the effect is substantially greater for winners 55 and older.

There are several studies that use ARMS (Agricultural Resource Management Survey of USDA) data to explore the labor time response to decoupled payments. ARMS is a stratified cross-sectional survey; it is not a panel and cannot track household responses across years.

Ahearn et al. (2006) examine whether government payments influence recipient households' off-farm work hours using 1996 and 1999 ARMS data and find a very small, but statistically significant reduction in off-farm hours worked. The study does not examine on-farm hours, nor does it include off-farm employment earnings in the analysis. El-Osta et al. (2004) examine the off-farm and on-farm household labor response to the expected receipt of government agricultural program payments using 2001 ARMS data and find that both coupled and decoupled payments are associated with a reduction in off-farm employment and a slight increase in on-farm employment. Curiously, the impact of decoupled payments is greater than for coupled payments, but the effects are small – about an additional week of on-farm work for the average decoupled payment. The authors suggest that "the positive impact of on-farm hours worked implied that payments, in total, are viewed as synonymous with an increase in the farm wage rate, rather than as a decoupled lump-sum subsidy." [381] That is, they suggest that recipients somehow mentally re-couple the decoupled payment as an increase in the relative value of farm effort.

Dewbre and Mishra (2007) use 1998-2001 ARMS data and find that decoupled payments received by farm households that do not engage in any off-farm work are associated with an increase in leisure hours, while coupled payments result in an increase in on-farm work hours. Both effects are small. For households that do work off-farm, decoupled payments are associated with a small increase in on-farm hours, but less than the effect for coupled payments. The study also estimates the transfer efficiency of payments. This is measured as the proportion of the payment that is retained as net household income. About 97 percent of decoupled payments are transmitted to household income. Coupled payment transmission ranges between 49 and 83 percent. The differences between the coupled and decoupled transfer efficiencies are statistically significant. The reasoning is that a portion of coupled payments are absorbed in expenditure on farm production costs.

Key and Roberts (2009) provide an interesting reinterpretation of these earlier ARMS-based studies. They estimate a large wage differential between on-farm work and off-farm work for farm operators: off-farm work pays substantially more,

as reported in ARMS (2002-04) and calculated in the paper. The calculated median hourly wage for farm work (imputed based on net income from farming) is *negative* $1.32; the corresponding off-farm wage is $19.69. Key and Roberts argue that this difference can be interpreted to indicate large non-pecuniary benefits from farm work; otherwise the revealed preference for on-farm work is economically irrational. This re-frames the standard labor-leisure model: on-farm labor is quasi-leisure as it is apparently generates utility, while off-farm work hours involve normal labor dis-utility. This revealed preference for on-farm over off-farm work may provide an alternative explanation of the results of the three studies reviewed above. It follows that decoupled payments or any exogenous increase in income will lead to an increase in on-farm hours (as work-cum-leisure) and a decrease in off-farm labor supplied by the farm household. The authors also assert that this increase in on-farm labor could be substantial and therefore generate large production effects with potential WTO implications. They provide no evidence of this magnitude, but the increase in on-farm hours must approximate that found in the other ARMS studies: small. Indeed, the low (negative) returns to on-farm labor reported by Key and Roberts indicate that additional hours "working" on-farm have a very low or negative value marginal product. Findings of a revealed preference for on-farm work are not unique the United States. Fall and Magnac (2004) find comparable gaps between on-farm and off-farm hourly earnings for French farm households.

The Single Farm Payment has not been in effect sufficiently long for much empirical work to come to light. Douarin (2008) surmounts this data barrier by surveying French farmers about their likely time allocations under three policy scenarios: Agenda 2000, SFP as applied currently in France (this includes some coupled payments for specific crops and livestock), and "full decoupling" defined as flat-rate area payments. Respondents' time allocations are relatively invariant to the scenarios. The comparison of interest is between SFP as currently administered and full decoupling. A shift to decoupling reduces the proportion of respondent stating they would increase on-farm time from 28% to 24% and the proportion reducing on-farm time increases from 23% to 28%; the third alternative is no change. As for off-farm work decoupling raises the "increase off-farm" response from 16% to 18% and reduces the "decrease off-farm" rate from 9% to 8%. The results are consistent with the other studies: the effects are small and there is a bias toward more leisure. The results also underscore the importance of controls and counterfactuals in empirical policy work. Roughly one-quarter of respondents are planning to increase on-farm time regardless of the policy. It is difficult to identify the proportion of the increase, ex post, that is induced by the policy change.

Latruffe and Mann (2009) compare how direct payments in France and Switzerland influence off-farm work time. Swiss direct payments are largely for environmental public amenities and do not require commodity production; environmental amenity production (or management) requires less labor input than commodity production. French Single Farm Payments remain relatively coupled to commodity production.

Ceteris paribus, French payments require more farm labor time than Swiss payments. The study finds that the share of off-farm income is positively correlated with the amount of direct payments in Switzerland; this correlation is negative in France. Because it is not a time allocation study the results cannot be expressed in terms of changes in hours work on- or off-farm.

This brief survey of recent studies indicates that effect of decoupled payments on the allocation of recipient household time remains a puzzle. Part of the puzzle is that the effects, to date, appear to be small, so small that they are hard to distinguish from the ambient noise in the data. Another part of the puzzle is that data tend to be, in Leontief's terms, second-hand: our observations are based on questions and measurements made for other ends than measuring household time allocation – this suggests devising new and improved measures and questions. Finally, there is the perennial farm household problem – there is not a clear distinction between production and consumption and between work and leisure, particularly in the mind of the respondent. It would likely require a Tayloristic time-and-motion study to determine whether the marginal hour of self-described "on-farm work" has a marginal physical (commodity) product.

Financial channel: credit

Decoupled payments may influence a recipient household's decisions through credit. The receipt of a decoupled income transfer by a net creditor household may simply be deposited into savings or invested in other financial assets; it increases household net worth but does not relax any binding financial constraint on the household. In contrast, a decoupled transfer to a credit-constrained household can relax the binding credit constraint and expand its feasible choice set. There are at least two ways decoupled payments can relax the household's financial constraint. The direct effect is that the payment increases current cash flow. The indirect effect may arise because the entitlement to a stream of decoupled payments may improve the recipient's credit rating. A loan officer may be willing to provide more credit based on the expected security of the payment stream. (But see the section below on capitalization and policy risk). Phimister (1995) provides an analytical exposition of how a decoupled transfer could have positive output effects for a debt-constrained household; he finds no causal channel for un-constrained recipient households. Phimister's farm household maximizes inter-temporal utility, but it is decision variables are limited to farm production activities, specifically on-farm investment. By foreclosing other means of income generation the farm household model can implicitly re-couple decoupled payments into on-farm investment.

Roe, Somwaru, and Diao (2003, 2004) indirectly simulate the credit effect of decoupled payments in an intertemporal CGE model. They draw on Stiglitz's concept of credit rationing and imperfect credit markets and compare the impact of a fixed decoupled payment paid in perpetuity in a model with and without

integrated capital markets. The payment value is based on the direct payments of the 1996 U.S. Farm Act. When capital markets are integrated there is efficient capital arbitrage between sectors. When capital markets are segregated, there is imperfect arbitrage between agricultural and other sectors of the economy: farms face higher interest rates and payments made to farm household are assumed to remain with the agricultural sector. The experiment is deliberately designed to induce coupling via the credit channel in the segmented capital markets scenario. Their summary follows:

> We find that, in the short to intermediate run, direct payments tend to cause capital deepening, to increase the employment of labor, and to increase agricultural output. However, these effects are extremely minimal. They cause aggregate agricultural production to rise by less than 0.2 percent in the short run. In the long run, payments cause no resource allocation and output effects. The only long-term effect of payments is to increase land values and land rental rates.

Thus, even with a stylized assumption of sector-wide credit rationing, the impact of decoupled payments on output is minimal and only in the short run. When markets adjust payments are capitalized into land values. The assumption of segmented capital markets exaggerates the imperfections, if any, of credit availability for farm households in most OECD countries. But it might be a reasonable assumption for the Mexican *ejido* sector in the 1990s. Sadoulet, et al (2001), using household data, find that *ejido* (cooperative land reform community) households that received PROCAMPO direct payments reduced significantly their use of formal credit. (The focus of the study is the income multiplier of the payment, not its impact on commodity production.) This appears contrary to the concept that payments would allow more credit; however, it is likely that recipient households prefer to rely on internal financing. The reduced use of external credit is consistent with reducing finance costs.

Girante et al. (2008) use Kansas Farm Management Association data, which allows one to track individual commercial farms over time. They use a Chavas-Holt (1990) framework (discussed in the next section) in which the farm operator seeks to maximize expected wealth through planted area allocation. There is no time allocation decision (between on- and off-farm) or non-farm financial decision; it is an acreage allocation model with farm wealth, farm leverage (farm liabilities divided by farm assets) and government payment variables added – this is a pseudo-household model. The study uses leverage as a proxy for being credit-constrained; there is no information on whether farms are actually credit-constrained, however. They find that decoupled payments have a small, positive and significant effect on area planted: the area elasticity with respect to payments ranges between 0.05 and 0.08 for fixed effects specification. The leverage-payment interaction term is not significant, which indicates no significant credit-constraint effect. One should note that the data set is of relatively wealthy, well-capitalized commercial farms, and may lack sufficient representation of credit-constrained farm households.

Briggeman, Towe and Morehart (2009) use individual-level data from ARMS and the Survey of Consumer Finances (SCF) to measure the incidence of credit constraints for farm and non-farm sole proprietorships. They find that the incidence of credit constraints on farm sole proprietorships is substantially lower than for non-farm sole proprietorships. Only 5.3% of farm versus 23.5% of non-farm proprietorships can be considered credit constrained. 36% of farms did not apply for credit, having no need, as opposed to 15% of non-farm proprietorships. The authors note that the low relative observed incidence of credit constraints for farm proprietorships may be in part due to agricultural support programs. They add that livestock farms, which, in the United States, receive proportionately fewer farm benefits than crop farms, are relatively more credit constrained than crop farms.

Kropp and Whitaker (2009) examine 2005-2007 ARMS data to estimate the relationship between base acres operated (on which decoupled payments are based) and the interest rate paid on operating loans by payment recipients. They find a significant negative relationship. However, the value of the coefficient is small. For a farm that operates mostly base acres the reduction in interest paid on a one-year load of $100,000 is $306. They argue that "such a small savings relative to the size of the loan may not be sufficient to cause a farmer that would otherwise leave the market to remain in production." Because recipients receive both direct (decoupled) and counter-cyclical payments the value reported in the study probably overstates the impact of the direct payment entitlement alone.

The analysis of farm household finances benefits from the comparison to other kinds of entrepreneurs. Entrepreneurs as self-employed persons exhibit different characteristics from employees; farmers share many of these characteristics. Acs and Audretsch (2007) and Parker (2006) provide recent surveys of the field. Cressy (1995, 1996) and Cressy and Olofsson (1997) are particularly relevant contributions for understanding farm entrepreneurs. They show that entrepreneurs value control and exhibit a strong preference for internal over external financing. They wish to limit scrutiny of their business operations and planning from creditors, such as bank loan officers; consequently, they often appear credit constrained, when in fact, the constraint is largely voluntary.

The incidence of credit rationing or severe credit constraint appears to be very low among commercial farms in the United States. This is hardly surprising given the depth of financial intermediation in U.S. agriculture. Because commercial farms account for the bulk of commodity production, it follows that there is minimal scope for decoupled payments to influence production via relaxation of credit constraints. This low incidence of credit rationing cannot be generalized to all farm households in the United States or in the OECD. Financial deepening is not uniform. Most OECD countries have well-developed farm credit institutions, farm cooperatives benefit from tax advantages and other exemptions and support, but access is not universal. The right-skewed distribution of output across farm households suggests

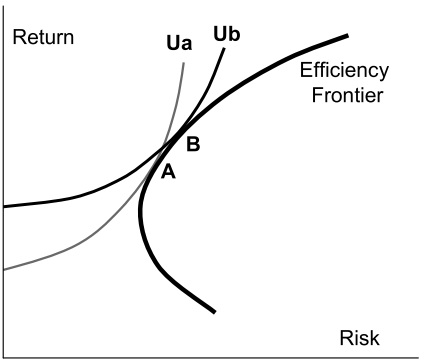
that most of the 10-20 percent of farm households that accounts for vast majority of output is unlikely to be credit-constrained. If there are significant output effects via the credit channel, they are likely to be limited to marginalized farm households that encounter extensive credit-rationing, these farms generally account for a small share of output[14].

Financial channel: wealth and risk

A decoupled payment increases the recipient's income and wealth. A change in wealth can change how one views risk and risk-bearing. There is a vast literature on this topic, but Hennessy (1998) is the logical place to start[15]. Hennessy shows that for a decoupled payment to have no impact on production the payments must be fixed and the recipient must have Constant Absolute Risk Aversion (CARA), that is, changes in one's wealth do not influence one's willingness to bear or take risks.

Hennessy does not use a figure, but the Figure 2.6 illustrates his argument. It shows a standard portfolio allocation problem. Point A is the point of tangency of a relatively risk-averse indifference curve (Ua) and the efficiency frontier of a set of investment opportunities or, in a farm production context, a set of area allocations. B represents the tangency for a less risk-averse indifference curve (Ub).

FIGURE 2.6:
Wealth and insurance effects



[14] It is possible that a decoupled payment that relaxes the credit-constraint on a credit-rationed farm household would be considered output- or trade-distorting, but a policy that remedies credit-rationing (as a market failure) might not be considered output- or trade-distorting, even if the output effects are identical.

[15] Moschini and Hennessy (2001) is an excellent survey of the literature on risk aversion in agricultural production.

A decoupled transfer can have a wealth effect only if the recipient has Decreasing Absolute Risk Aversion; that is, an increase in wealth increases one's willingness to bear risk[16]. This changes the curvature of the indifference curve – it becomes less steeply sloped – and results in a new tangency point such as the shift from A to B along the fixed efficiency frontier. This represents a reallocation towards a riskier portfolio.

If a decoupled payment is not fixed it can generate what Hennessy calls an insurance effect. This can only happen if the payment varies inversely with the recipient's other sources of income. If the payment, for example, goes up when wheat prices go down, it makes the expect return to producing wheat less risky. It is a form of insurance and can encourage the recipient to plant more wheat than otherwise. The insurance effect could be illustrated by a leftward shift in the efficiency frontier.

How likely are we to observe these effects? The insurance effect depends on policy design. As long as decoupled payments are fixed, the insurance effect will not occur. Box 2.3 examines U.S. counter-cyclical payments which do vary inversely and do generate an insurance effect. The wealth effect depends on recipients' risk preferences. The consensus is that most decision makers, human and non-human, exhibit some form of risk aversion. In a Darwinian sense, selective risk-bearing enhances one's survival and reproductive success, so it is not surprising that risk-averse decision algorithms are integral to human cognition. The short answer, then, is that wealth effects exist; however, they are difficult to observe and measure. The empirical findings of economic psychology, also known as behavioral economics, challenge the deductive framework that economists have employed to analyze decisions involving risk and uncertainty. The anomalies in expected utility theory found by Kahneman, Thaler and Tversky, among others, are no longer peripheral curiosities: they are central to the search for a new paradigm. McFadden (1999) provides a concise survey of this research program; Just and Pope (2003) critique the representation of risk in agricultural economics: there are now more questions about risk than answers.

The decision algorithms humans employ instinctively are more complex, varied and contextual than the measures and models derived from expected utility theory predict. The general consensus is that Constant Relative Risk Aversion (CRRA) provides the best approximation to observed behavior. CRRA implies that portfolio shares of risk-free and of risky assets do not change as wealth changes. For example, someone with CRRA preferences would always invest about 5 percent of their portfolio in high-risk assets regardless of their level of wealth. If wealth increases, the absolute investment in high-risk assets also increases. Thus CRRA

[16] In theory increasing absolute risk aversion (IARA) is also possible: when getting richer makes one less willing to take risks.

Box 2.3

The insurance effect: U.S. counter-cyclical payments

U.S. counter-cyclical payments account for the majority of OECD domestic support provided by variable direct payments, not requiring current production; Australia and Canada also provide support under this OECD rubric through income or revenue averaging accounts. Variable payments in the OECD averaged $3 billion in 2005-07 compared to $48 billion for fixed direct (decoupled) payments. U.S. Counter-cyclical payments [CCPs] were introduced in 2002 farm legislation and were extended in 2008 legislation. Skully and Plato (2004) and Plato et al. (2007) show that CCPs are equivalent to a bear option spread on the underlying program commodity. Simply stated, in a high-price year the counter-cyclical payment is zero; in a low-price year it pays the maximum statutory value; and in an average-price year the payment is between zero and the maximum. Thus the payment is counter-cyclical, although within bounds. The 2008 legislation increased the value of CCPs by increasing the price range covered: target prices were increased and loan rates were lowered.

The exempt status of these payments was examined by the WTO (DS 267 – U.S. Subsidies on Upland Cotton). Because counter-cyclical payments are based on current-year prices they do not comply with Annex 2, paragraph 6(c) of the Agreement on Agriculture (see Box 2.2) and the WTO determined that they are non-exempt. [Schnepf 2009] This is a categorical, per se, determination.

Skully and Plato (2004) find that CCPs provide an effective, although limited hedge against lower prices. Most payment recipients are entitled to a portfolio of direct and counter-cyclical payments. For example, a typical Midwestern farm has corn, soybean and a small amount of wheat payment base, and usually produces these commodities. The portfolio of CCPs payments varies inversely with the receipts from the portfolio of crops produced. Because the prices of these crops are positively correlated, the CCPs provide a hedge for grain and oilseed production generally. In Hennessy's terminology, CCPs provide an insurance effect in addition to a wealth effect: they provide negative covariance and reduce the variance of farm income and increase its mean. This insurance effect is distinct from, in addition to, the wealth effects discussed above; for CCPs to influence production or investment decisions the recipient only needs constant absolute risk aversion. No change in risk-aversion is required as in the wealth-risk aversion channel. Note, for farms that are net buyers of grains and oilseeds, such dairy and livestock operations, CCPs provide positive covariance and increase the variance of farm income – this is a negative insurance effect.

Makki et al (2005) simulate the impact of CCPs for a representative farm in conjunction with other farm payments and subsidized crop insurance. They find small insurance effect for CCPs. CCPs are also found to have a greater impact in low-price years, which follows, ex post. Antón and le Mouël (2004) simulate the impact of CCPs assuming the representative producer has CRRA preferences with a coefficient of risk-aversion equal to 2. They find that CCPs have a modest insurance effect, equivalent to a 1 to 3 percent increase in market prices. But recall that CCPs account for a modest share of U.S. commodity support; an immodest increase in CCP expenditure would likely generate significant production effects.

implies DARA – decreasing absolute risk aversion – that the absolute amount of wealth invested in risky assets increases with wealth.

The early survey-based studies of Friend and Blume (1975) and Siegel and Hoban (1982) found that CRRA is a good approximation and that, if a single value is required, 2.0 is a reasonable value for the coefficient of relative risk aversion. Barsky et al (1997) confirm that most households conform to CRRA, and that there is a wide variation in willingness to bear risk: households relative risk aversion coefficients are usually between 1 and 10. Brunnermeier and Nagel (2006, 2008) examine PSID (Panel Study of Income Dynamics) data on household asset allocations. They find that CRRA provides a reasonable approximation but that household portfolios exhibit high levels of inertia. That is, CRRA portfolio rebalancing occurs, but with considerable delay. Behavioral economics finds that people are decision and regret averse in addition to risk averse. [Loomes and Sugden, 1982]

A further complication in the representation of risk aversion stems from a paper by Rabin (2000) showing that the levels of risk aversion elicited from choices involving relatively small stakes imply absurdly high levels of risk aversion for decisions involving large stakes. This result was later found to hold only if utility is defined in terms of terminal wealth; this has been the default assumption in expected utility theory. However, if utility is defined in terms of income, the absurd levels of risk aversion for high stake choices do not follow. The issue is far from settled. Harrison et al. (2007) provides a good discussion of this literature. These findings underscore the fragility of measurements of risk aversion. The sensitivity of risk aversion to whether income or terminal wealth is used is compounded by the difficulty in measuring income and particularly wealth.

The classic contribution to crop production response to risk is Chavas and Holt (1990) which models a farm household's area allocation decision under price and yield uncertainty. The initial import of this article was to demonstrate the empirical importance of price support policies in truncating the distribution of crop prices. Even if expected market prices are above support levels, the existence of a lower bound on the distribution of potential outcomes influences area planting decisions by modifying the distributions of relative returns. The Chavas-Holt household seeks to maximize expected utility given non-farm, exogenous income, a set of crop production technologies, an area endowment and expectations about yields, input and output prices. It seeks to maximize expected income and minimize the expected variance of income. However, the only choice variable is allocation of area among crops; there is no household labor allocation, or non-farm income and investment choices. The model is not applied to household or farm-level data; rather it is applied a 1954-85 time series for U.S. national-level data for corn and soybeans: the area allocation decision has two alternatives. The country is treated as if it were the decision of a single farm household. This blurs the distinction between household and market. It is an excellent example of a pseudo-household model. The import of

the paper is that presented empirical evidence of risk aversion by producers. Chavas and Holt reject CARA and CRRA and argue that DARA fits the data best; although, as Hennessy 1998 points out, DARA does not fit their data particularly well.

When turning to farm household and payment recipient households the question arises whether farmers are different from non-farm households. Farming, like other forms of self-employment, involves greater variability than most forms of wage and salary employment. Sckokai and Moro (2006) examine the relative risk aversion of farm households using Italian farm household survey data. They find that the estimated risk aversion coefficient decreases with the size of farming operation. This is a cross-sectional result. It does not imply that increasing farm size reduces risk aversion, but it is consistent with the interpretation that individuals with greater risk tolerance choose to bear the greater risk involved in operating a larger farm. For small farms the coefficient of risk aversion is about 5.5, for medium size farms (20-40 ha) it is 0.5; and for large farms it is 0.05, virtually risk-neutral. Sckokai and Moro estimate the wealth, insurance and total effects for EU area payments. The output elasticities range between 0.014 and 0.087; the area elasticities range between 0.014 and 0.088. These are modest effects but larger than those found by similar studies of direct payments in the United States[17].

Problems with linking decoupled entitlements to land ownership or rental

> "Corn is not high because a rent is paid, but a rent is paid because corn is high. And it has been justly observed that no reduction would take place in the price of corn, although landlords should forego the whole of their rent."
>
> --Ricardo (1817) Principles of Political Economy, Vol. 1: 74-75

The ideal decoupled payment is a pure transfer payment – a direct deposit or government check that requires no action on the part of the recipient (beyond cashing the check). Existing decoupled payments are almost always linked to land, either owning farmland or leasing farmland; thus, existing payments are impure and the question is whether this deviation from the ideal matters, theoretically and empirically.

Two complementary forces help explain why governments choose to link decoupled payments to land: inertia and political economy. Consider inertia first. Decoupled payments are a means of compensating the recipient for the removal or reform of coupled forms of support. Official records of former support payments are organized on a farm and area basis and it is a simple matter of administrative ease

[17] Burfisher et al. (2000) find output elasticities of 0.010 for wheat and 0.022 for oilseeds. Goodwin and Mishra (2006) estimate acreage elasticities with respect to decoupled payments of 0.025 for soybeans and 0.034 for grains, however these elasticities are not statistically significant. Goodwin and Mishra also find no significant relationship between wealth and risk aversion, consistent with CRRA.

and continuity to administer the new decoupled payments in the same manner. The political economy of agricultural support also predicts linking decoupled payments to land. Much of the benefit of coupled farm support is capitalized in the value of (eligible) farmland. Linking decoupled payments to farmland ownership or use prevents or moderates the decline in farmland values when coupled payments are reduced or abolished. There are examples of successful payment terminations: Mexico's PROCAMPO limited compensatory decoupled payments to a 15-year transition period; Australia used decoupled payment to terminate dairy supports; and the United States bought out peanut quota rights with decoupled payments. But decoupled payments are often open-ended: with no explicit sunset, the payment flow continues until the next reform or negotiation of agricultural policy. Unless there is a sufficient deterioration in the relative political influence of farmland owners and payment recipients, it is likely – but far from certain – that the flow of payments will be perpetuated in subsequent agricultural legislation and regulations.

Capitalization of benefits: One strand of research on decoupled payments examines the capitalization of benefits into land prices. When payments are tied to particular parcels of land, whether or not the land is cultivated or whether anything is produced, the payment entitlement should be reflected in the resale value of such land. In theory, the increase in land value should equal the present discounted value of the benefit payment stream. The assumption, usually implicit, is that if payments are not observed to be fully capitalized in (higher) land values, then the portion not capitalized might be re-coupled somehow. Bureau (2008) notes that a Belgian capitalization study (Duvivier et al 2005) finds the same marginal degree of capitalization as recent U.S. studies (Roberts et al 2003): it ranges between 0.30 and 0.40. So, where do the non-capitalized benefits go?

There may be a simple answer to this question: the actual and prospective buyers of farm land entitled to payments are not fully confident about the durability of the future policy benefit stream. Governments often change agricultural policies and the stream of future policy benefits embodies considerable policy risk; thus it cannot be valued as if it were as certain as the flow of payments from a 30-year Government Bond: it will be valued at a discount proportionate the subjective perception of policy risk[18].

Policy risk is commonly acknowledged. For example, the U.S. Farm Credit Administration (2003: 48) makes the follow assessment regarding the use of farmland as loan collateral. "Two factors are increasing the risk that government

[18] Johnson (1991:202) reviews an earlier literature on capitalization of agricultural program benefits that focuses on policy risk; it includes the value of tobacco production quota in the United States (Seagraves 1969, Shuffett 1969, Hedrick et al. 1970) and dairy quota in Canada (Barichello 1996). Sumner and Wilson (2005) contribute to this literature with an analysis of the capitalized value of California dairy quota. They find the (ex post) rate of return on purchasing dairy quota to be 27%. They argue that such a high return is only plausible if there is a correspondingly high policy risk (ex ante).

payments may decline: (1) the pressure from the World Trade Organization (WTO), developing countries, and environmental groups to reduce agricultural subsidies in industrialized countries and (2) the surging budget deficit." Another factor increasing perceived policy risk is the greater transparency of agricultural support within the OECD. The research effort to measure producer support has contributed to its heightened visibility; so too have legal cases brought by civil society organizations to force governments to make agricultural support payment data publicly available. In the United States, the Environmental Working Group maintains an online "Farm Subsidy Database" from which one may access detailed payment data at the recipient level. Farmsubsidy.org is developing a similar service for Common Agricultural Policy payments, coverage varies by country[19].

Rental rates: When payment entitlements can be separated from specific land units – if they can be traded independent of land – the payments will become capitalized into the tradable entitlement right, not into farmland values. The tobacco, peanut, and dairy quota studies discussed above are examples[20]. In the land rental market the relative supplies of entitlement units and land units determines whether payments are reflected in land rental rates. When the supply of arable land exceeds the number of tradable entitlements landowners must compete for entitled tenants; this reduces the likelihood that payments are captured in rents. In the limit, tradable payments have no impact on land rents. However, when entitlements exceed land area, entitled tenants compete for land, this bids payments into rental rates. An excess of entitlements and a perfectly inelastic supply of land are necessary for complete payment capture. Courleux et al. (2008) provide a formal model of this market in the context of 2003 CAP reforms. Kilian et al. (2008) apply a variant of this model to Bavarian data and find evidence of a surplus of Single Farm Payment entitlements relative to land, and a higher rate of payment capture in rents after implementation of the 2003 Reforms. Kirwan (2008) uses Herfindahl indexes of renter and landowner concentration in the United States and finds the expected relationship between local market power and rental rates. This line of research suggests that policy design can influence the landlord/tenant benefit split. Allowing resale and geographic portability of entitlements will allow arbitrage to reduce local imbalances between land and entitlements. Limiting the quantity of area payment entitlements to less than the quantity of land will favor tenants; granting excess entitlements will favor landowners.

Compliance conditionality: Decoupled payments come with conditions. Usually the recipient must maintain the land (on which the payment entitlement is based) in good agricultural and environmental condition. It is theoretically possible for such conditions to "re-couple" decoupled payments by inducing recipients who would otherwise refrain from commodity production to produce. Consider an extra-marginal farm: it expects to lose $-\pi$ if it produces and to lose $-C$ if it does not

[19] http://farm.ewg.org/farm/ and http://farmsubsidy.org/, respectively.

[20] A "bond scheme" – see Swinbank and Trantor (2004) is another example.

produce, as -C > -π it is better not to produce. A decoupled payment of M does not change the decision because M-C > M-π. Adding a constant to both alternatives does not change the decision – indeed, this is the essence of decoupled payments: they have no effect at the margin.

Now suppose receipt of a decoupled payment obligates the recipient to incur an additional compliance cost of A and that commodity production would satisfy these compliance conditions at no additional cost. If the additional compliance cost is sufficiently great then M-π > M-C-A and commodity production dominates not producing. The compliance conditions reduce the net decoupled benefit (M-A) to the non-producer, whereas a producer receives M. This changes incentives at the margin; thus, compliance costs could induce production, given these assumptions and relative magnitudes. This inducement is a significant increase in output for an individual extra-marginal farm, but the incidence of this re-coupling effect is likely rather small in aggregate as it involves a small shift outwards of the margin of commodity production. It has no impact on prime productive farmland where π > 0.

2.5 Biofuel policies

Policies that encourage domestic production beyond the level that would result from market-based incentives lower international prices and impair competing producers in other countries. However, when a country implements a policy that encourages consumption, its trading partners typically do not object. Biofuel policies induce a mixed reaction because they simultaneously subsidize production and consumption. They encourage (or mandate) the production and use of biofuels and this increases the demand and disappearance of feedstocks. The two most important OECD examples are subsidies (tax credits) for maize-based ethanol in the United States and subsidies (tax credits) for oilseed-based bio-diesel in the European Union. The global impacts of these policies are to reduce slightly the demand for and thus the price of oil and other fuels and to increase the prices of the feedstocks. To date biofuel policies have not faced concerted opposition from petroleum exporting countries. But concerns have been voiced about whether biofuels are an alternative means of subsidizing farmers and evading the disciplines of the WTO Agreement on Agriculture. And, particularly during and after the commodity price surge of 2006-2008, there is concern that biofuel policies caused or exacerbated the price surge and that expansion of biofuel production will absorb a growing share of grain and oilseed output and threaten global food security.

Biofuel policies belong to the set of public policies designed to increase demand for agricultural commodities viewed as being in surplus: increased demand, if market-driven, raises prices and reduces public expenditure on output-based commodity support. The critical qualification is market-based. Of current biofuel

production, only ethanol derived from sugarcane in Brazil is regularly economically profitable. The U.S. maize-based ethanol and EU oilseed-based bio-diesel industries are unviable without substantial public support. Only at high ratios of the price of crude oil to the price of maize (as occurred briefly during the price surge of 2006-2008) is maize-ethanol production profitable without subsidy[21]. Thus biofuel policies reduce budget outlays on commodity support but the reduction in commodity support comes at a high cost in budgetary and welfare terms. As Gardner (2007) and de Gorter and Just (2009) demonstrate, subsidies (tax credits) for U.S. ethanol production are a costly and inefficient means of transferring income to maize producers[22]. Poor transfer efficiency is characteristic of many forms of agricultural support; what distinguishes biofuel policies is that they create or mandate additional demand. The output- or trade-distortion is a reduction rather than an increase in net exports. This changes the usual trade dispute calculus. Such "box shifting" – shifting the means of support to recipients from a disciplined box (e.g., Amber-box, coupled policies) to an undisciplined policy (biofuel or environmental policies) – might provide a basis for complaint if it resulted in an increase in net exports; but with biofuels this not the case.

The decease in net exports is alarming to many food importing countries. As biofuel mandates are phased in and new mandates enacted, will feedstock demand crowd out global food supplies? Preliminary answers are provided in two recent studies: Bouët et al. (2008) examines the implications of the EU biofuel mandate, and Westcott (2007) examines how the U.S. agricultural sector will adjust to higher mandated use of ethanol. Both studies find that the mandates induce major shifts in crop area allocation.

EU mandates for biodiesel have already resulted in an increase in area allocated to oilseeds (particularly rapeseed) in the EU-27 and this expansion will continue. The EU mandate for ethanol will induce a significant expansion in the area planted to sugar beets in the EU-27. Guindé et al. (2008), focusing on France, find that bio-diesel expansion is likely to induce a doubling or trebling of the area planted to rapeseed in France – from 8% to 16-23% -- and similar expansion for sunflower seed, from 3% to 6-8%; most of the expansion would come from a reduction in area planted to cereals. Bouët et al. (2008), looking at the entire EU-27, do not forecast a reduction in wheat or maize area. The study also examines the impact on global prices and likely area adjustments globally; these results depend on trade policy scenarios: whether greater market access will be allowed for imports of ethanol, biodiesel and feedstocks. All scenarios reveal moderately higher international prices for cereals and sugars, and significantly higher prices for vegetable oils.

[21] Steenblik (2007) and FAO (2008) report cost, profit, and support data.

[22] De Gorter and Just (2009) show that the ethanol tax credit results in "rectangular deadweight costs" and that the existence of commodity price supports (loan rates) amplifies the welfare losses of the tax credit. Steenblik (2007) provides a concise and quantitative survey of the biofuel policies in Australia, Canada, the European Union, Switzerland and the United States. Westcott (2007: 15-16) includes baseline forecasts of the influence of ethanol mandates on price-contingent support outlays.

Area planted to corn has increased in the United States because of mandated ethanol use. The increase is expected to continue as more ethanol capacity becomes operative. Most of expansion in corn area comes from reductions in soybean area, signifying a change in rotation patterns. Biodiesel production, less important in the United States than in the European Union, but expanding via mandate, is forecast to increase soybean prices and intensify production. As in the scenarios for the European Union, vegetable oil prices will increase with greater biodiesel production. The various tax credits and blending mandates employed to induce greater biofuel production and consumption result in a highly inelastic demand for biofuel feedstocks. Westcott (2007: 9) explains the implications:

> Ethanol demand is very inelastic (unresponsive to price changes) over the range of prices projected for the next decade, and is more inelastic than other major demands for corn, such as feed use and exports. Thus, overall demand in the corn sector is expected to become more inelastic as ethanol production expands. At the same time, carryover stocks of corn are expected to be maintained at relatively low levels. … Relatively low stocks can provide only a limited buffer to shocks. And with demand for corn becoming more inelastic, a greater change in market prices would be needed in response to a shock to adjust uses and bring the market to equilibrium. Thus, overall price variability and market volatility in the agricultural sector are likely to increase.

The impact of expanded biofuel production (through mandates, subsidies and credits) is to raise agricultural commodity prices generally (but especially vegetable oil prices) and, by making feedstock commodity demand more inelastic, increase commodity price variability as well. Thus, there are legitimate grounds for concern about the adverse effects of biofuel policies on global food security.

There is potential good, or at least mitigating, news that there is a second generation of biofuel feedstocks that may replace current, first-generation feedstocks. Maize, for example, is not a particularly good feedstock for ethanol production: it is used because it is widely produced, because maize genetics are well-understood, because of the bias of agricultural research toward the major subsidized or protected crops, and because of political support for a supposedly "green" infant industry. Starchy crops, such as maize, may be replaced in ethanol production by cellulosic materials and cellulosic plants are unlikely to compete directly for prime crop land. So increased use of second-generation feedstocks is likely to reduce if not reverse the risks current biofuel policies pose for global food security. The primary problem with this otherwise optimistic scenario is that the technological (or biotechnology) needed to covert raw cellulosic feedstock into a commercially viable fermentation stock has yet to be developed. A second potential problem is that large investments have been made (usually with tax credits or other public subsides) in first-generation biofuel production capacity. The owners of these facilities are as well-organized as commodity producers in protecting the value of

their assets, the value of which is almost entirely dependent on the continuation of first-generation feedstock use. So the generational substitution, if it becomes technically feasible, may prove politically difficult. [FAO (2008) provides a clear overview of the second-generation feedstocks and of biofuels generally.]

2.6 Conclusions

This chapter provides an overview of the impact of OECD agricultural support policies on world agricultural markets. Overall, current OECD agricultural support encourages production and discourages consumption of agricultural products within the OECD; this reduces the volume of global agricultural trade and tends to reduce commodity prices on the world market. It reduces returns to non-OECD agricultural producers and thus inhibits investment and agricultural development.

Restrictions on market access (such as tariffs) by OECD countries account for almost all – over 90 percent – of these distortions; and aggressive agricultural tariff reduction would eliminate most these distortions. Since the mid-1980s, when multilateral agricultural trade negotiations began, many OECD countries have reduced tariffs and other impediments to market access. This exposes formerly protected producers to global competitive forces. To mitigate political opposition to agricultural trade liberalization many OECD countries introduced direct payments to producers; these tax-financed payments partially compensate for the loss of tariff protection. Direct payments distort output and trade, but to lesser degree than tariff protection.

The economic model of the farm household is logically the best way to analyze decoupled payments. However, household models require data that we usually do not have or do not have in sufficient quality or scale to yield robust empirical results. Empirical analysis with standard models, such as treating the entire agricultural sector as if it were a representative farm, treat the household as a black box and cannot identify causal processes within the household. Moreover, aggregation across households masks their underlying diversity and cannot detect differential household responses.

Despite the analytical challenges and variety of approaches the emerging consensus is that decoupled payments are minimally output- and trade-distorting; in many cases no significant output effect is observed. This indicates that the Annex to the WTO Agreement on Agriculture that specifies what shall constitute a minimally-distorting direct payment is well-designed: payments that comply with the rules have little or no output effect. This is good news; but there is potential to design even less-distorting policies. For example, most decoupled payments are currently linked to agricultural land, even though no production is required. This linkage is not necessary and it increases the risk of inducing some recipients to

produce more output than otherwise; this effect appears to be minor, but it could be eliminated by severing the linkage to land.

Research on decoupling, particularly at the household level, can and should inform improved policy design. Indeed, if, as seems likely, agricultural support shifts from distortionary commodity market intervention to direct payments targeted to specific kinds of households or to specific areas and for environmental amenities, more household and site-specific data and analysis will be required.

The small production impact we observe from decoupled payments in large part comes from recipient household with low incomes or that cannot obtain credit: additional income can influence output in such cases. But the incidence is low, the share of agricultural output produced by such households is small in OECD countries. The bulk of agricultural output in the OECD is produced by households that are much wealthier than the average household. If decoupled support had been distributed in 1950, when farm households were typically poorer-than-average and when credit markets and supply chains much were relatively undeveloped, it would have had substantial production effects: recipients would have bought inputs and machinery, otherwise unaffordable. Similarly, decoupled support would likely have significant production effects in many developing countries today. With relatively complete markets and higher farm household incomes the scope for production effects diminishes.

Finally, the chapter examines biofuel policies, which are not agricultural policies but influence agricultural output and trade. Biofuel policies effectively subsidize the consumption of biofuel feedstocks – maize for ethanol and oilseeds for biodiesel. Feedstock use is expanding rapidly and has raised concerns about global food security, particularly during the 2007-08 surge in commodity prices. In the short and medium-run grain and oilseed prices are likely to be higher and more variable than in the absence of biofuel programs. It appears likely, however, that alternative feedstocks will become economically viable, replacing maize and oilseeds, and reducing the growing diversion of farmland to energy use.

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