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'Effective prices' as a device to analyze the impact of the Agenda 2000 and Mid-Term Review policy reforms on dairy and beef: measurement and simulation results for Germany

Effektive Preise: Analyse der Effekte der Agenda 2000 auf Rindfleisch- und Milchproduktion in Deutschland

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Abstract

The Agenda 2000 and the Mid-Term Review introduced a complex combination of policy changes for beef and dairy. It is not clear to what extent the package will influence production decisions. This study proposes a simple method for incorporating the effect of direct payments into the analysis of cow herd response. Effective support prices are derived by adjusting the Agenda 2000 reductions in dairy and beef support prices to reflect the compensation given to farmers in terms of direct payments and premiums. Following the Mid-Term Review different assumptions are made with respect to the extent to which these payments are, or are perceived as being coupled to production. The effective prices obtained for Germany are used in a simulation model to assess the impact of the latest agricultural policy reforms on German milk and beef producers.

Key words

effective price, decoupling, direct payments, agricultural policy, Agenda 2000, Mid-Term Review, beef, dairy

Zusammenfassung

Agenda 2000 und der Mid-Term-Review beinhalten eine komplexe Kombination von Politikänderungen in der Rindfleisch- und Milchviehproduktion. Es ist jedoch nicht bekannt, in welchem Maße diese die landwirtschaftlichen Produktionsentscheidungen beeinflussen. In diesem Beitrag wird eine einfache Methode vorgestellt, um den Einfluss der Direktzahlungen in die Analyse des Kuhbestandes einzubeziehen. Um den kombinierten Effekt von Preiskürzungen und Direktzahlungen darzustellen, werden effektive Stützpreise berechnet. Entsprechend der Mid-Term-Reform werden verschiedene Annahmen über den Grad der Entkopplung von Direktzahlungen gemacht. Die für Deutschland berechneten Preise werden in einem Simulationsmodell verwendet, um den Einfluss der agrarpolitischen Reformen auf die Rindfleisch- und Milchproduzenten darzustellen.

Schlüsselwörter

effektiver Preis, Direktzahlungen, Entkopplung, Gemeinsame Agrarpolitik, Mid-Term-Review, Rindfleischsektor, Milchviehsektor

1. Introduction

Since the MacSharry reform of the common agricultural policy (CAP) in 1992, traditional price support policy has played a less prominent role. Direct income payments of various kinds have become a second pillar of the common market organization for some products, in particular cereals and beef. The Agenda 2000 reforms, adopted in Berlin in March 1999, both deepen (cereals and beef) and extend (dairy) this shift from price support to direct payments. Moreover, the Mid-Term Review (June 2003) (MTR) led to an important adjustment of Agenda 2000, by introducing a single payment scheme for EU farmers. The most important element in this latter reform is that the direct payments will be largely independent from production (decoupled). Although from 2005 onwards the general principle is full decoupling, for the dairy and bovine sectors member states may decide to maintain an important proportion of the direct payments in their existing form, i.e. linked to production. More precisely in the dairy sector full decoupling will take place once the dairy reform is fully implemented in 2007. On a voluntary basis member states may already start in 2005 to apply decoupling in dairy. In bovine sector member states can opt for fully decoupled payments, for partially coupled suckler cow and slaughter premiums, or alternatively for a partially coupled special male premium combined with decoupled slaughter premiums (see further details in section 3).

The increased reliance on direct payments instead of on traditional price support and the de-linking of these direct payments from production, raise two questions.

A first question is: to what extent are these various kinds of direct payments decoupled? According to the Uruguay Round Agreement on Agriculture classification of support, the direct payments are “blue box” payments, i.e. payments linked to current production decisions but in the context of a supply-limiting policy. This last condition is satisfied by the cereals and beef regimes because of the regional ceilings, which even apply under Agenda 2000, and by the dairy regime because of the milk quota restrictions. However, the empirical question arises: do producers perceive them as decoupled, and if not, how much difference does it make to their response to the changed policy signals?

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A second question is: to what extent do the increased or new "compensatory payments" actually compensate producers for the price reductions in Agenda 2000? In this paper, some simple calculations are performed for the "typical" EU dairy, beef and veal enterprises in order to answer this question.

The attempt to "decouple" policy support challenges the modelers of the agricultural policy regimes. Up till now in particular attention was given to the modeling of the new arable crop regime (see for the EU MORO and SCKOKAI (1999) and the references cited therein; for the USA see YOUNG and WESTCOTT (2000) and ADAMS et al. (2001)). From the literature it becomes clear that really decoupled support does hardly exist. Because of the unavoidable wealth-effect, direct payments are likely to affect production, even when they are approximating the ideal theoretical case of a lump sum transfer to producers. Payments raising the farmers' wealth have several potential effects on production:

- The guaranteed income stream resulting from the direct payments may make farmers more willing to undertake riskier strategies and associated different crop mixes;
- Increased income makes it more easy for farmers to invest in their farm operation, in particular when they are liquidity and debt constraints;
- Lenders are more willing to make loans to farmers with higher guaranteed incomes because of lower default-risk, which may subsequently impact agricultural investment decisions.

An additional point, which in contrast with the macroeconomic policy literature where it is an established concept, is less well addressed in the agricultural literature, is the issue of time inconsistency in policy and decoupled payments.[1] If farmers expect the policy maker to be time inconsistent, i.e. to change the policy regime with decoupled payments after some period and again link support in one way or another to agricultural activity or productive capacity (re-coupling), then they might use today's 'decoupled payments' for investing in expansion of production capacity, and therewith improve their long-term earnings.[2] This emphasizes the important role of the farmers' expectations with respect to the decision whether or not to invest available means in quasi-fixed factors.

The general strand of the literature with respect to the arable sector is that the impact of strongly decoupled direct payments (like the production flexibility contracts in the USA) on production is rather limited (YOUNG and WESTCOTT, 2000: 767). GARDNER (2002), for example, estimates that the FAIR Act lead to an increase of cereals and soybean output of about 4% of which one eight or one quarter is attributable to direct payments.[3] With respect to the partially decoupled payments, like those applied in the EU, the impact is supply is significant and they affect the crop mix (GOHIN et al., 2000; MORO and SCKOKAI, 1999; OUDE LANSINK and PEERLINGS, 1996; GUYOMARD et al., 1996). However, the empirical evidence still has a provisional character and more research is needed to get an established consensus. This is partly due to the relatively short period of experience with these payments. Only limited data are yet available, whereas at the same time the analytical models incorporating these payments tend to get more and more parameters to be estimated. This paper tries to circumvent this modeling problem of 'getting more out of less'.

The potential impact of the EU's direct payments on agricultural supply depends on the degree to which they are perceived as coupled as well as on the sensitivity of supply with respect to these payments. To analyze their impact, a two-stage decision making model of farmers` behavior is required. When farmers choose the optimal variable input mix, they are likely to react largely to market price signals. However, when deciding on land allocation, acreage planted, dairy cow herds, suckler cow herds and other beef animal stocks, direct payments are likely to play a role, because these payments are in most cases directly linked to base areas and herd numbers. In this second stage, farmers thus no longer react only to actual prices prevailing in the market, but rather to effective prices, which in addition to market conditions also reflect the impact of the direct payments. Since these quasi-fixed factors are slower to adjust, this two-stage reaction corresponds more or less to the immediate- and medium-run responses. This two-stage framework allows us to investigate the effect of different degrees of perceived coupling.

This article proposes and analyzes a relatively simple method for incorporating the impact of direct payments into so-called effective prices. Taking into account existing farming practices, these effective prices are constructed for the beef sector. Subsequently the effective prices are used to analyze the impact of the latest CAP reforms on the German dairy and beef markets under different assumptions about producers' perceptions of these payments. The article is structured as follows. In section 2 the two stage decision problem of farmers is presented. Moreover, the impact of coupled direct payments is illustrated and measured in terms of an effective price signal framework. Section 3 calculates the effective price signals relevant for the beef sector under various degrees of assumed or announced coupledness in Agenda 2000 and the Mid-Term Review. Section 4 uses the effective price methodology to illustrate the impact of latest CAP reforms on the German dairy-beef sector. Section 5 closes with the simulation results and conclusions.

2. Supply behavior

One of the characteristics of agricultural supply that is there is a time lag involved in the decision making process of farmers. The decision to supply a certain quantity of output can be decomposed into a decision with respect to the op-

[1] The original reference on time inconsistency, policy credibility and reputation is KYDLAND and PRESCOTT (1977).

[2] The move in the US agricultural policy from the FAIR Act (1996) with largely decoupled payments to the new Farm Bill (2002) with a partial re-coupling of support shows that such policy shifts are a real possibility.

[3] Also FAPRI in their policy analysis studies recognizes that really decoupled payments do hardly exist. A not unusual assumption they make is that 'decoupled' direct payments still have an output stimulating effect of about 30% of its price support equivalence (EUROPEAN COMMISSION, 2003).

timal level of quasi-fixed inputs used and a decision to determine the optimal mix of variable input used. Figure 1 provides a simplified graphical illustration.[4] The output of beef S is assumed to depend (among other things) on the price of beef p as well as on the (quasi-fixed) suckler cow herd SC. Now assume the policy maker announces that the beef price will be reduced, but that the farmer's income loss will be partly compensated by a suckler cow premium. The beef price decline from p^0 to p^1, can be decomposed into two effects. It induces a change in the variable input mix for a given suckler cow herd and it also leads to an adjustment of the suckler cow herd. Algebraically, the change in beef supply due to a beef price change may be written as

$$(1) \quad \frac{dS}{dp} = \frac{\partial S}{\partial p} + \frac{\partial S}{\partial SC}\frac{\partial SC}{\partial p}$$

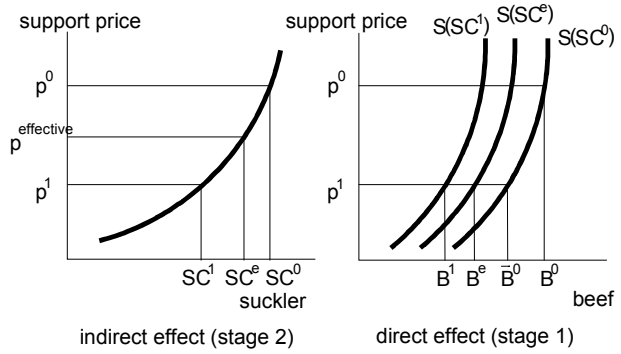
with the first right hand sight term denoting the direct effect and the second term the indirect effect.

If the compensatory direct payments were decoupled, both the suckler cow herd and the variable input mix would be adjusted based on the same beef price signal. The suckler cow herd would decline from SC^0 to SC^1 and beef supply from B^0 to B^1. If a change in the suckler cow herd has any consequences whatsoever for the number of suckler cow premiums a farmer receives, the direct payment is coupled. In deciding on the suckler cow herd, the farmer then not only takes the announced beef price decline into account, but also the direct payments associated with the suckler cow herd level. Assume that when taking this into account the farmer reduces his suckler cow herd from SC^0 to SC^e instead of to SC^1. The price signal supporting this suckler cow herd level is the effective price level $p^{effective}$, which clearly differs from the prevailing market price p^1.

As is shown in equation 1, the impact of a suckler cow herd change on beef output depends also on the partial derivative $\partial S / \partial SC$, which is dependent on the production technology. If there is a direct fixed relationship between the quasi-fixed input (suckler cows) and beef output, the effective price reasoning could be directly applied to the short-run supply equation. Examples of this latter case are land allocation with fixed crop yields (see HOUCK et al., 1973) and dairy cow herd size with fixed milk yields. If, however, the production technology allows for substitution (for example, between beef-producing dairy cows and suckler cows), the effective price reasoning should be applied to the cow herd equations only and not to the short-run supply relationships.

The difference between the announced market price for beef p^1 and the effective beef price depends on the height of the direct payments as well as the degree to which farmers perceive them as coupled. Although from a theoretical perspective direct payments are coupled as long as there is a link with a current factor of production, what finally matters is whether the farmer as decision maker perceives them as coupled. The EU's direct payments are usually subject to regional ceilings based on past reference areas, production levels or herd numbers. However, an individual farmer is only eligible for the direct payment if he currently uses the inputs associated with these payments, and thus his current production is influenced.

Figure 1. The concept of the effective price



In the following section, effective prices are calculated for the Agenda 2000 policy changes in the beef sector. Because beef originates from several different enterprises, different farming practices will be distinguished. For the dairy sector, which has an important linkage to EU beef production in most member states, it is assumed that a binding quota regime will remain in place.[5] Since output is not determined by the milk price it does not make much sense to calculate effective milk price signals for this sector.

3. Policy changes regarding beef and veal

With respect to beef and veal Agenda 2000 specifies (see Regulation EC1254/99):

- a beef price decline of 20% in two equal steps over the calendar year period 2000 to 2002;
- increased headage payments (suckler cow premium of 200 Euro, special premium of 210 (150) for bulls (steers), and slaughter premium of 80 (50) Euro for adult animals (calves));
- a national envelope to make additional payments, payable per head and/or per hectare.

Over the period 2000-2002, the basic beef price (equal to 80% of the intervention price and trigger level for intervention) is decreased by 20% (see table 2). The regime of compensatory direct payments consists of a special premium for male bovine animals (bulls and steers), a suckler cow premium, and a slaughter premium (differentiated for calves between 1-7 months and other animals from the age of 8 months). In addition to the suckler cow premium presented in table 1, member states may grant an additional suckler cow premium up to a maximum of 50 Euro per animal. This premium is partly financed (24.15 Euro) by the EAGGF's Guarantee Section if the holdings are located in specific areas, or completely financed if the share of suckler cows in a member state's cattle is at least 30%, and

[4] A detailed description of the farmers behavior is provided in Annex A.

[5] Z.BOUAMRA et al. (2002: S15) provide a shadow price estimate for Germany of € 0.19/kg of milk, which is about 60 to 65% of the actual milk price. When calculating the effective price declines for milk (not reported) they are all less than 35%, which implies that the quota constraint will remain binding.

if at least 30% of its male bovine animals slaughtered belong to conformation classes S and E.[6]

Table 1. Beef prices and direct payments

	1999	2000	2001	2002-2008	% change 2002/ 1999
'basic price'	2780	2595	2409	2224	-20%
special premium (bull)	136	160	185	210	74
special premium (steer)	109	122	136	150	41
suckler cow premium	145	163	182	200	55
add. suckler cow premium	0	50	50	50	50
slaughter premium calves	16	17	33	50	34
slaughter premium others	27	27	53	80	53

Price in €/ton, premiums in €/animal

Table 2. Composition of EU beef and veal output

		1988	%	1996	%	1999	%	Normalized 2000 base year EU-15	Germany
EU milk output	mill.t.	108.8		108.8		120.0		120.5	27.8
Milk output / cow	kg/animal	4534.0		5094.0		5513.1		5604.7	5755.7
Dairy cows	mill	24.0		21.4		21.8		21.5	4.8
Other cows	mill.	7.5		9.0		12.0		11.2	0.7
Slaughterings	x1000	28.8	100	27.8	100	28.1	100	28.1	5.1
calves		6.3	22	6.0	21	5.9	21	5.9	0.8
bulls		8.4	29	8.1	29	8.1	29	10.8	1.9
steers		3.0	10	2.8	10	2.7	10		
cows		6.8	24	7.2	26	6.6	24	6.6	1.6
heifers		4.2	15	3.7	13	4.9	17	4.9	0.8
Average slaughtered	kg/animal	264.4	100	287.4	100	272.5	100		
calves		134.0	51	155.0	54	140.1	51	130.2	119.9
bulls		317.0	120	350.0	122	329.6	121	336.5	343.9
steers		333.0	126	363.0	126	346.1	127		
cows		288.0	109	298.0	104	288.4	106	303.8	296.5
heifers		268.0	101	286.0	100	274.7	101	275.3	283.1
Meat production	1000t	7600.5	100	8001.2	100	7660.0	100	7737.1	1456.0
calves		848.8	11	925.5	12	820.8	11	763.0	89.9
bulls		2677.7	35	2831.2	35	2659.7	35	3620.2	666.4
steers		997.0	13	1015.7	13	930.9	12		
cows		1951.2	26	2157.2	27	1916.0	25	2018.5	480.3
heifers		1125.9	15	1071.6	13	1332.6	17	1335.4	219.4

Source: based on H.P. DRÖGE (1991, Übersicht 2) and own computations.

Moreover, there was already a deseasonalisation premium (unchanged), aimed at encouraging farmers who have steers to hold them through the winter months (mainly of interest to Ireland and the UK (Northern Ireland)). Besides, producers receiving the special and/or suckler cow premium may qualify for an extensification payment, provided they satisfy the relevant stocking density criteria (an additional 100 Euro per special premium and suckler cow premium, given that the stocking density on the holding concerned is less than or equal to 1.4 LU).[7] In this analysis, the extensification payments are neglected because our focus is on market level or average representative farm level rather than at individual farm level. The headage premiums are subject to a number of restrictions, notably regional ceilings (see Regulation (EC) No.1254/1999 for details).

Since the slaughter premium ceilings are based on year 1995 and production has declined since then, the corresponding regional ceiling is not likely to be binding. Regarding bulls and bullocks, the average EU herd of male animals aged less than 1 year over the period 1996-1999 was 9.38 million animals and showed a decrease of 4.4% per annum. The average herd of male animals aged between 1 and 2 years was 6.87 million animals and showed a 2.1% annual decline. The total number of male animals eligible for the special premium is 9.28 million animals. Conditional on the ceiling, the premium is granted once in the life of a bull from the age of 9 months, or twice in the life of a steer (first at the age of 9 months and then at the age of 21 months).[8] It is assumed, therefore, that on average the special premium can be received 1.25 times during an animal's lifetime.[9] Given the male animals older than 1 year, the number of premiums can then be estimated as 1.25 times 6.87, which is 8.6 million, while there still remains 0.68 million premiums available for the cohort aged between 9 and 12 months. Given a normal age structure this is a low number. In other words, the current herds appear to have the potential to overshoot the ceiling for special premiums.

In addition to the price changes and direct payment increases announced in Agenda 2000 the Mid-Term Review introduced three options of decoupling for the beef sector. Member states have several options. They can opt for 1) fully decoupled payments, 2) only coupled slaughter premiums, 3) fully coupled suckler cow premium combined with 40% coupled slaughter premium and decoupled special male premium, or 4) 75% coupled special male premium combined with fully decoupled suckler cow and slaughter premiums (see COM(2003) 23/10961/03 for details).

The share of the total EU beef and veal output coming from bulls and bullocks varies between 45% and 50% of total EU beef and veal output. Cows and heifers account for another 40%, while the share of calves is about 11% (see table 2). These shares are rather stable over time. In terms of number of slaughtered animals, the share of dairy cows in the total number of cows slaughtered is estimated at 75%. This is

6 Assuming the male meat quality requirement is satisfied, according to the suckler cow share criterion and our 1999 estimates Belgium, Greece, Spain, France, Ireland, Luxembourg, Portugal and the UK would qualify for completely financed premiums. It is uncertain whether the other member states which have to finance the premium by themselves will decide to grant this additional premium, and for what amount.

7 Member states may decide to grant the extensification payments in an alternative way, with the stocking densities further differentiated and the premiums adjusted (see EC 1254/99, Article 13 for further details).

8 The share of steers is in the total slaughterings of bulls and bullocks estimated to be 25%.

9 Based on the estimated bull/bullock herd composition (see table 3), which suggests that about 25% of the herd is eligible to receive the special premium twice in its lifetime.

mainly due to differences in average lifetime of animals in dairy and suckler cow herds. The average life of a dairy cow is estimated to be 4-5 years, and that of suckler cows at 5-7 years. Dairy cow culling is mainly based on optimal dairying considerations (aimed at low costs of milk) and less or not at all on meat producing considerations. Because suckler cows have a higher slaughter weight than dairy cows, the share in final cow meat production of suckler cows will be higher than 25%. Table 2 also shows the estimated beef and veal output composition for Germany and the EU-15 for normalized base year "2000". The indicated beef output mix will be used later in the calculation of effective prices at sector and country level.

In order to estimate the effective price decline resulting from the beef and veal policy adjustments, some stylized calculations have been made for suckler cow holdings and bull and bullock operations. Table 3 presents the policy impact per suckler cow under various assumed degrees of perceived coupling. First, it is assumed that the intervention price decline of 20% leads to an equivalent decline in the farm gate price of meat.[10] The implicit technical coefficients (like number of calves raised per cow, number of heifers kept per cow, assumed slaughter weights, replacement rate) of the typical suckler cow operation presented in table 3 (and following tables), are own estimates based on and HEINRICH and KÖGL (1992). The prices are plausible values selected from actual realizations in recent years (cf. for example table 4.15.5.1 in EUROPEAN COMMISSION, 1999). In the calculations, a premium utilization rate of 100% of the regional ceiling is assumed. Table 3 measures the effective price change in two ways: a) as measured in (direct) revenue terms and b) also when accounting for related animal input cost changes. Following the MTR, it considers three alternatives with different degrees of (perceived) coupling (see columns of table 3). For each variant the effective price in terms of meat revenue and in terms of meat revenue corrected for changed animal input costs is given. The following alternatives resulted:

The impact when only the increased slaughter premiums are perceived as fully coupled. Effective price changes are –12.0% and –10.4%, respectively.

1. The increased (general) suckler cow premium is fully coupled, but the slaughter premium only coupled for 40%. Effective price changes are –11.8% and –10.3%, respectively.
2. All direct payments, including the additional payments coming from the national envelope funds are coupled.[11] Effective price changes are –0.2% and +2.2%, respectively.

Table 3 does not present a gross margin analysis, because it excludes non-animal input costs. So it does not take into account the feed cost price decline expected following the 15% fall in cereal intervention prices. It is assumed that a sector simulation model would take the feed price adjustment directly into account, rather than incorporate it into an effective output price.

Table 3. Policy impacts per suckler cow under various assumptions

	before			+ slaughter prem. 100% coupled			+ suckler cow prem. 100% coupled + slaughter prem. 40% coupled			+ all payments coupled		
	quantities	Euro	Euro/s.c.	Euro/100kg	Euro	% change	Euro/100kg	Euro	% change	Euro/100kg	Euro	% change
Herdsize (1 suckler cow)	1.00											
Premium utilization rate	1.00											
Output												
member state s.c. premium	1.19									50.0	59.38	
national envelope											23.00	
'calves' (330 kg.sl.w.)	0.95	280.0	877.80	224.0	702.24	-20.0	224.0	702.24	-20.0	224.0	702.24	-20.0
slaughter premium	0.95	27.0	25.65	80.0	76.00		32.0	30.40		80.0	76.00	
suckler cow premium	1.00	145.0	145.00	145.0	145.00		200.0	200.00		200.0	200.00	
culled cows (330 kg.sl.w.)	0.16	220.0	117.98	176.0	94.38	-20.0	176.0	94.38	-20.0	176.0	94.38	-20.0
slaughter premium	0.16	27.0	4.39	80.0	13.00		32.0	5.20		80.0	13.00	
Revenue			1170.81		1030.62	-12.0		1032.22	-11.8		1168.00	-0.2
Input												
heifers	0.19	410.0	76.88	328.0	61.50	-20.0	328.0	61.50	-20.0	328.0	61.50	-20.0
suckler cow premium	0.19	0.0	0.00	55.0	-10.31		55.0	-10.31		55.0	-10.31	
calves	0.05	85.0	4.25	68.0	3.40	-20.0	68.0	3.40	-20.0	68.0	3.40	-20.0
			81.13		54.59	-32.7		54.59	-32.7		54.59	-32.7
Net revenue			1089.69		976.03	-10.4		977.63	-10.3		1113.41	2.2

Prices are in €/100kg or /animal (all premiums, input costs); Premiums are measured in terms of changes w.r.t. base year 1999

The impact of the Agenda 2000 policy change on bull and bullock operations is illustrated in table 4. The calculation scheme is again based on HEINRICH and KÖGL, 1992, and takes into account fattening practices in Germany, France and Ireland. A premium utilization rate of 80% is used. Based on the estimated bull/bullock herd composition, it is assumed that on average the special premium can be received 1.25 times during an animal's lifetime. Likewise in table 3, again the effective price changes are calculated in terms of the change in meat revenue, and in terms of changed meat revenue corrected for expected changes in related animal input costs.[12] Table 4 shows the impact of the policy change on bull and bullock operations under three different assumptions. Following the MTR, first only the slaughter premium is perceived as fully coupled. The second option is to have slaughter premiums decoupled, but have the special premiums coupled for 75%. The third scenario considers the case in which farmers perceive all direct

[10] This is a minimum estimate. Taking into account a non-zero fixed processing margin would imply a greater price decline at farm gate level.

[11] Expressing the national envelope funds in terms of an amount per kilogram of meat yields an amount of roughly €6/100kg

[12] Where it is assumed that bull/bullock replacement costs follow the beef price.

Table 4. Policy impact per bull/bullock under various assumptions

	before			+ slaughter prem. 100% coupled			+ special premium 75% coupled + slaughter prem. decoupled			+ all payments coupled		
	quantities	prices	value	prices	value	% change	prices	value	% change	prices	value	% change
Herd (1 bull/bullock)	1											
Spec.premium utiliz. rate	0.8											
Output revenue												
National envelope payments											21.75	
bull (625kg lw;362.5kg sw)	0.99	2.0	1231.25	1.6	985.00	-20.0	1.6	985.00	-20.0	1.6	985.00	-20.0
slaughter premium	0.99	27.0	26.60	80.0	78.80		27.0	26.60		80.0	78.80	
special premium	1.00	136.0	136.00	136.0	136.00		157.5	157.50		210.0	210.00	
Revenue			1393.85		1199.80	-13.9		1169.10	-16.1		1295.55	-7.1
Input costs												
calves (45 kg)	1.00	5.0	225.00	4.0	180.00	-20.0	4.0	180.00	-20.0	4.0	180.00	-20.0
Net revenue			1168.85		1019.80	-12.8		989.10	-15.4		1115.55	-4.6

Prices in Euro (animal prices in €/kg liveweight); Premiums are measured in terms of changes w.r.t. base year.

payments as coupled, including a national envelope payment of €6/100kg. This lead to the following results:

1. Only fully coupled slaughter premiums are accounted for. Effective price changes are –13.7% and –10.4%, respectively.
2. Special premium coupled for 75%, but slaughter premiums fully decoupled. Effective price changes are –11.0% and –6.2%, respectively.[13]
3. All payments, including the additional payments coming from the national envelope funds are coupled. Effective price changes are –7.1% and –4.6%, respectively.

The calculated effective price changes do not yet take into account changes in other input costs. If it is assumed that the animals are fed with home-grown silage maize, supplemented with compound feed (a usual practice), and assuming a constant calf grow-up cost of €94, the effective revenue decline (measured in gross margin terms) would be –12.0%, -16.1% and +0.6% for scenarios 1, 2, and 3, respectively (not reported in table 4).

Comparing tables 3 and 4 shows that the effective price declines for suckler cows and bulls are approximately of the same order in the case where only coupled slaughter premiums are accounted for or if, in addition to this, all other payments, including the national envelope are accounted for. The effective price decline associated with a 100% coupled suckler cow premium and 40% coupled slaughter premium is significantly lower than for the 75% coupled special male premium combined with fully decoupled slaughter premiums. Adding the additional suckler cow premium member states may grant to suckler cow operations and the national envelope payments lead to nearly full compensation for the meat output price decline. With respect to bulls, even when national envelope payments are taken into account, compensation is only partial. However, bull/bullock operations are relatively more reliant on non-grass feed input. Taking the approximated feed input cost change into account, more than 90% of the meat price decline is compensated (measured in gross margin terms).

Table 5, based on numbers on red meat production practices provided by VAN DER SCHANS (1995), considers an example of (red) veal production. Calves are assumed to be weaned at 10 weeks and to be finished for slaughter at about 32 weeks (275 kg live weight).[14] Since calves are not subject to suckler cow or special premiums, here only the

Table 5. Policy impact per calf for (red) veal production

	before			only including sl. premium			+ national envelope payments		
	quantities	prices	value	prices	value	% change	prices	value	% change
Herd (1 calf)	1								
Output revenue									
national envelope payments								16.50	
culled calve (275 kg.l.w.)	1	2.10	577.50	1.68	462.00	-20.0	1.68	462.00	-20.0
slaughter premium	1	16.00	16.00	50.00	50.00		50.00	50.00	
Revenue			593.50		512.00	-13.7		528.50	-11.0
Input costs									
1 calf	1	205.00	205.00	164.00	164.00	-20.0	164.00	164.00	-20.0
Net revenue			388.50		348.00	-10.4		364.50	-6.2
Feed costs									
milk substitute (kg.)	45	1.10	49.50	0.94	42.08	-15.0	0.94	42.08	-15.0
feed (kg)	1125	0.18	205.31	0.16	174.52	-15.0	0.16	174.52	-15.0
			254.81		216.59	-15.0		216.59	-15.0
Gross margin			133.69		131.41	-1.7		147.91	10.6

Prices in €/ton and premiums in €/animal

[13] As can be seen from table 1 the special premium for bulls amounts €210 (for 2002 and onward). With the special premium 75% coupled, the effective contribution to output revenue is 0.75 times €210 is €157.5 (see number in table 4).

[14] The table excludes animal loss due to sickness. This is no problem if the only goal is to make a comparative analysis and there is no reason to think something is changed due to the policy change.

impact of changed coupled slaughter premiums and introduced national envelope payments is considered. The increased slaughter premium reduces the effective meat output revenue decline to 14% (instead of 20%). More precisely the following effective price changes were obtained:

1. Only fully coupled slaughter premiums are accounted for. Effective price changes are –10.4% and –1.7%, respectively.
2. All payments (slaughter premium and national envelope payment[15]) are coupled. Effective price changes are –6.2% and +10.6%, respectively.

Here it is assumed that the calf input costs follow the meat price decline the effective revenue.[16] Including national envelope payments, and measuring in gross margin terms the effective prices for veal production increase with about 10%. This indicates that (in 'gross margin' terms) the increased direct payments overcompensate the declined price support.

So far effective prices have been calculated at the level of typical farm operations. Depending on the policy scenarios specified in the next section, these numbers are subsequently used to calculate effective prices for Germany and the EU-15. Effective beef prices at country level are generated by calculating a weighted average of the effective price changes of the beef producing operations, where the weights take into account the country's specific beef output mix (see normalized base year 2000 in table 2).

4. Effective prices and policy simulation

In this section 6 different coupling/decoupling scenarios based on Agenda 2000 and the Mid-Term Review are defined. Effective prices are calculated for the following six scenarios (S1-S6):

S1: Agenda 2000 price changes, without compensatory changes in direct payments

Assumptions: beef price –20%, milk price –15%, and feed price –15%, annual milk yield growth 1.15%, constant slaughter weights, including planned specific and general milk quota increases, and no increase in compensatory direct payments;

S2: Agenda 2000 with compensatory changes in direct payments and payments perceived as coupled;

S3: Agenda 2000 with compensatory changes in direct payments and payments perceived as decoupled;

S4: MTR Option 1: slaughter premiums fully coupled, all other payments decoupled;

S5: MTR Option 2: suckler cow premium fully coupled and slaughter premiums 40% coupled[17];

S6: MTR Option 3: special male premium 75% coupled, slaughter premiums fully decoupled.

The associated effective (beef) price declines for Germany and the EU (weighted average) are presented in table 6. The reported price declines are total adjustments, taking into account the full implementation of the announced policies. In the policy simulations their phased introduction is accounted for.

Table 6. Expected (beef) price declines for the six scenarios

		Germany	EU-15
S1	Ag 2000 without compensation	-20.0	-20.0
S2	Ag 2000 with fully coupled compensation	-5.8	-6.3
S3	Ag 2000 with fully decoupled compensation	-20.0	-20.0
S4	MTR Option 1: 100% coupled slaughter prem.	-13.0	-13.1
S5	MTR Option 2: 100% coupled suckler cow prem.	-14.7	-15.0
S6	MTR Option 3: 75% coupled special male prem.	-18.2	-18.2

In order to further demonstrate how the degree of decoupling, or perceived coupling can affect producers' response to the Agenda 2000 policy changes, a simulation model of the German dairy and beef sectors is used. The model includes the allocation of variable input (feed) and output (beef and veal), as well as the evolution of dairy cow herd, suckler cow herd and land (including forage area). Dairy cow and suckler cow herds compete for inputs (land and feed) and contribute to beef and veal output, either directly or indirectly (fattened offspring). The contribution of dairy cow and suckler cow offspring to final meat output is implicitly taken into account, but not modeled by a separate stock equation.[18] The empirical model is econometrically estimated on aggregated time series data over the period 1973-1995. For more details see BURRELL and JONGENEEL (2001).

In the model, variable beef and veal output and feed input are depending on beef and feed prices, as well as on the quasi-fixed factors dairy cows, suckler cows and land (including forage area). Another fixed factor in the relationships for beef supply and feed demand is the restricted milk output (milk quota). Suckler cow numbers are explained by beef and feed prices and all other quasi-fixed factors one period lagged. Dairy cows are linked to restricted milk output by a simple yield-relationship, including an autonomous milk yield increase of 1.15% per annum.[19] It is implicitly assumed that the actual level of the quasi-fixed factors follows a partial adjustment scheme to approach the desired

[15] National envelope payment is again valued at 6€/100kg.

[16] Based on VAN DER SCHANS (1995) and TOULEC (1992) similar calculations were made for white veal production. Although white veal sells for a different price, requires different feed (only milk substitute), and is on average culled at a live weight of about 200 kg (instead of 275 kg) rather similar effective price changes were obtained. So, the effective price changes of red meat are also used as a proxy for white meat production.

[17] The impact of 40% coupled slaughter premiums can easily be calculated by using the calculation schemes presented in tables 3 and 4. For example, multiplying the slaughter premium in table 4 in the variant with slaughter premiums 100% coupled, will set the effective contribution to revenues of the increased slaughter premium to €32/animal and generate an effective price decline (in terms of output revenue) of -17.3%.

[18] Given the stability over time of meat composition and herd age structure and the illustrative use of the model this justified.

[19] Milk yield/cow for Germany increased with 1.36% p.a. over the period 1973-95, with a higher growth rate in the pre-quota period (1.73% p.a. in period 1973-84) than in the quota period (1.14% p.a. in period 1984-95).

level of quasi-fixed inputs. Table 7 provides a characterization of the model in terms of (intermediate run) price and factor elasticities.

As table 7 shows both beef and veal output and feed input are inelastic with respect to prices, as well as quasi fixed factors (cow herds and land). Also the quasi-fixed factors have low beef and feed price elasticities, with suckler cows being most sensitive for beef price changes. Looking at the coefficients for the lagged dependent variables for the quasi-fixed factors, shows that suckler cows adjust much more slowly than dairy cows. Land (including forage area) is rather insensitive with respect to beef and feed price changes, but mainly determined by the dairy cow herd. At first sight the elasticity of suckler cows with respect to dairy cows is extremely high. However, the associated calculated coefficient is -0.5, which implies that an increase of the dairy herd with one cow leads to a reduction of the suckler herd with 0.5 cow (competition effect), which seems reasonable. Likewise the calculated coefficient of suckler cows with respect to land is equal to 0.8, which is comparable to the coefficient of dairy cows with respect to land (0.7).

Table 7. Elasticities in simulation model for Germany

	P beef	P feed	Milk output (restricted)	Dairy herd (lagged)	Suckler herd (lagged)	Land (lagged)
variable factors						
Beef&veal	0.14	-0.01		0.86	0.13	0.34
Feed	0.03	-0.20	0.93	0.19	0.03	-0.16
quasi-fixed factors						
Dairy herd	0.07	-0.06	0.52	0.13	-0.04	1.00
Suckler herd	0.48	-0.09		-6.97	0.67	8.28
Land	0.00	0.02		0.27	0.01	0.18

Source: BURRELL and JONGENEEL (2001)

In the simulations it is always assumed that, with respect to the optimization of variable output and input, farmers react to actual market prices. Because in the short-run farmers maximize revenues over variable inputs (feed input) conditional on fixed animal numbers and other quasi-fixed inputs (land) it are the prevailing market prices which are relevant and not the effective market prices. The effective market prices are only relevant when farmers take (intermediate-run) decisions with respect to dairy and suckler cow herds. For it is the optimal herd size which depends both on the expected beef and feed prices and on the direct (headage) payments associated with these herds.

5. Results and conclusions

The simulation results for Germany are summarized in table 8. In addition to the scenarios discussed before a scenario S0 is added, which extrapolates what happens if the old policy preceding the current reforms would be continued instead of the Agenda 2000 and Mid-Term Review policies.

When the direct payments are not increased, the price declines implicit in Agenda 2000 lead to a reduction of 'net revenue' (defined as total beef&veal and milk revenue less feed costs) of nearly 16% (see S1) as compared with the base year 2000. When comparing S1 with the without-Agenda 2000 scenario (S0), the 'net revenue' in 2010 is about 30% lower, than it would have been with the continuation of the previous policy. Adding the increased direct payments and assuming the farmers consider them as being coupled to production (see S2 as compared with S1) reduced the 'net revenue' loss in 2010 with 11 percentage points. Comparing S2 with S0, the direct payments reduce the net revenue loss to –15% (in 2010) instead of nearly 30% (without compensation). Would also the net envelopes have been included in the compensatory payments the net revenue loss would have been a 0.5 percentage point lower. When various degrees of decoupling are accounted for (see scenarios S2 - S6) the sectors' loss in net revenues is slightly reduced, but still only about 4% to 5% lower as compared with the base year, or

Table 8. Simulation results (index, base year 2000)

Simulation results		S0	S1	S2	S3	S4	S5	S6
stock dairy	2000	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	2004	95.7	95.7	95.7	95.7	95.7	95.7	95.7
	2008	91.4	92.7	92.7	92.7	92.7	92.7	92.7
	2010	89.4	90.7	90.7	90.7	90.7	90.7	90.7
stock suckler	2000	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	2004	129.0	102.3	117.0	102.3	109.6	107.8	104.2
	2008	188.4	139.3	162.1	139.3	150.6	147.8	142.2
	2010	221.2	162.5	187.0	162.5	174.6	171.6	165.6
q milk	2000	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	2004	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	2008	100.0	101.5	101.5	101.5	101.5	101.5	101.5
	2010	100.0	101.5	101.5	101.5	101.5	101.5	101.5
q beef & veal	2000	100.0	99.2	99.2	99.2	99.2	99.2	99.2
	2004	98.4	92.9	94.5	92.9	93.7	93.5	93.1
	2008	102.1	94.5	97.5	94.5	96.0	95.6	94.8
	2010	104.6	95.4	98.7	95.4	97.0	96.6	95.8
q feed	2000	100.0	101.4	101.4	101.4	101.4	101.4	101.4
	2004	97.8	100.0	100.2	100.0	100.1	100.1	100.0
	2008	96.5	99.6	100.1	99.6	99.9	99.8	99.7
	2010	96.0	98.8	99.4	98.8	99.1	99.1	98.9
land	2000	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	2004	99.2	98.6	98.7	98.6	98.6	98.6	98.6
	2008	98.2	97.7	97.9	97.7	97.8	97.7	97.7
	2010	97.8	97.3	97.6	97.3	97.5	97.4	97.4
"net revenue"	2000	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	2004	103.6	94.9	98.7	98.0	98.4	98.3	98.1
	2008	112.4	83.9	95.8	94.4	95.1	94.9	94.6
	2010	112.7	84.3	95.8	94.6	95.2	95.1	94.8

Source: own calculations

about -15% as compared with without-reforms scenario S0.

As is also shown in table 8, the degree to which the direct payments associated with beef and veal are coupled does significantly influence the suckler cow herd. The difference between fully coupled and fully decoupled payments on the suckler cow stock is more than 20 percentage points (compare S2 and S3 in 2008 and 2010). However, since the suckler cow herd presents only a small proportion (circa 12%) of the total cow herd, the impact of changes in the suckler herd on total beef and veal output is limited. As compared with without-scenario S0, Agenda 2000 effectively curbs the increase of beef output. Even in the scenario with all payments perceived as coupled (S2) beef output is 5.7percentage points lower that in without-scenario S0. Effective milk prices have no impact on the milk supply since the milk quota are assumed to be binding (even when taking into account the planned quota increase).[20]

The decoupling-options included in the Mid-Term Review differ not much from Agenda 2000 with respect to the impact on the revenue earned by the sector. From the MTR scenarios (S4, S5 and S6) the scenario with the only slaughter premiums fully coupled (S4) has the highest suckler cow stock and beef and veal output. As compared to the completely decoupled payments case (see scenario S2) in S4 the suckler cow stock is about 7.5% higher, but beef and veal output is 1.5% higher. At the same time beef and veal output in S4 is only 1.7 percentage points lower than in the standard Agenda 2000 case, with all direct payments perceived as coupled (see meat output index in S2 in 2010). The MTR scenario with the special male premium coupled at a rate of 75% (S6) comes most close to the completely decoupled scenario (S3).

From this analysis the following conclusions can be drawn:

1. The suckler cow premium, when perceived as coupled, significantly influences the number of suckler cows.
2. Although the suckler cow premium increases suckler cow numbers this does not lead to a significant beef and veal output increase. The effect associated with the decline in dairy cow numbers (due to the combined impact of increasing yields and restricted milk output) dominates the 'suckler cow number'-effect.
3. The direct payments (compensating for price support decline) satisfy the blue box criterion in that they, whether perceived as coupled or not, in all cases lead to a lower beef output that with the status quo policy (cf. beef&veal output in scenario S0 with all other scenarios).
4. With respect to the MTR decoupling scenarios, the scenario with the slaughter premiums being fully coupled and all other premiums perceived as decoupled has the highest suckler cow stock, beef output and net revenue for the sector.
5. Both the effective price and 'revenue' calculations, as well as the simulation results indicate that the premiums in the beef and veal sector are in general not sufficient to fully compensate for the support price reduction. However, the compensation rate is usually higher than 90%. Bull/bullock fattening has the lowest compensation rate, veal production is intermediate, and suckler couws hve the highest compensation rates.

Some important qualifications of this analysis should be kept in mind. Firstly, the effective prices are calculated for typical farm operations while using the institutionally announced price declines. In particular when support prices are going to approach (world) market prices the impact of institutional prices on prices at farm gate level will become less direct and/or less significant. More in general, therefore, a kind of price transmission relationship, which links institutional and farm gate prices should be accounted for. But this requires taking into account actual market conditions, *viz*. considering supply and demand simultaneously. This study focuses only on the supply side and assumes a one-to-one relationship between institutional prices and farm gate prices. It should be noted that taking into account actual market conditions, already presupposes the impact direct payments may have on supply. As such they do not make the current analysis superfluous. Moreover, there might be a difference between relying on announced direct payments (as is done here) and actual EU payment rates as indicated in the EU's annual financial report.

Secondly, if farms and/or production circumstances are very diversified within a country it might be difficult to use the assumption of one typical farm operation as 'representative' at country level.

Thirdly, the simulation model might underestimate the impact of the direct payments on beef output, since the simulation model does not include separate stock equations for other categories of fattening animals but instead relies on fixed indirect contributions of suckler cow and dairy cows to final beef and veal output, which are however empirically estimated.

Finally, the wealth-effect of direct payments and its impact on the farmers' risk aversion and investment decisions are not accounted for.

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[20] See remarks made before and previous reference to Z.BOUAMRA et al. (2002: S15) in footnote 6.

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Annex A. Farmer's behavior

This annex provides some further background to the simplified graphical presentation of farmer's behavior in figure 1 of the text. Assume that the farmers behavior can be described by a (normalized) restricted or short-run dual profit function $\pi(.)$, which satisfies the usual regularity properties. For the ease of exposition it is further assumed that only one product (beef) is supplied, which depends on the normalized price of beef p_b and the stock of cows z, e.g. $\pi = \pi(p_b, z)$. Short-run profits including the direct payment attached to the cow stock $\Pi(p_b, z; \delta)$, in the following denoted as the inclusive profit function, is defined as

$$\text{(A-1)} \qquad \Pi(p_b, z; \delta) \equiv \pi(p_b, z) + \delta . z$$

with δ representing the (annual) direct payment per cow (suckler cow premium).

In the very short-run, the cow stock z is considered as a quasi-fixed input and the impact of a beef price decline can be inferred from the short-run beef supply function. Applying Hotelling's lemma this short-run supply function $q_b(.)$ is equal to

$$\text{(A-2)} \qquad \frac{\partial \pi(p_b, z)}{\partial p_b} = q_b(p_b, z)$$

In the long-run the direct payment will also affect the cow stock, and so indirectly beef supply. To see this the inclusive profit function is differentiated with respect to z. This yields the shadow price equation for the quasi-fixed factor, which in the long-run should be equal to the market price or input cost of z, which is denoted as p_z. So,

$$\text{(A-3)} \qquad \frac{\partial \Pi(p_b, z; \delta)}{\partial z} = \frac{\partial \pi(p_b, z)}{\partial z} + \delta = p_z$$

This can be rewritten as

$$\text{(A-4)} \qquad \frac{\partial \pi(p_b, z)}{\partial z} \equiv \tilde{p}_z(p_b, z) = p_z - \delta$$

where $\tilde{p}_z(p_b, z)$ (which is by definition equal to $\partial \pi(p_b, z) / \partial z$) represents the shadow price function, and the term $p_z - \delta$ represents the input costs of cow stock z, corrected for the direct payment.[21] The direct payment works like a subsidy on the cow stock input z.

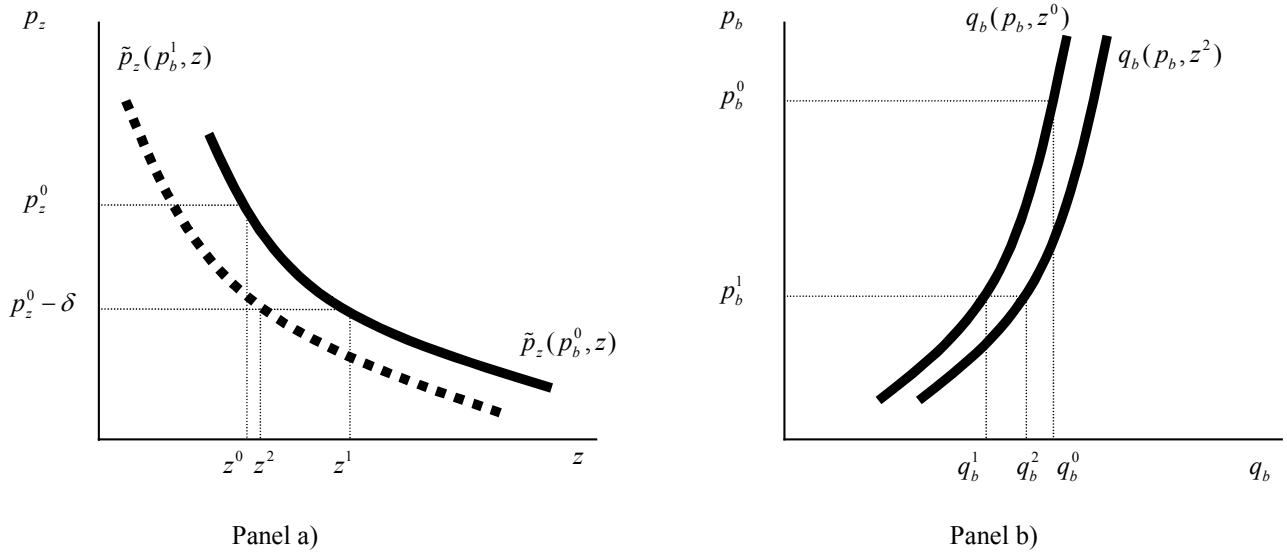
The direct effect of a beef price decline is shown in figure A-1, panel b, where as a consequence of the beef price decline from p_b^0 to p_b^1 beef supply is reduced from q_b^0 to q_b^1. However, in the long-run further adjustments take place. As panel a of figure A-1 shows, the introduction of the direct payment lowers the effective input costs for the cow stock from p_z^0 to $p_z^0 - \delta$, inducing the cow stock to increase from z^0 to z^1. As can be seen from equation A-4, however, the shadow price function is itself also a function of the beef price. According to economic theory the shadow price function is increasing in the beef price.[22] The beef price decline will induce an inward shift of the shadow price function (see the broken line denoted by $\tilde{p}_z(p_b^1, z)$).

As figure A-1 shows, the net effect of the beef price decline cum direct payments is an increase of the cow stock from z^0 to z^2. As a consequence of the increased cow stock, the short-run supply function, which is increasing in z adjusts to $q_b(p_b, z^2)$. The long-run beef supply is thus equal to q_b^2, which, depending on the magnitudes of the beef price decline and direct payment increase, might be smaller or larger than the original beef supply.

[21] The decision to vary the size of the herd may also depend on other variables like the interest rate. For this analysis those variables are assumed to remain constant and are therefore suppressed in the algebra.

[22] Note that based on this in figure 1 in the main text, the cow stock is drawn as an upward sloping function of the beef price and not as a declining input demand function as in figure A-1 panel a). Subsequently, the impact of the direct payments is translated in an effective beef price change relevant for the stock adjustment equation.

Figure A-1. Effective price effects of CAP reform



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