Distributive Leakage of Agricultural Support:
Some Empirical Evidence from Austria

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ABSTRACT:

The paper evaluates the transfer efficiency of the Austrian bread grain policy taking into account distributive leakage, i.e. how much of the transfers officially intended to support farm income are finally realized in the upstream and downstream industries. Gardner's well-known measure of average transfer efficiency is augmented for the case of more than two social groups and computer intensive simulation procedures are utilized to deal with parameter uncertainty.

Keywords: transfer efficiency, distributive leakage, computer intensive simulations

1. Introduction

Assessing the efficiency of income redistribution through agricultural policies has been an important topic in agricultural policy analysis since decades (e.g. Nerlove, 1958; Josling, 1969; Gardner, 1983; Alston and Hurd, 1990; Salhofer, 1996; Giannakas and Fulton, 2000). Moreover, assessing the transfer efficiency of agricultural policies also became an important tool of the OECD (1995, see also Blandford and Dewbre, 1994) to stimulate the discussion on how governments can achieve their income support objectives at relatively low cost. While there have been many developments in this area of research in the last 40 years there are still some important questions unanswered. One of these questions is how much of the transfers intended to support farm income are finally realized in the upstream (agricultural input) sector and downstream (food) sector.

While the OECD (1995) discusses this problem theoretically and also derives some stylized empirical results for simple policies (market price support, deficiency payments, direct income support), i.e. policies which use only one policy instrument at a time. The objective of the study is to evaluate this problem in a more comprehensive framework. In particular, the distributive leakage of the Austrian bread grain policy before joining the EU is evaluated by developing a three-stage vertical-structured model consisting of agricultural input markets, the bread grain market, and the food processing industry.

To give intuitive measures of how efficient agricultural policy transfers welfare (income) to farmers we augment Gardner's (1983) average transfer efficiency measure for a case of more than two social groups.

To deal with parameter uncertainty a computer intensive simulation technique (Zhao, Griffiths, Griffith, and Mullen, 2000; Salhofer, 1998) is utilized. It is based on choosing randomly parameter values from a range of potential parameter values. By conducting this procedure repeatedly one can derive a probability distribution of transfer measures rather than point estimates.

The reminder of this study is organized as follows: The next section, briefly reviews the Austrian bread grain policy, represents the utilized model and welfare measures, and discusses parameter values. In section 3 transfer efficiency measures are developed. Section 4 presents empirical results and tests for their sensitivity. A final discussion is given in Section 6.

2. Modeling the Austrian agribusiness of bread grain

The Austrian bread grain policy

Government intervention in Austria's bread grain (wheat, rye) market is illustrated in Figure 1. D_{fo} represents domestic demand for bread grain in food production only, while D

represents total domestic demand for bread grain including demand for feeding purposes. Initial domestic supply is represented by S and supply including a fertilizer tax by S_t. World market price is assumed to be perfectly elastic at P_w. Farmers obtain a high floor price (P_D) for a specific contracted quantity (or quota) Q_Q. Since farmers have to pay a co-responsibility levy (CL_{PD}) the net producer price is P_D - CL_{PD}. Quantities, which exceed the quota, can be delivered at a reduced price P_E. Again farmers' net floor price is P_E - CL_{PE}, with CL_{PE} being the co-responsibility levy for bread grain beyond the quota. Food processors have to buy bread grain at the high price P_D, while the price of bread grain for feeding purposes is P_E. Therefore, domestic demand for bread grain in food production is Q_D, domestic demand for feeding purposes is $Q_E – Q_D$, total domestic demand is $Q_D + Q_E$, and exports are $Q_X = Q_S –$ $(Q_D$+- $Q_E)$.

The model

The Austrian agribusiness of bread grain is modeled by a log-linear, three-stage, vertically-structured model (Salhofer, Schmid, Schneider and Streicher, 2000). The first stage includes four markets of input factors used for bread grain production: land, labor, durable investment goods (e.g. machinery and buildings), and operating inputs (e.g. fertilizer, seeds). Since 95% of farmland is owned by farmers and 86% of labor in the agricultural sector is self-employed, land (A) and labor (B) are assumed to be factors offered solely by farmers in perfectly competitive markets. On the contrary, investment goods (G), and operating inputs (H) are supplied by upstream industries, which are assumed to have some market power to set the prices above marginal cost. Assuming constant elasticity supply functions:

(1a) $Q_i = X_i P_i^{e_i}$, ($i = A, B$), and

(1b) $Q_i = X_i \left((1-L_i)P_i\right)^{e_i}$, ($i = G, H$), where Q_i denotes the quantity supplied, X_i is the shift parameter, P_i the price, ε_i the supply elasticity of input factor *i*, and L_i is the Lerner index (defined as the ratio between the profit margin and the price) of input factor industry *i*.

Export and import of input factors are not considered. Hence, it is assumed that domestic consumption of input factors equals domestic production. This is certainly correct for land and agricultural labor and is also appropriate for important industrially produced input factors (e.g. tractors, fertilizer) before joining EU.

At the second stage, input factors of the first stage are used to produce bread grain assuming a CES production technology:

$$(2) \quad Q_S = X_{QS}\left(\sum_i \alpha_i Q_i^{\rho}\right)^{\frac{1}{\rho}}, \quad (i = A, B, G, H), \quad \text{with } \rho = \frac{\sigma_S - 1}{\sigma_S} \quad \text{and, } \sum_{i=A,B,G,H} \alpha_i = 1,$$

where Q_S denotes the produced quantity of bread grain, X_{QS} the production function efficiency parameter, α_i the distribution parameter of factor *i*, ρ the substitution parameter, and σ_S the elasticity of substitution between input factors at the farm level.

The first and the second stage are linked by the assumption that bread grain producers maximize their profits. Assuming a perfectly competitive bread grain market factor prices equal the value of marginal product:

$$(3.a) \quad P_i = X_{QS}^{\rho}\alpha_i\left(\frac{Q_S}{Q_i}\right)^{1-\rho}\left(P_E - CL_{PE}\right), \quad (i = A, B, G), \text{ and}$$

$$(3.b) \quad P_H + T_F = X_{QS}^{\rho}\alpha_H\left(\frac{Q_S}{Q_H}\right)^{1-\rho}\left(P_E - CL_{PE}\right),$$

where P_E is the gross price and CL_{PE} is the co-responsibility levy for bread grain that exceed the quota Q_Q (see Figure 1), and T_F is the fertilizer tax per unit.

The produced quantity of bread grain is used for food production (Q_D), animal feed (Q_E), and exports (Q_X):

(4) $Q_S = Q_D + Q_E + Q_X$.

The third stage represents firms which process and distribute bread grain, such as wholesale buyers, mills, exporters, and foodstuffs' producers. Bread grain (D) along with other input factors of labor (J), and capital (K) which is a residual of including all other inputs except D and J) are combined to produce food (bread grain products like flour, bread, noodles). Supplies of J and K are again modeled by constant elasticity functions:

(5) $Q_i = X_i P_i^{\varepsilon_i}$, (i = J, K,),

and food production by a CES technology:

(6) $Q_{SF} = X_{QSF}\left(\sum_i \alpha_i Q_i^{\gamma}\right)^{\frac{1}{\gamma}}$ (i = J, K, D), with $\gamma = \frac{\sigma_F - 1}{\sigma_F}$, and $\sum_{i=J,K,D} \alpha_i = 1$,

where Q_{SF} represents the produced quantity of food (bread grain products), X_{QSF} the production function shift parameter, α_i the distribution parameter of factor i, γ the substitution parameter, and σ_F the elasticity of substitution between input factors at the food industry level.

Assuming some market power in the food sector input demand is represented by

(7) $P_i = \left(1 - L_F\right) X_{QSF}^{\gamma} \alpha_i \left(\frac{Q_{SF}}{Q_i}\right)^{1-\gamma} P_F$, (i = J, K, D),

where P_F denotes the price of food, P_D the gross price of bread grain under the quota, and L_F the Lerner index of the downstream sector.

Food demand is modeled by a constant elasticity function:

(8) $Q_{DF} = X_{QDF} P_F^{\eta_F}$,

where Q_{DF} represents the demanded quantity of food, X_{QDF} a shift parameter, and η_F the elasticity of demand.

Import and export of processed bread grain do not play an important role in Austria. According to Astl (1991), the ratio of imports to total consumption of bread and baker's ware is less than 7%. According to Raab (1994), exports of flour and flour products increased but were still only 20,000 t or 4% of domestically processed bread grain in 1993. Given these facts, we assume that domestic demand of bread grain products equals domestic supply:

(9) $Q_{DF} = Q_{SF}$.

Bread grain demand for feeding purposes are also modeled by a constant elasticity demand function:

(10) $Q_E = X_{QDE} P_E^{\eta_E}$,

where X_{QDE} and η_E are the shift parameter and the elasticity of animal feedstuffs demand.

Finally, we define the agricultural share of expenditures for bread grain products (λ) as

(11) $\lambda = \dfrac{P_D Q_D}{P_F Q_{DF}}$.

The model is calibrated to fit the price and quantity averages from the period 1991 - 1993.

Welfare Measures

Welfare changes of bread grain farmers (ΔU_{BF}) are measured as the difference between the current situation (average 1991-1993) and a simulated nonintervention situation. Welfare in both situations is given by revenues (first term in Equation (12)) minus production costs (second term), and minus the opportunity costs of supplying land and farm labor, measured as the area below the supply curve (last term):

(12)
$$\Delta U_{BF} = \left[(P_E - CL_{PE} - P_w)(Q_S - Q_{Sw}) + (P_D - CL_{PD} - P_E + CL_{PE})Q_Q \right] \\ - \left[(P_G - P_{Gw})(Q_G - Q_{Gw}) + (P_H + T_F - P_{Hw})(Q_H - Q_{Hw}) \right] \\ - \left[\frac{X_A}{\varepsilon_A + 1}(P_A^{\varepsilon_A+1} - P_{Aw}^{\varepsilon_A+1}) - (P_A - P_{Aw})(Q_A - Q_{Aw}) + \frac{X_B}{\varepsilon_B + 1}(P_B^{\varepsilon_B+1} - P_{Bw}^{\varepsilon_B+1}) - (P_B - P_{Bw})(Q_B - Q_{Bw}) \right],$$

where P_w is the world market price of bread grain, CL_{PD} is the co-responsibility levy of bread grain under the quota. The subscript *w* indicates prices and quantities in the nonintervention situation.

Wealth transfers to upstream industries (ΔU_{UI}) are measured as the sum of changes in Marshallian producer surpluses from supplying investment goods and operating inputs to farmers (first term in Equation (13)) and oligopoly rents in these industries (second term),

(13)
$$\Delta U_{UI} = \left[\sum_{i=G,H} \frac{X_i(1-L_i)^{\varepsilon_i+1}}{\varepsilon_i + 1}(P_i^{\varepsilon_i+1} - P_{iw}^{\varepsilon_i+1}) \right] + \left[L_i(P_i Q_i - P_{iw} Q_{iw}) \right].$$

Wealth transfers to downstream industry (ΔU_{DI}) are measured as changes in producer surpluses from supplying capital and labour to food industry (first term) and food industries oligopoly rent (second term):

(14)
$$\Delta U_{DI} = \sum_{i=J,K} \left[\frac{X_i}{\varepsilon_i + 1}(P_i^{\varepsilon_i+1} - P_{iw}^{\varepsilon_i+1}) \right] + \left[L_F(P_F Q_{DF} - P_{Fw} Q_{DFw}) \right].$$

The change in welfare of food consumers (ΔU_{CS}) are calculated as the change in consumer surpluses:

(15)
$$\Delta U_{CS} = \frac{X_{QDF}}{\eta_F + 1}(P_{F,w}^{\eta_F+1} - P_F^{\eta_F+1}).$$

Similar, the change in welfare of buyers of bread grain for animal feed (ΔU_{BS}) are calculated as

(16)
$$\Delta U_{BS} = \frac{X_{QDE}}{\eta_E + 1}(P_{E,w}^{\eta_E+1} - P_E^{\eta_E+1}).$$ [1]

The taxpayers' costs (ΔU_{TX}) are measured by budget expenditures and revenues times marginal cost of public funds (*MCF*):

$$(17) \quad \Delta U_{TX} = MCF\left\{\begin{bmatrix} -(Q_Q - Q_D)(P_D - CL_{PD} - P_E) - Q_X(P_E - CL_{PE} - P_w) \\ -Q_X AEC - Q_Q ST + CL_{PD} Q_D + CL_{PE}(Q_E - Q_Q + Q_D) \end{bmatrix} + [T_F Q_H]\right\},$$

where *AEC* refers to export cost in addition to the difference between the domestic price and the world market price, like transportation cost and the wholesalers' markup, *ST* refers to the premium wholesale buyers get for storing bread grain under the quota. The first term in Equation (17) describes expenditures for exports and revenues from the co-responsibility levy, and the second term describes revenues from fertilizer taxation.

Parameters and simulation technique

To run the model and calculate welfare changes as described above 32 parameter values are necessary (ε_A, ε_B, ε_G, ε_H, ε_J, ε_K, α_A, α_B, α_G, α_H, α_J, α_K, α_D, σ_S, σ_F, η_E, η_F, L_G, L_H, L_F, X_A, X_B, X_G, X_H, X_J, X_K, X_{QS}, X_{QSF}, X_{QDF}, X_{QE}, λ, *MCF*). While values for 13 (X_A, X_B, X_G, X_H, X_J, X_K, X_{QS}, X_{QSF}, X_{QDF}, X_{QE}, α_D, α_H, α_K) of these 32 parameters are endogenously derived in the calibration process, 19 (ε_A, ε_B, ε_G, ε_H, ε_J, ε_K, α_A, α_B, α_G, α_J, σ_S, σ_F, η_E, η_F, L_G, L_H, L_F, λ, *MCF*) specific parameter values are exogenously given.

In contrast to most empirical studies of this kind we do not assume one (or a few) specific value(s) for each parameter, but rather assume each parameter to be in a plausible range. The upper (*a*) and lower (*b*) bounds of these ranges are based on extensive literature and data analysis (described in detail in Salhofer, Schmid, Schneider and Streicher (2000)) and are presented in Table 1. Two alternative distributions are assumed between the upper and lower bounds: i) a uniform distribution $U(a, b)$; and ii) a symmetric normal distribution $N(\mu, \sigma,)$ with $\mu = (a+b)/2$ and $\sigma = (\mu - a)/1.96$, which is truncated at *a* and *b*.

On the base of these parameter ranges, 10,000 independent draws are taken for every single parameter and each alternative distribution. Hence, we derive 10,000 parameter sets including 19 elements for each alternative distribution, separately. These parameter sets are used to derive 10.000 welfare measures for each defined group and each alternative parameter distribution.

3. Transfer efficiency measures

The most common measure to express the efficiency of agricultural programs in redistributing welfare to farmers is Gardner's (1983) average transfer efficiency (*ATE*) measure, defined as the ratio between the gains of farmers (ΔU_{BF}) and the expenses of non-farmers (consumers (ΔU_{CS}) plus taxpayers (ΔU_{TX})), $ATE = \Delta U_{BF}/(\Delta U_{CS} + \Delta U_{TX})$. Hence, Gardner like many successors (e.g. Alston and Hurd, 1990; Kola, 1993; Salhofer 1996) divide society into two social groups. This seems plausible given that in their simple single market models farmers are usually the only beneficiaries while consumers and taxpayers cover the same group of individuals. However, in this study society is differentiated in more than two social groups with more than one group gaining (as we will see later on) from agricultural policy. Therefore, more differentiated efficiency measures are desirable and necessary.

To express how much each group is gaining and loosing we suggest the following set of measures: First, benefit/cost ratios

$$(18) \quad BC_i = \frac{\Delta U_i}{-\sum_{j=1}^{m} \Delta U_j}, \quad (i = 1, \ldots, n,),$$

where ΔU_i is the welfare change of one of n benefiting groups and ΔU_j is the welfare change of one of m loosing groups. Hence, BC_i times 100 measures what percentage of the total cost caused by agricultural policy are realized as benefits by group *i*. All remaining costs which are not attributable to any winning group are social cost (*SC*) and hence

$$(19) \qquad \frac{\Delta U_1}{-\sum_{j=1}^{m} \Delta U_j} + \; . \; . \; . \; + \frac{\Delta U_n}{-\sum_{j=1}^{m} \Delta U_j} + \frac{SC}{-\sum_{j=1}^{m} \Delta U_j} = \frac{\sum_{i=1}^{n} \Delta U_i + SC}{-\sum_{j=1}^{m} \Delta U_j} = 1 , \quad \text{with}$$

$$SC = -\left[\sum_{j=1}^{m} \Delta U_j + \sum_{i=1}^{n} \Delta U_i \right].$$

Hence, $SC / \sum \Delta U_j$ gives the fraction of total cost not realized as benefits by any group.

Second, cost/cost ratios

$$(20) \quad CC_j = \frac{\Delta U_j}{\sum_{j=1}^{m} \Delta U_j} , \quad (j = 1, . . . , m),$$

with ΔU_j being the welfare change of one of *m* loosing groups. Therefore, CC_j measures the part of total cost borne by group *j*.

4. Empirical results

The 10,000 calculated welfare measures for each social group are utilized to derive distributions of efficiency measures. The results are summarized in Table 2 (for the case of normally distributed parameter values) and in Table 3 (for the case of uniform distributed parameter values). Bread grain farmers (*BF*), upstream industry (*UI*) and downstream industry (*DI*) benefit from agricultural policy and hence their shares (as well as the share of social cost (*SC*)) are expressed with discussed benefit/cost ratios (BC_i). Consumers (*CS*), buyers of bread grains (*BS*) and taxpayers (*TX*) loose and their shares are expressed with cost/cost ratios (CC_i).

At the mean 33% of all program cost are realized as benefits by agricultural producers. In 95% of our 10,000 simulations this value is between 26% and 41%, and in 75% of total simulation runs the value is between 28% and 38%. This is also illustrated by a Kernel Density function in Figure 2.

Beside farmers, the upstream industries benefit about 12% and downstream industries about 15% of all program costs. The high coefficient of variation of the downstream industries illustrates a high dependency of the results from assumed parameter values. About 40% of all program costs are on average lost through inefficient resource allocation.

About 53% of the program costs are on average paid by consumers, 28% by buyers of bread grain for feeding purposes and 22% by taxpayers.

The results for the case of uniformly distributed parameter values do not vary significantly in regard to their means and medians, but, as expected, have a higher variance.

To analyze how sensitive the transfer efficiency measures are with respect to the model parameters surface response functions are utilized (Zhao, Griffiths, Griffith and Mullen, 2000). In particular, we first describe the nonlinear relationships by estimating its second order approximation, i.e. quadratic polynomials:

(21) $$BC_i = c_0 + \sum_{k=1}^{19} c_k X_k + \sum_{k=1}^{19} \sum_{l=1}^{i} d_{kl} X_k X_l + e_i, \quad (i = BF, UI, DI, SC),$$

$$CC_j = c_0 + \sum_{k=1}^{19} c_k X_k + \sum_{k=1}^{19} \sum_{l=1}^{i} d_{kl} X_k X_l + e_j, \quad (j = CS, BS, TX),$$

with X_k and X_l being the 19 model parameters, c_0, c_k, and d_{kl} are regression coefficients, and e_i error terms. Details of the 210 estimated coefficients of each of the seven regressions are available upon request. The adjusted R^2s are all very high, at least 0.994.

Second, the elasticities of transfer efficiency measures (her for the case of benefit/cost ratios) with respect to model parameters (E_{ik}) are calculated through partial differentiation of the quadratic surface response functions (Zhao, Griffiths, Griffith and Mullen, 2000)[2]

$$(22)\quad E_{i,k} = \left(\frac{\partial BC_i}{\partial X_k} \frac{X_k}{BC_i} = c_k + 2d_{kk}X_k + \sum_{\substack{l=1 \\ k \neq l}}^{19} d_{kl}X_l \right) \frac{X_k}{BC_i}, \; (i = BF, UI, DI, SC;\ k,l = 1, \ldots, 19),$$

Plugging the 19 x 10,000 uniformly distributed parameter values and the implied *BC* measures into equation (22) a distribution for each elasticity is derived. For example the Kernel density function in Figure 3 describes the distribution of the elasticity $E_{BF,l}$, i.e. how much a one percentage change alters the ratio between bread grain farmers' benefits and total cost of the program.

The mean value for $E_{BF,l}$ (- 0.76) and all other elasticities are presented in Table 4. Most measures are quite inelastic to most model parameters. This is especially true for the $BC_{Bread\ grain\ farmer}$ as well as all cost/cost ratios. In the case of $BC_{upstream\ industry}$ and $BC_{downstream\ industry}$ there are some quite influential parameters (bold in Table 4) including Lerner indices, the demand elasticity for food and the elasticity of substitution at the farm level.

6. Summary and Discussion

Agricultural programs in developed countries commonly redistribute income from consumers and taxpayers to farmers. Many studies have measured the economic costs of such transfers steaming from inefficiencies in the use of productive resources and distortions in consumption patterns (e.g. Babcock, Carter and Schmitz, 1990; Cramer et al., 1990; Gisser, 1993; Kola, 1993; Salhofer 1996). Much less is known about distributive leakages due to income gains accruing to groups other than the intended beneficiaries of support. The study in hand gives some empirical evidence of distributive leakage for the case of bread grain policy in Austria before EU accession. It is shown that the welfare gains of upstream and downstream industries are almost as large as those of bread grain farmers.

To cover the transfer effects in a multi-group analysis we have augmented Gardner's (1983) two-group (farmer and nonfarmer) based measure of average transfer efficiency. Utilizing these new measures we can reveal that 30% of all program cost are realized as benefits by farmers, 12% by upstream industries, 15% by downstream industries, while 40% are distorted due to inefficient resource allocation. Hence, the study confirms once again a low transfer efficiency of agricultural programs, but reveals that this is not only due to inefficient resource use but also because of distributive leakage.

Utilizing computer intensive simulation techniques analysis we are able to show that most of our results are quite stable over a wide range of parameter. Moreover, utilizing regression analysis we are able to identify the most important parameters with respect to model outcome.

Footnotes

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1 It is not quite obvious from the first place whose wealth is measured buyers welfare. According to Just, Huth und Schmitz (1982) it includes the welfare change of final consumers as well as the changes in rents of all suppliers of factors necessary to produce a final good (e.g. meat)

2 Alternative ways to derive elasticity measures from surface response functions are discussed in Salhofer, Schmid, Schneider and Streicher (2000).

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Table 1: Summary of parameter ranges

Parameter	Range	Parameter	Range
e_A	0.1 – 0.4	a_A	0.06 – 0.1
e_B	0.2 – 1.0	a_B	0.29 – 0.39
e_G	1.0 – 5.0	a_G	0.11 – 0.19
e_H	1.0 – 5.0	a_J	0.27 – 0.37
e_J	0.2 – 1.4	l	0.07 – 0.10
e_K	1.0 – 5.0	L_G	0 – 0.2
s_S	0.1 – 0.9	L_H	0 – 0.2
s_F	0.5 – 1.5	L_F	0 – 0.2
h_E	-0.1 – -0.6	MCF	0.1 – 0.4
h_F	-0.5 – -1.5		

Table 2: Benefit/cost and cost/cost ratios of bread grain policy in Austria under the assumption of normal distributed parameter values

					95% Interval		75% Interval	
	Mean	Median	Std. Dev.	Coeff.Var.	Maximum	Minimum	Maximum	Minimum
Benefit/cost ratios								
$BC_{Bread\ grain\ farmer}$	0.33	0.33	0.04	0.12	0.41	0.26	0.38	0.28
$BC_{Upstream\ industry}$	0.12	0.11	0.02	0.18	0.16	0.08	0.14	0.09
$BC_{Downstream\ industry}$	0.15	0.15	0.05	0.37	0.26	0.05	0.22	0.09
$BC_{Social\ cost}$	0.40	0.40	0.04	0.09	0.47	0.32	0.45	0.35
Cost/cost ratios								
$CC_{Consumer}$	0.53	0.53	0.05	0.09	0.62	0.43	0.59	0.47
$CC_{Buyer\ of\ bread\ grain}$	0.28	0.28	0.02	0.08	0.33	0.24	0.31	0.26
$CC_{Taxpayer}$	0.22	0.22	0.02	0.11	0.27	0.18	0.25	0.19

Table 3: Benefit/cost and cost/cost ratios of bread grain policy in Austria under the assumption of uniform distributed parameter values

					95% Interval		75% Interval	
	Mean	Median	Std. Dev.	Coeff.Var.	Maximum	Minimum	Maximum	Minimum
Benefit/cost ratios								
$BC_{Bread\ grain\ farmer}$	0.33	0.33	0.05	0.16	0.44	0.24	0.40	0.27
$BC_{Upstream\ industry}$	0.12	0.12	0.03	0.24	0.18	0.07	0.15	0.08
$BC_{Downstream\ industry}$	0.15	0.15	0.07	0.49	0.31	0.03	0.25	0.06
$BC_{Social\ cost}$	0.40	0.40	0.05	0.13	0.49	0.29	0.46	0.33
Cost/cost ratios								
$CC_{Consumer}$	0.53	0.53	0.06	0.12	0.64	0.41	0.61	0.45
$CC_{Buyer\ of\ bread\ grain}$	0.29	0.29	0.03	0.10	0.34	0.23	0.32	0.25
$CC_{Taxpayer}$	0.22	0.22	0.03	0.15	0.29	0.16	0.26	0.18

Table 4: Sensitivity of transfer efficiency measures with respect to model parameters

	Benefit/cost ratios				Cost/cost ratios		
	$BC_{B.\ g.\ farmer}$	$BC_{Upstr.\ ind.}$	$BC_{Downstr.\ ind.}$	$BC_{Social\ cost}$	$CC_{Consumer}$	$CC_{Buyer\ b.\ g.}$	$CC_{Taxpayer}$
h_E	-0.10	-0.09	-0.10	0.15	0.19	-0.10	-0.10
h_F	0.07	0.07	**-1.25**	0.17	-0.05	-0.06	0.07
s_S	-0.04	0.06	0.00	0.02	-0.01	0.00	0.00
s_F	-0.52	-0.54	**1.88**	0.03	-0.21	0.42	-0.50
e_A	-0.03	0.02	0.01	0.02	-0.01	0.00	0.00
e_B	-0.21	0.16	0.00	0.12	-0.06	0.00	0.00
e_G	0.03	-0.22	0.00	0.04	-0.02	0.00	0.00
e_H	0.07	-0.55	0.00	0.09	-0.04	0.00	0.00
e_J	0.05	0.05	-0.39	0.06	-0.01	-0.04	0.05
e_K	0.09	0.09	-0.76	0.12	-0.01	-0.08	0.09
a_A	0.11	-0.20	0.03	-0.04	0.01	-0.01	0.03
a_B	0.41	-0.95	0.05	-0.08	-0.02	-0.02	0.10
a_G	-0.02	0.36	0.00	-0.08	0.00	-0.02	0.06
a_J	-0.06	-0.04	0.27	-0.04	-0.01	0.04	-0.05
l	-0.76	-0.77	0.90	0.61	-0.61	0.68	-0.78
L_F	-0.05	0.27	**-2.58**	0.72	-0.52	0.04	-0.05
L_G	0.01	**-1.46**	-0.02	0.42	-0.19	-0.01	0.01
L_H	-0.01	**-3.75**	-0.05	**1.08**	-0.55	0.00	0.00
MCF	-0.05	-0.10	-0.02	0.08	-0.14	-0.04	0.16

Figure 1: Austrian bread grain policy

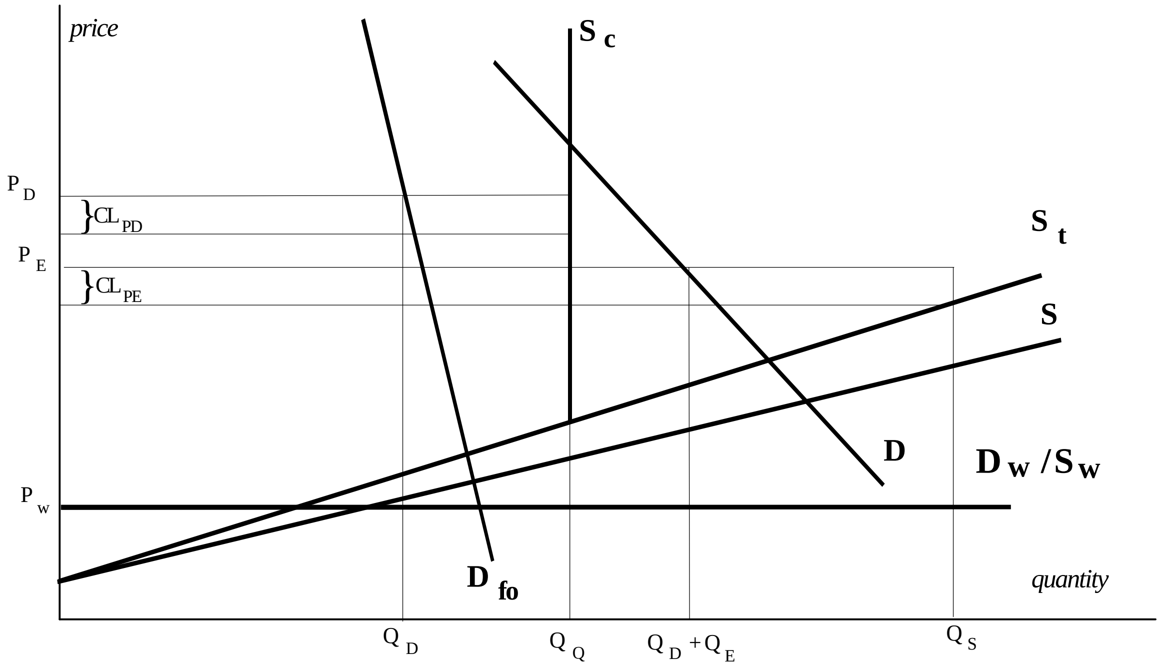

Figure 2: Kernel density function of the ratio between bread grain farmers' benefits and total cost of the program

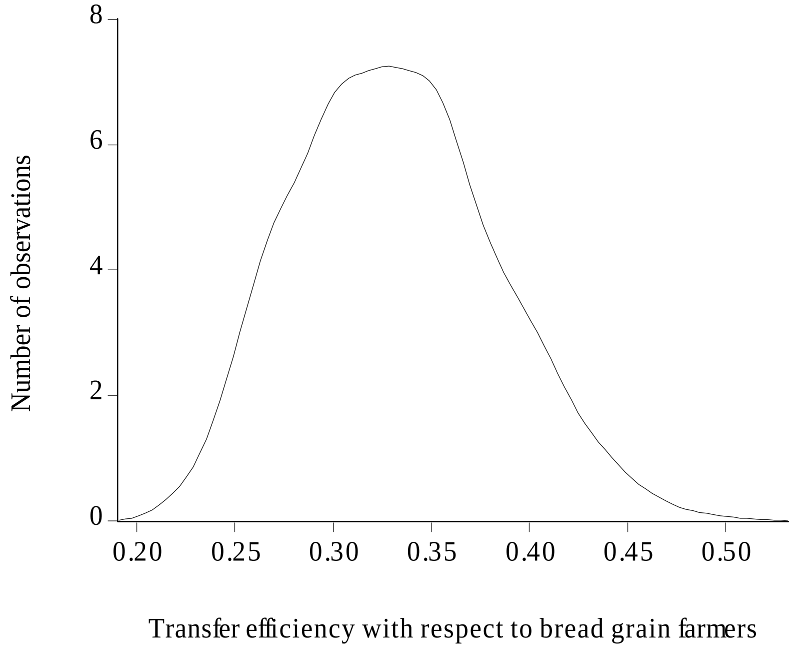

Figure 3: Kernel density function of the elasticity $E_{BF,\lambda}$, i.e. percentage change of the ratio between bread grain farmers' benefits and total cost of the program with respect to the agricultural share of expenditures for bread grain products (λ)