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CONTENTS

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IMPLICATIONS OF RECENT AUSTRALIAN WHEAT INDUSTRY DEVELOPMENTS FOR DOMESTIC AND OVERSEAS PRICES[φ]

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ABSTRACT

A model is developed to examine the impact of commercialisation of the former Australian Wheat Board on the pricing policies of a multi-market, price-setting firm. Conceptualising the change in firm structure as a change in the objectives of the AWB as a shift from a revenue maximiser to a profit maximiser, this paper investigates a risk averse firm's price-setting behaviour in an "overseas" and a "domestic" market. In particular, it has been shown that the general effect of commercialisation has been an increase in both domestic and overseas prices. During the 1990s, in association with commercialisation, the Australian wheat industry also experienced deregulation of the domestic market, a decline in wheat transport costs and a decrease in world market uncertainty. Simulation results suggest that the contemporaneous occurrence of these developments with commercialisation may have ameliorated to some extent the price increases associated with commercialisation.

Key words: Australian wheat industry; privatisation; pricing policies.

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INTRODUCTION

Historically, the Australian Wheat Industry has been the beneficiary of considerable government-funded support. However, commencing with the cessation of the Guaranteed Minimum Price Scheme in 1989 this support has been in the process of being removed, with the aim of leaving the industry exposed to economic realities. Over this period a central player in the Industry has been the former Australian Wheat Board (AWB). The AWB's activities, as a result of the regulatory framework (Wheat Marketing Act, 1989), have been targeted in relation to the removal of government-funded support and the encouragement for the former government owned and operated marketing authority to adopt fully commercial practices.

In this context the changes imposed on the AWB Ltd have been similar to those imposed by governments on other former public enterprises in the privatisation process. The privatisation process has been the subject of a considerable economics literature. One of the interests of this literature is the impact of privatisation on the objectives, and consequently the behaviour, of the firm (Vickers and Yarrow, 1989; Bishop, Kay and Mayer, 1994). However, one key difference is that whereas the privatisation of public enterprises that retain considerable monopoly power has been associated with post-privatisation regulation of their behaviour, typically of the "price-cap" variety, the AWB Ltd, by virtue of trading across national boundaries, is not subjected to such price regulation.

Bos notes that the study of public enterprise economics, focusing specifically on pricing, is indeed different to the study of pricing in private firms and this difference is not ownership, "The main difference is the multitude of political and economic determinants of public enterprises' activities as compared to the mainly commercial determinants of the activities of private enterprises"…"Prices are the best indicator of the consequences of combining such political and economic determinants" (Bos, 1986). From this it can be acknowledged that the transformation from public to private ownership may have a substantial impact on both the pricing behaviour of a firm but also on its political and economic influences.

This observation suggests that an examination of the AWB Ltd's situation using the methods of the privatisation literature might reveal insights regarding how its behaviour is likely to have been modified by the removal of government-funded support to the Industry. The aim of this paper is to undertake such an analysis, focusing, in particular, on how the government's requirement, under the National Competition Policy, of the AWB to look towards fully commercial practices can be expected to have affected its pricing behaviour.

Deregulation in Australia began with the Whitlam government's 25% across-the-board tariff cut in 1973. Microeconomic reform continued with the establishment of an Industries Assistance Commission (now the Productivity Commission). In 1995, following the Hilmer Report (1993), the National Competition Policy Act (1995) was ratified by the Council of Australian Governments (COAG). This Act saw the creation of the Australian Competition and Consumer Commission and the National Competition Council (NCC). The aim of the NCC is "to supervise the progress of federal and state governments towards implementation of competitive reform" (Quiggin, 1996). Since its establishment, the NCC has overseen many industry reviews, including the 2000 Review of the Wheat Marketing Act.

During the 1990s the Australian wheat industry was subject to institutional, regulatory and macroeconomic changes which have had a profound impact in conjunction with the commercialisation of the AWB Ltd. These changes, which are presented in the analysis section of this paper, include deregulation of the domestic market, changes to costs structures and a period of international stability.

The structure of this paper is as follows: a model representing the change in the firm's objectives following the commercialisation process is presented. Several recent Australian wheat industry developments, which manifest themselves as differing price elasticities, differing transport costs and uncertain demand functions, are then outlined and these changes are imposed on the hypothetical data to determine how pricing behaviour differs from a base case scenario and the results for each case are then analysed, conclusions made and policy implications are noted.

THE MODEL

The model developed in this section is based on that outlined in Fraser (1989) of a size-orientated price-setting firm operating in multiple markets. In that case little was done to specify the firm's alternative markets other than for them to differ in terms of the extent to which demand was uncertain. In this case, in order to characterize more fully the differences between the AWB's domestic and overseas markets, the following market-based assumptions are made: (a). The product is a homogenous good; (b). Three markets exist: "overseas", "domestic" and residual production ("dump market") in which revenue just covers costs; (c). Costs to supply are greater in the overseas market than the domestic market; (d). Demand in the overseas market is more elastic than in the domestic market; and, (e). Demand in the overseas market is more uncertain than in the domestic market.

In relation to the homogeneity assumption (a), it is important to recognise that wheat is differentiated in this model as "domestic wheat" and "overseas wheat". It is maintained that product differentiation within these major categories would add complexity to the analysis, without enhancing the insights provided by the modelling approach. In particular, it seems unlikely that the key features of the results regarding the impact of privatisation on overseas prices would be affected. Moreover, the question of 'Is wheat just wheat?' has been avidly pursued by agricultural economists over the last twenty years. Recent literature sees wheat investigated, either as a single product or differentiated by quality or variety (e.g. Wilson, 1989; Larue and Lapan, 1992; and Ahamdi-Esfahani and Stanmore, 1996).

To qualify the issue of AWB Ltd's ability to price set and hence command market power, previous literature on the AWB's market power in the international arena has been examined and the consensus is very much inconclusive. Research by the United States Department of Agriculture (USDA) Economic Research Services notes that the Australian and Canadian Wheat Boards handled 33% of all world wheat exports between 1994 and 1997 (USDA). However, few quantitative studies have been completed, and there appears to be no formal method of computation. The majority of studies use derivatives of game theory to explain market structure in a qualitative manner. Others have assumed, for the benefit of their research, either that the AWB does or does not command market power, depending on the structure of their models. Several studies have attempted to compute the AWB's market power and have achieved inconclusive results due to the continuing lack of appropriate and detailed data (Paarlberg and Abbott, 1986 (Partial Equilibrium Model with endogenised policy decisions); and Piggott, 1992 (Equilibrium Displacement Model)). However, until publicly available studies are conducted to confirm or deny the existence of market power, it is plausible to assume the AWB Ltd has sufficient ability to set prices in overseas markets[1].

Since deregulation of the domestic market there have been very few studies examining this issue, although the general opinion is that AWB Ltd still holds a substantial share of trade in the domestic market (see Wait and Ahmadi-Esfahani, 1996). From a basic numerical analysis the AWB Ltd has, on average, since 1992/93, commanded approximately 50% of domestic market share and hence has the capacity to price discriminate in the Australian domestic market[2].

Regarding the specification of the firm's objective, based on Fraser (1989), it is assumed that before commercialisation the objective of the firm is to maximize the expected utility of sales revenue[3] ($EU(Rev)_T$) subject to an expected profit constraint ($E(\Pi)_T$) and a total production constraint ($\overline{Q}$). An expected profit constraint has been used as prior to commercialisation the AWB had a financial responsibility to farmers to generate some profit. Note that in what follows consideration of revenue from the sale of residual production is omitted in order to simplify the analysis. In this case the firm's objective is by choice of overseas (p_o) and domestic (p_d) prices, given by:

$$\text{Max} \quad EU(\mathrm{Re}v)_T$$

$$\text{Subject to: } \overline{Q} = E(q_o) + E(q_d) + q_x$$

$$\text{and, } E(\Pi)_T = p_o E(q_o) - c_o E(q_o) + p_d E(q_d) - c_d E(q_d) \tag{1}$$

Where $E(q_o)$ is the expected sales in the overseas market; $E(q_d)$ is the expected sales in the domestic market; q_x is the sales of residual production; c_o are the costs of supply per unit to the overseas market and c_d are the costs of supply per unit to the domestic market.

Demand in both the overseas and domestic markets is assumed to be characterised by constant elasticity (b_i) demand functions subject to additive uncertainty (u_i, where i represents either the overseas (o) or domestic (d) markets).

$$q_i = a_i p_i^{b_i} + u_i \tag{2}$$

a_i is the scaling factor in each market and $E(u_i) = 0$, as a consequence $E(q_i) = a_i p_i^{b_i}$. Demand is assumed to be uncorrelated in the two markets and price is chosen as an optimal

[1] An interesting working paper to view is Lobb, A.E. and Burton, M.P. 2005, Estimating Price Premiums for Australian Wheat Exports, University of Western Australia Working Paper.

[2] Using data from ABARE, 2001 (Australian domestic use (p 216), and www.awb.com.au (AWB receivals and net exports). Also, quoted in Kronos Corporate (2002): "AWB claim 50% domestic market share (A. Lindberg, FMCA Conference, 2002)", (Footnote 30, p 30).

[3] See Rees, 1984, pp 24-26, where the case is made for public enterprises tending towards size maximisation behaviour because of the separation of ownership and control.

mark-up (λ) on per unit costs of supply, $p_i = (1+\lambda_i)c_i$. This mark-up formulation is used for price-setting because it creates transparency in the relationship between prices and costs.

Expected revenue ($E(Rev)_T$) is given by:

$$E(\mathrm{Re}\,v)_T = p_o E(q_o) + p_d E(q_d) \tag{3}$$

While the variance of revenue ($Var(Rev)_T$), where $Var(u_i)$ measures the level of uncertainty of demand in each market, is given by:

$$Var(\mathrm{Re}\,v)_T = p_o^{\,2} Var(u_o) + p_d^{\,2} Var(u_d) \tag{4}$$

On this basis, using the mean-variance specification of expected utility, the firm's objective is to maximize[4]:

$$EU(\mathrm{Re}\,v)_T = U(E(\mathrm{Re}\,v)_T) + \frac{1}{2}U''(E(\mathrm{Re}\,v)_T)Var(\mathrm{Re}\,v)_T$$

Subject to: $\overline{Q} = E(q_o) + E(q_d) + q_x$

and, $E(\Pi)_T = (p_o E(q_o) - c_o E(q_o)) + (p_d E(q_d) - c_d E(q_d))$ (5)

The first order conditions for the optimal prices, subject to the expected profit and total production constraints are as follows where $E'(\mathrm{Re}\,v)_i = c_i(E(q_i))(1-b_i)$ and $Var'(\mathrm{Re}\,v_i) = c_i p_i (Var(u_i))$:

$$\begin{aligned} foc_i &= U'(E(\mathrm{Re}v))_T * E'(\mathrm{Re}v)_i + \frac{1}{2}\left[U'''(E(\mathrm{Re}v))_T * Var(\mathrm{Re}v_T) * E'(\mathrm{Re}v)_i\right] \\ &+ \frac{1}{2}\left[U''(E(\mathrm{Re}v))_T * Var'(\mathrm{Re}v_i)\right] = 0 \end{aligned} \tag{6}$$

Following commercialisation there is assumed to be a focus on profit rather than revenue, in which case the firm's objective is to maximize the expected utility of profit, subject only to the total production constraint.

Max $EU(\Pi)_T$

Subject to: $\overline{Q} = E(q_o) + E(q_d) + q_x$ (7)

Using the same specification of the demand functions, expected profit is given by:

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[4] See Hanson and Ladd, 1991 for empirical support for this assumption.

$$E(\Pi)_T = p_o E(q_o) + p_d E(q_d) - c_o E(q_o) - c_d E(q_d) \tag{8}$$

and the variance of profit is given by:

$$Var(\Pi)_T = (p_o - c_o)^2 Var(u_o) + (p_d - c_d)^2 Var(u_d) \tag{9}$$

Once again using the mean-variance formulation gives:

Max $$EU(\Pi)_T = U(E(\Pi)_T + \frac{1}{2}U''(E(\Pi)_T)Var(\Pi)_T$$

Subject to: $$\overline{Q} = E(q_o) + E(q_d) + q_x \tag{10}$$

On this basis, the first order conditions for the optimal prices subject to the total production constraint are given by, where $E'(\Pi)_i = c_i E(q_i) - \lambda_i b_i c_i^2 a_i ((1+\lambda_i)c_i)^{-b_i-1}$ and $Var'(\Pi_i) = 2\lambda_i c_i^2 Var(u_i)$:

$$\begin{aligned} foc_i = {} & U'(E(\Pi))_T * E'(\Pi)_i + \frac{1}{2}\left[U'''(E(\Pi))_T * Var(\Pi_T) * E'(\Pi)_i\right] \\ & + \frac{1}{2}\left[U''(E(\Pi))_T * Var'(\Pi_i)\right] = 0 \end{aligned} \tag{11}$$

In order to undertake a numerical analysis of the model developed it is necessary to specify a functional form for the firm's utility function, and a set of base case parameter values. In what follows, use is made of the constant relative risk aversion utility function, given a relative risk aversion coefficient, *R*. The constant relative risk aversion utility function is often used in analyses due to its computational efficiency (see Pope and Just, 1991). On this basis, total utility for the before commercialisation case ($U(\mathrm{Re}v)_T$) is given by:

$$U(\mathrm{Re}v)_T = {(\mathrm{Re}v)_T}^{1-R} \big/ 1-R \tag{12}$$

And after commercialisation, the firm's utility is given by:

$$U(\Pi)_T = {\Pi_T}^{1-R} \big/ 1-R \tag{13}$$

The parameter values used for the 'base case' in the numerical analysis are presented in table 1. Note that the figures used in the 'base case' are purely hypothetical and have been used primarily for convenience because the focus of this analysis is on establishing the directional impact on pricing of commercialisation, not the magnitudes involved. This issue is also addressed in what follows by a sensitivity analysis of parameter values.

Table 1. Model parameter values

Overseas Market	Domestic Market	Residual Market
$a_o = 10000$	$a_d = 10000$	$\overline{p}_x = c_x = 1$
$b_o = 1.2$	$b_d = 1.1$	$\overline{Q} = 500$ *('000 Kt)*
$c_o = 70$	$c_d = 60$	
$u_o = 500$	$u_d = 100$	

Note the relative risk aversion coefficient is set at $R = 0.5$. The model was solved for this 'base case' scenario, the results of which can be found in columns 2 and 4 of table 3[5].

From the initial numerical analysis of the sensitivity of the relative prices and quantities three hypotheses were developed[6]:

H1: $p_o(\Pi) > p_o(\mathrm{Re}\,v)$

H2: $p_d(\Pi) > p_d(\mathrm{Re}\,v)$

H3: $Q_T(\Pi) < Q_T(\mathrm{Re}\,v)$

ANALYSIS

As indicated in the Introduction, the Australian wheat industry has undergone many changes during the 1990s including deregulation of the Australian wheat market (case 1); changes in domestic and export transport costs (case 2); and developments in international stability (case 3), (see table 2). These changes are imposed on the hypothetical data used in the base case (see table 1 and table 3, columns 2 and 4), to determine how pricing behaviour differs given three different scenarios.

Each of these recent Australian wheat industry development are analysed and the results of these impacts on the pricing behaviour of the AWB as it shifts from a revenue maximiser to a profit maximiser is measured.

5 It might be expected that the AWB Ltd's attitude to risk (R) would also change with commercialisation. However, previous numerical analysis of this model suggests that the pattern of results is insensitive to the assumed value of R (see Lobb and Fraser, 2002, for details).

6 It was also shown in Lobb and Fraser (2002) that: $p_o(\Pi_i) \lessgtr p_d(\Pi_i)$; depending on the parameter values chosen.

Table 2. Policy developments in the Australian wheat industry

	Policy developments	Application to the model	Changes
Case 1	Deregulation	Increase in the elasticity of demand for the domestic market	5%
Case 2	Changes in transport costs	Decline in both domestic and export transport costs	19% (domestic) 25% (export)
Case 3	Developments in international stability	Decline in uncertainty in the international arena	33%

Domestic Deregulation of the Australian Wheat Market

The Australian Wheat Board (AWB), was originally established as a temporary measure during WWII, "to handle wheat marketing as a war-time emergency" (AWB, 1999). These terms were formalised with the introduction of the Wheat Industry Stabilisation Act (WISA), (1948). The act ensured the former AWB was the sole marketer and seller of Australian wheat on the domestic and export markets. As described by Wait and Ahmadi-Esfahani, prior to deregulation:

> All domestically produced wheat became the property of the AWB once it left the farm gate. The Wheat (*sic*) was then taken to the AWB-appointed receiver in each State – the Bulk Handling Authorities (BHAs), which were statutory monopolies. Growers were charged for the use of the services of the BHAs at the same amount per tonne regardless of the handling facility to which they delivered their wheat and the time of delivery within the season.
>
> (Wait and Ahamdi-Esfahani, 1996)

The preliminaries of deregulation followed the Industry Assistance Commission's (IAC) reports[7] and the announcement by the Australian Federal Government (1985), that they were no longer willing or able to provide assistance to wheat producers in order to match the subsidies provided to farmers in other countries. The Wheat Marketing Act (WMA), (1984, 1989), was developed to replace WISA (1948). Changes included the removal of the provision of government underwriting of loans and price guarantees for the AWB as well as opening the domestic market to competition to increase internal and allocative efficiency.

The deregulation process culminated with the signing of the WMA on 1st July 1989. The WMA imposed a new structure for the Australian wheat industry and the AWB became merely one of several players in the newly competitive domestic market. Multinational companies took this opportunity to enter the Australian market. The companies that began marketing, trading and broking in the domestic market included Cargill, Conagra and Louis Dreyfus (Wait and Ahmadi-Esfahani, 1996). Farmers were no longer restricted to selling solely to the AWB and now had marketing choices for domestic sales. Buyers also benefited from the increased competition in the marketplace (Wait and Ahamadi-Esfahani, 1996).

On a theoretical level, domestic market deregulation may have resulted in an increase in the elasticity of the AWB's domestic demand as consumers would not be as constrained to purchasing wheat from the AWB as they had been prior to deregulation. It is important to note that although this is a widely accepted theoretical construct there have been no studies examining the elasticity of demand for the domestic wheat market (Wait and Ahmadi-Esfahani, 1996). This is because the data required is deemed commercially sensitive and has not been released by marketing agents.

For this study, the increase in the elasticity of domestic demand is represented by a 5% increase in b_d. Costs and uncertainty are held the same as in the base case. The elasticity of demand for the international market also remains unchanged.

As expected, the results in table 3 indicate that an increase in the AWB's elasticity of domestic demand, by weakening the expected profit constraint, will lead to a decline in both its overseas and domestic prices (A$/tn)[8].

These results are consistent with the previous findings that overseas and domestic prices of the profit maximiser are greater than for the revenue maximiser, and that the quantity for the profit maximiser is less than for the revenue maximiser (see hypotheses, section 3).

These results suggest that if the effects of deregulation in the domestic wheat market appeared in advance of the commercialisation of the AWB being implemented then domestic consumers would have seen this in terms of a decrease in domestic prices until the implementation of commercialisation brought about a price increase. Alternatively, if the impact of deregulation appeared in conjunction with the impact of commercialisation, then no such price cut would be observed. Rather, the extent of the increase in the domestic price associated with commercialisation would simply have been reduced.

Table 3. Comparing sales and profit maximisation results when b_d is increased

	*Sales** [a]	*Sales*	*Profit**	*Profit*
p_o	$190.05	$137.55	$195.30	$187.46
p_d	$95.82	$93.00	$326.88	$271.20
[b] Q_T	84.55	81.64	34.97	34.64
$E(\Pi)_{Total}$	$4580.45	$3632.18	$6810.16	$5560.44

[a] Where '*' indicates the scenario results from the initial 'base case'.

[b] Where Q_T is the total expected sales in the domestic and overseas markets.

Changes in Transport Costs

The Australian transportation industry (road, rail, and sea), and bulk handling corporations are closely linked with the wheat industry as they provide an integral network between farmers and consumers. Transportation has remained a key cost component of the AWB Ltd as the majority of wheat (85%) is destined for the export market and requires transportation from receival points to port facilities. Domestic wheat sales account for the remaining 15% where the principal modes of transport are rail and road.

[7] See IAC Reports, 1977, 1978, 1984, 1988(a) and 1988(b).

[8] Note that the expected utility of revenue maximiser will choose to lower prices until it is constrained by the expected profit constraint. Because of this the first order conditions (focs), are not equal to zero for the expected utility of revenue maximiser. However, the focs must equate in order for the best contribution to be made to increasing the expect utility of the revenue maximiser.

There are two main stages of grain transportation in the domestic arena. First, grain is transported from the farm to storage facilities (on average 17 kilometres), this cost is usually borne by the farmer (AWB Ltd, 2001a). Secondly, wheat is transported from receival storage facilities to domestic customers or merchants (a national average of 350 kilometres), the costs of which are usually incurred by the marketer, AWB Ltd (AWB Ltd, 2001a).

Exported bulk commodities, requiring shipment by sea, are particularly dependent on a low cost structure to ensure a competitive advantage. The majority of Australian wheat is sold 'free on board' (fob) with an increasingly large proportion (30%), of wheat sold as 'costs, insurance and freight' (cif), (Productivity Commission (PC), 1998). Cif requires the AWB Ltd to charter a ship to pick up and deliver wheat for export to a specific buyer. The AWB Ltd is responsible for all port authority charges including government levies, stevedoring charges, wharfage, tonnage, navigation charges, berthage and all other loading and delivery costs (PC, 1998).

Prior to privatisation, the AWB Ltd sold nearly all wheat as fob, with the importer accountable for the product after release from Bulk Handling Corporations (BHCs) and prior to loading[9]. As a result of fob sales and operating as a statutory marketing authority, the Australian Wheat Board had no contractual relationship with port authorities. There was little or no incentive for shippers to rally for an increase in efficiency as costs were sustained by the buyer (IC, 1993). Potentially, post deregulation, the AWB Ltd stood to benefit from waterfront reform by decreasing the cost margin included in the comparative price of Australian wheat. The increase in cif sales also provided an incentive for AWB Ltd to demand highly efficient and low cost services.

Data for the changes in domestic transport costs over the period 1990 till 2000 was calculated solely on rail freight price trends for wheat per tonne 1995-96 to 2000-01. Data for road and BHCs costs were unobtainable. Rail data was compiled from a Productivity Commission (2002a) report on "Trends in Australian Infrastructure Prices, 1990-91 to 2000-01". The data represents the average cost of transporting wheat from storage to ports in each state (PC, 2002a).

Table 4. Real rail freight price trends – wheat (per tonne) (Index 1996-97 = 100)

	NSW	VIC	QLD	SA	WA	National
1996-97	100	100	100	100	100	100
1997-98	101.3	100.1	100.1	100	98.9	100
1998-99	92.6	99.2	97.0	103.2	96.4	96.2
1999-00	91.4	91.3	93.5	98.4	90.3	92.1
2000-01	78.1	80.1	82.8	93.7	91.3	84.7

Source: PC estimates based on Australian Bureau of Statistics (ABS, *Consumer Price Index, Australia*, Cat no. 6401.0); (PC, 2002a).

The data in Table 4[10], show a 15.3% decline in national average real freight rail price trends for wheat per tonne over the five years 1996-97 and 2000-01[11]. If this fall in costs was

[9] This process is often referred to as 'ex spout' (PC, 1993, p 153, footnote 4).

[10] Note from PC (2002a): The real price index for each State reflects the average cost of transporting wheat from silos to the port. The average is equal to the cost of transporting the grain from each silo, weighted by the

constant and consistent from 1990-91 one could assume, holding all else constant, that costs have fallen by at least 30.6% over the last decade[12].

The data used in this paper for examining the port costs to the AWB Ltd are taken from several Australian government reports (IC, 1993 and PC, 1998), and various public submissions associated with these investigations. As a result of the material available it has been possible to estimate the port and related government charges associated with the export of bulk wheat, cif, out of various Australian ports. Table 5 shows the changes in average per tonne costs in Australian dollars and indicates that during the period 1992 to 2002 there has been a decline in costs of around 9.75%. Costs are in A$ per tonne for 1992 and 2002 for a ship with a gross registered tonnage of 30000 tonnes.

Table 5. Port authority costs in A$ per tonne for 1992 and 2002

	1992[a] A$/tn	2002[b] A$/tn	Difference $/tn 1992-2002	% 1992-2002
PORT				
Brisbane	$2.53	$1.57	$0.96	37.94%
Adelaide	$2.26	$1.79	$0.47	20.08%
Port Lincoln	$2.28	$1.71	$0.57	25.00%
Esperance	$2.48	$2.63	-$0.15	-6.05%
Albany	$2.23	$2.06	$0.17	7.62%
Kwinana	$1.06	$1.80	-$0.74	-69.81%
Geraldton	$2.44	$2.23	$0.21	8.61%
Average	**$2.18**	**$1.97**	**$0.21**	**9.63%**

[a] Source: IC, 1993, Table B8, p 216
[b] Source: Shipping Australia Ltd, 2002, Attachment C, p 7

Reforms are continuously and simultaneously occurring in both the wheat and the waterfront industries. Hence lower port authority costs are due not only to the AWB Ltd's attitude to costs, but also to increased efficiency on the waterfront. It is difficult to distinguish which component of the 9.63% decrease, over the period 1992-2002, can be accounted for either by changes in the AWB Ltd's corporate structure or by an increase in efficiency in waterfront operations. However, the fact that the AWB Ltd, prior to deregulation, traded in fob contracts (not cif), suggests that the decline in costs of 9.63% must be at least partially accounted for by the AWB Ltd's change in corporate structure.

It is important to note that domestic and overseas costs in the model are representative of total marketing costs and hence a proportion of these total selling costs needs to be allocated specifically to transport costs. The AWB Ltd, report that their 'Site to Sea' direct costs[13] are approximately 14%, and other marketing costs (pool management fees, insurance and

tonnage of Export Pool grain moved from that site as a proportion of aggregate State tonnage of AWB Pool Grain to the port for export.

[11] "Efficiency improvements in Australia's railways have lowered the cost of grain transport (in general) by over 25% since 1990" (Australasian Railway Association (ARA), 2002).

[12] This has been extrapolated from the same trends seen in table A6.10 for general freight rail prices over the decade 1990-91 to 2000-01 in the same Productivity Commission report (PC, 2002a, p 227).

[13] AWB Ltd defines these costs as: "direct costs paid from pool proceeds to service providers involved in the supply chain from up- country receivals sites to bulk wheat shipments, free on board" (AWB, 2001, p 10).

demurrage costs), account for 3% of their National Pool for 2000-01 (AWB, 2001b). Following from this, it can be inferred that transport costs of wheat by the AWB Ltd, as a proportion of total sales costs, are to the order of 82% of total selling costs.

Export costs for the AWB Ltd should also include domestic costs – that is, the transfer of wheat from the receival point to the port, as a result it is necessary to allocate the proportion of total costs to domestic (internal) and international (export) transport respectively. In what follows it is assumed, from the original and hypothetical parameter values, stipulated in the model section, that wheat exported attracts total sales costs which are two thirds (67%) greater than the domestic sales costs (that is, c_d=60 and c_o=70, a 16.7% difference). Given that domestic costs have declined by 30% over the last decade, the figure used to represent the change in export costs for this time period is 23%. Modifying these statistics to take into account the proportion of costs allocated to transport (82%), domestic transport costs represent a 25% decline in total domestic selling costs and overseas transport costs represent a 19% decline in total export costs.

The results in table 6 the sales and profit maximiser show a decrease in domestic and export prices when costs have been decreased in both markets. Note that all elasticities and values of uncertainty are held constant per the base case.

Table 6. Comparing sales and profit maximisation results when costs are decreased (export costs down by 19%; domestic costs down by 25%)

	Sales*	Sales	Profit*	Profit
p_o	$190.05	$141.64	$195.30	$175.83
p_d	$95.82	$76.55	$326.88	$283.28
Q_T	84.55	110.88	34.97	40.30
$E(\Pi)_{Total}$	$4580.45	$4897.50	$6810.16	$7191.83

Similar to the case of deregulation, these results suggest that if the effects of transport cost reductions appeared in advance of the commercialisation of the AWB being implemented then domestic consumers would have seen this in terms of a decrease in domestic prices until the implementation of commercialisation brought about a price increase. Alternatively, if the impact of transport cost reductions appeared in conjunction with the impact of commercialisation, then no such price cut would be observed. Instead, the extent of the increase in the domestic price associated with commercialisation would simply have been reduced.

Uncertainty in the International Arena

The international trading arena is viewed as becoming increasingly unstable in light of fluctuating exchange rates and general economic uncertainty following September 11th events in 2001 as well as financial upheaval throughout 2002. However, throughout the 1990s there were two periods of global macroeconomic instability, firstly in 1991-93 and then 1998-99 with an average growth rate of 3% (down from 3.5% in the 1980s and 4.5% in the 1970s (IMF, 1999). The major reason for this instability was currency crises in Mexico, Brazil, Russia and Asia. Many economies remained stable throughout this period, namely the USA, Australia, China, India, Ireland, the Netherlands, Norway and Taiwan (IMF, 1999). As a result, the International Monetary Fund (IMF), believes that it is ambiguous as to whether macroeconomic instability has been increasing, although they note "the mere fact that it has been pervasive may be considered surprising given the general improvement in macroeconomic policies in most countries compared with the two preceding decades" (IMF, 1999).

For the purposes of this study a measure of the change in the level of international uncertainty from 1988/89 to 1998/99 is taken by examining gold prices[14]. Gold is generally seen as a distinct and relatively stable commodity (less fluctuating than paper currencies), with a "universally acceptable storehouse of value" (Amey, 1998). Gold is both a commodity and a form of legal tender and it is this dichotomy that enables gold to be used as an indicator for world economic stability – "international political and economic events that may influence the market for gold as a commodity may be outweighed by developments perceived to favor gold as a medium of exchange" (Amey, 1998).

Generally declining gold prices throughout the 1990s lead to the international trading arena becoming increasingly more certain. Following from the above discussion and based on fluctuations, or changes in the level of the gold price, as a proxy for international uncertainty, it is assumed that uncertainty in the overseas market has declined by 33% during the 1990s (Amey, 1998). This stability is imposed on the model where costs, elasticities, and domestic uncertainty are held the same as in the base case scenario.

Table 7. Comparing sales and profit maximisation results when uncertainty in the overseas market decreases (33%)

	Sales*	**Sales**	**Profit***	**Profit**
$\mathbf{p_o}$	\$190.05	\$172.20	\$195.30	\$212.80
$\mathbf{p_d}$	\$95.82	\$101.94	\$326.88	\$326.89
$\mathbf{Q_T}$	84.55	82.51	34.97	33.23
$\mathbf{E(\Pi)_{Total}}$	\$4580.45	\$4710.28	\$6810.16	\$6873.04

Table 7 shows, for the sales maximiser, a small decline in export prices and a small rise in domestic price as international uncertainty decreases. These results follow from the revenue maximiser feeling less at risk generally and therefore willing to bear the increased risk associated with lowering prices in the more responsive market to increase expected revenue.

Further, in table 7, as a profit maximiser, the firm adjusts its prices upwards to reflect the decreased demand uncertainty in the overseas market. In particular, given the firm's risk aversion, the overseas market is perceived as more attractive, and the price set for that market is raised in the pursuit of increased expected profits even though this also increases the variability of profits. It follows that as the AWB Ltd has shifted from a revenue maximiser to a profit maximiser changes in the level of international uncertainty can be expected to have had the opposite impact on price setting in the overseas market, with the revenue maximiser avoiding risk with price increases, and the profit maximiser avoiding risk with price decreases.

This section has shown how the change in the objective of the firm affects optimal prices when the firm's markets differ in each respect as well as the combined effect of all differences. This and a further sensitivity analysis[15] of the effect of the firm's level of risk aversion was conducted which confirmed the robustness of the three hypotheses.

CONCLUSION

This paper has investigated the effects of internal deregulation, transport costs and international uncertainty on the AWB's pricing behaviour in the context of commercialisation, where this shift is modelled as a change in its objectives from a revenue to a profit maximiser. Certain, somewhat controversial, assumptions have been made in order to conduct this analysis and to reduce unnecessary complexities. These include assumptions such as that the AWB commands some degree of market power and that wheat can be referred to as a homogenous good. Although the market power assumption is crucial to this research, relaxing the assumption of homogeneity could be addressed in future research.

The results of the above analyses are evaluated in relation to the developed hypotheses and indicate the impact of recent wheat industry developments on hypothetical prices. In particular, it has been shown that the general effect of commercialisation has been an increase in both domestic and overseas prices. However, during the 1990s in association with commercialisation the Australian wheat industry also experienced deregulation of the domestic market, a decline in wheat transport costs and a decrease in world market uncertainty. Based on the simulation results it has been suggested that because both deregulation and lower transport costs have acted to decrease domestic and export prices, their contemporaneous occurrence with commercialisation will have ameliorated to some extent the price increases associated with commercialisation, and may have even dominated this impact.

Policy implications are difficult to assess without testing the model using actual data, and this study suggests that there is a real need for further empirical research in this area using actual data. However it is clear from these hypothetical results that regardless of the associated pricing implications, commercialisation created the potential for higher AWB Ltd trading profits, and therefore for increased returns to farmers which in turn suggests an increase in net public benefits for Australia. Alternatively, from a global perspective, following the general stance of the World Trade Organisation, governments in charge of privatised STEs with the ability to exploit monopoly power are going to have to clearly define their status to avoid potential implications.

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[14] It is important to note that many alternate measures of international uncertainty could be substituted into this analysis including the use of oil prices or even the international risk reported by several agencies which would include country, credit or exchange rate risks amongst others.

[15] Available from the authors on request.

REFERENCE LIST

Australian Bureau of Agricultural and Resource Economics (ABARE), 2001. *Australian Commodity Statistics 2001*. Canberra.

Amey, E.B., 1998. "Gold.", Metal Prices in the United States Throughout 1998. *United States Geological Society*. July: 49-53.

Ahamdi-Esfahani, F.Z. and R.G. Stanmore, 1992. Is Wheat a Homogeneous Product? A Comment. *Canadian Journal of Agricultural Economics*, 40(1), pp141-146.

Austroads Incorporated, 2000. *Austroads Roadfacts 2000*. Publication Number AP-G18/00, Canberra.

Australasian Railway Association Inc., 2002. *From Farm Gate to Plate*, Rail Fact Sheet #18. Available at: www.ara.net.au (cited 2002).

Australian Wheat Board (AWB) Ltd., 1999. *The Australian Grains Industry – An Introduction*. Available at: www.awb.com.au (cited 2000).

AWB Ltd., 2001a. *Community Education – Transporting Grain*. Available at: www.awb.com.au (cited 2002).

AWB Ltd., 2001b. *National Pool Performance Report 2000-01*. Available at: www.awb.com.au (cited 2002).

Bishop, M., J. Kay, and C. Mayer, eds. 1994. *Privatisation and Economic Performance*. Oxford: Oxford University Press.

Bos, D.,1986. *Public Enterprise Economics: Theory and Application*, North-Holland, Oxford

Fraser, R.W., 1989. Uncertainty and the Positive Theory of Public Enterprise. *Bulletin of Economic Research*. 41(2): 147-155.

Hanson, S.D. and G.W. Ladd, 1991. Robustness of the Mean-Variance Model with Truncated Probability Distribution. *American Journal of Agricultural Economics.* 73(2): 436-445.

Industry Assistance Commission (IAC), 1977. *Wheat Stabilisation*. IAC Report. Melbourne.

IAC, 1978. *Wheat Stabilisation*. IAC Report. Melbourne.

IAC, 1984. *The Wheat Industry*. IAC Report. Melbourne.

IAC, 1988a. *The Wheat Industry – Conclusions and Recommendations*. IAC Report. Melbourne.

IAC, 1988b. *The Wheat Industry*. IAC Report. Melbourne.

Industry Commission (IC), 1993. *Port Authority Services and Activities*. IC Inquiry Report No. 31. AusInfo. Canberra.

International Monetary Fund (IMF), 1999. *World Economic Outlook*. Washington DC.

Kronos Corporate, 2002. *A Review of Structural Issues in the Australian Grain Market*. Available at: www.capgrains.com.au/grain/kronos_report/ full_kronos_report.pdf (cited 2002).

Larue, B. and H.E. Lapan, 1992. Market Structure, Quality and World Wheat Market. *Canadian Journal of Agricultural Economics*, 40, pp311-328.

Lobb, A.E. and R.W. Fraser, 2002. Pricing Policies under Different Objectives: Implications for the Pricing Behaviour of AWB Ltd. (Paper presented at Australian Agricultural and Resource Economics Society 46th Annual Conference, Canberra, 12-14 February, 2002).

Lobb, A.E. and M.P. Burton, 2005. Estimlating Price Premiums for Australian Wheat Exports. University of Western Australia, Working Paper.

Paarlberg, P.C. and P. Abbott, 1986. Oligopolistic Behavior by Public Agencies in International Trade: The World Wheat Market. *American Journal of Agricultural Economics* 68(3): 528-543.

Piggott, R.R., 1992. Some Old Truths Revisited. *Australian Journal of Agricultural Economics* 36: 117-140.

Pope, R.D. and Just, R.E., 1991. On testing the structure of risk preferences in agricultural supply response. *American Journal of Agricultural Economics* 71(3): 743-748.

Productivity Commission (PC), 1998. *International Benchmarking of the Australian Waterfront. International Benchmarking Report*. AusInfo. Canberra.

PC, 2002. *Trends in Australian Infrastructure Prices, 1990-91 to 2000-01*. Performance Monitoring. AusInfo. Canberra.

Quiggin, J., 1996. *Great Expectations: Microeconomic Reform in Australia*. Sydney: Allen and Unwin.

Rees, R., 1984. *Public Enterprise Economics*. Second edition. London: Weidenfeld & Nicolson.

Shipping Australia Ltd., 2002. Submission to the Productivity Commission by Shipping Australia Ltd., Regarding the Inquiry into Economic Regulation of Harbour Towage and Related Services in Australia. Attachment C. in PC, 2002. *Economic Regulation of Harbour Towage and Related Services*. Position Paper. Canberra.

United States Department of Agriculture (USDA), 1998. State trading enterprises in world agricultural trade. *Economic Research Services Paper WRS-98-44*, Washington DC.

Vickers, J. and G. Yarrow, 1989. *Privatization – An Economic Analysis*. Cambridge, MA: The MIT Press.

Wait, M. and F. Ahmadi-Esfahani, 1996. How has the Domestic Wheat Market Changed since Deregulation? *Review of Marketing and Agricultural Economics* 64(3): 319-324.

Wilson, W.W., 1989. Differentiation and Implicit Prices in Export Wheat Markets. *Western Journal of Agricultural Economics* 14(1)

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EVOLUTION, CURRENT STATE AND FUTURE OF EU TRADE PREFERENCES FOR AGRICULTURAL PRODUCTS FROM NORTH-AFRICAN AND NEAR-EAST COUNTRIES

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ABSTRACT

The EU recently completed negotiating a series of Association Agreements with Mediterranean countries. Trade preferences for agricultural goods granted under these Agreements, as well as under former arrangements, are analyzed by calculating the value of preference margins at several stages in the evolution of preferences. The total value of preference margins for all countries covered was about €130 million under the agreements of the mid-1970s and increased by 48 per cent until 1995; by 2000 this value declined by about 14 per cent due to reduced EU MFN tariffs. The extended preferences under the new Agreements more than compensate for this decline and will result in a total value of preference margins of €226 million once all Agreements have entered into force.

Key words: preferential trade, preference margin, Mediterranean countries, Euro-Mediterranean Agreements, preference erosion.

1. INTRODUCTION

Since its foundation, the European Union (EU) has maintained special political and economic relations with the countries of the Mediterranean Basin.[16] Arrangements for preferential trade have been core elements of various Agreements. After an "explosion in the number of the European Community's Mediterranean trade agreements between 1969 and 1972" (Pomfret, p. 20), the EU began to harmonize the various bilateral agreements in a framework called the "Global Mediterranean Policy". This process resulted in a series of Cooperation Agreements with the Maghreb and Mashrak countries of Morocco, Algeria, Tunisia, Egypt, Jordan, Lebanon and Syria and a Trade Agreement with Israel, all concluded in the years 1975 to 1978. Hereafter the term "Mediterranean Countries" (MCs) is used to refer to this specific group of countries.[17] The EU agreements with the MCs were amended by Additional Protocols from 1987 to 1988, which included substantially extended trade preferences for agricultural products. In the 1990s, the EU began to negotiate a series of Euro-Mediterranean Agreements (EMAs), with all MCs as well as an interim agreement with the Palestinian Authority. Although not all of the agreements are yet in force, the EMAs will eventually replace all former arrangements in the area of trade. In addition, Tunisia, Morocco, Israel and the Palestinian Authority have negotiated an amendment of the agricultural protocols in the EMAs to further liberalize trade with the EU.

The establishment of EMA is part of the "Barcelona Process", which was launched in November 1995 and aims at "political stability and security" (political chapter), "shared prosperity" (economic chapter), and "understanding between cultures and exchanges between civil societies" (social chapter) (European Commission 2005). The implementation of the political and cultural dimensions of the EMA and their contribution to achieving the aims of democratization and stabilization of the MC region are widely assessed as rather weak for a variety of reasons (Jünemann, Attina). As far as economic aspects are concerned, the core element of the new agreements is the creation of bilateral free trade areas between each of the MCs and the EU. Tunisia is the first country with which an EMA was concluded in 1995, and the time schedule foresees a full opening of Tunisian markets for industrial products from the EU in 2008, although domestic pressure for a postponement is increasing (Riess et al.). Although agricultural goods are exempted from the establishment of bilateral free trade areas, they are subject to preferential trade rules, as under the former agreements. This exclusion of agriculture from future bilateral free trade areas reflects interests at both sides. The EU considers many of its typical Mediterranean products like olive oil, many fruits and vegetables, wine, and tobacco as "sensitive", and does not want to open its markets fully for competition from the MCs. The MCs, on the other hand, often extend greater protection to

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16 For simplicity, the term European Union is used throughout, even when referring to the earlier entities the European Economic Community (EEC) or European Communities (EC).

17 The Palestinian territories are also included in this group and the term "country" used in this article also refers to them. For simplicity, the term "Palestine" is used in some cases to refer to the Palestinian Authority or the Palestinian territories. EU linkages with various other groups of countries in the Mediterranean Basin developed in various ways. Some southern European countries became, after a period of preparatory Association Agreements, EU members in 1981 (Greece), 1986 (Portugal and Spain), and 2004 (Cyprus and Malta). The EU and Turkey currently have an Association Agreement, and accession negotiations are scheduled to start in October 2005. A Cooperation Agreement was negotiated with Yugoslavia in 1980. After its dissolution, Slovenia became a member of the EU in 2004 and Croatia has accession candidate status. Macedonia and the EU have a Stabilization and Association Agreement which was concluded in 2000, the trade related part of which entered into force in 2001. No trade arrangements were negotiated with Libya and Albania, although Libya has observer status in the process of Euro-Mediterranean integration since 1999 (European Commission, 2005).

temperate zone products such as cereals, beef and dairy products than does the EU and would therefore experience decreasing prices for these products with a free trade area in agriculture (Radwan and Reiffers, Garcia-Alvarez-Coque).

This article reviews the evolution, structure and significance of agricultural trade preferences granted by the EU to the Mediterranean countries from the Cooperation Agreements of the 1970s up to the newly negotiated EMA. It provides an account of how these preferences have developed over time, in qualitative and quantitative terms. The quantitative account is based on estimates of how product coverage and the value of preference margins have evolved under the various arrangements. Finally, the future of EU agricultural trade preferences for the MCs is discussed.

2. Agricultural Trade between Mediterranean Countries and the EU

Before dealing with agricultural trade between the MCs and the EU, it is revealing to take a short look at market size of the EU and the MCs as well as Croatia, Romania, Bulgaria and Turkey, which currently have the status of Accession Candidates.

Table 2.1. Market Size: EU, Accession Candidates and MCs, Annual Average 2001-2003[a]

	EU-25	Accession Candidates		Mediterranean Countries	
		total	% of EU	total	% of EU
Population, million	453	104	23.0%	174	38.3%
GDP, billion €	9,509	278	2.9%	375	3.9%
GDP/capita, €	20,980	2,667	9.0%	2,163	7.3%
$GDP_{agriculture}$, billion €	204	35	17.3%	41	20.2%

[a] Agricultural share in GDP available only for 2001-2002 in most regions, for 2001 in Cyprus, for 2002 in Malta and Israel; GDP available only for 2001-2002 in Israel.

Sources: World Bank (2005a, 2005b), International Monetary Fund, Central Bureau of Statistics, European Central Bank (2004), own calculations

Table 2.1 shows that population of the MCs is as much as 38 per cent of that of the EU, whereas overall GDP amounts to only 3.9 per cent of the EU's GDP. The MCs' agricultural sector, however, is relatively large if compared to the EU, at about 20 per cent of the size of EU agriculture.

The EU and the MCs are important trading partners for each other, although for reasons of size, the EU is a more important trading partner for the MCs than the MCs are for the EU (Table 2.2). From 2001-2003 roughly half of total exports and imports of the MCs were traded with the EU. About two-thirds of total MC agricultural exports went to the EU and about one-third of total agricultural imports came from the EU.[18] Overall, the MCs had a trade

[18] The term "agricultural products" is defined throughout this article as all products in CN Chapters 1 to 24, plus CN headings 29.05.45.00, 33.01, 33.02.10, 35.01-02, 35.03.00.10, 35.05.10.10, 35.07, 38.24, 40.01, 41.01-03, 41.10, 43.01, 44.01-04, 44.06-07, 44.09, 45.01-02, 50.01-03, 51.01-05, 52.01-03 and 53.01-05. The figures for agricultural trade with the world in Table 2.1, however, are taken from FAO statistics according to the

deficit of about €20 billion, of which about €10 billion resulted from agricultural trade. The total trade deficit with the EU, was about €6.5 billion in the same period, with agriculture accounting for about €1.5 billion of that deficit figure. In agriculture, the EU is a more important trade partner for the MCs on their export side than on the side of their imports

Table 2.2. MCs' Total Trade and Trade with the EU, Annual Average 2001-2003[a]

	MC exports		MC imports	
	Million €	Per cent	Million €	Per cent
Total trade with the world	84,640	100.0%	104,654	100.0%
of which with the EU	43,246	51.1%	49,710	47.5%
Agricultural trade with the world	4,941	100.0%	14,225	100.0%
of which with the EU	3,069	62.1%	4,579	32.2%

[a] FAO trade data for fishery products was available only until 2001, therefore a three-year average of 1999-2001 is used.

Sources: Eurostat for trade with the EU, FAO for trade with the world, European Central Bank (2002, 2004) for exchange rates, own calculations

Table 2.3 presents trade relations with the MCs from the point of view of the EU. About 4 per cent of both the EU's total as well as the EU's agricultural imports came from the MCs, and about 5 per cent of EU total exports and 7 per cent of EU agricultural exports went to the MCs in 2001-2003. In other words, the relative importance of the MCs as trading partners of the EU is highest in the area of agricultural exports to these countries. Agricultural exports from the EU to the MCs consist mainly of temperate zone products such as meat, dairy and eggs, cereals, sugar and fats and oils, which accounted for more than half of total agricultural exports to the MCs in 2001-2003. EU imports of agricultural products from the MCs, on the other hand, are concentrated on fruit and vegetables, fresh as well as processed, olive oil (included in the product group fats and oils), fish and, to a lesser extent, cotton. These latter product groups made up about 70 per cent of total agricultural exports from the MCs to the EU in 2001-2003.

EU trade preferences for product groups of special export interest to the MCs must be viewed in light of the nature of EU import policies in these sectors. EU imports of olive oil are subject to high specific tariffs from €1,102 to €1,603/t resulting from the Uruguay Round (UR) process of tariffication of the former variable levies. *Ad valorem* tariffs of up to 26 per cent are charged on fish and fish products. Fresh fruit and vegetables are subject to *ad valorem* tariffs from zero to 20.8 per cent. In addition, some fruits and vegetables are subject to the EU entry price system, which resulted from UR tariffication of its predecessor, the reference price system. Under this system, the EU charges additional duties if the import shipment concerned undercuts a minimum import price. These additional duties are high enough to provide a strong incentive to the importer not to undercut the minimum import price, and an economic rent results when the world market price is below the minimum import price. This rent accrues to the importing or exporting companies depending on their respective negotiating position. Implicitly, a binding minimum import price defines a

SITC classification (total agricultural products and fishery products) and therefore deviate slightly from the definition given above.

maximum import quantity and therefore has an effect similar to that of a binding voluntary export restraint (Grethe and Tangermann 1999b). Any shift in export supply curves only affects the size of the economic rent which results from these policies, not the quantity of exports.

For processed fruits and vegetables, the EU applies a mixture of specific and *ad valorem* tariffs and the entry price system only applies in the case of grape juice. For typical temperate zone products, the EU applies high tariffs which are prohibitive in many cases. These products, however, are not of export interest to the MCs, with very few exceptions (e. g. rice from Egypt).

Table 2.3. EU Total Trade and Trade with the MCs, Annual Average 2001-2003

	EU imports (mio. €)		EU exports (mio. €)	
Total trade with the world	1,002,180	100.0%	986,545	100.0%
of which with the MCs	43,246	4.3%	49,710	5.0%
Agricultural trade with the world	83,526	100.0%	66,329	100.0%
of which with the MCs	3,068	3.7%	4,579	6.9%
Total agricultural trade with the MCs	(100%)		(100%)	
of which: Meat and live animals	0.5%		3.2%	
Fish	17.8%		1.2%	
Dairy and eggs	0.1%		13.1%	
Flowers and live plants	5.6%		0.7%	
Vegetables	18.2%		3.7%	
Fruit	18.6%		1.1%	
Cereals and milling ind. prod.	0.6%		19.1%	
Oilseeds and oleaginous fruit	1.1%		0.2%	
Fats and oils	3.6%		4.8%	
Preparations of meat and fish	6.7%		0.9%	
Sugars	2.0%		11.3%	
Preparations of cereals	0.6%		4.3%	
Prep. of vegetables and fruits	5.4%		1.5%	
Tobacco	0.1%		2.8%	
Cotton	4.8%		0.7%	
Other	14.3%		31.4%	

Sources: Eurostat, own calculations

3. Quantitative Indicators of the Evolution of Preferential Treatment

Various indicators can provide an impression of the changing nature and significance of the agricultural preferences which the EU has granted to the MCs under the varying arrangements that followed each other in historical sequence. None of these indicators is perfect in the sense of yielding a precise analysis of the economic implications of preferential treatment, however they can do a reasonable job of providing a quantified historical account.

One such indicator is product coverage (PC), i.e. the share of products covered by preferences in total agricultural exports from the respective MC to the EU, defined as

$$PC = Ex_p^{A,EU} / Ex_t^{A,EU} \quad (1)$$

In this definition, $Ex_p^{A,EU}$ is the value of exports from MC A to the EU of all agricultural products receiving preferences granted by the EU, irrespective of the magnitude of the preference. $Ex_t^{A,EU}$ is the value of all agricultural exports from country A to the EU, i.e. including exports of products that do not qualify for preferential treatment.[19] Product coverage will thus be between 0 and 1. It indicates the extent to which the EU was prepared to structure its preferences such that products of particular export interest to the MC concerned could (at least potentially) benefit from preferential treatment. Product coverage is a useful indicator to compare the extent of preferences granted to different countries with similar export products under similar agreements. Product coverage for one country, however, does not say much by itself. Suppose, for example, that the EU has high most favored nation (MFN) tariffs, which are prohibitive for all potential imports from exporting country A. If the EU then grants a preference to A for one unit of a single good that enables actual export of this unit, product coverage would be shown to be 100 per cent, as no trade occurs in all other products. In order to avoid this problem, a much more telling indicator would be the share of products qualifying for preferential treatment in all potential exports to the EU. However, estimating this indicator would require a model that estimates trade flows in the absence of all trade restrictions in the EU, an effort beyond the scope of this study.

Along with information on product coverage, an indicator of the depth and evolution of tariff cuts would also be needed. One method of doing so would be to simply compare preferential and MFN tariffs, and to calculate a (simple or weighted) average of the preferential reduction in tariff rates, expressed in percentage *ad valorem* terms. An alternative approach is to express the depth of tariff reductions in absolute money terms, taking into account the value of trade in individual products and the respective magnitudes of tariff reductions. Essentially this indicator is a variant of a weighted average tariff reduction, with trade values used as weights and the result expressed in money terms rather than as a percentage tariff rate. Such an indicator of the depth of tariff cuts is the preference margin, which also indicates the extent to which the EU was willing to forego (potential) tariff revenue by granting preferential access to its markets.

Estimation of the preference margin starts with the assumption that both MFN exporters and preferential exporters of a given product earn the same price on the domestic EU market, which implies homogeneous goods. The relationship between the export prices received by the MFN supplier (p_w) and the preferential supplier (p_p) is described in equation (2).

$$p_w (1 + t_{MFN}) = p_p (1 + t_p) \quad (2)$$

[19] Alternatively, Table 4.1 below also presents the value of exports qualifying for preferential treatment in the EU as a share of total agricultural exports of the MCs, in order to show the overall importance of EU preferences for total agricultural exports from the MCs.

with t_{MFN} being the (*ad valorem*) tariff rate for exports to the EU market, and t_p being the preferential tariff rate.[20]

The value of the preference margin for the product concerned is then the difference between p_p and p_w, multiplied by the quantity exported to the EU. In using trade statistics, it is more convenient to work with export values rather then export quantities and prices. Hence in the estimates presented below, the value of the preference margin (VPM) is calculated as a share of the export value of the product concerned (V), as defined in equation (3), which is easily derived from (2).

$$\text{VPM} = \frac{t_{MFN} - t_p}{1 + t_{MFN}} * V \tag{3}$$

The value of the preference margin is estimated in this way for each product receiving preferential treatment in the EU, and then aggregated across all products, to yield the total value of preference margins for the exporting country concerned.[21] Of course the value of the preference margin can also be expressed as a percentage of the export value, in which case it will be referred to as the percentage preference margin throughout this article.

While the preference margin is estimated here primarily as an indicator of the depth of tariff cut in assessing the evolution of the preferential arrangements with the MCs, it also can indicate the way in which the value of these arrangements for the beneficiary countries has developed over time. It should be noted, though, that the value of the preference margin estimated in this way and presented in Section 4 is not necessarily equivalent to a direct economic gain to the exporting country. The preference margin essentially is equivalent to a price difference, which can take either of two forms (or some combination of them). One possibility is that the preferential tariff reduction can be used to sell at a lower price on the domestic market of the EU, in an effort to expand the quantity of exports. Alternatively, a given selling price on the domestic market of the EU can mean that the preference margin can result in an increase of the price received for a given quantity. However, even in the latter case, which is assumed in equation (3), it is not necessarily clear who captures the higher price. Depending on the distribution of negotiating power between the export and import side, which depends heavily on the institutional framework, e.g. license allocation in connection with tariff rate quotas (TRQs; Skully), or the existence of minimum import price systems, the price differential may accrue to the exporting or to the importing companies, and hence to the exporting country (MC) or the importing country (EU).

Unfortunately an analysis of the actual distribution of the preference margin can be rather complex and inconclusive, not the least as a result of the way EU market regimes for some of the products of interest to the MCs are administered. In the case of a binding TRQ, where no minimum import price system is in operation, the result strongly depends on the method chosen for allocating licenses for trade under the TRQ. This is because the "owner" of the license is likely to attract (most of) the preference margin as he is in a quasi-monopolist position. Like other countries, the EU has decided to issue all licenses under the preferential

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[20] An equivalent analysis can, of course, be presented for specific (rather than *ad valorem*) tariffs. In the estimates presented, however, all specific tariffs were converted to *ad valorem* tariffs, based on unit values of EU imports.

[21] Preference margins for individual products can be obtained from the authors on request.

regimes to trading companies registered in the EU. This would suggest that in such cases most of the price advantage resulting from the preference margin accrues to importing EU companies. As far as EU preferences for the MCs are concerned, these cases are infrequent as many of the major products concerned fall under the entry price regime. Under this regime, price formation in trade differs from that under a pure tariff regime. In particular, the entry price regime acts as an invitation to the exporting countries to establish monopolistic export structures. These agencies have a much stronger negotiating position *vis-à-vis* EU importing companies than would a multitude of individual exporting companies. As a result they may be able to attract at least some part of the preference margin which otherwise might accrue to the EU importing company.

In the case of fruits and vegetables, preferential TRQs are administered on a first come first serve basis, i. e. no licenses are issued and the full MFN tariff is charged from that moment on when the TRQ is fully exploited. This system may also tend to let part of the preference margin end up with the importing company, as no information is published by the EU on the extent to which quotas are used at any particular time. Hence the importing companies tend to base their price negotiations with exporters on the worst-case assumption that the full MFN tariff will be charged, at least towards the end of the import period when the risk of exceeding the TRQ increases.

There are two other reasons why the economic gain accruing to the exporting country can differ from the value of the preference margin. First, the MFN tariff may be prohibitive, in which case part of the preference just reduces the redundant part of that prohibitive tariff, and the potential economic gain to the exporting country is less than the preference margin.[22] Second, tariff preferences usually result in an expansion of the quantities traded (i.e. if not subject to TRQs or minimum import price systems). Therefore the potential economic gain tends to be somewhat higher than the preference margin calculated based on trade figures before the implementation of the preferences concerned.

In summary, because of the complexity of the trading regimes involved in EU agricultural trade with the MCs, it is impossible to make any general statements about where the preference margins end up, and hence about the actual economic gain for the exporting countries. Furthermore the actual economic gain resulting from trade preferences is not necessarily the same size as the preference margin, no matter to whom it accrues. Only detailed product- and country-specific empirical analyses of price formation can shed light on this issue. Such analyses were beyond the scope of this study. As a consequence, the value of the preference margin estimated here must be interpreted as an indicator of the potential loss in EU tariff revenue and potential benefits to the exporting countries.

In the calculations presented in Section 4, actual average trade flows of the years 2001 through 2003 were used as a basis for assessing both product coverage and the value of preference margins resulting from all historical trade arrangements, even though some of the preferences were applied much earlier, starting in the mid-1970s. The reason is that an attempt is made in this study to assess the historical evolution of trade preferences granted to the MCs by the EU, and to see how preferential treatment has improved (or deteriorated) over time. For analytical reasons this is possible only if the trade preferences studied are the only factor that changes, while trade flows are kept constant in the analysis. If both trade

22 As the estimates of preference margins presented below are based on actual (i.e. non-zero) trade flows, a case in which the preference is no more than the redundant part of the prohibitive tariff is not relevant here.

preferences and trade flows were to change from step to step of the historical analysis, then it would be impossible to say whether any apparent improvement (or deterioration) in the quantitative indicators of preferential treatment calculated here was due to changes in trade flows which may be caused by many factors other than changes in preferences, or to changes in preferences. For this reason, the trade flows used in the calculations needed to be kept constant across the whole analysis, and it was considered best to use a recent reference period. Over the same period of time, however, MFN tariffs to which the reduction rates of the trade agreements apply have undergone the process of tariffication and reduction according to the UR Agreement on Agriculture (AoA). There would be no point in applying the reduction rates of currently valid trade agreements to pre-UR MFN tariffs. On the other hand, one would underestimate preference gains considerably if post-UR tariffs were to be applied to reduction rates of agreements from the 1970s and 1980s. The pre-UR agreements have therefore been evaluated at pre-UR tariffs and the current EMAs have been evaluated at current tariffs. To provide as the closest possible comparability of the preferential conditions of the successive agreements, the preference erosion during the implementation of the AoA has been quantified by evaluating the agreements in 1995 both at pre- and post-UR applied tariffs. Product coverage and the value of preference margins resulting from the EU agreements with the MCs have been calculated for all countries covered, and for all agricultural products benefiting from preferential treatment. Because of seasonal MFN tariff variation and seasonal preferences, much of the analysis is based on monthly trade data and on EU import unit values rather than export unit values of preference-receiving countries due to the much better availability of disaggregated trade data.

4. The Evolution of EU Agricultural Trade Preferences for the Mediterranean Countries

4.1. The "Global Mediterranean Policy"

The trade arrangements under the "Global Mediterranean Policy", concluded during the mid-1970s (in the following referred to as 1975/78 Agreements) were similar for all MCs. For industrial products, the EU granted free access to its markets except for some categories of textiles and some processed agricultural products, the so called "non-Annex I products". For agricultural products ("Annex I products"), the EU did not provide free access to its markets but granted preferences of a limited scope. For some products, tariff concessions were granted without a quantitative limit or any other conditions, but often restricted to certain calendar periods. For example, Egypt, Israel and Tunisia were granted tariff reductions that averaged between 60 and 70 per cent of the MFN tariff. For a few products, which differed per country, the tariff and levy reductions were limited to TRQs and no reduction was granted for quantities in excess of these quotas. Table 4.1 presents in its first nine rows an overview of product coverage and the value of preference margins under the 1975/78 Agreements.

Table 4.1. Product Coverage and Value of Preference Margins Resulting under the 1975/78 Agreements and Subsequent Changes

		Algeria	Egypt	Israel	Jordan	Lebanon	Morocco	Palestine	Syria	Tunisia	Total MCs
1975/78 Agreements											
(1)	Total agricultural exports (in mio. €), 2001-03	40.4	781.1	1,101.9	392.9	196.6	1,125.90	62.1	794.4	445.3	4,940.5
(2)	Total agricultural exports to the EU (in mio. €), 2001-03	39.9	306.7	860.9	7.2	32.8	1,384.30	5.1	137.3	293.8	3,068.0
(3)	of which preferential exports (in mio. €)	14.2	87.6	227.7	1.1	14.1	932.6		21.4	210.0	1,508.5
(4) = 3)/(1)	In % of total agricultural exports	35.1%	11.2%	20.7%	0.3%	7.2%	82.8%		2.7%	47.2%	30.5%
(5) = 3)/(2)	In % of total agr. exp. to the EU (product coverage)	35.6%	28.6%	26.4%	15.2%	43.0%	67.4%		15.6%	71.5%	49.2%
(6)	Value of preference margin (in mio. €)	1.5	5.7	14.6	0.1	0.0	90.7		0.1	17.2	129.8
(7)	of which for fish	1.0					62.9			9.8	73.7
(8) = 6)/(1)	In % of total agricultural exports	3.6%	0.7%	1.3%	0.0%	0.0%	8.1%		0.0%	3.9%	2.6%
(9) = (6)/(2)	In % of total agricultural exports to the EU	3.7%	1.9%	1.7%	0.9%	0.0%	6.6%		0.0%	5.8%	4.2%
Revisions until 1995											
(10)	Product coverage 1995 (in %)	36.3%	29.30%	43.1%	22.6%	43.0%	65.0%		15.6%	72.4%	53.0%
(11)	% change compared to 1975/78	1.9%	2.6%	63.0%	48.3%	0.0%	-3.5%		0.0%	1.3%	7.8%
(12)	Value of preference margin 1995 (mio. €)	1.5	9.4	39.9	0.2	0.0	103.8		0.3	36.6	191.7
(13)	% change compared to 1975/78	1.7%	65.9%	173.1%	184.2%	0.0%	14.5%		384.7%	112.7%	47.7%
Effect of MFN tariff reduction 1995-2000											
(14)	Value of preference margin 2000 without EMA (mio. €)	1.3	6.4	26.6	0.1	0.0	94.5		0.3	34.9	164.2
(15)	% change compared to 1995	-12.8%	-32.1%	-33.2%	-18.8%	-56.2%	-9.0%		-21.6%	-4.4%	-14.4%
EMA											
(16)	Product coverage under the EMA (in %)	52.7%	44.1%	55.4%	52.0%	22,0%	84.2%	79.9%	17,4%	76.0%	67.2%
(17)	% change compared to 2000 before EMA	45.3%	50.6%	28.5%	130.5%	-48.8%	29.5%		11,5%	5.0%	26.8%
(18)	Value of preference margin under the EMA (mio. €)	1.8	11	36.6	0.3	0,9	122.3	0.4	5,7	46.6	225.5
(19)	% change compared to 2000 before EMA	34.5%	71.6%	37.3%	119.1%	37,900%	29.5%		2,118%	33.3%	37.4%

Sources: Eurostat, FAO, GATT, European Union, own calculations. Note that data for external trade with the EU and total trade have been extracted from different sources and therefore may be inconsistent in some cases

The coverage of preferences (row 5) under the 1975/78 Agreements differed markedly among the MCs. It was lowest for Syria and Jordan, where only around 15 per cent of total agricultural exports to the EU benefited from preferences. Coverage was highest for Tunisia, with around 72 per cent of its agricultural exports to the EU covered by preferential treatment. For the group of MCs on average, product coverage was 49 per cent. In relation to total agricultural exports to all destinations, the share of exports benefiting from agricultural preferences in the EU was of course smaller, 30 per cent on average for all Mediterranean countries, and for individual countries between 0.3 per cent for Jordan and almost 50 per cent for Algeria (row 4).[23]

The aggregate value of the preference margin for all products is presented in row 6 of Table 4.1 in million €, and expressed as a percentage of the value of agricultural exports to the EU in row 9. For the 1975/78 Agreements, the aggregate value of the preference margin for all MCs was 4.2 per cent of their agricultural exports to the EU. For Jordan, Lebanon and Syria it was 1 per cent or less of the value of their agricultural exports to the EU. For Morocco and Tunisia, on the other hand, the value of their preference margins amounted to more than 5 per cent of the value of their agricultural exports to the EU.

4.2. Revisions up to 1995

Over the years notable changes in preferences common to all Cooperation Agreements were implemented. The first significant amendment was a series of protocols added to all of the Cooperation Agreements in 1987 and 1988.[24] The stimulus for the changes in preferences laid down in the additional protocols was the accession of Portugal and Spain to the EU in 1986. Portugal and Spain were strong competitors for the MCs with regard to exports of many agricultural products to the EU, and it was felt that the abolition of EU tariffs for these two countries would weaken the competitive position of the MCs considerably. Aimed at compensating the MCs for these disadvantages in agricultural trade, the additional protocols contained lists of agricultural products for which tariffs were to be phased out over the same periods and at the same reduction rates as laid down in the Acts of Accession for Portugal and Spain. In most cases this implied phasing out tariffs for products which were already subject to preferential treatment under the original Cooperation Agreements. However, in some cases tariffs were to be phased out for products which had not previously benefited from preferential treatment. For most products the phasing out of tariffs was restricted by TRQs or reference quantities (RQs). On quantities exported in excess of RQs, the preferential tariff (and not the MFN tariff as for TRQs) was still to be applied, but the EU reserved the right to convert RQs into TRQs at the same level. For products where tariff reductions were granted without a quantitative limit, the EU reserved the right to set limits later if imports caused "difficulties" on EU markets. None of these two provisions have ever been applied by the EU. In addition, preferential reference prices (lower than MFN reference prices) were agreed upon under the 1987/88 revisions for oranges from Tunisia; oranges, some other citrus and tomatoes from Morocco; and for oranges, mandarins and lemons from Israel.

23 The percentage presented in Table 4.1 for Morocco is higher, but this is attributable to inconsistencies between total agricultural trade data and bilateral agricultural trade data.

24 The protocols with Algeria, Egypt, Jordan and Tunisia were signed in 1987; with Morocco and Syria, in 1988. The additional protocol with Lebanon was not ratified by this country and thus did not enter into force.

During the early 1990s, the "new Mediterranean policy" of the EU meant agricultural preferences were extended further for all individual MCs. In line with the reduction of import tariffs for products originating from Portugal and Spain, tariffs on products contained in the lists of the additional protocols were to be reduced to zero by January 1, 1993. In addition, all TRQ and reference quantities were to be increased by five per cent per year from 1992 to 1995. For “sensitive” products including flowers, potatoes, tomatoes, oranges and some other products, the annual rate of increase was three per cent.

The impact of the 1987 revisions and of the later tariff reductions and quota increases on preference margins is shown in rows 10 to 13 of Table 4.1. Little change in product coverage occurred, with the exception of Israel and Jordan, where coverage increased significantly. On average over all MCs, product coverage was 53 per cent. However, under the 1987 revisions, the value of preference margins increased significantly, due to the 100 per cent tariff reductions which were then granted for many products. The only exceptions were Algeria and Lebanon, the latter of which had an insignificant VPM under the Cooperation Agreement and did not ratify the 1987 revision. In Jordan and Syria, the value of preference margins remained small under the 1987 revision, but increased by large percentages in comparison to the arrangements of the mid-1970s.

4.3. The Uruguay Round

In historical sequence, the next changes to take place in agricultural trading relations between the EU and the MCs resulted from the Uruguay Round. With all the new provisions introduced in the EU after the UR, and in particular with the new entry price system it is difficult to make a general statement on whether access to EU markets for products in which the MCs have an export interest have improved or deteriorated as a result of the UR. However, the impact of the reductions in MFN tariffs which are made during the implementation period of the UR (i.e. between 1995 and 2000) on preference margins enjoyed by the MCs under their past arrangements with the EU can be assessed. For this purpose, the value of preference margins has again been calculated as explained above, but for the new final bound tariffs which prevail at the end of the implementation period and in the absence of any revisions of preferential treatment negotiated after the UR (i.e. the new provisions under the recently negotiated EMAs are not yet taken into account). The results, therefore, show what would have happened had the pre-UR preferential arrangements for the MCs remained unchanged, so that the value of preference margins eroded as a result of reductions in MFN tariffs. Hence, in a way this analysis shows what some of the incentives were for negotiating new post-UR arrangements between the EU and the MCs.

The results of these calculations are presented in rows 14 and 15 of Table 4.1. Due to the fact that, in absolute terms (in terms of percentage points), MFN tariffs are reduced more than preferential tariffs, the value of the margin of preferences would have decreased (in the absence of any improvements of preferential treatment) by about 14 per cent on average for all MCs (row 15). For a number of individual MCs, the decline in the value of the preference margin resulting from UR tariff cuts is a larger percentage. Remarkable in this context is Lebanon, where the value of the preference margin decreased by more than by the average reduction rate for agricultural tariffs of 36 per cent, actually by 56 per cent. This stems from the fact that most of the products exported by Lebanon to the EU were subject to tariffs of 3 per cent *ad valorem* which where completely abolished after the implementation of the AoA.

This decline in the value of the preference margins must not be interpreted as an absolute deterioration of market access. In fact, almost all preferential tariffs decrease as a consequence of the MFN tariff reductions, because they are set as given percentages of MFN tariffs. However, the decline in the value of the preference margins resulting from the UR Agreement as such indicates a diminishing relative advantage of the MCs compared to MFN suppliers.

4.4. The Euro-Mediterranean Agreements

The last step in the evolution of preferential trade rules between the EU and the MCs in the area of agriculture, at least for the time being, has come in the form of the series of EMAs which replace the former Cooperation Agreements and their amendments. In the meantime, EMAs are in force with Tunisia (1998), Israel (2000), Morocco (2000), Jordan (2002) and Egypt (2004). An Association Agreement also was concluded with Lebanon in 2002, however, only the trade and trade related measures are as yet applied. An Association Agreement was signed with Algeria in 2001, but has not yet entered into force. An interim agreement was concluded with the Palestinian Authority in 1997. Negotiations with Syria were concluded in October 2004.[25]

Reasons to review preferences in the area of agriculture which have sometimes been mentioned are the erosion of preferences due to the reduction of MFN tariffs under the AoA discussed above, and the establishment of a series of Association Agreements of the EU with the Central European Countries (CECs), of which most are meanwhile EU members. Under the EMAs, preferences that existed under the former agreements were usually consolidated and, in some cases, extended. In contrast to the situation before the EMA, agricultural trade preferences are mutual, i.e. for the first time, preferences are granted to the EU by the MCs. Preferences to the MCs are generally limited to typical Mediterranean products. In many cases tariff reductions are limited to certain calendar periods. Tariff reduction rates differ between 5 and 100 per cent and are 100 per cent in most cases where the tariff reduction is limited by a TRQ or a RQ. As under the additional protocols to the old Cooperation Agreements, exports in excess of reference quantities are not immediately subject to MFN tariffs instead of preferential tariffs, but the EU reserves the right to convert reference quantities to TRQs in the future. In some cases exports in excess of TRQ, or future TRQ resulting from the conversion of reference quantities, are not eligible for any tariff reductions. In other cases lower tariff reductions apply to exports exceeding the TRQ. Some of the TRQ and reference quantities are increased by four equal steps of 3 per cent annually from the conclusion of the agreement. Finally, for some products the EU reserves the right to define reference quantities at any level if the volume of imports "threatens to cause difficulties on the Community market".

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[25] Most of the agreements are found in European Union. The ones that have not yet been ratified by all parties are taken from following sources: Commission of the European Communities (2002a), Commission of the European Communities (2002b), Kommission der Europäischen Gemeinschaften.

In addition to tariff preferences, significant reductions of entry prices for limited quantities were negotiated for oranges with Israel and some other products, too, with Morocco. Reductions in entry prices of between 5 and 58 per cent enable the countries concerned to supply products to EU markets priced significantly below supplies originating from countries which have to accept the MFN entry price. As a result reduced entry prices enable the countries concerned to export products to the EU even if at high season the EU domestic price is below the MFN entry price plus tariff. If the EU domestic price is above the level of the entry price plus the relevant tariff, and countries that do not benefit from a reduced entry price are also exporting to the EU, the preferential entry price will have no direct effect except the assurance of being the last exporter to leave the market if the EU domestic price declines. Preferential entry prices could in this case also enable countries to export low quality products to the Community which would not be marketable at MFN entry price level. The welfare effects of reduced entry prices are complex to assess and are therefore not included in this analysis. For an example of the assessment of the economic rent resulting from reduced entry prices, see the case study for tomatoes from Morocco by Chemnitz and Grethe (2005).

To assess the impact of the new EMA compared to the situation under the old agreements, product coverage and the value of preference margins are calculated again based on 2001 to 2003 trade flows. Preferential reduction rates are applied to 2004 applied tariffs, which are equal to the final WTO bound tariffs in the year 2000 for all products of relevance here except rice. The scheduled increase in some TRQ and reference quantities and the subsequent extension of preferences for Israel, Morocco, the Palestinian territories, and Tunisia are fully considered. The results of these calculations are presented in rows 16 to 19 of Table 4.1.

The increase in product coverage is 27 per cent on average. This indicator again differs significantly among countries. It is highest for Jordan with 130 per cent and lowest for Tunisia with 5 per cent. Product coverage (PC) deteriorates even for Lebanon. This is mainly due to a product that used to make up a large share of Lebanon's agricultural exports to the EU but is no longer listed in the new agreement.[26] This therefore does not indicate a real loss in preferential treatment (see row 17). For Israel and Lebanon, the EMAs also grant preferences for non-Annex I products.[27] Including these preferences, the product coverage would increase by roughly one percentage point for Israel to 56.5 per cent, but would almost double for Lebanon to 40.6 per cent. Preference margins for these products are hard to calculate, as the MFN levy differs with each consignment, since it depends on the amount of certain components contained in the product. Non-Annex I products have therefore been excluded from the analysis. The average PC for all MCs is 67.2 per cent.[28]

The value of preference margins (VPMs) increased between 30 per cent for Morocco and more than 100 per cent for Jordan, and by 37 per cent on average for the MCs. For Lebanon,

[26] This product is CN-Code 0504 (Guts, bladders and stomachs of animals…), for which the MFN tariff was reduced to zero even before 1995.

[27] As pointed out above, only the trade-related part is currently in force for Lebanon.

[28] This is less than the 78.6 per cent of product coverage which result under the Cotonou Agreement for the non-LDC ACPs and the 100 per cent which will result for the LDC ACPs after full implementation of the Everything But Arms initiative. Cotonou preferences in agriculture contain a significant amount of "empty preferences" in the sense of preferences for products for which EU MFN tariffs are already zero. Excluding these empty preferences, product coverage for the non-LDC ACPs is 47.7 per cent, and 45.2 per cent for the LDC ACP (Nolte 2002).

the VPM increased almost four hundred fold. However the absolute value has remained small with €0.9 mio. Syria is a similar case, where the VPM increased two hundred fold to €5.7 mio. Looking at the enormous increase, in percentage terms, of product coverage and VPM for Jordan, one has to consider that both were very small in absolute terms under the old agreements. Jordan's preference margin under the EMA, which amounts to about 5 per cent of the value of total agricultural exports to the EU, is now in the same order of magnitude, relative to total agricultural exports to the EU, as those of the other countries covered by an EMA. Morocco's VPM is the highest, exceeding €120 mio. and thus makes up more than half of the VPM for all MCs. In relation to the total value of agricultural exports to the EU, however, Tunisia scores higher than Morocco with the VPM at about 16 per cent of its agricultural exports to the EU. For the MCs on average this share is about 7 per cent.

One should keep in mind that the VPMs resulting from the EMAs are underestimated compared to those resulting from former agreements. This is because new trade flows induced by new preferences (e.g. cut flowers in the case of Tunisia) are not accounted for in all cases as calculations are based on 2001-2003 trade flows, whereas all induced trade flows were implicitly considered in the analysis of the former agreements. This is the case for Lebanon, where the trade part of the EMA was in force only since 2002, Egypt where the trade part entered into force only in 2004, the Palestinian territories where preferences have been extended in January 2005, and Algeria and Syria where the agreement is not yet in force.

An interesting question in the analysis of the evolution of preferential arrangements is whether preferences were trade inducing or just resulted in more favorable market access conditions for existing trade. A comprehensive analysis of this question is beyond the scope of this study, but examples support both explanations. Table 4.2 shows agricultural trade flows and TRQs before (1990-1994) and after (2000-2003) the implementation of the EMAs.

Table 4.2. Moroccan Exports, TRQs and Tariff Reduction Rates, 1990-1994 and 2000-2003 (tons)

Product	1990-1994					2000-2003				
	Trade		TRQ	Tariff red. rates		Trade		TRQ (2000)	Tariff red. rates (2000)	
	Average	Max.		in TRQ	above TRQ	Average	Max.		in TRQ	above TRQ
Sweet peppers	1,885	2,330	0		40%	7,498	12,535	0		100%
Wine	4,649	5,420	5,600	100%	80%	7,651	9,502	9,520	100%	80%
Orange juice	23,903	34,865	16,800	100%	0%	7,733	10,606	33,607	100%	70%

Sources: European Union (various issues), own calculations

For sweet peppers, the tariff reduction was considerably extended under the EMA and trade increased significantly after the new provisions were in force in 2000. Also for wine, the extension of the preference seems to have induced additional trade. In the period before the new EMA was negotiated, quantities of exports from Morocco to the EU were close to the TRQ of 5,600 tons at that time. Under the new EMA, which was concluded in 1995 and implemented in 2000, the TRQ was almost doubled and export quantities approached the new TRQ level. For orange juice, the situation is different. Morocco substantially exceeded its TRQ of 16,800 tons in the period 1990-1994. Under the EMA, the TRQ was increased and above-TRQ tariffs were reduced. In this case the preference clearly traced existing trade.

However, Morocco was unable to maintain its orange juice exports to the EU at the pre-EMA level and they declined to about 23 per cent of the TRQ level for the period 2000-2003.

4.5. Product Coverage Revisited

The significance of product coverage as an indicator for the gains from preferential trade is very limited. Not only does it not provide any information about the depth of preferences, i.e. a 5 per cent reduction of a tariff is evaluated as equal to a full exemption, but it also may indicate a product as preferentially traded if there is no preference gain at all, which is the case when the MFN tariff is zero or is reduced to zero over time, as happened during the implementation of the UR AoA. To enhance the explanatory power of product coverage, one has to identify the share of these empty preferences and relate the value of non-empty preferential trade to the total trade volume. This is done in Table 4.3 for all MCs and for Lebanon as a special case. In the last row of the table the value of preferential trade is related to the volume of trade which actually faces an MFN barrier at the EU border.

Table 4.3 shows that the product coverages including and excluding empty preferences are very close for the MCs on aggregate. The product coverage as the share of non-empty preferences in the trade volume with MFN-tariff, however, is significantly higher in all cases. Compared to the ordinary measurement of product coverage (row 1) this means that more non-empty preferences are laid down in the agreements than empty ones, otherwise the ordinary measurement of product coverage would be greater.

Table 4.3. Different Measures of Product Coverage for all MCs and Lebanon

	1975/78 Agreements		Revisions up to 1995		After MFN reduction 1995-2000		EMAs	
	MCs	Lebanon	MCs	Lebanon	MCs	Lebanon	MCs	Lebanon
Preferential/ total agricultural trade	49.2%	43.0%	53.0%	43.0%	53.0%	43.0%	67.2	22.0%
Preferential (non-empty)/ total agricultural trade	47.2%	0.5%	51.1%	0.5%	50.6%	0.1%	65.5%	22.0%
Preferential (non-empty)/total agr. trade with MFN-barrier	54.6%	1.0%	59.1%	1.0%	58.5%	0.3%	75.8%	46.4%

Sources: Eurostat (various issues), GATT (1994), European Union (various issues), own calculations

The observations for the aggregate of the MCs fit very well with the observations of individual MCs. In most cases, product coverage and the indicator of non-empty preferential trade related to trade with an MFN-tariff do not differ by more than 10 per cent. The most remarkable exemption from this rule is Lebanon, where for all Agreements the two indicators differ greatly. In the two pre-EMA agreements there is a large share of empty preferences involved, as was previously pointed out (see Table 4.1). Under the EMA, product coverage including and excluding empty preferences are very close together, which means there are very few empty preferences. The share of preferential trade in total trade subject to a MFN barrier, however, is about twice the ordinary product coverage.[29] This stems from the fact that less than half of Lebanon’s agricultural exports to the EU are subject to an MFN tariff in the EU's import regimes.

4.6. Product Composition and Size of the Value of the Preference Margin

It is also interesting to look at the product composition of the total VPM for the individual MCs. For Morocco about half of the VPM results from fish (fresh and processed), and more than 10 per cent from oranges and mandarins. More than 70 per cent of the VPM of Tunisia results from preferential treatment of olive oil and another 20 per cent from fish. In the case of Jordan, cucumbers and gherkins are the most important product which account for about 23 per cent of the VPM, and for Palestine fresh flowers and strawberries are the only relevant products. Cut flowers make up for about 24 per cent of the VPM for Israel.

Generally, the preference margin is highly concentrated on a few products. For all MCs, four or fewer products at the 4-digit CN level account for more than half of the VPM. In some cases this concentration is even more pronounced. Syria for instance obtains 86 per cent of its VPM from only one product (CN 1509, olive oil). Table 4.4 displays the distribution of the VPM for each MC and the MCs as a group.

Table 4.4 shows that for the MCs as a group about 83 per cent of the preference margin is concentrated on the product groups of fresh and processed fruit and vegetables as well as fish and fats and oils (mainly olive oil). The composition, however, varies strongly among countries.

A directly related aspect that throws light on the nature of the EU’s agricultural trade policies vis-à-vis the MCs and on pressure for future change, is the extent to which the overall size of the VPM is evenly (or unevenly) spread over all agricultural exports to the EU from the MC concerned. Figure 1 presents information on this issue in graphical form for four selected MCs. In the country graphs, the cumulative size of the VPM under the EMA as a per cent of the total VPM (on the vertical axis) is plotted against the cumulative value of the respective country’s agricultural exports to the EU in per cent of total agricultural exports to the EU (on the horizontal axis), and products are arranged by increasing size of their percentage preference margin. Clearly, product coverage as defined above is where the upward sloping line hits 100 per cent of the total VPM and becomes flat (compare graphs with Table 4.1). The most interesting feature of the graphs, then, is the curvature of the lines. Where the upward sloping line is linear, the product-specific preference margins make up the same percentage of the export value of all products covered by preferences. On the other hand, the more curvature there is in a line, the more unequal is the percentage margin among products.

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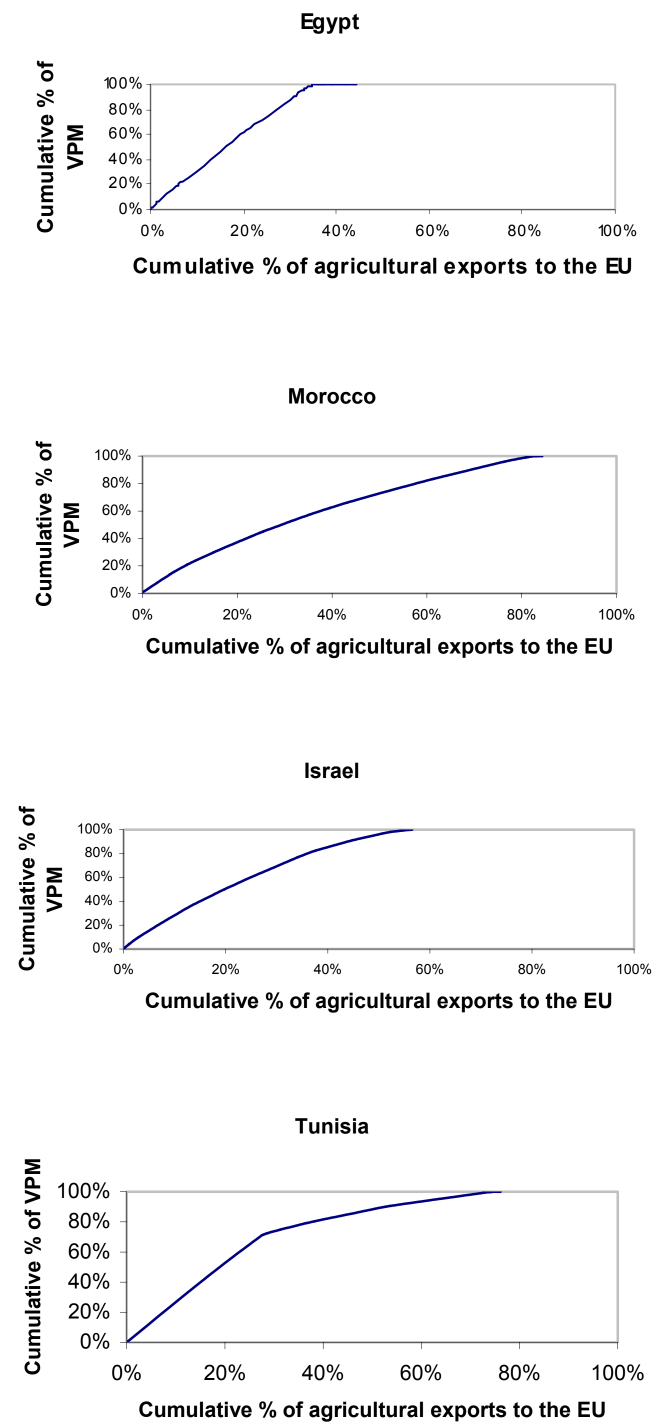
[29] This distance is even greater for Syria, where the share of preferential trade in trade which is subject to an MFN-tariff is four times the product coverage.

Table 4.4. Distribution of VPM under the EMAs by Product Groups

	Algeria	Egypt	Israel	Jordan	Lebanon	Morocco	Palestine	Syria	Tunisia	Total MCs
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
of which:										
Meat and live animals	-	-	0.7%	-	0.0%	0.0%	-	0.0%	0.0%	0.1%
Fish	55.0%	-	-	-	0.5%	32.2%	-	0.0%	19.3%	21.9%
Dairy and eggs	0.1%	-	0.0%	-	1.2%	-	-	0.2%	-	0.0%
Flowers and live plants	-	1.0%	29.5%	0.4%	0.1%	0.3%	60.8%	0.2%	0.0%	5.1%
Vegetables	1.4%	64.1%	19.4%	41.0%	2.0%	18.5%	4.4%	9.2%	0.4%	16.8%
Fruit	25.4%	29.5%	28.6%	52.8%	1.2%	21.0%	34.8%	0.3%	6.6%	19.2%
Cereals and milling industry products	-	4.4%	-	-	0.8%	-	-	-	-	0.2%
Oilseeds and oleaginous fruit	0.6%	0.1%	-	-	0.4%	0.1%	-	0.1%	0.0%	0.1%
Fats and oils	-	-	-	-	11.3%	0.1%	-	86.4%	71.2%	17.0%
Preparations of meat and fish	1.5%	-	2.0%	-	0.6%	18.2%	-	-	0.4%	10.3%
Sugars	-	0.0%	-	-	0.1%	-	-	0.2%	-	0.0%
Preparations of cereals	-	-	-	-	-	-	-	-	-	-
Preparations of vegetables and fruits	0.5%	0.6%	18.9%	5.8%	42.2%	8.8%	-	2.4%	0.2%	8.2%
Tobacco	-	-	-	-	34.4%	-	-	0.8%	-	0.2%
Cotton	-	-	-	-	-	-	-	-	-	-
Other	15.6%	0.3%	0.8%	-	5.3%	0.7%	-	0.1%	1.8%	0.9%

Sources: As for Table 4.1.



Sources: Eurostat, European Union, own calculations.

Figure 1. Cumulative Value of Preference Margins and Export Values for Selected MCs under the EMAs

In the case of Egypt, the line is rather steep (showing that product coverage is relatively low), but nearly linear, which indicates that products that receive preferences experience nearly equal preferential margins in terms of their share in the export value. The average percentage preference margin for preferential products exported by Egypt to the EU is 9.9 per cent. Some products, mainly preserved fruit and vegetables and fruit juices, have a higher percentage preference margin of up to 53 per cent. These products, however, matter little compared to total preferential trade. Products with a percentage preference margin of above 15 per cent have only a 0.1 per cent share in total preferential trade. In absolute terms, the bulk of the VPM accrues to very few products. Potatoes, green beans, onions, table grapes, lemons and strawberries, all of which have a percentage preference margin very close to the average of 9.9 per cent, make up 73 per cent of Egypt's VPM.

For Morocco, the line is much flatter (larger product coverage) but still close to linear, again indicating essentially equal treatment of all preferential products. The average percentage preference margin here is 10.7 per cent. Products with higher individual percentage preference margins include olive oil, preserved strawberries and mushrooms with up to 35 per cent. Preparations of fish and aquatic animals also have a higher percentage preference margin of up to 20 per cent. While the plant products mentioned before do not contribute significantly to the total VPM of Morocco, fish and preparations are by far the most important products for Morocco and make up for more than 50 per cent of Morocco's VPM. Among crop products, tomatoes with 9 per cent, mandarins with 7 per cent and oranges with 5 per cent of the total VPM are the most important products. The latter, as well as most fishery products, has an individual percentage preference margin rather close to the average one.

For Israel and particularly Tunisia, there is more curvature in the lines, indicating that the percentage preference margins differ significantly among products, either due to differing MFN tariff rates or different magnitudes of the preferential tariff cuts. In such cases, not only is there a difference between products receiving preferences and those not benefiting from preferences, but also among the products covered by preferences. The average percentage preference margin for Israel is with 7.7 per cent lower than those of the above-treated countries. Israel is, however, exporting quite a lot of products to the EU with preference margins above 10 per cent and below 5 per cent, making up for 37 per cent and 10 per cent of the total VPM and for 24 per cent and 22 per cent of preferential trade. The products with the highest percentage preference margin are various types of fruit juices with up to 35 per cent, not, however, importantly contributing to the total VPM. The case is different for Tunisia, where olive oils make up 71 per cent of that country’s total VPM, at up to 42 per cent. This stems from the high MFN tariffs as well as substantial reduction rates. As a result of the tariff preference for olive oils, at 21 per cent, the average percentage preference margin of Tunisia exceeds that of all other MCs. Excluding olive oils from the analysis, the average percentage preference margin and the distribution over preferential products would be very similar to the other countries analyzed in this section. Apart from olive oil, fish, dates and oranges contribute most to Tunisia's VPM.

In the latter two cases, the benefits resulting from preferential treatment by the EU are distributed unevenly across product sectors, so producers in different product sectors may tend to be happy about EU preferences to rather different degrees. More generally, the larger the area below the lines and above the diagonal, the more unequal are the effects of preferential treatment for different product sectors, and the more potential there is for split opinions among different producer groups about the benefits of the arrangements with the EU.

Finally, in order to make an attempt at saying something about the importance and size of the overall VPM for the individual country, the VPM is compared to the size of several economic indicators. In Table 4.5, VPMs under the EMA are related to total agricultural exports to the EU and to the agricultural GDP of the countries concerned (to indicate the relevance of EU preferences for the agricultural sector) and to their total GDP (to indicate the significance of EU agricultural preferences for the whole economy).

Table 4.5. Size of the Value of the Preference Margin

	Value of preference margin			
	in mio. €	% of agr. ex_{EU}	% of $GDP_{agr.}$	% of GDP_{total}
Algeria	1.75	4.39%	0.03%	0.00%
Egypt	10.98	3.58%	0.07%	0.01%
Israel	36.55	4.25%	1.23%	0.03%
Jordan	0.33	4.56%	0.16%	0.00%
Lebanon	0.92	2.80%	0.04%	0.00%
Morocco	122.34	8.84%	1.91%	0.32%
Palestine	0.35	7.00%	0.13%	0.01%
Syria	5.72	4.16%	0.12%	0.03%
Tunisia	46.60	15.86%	1.83%	0.21%
Total MCs	225.52	7.35%	0.55%	0.06%

Sources: Eurostat, World Bank (2005a, 2005b), International Monetary Fund, Central Bureau of Statistics, European Central Bank (2004), own calculations. All GDP and export data for 2001-2003 (agricultural share in GDP available for 2001-2002 in most regions, for 2001 in Cyprus, for 2002 in Malta and Israel; GDP available only for 2001-2002 in Israel)

The value of preference margins amounts to a significant share of MC agricultural exports to the EU in all cases. But the situation looks somewhat different if the VPM is compared to the GDP of the agricultural sector. For Israel, Morocco and Tunisia, the VPM exceeds 1 per cent of the agricultural GDP, for all other countries the VPM is 0.2 per cent or less of the agricultural GDP. As a group, the VPM for the MCs is equivalent to about 0.6 per cent of the agricultural GDP. If preference margins are compared to total GDP, they appear, of course, much smaller. On average for all MCs, the VPM is no more than 0.06 per cent of total GDP. Only for Morocco and Tunisia does the VPM exceed 0.2 per cent of their total GDP. This is due to the combination of their relatively large preference margins compared to the size of their agricultural sectors and the relatively large shares of their agricultural sectors in the whole economy. For all other MCs the VPM is 0.03 per cent or less of their total GDP.

One element which is completely new in the EMA, but not covered here, is the reciprocity of agricultural preferences; preferences are also granted by the MCs for imports of temperate zone products originating from the EU. These preferences are considerable: for example, for wheat the TRQs agreed upon by the MCs in the EMAs to date add up to more than 1.8 mio. tons, equivalent to about 13 per cent of all wheat exports of the EU in 2001-2003.[30]

OUTLOOK

A gradual extension of preferences will be an element of the relations between the EU and the MCs in the field of agricultural trade in the years to come. All EMAs include provisions which foresee the further liberalization of agricultural trade, although at a date that differs from country to country. Tunisia, Israel, Morocco and the Palestinian Authority have already negotiated such extensions. Throughout this process preferential access to EU markets will be improved further. However, the value of preferences granted to the MCs eventually depends on the level of EU import barriers to MFN suppliers which themselves depend, finally, on the nature of future agricultural policies applied by the EU.

Due to various internal and external factors, the trend of agricultural policy making leads away from price support as implemented by border protection. This process started in 1992 with the reforms under EU Commissioner MacSharry for typical temperate zone products. The Agenda 2000 as well as the most recent Mid Term Review reforms (MTR) have carried forward this process. A significant reduction of the intervention price has recently been agreed for rice, and a reform of the EU's sugar policies, including substantial price reductions, is under negotiation. Many elements contribute to this process. First, the continuing enlargement of the EU to include some large agricultural producers puts pressure on the EU budget. In the years to come, the current accession candidates Bulgaria, Romania and Croatia will probably become EU members. Turkey may follow later. Turkish accession in particular may contribute to further reform of policies for Mediterranean products such as olive oil. A second factor contributing to a reduction of agricultural price supports are the constraints resulting from the EU's agricultural commitments under the WTO. The commitments that have resulted from the UR have already required policy adjustments in the EU. In the current round of negotiations, further tariff reductions and a full phasing out of export subsidies will probably be agreed upon, and will force the EU to reduce the level of price support.

A third external factor could result in the long run decline of EU protection for Mediterranean agricultural products: the ongoing process of bilateral trade liberalization not only with the MCs, but also with many other "southern countries". In the negotiations with South Africa and MERCOSUR, agricultural trade was the most profound concern of the EU, and so far the EU has tried to avoid opening up its markets for agricultural products substantially. On the other hand, the EU has a strong economic interest in trade liberalization for industrial products and it could become more and more difficult for the EU to pursue a policy of free trade in industrial products while exempting large segments of agricultural production.

30 For an analysis of the preferences granted by the MCs to the EU under the EMAs, see Grethe and Tangermann (1999a, pp. 23-6). The EU's preferential access to the wheat markets of Jordan and Syria is not limited by TRQs. The amount of wheat exported by the EU to Jordan have been minor in the past, but have risen twenty fold to about 100,000 tons after the EMA entered into force in 2003. The quantities of wheat exported to Syria are small as well. In addition, Syria usually applies MFN tariffs of less than 10% to wheat products. Therefore, Syria is not expected to become an important destination for EU wheat exports as a result of the EMA.

For all these reasons it is likely that protection for agricultural products in the EU will continue to decline, and hence margins of preference will erode in the future. While valuable in the short run, the economic benefits potentially resulting from trade preferences granted by the EU will thus be of a transitory nature. For the EU, on the other hand, the remaining trade barriers against the MCs become less relevant due to the decreasing domestic EU price level. Against this background the questions arises as to whether cumbersome future negotiations towards a gradual extension of agricultural preferences granted to the MCs are a wise policy to pursue. Transaction costs involved in preferential trade are high, and accrue at many stages: in bilateral trade negotiations, in the administration of innumerable TRQs and high geographical and seasonal variations of tariffs, and at the level of trading companies which have to act in a rather nontransparent field of complex bilateral trade policies (Abbott 2002). In addition, the entry price system as well as the wide prevalence of TRQs lead to economic rents resulting in a waste of resources due to rent-seeking behavior and a non-optimal allocation of resources in production.

Given these high costs of product-specific and differentiated preferences, the full inclusion of MCs' agricultural exports in a free trade area with the EU seems a worthy alternative. The effect on EU markets may be limited for many reasons. First, compared to an increasing EU market, the MCs are relatively small in terms of agricultural production. Agricultural GDP in the MCs is only about 17 per cent of that in the current EU-25 and the four accession candidates combined. Furthermore, natural resources, especially water, are rather scarce in most of the MCs and therefore put a limit on additional exports. Finally, transportation costs and increasing quality standards applied by EU importers limit the competitiveness of many MC products on EU markets. Garcia Alvarez-Coque (p. 408) states that "only a few countries … are able to export the quality products demanded by high-income consumers". Grethe (2004) arrives at a similar conclusion for Turkey where, in contrast to a priori expectations, full abolishment of EU market access barriers for fruits and vegetables would lead to only small gains in exports.

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REFERENCES

Abbott, P.C. Tariff-Rate Quotas: Failed Market Access Instruments? *European Review of Agricultural Economics*. 1 (2002): 109-130.

Attina, F. The Euro-Mediterranean Partnership Assessed: The Realist and Liberal Views. *European Foreign Affairs Review.* 2 (2003): 181-200.

Central Bureau of Statistics (2003). *Statisitlite No. 35 – The Israeli Economy.* Jerusalem, December 2003. http://www.cbs.gov.il/statistical/is_eco_e.pdf, accessed 5 January 2005.

Chemnitz, C., and H. Grethe. *EU Trade Preferences for Moroccan Tomato Exports – Who Benefits?* Contributed paper at the XIth International Congress of the European

Association of Agricultural Economists, "The Future of Rural Europe in the Global Agri-Food System", 23-27 August 2005, Copenhagen.

Commission of the European Communities. *Council Decision on the signing, on behalf of the European Community, of the Euro-Mediterranean Agreement establishing an Association between the European Community and its Member States, of the one part, and the People's Democratic Republic of Algeria, of the other Part.* COM(2002) 157 final, Brussels, April 2002a.

_. *Council Decision on the signing, on behalf of the European Community, of the Euro-Mediterranean Agreement establishing an Association between the European Community and its Member States, of the one part, and the Republic of Lebanon, of the other Part.* COM(2002) 170 final, Brussels, June, 2002b.

European Central Bank. *Monthly Bulletin – December 2004*. Frankfurt am Main, December 2004. http://www.ecb.int/pub/pdf/mobu/mb200412en.pdf, accessed 6 January 2005.

_. *Monthly Bulletin – January 2002*. Frankfurt am Main, December 2002. http://www.ecb.int/pub/pdf/mobu/mb200201en.pdf, accessed 6 January 2005

European Commission. *External Relations: The Euro-Mediterranean Partnership.* 2005. http://europa.eu.int/comm/external_relations/euromed/index.htm, accessed 19 January 2005.

European Union. *Official Journal*. Various issues.

EUROSTAT. *EEC External Trade*. CD ROM version, various issues.

FAO. *Internet Database.* http://apps.fao.org, accessed January 2005.

GATT. *Schedules of Market Access Concessions*. Electronic version, Geneva 1994.

Garcia-Alvarez-Coque, J.-M. Agricultural Trade and the Barcelona Process: Is Full Liberalization Possible? *European Review of Agricultural Economics*. 3 (2002): 399-422.

Grethe, H. *Effects of Including Agricultural Products in the Customs Union between Turkey and the EU. A Partial Equilibrium Analysis for Turkey*. CeGE-Schriften, Center for Globalization and Europeanization of the Economy, Georg-August-Universität Göttingen, No. 9. Peter Lang Verlag, Frankfurt am Main, 2004. Also published at http://webdoc.sub.gwdg.de/diss/2004/grethe/index.html.

Grethe, H. and S. Tangermann. The New Euro-Mediterranean Agreements – An Analysis of Trade Preferences. In FAO (ed.), *Expert Consultation on the Preparation for the Next Trade Negotiations on Agriculture, Report of a Meeting held in Rabat, Morocco, 9-11 December 1998*, FAO Sub-Regional Office, Tunis, Tunisia. Reprinted as Discussion Paper 9901, Institute of Agricultural Economics, University of Göttingen. http://www.gwdg.de/~uaao. 1999a.

_. The EU Import Regime for Fresh Fruit and Vegetables after Implementation of the Results of the Uruguay Round. In FAO (ed.), *Expert Consultation on the Preparation for the Next Trade Negotiations on Agriculture, Report of a Meeting held in Rabat, Morocco, 9-11 December 1998*, FAO Sub-Regional Office, Tunis, Tunisia. Reprinted as Discussion Paper 9902, Institute of Agricultural Economics, University of Göttingen. http://www.gwdg.de/~uaao. 1999b.

International Monetary Fund. *IMF Country Report No. 03/31 – Cyprus: Selected Issues and Statistical Appendix*. Washington D.C., February 2003. http://www.imf.org/external/pubs/cat/longres.cfm?sk=16336.0, accessed 4 January 2005.

Jünemann, A. Six Years after: Reinvigorating the Euro-Mediterranean Partnership. In: Hanelt, C.-P. et al. (ed.). *Europe's Emerging Foreign Policy and the Middle Eastern Challenge.* Bertelsmann Foundation, 2002: 59-77.

Kommission der Europäischen Gemeinschaften. *Vorschlag für einen Beschluß des Rates über die Unterzeichnung und die vorläufige Anwendung einiger Bestimmungen des Europa-Mittelmeer-Assoziationsabkommens zwischen der Europäischen Gemeinschaft und ihren Mitgliedstaaten einerseits und der Arabischen Republik Syrien andererseits im Namen der Europäischen Gemeinschaft*. KOM(2004) 808 endg., Brussels, December 2004.

Nolte, S. *From Lomé IV to Cotonou and EBA – An Analysis of Trade Preferences and Redistribution of Economic Benefits.* M. Sc. Thesis. Göttingen, December 2002.

Pomfret, R. *Mediterranean Policy of the European Community. A Study of Discrimination in Trade*. 1986.

Radwan, S., and J.-L. Reiffers. *The Impact of Agricultural Liberalization in the Context of the Euro-Mediterranean Partnership.* FEMISE report, November 2003.

Riess, A., Vanhoudt, P. and K. Uppenberg. Further Integration with the EU: Just One Ingredient in the Reform Process. *EIP Papers*. 6 (2), The Mediterranean Region, a Special Report, 2001.

Skully, D. *Economics of Tariff-Rate Quota Administration.* USDA, ERS Technical Bulletin No. 1893, 2001.

World Bank. *World Development Indicators Data Query.* Washington D.C. 2005a. http://devdata.worldbank.org/data-query/, accessed 4 January 2005.

_. *Country at a Glance Tables – Malta at a Glance*. Washington D.C. 2005b http://www.worldbank.org/cgi-bin/sendoff.cgi?page=%2Fdata%2Fcountrydata%2Faag%2Fmlt_aag.pdf, accessed at 4 January 2005.

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MEASURING MARKET POWER IN THE JAPANESE CHICKEN MEAT MARKET

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ABSTRACT

This study investigates the market power of Brazil, China, Thailand, and the U.S. in the Japanese chicken meat market by product type. A residual demand elasticity model is fitted with monthly data from January 1988 to December 2002. The results indicate that China, Thailand and the US have a significant mark-up over marginal cost in the whole birds segment; Brazil and China have a significant mark-up over marginal cost in the chicken leg segment; and no country has a significant mark-up over marginal cost on the other cuts segment.

There is evidence that exporters look at the costs of other suppliers when they price their chicken products to the Japanese. The results clearly show that there is much competition in the Japanese chicken meat market. The largest exporters in each market segment price competitively; pricing above marginal cost is only found for smaller exporters in smaller market segments.

Japan is one of the world's largest chicken meat importing countries. In 2002 it imported 524,000 metric tons ($877 million), ranking it second in the world (Figure 1). Their imports are mainly from Brazil, China, Thailand and the U.S., which together accounted for 99% of imports in 2002. Among these four countries, the U.S. held the biggest share of imports from 1988 to 1989, accounting for 38-45% (Ministry of Agriculture, Forestry, and Fisheries, MAFF, Japan). From 1990 to 1993, Thailand surpassed the U.S. and became the leading supplier with a 33-36% share, depending on the year. Between 1994 and 2001, China overtook Thailand and became the leading supplier with a 28-42% market share. Brazil was in third or fourth position between 1988 and 2001 with a share from 13-22%. In 2002, Brazil surpassed China and the U.S. to become the second largest supplier with a 32% market share. The changes in market shares across these years were due to many factors; for example,

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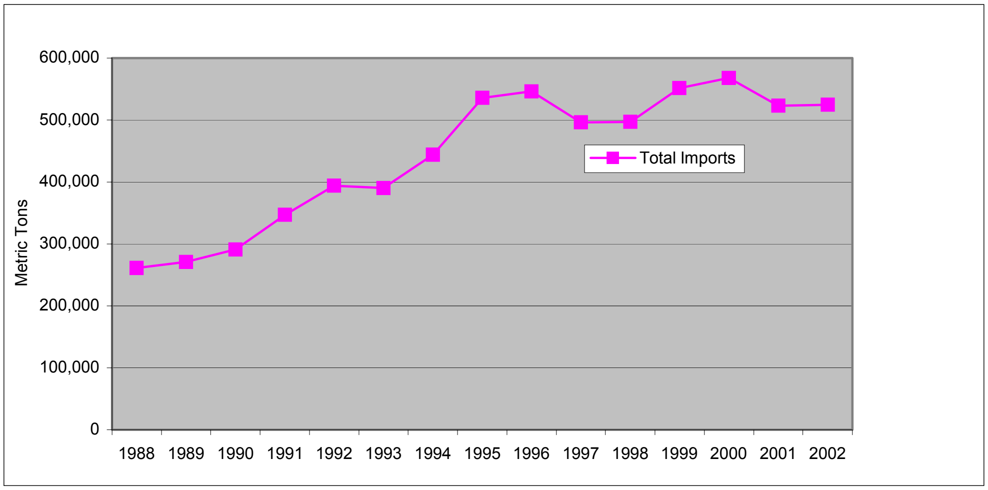
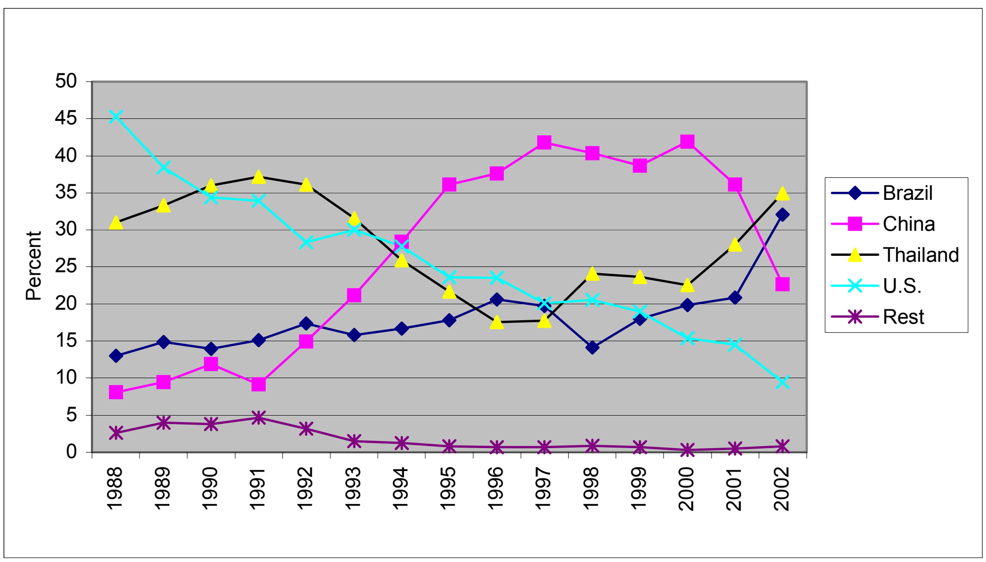
changes in Japanese consumers' preferences, depreciated currencies for some exporting countries, and poultry diseases in exporting countries (Figure 2).



Source: Ministry of Agriculture Forestry and Fisheries, Japan.

Figure 1. Total Japanese Chicken Meat Imports 1988-2002.



Source: Ministry of Agriculture Forestry and Fisheries, Japan.

Figure 2. Shares of Japanese Chicken Meat Imports by Country of Origin

Data on Japanese frozen and chilled chicken meat imports are classified into three categories: whole birds, legs with bone, and other cuts. Brazil is the consistent leader in the whole bird market segment (with a 78% share in 2002), while the U.S. dominates the chicken leg market segment (with a 72% share in 2002). Thailand was the leader for 2002 in the other cuts market segment with a 38% share, followed by Brazil (33%) and China (25%) (Table 1).

Japanese chicken meat imports continue growing because of diminished production due to labor shortages and high production costs.

Table 1. Japanese Frozen and Chilled Chicken Meat Imports by Country of Origin, 2002

					Unit: Metric Tons	
	Brazil	China	Thailand	US	Rest	Total
Whole Chicken	3,415	125	88	216	548	4,392
Share (%)	78	3	2	5	12	100
Leg with Bone	7,152	472	5,591	35,467	616	49,298
Share (%)	15	1	11	72	1	100
Other Cuts	157,589	118,400	177,617	13,963	3,178	470,747
Share (%)	33	25	38	3	1	100
Total	168,157	118,997	183,296	49,646	4,341	524,437
Share (%)	32	23	35	9	1	100

Source: Ministry of Agriculture Forestry and Fisheries, Japan.

Despite intense competition in the Japanese chicken meat market, a high concentration of suppliers and differentiated products point to the potential for imperfect competition. Each of these major suppliers has sufficient market power to influence the price of chicken meat in Japan. Yet there has been little work on testing the existence of market power in the Japanese chicken meat market. This study aims to investigate the market power of Brazil, China, Thailand, and the U.S. in the Japanese chicken meat market by product type. The main hypothesis is that imperfect competition is present in the Japanese chicken meat market. It is hypothesized that 1) Brazil has market power in the sale of whole birds by keeping its price above the competitive level, 2) the U.S. has market power in the sale of chicken legs bone by keeping its price above the competitive level, and 3) Thailand and China have market power in the sale of other chicken cuts by keeping their price above the competitive level.

CONCEPTUAL FRAMEWORK

Many theoretical concepts have been introduced to investigate market power, such as the Structure-Conduct-Performance paradigm, the Lerner index, the Pricing-to-Market model, and the Residual Demand Elasticity (RDE) approach. Lately, the RDE model has been gaining in popularity because of its ease in use. Although critics say that the RDE approach entails a significant loss of information (such as price elasticity of demand, marginal cost, and unidentified conduct parameters), the number of studies using the RDE model are growing. The advantages of the RDE model are that it requires a modest amount of data and has fewer computational burdens. The point of estimating a single equation rather than a structural demand system involving all firms in an industry is to economize on data.

The RDE model was first developed by Baker and Bresnahan in 1987. Goldberg and Knetter (1999) extended the RDE framework to estimate market power in international markets. Rather than estimating all the parameters of a full export supply/import demand structural model, the RDE approach is manipulated so that only one equation has to be estimated. The elasticity of the residual demand curve is a proxy for market power, telling how much power the firm has (or group of firms have) over price, taking into account the price or quantity response of other firms.

This study extends Goldberg and Knetter's RDE empirical model to measure market power of major chicken meat suppliers to Japan. To derive the residual demand, one assumes there is a group of exporters selling their products in a particular foreign market destination market. Let P^{ex} be the price of the export good (in units of the destination market currency), Q^{ex} be the total quantity of exports from the source country to this destination market, $p^1,...,p^n$ be the prices of *n* competing products produced in other countries, and Z be a vector of demand shifters in the destination market.

If the demand function for the exporters is $Q^{ex} = Q^{ex}(p^{ex}, p^1,...p^n, Z)$, then its inverse demand function is

(1) $p^{ex} = D^{ex}(Q^{ex}, p^k, Z)$*, where k=1,...n, and*

$$Q^{ex} = \sum_{i=1}^{n} q_i^{ex} = q_1^{ex} + q_2^{ex} + ... + q_n^{ex}$$

The inverse demand function for the other competitors is

(2) $p^k = D^k(Q^k, p^j, p^{ex}, Z)$, where

$$p^j = p^1,..., p^n, j \neq k$$

Based on the residual demand and the individual cost functions, the profit maximization problem for any single destination market of the i^{th} exporter is:

$$\text{Max } \prod_i^{ex} = p^{ex} q_i^{ex} - eC_i^{ex}$$

Where e is the exchange rate (destination currency per unit of export source currency) and C_i^{ex} is total cost in the source currency units.

The first order condition for the i^{th} exporter implies that *MR=MC, or:*

$$p^{ex} = e\left(\frac{\partial C_i^{ex}}{\partial q_i^{ex}}\right) - q_i^{ex} D_1^{ex}\left(1 + \sum_{j \neq i} \frac{\partial q_j^{ex}}{\partial q_i^{ex}}\right)\left(1 + \sum_{j \neq i} \frac{\partial D^{ex}}{\partial p^k} \cdot \frac{\partial p^k}{\partial p^{ex}}\right)$$

where $\frac{\partial Q^{ex}}{\partial q_i^{ex}} = 1 + \left(\sum \frac{\partial q_j^{ex}}{\partial q_i^{ex}} \right)$, $i \neq j$

(3) $p^{ex} = eMC_i^{ex} - q_i^{ex} D_1^{ex} \lambda_i \delta$

Where, D_1^{ex} denotes the partial derivative of the inverse demand function with respect to its first argument. The condition in equation (3) reveals how the exporter's marginal revenue depends on the interactions of firms within the exporting country as well as the interactions between the exporters and foreign competitors. The term $\lambda_i = 1 + \sum_{i \neq j} \frac{\partial q_j^{ex}}{\partial q_i^{ex}}$ captures the competitive behavior among exporters within the source country, and $\delta = 1 + \sum_{j \neq i} \frac{\partial D^{ex}}{\partial p^k} \cdot \frac{\partial p^k}{\partial p^{ex}}$ captures the competitive interaction between source country firms and other foreign producers. Multiplying equation (3) by the market share, s_i, for each of the export firms and summing across firms, one obtains

$$\sum_i s_i p^{ex} = \sum_i s_i eMC_i^{ex} - \sum_i s_i q_i^{ex} D_1^{ex} \lambda_i \delta$$

Since $\sum_i s_i = 1$, *and* $q_i^{ex} = s_i Q^{ex}$, the first order condition for the market level is

(4) $p^{ex} = eMC^{ex} - Q^{ex} D_1^{ex} \lambda \delta$

Where $MC^{ex} = \sum_i s_i MC_i^{ex}$, $\lambda = \sum_i s_i^2 \lambda_i$, and λ, δ are conduct parameters. Similarly for the competitors, the first order condition is

(5) $p^k = e^k MC^k - Q^k D_1^k \gamma^k$

Where $k=1,\dots,n$, γ^k is all conduct parameters, and e^k is the exchange rate for the k th competitor in the destination market. The demand curves are general, so that the competing products may or may not be perfect substitutes. Similarly, the supply curves are general; marginal cost can be constant or functions of the quantities produced.

Estimation of the market power for the exporter group requires system estimation of equations (1), (2), (4), and (5). To reduce the number of parameters that must be estimated in an industry with many products, and to economize on data, Baker and Bresnahan (1988), and Goldberg and Knetter (1999) manipulated these equations to obtain only one reduced-form equation. This approach can capture the joint impact of market power through the elasticity of the residual demand curve. To obtain this single equation, they first solved equations (2) and (5) for the price and quantities of the *n* competitors' products. In general, the marginal cost for competitor *k*, MC^k, will be a function of the quantity produced, Q^k, and a vector of cost shifters, W^k , so that equation (5) can be written as:

$$P^k = e^k MC^k(Q^k, W^k) - Q^k D_1^k(Q^k.p^j, p^{ex}, Z)\gamma^k$$

After solving the system of *2n* equations defined by equations (2) and (5), the prices of the competitors' products as functions of the cost and demand shifters for the *n* products, and the quantity (or price) of the export good, Q^{ex}, are obtained. Let W^N denote the union of all firm-specific cost shifters (excluding the exporter group of interest), and similarly γ^N be the union of all the conduct parameters for *k=1,…,n*. Then:

$$(6)\quad P^k = P^{k^*}(Q^{ex}, W^N, Z, \gamma^N)$$

Each p^{k*} represents a partial-reduced form; the only endogenous variable appearing on the right hand side is Q^{ex}. The dependency of p^k on Q^{ex} arises because only the competitors' products 1,…, n have been solved. To obtain the residual demand curve for the exporter group, we substitute the *n* expressions defined by equation (6) into equation (2) to eliminate the prices of the competing products from (2).

$$(7)\quad p^{ex} = D^{ex}(Q^{ex}, p^{1*}(.),...., p^{n*}(.), Z) = D^{res,ex}(Q^{ex}, W^N, Z, \gamma^N)$$

Thus the residual demand curve is a function of the quantity produced by the exporter group, Q^{ex}, other firms' cost shifters, W^n ,and demand shifters, Z. Its slope is the slope of the demand curve facing the exporting firm, taking into account the competitive interaction of all other firms in the market.

Differentiating the log form of equation (7) with respect to Q^{ex} , yields the (inverse) demand elasticity, η^{ex} :

$$\eta^{ex} = \frac{\partial \ln D^{res,ex}}{\partial \ln Q^{ex}} = \frac{\partial \ln D^{ex}}{\partial \ln Q^{ex}} + \sum_k \frac{\partial \ln D^{ex}}{\partial \ln p^{k*}} \cdot \frac{\partial \ln p^{k*}}{\partial \ln Q^{ex}}$$

Empirical Model and Data

Equation (7) is estimated in double-log form (a common specification for import demand studies), so that the coefficients have a direct interpretation as elasticities:

$$(8)\quad \ln p_{mt}^{ex} = \lambda_m + \eta_m \ln Q_{mt}^{ex} + \alpha_m' \ln Z_t + \beta_m' \ln W_{mt}^N + \varepsilon_{mt}$$

Where, m denotes a specific destination market, p^{ex} is the price of the export good, λ is the intercept, Q^{ex} is the total quantity of exports from the source country, η is the inverse demand elasticity, Z is demand shifters, α is the vector of demand parameters, W^N is other firms' cost shifters, β is a vector of cost parameters, and ε_{mt} is an error term. The estimation procedure corrects for serial correlation if the null hypothesis of $\rho = 0$ is rejected at the 5% level.

Data on individual company operations in Japan are not available, so we are forced to aggregate companies within a country. This necessitates using the model to study exports to Japan by country. It is assumed that each major Japanese supplier (Brazil, China, Thailand, and the US) faces a residual demand curve that is downward sloping. The demand shifter included is real Japanese per capita income. The competitor's cost shifter included is the exchange rate because exchange rate variations shift the costs of exporters in the destination market. A dummy variable is added to identify unusual export activities from China (an export boom in 1994 and bird flu problems in 2000-2002). The dummy has a value of one during months when these activities occurred and a zero otherwise. Twelve versions of equation (8) are estimated; four major Japanese suppliers and three chicken products.

Monthly data from January 1988 to December 2002 for four major Japanese suppliers' exports of whole birds, legs with bone, and other cuts are analyzed[1]. Import unit values in Japan (prices) and import quantities came from the Customs and Tariff Bureau, Ministry of Finance, Japan. Real exchange rates (expressed in exporting countries' currency against the yen), Japanese per capita income, and the consumer price index were obtained from the USDA.

Generalized least squares is used to estimate the regression models. Whenever serial correlation is detected as a problem, the data are transformed using the Cochrane-Orcutt method.

RESULTS

The econometric results for the four countries are presented in tables 2 to 5. Because the model is in double log form, coefficients are elasticities (except for the dummy variable). If countries are perfect competitors (do not have market power) in the Japanese market, one would expect all coefficients to equal zero.

Brazil

The results for Brazil are presented in table 2. For whole birds, the coefficient for quantity exported (-0.253) had the expected sign and was statistically significant, implying that there is mark-up of price over marginal cost (Lerner index) by Brazilian exporters of whole birds. Brazil dominates the market for whole birds in Japan and they use this market power in their pricing decisions (table 1).

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[1] Shorter data series are used to analyze exports for some chicken products because data were not available back to 1988. Time series data were only available from January 1991 for Chinese and Thai exports of whole birds and January 1992 for Chinese exports of leg with bone.

Table 2. Residual (Inverse) Demand Results for Brazilian Chicken Meat

	Whole Birds		Legs with Bone		Other Cuts	
Variables	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error
Intercept	-6.686**	1.326	9.501**	2.545	7.227*	3.200
lnQbz	-0.253**	0.061	-0.103**	0.037	-0.020	0.028
lnZjp	0.502	0.264	-1.614**	0.302	-1.187**	0.414
lnERcn	0.026	0.062	0.233*	0.099	0.017	0.074
lnERth	-0.147*	0.061	-0.501**	0.127	-0.258*	0.109
lnERus	-0.324	0.338	-2.255**	0.398	-1.362**	0.452
D	-0.157**	0.022	-0.213**	0.039	-0.081*	0.033
R-Square		0.998		0.988		0.936

** significant at 1% level
* significant at 5% level

The income elasticity (0.502) was statistically different from zero and positive, implying that whole Brazilian birds are a normal good in the Japanese market. If incomes increase by 1%, Brazil's price for whole birds will increase by 0.502%. This bodes well for Brazilian whole bird exporters when Japanese real income starts growing again consistently. Almost all of the income flexibilities (or elasticities, as they will be called here) found in this analysis were negative (by product and exporter). This particular income elasticity was the only one that was positive and significantly different from zero.

The coefficient on the exchange rate for the Thai baht (-0.147) was statistically significant and had the expected sign. Brazilian exporters of whole birds pay attention to the Thai currency's value and incorporate changes in its value into their prices offered to Japanese customers. As the Thai currency depreciates in real terms, Thailand's costs of selling to the Japanese market fall, forcing Brazilian exporters to charge lower prices. It is unlikely that the price of whole birds from Thailand would cause this movement in Brazil's price for whole birds, but rather the price of processed Thai chicken is the cause (Thai exports of whole birds are quite small). It is interesting, though, that the real value of the Chinese yuan was not significant in explaining the pricing of Brazilian whole birds.

The coefficient for the dummy variable (-0.157) was statistically significant, implying that the boom of Chinese chicken meat exports and the bird flu problem in China did have an impact on changes in Brazilian whole bird prices. These episodes in China have salutary impacts on the world chicken market and this is verified in this regression analysis.

The results for Brazilian exports of chicken legs also shows pricing over marginal costs, with a quantity coefficient of -0.103 that is significantly different from zero. The income elasticity for legs was negative and significantly different from zero. Japanese real incomes were generally falling during much of the observation period, so consumers have been substituting chicken over time for other more expensive sources of protein (such as beef). This (and the other) relatively larger negative income elasticities indicate that during hard economic times, Japanese consumers have moved toward consumption of these more processed chicken products (in contrast to the income elasticity for whole birds). Consumers want to save money by purchasing lower-priced chicken as their incomes fall, but they still want convenience in preparation.

Brazilian exporters are conscious of the baht and dollar when they price their chicken legs and other cuts in the Japanese market. They are particularly conscious of the dollar's value for these cuts, making sure that the price they offer the Japanese more than compensates for a depreciation of the US dollar (since its elasticity is greater than one in absolute value for legs and other chicken cuts).

In addition, the value of the Chinese yuan has little role in influencing Brazil's pricing. The coefficient for the Chinese exchange rate was positive for leg with bone. However, since the yuan is nominally pegged to the US dollar, the positive coefficient might be picking up the correlation between Chinese and US exchange rates. If this is the case, one could add the Chinese and US exchange rate elasticities to obtain a more reliable estimate of the effects of a dollar depreciation (which affect US's and China's price). For instance, the elasticity of Brazilian chicken leg prices with respect to the US dollar would be -2.022 (-2.255 + 0.233). This would still suggest that Brazilian exporters are quite responsive to changes in the value of the dollar since it will lower the yen price for American and Chinese chicken.

In two instances there were significant mark-ups of price over marginal cost for Brazil: whole birds, -0.253, and leg with bone, -0.103. Both prices are responsive to changes in Brazilian exports, but prices change little relative to quantities (a 10% increase in quantity only requires a 1.0% to 2.5% reduction in price to move the product). So these Brazilian chicken exporters have some market power, but the residual demand curve that they face in Japan is rather flat. For other chicken cuts, these findings do not support the hypothesis that Brazil has market power to keep its price above competitive levels.

The coefficient for the dummy variable was statistically significant for all three chicken cuts. The magnitude of the coefficient for other cuts was smaller in magnitude for whole birds and legs with bone, indicating that factors in China had less influence on Brazilian chicken prices.

China

Table 3 presents the estimated residual (inverse) demand elasticities of whole birds, chicken legs, and other cuts for China. These results show less pricing over marginal cost for China than Brazil. The coefficients on all export quantities for Chinese chicken are small and negative, but none are significantly different from zero. In contrast, all income elasticities are large and negative, but only the coefficient for other cuts is significantly different from zero. These results suggest that Japanese consumers have moved to other Chinese chicken cuts as their real incomes have fallen; it is a cheap source of protein. Chinese chicken import unit values are typically the lowest among all competitors (closely followed by Thailand), but generally these prices offered by the Chinese do not change as Japanese income or import quantities change.

Chinese exporters appear to incorporate real exchange rates into their pricing decisions. A total of four exchange rate coefficients are significantly different from zero, but the exchange rates to which Chinese exporters react vary by chicken product. For whole birds, the Chinese appear to pay close attention to the Thai baht. If the baht depreciates by 1% in real terms, the Chinese reduce their price by 0.8%. For chicken legs, the Chinese seem to follow the U.S. dollar (the market leader) and their price movement is much more pronounced – a 1% depreciation in the U.S. dollar generates a 3.6% fall in Chinese prices. For other cuts, where the Chinese have much greater export volumes, they follow two currencies, the real and the dollar; but Chinese prices are much more sensitive to changes in the real value of the dollar (a 1% depreciation of the US dollar generates a 1.4% fall in the Chinese export price).

Table 3. Residual (Inverse) Demand Results for Chinese Chicken Meat

	Whole Birds		Legs with Bone		Other Cuts	
Variables	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error
Intercept	19.035	16.469	18.709	12.202	7.859**	2.593
lnQcn	-0.108	0.082	-0.048	0.041	-0.020	0.016
lnZjp	-2.431	2.219	-2.968	1.626	-1.310**	0.344
lnERbz	-0.069	0.195	-0.278	0.157	-0.221**	0.055
lnERth	-0.836*	0.333	0.022	0.303	-0.150	0.105
lnERus	-2.249	2.406	-3.569*	1.827	-1.370**	0.391
D	-0.219*	0.089	-0.002	0.067	-0.033	0.030
R-Square		0.891		0.968		0.970

** significant at 1% level,
* significant at 5% level

The coefficient for the dummy variable was statistically significant and negative in the whole bird equation, but not in the other equations. These Chinese supply factors seem to have a limited effect on export pricing.

Thailand

Table 4 presents the estimated residual (inverse) demand elasticities for Thailand. Thailand is the leading exporter of other chicken cuts to Japan, but there is no evidence that they price above marginal cost for that product. The coefficient on other cut exports is negative, but not significantly different from zero. The only quantity coefficient that was significantly different from zero was for whole birds, a minor export item for Thailand, and it was positive. This suggests that Thailand could increase its price of whole birds if it exported more. This may simply reflect Thailand's desire to export value-added chicken products; a slightly higher price for whole birds will not encourage them.

The income elasticities for two of the Thai chicken types (leg with bone and other cuts) are significantly different from zero, negative, and large in absolute value. These are the two most negative income elasticities that are significantly different from zero among the four exporters, -1.81 and -1.90. This should worry Thailand if the Japanese economy picks up in the future because the results show that Japanese consumers are not likely to increase their consumption of imported Thai chicken if their real income increases. These results might be picking up two effects, though. One is the move toward inexpensive chicken products (which will not be important as Japanese incomes rise), but the other is the move toward convenience by Japanese consumers and food service firms. This later trend will continue as incomes rise.

Table 4. Residual (Inverse) Demand Results for Thai Chicken Meat

	Whole Birds		Legs with Bone		Other Cuts	
Variables	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error
Intercept	-6.872	15.003	10.844**	3.298	12.966**	2.111
lnQth	0.104**	0.035	-0.061	0.082	-0.081	0.082
lnZjp	0.012**	1.865	-1.805**	0.310	-1.903**	0.284
lnERbz	-0.351*	0.173	-0.141**	0.041	-0.228**	0.047
lnERcn	0.047	0.254	0.128*	0.058	0.146*	0.066
lnERus	-0.591	1.917	-2.363**	0.345	-2.247**	0.301
D	0.611**	0.096	-0.049*	0.025	-0.087*	0.027
R-Square		0.890		0.988		0.974

** significant at 1% level

* significant at 5% level

Thai pricing decisions on chicken meat are sensitive to exchange rates. Whole bird export prices are sensitive to the real's value (an elasticity of -0.35). Thai chicken leg and other cut export prices vary significantly with all the competitors' exchange rates. The elasticities for the Chinese yuan are positive, which is not expected. Recall, though, the yuan's pegged value vis-à-vis the US dollar. Adding the coefficient for the yuan with the coefficient for the dollar generates a value of -2.43 for leg with bone and -2.10 for other cuts; both reasonable values.

The coefficient for the dummy variable was significantly different from zero, large and positive for Thai whole bird exports and significant and negative for Thai exports of the other two products. The model is picking up the supply disruptions from the bird flu in China and indicating that Thailand was able to increase its exports of whole birds during that time.

US

The estimated residual (inverse) demand elasticities for the US are presented in table 5. No coefficients were significantly different from zero in the whole bird and leg with bone equations. US exporters do not change their pricing based on any factors included in this study. US exporters were found to price above marginal cost in only one market, for other cuts, which is surprising since their exports of this product are rather small. If US exporters decide to increase exports of other cuts by 10%, they must reduce their price by 2.3%. US exporters might be pushing this category hard because they want to get rid of dark meat chicken parts (beyond legs) that are left after the white meat is sold in the US. They realize that with such large supplies that they must cut back exports in order to preserve prices.

The only chicken category where the income elasticity was significantly different from zero for the US was for other cuts; it was negative (-0.55). The US price equations had fewer significant estimates for the real exchange rate than any other exporter. Two exchange rate coefficients were significantly different from zero; both in the other chicken cuts equation. Both are smaller than some of the other exchange rate elasticities, especially relative to how other exporters react to changes in the US dollar. It appears that US exporters consider some exchange rates in their pricing decisions, but they react in a less extreme manner than exporters from other countries.

Table 5. Residual (Inverse) Demand Results for US Chicken Meat

	Whole Birds		Legs with Bone		Other Cuts	
Variables	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error
Intercept	-11.839*	5.230	-0.980	4.455	7.315**	2.176
lnQus	-0.111	0.073	0.024	0.168	-0.229**	0.061
lnZjp	0.726	0.456	-0.130	0.182	-0.554**	0.137
lnERbz	-0.016	0.256	-0.030	0.048	-0.270**	0.052
lnERcn	-0.500	0.354	-0.086	0.057	-0.002	0.063
lnERth	-0.649	0.490	-0.068	0.092	-0.462**	0.093
D	0.130	0.152	0.040	0.027	-0.094**	0.030
R-Square		0.864		0.907		0.968

** significant at 1% level
* significant at 5% level

The bird flu and supply surges in China had minimal impact on US pricing of chicken products. The coefficient on the dummy variable was only significantly different from zero in the other chicken cuts equation and it was small in absolute value.

FURTHER DISCUSSION AND CONCLUSIONS

The conclusion drawn concerning market power of the four major suppliers in the Japanese market is summarized in Table 6. Their market power depends on the ability to increase their price if exports are withheld. Significant, negative residual (inverse) demand elasticities indicate that the exporter has market power and can restrict their exports in order to increase their margins. The elasticities in Table 6 reveal that only Brazil (in whole birds and leg with bone) and the US (in other cuts) have significant mark-up over marginal cost.

Table 6. Summary Results of Residual (Inverse) Demand Elasticities

Products	Price: Residual (Inverse) Demand Elasticity (RDE)			
	Brazil	China	Thailand	United States
Whole Birds	-0.253**	-0.108	0.104**	-0.111
Legs with Bone	-0.103**	-0.048	-0.061	0.024
Other Cuts	-0.020	-0.020	-0.081	-0.229**

** significant at 1% level
* significant at 5% level

Brazil dominates the whole bird segment with 78% of total volume of whole bird imports (Table 1), so the finding that there is significant mark-up over marginal cost is not surprising.

Their cost advantages due to low cost feed, abundant land, and cheap labor give them an advantage in this market segment. Yet, they might dominate this segment because no other country wants to export whole birds.

The US dominates the leg with bone segment, but they do not have market power. The ability of the other three suppliers to change their mark-up might indicate that they price off the lead set by US. After the US sets its price, the others react in order to capture some share, though usually a smaller share, of the market for leg with bone. This is probably the most saturated market segment for chicken too, so consumers are ready to move to other chicken products if a country attempts to capture advantages. Nonetheless, Brazilian exporters were found to have some market power, though there was less pricing flexibility than they had in whole birds. They are the second-leading chicken leg supplier to Japan.

The results suggest that the US has market power for other chicken cuts, despite their small market share. US exporters certainly haven't exploited this power to increase export volumes. This market power might stem from the higher quality or safety associated with US chicken cuts. US prices are higher than the other suppliers and this might be required to pull US chicken from the domestic and other export markets.

Neither China nor Thailand has market power in the Japanese market for any chicken cut. They relied on Japan for virtually all of their chicken exports during this period and the Japanese had the upper hand in price negotiations. A better strategy for those countries is to diversify the markets where they sell so that they can ask more from the Japanese market. This competitive market with four major suppliers, all looking to sell increasing supplies of chicken, is not ripe for non-competitive behavior by captured suppliers like China and Thailand (who often enter the market through Japanese joint ventures).

The results clearly show that there is much competition in the Japanese chicken meat market. Japanese importers seem to be quite successful in holding the line on the price of chicken meat. The competition between chicken and other meats might be part of the reason for this pricing competition.

Almost all of the income elasticities estimated in this study were negative, which should worry chicken exporters. Since Japanese people have very high incomes and their consumption patterns are sophisticated, chicken meat could be viewed as an inferior good when compared with other expensive meats like beef. During the study period, beef prices were about 10 times higher than chicken meat prices in Japan. If real incomes begin to increase again in Japan, their consumers may move toward more expensive meats and away from chicken. This could present challenges to chicken exporters unless they supply new, high-valued chicken meat products that are demanded by higher income consumers.

The Japanese chicken market will always be attractive to exporting countries because Japanese production is trending downward due of high labors costs. Hence, there is potential for more chicken meat exports to Japan. The question is which suppliers will capture this market. These findings indicate that the emergence of China (in 1994) in the Japanese chicken meat market has had a significant impact on import prices. If that country continues to improve standards of chicken farming and processing, other exporters could have a difficult time in reaching the Japanese market with prices that compare favorably with the Chinese.

There is evidence that exporters look at the costs of other suppliers when they price their chicken products to the Japanese. Coefficients for the exchange rates of competitors were often significant in the pricing models. During the observation period, the value of the dollar relative to the yen fluctuated without a clear trend. The dollar was weak in the mid 1990s and quite strong in the late 1990s relative to the yen. It was weak again in 2000 and 2001, and stronger after that. Consistently, though, Brazil, China, and Thailand priced off changes in the real value of the dollar for almost all chicken products. In six of the nine cases, the elasticity on the real value of the dollar was significantly different from zero and greater than one in absolute value. These countries are trying to match the US for lower prices when the dollar depreciates, and taking advantage of less pricing pressure when the dollar appreciates. This makes it difficult for the US to maintain a large market share in any chicken product.

The Japanese chicken meat market is an interesting one. Nowhere in the world is there such a large, low-barrier import market served by four aggressive suppliers (Hong Kong and Singapore might be exceptions). Competition from domestic producers is diminishing over time, so imported sources are increasingly important in meeting consumer demands. However, the Japanese market might be a precursor of other markets where trade barriers will be lowered and domestic production will stagnant. Countries such as Korea, Mexico, and Taiwan might evolve in a similar way – taking advantage of competition among import suppliers to provide chicken to consumers.

If the Japanese market is, indeed, a precursor of things to come in importing countries throughout the world, this will be qualified good news for chicken exporting countries. Those exporting countries will enjoy increased exports of their product, but they will face stiff competition among suppliers. This could be very good for world consumers of chicken and other meats.

REFERENCES

Baker, J.B., and T. F. Bresnahan. "Estimating the Residual Demand Curve Facing a Single Firm." *International Journal of Industrial Organization 6(1988):*283-300.

Customs and Tariff Bureau. Japanese Ministry of Finance. http://www.customs.go.jp

Goldberg, P.K. and M.M. Knetter. "Measuring the Intensity of Competition in Export Markets." *Journal of International Economics* 47(1999):27-60.

Lerner, A. "The Concept of Monopoly and the Measurement of Monopoly Power." *Review of Economic Studies* 1(1934):157-175.

Ministry of Agriculture, Forestry and Fisheries (MAFF), *Statistical Yearbook of the Ministry of Agriculture, Forestry and Fisheries.* Statistics and Information Department, Tokyo, Japan.

United States Department of Agriculture, Foreign Agricultural Service: http://www.fas.usda.gov.

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REVENUE INSURANCE FOR SPANISH WINE GRAPES

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ABSTRACT

Wine grape production in Spain is an economically and culturally important enterprise. However, Spanish wine grape producers are exposed to considerable variability in revenue caused by volatile prices and yields. Revenue insurance is a market-based risk management innovation that can help Spanish wine grape producers indemnify revenue losses that occur due to adverse yields, prices, or both. Using a contingent claims valuation framework and Monte Carlo simulation, actuarially fair premiums for a revenue insurance product for Spanish wine grapes are calculated. The simulation suggests that revenue insurance premiums may be cheaper than similar multi-peril insurance products currently available in Spain. Moreover, subsidized revenue insurance premiums are less expensive than current price support programs. Given pressure on the EU to reduce wine market subsidies in accord with the WTO, the results suggest that revenue insurance may provide Spanish wine grape growers with income stabilization that does not distort trade like current subsidy programs.

Key Words: wine grapes, insurance, contingent claims, subsidies, trade

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INTRODUCTION

Of the many specialty crop commodities grown in Spain, wine grapes are of particular economic importance. In 2000, there were approximately 1.1 million hectares of vineyard under cultivation in Spain, constituting about one-third of all vineyard area in the European Union (Perez). Globally, Spain is the fourth largest producer of grapes, representing about 14 percent of total grape production among the top ten grape growing countries in the world (table 1). Given most of Spain's grape production is used for wine making and not table consumption, Spain is also the third largest wine producing country in the world behind Italy and France, producing nearly 4 million metric tons of wine and accounting for more than 17 percent of wine produced by volume by the top ten wine producing countries (table 2). Spain also exports nearly 20 percent of its wine production, with the main destination being other EU countries.

Table 1. Top Ten Grape Producing Countries and Percentage of Production – Year 2000

Rank	Country	Metric Tons (thousands)	Percent [a]
1	Italy	8,870	18.96%
2	France	7,763	16.59%
3	U.S.	6,974	14.90%
4	Spain	6,540	13.98%
5	Turkey	3,600	7.69%
6	China	3,282	7.01%
7	Iran	2,505	5.35%
8	Argentina	2,460	5.26%
9	Chile	1,900	4.06%
10	S. Africa	1,450	3.10%
	Total:	46,792	100.0%

Source: Food and Agricultural Organization of the United Nations FAOSTAT Database (http://www.fao.org/es/ess/top/country.jsp)

[a] Reflects the percent production of each country relative to the total production contributed by the top ten grape producing countries. Production numbers represent grapes grown for both wine production and table consumption.

Vineyards and wineries can be found dotting the landscape across Spain's diverse geographical landscape. One common characteristic across grape growing regions, however, is that most vineyards are not irrigated, and most are small in size. Of the approximately 250,000 vineyard operations in Spain, nearly one-half are three or less hectares in size (personal communication). Due to the differences in soil types, micro-climates, agronomic practices, and varieties of grapes grown across regions, the Spanish wine grape and wine production sector can best be described as diverse. Furthermore, Spain and other wine producing countries in the EU are facing greater competition on the world wine market, mainly from the United States, Australia, and Chile. Prior to the Uruguay Round of GATT, the EU wine market was essentially isolated from foreign competition due to import tariffs in excess of 20 percent (European Commission, 2000a). Indeed, this increased competition in the global wine market creates additional uncertainty for Spanish wine grape growers. Given increased global competition, as well as the heterogeneity among wine grape producing regions in terms of yield, quantity, quality, and prices received for wine grapes, Spanish wine grape growers face considerable revenue variability.

Table 2. Top Ten Wine Producing Countries, Percentage of Wine Production, and Export Volume – Year 2000

		Wine Production Metric Tons		Wine Exports Metric Tons	Exports as % of Domestic Production
Rank	Country	(thousands)	Percent	(thousands)	Percent
1	France	5,977	24.96%	1,503	25.15%
2	Italy	5,409	22.59%	1,580	29.21%
3	Spain	4,179	17.45%	818	19.57%
4	U.S.	2,660	11.11%	281	10.56%
5	Argentina	1,254	5.24%	93	7.42%
6	China	1,050	4.39%	6	0.57%
7	Germany	1,008	4.21%	254	25.20%
8	Australia	859	3.59%	311	36.20%
9	Portugal	784	3.27%	188	23.98%
10	S. Africa	762	3.18%	170	22.31%
	Total:	23,942	100.00%		

Source: Food and Agricultural Organization of the United Nations FAOSTAT Database (http://www.fao.org/es/ess/top/country.jsp) and the Wine Institute (http://www.wine institute.org/).

[a] Reflects the percent production of each country relative to the total production contributed by the top ten grape producing countries.

Not unlike other specialty crop producers in the European Union and United States, there are limited tools available to help wine grape growers manage both price and yield risk (Richards and Manfredo). While futures and options markets do exist for several EU crops, none exist for wine grapes.[32] However, in Spain and other EU wine growing countries, subsidies do play a considerable role in reducing wine grape growers' price risk. While there is not a direct system of subsidies for wine grapes under the European Union's Common Agricultural Policy (CAP), there is an indirect subsidy to grape growers through wine market subsidies. These subsidies are primarily designed to keep wine prices, and subsequently wine grape prices, artificially high relative an unsubsidized equilibrium price. Thus many of the subsidy mechanisms prescribed under the CAP are market distorting. Under CAP, wines are classified as either table wines or quality wines. For quality wines, the EU delegates

[32] Several successful futures markets exist in Europe which list agricultural futures contracts. For instance, the MATIF (French Exchange) lists futures contracts on rapeseed, milling wheat, corn, and rapeseed meal, and the LIFFE exchange (London) lists contracts for cocoa, coffee, sugar, wheat, barley, and potatoes. There was a specialized futures exchange in Spain which listed futures contracts on fresh citrus products (Futuros de Citricos y Mercaderias de Valencia), but the exchange closed in 2000 due to low volume of trade.

responsibility to member states to classify and control this market. For table wines, constituting approximately 50 to 60 percent of wine produced in Spain, the market distorting measures most commonly used to support prices are distillation measures and abandonment premiums. With distillation measures, the objective is to withdraw production surpluses from the market and transform the wine into alcohol for the potable alcohol and fuel market, artificially raising prices for table wines. Abandonment measures sponsor the removal of wine grapes from production usually in an effort to increase the quality of vineyards and ultimately the quality and price of wines (European Commission, 2000a). For 2004/2005, the EU budgeted 145 million Euros to Spain to reduce vineyard acreage of lower quality table wines, and to shift production into higher quality wines which have a greater chance of competing in the world market (Berry Bros & Rudd).[33]

Recently, the EU has been under pressure from grape growers in the United States to reduce these subsidies for wine grapes. In a 2004 press release, the California Association of Winegrape Growers (CAWG) called EU wine grape subsidies "a clear violation of World Trade Organization (WTO) commitments previously undertaken by the EU" (CAWG). The CAWG further stated "We believe it is the ideal time to examine EU supports for the wine sector and to call for the elimination of those subsides, like the restructuring and conversion program, that distort trade," (CAWG). Due to this increased pressure to reduce wine subsidies, as well as an overall desire to improve the competitiveness of EU agricultural products in the world market, there has been considerable interest in exploring and expanding the use of more market-orientated risk management tools, such as insurance products, which are not market distorting (European Commission 1999, 2000, 2000a, 2001).

Multi-peril crop insurance products are one of the few market-based risk management mechanisms available to Spanish wine grape growers. *La Ley de Seguros Agrarios Cambinados* or Multi-Peril Agricultural Insurance Act of 1980 established a system of subsidized multi-peril insurance products to protect against yield shortfalls due to hail, flood, wind, and other perils (Burgaz and Perez). As recently as 1996, participation levels in multi-peril crop insurance programs by Spanish wine grape growers were at about 40 percent (ENESA). While multi-peril crop insurance is a useful tool for managing economic losses associated with risks that adversely effect yields, it does not protect against shortfalls in revenue that may be caused by low prices, or even a combination of poor yields and low prices.

In the United States and Canada, revenue insurance has received considerable interest among academics, and research has shown that it is often a more complete and less expensive alternative than multi-peril crop insurance (Turvey; Turvey and Amanor-Boadu; Richards and Manfredo; Stokes, Nayda, and English; Stokes; Goodwin, Roberts, and Coble). Revenue insurance provides an indemnity to growers if revenues fall below a pre-determined level. Therefore, regardless of what causes the revenue shortfall (poor prices, yields, or both), revenues are protected. While the results of initial studies examining the feasibility of revenue insurance products for some EU crops appear promising, there is still a lack of preliminary research for specialty crops such as wine grapes (Meuwissen, Huirne, Hardaker). Therefore,

[33] The subsidy programs described directly influence the price of wines, and therefore, indirectly affect the price of wine grapes. Prices ultimately realized by wine grape growers depend on how growers market their grapes. For example, many Spanish wine grape growers market their grapes through wine cooperatives. In this case, higher prices as a result of subsidies are passed on to grower-members.

the research presented here helps broaden the knowledge base necessary for revenue insurance to expand into such specialty markets.

One of the first steps in examining the feasibility of any insurance product is to determine actuarially fair premiums. Estimated premium levels provide insurance companies, farmers, and policy makers the ability to evaluate such programs in relation to other risk management alternatives. In the case of specialty crops, such comparisons are often made using valuation techniques based on historical price and yield data (Richards and Manfredo). However, the heterogeneity of the Spanish wine grape sector makes it difficult to price hypothetical revenue insurance products. Regional-level yield data by variety is either non-existent, of poor quality, or closely guarded from external researchers.[34] However, simulation techniques may be used to circumvent these problems. Indeed, simulations of actuarially fair insurance premiums allow researchers and policy makers to make reasonable assessments of how revenue insurance for Spanish wine grapes may be priced. As well, given that most crop insurance programs are government subsidized, understanding the distribution of potential revenue insurance premiums is useful in projecting subsidy outlays.

The overall objective of this research is to simulate actuarially fair premiums for revenue insurance contracts for Spanish wine grapes. Using a contingent claims framework similar to that of Turvey and Richards and Manfredo, we illustrate that a revenue insurance contract has relatively cheaper premiums than similar yield only contracts. Further, our findings suggest that revenue insurance for Spanish wine grapes provides not only greater coverage (i.e., both price and yield protection), it is also cheaper to the government agency than price supports or subsidized multi-peril crop insurance. This is an important finding given the emphasis by the EU in exploring more market-oriented risk management mechanisms (Dismukes, Bird, and Linse; European Commission 2001), and an overall emphasis of the WTO to reduce or eliminate trade-distorting domestic price subsidies in general (Roberts, Nair, and Jacenko). Further, if the EU does succumb to pressure to reduce subsidies to the wine industry, wine grape growers will continue to demand some form of income stabilization, and revenue insurance provides a potential mechanism for this. Given the importance of the wine grape industry within both Spain and the EU, this research can serve as a model for other researchers and policy makers for simulating revenue premiums for other crops, especially crops that have a high degree of heterogeneity or where lack of data prevent the use of other methods.

METHODS AND DATA

Contingent Claims Valuation

In estimating revenue insurance premiums for Spanish wine grapes, a contingent claims valuation framework is used. This research incorporates the contingent claims methodology put forth by Turvey and more recently by Richards and Manfredo, who specifically applied a contingent claims valuation framework in estimating revenue insurance premiums for

[34] The authors were informed by MAPYA that regional data were proprietary and not available to researchers outside of Spain.

California (USA) grapes.[35] The underlying premise in using a contingent claim valuation approach is that insurance can be viewed as an option, similar to an option on a financial asset such as stock or a futures contract. For instance, a put option on a futures contract gives the buyer of the contract the right, but not the obligation, to take a short position in the futures market at a specific price, within a specified time period (Leuthold, Junkus, and Cordier). In the context of revenue insurance, the contract will pay an indemnity if the realized revenue falls below a particular pre-determined level.[36] If no revenue shortfall occurs, the buyer of the insurance contract still benefits from positive revenue gains, and only loses the insurance premium. Applying contingent claims valuation techniques to price revenue insurance assumes that revenue is the underlying asset, and applies standard option pricing techniques to determine the price or premium for the option. More intuitively, the option valuation procedures place a price on the probability of a revenue shortfall occurring (and subsequent indemnity). This value or price is the premium for the insurance contract.

Following the work of Turvey and Richards and Manfredo, revenue insurance for Spanish wine grapes is valued as a European put option using Black's (1976) model for valuing options on futures contracts.[37] In general, Black-Scholes type models express the option premium as a function of the option strike price, the value of the underlying (e.g., revenue), the risk-free rate of interest, time to maturity of the option, and the volatility of the underlying. Except for the volatility, all the inputs of the model are known at a particular point in time. However, volatility is the most important input affecting the value of any option.

In valuing revenue insurance contracts for Spanish wine grapes, we define revenue as $R=py$ where p is the price of grapes and y is the yield (Turvey; Richards and Manfredo). Thus, the stochastic process of revenue used in the valuation model is composed of random processes on both price and yield (see Turvey, 1992, pp. 187-189). In the context of a revenue insurance contract, the model can be expressed specifically for a put option as follows:

$$V_R = e^{-rt}\left[Z_R\phi(-d_2) - R_0\phi(-d_1)\right] \tag{1}$$

where V_R is the value of the insurance contract (e.g., the value of a put option on revenue), e is the exponential function, r is the risk-free rate of interest, t is the time to maturity, Z_R is a pre-determined level of cut-off revenue (the strike price) where an indemnity is paid if realized revenue falls below this value, R_0 is the contracting revenue, and ϕ is the normal cumulative distribution function. Note that in the case of most proposed revenue insurance schemes, R_0 is based on both harvest-time price and yield expectations.[38] The volatility of

[35] Richards and Manfredo use a contingent claim valuation approach incorporating a jump diffusion process in the underlying revenue. They tested their model for table grapes, wine grapes, and raisin grapes in select counties in Central California.

[36] See Goodwin and Ker for a discussion of revenue insurance programs in the United States.

[37] See Turvey (1992) and Richards and Manfredo for an explanation regarding the appropriateness of the Black (1976) model for applications in pricing insurance contracts as well as the theoretical assumptions underlying Black- Scholes type option pricing models. Also see Hull for a general discussion of option pricing.

[38] It is important not to confuse the contracting revenue R_0 with the realized harvest-time revenue R. For a contract that is at-the-money, the cut-off revenue (Z_R) is set equal to the contracting revenue (R_0) when the contract is written.

revenue is expressed as the standard deviation of revenue and is included in the definition of d_1 and d_2 where:

$$d_1 = \left(\frac{\ln(R_0 / Z_R) + 1/2(\sigma_p^2 + \sigma_y^2 + 2\rho_{py}\sigma_p\sigma_y)t}{\sqrt{\sigma_p^2 + \sigma_y^2 + 2\rho_{py}\sigma_p\sigma_y}\sqrt{t}} \right) \quad (2)$$

and

$$d_2 = \left(\frac{\ln(R_0 / Z_R) - 1/2(\sigma_p^2 + \sigma_y^2 + 2\rho_{py}\sigma_p\sigma_y)t}{\sqrt{\sigma_p^2 + \sigma_y^2 + 2\rho_{py}\sigma_p\sigma_y}\sqrt{t}} \right). \quad (3)$$

Here $\sqrt{\sigma_p^2 + \sigma_y^2 + 2\rho_{py}\sigma_p\sigma_y}$ is the standard deviation of revenue, σ_p^2 is the variance of log price relatives defined as $V[ln(p_t/p_{t-1})]$, σ_y^2 is variance of log yield relatives defined as $V[ln(y_t/y_{t-1})]$, ρ_{py} is the sample correlation between the log price relatives and log yield relatives, and t is the time from when the insurance contract is initiated to the time of harvest (when the insurance contract expires). In order to estimate the fair value of a revenue insurance contract, the values of R_0, Z_0, r, and t are necessary as well as the volatility of revenue given by the values of σ_p^2, σ_y^2, and ρ_{py}, which are typically estimated from sample data.

Given the heterogeneity of the Spanish wine grape industry, estimates of σ_p^2, σ_y^2, and ρ_{py}, and subsequently insurance premiums, are likely to be considerably different depending on farm location (region), variety of grapes grown, and production practices of individual growers. Indeed, it is probable that estimated revenue insurance premiums for a specific *Sauvignon Blanc* grower in the *Ribera del Duero* region versus a specific *Pinot Noir* grower in the *Alicante* region will be quite different. Ideally, long series of both annual yield and price data would be available for each growing region and variety of grape to calculate insurance premiums. For example, Richards and Manfredo use county-level price and yield data to estimate revenue insurance premiums for California specialty crops.[39] Unfortunately, data of this nature were not available for this study (see footnote 3). Sherrick et al. suggest that paucity of data is not a unique problem to researchers examining agricultural insurance markets, and note that it is the lack of quality farm-level yield data that creates uncertainty in the specification of yields in crop insurance valuation models. While Sherrick et al. show that differences in farm-level yield specifications may indeed be economically significant, researchers are often faced with the reality that farm-level data is not available for study, especially when examining the feasibility of new insurance markets and programs. As is

[39] Currently, the multi-peril crop insurance program of the Spanish Ministry of Food Agriculture, and Fishery (MAPYA) uses historical yield data for individual wine grape growers in pricing these yield insurance contracts. This is consistent with that of the popular Crop Revenue Coverage (CRC) program in the United States.

presented here, simulation methods provide a robust, low-cost way to account for the potential heterogeneity in prices and yields when actual farm-level or regional-level sample data is unavailable.

Monte Carlo Simulation

Monte Carlo simulation methods were used to derive a distribution of estimates of price and yield volatility (σ_p^2 and σ_y^2) and correlation (ρ_{py}) for use in the option pricing model described above in equations (1) through (3). The sample data used in the Monte Carlo simulation are historical price and yield for Spanish wine grapes taken from the FAO (Food and Agricultural Organization of the United Nations) database for the years 1980 to 1995. The price of wine grapes is quoted as pesetas/metric ton, while wine grape yield is expressed in metric tons/hectare.[40] Both the price and yield data, in essence, represent averages for the entire country of Spain. While this average data certainly encompasses the heterogeneity of prices and yields faced by Spanish wine grape growers in the aggregate, it does not adequately describe the prices, yields, and correlations faced by individual growers that (say) farm level data or regional level data could.

Given that estimates of volatility and correlation are likely to be different among various grape growing regions and farms throughout Spain, a distribution of fair values for revenue insurance for Spanish wine grapes is simulated under alternative volatility and correlation estimates. To adequately capture this heterogeneity in a simulation framework, the following steps are taken. First, using the FAO data, estimates of the variance (standard deviation) of the log relatives of price and yield (σ_p^2 and σ_y^2) are calculated as well as the correlation coefficient (ρ_{py}). Since the FOA data reflect average prices and yields for the entire country, σ_p^2 and σ_y^2 represent the price and yield variance and ρ_{py} represents the price/yield correlation for the country as a whole. In other words, these estimates are reflective of the "average" Spanish wine grape operation. Second, confidence intervals are constructed for each of these estimates. For the variance estimates of price and yield, 99 percent confidence intervals were estimated while 95 percent confidence intervals were calculated for the correlation coefficient following the procedures outlined in Dowdy and Wearden (1991, p. 176 and p. 265). These confidence levels are estimated in order to provide a reasonable approximation for the upper and lower bounds that these estimates may take, thus accounting for the heterogeneity of the Spanish wine grape sector.[41]

Using the @RISK simulation software for Microsoft Excel, $\sigma_p^2, \sigma_y^2, \rho_{py}$ are assumed to follow a triangular distribution where the sample estimate is set as the "most-likely" value (midpoint).[42] The upper and lower confidence bounds are set as the "max" and "min" values

[40] Note, on January 1, 1999 the Spanish peseta/Euro irrevocable exchange rate was set to 166.368 pesetas/Euro. In this paper, pesetas are used to be consistent with historical data collected.

[41] Even though the procedures for calculating these confidence intervals are designed for large samples, the estimated confidence levels should be adequate for determining plausible values that these parameters can take.

[42] While the triangular distribution is used here, alternative distributions may be used.

respectively as estimated from the confidence intervals of σ_p^2, σ_y^2, and ρ_{py}.[43] Third, values of $\sigma_p^2, \sigma_y^2, \rho_{py}$ are drawn from these respective distributions using the Monte Carlo sampling methods in @RISK. Each of the sampled values represents one possible set of parameters for a producer. Each draw of parameters, $\sigma_p^2, \sigma_y^2, \rho_{py}$ are then used as inputs into the Black (1976) model in the Financial CAD program to come up with fair premiums for the insurance contract.[44]

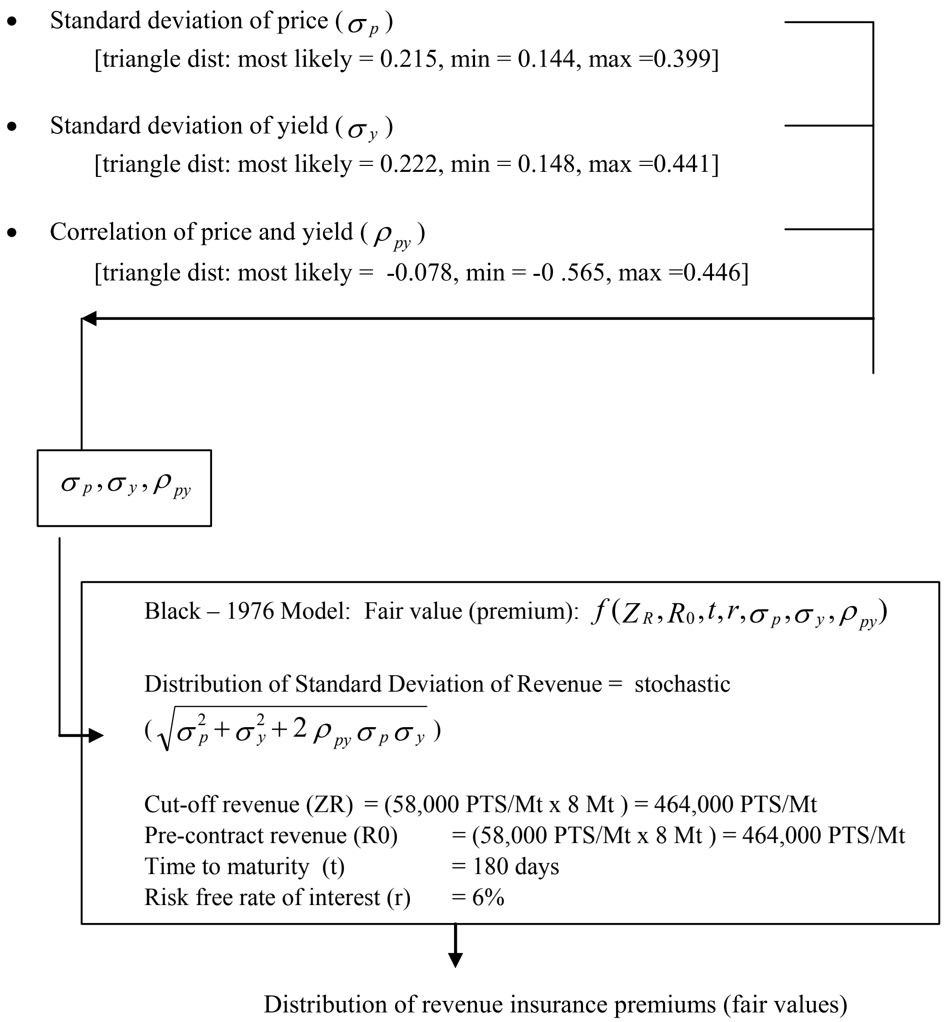

Figure 1. Diagram of Monte Carlo Simulation for Revenue Insurance Premiums (Sampled 10,000 Times using @RISK)

[43] The @RISK program, an ad-in program for Microsoft Excel, allows the user to define distributions around values that are deemed stochastic in nature. The program uses Monte-Carlo sampling methods such that draws from the established distribution are made. Note, that the max and min values set in the triangle distribution represent the 5 percentile and 95 percentile respectively, and not true max/min values for the triangle distribution.

[44] Financial CAD is a Microsoft Excel add-in program designed to price options and other financial derivative products and is used extensively by derivatives and risk management practitioners.

Other information needed in calculating the distribution of premiums includes cutoff revenue (Z_R), the contracting revenue (R_0), length of the insurance contract (time-to-maturity, t) and the risk free rate of interest, r (equation 1). To simplify the simulation process, Z_R and R_0 are set equal to each other such that the contract is valued as an "at-the-money" option. The cutoff revenue (Z_R) and pre-contracting revenue (R_0) are set at 464,000 pesetas/hectare. This is consistent with the example presented by MAPYA for a comparable multi-peril insurance scenario for a grape grower in *La Mancha* region growing *Cencibel* grapes where expected yield is 8 metric tons / hectare (8,000 kilograms/hectare), production area is 5.5 hectares, and pre-contracting price is 58 pesetas/kilogram (see table 8). Using this information provided by MAPYA allows us to later compare the premiums from revenue insurance to that of the existing multi-peril insurance program. The length of the contract (t) is assumed to be 180 days, and r is set at 6 percent.[45] The sampling of σ_p^2, σ_y^2, and ρ_{py} is repeated 10,000 times resulting in a distribution of fair premium values for Spanish wine grapes via equation (1). Figure 1 provides a graphical schematic of this process.

This resulting distribution of revenue insurance premiums from the Monte Carlo simulation represents the range of values that revenue insurance premiums may feasibly take, given the heterogeneity that exists among different wine grape growing operations across Spain. Examining the properties of this distribution of revenue insurance premiums (e.g., summary statistics and percentiles), allows for a comparison to be made to that of the premiums of a specific multi-peril insurance contract offered by MAPYA, and it also provides an indication of the potential program costs.

RESULTS

Distribution of Revenue Insurance Premiums

Table 3 presents the summary statistics of the sampled values for the stochastic inputs: σ_p, σ_y, and ρ_{py}. Not surprisingly, these summary statistics are very similar to those designated in the triangle distributions defined in @RISK (see figure 1). The mean standard deviation of log price relatives is 25.4 percent, and 26.2 percent for log yield relatives. Clearly, prices and yields for the Spanish wine grape sector are volatile. Volatility of prices and yields directly translates to revenue volatility, hence, one of the most important outputs from the simulation is the standard deviation of revenue ($\sqrt{\sigma_p^2 + \sigma_y^2 + 2\,\rho_{py}\,\sigma_p\,\sigma_y}$). Table 4 presents summary statistics for the distribution of the standard deviation of revenue. Depending on the combinations of values for σ_p, σ_y, and ρ_{py} drawn from the input distributions in the simulation, the standard deviation of revenue can take on a wide range of values, which one would expect among the characteristically heterogeneous wine grape production units in Spain. The minimum, mean, and maximum value of the standard deviation of revenue is 13.7 percent, 35.5 percent, and 65 percent respectively.

[45] As with any option pricing model, the choice of r (the risk-free rate of interest) has very little effect on the option price.

Table 3. Summary Statistics of Stochastic Inputs $\sigma_p, \sigma_y, \rho_{py}$

Values	Minimum	Mean	Maximum
(Input) σ_p	0.133	0.254	0.414
(Input) σ_y	0.138	0.262	0.423
(Input) ρ_{py}	-0.703	-0.006	0.582

σ_p is the standard deviation of the log price relatives, $\ln(p_t/p_{t-1})$, σ_y is the standard deviation of log yield relatives, $\ln(y_t/y_{t-1})$, and ρ_{py} is the correlation between the log price relatives and log yield relatives. Both σ_p and σ_y are interpreted as percentages (e.g., 0.133 = 13.3%).

Table 4. Summary Statistics for the Standard Deviation of Revenue

$$\sqrt{\sigma_p^2 + \sigma_y^2 + 2\rho_{py}\sigma_p\sigma_y}$$

Summary Statistics	
Minimum	0.137
Mean	0.355
Maximum	0.650

σ_p is the standard deviation of the log price relatives, $\ln(p_t/p_{t-1})$, σ_y is the standard deviation of log yield relatives, $\ln(y_t/y_{t-1})$, and ρ_{py} is the correlation between the log price relatives and log yield relatives. Since σ_p and σ_y are interpreted as percentages, the standard deviation of revenue, $\sqrt{\sigma_p^2 + \sigma_y^2 + 2\rho_{py}\sigma_p\sigma_y}$, is also in percent (e.g. 0.137 = 13.7%).

Following the methodology outlined previously and illustrated in figure 1, the final and most critical output of interest from the Monte Carlo simulation is the distribution of revenue insurance premiums. The distribution of revenue insurance premiums provides plausible insurance premiums that a grape grower would pay assuming cutoff revenue (Z_R) and pre-contract revenue (R_0) equal to 460,000 pesetas/hectare as previously described. The descriptive statistics for this distribution are shown in table 5. The mean of the revenue insurance premium distribution is 45,145 pesetas/hectare, with a standard deviation of 9,915 pesetas/hectare. The minimum premium is 17,501 pesetas/hectare and maximum premium is 85,252 pesetas/hectare. The percentiles of this distribution are presented in table 6. The simulated premium distribution has a median of 44,655 pesetas/ha, with 90 percent of the premiums falling between 29,705 pesetas/hectare (5 percentile) and 62,463 pesetas/hectare (95 percentile).

Table 5. Summary Statistics for Spanish Wine Grape Revenue Insurance Premiums

Summary Statistics	Pesetas/Hectare
Minimum	17,501
Mean	45,146
Maximum	85,252
Standard Deviation	9,915

Table 6. Percentiles of Estimated Revenue Insurance Premium Distribution

Percentile	Fair Value of Revenue Insurance Premiums (Pesetas/hectare)
5% Perc =	29,705
10% Perc =	32,543
15% Perc =	34,737
20% Perc =	36,525
25% Perc =	38,026
30% Perc =	39,478
35% Perc =	40,901
40% Perc =	42,161
45% Perc =	43,378
50% Perc =	44,654
55% Perc =	45,925
60% Perc =	47,174
65% Perc =	48,547
70% Perc =	50,027
75% Perc =	51,667
80% Perc =	53,487
85% Perc =	55,636
90% Perc =	58,415
95% Perc =	62,463

A feature of the @RISK simulation software is that it can identify values of inputs associated with certain percentiles of an output distribution. Therefore, we examine the values of the stochastic inputs ($\sigma_p, \sigma_y, \rho_{py}$) associated with 10, 20, 50, 80, and 90 percentiles of the simulated revenue insurance premium distribution (table 7).[46] For average premium values (e.g., the 50 percentile = 44,654 pesetas/hectare), σ_p equals 0.277, σ_y equals 0.297, and ρ_{py} is 0.068. That is, average premium values, those around the 50 percentile of the distribution, represent those wine grape growers that are exposed to a fairly high price and yield variability, yet a near zero correlation between prices and yields. These values are reasonably consistent with the mean values of stochastic inputs shown in table 3. Lower premiums, such as those associated with the 10 and 20 percentiles of the premium distribution, represent lower than average variability for prices and yields, but negative correlations between the two. For example, for premiums at the 10 percentile (32,543 pesetas/hectare) the standard deviation of prices (σ_p) is 0.204, the standard deviation of yields (σ_y) is 0.206, and the correlation between prices and yields (ρ_{py}) is -0.421. The standard deviation of both prices and yields are approximately 5 percent less than the mean input values shown in table 3. However, the correlation coefficient of –0.421 is considerably

[46] The @RISK program only allows the user to input a limited number of target percentiles. Because of this, only input values associated with the 10, 20, 50, 80, and 90 percentiles were examined. These percentiles do adequately describe the middle of the distribution (e.g., 50 percentile) as well as both the left tail (10 and 20 percentiles) and right tail (80 and 90 percentiles), respectively.

smaller than the mean input value of –0.006. The most expensive premiums (e.g., the 90 percentile) are associated with higher price and yield variability (σ_p = 0.318 and σ_y =0.334) and positive correlation between price and yield (ρ_{py} = 0.229). Note that the price and yield variability associated with premiums in the 90 percentile are about 6 to 7 percent higher than the mean input values reported in table 3. The correlation is considerably larger than the mean input value, but considerably less than the maximum value of 0.582. While the notion of a positive price-yield correlation may appear counterintuitive, it is potentially feasible given the small size of Spanish wine grape operations. That is, an individual grower may realize poor yields, while prices in the larger market are also low. Also, the degree to which contracting or cooperative marketing arrangements are used could also create a situation where there is a positive relationship between price and yield. In fact, Heien finds this to be the case with wine grapes in California, USA. Indeed, the correlation between price and yield is the most relevant input when computing the premiums.

Comparison of Revenue Insurance Premiums to Existing Multi-Peril Premiums

The simulation results also allow for a comparison of the premiums from a potential revenue insurance program to that of the current multi-peril crop insurance products offered to Spanish wine grape growers. The benchmark used for comparison here is adapted from the publication *Lo Que Saber el Seguro de Vinedo 2000 (What You Must Know about Wine Grape Insurance 2000)* published by MAPYA. The example is for a registered full-time grape grower in the *Denominacion de Origen La Mancha* who grows the *Cencibel* variety of grapes. Table 8 illustrates the calculation of premiums for this particular multi-peril insurance product.

Table 7. Premiums (pesetas/hectare) and Input Values (percent) at Target Percentiles of Estimated Revenue Insurance Premium Distribution

	At 10th percentile	At 20th percentile	At 50th percentile	At 80th percentile	At 90th percentile
Premium	32,543	36,525	44,654	53,487	58,415
σ_p	0.204	0.208	0.277	0.301	0.318
σ_y	0.206	0.213	0.290	0.320	0.334
ρ_{py}	-0.421	-0.339	0.068	0.170	0.229

σ_p is the standard deviation of the log price relatives, $\ln(p_t/p_{t-1})$, σ_y is the standard deviation of log yield relatives, $\ln(y_t/y_{t-1})$, and ρ_{py} is the correlation between the log price relatives and log yield relatives. Both σ_p and σ_y are interpreted as percentages. Premiums are in pesetas/hectare.

In the example provided by MAPYA (table 8), farm size is designated as 5.5 hectares, and the historical average farm yield is 8000 kilograms per hectare. This policy covers multiple perils, including sleet, hail, floods, and windstorms, with each one having different coverage and deductible levels. With this type of plan, the farmer is able to choose any level of coverage within a set price range. For example, for *Cencibel* grapes grown in *La Mancha* region, the maximum price coverage level is 70 pesetas and the minimum price level is 30 pesetas per kilogram. Therefore, at a price of 30 pesetas/kilogram, the value of the insured quantity would be 8,000 kilograms/hectare x 5.5 hectares x 30 pesetas/kilogram = 1,320,000 pesetas total or 240,000 pesetas/hectare. The premium in pesetas is calculated as a percentage of the insured quantity. The premium in this example is 16.88 percent of the insured quantity.[47] Given this, the total premium in pesetas is calculated as 1,320,000 x .1688 = 222,816 pesetas or 40,512 pesetas/hectare. The premium percentage of 16.88 percent also accounts for an approximate 40 percent administrative charge (personal communication). Thus, for a fair comparison to the simulated revenue insurance premiums, the multi-peril premiums must be reduced to reflect the administrative charge. Continuing with this example, an administrative charge of 40 percent, (222,816 x .40 = 89,126) reduces the value of the multi-peril insurance to 133,690 pesetas (222,816 – 89,126 = 133,690) or 24,307 pesetas/hectare. Table 8 shows the analogous calculation for the maximum price of 70 pesetas/hectare, which generates a fair value multi-peril insurance premium of 311,943 pesetas or 56,716 pesetas/hectare, and a mid-level price of 58 pesetas/hectare generating a premium of 258,467 pesetas or 46,994 pesetas/hectare.

Comparing the distribution of simulated revenue insurance premiums in table 6 to the example multi-peril insurance premiums in table 8, if a *Cencibel* grape grower in *La Mancha* buys multi-peril insurance with the lowest level of protection (grape price = 30 pesetas per kilogram), revenue insurance will be cheaper less than five percent of the time. The multi-peril insurance premium of 24,207 pesetas/hectare is less than the 5 percentile revenue insurance premium of 29,705 pesetas/hectare. In the multi-peril contract, if the value of the insured quantity of grapes is chosen as 58 pesetas per kilogram, the premium is 46,994 pesetas/hectare. This premium falls between the 55 and 60 percentile of the simulated revenue insurance distribution. Therefore, an equivalent revenue insurance product will be less expensive than multi-peril insurance about 55 percent of the time. So, a grape grower can buy revenue insurance instead of multi-peril insurance, pay less for it on average, and benefit from higher protection since revenue insurance protects against both yield and price risks. Finally if the grower decides to insure his production of grapes at the highest price allowed with the multi-peril contract—70 pesetas per kilogram—revenue insurance will be cheaper approximately 85 percent of the time. Most importantly, with the multi-peril contract, none of the three different levels of protection offer coverage against revenue shortfalls driven by either yield and/or price; whereas, revenue insurance guarantees a minimum level of revenue for wine grapes regardless of price and/or yield outcomes. Therefore, revenue insurance can provide more complete protection at favorable premium levels.

[47] The premium percentage given here is specific to the La Mancha region and Cencibel grapes.

Table 8. Calculations of Multi-Peril Insurance Premiums at Minimum, Average, and Maximum Prices of Potential Coverage

Grape Price = 30 Pesetas /Kilogram[1]	Grape Price = 58 Pesetas/Kilogram	Grape Price = 70 Pesetas/Kilogram
Insured Quantity = Expected Yield * Area = 8,000 kg/ha * 5.5 ha = 44, 000 kg	**Insured Quantity** = Expected Yield * Area = 8,000 kg/ha * 5.5 ha = 44, 000 kg	**Insured Quantity** = Expected Yield * Area = 8,000 kg/ha * 5.5 ha = 44, 000 kg
Value of the Insured = Insured Quantity * Price **Quantity** = 44,000 kg * 30 PTS/kg = 1,320,000 PTS or = 240,000 PTS/ha	**Value of the Insured** = Insured Quantity * Price **Quantity** = 44,000 kg * 58 PTS/kg = 2,552,000 PTS or = 464,000 PTS/ha	**Value of the Insured** = Insured Quantity * Price **Quantity** = 44,000 kg * 70 PTS/kg = 3,080,000 PTS or = 560,000 PTS/ha
Total Cost of Insurance = 1,320,000 PTS * 0.1688 **or Premium** = 222,816 PTS or = 40,512 PTS/ha	**Total Cost of Insurance** = 2,252,000 * 0.1688 **or Premium** = 430,778 PTS or = 78,323 PTS/ha	**Total Cost of Insurance** = 3,080,000 PTS * 0.1688 **or Premium** = 519,904 PTS or = 94,528 PTS/ha
Administrative Cost = 222,816 PTS * 0.40 = 89,126.4 PTS	**Administrative Cost** = 430,778 PTS * 0.40 = 172,311 PTS	**Administrative Costs** = 519,904 PTS * 0.40 = 207,961 PTS
Fair Value of Multi- = 222,816 PTS– 89,126.4 PTS **Peril Insurance** = 133,690 PTS or = 24,307PTS/ha	**Fair Value of Multi-** = 430,778 PTS – 172,311 PTS **Peril Insurance** = 258,467 PTS or = 46,994 PTS/ha	**Fair Value of Multi-** = 519,904 PTS – 207,961 PTS **Peril Insurance** = 311,943 PTS or = 56,716 PTS/ha

1. PTS = pesetas; kg = Kilograms.

This specific comparison of revenue insurance premiums versus the multi-peril insurance scheme is valid only for *Cencibel* grapes in *La Mancha* region. However, it does illustrate how policy makers, insurance designers, and farmers can use the information from the distribution of revenue premiums in deciding on the adoption and/or design of revenue insurance products. Clearly, a logical step for policy makers is to expand the comparison to other varieties and regions.

Costs of Subsidizing Revenue Insurance

Understanding the distribution of potential revenue insurance premiums also provides policy makers with an understanding of potential program costs. This is especially important since the current multi-peril crop insurance program in Spain is subsidized. Given the interest in more market-based risk management tools, revenue-based insurance programs could potentially displace current market intervening mechanisms for subsidizing wine grape prices – mechanisms that are accused of distorting the international wine trade (CAWG). Hypothetically, if revenue insurance premiums for Spanish wine grapes are subsidized—assuming levels of participation commensurate with multi-peril contracts—then insurance premium subsidies relative to current government support is considerably cheaper. For example, given the approximately 1,000,000 hectares of wine grapes under cultivation in Spain, and assuming 40 percent of these hectares participate in the revenue insurance program (400,000 hectares) at a premium of 55,635 pesetas/hectare (85 percentile), then the total program cost would be 22,254,000,000 pesetas (assuming that 100 percent of the premium is subsidized). Under the current multi-peril insurance program, participants receive a subsidy for approximately 40 percent of the premium. Therefore, at a 40 percent subsidy level, the program would cost approximately 8,901,600,000 pesetas.

The cost of indirect wine grape price supports for Spain, such as abandonment payments and distillations, totaled 51,274,617,600 pesetas in 1997 (Ramirez; Agroeuropa). Clearly, revenue insurance subsidies would be considerably cheaper than these subsidy programs. More importantly, revenue insurance is a market-based risk management tool which does not interfere with the Spanish wine grape market. It is also important to note that the revenue premium used in the above calculation, 55,635 pesetas/hectare, represents the 85 percentile of the simulated distribution of revenue insurance premiums (table 6). Therefore, 85 percent of feasible revenue insurance premiums would be less than this figure. Thus, the estimated cost of this program, under this scenario, is conservative. Ultimately, these results show that revenue insurance provides a less expensive, market-based risk management tool that does not have the side effects, such as market distortion, that result from current subsidy programs.

While not specifically considered here, the issues of adverse selection and moral hazard are important considerations for insurance pricing, in particular when considering subsidized insurance. Turvey notes that subsidized, crop specific insurance may lead to adverse selection. That is, subsidized insurance premiums do not adequately discriminate among participants that may have different risk preferences. But at the same time, adverse selection may be warranted from a public policy perspective, particularly if subsidized insurance can be used as a substitute to price subsidies that interfere with market prices. While deductibles and/or coverage limits may reduce moral hazard, Turvey states that subsidized commodity specific insurance may induce moral hazard in that the policy may lead to a different optimization of resources by farmers than if the insurance policy did not exist. Given this, Turvey (pg. 195) states that insurance policies free of moral hazard are "not only unreasonable as a goal but impossible as a practice." Indeed, possible adverse selection and moral hazard may be tolerable side effects of subsidized revenue insurance. In particular these side effects may be warranted if revenue insurance provides Spanish wine grape growers with a market-based risk management mechanism that is more conducive to fostering free trade than traditional price subsidies.

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

The production of wine grapes in Spain is important not only from an economic perspective, but also from a cultural perspective. Currently, Spanish wine grape producers rely on a combination of wine price supports, which indirectly influence the price of grapes, and multi-peril crop insurance to manage price and production risks respectively. Indeed, revenue insurance has the ability to manage both price and yield risks simultaneously, and therefore provides Spanish wine grape growers with a needed risk management alternative. Furthermore, the European Union has come under increasing pressure to reduce subsidies for the wine grape sector in order to comply with commitments of the WTO. As stated by Karen Ross, President of the California Association of Winegrape Growers, subsidies "give EU wines a significant and unfair advantage in international markets and should be assessed by the WTO." (CAWG). Subsidies to the EU wine sector distort market prices, potentially lead to misallocation of resources, and ultimately provide a serious barrier to free trade. Revenue insurance is a market-based risk management mechanism that can provide Spanish wine grape growers with risk management protection without the market distorting side effects of subsidies. Given revenue variability faced by Spanish wine growers, and the desire by the European Union to adopt more market orientated risk management mechanisms, revenue insurance appears to be a feasible alternative for managing risks.

This research takes an important first step in assessing the feasibility of revenue insurance for this important sector of the Spanish agricultural economy by examining potential premiums levels of a revenue insurance program. Due to the paucity of varietal- and region-specific data, a Monte Carlo simulation is used to create a distribution of revenue insurance premiums calculated from a contingent claims valuation model. Not surprisingly, simulated production areas that face high yield and price variability along with a low, but positive, price-yield correlation would pay the highest premiums. Similarly, operations with lower price and yield variability along with negative price-yield correlations would realize the lowest level of premiums.

At equivalent coverage levels, revenue insurance is often more cost effective than multi-peril crop insurance. Under the highest level of protection with a multi-peril insurance contract, 85 percent of the time revenue insurance premiums would be the cheaper alternative. Similarly, using average protection levels under the multi-peril program, revenue insurance would be cheaper in 55 percent of the feasible revenue insurance premiums while providing broader price-yield protection. Moreover, subsidizing revenue insurance premiums is less costly than traditional price support programs such as distillation and acreage abandonment measures. These results illustrate how simulation methods can be used to compare the potential cost of a revenue insurance scheme to that of existing insurance products.

Overall, the results of this study should be of interest to Spanish and EU agricultural policy makers, Spanish grape growers, their local marketing cooperatives, and Spanish insurance companies. The information also allows policy makers to project potential revenue insurance subsidy costs. Furthermore, these potential costs can be examined vis-à-vis the cost of current insurance and subsidy programs. Insurance companies can gain an idea of the potential revenue from the insurance, and conversely, farmers can consider the potential cost of revenue insurance. Also, the simulation framework presented here can be applied to assess revenue insurance premiums in other sectors of the Spanish and EU agricultural economy, especially when data constraints prevent the ability to estimate a full set of insurance premiums for heterogeneous production regions. Given the positive experience and success of revenue insurance in the United States, and potential for EU crops (Meuwissen, Huirne, and Hardaker), revenue insurance holds tremendous potential for mitigating revenue risks faced by Spanish wine grape growers, providing a potentially cost effective, market-based risk management mechanism that does not interfere with market prices nor distort trade as do current subsidy programs. Indeed, current EU wine subsidies are controversial, and have the potential of impeding free trade in this important sector. If the EU does indeed lower or eliminate wine subsidies to help foster free trade and comply with the WTO, Spanish and other EU wine grape growers will continue to demand some form of income protection. Revenue insurance is a risk management tool that may help fill this gap.

REFERENCES

Agroeuropa. "Especial Fichas Financieras," Numero 565, 1997.

Berry Bros. & Rudd (2004) "EU Offers Wine Producers Subsidies," http://www.bbr.com/US/db/news-item/611?ID=50BBBT4XNKB009M&first_news_F=41

Black, F. (1976) "The Pricing of Commodity Contracts," *Journal of Financial Economics* 3: 67-179.

Black, F. and Scholes, M. (1973) "The Pricing of Options and Corporate Liabilities," *Journal of Political Economy* 81: 637-659.

Burgaz, F. and Perez, M. (1996) "1902-1992: 90 Anos de Seguros Agrarios en Espana," Ministerio de Agricultura Pesca y Alimentacion (MAPYA).

California Association of Winegrape Growers, "CAWG Calls for End of EU Subsidies to Winegrape Growers That Distort Trade," Press Release, Sacramento, CA. October 26, 2004. http://www.cawg.org/pdf/EU_press%20rls.pdf

Dismukes, R., Bird, J.L., and Linse, F. "Risk Management Tools in Europe: Agricultural Insurance, Futures, and Options," USDA-ERS Agriculture and Trade Report No. WRS04-04, February 2004. http://www.ers.usda.gov/publications/WRS0404/WRS0404d.pdf

Dowdy, S. and Wearden, S. (1991) *Statistics for Research: Second Edition.* John Wiley and Sons. New York; NY.

Entitad Estatal de Seguros Agrarios (ENESA), “Los Seguros Agriarios en el Umbral del Siglo XXI,” Confrencia Nacional de Seguros Agrarios, Ministerio de Agricultura Pesca y Alimentacion (MAPYA), April 1997 (conference proceedings).

European Commission (1999) “The Common Agricultural Policy – 1999 Review,” http://europa.eu.int/comm/agriculture/publi/review99/index_en.htm

European Commission (2000) “The Agricultural Situation in the European Union – 1999 Report” http://europa.eu.int/comm/agriculture/publi/agrep/index_en.htm

European Commission (2000a) “CAP 2000 Situation and Outlook: Wine Sector,” http://europa.eu.int/comm/agriculture/publi/pac2000/wine/index_en.htm

European Commission. “Risk Management Tools for EU Agriculture with a Special Focus on Insurance,” Working Document, Agriculture Directorate-General, January 2001. http://europa.eu.int/comm/agriculture/publi/insurance/index_en.htm

Goodwin, B. and Ker, A. (1998) “Revenue Insurance: A New Dimension in Risk Management, *Choices* Fourth Quarter: 24-27.

Goodwin, B.K, Roberts, M.C., and Coble, K.H. (2000) “Measurements of Price Risk in Revenue Insurance: Implications of Distributional Assumptions,” *Journal of Agricultural and Resource Economics* 25: 195-214.

Heien, D. “Contracting in California Wine Grapes.” Working paper. Department of Agricultural and Resource Economics, University of California – Davis. Davis, CA. February 2000.

Hull, J. (2000) *Options, Futures, and Other Derivatives*, 4th ed. Upper Saddle River NJ: Prentice-Hall.

Leuthold, R., Junkus, J. and Cordier, J. (1989) *The Theory and Practice of Futures Markets.* Lexington M.A.: Lexington Books.

Mieuwissen, M.P.M, Huirne, R.B.M., and Hardaker, J.B. “Income Insurance in European Agriculture,” European Economy – Reports and Studies, No. 2, 1999. http://europa.eu.int/comm/economy_finance/publications/european_economy/reportsandstudies0299_en.htm

Ministerio de Agricultura Pesca y Alimentacion (MAPYA) “*Lo Que Usted Debe Saber Sobre el Seguro de Viñedo*”, 2000.

Perez, D. (2000) “Spain Wine Competition Annual,” GAIN Report #SP0047, USDA Foreign Agricultural Service.

Ramirez, A. (2001) “The Feasibility of Revenue Insurance for Spanish Wine-Grape Production,” Royal Agricultural College, Cierencester, UK. Unpublished Master’s Thesis.

Richards, T.J, and Manfredo, M.R. (2003) “Infrequent Shocks and Rating Revenue Insurance: A Contingent Claims Approach,” *Journal of Agricultural and Resource Economics* 28: 233-251.

Roberts, I., R. Nair, and A. Jacenko (2005) “WTO Trade Negotiations – Principles and Politics Affecting Agriculture,” *Australian Commodities* 12: 208-218.

Sherrick, B. J., F.C. Zanini, G.D. Schnitkey, and S.H. Irwin (2004) “Crop Insurance Valuation Under Alternative Yield Distributions,” *American Journal of Agricultural Economics* 86(2004): 406-419.

Stokes, J.R., Nayda, W.I., and English, B.C. (1997) “The Pricing of Revenue Assurance,” *American Journal of Agricultural Economics* 79: 439-531.

Stokes, J.R. (2000) "A Derivatives Security Approach to Setting Crop Revenue Coverage Insurance Premiums," *Journal of Agricultural and Resource Economics* 25: 159-176.

Turvey, C.G. and Amanor-Boadu, V. (1989) "Evaluating Premiums for a Farm Income Insurance Policy," *Canadian Journal of Agricultural Economics* 37: 183-198.

Turvey, C.G. (1992) "Contingent Claim Pricing Models Implied by Agricultural Stabilization and Insurance Policies," *Canadian Journal of Agricultural Economics* 40: 183-198.

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EFFECTS OF TWO NON-U.S REGIONAL TRADE PACTS ON THE VENEZUELAN SOY PRODUCTS TRADE AND U.S. EXPORTS

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ABSTRACT

Since the mid-1990s, the two regional trade agreements in South America, the southern Mercosur Pact (among Brazil, Argentina, Paraguay and Uruguay), and the northern Andean Pact (among Venezuela, Colombia, Ecuador, Bolivia, and Peru) noticeably affected certain trade patterns between the two pacts' members and with the United States for various reasons discussed herein. The effect of trade diversion owing to the Andean Pact with its common external tariff and price band system against non-Andean products was examined for soybean and soybean meal imports into Venezuela historically an important market for U.S. products. As well, the recent combining of Mercosur and Andean nations into a single regional trade agreement is likely to further adversely affect U.S. soy product sales to Venezuela. A partial equilibrium, deterministic, and Armington-type model of the Venezuelan market for soybeans and meal was formulated by combining tariffs and the Andean price band variable levy into a single price wedge. Model results suggest that a combined Mercosur and Andean customs union under either a high or a low world soybean product price scenario would noticeably benefit Mercosur suppliers at the expense of the United States as well as adversely affect domestic Venezuelan producers (soybean processors) and fellow Andean member Bolivia.

Key words: Venezuela, soybeans, soybean meal, trade diversion, Mercosur, Andean Pact, U.S. exports, Armington-type import model, price bands, regional trade agreements

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Effects of Two Non-U.S. Regional Trade Pacts on the Venezuelan Soy Products Trade and U.S. Exports

Regional Trade Agreements in the Americas

Regional trade agreements (RTAs) have become increasingly important in the world as a means of trade expansion as negotiations under the Doha round of the multilateral World Trade Organization have languished.[1] The effects of regional trade agreements (or RTAs) can be quite powerful in changing trade patterns of certain products; RTAs can shift trade away from the lower cost suppliers of a product outside the trade pact to higher cost suppliers within it (Burfisher and Zahniser 2003). Such trade diversion occurs mainly for products that have high tariffs imposed on non-member countries that are competitive suppliers to world markets. RTAs that include the United States have often benefitted U.S. agricultural exports. For example, U.S. agricultural exports to Canada and Mexico under the NAFTA have grown far faster than such exports to the rest of the world.[2]

However, RTAs that exclude the United States can work to the disadvantage of U.S. exporters that are otherwise competitive in world markets. The EU, for example has the largest number of RTAs and preferential trading arrangements of any country or region, affecting 42 least developed countries and 77 former colonies of EU countries (Hasha 2004). Within the Americas, two RTAs exclude the United States-- the ***Andean Pact***, which consists of Venezuela, Colombia, Ecuador, Bolivia, and Peru, and the Common Market of the South **(*Mercosur)***, which includes Argentina, Brazil, Paraguay, and Uruguay.[3] Trade among the member countries of the Andean Pact is free of duty (U.S. Department of State 2001, p. 26). The Mercosur is an RTA with a common external tariff. All of these countries are members of the Latin-American Integration Association (ALADI) whose goal is to eventually set up a common market among the 12 member countries.[4] As part of the ALADI framework, agreements providing certain tariff preferences already exist among the ALADI countries. Additionally, negotiations between the Mercosur and Andean Pact countries recently concluded in October 2004 with the signing of a general free trade agreement, to be implemented over 15 years, between these two groups of countries.[5]

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graphs and figures. This article is a U.S. Government work and as such, is in the public domain within the United States of America.

[1]WTO negotiations under the Doha Round began in 2001, and are scheduled to conclude in 2005, but may very well last longer. See Burfisher and Zahniser (2003).

[2]Between 1993-2000, U.S. agricultural exports to Mexico and Canada grew by 59 percent, while such exports to the rest of the world grew by 10 percent; U.S. agricultural imports from Mexico and Canada grew by 86 percent, and agricultural imports from the rest of the world by 42 percent. See Zahniser and Link (2002).

[3]Bolvia, Chile, and Peru are associate members.

[4]In addition to the 5 Mercosur and 4 Andean Pact countries, ALADI members include Mexico, Cuba, and Chile.

[5]U.S. Department of Agriculture, Foreign Agricultural Service (hereinafter, USDA, FAS), *Brazil Trade Policy, Monitoring the Mercosur and Andean Group Agreement, 2004*. GAIN Report No. BR4627, Oct. 25, 2004. Readers should note: this paper utilizes numerous USDA, FAS GAIN reports. These reports have issues for many time periods and for various countries. And as well, the various issues of a particular GAIN report for a particular country have similar titles and are easy to confuse with each other. We deemed the number of utilized reports too large and the likelihood of confusion among similarly titled reports too large to list as separate references at the end of this article. Instead, we footnote these separately throughout the report, rather than list them in the section on cited references.

The effects of RTA's are difficult to chart accurately because of the diversity of tariffs and non-tariff measures applied. However, for primary or agricultural commodities that are traded widely world-wide, and for which there exist a number of competitive suppliers and multiple markets, it is possible to isolate the likely effects of an RTA.

The purpose of this paper is to analyze some of the likely impacts of the Andean RTA and of the RTA between the Mercosur and the Andean Pact countries. More specifically, we intentionally focus on estimating and modeling the impacts of these two agreements on Venezuelan purchases of soybeans and soybean meal from the United States and from U.S-competing Andean and Mercosur suppliers. Venezuela was previously a large U.S. market for such products. Throughout, volumes of trade in soybeans and soybean meal are denoted as a composite "soybeans and meal" product.[6] Trade data suggest that the formation of the Andean Pact may have resulted in trade diversion of U.S. and Mercosur soybean exports to Venezuela in favor of Bolivia, an Andean Pact member. This paper analyzes how an FTA between the Mercosur and Andean countries, which will eventually provide duty-free access to the Venezuelan market for exports from Brazil and Argentina, may further affect trade flows in the soybean sector. More specifically, the paper:

(i) describes the Venezuelan tariff treatment and elements of the Andean Pact and the upcoming Mercosur/Andean RTA which are relevant to Venezuelan imports of soybeans and meal,
(ii) reviews Venezuela's patterns of soybean and meal imports before and after the Andean Pact to examine how the Pact affected U.S. exports of soybeans and meal to Venezuela, and
(iii) uses counterfactual economic modeling simulations to estimate likely effects on Venezuela's imports of soybean and meal from the United States and other competing South American supplies when Mercosur and Andean Pact countries form a unified South-America-wide RTA

U.S. and South American Trade in Soybeans and Meal

World trade in soybeans and soybean meal grew rapidly during the past two decades; in 2003/04, world exports of soybeans and meal totaled $30 billion, according to data of the

[6]Throughout this report, volumes of trade in soybeans and meal are combined into a composite, "soybeans and meal" product where soybean quantities are converted to a meal basis through multiplication by a 0.79 conversion factor and added to soy meal quantities. This composite soybeans-and-meal product is necessary to capture an adequate amount of the trade for an accurate analysis for three reasons supported by data and analysis presented in the main text: (1) the nature of Andean/Mercosur soy products has changed for such major players in the analysis as Bolivia, which exported only soybeans to Venezuela in 1994 and only soy meal to Venezuela by 2002; (2) Bolivia exports both products to other Andean/Mercosur countries, and (3) Venezuela produces little or no soybeans but does produce and export modest amounts of soy meal (as noted by USDA, FAS, GAIN Report No. BL4001, Feb. 6, 20004) So defining the soybean and meal composite seemed logical, given the changing mix of soybean and soy meal product production and trade since 1994 for Andean and Mercosur countries. Our analysis is admittedly a partial equilibrium one for a non-U.S. country and for a single composite product. We excluded soy oil from the analysis because of soy oil's competition for end use with other vegetable oil markets, and capturing these non-soy oil markets would magnify the scope of the model beyond its capabilities. We acknowledge this limitation of our analysis from the onset.

U.S. Department of Agriculture and *Oil World*.[7] Argentina, Brazil, Paraguay, and the United States in marketing year 2002/04 accounted for 96 percent of the volume of world soybean exports, and 85 percent of world soybean meal exports.

In the Americas, the United States, Brazil, Argentina, Paraguay, and Bolivia are the leading producers and exporters of soybeans and meal. The South American soybean producers have sharply expanded their production and exports, a result of doubling the area planted to soybeans and near tripling of production .[8] Bolivia, a much smaller producer than the soybean giants of Brazil, Argentina, and the United States, has become a significant exporter of soybeans and meal, with its production and exports having tripled during the past ten years.[9]

Most of the other countries in the Americas are net importers and substantial markets for soybeans and meal, and among the largest is Venezuela. Venezuela, one of the world's leading petroleum producers, has historically been among the top 30 markets for U.S. merchandise exports. In 2001, Venezuela imported annually nearly $6 billion of U.S. merchandise, and a total $17 billion from all countries (U.S. Department of State 2003, pp. 1-3). Venezuelan imports from the United States then fell sharply to $4.1 billion in 2002, and then to $2.6 billion in 2003 (U.S. Department of Commerce, hereinafter, Commerce). The political and economic crisis within Venzuela resulting in a general strike and a petroleum output decline in 2003 adversely affected its trade (U.S. Trade Representative or USTR 2003, pp. 487-488).

The United States has been a major supplier of soybeans and soybean meal to the world and to Venezuela. South American suppliers of Brazil, Argentina, Paraguay, and Bolivia compete as well with the United States for soybean and meal exports to Venezuela. Over the past 15 years, U.S. exports of soybeans and meal worldwide have grown from about $5 billion in 1989 to about $9 billion in 2003, according to data of the U.S. Department of Commerce (figure 1). For the first half of the period (1989-97), U.S. exports of soybeans and meal to Venezuela followed a similar trend, rising irregularly from $100 million from 1989 to a peak in 1997 of nearly $200 million. Thereafter, U.S. exports to Venezuela dropped to $40 million by 2003. On a volume basis, reported Venezuelan imports of soybeans and meal during 1994-2002 (the latest year for which data are available) rose even as U.S. exports fell (figure 2).

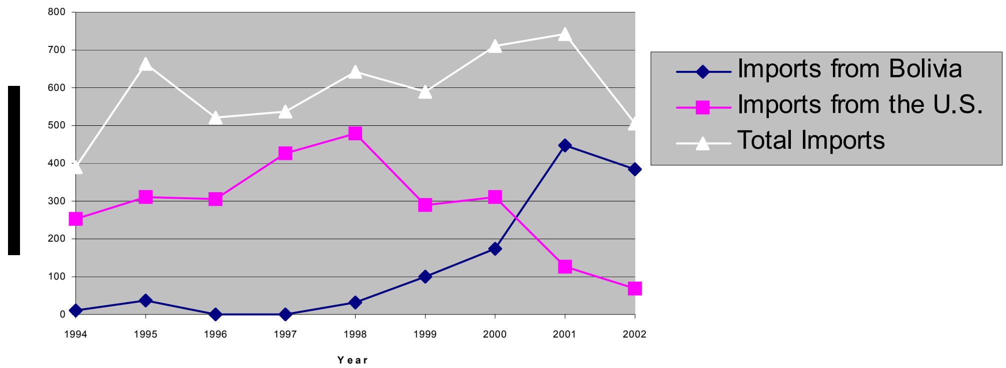
About three-quarters of these U.S. exports to Venezuela consisted of soybean meal and one-quarter of soybeans over the past 15 years, according to data of the U.S. Department of Commerce. Worldwide, the reverse is true: U.S. soybean exports represent about three-quarters of the total and soybean meal, one quarter. Venezuela grows no soybeans, and has limited soybean processing capacity, with high costs of production (U.S. Department of State 2001, pp. 25-26). Venezuela had four oilseed processors (crushers) in 1999, and only one by

[7]For marketing year 2003/04, beginning Oct. 1, source: export volume from USDA (2004), p. 26-27; and ISTA Mielke GmbH (2004, p 547). The value estimates reflect average world export prices (at Rotterdam) of $316 per mt for soybeans, and $273 per mt for soybean meal (Brazilian).

[8]Combined Argentine and Brazilian harvested acreage rose from 14.5 million hectares in 1992/93 to 31.0 million hectares in 2003/04, and production rose from 30 mmt to 88 mmt. Source: USDA, FAS, *World Markets and Trade*, Mar. 1995, and Oct. 2004, tables 12-14.

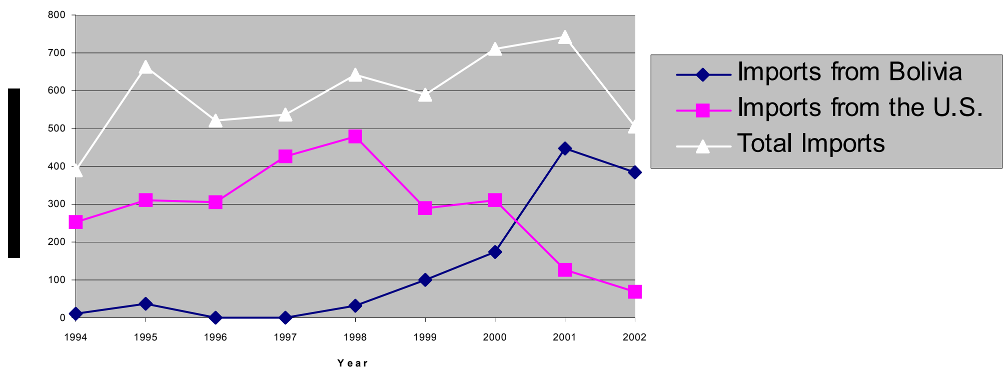
[9]Production rose from 0.4 million mts in 1992/93 to 1.2 million mts in 2003/04, and soybean meal exports from 0.15 million mt (mmt) to 0.35 mmt, respectively. In 2003, Bolivia exported 350,000 mt of soybean meal and 200,000 mt of soybeans, mostly to Venezuela, Colombia and Peru. USDA, FAS, *Bolivia Agricultural*

2002.[10] Venezuela produces about one-quarter of its soybean meal consumption from imported soybeans, although the share of meal imported has steadily risen, driven in part by the high costs of domestic soybean processing (U.S. Department of State 2001, p. 26).



Source: Compiled from official statistics of the U.S. Department of Commerce.

Figure 1. U.S. soybean and soybean meal exports (in soybean meal equivalents) to the World and to Venezuela, 1989-2003



Source: Compiled from official statistics of the U.N.

Figure 2. Venezuela soybean and soybean and meal imports (in soybean meal equivalents), 1994-2002

Trade Agreements and Venezuelan Tariff Treatment of Soybean and Meal Imports.

Situation Annual 2004, GAIN Report No. BL4001, Feb. 6, 2004, p. 3. And USDA, FAS, *Bolivia's Oilseed Annual Report,* GAIN Report No. BL2001, Feb. 5, 1992, p. 18.

[10]USDA, FAS, *Venezuela to Continue Strong Oilseed Imports,* GAIN Report No. VE8001, Mar.18, 1998, p.8; and *Venezuela Oilseeds and Products Annual 2002,* GAIN Report No. VE2005, Mar.15, 2002, p. 3.

The Andean Pact and Venezuela

The Andean Pact is a customs union with most trade free among its four members, and with a mostly common external tariff.[11] Since February 1995, Venezuela has been a member of the Andean Pact, along with Colombia, Ecuador, Bolivia and Peru, and as such, products traded are free of duty within the five countries (U.S. Department of State 2001, p. 26). With duty-free trade, Venezuelan imports from other Andean Pact countries–mostly Colombia–have more than doubled from $490 million in 1994 to $1,277 million in 2002, according to data of the U.N. Venezuelan imports from Colombia rose respectively by $562 million to $964 million, accounting for most of the higher imports from other Andean Pact members. According to UN data, total commodity imports from Bolivia rose from $4 million to $164 million during 1994-2002, and soybean and meal imports from Bolivia rose by $89 million, and accounted for most of this increase.

The duty free treatment for goods traded among the Andean Pact countries encouraged trade substantially among these adjacent countries that straddle the rugged Andes Mountains and the vast Amazon River basin in northern South America (map, figure 3). Colombia, being the largest Andean member nation in population and size of its economy, and geographically the center of the Pact countries, benefitted the most with regards to increased exports. Land-locked Bolivia, the most remotely situated Pact member, benefitted the least as transportation costs limited its access to other members until the late 1990s.

With regard to imports entering from countries outside the Andean Pact, Venezuela applies a Common External Tariff (CET) and requires import licenses and sanitary and phyto-sanitary import certifications for non-Andean soybean imports.[12] The CET is a four-tiered tariff system (5, 10, 15 and 20 percent, depending on the product imported), and has been in effect since February 1, 1995.[13] In 2002, Venezuela applied an NTR (Normal Trade Relations) duty of 15 percent to its imports of soybeans and meal from non-Andean countries.[14]

In conjunction with the CET, Andean Pact members use the Andean price band system as a price stability mechanism for certain commodities, including soybeans.[15] The price band is based on a floor price, a ceiling price, and reference price that represents the import price.[16] If the reference price is lower than the floor price, a variable surcharge is applied to the import along with the CET, which can render a very high effective tariff. If the reference price is above the ceiling price, no price band duty will be applied.[17] Generally, an import surcharge has been the more likely outcome.

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[11]Free trade is in place for all countries except Peru which has some limited exceptions; common external tariffs differ mainly on certain agricultural products (Taccone and Nogueira 2002, pp. i-ii and 19).

[12]USDA, FAS, *Venezuela Exporter Guide Annual 2003*, Caracas, GAIN Report No. VE3010, Dec. 1, 2003. USDA, FAS, *Venezuela Oilseeds and Products Annual 2004*, GAIN Report No. VE4005, Apr. 15, 2004. USDA, FAS, *Venezuela Oilseeds and Products: Venezuela's Oilseed Imports Down, But U.S. Market Share Improves 2003*, Caracas, GAIN Report No. VE3012, Oct. 16, 2003.

[13]See Andean Community website http://www.comunidadandina.org/endex.htm.

[14]Data from the Free Trade of the Americas (FTAA) Hemispheric Database, retrieved Aug. 16, 2004, from http://198.186.239.122/chooser.asp?Idioma=Ing.

[15]USDA, FAS, *Venezuela Oilseeds and Products Annual 2004*; and USTR (2004, p. 487).

[16]However the reference price is roughly indicative of market prices, created from certain market averages and price indicators. The reference price is adjusted every two weeks while floor and ceiling prices are adjusted every April. Office of the U.S. Trade Representative (USTR 2004, p. 487).

[17]USDA, FAS, *Venezuela Adopts Andean Price Bands*, GAIN Report No. VE5014, June 20, 1996.

Source: CIA The World Factbook
http:/www cia.gov.cia/publications/factbook/reference_maps/central_america.html

Figure 3. Map of South America

In 1996, the total effective average duty was the 15 percent NTR duty, plus the price band duty of 10 percent for a total duty of 25 percent ad valorem (AVE).[18] The price band was then adjusted every two weeks, but in general the representative tariffs presented below were collected during 1997-2004. In 1997, higher world prices led to a zero duty for the price band and a total applied duty of 15 percent.[19] In August 1999, the effective tariff was 59 percent (15 percent tariff plus 44 percent price band) on soybeans and meal.[20] In 2004, the much higher world prices for soybeans lowered the total duty (including the price band) on U.S. soybeans and meal to 15 percent.[21] The 2004 Venezuelan tariff scheme is summarized in table 1.

Table 1. Venezuela: Duty treatment of soybeans, soybean meal, and soybean oil, 2004

Commodity	Intra-Andean community Imports	U.S. and third country Imports[1]	Tariff Preferences[2] Paraguay	Uruguay	Argentina	Brazil
Soybeans	no duty	15%+/-DAV	15%+/-	15%+/-DAV	40%	40%
Soybean meal	no duty	15%+/-DAV	75%	15%+/-	35%	35%
Soybean oil	no duty	15%+/-DAV	95%	70%	60%	50%

[1] DAV is a variable tariff resulting from Andean Community Price Band System.
[2] Preferential tariff rate is the listed percentage of the third-Country or WTO rate.
Source: USDA, FAS, *Venezuela Oilseeds and Products Annual 2004*, GAIN Report No. VE4005, April 15, 2004, p.7.

In November 1999, Venezuela established tariff rate quotas for oilseeds and products, with an import licensing regime, and with the ultimate aim of supporting the purchase of domestic oilseed and grain crops.[22] The initial in-quota tariff was 40 percent, and the above-quota tariff was the combined CET and price band. In 2001, owing to the low levels of domestic oilseed production and soybean crushing, and the need for a much higher volume of imported soybean meal, Venezuela rebated ("exonerated ") the in-quota 40-percent duty collected to soybean meal importers (who are feed mill operators) in exchange for their purchase of Venezuelan corn and sorghum crops.[23] In 2002, the in-quota tariff for soybeans and soybean meal remained at 40 percent, and the above-quota tariff was 48 percent (combined price band and CET).[24] In 2003-04, Venezuela's duty treatment became less transparent by having restricted the issuance of import licenses for the quotas on soybean meal, and by having discontinued publishing information on license requests or license issuance (USTR 2004, p. 487).

[18]USDA, FAS, *Price Band Impact on U.S. Oilseed/Product Exports*, GAIN Report No. VE5016, June 26, 1995, table 9.
[19]USDA, FAS, *Oilseeds and Products Annual Report 1997*, GAIN Report No. VE7008, Mar. 15, 1997, p. 5.
[20]USDA, FAS, *Venezuela Oilseeds and Products: Tariff Schedule for Soybean Complex 1999*, GAIN Report No. VE9037, Aug. 27, 1999.
[21]USDA, FAS, *Venezuela Oilseeds and Products Annual 2004*, p. 7.
[22]USDA, FAS, *Oilseeds and Products Import Licensing Requirements for the Oilseed Complex, 2000*, GAIN Report No. VE0015, Mar. 31, 2000, p. 2.
[23]USDA, FAS, *Venezuela Oilseeds and Products Import Tax Exoneration for Soybean Meal 2001*, GAIN Report No. VE1007, Feb. 12, 2001, p. 2; and *Venezuela Oilseeds and Products Annual 2001*, GAIN Report No. VE1011, Apr. 11, 2001, p. 7.
[24]USDA, FAS, *Oilseeds and Products Annual Report 2002*, GAIN Report No. VE2005, Mar. 15, 2002, p. 5.

The Mercosur RTA and Venezuela

The Mercosur is a customs union with common external tariffs. The members are Argentina, Brazil, Paraguay, and Uruguay. Bolivia, Chile, and Peru participate in the Mercosur free trade area, but not in the system of common external tariffs (USITC 2003, pp. 5-26). The Mercosur is the largest RTA in the Americas after NAFTA, and its members began phasing out tariffs levied on each other's products in 1991, and established common external tariffs in 1995 (Raney and Peredea 1996, p. 27).

The current tariff preferences for Venezuela's imports of soybeans, soybean meal, and soybean oil from Paraguay, Uruguay, Argentina and Brazil are shown in table 1. The preferences shown are listed percentages off the third-country or WTO rate.

Tariff preferences for Argentina and Brazil currently range from 35 to 60 percent. A new RTA between the Andean Pact and Mercosur countries has been signed. Under this new agreement, duties on products such as soybeans and meal immediately went to zero, whereas duties on soybean oil are to be phased out over 7 years.[25] Even these lower preferential rates (table 1), Venezuelan imports from Brazil, Argentina, and Paraguay have fallen during 1998-2002, perhaps outweighed by the CET duty.

Analysis of Venezuelan Soybean Trade Data: Effects of the Andean Pact

Trade data suggest that tariff preferences provided to Andean Pact members may have resulted in trade diversion of U.S. and Mercosur soybean exports to Venezuela in favor of Bolivia, an Andean Pact member. Tables 2 and 3 provide data on Venezuelan soybean and meal imports from leading suppliers, as compiled by the United Nations (U.N.) database.[26] For the purpose of this study, 1995 may be considered the year of the Andean Pact implementation as this is when the CET was enacted.

Table 2. Venezuela: Soybeans and soybean meal, imports by source, 1994-2002

Country	1994	1995	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars								
Argentina	126	6,379	17,581	10,235	4,014	1,063	2,084	5,683	7,180
Bolivia	3,227	12,610	0	0	8,888	24,035	52,394	126,923	91,954
Brazil	11,687	2,474	6,301	4,080	2,262	7	17,048	13,701	97
Paraguay	12,431	64,415	32,347	4,777	17,495	24,945	14,621	6,526	747
United States	64,338	84,472	99,385	155,535	124,143	54,932	71,260	30,427	18,058
All other	6,266	3,467	7,140	16,183	5,511	17,545	23,982	12,498	3,593
World	98,075	173,817	162,754	190,810	162,313	122,527	181,389	195,758	121,629

Source: Compiled from data of the United Nations Statistical office.

[25]USDA, FAS, *Venezuela Oilseeds and Products Annual 2004*, p. 7.

[26]See U.N. (2004), Trade Database. The volume data for combined soybeans and soybean meal are shown on a meal basis, with bean imports converted to meal basis by multiplying by a factor of 0.79.

Table 3. Venezuela: Soybeans and soybean meal, imports by source, 1994-2002

Country	1994	1995	1996	1997	1998	1999	2000	2001	2002
	1,000 metric tons, soybean meal equivalents								
Argentina	522	16,510	47,186	32,445	13,024	4,428	8,142	25,971	31,207
Bolivia	9,834	38,689	0	0	29,424	99,117	176,381	449,986	385,059
Brazil	48,338	11,400	24,822	127,876	10,375	13	68,001	55,305	159
Paraguay	53,141	271,801	125,375	15,276	79,978	116,298	63,722	30,597	4,000
United States	253,223	310,189	302,750	425,449	477,175	276,544	308,572	125,962	71,396
All other	22,405	14,145	22,988	65,160	32,096	93,614	84,891	89,647	15,644
World	387,463	662,734	523,121	535,886	642,072	590,014	709,709	777,468	507,465

Note.–The reported soybeans, imports were multiplied by a factor of 0.79, and then added to reported soybean meal imports.

Source: Compiled from data of the United Nations Statistical office.

Venezuela's overall market for soybeans and meal grew annually by 8.6 percent during 1994-2001, rising from about 400 thousand metric tons (tmt) to 777 tmt (table 3). The drop in imports in 2002 was connected to the political and economic crisis that resulted in a sharply devalued currency and import licensing described earlier on grain and oilseeds in Venezuela.[27]

Owing to business ties, geographical proximity, and competitive ocean freight rates,[28] the United States had dominated the Venezuelan import market for soybeans and meal. For example, U.S. product accounted for 66 percent of Venezuela's 1994 imports of $98 million, and for 82 percent of 1997 imports of $198 million (table 2). Thereafter, U.S. soybean and meal exports fell as sales from Bolivia increased to Venezuela.[29]

During 1998-2002, reported imports of U.S. soybeans and meal into Venezuela fell 85 percent from 477 tmt to 71 tmt (table 3). Meanwhile, Venezuelan imports of Bolivian soybeans and meal rose markedly from 29 tmt to 385 tmt, more than a ten-fold gain. Imports from Brazil, Argentina and Paraguay, the Mercosur countries, averaged about 200 tmt annually during 1996-97, but then began a steady decline to 35 tmt in 2002. USDA forecasts indicate a strong increase in 2003-04 in South American soybean sales to Venezuela, particularly from Bolivia.

Bolivian soybean and meal exports to Venezuela were erratic until 1997 in part because of the rudimentary transportation system between Bolivia and Venezuela,[30] and a lack of Bolivian confidence in Venezuelan payment procedures.[31] Since the latter 1990s, the development of a soybean marketing system through northern Brazil and the Amazon River basin considerably lowered freight costs of Bolivian products moving to Venezuela. Bolivian

[27]See U.S. Department of State (2003, pp. 1- 3). Import licensing is described in USDA, FAS, *Venezuela Grain and Feed Annual 2002,* GAIN Report No. VE2007, Mar. 27, 2002; and *Venezuela Oilseeds and Products Annual 2002.*

[28]For example in mid-2004, the ocean freight rate for bulk grain and oilseeds moving to Venezuela from U.S. Gulf ports (where most U.S. exports transit) was $29 per metric ton, only a dollar above the rate for grain moving to east coast Mexican ports, and slightly lower than the $32 a ton rate for U.S. grain moving to the EU (Antwerp ports). Source: International Grains Council (2004, table 30).

[29]USDA, FAS, *Venezuela Exporter Guide Annual 2002*.

[30]USDA, FAS, *Venezuela Oilseeds and Products, Price Band Impact*, July 13, 1995.

[31]USDA, FAS, *Venezuela's Oilseed Imports Down,* Oct. 16, 2003.

soybean areas are adjacent to the largest Brazilian producing state of Mato Gross (figure 3).[32] Soybeans and meal move by river barge on the Madeira River to ocean-vessel ports on the Amazon River at Itacoatira or by truck across the Brazilian State of Amazones to the port at Santarem.[33] As the barge and highway system through northern Brazil are improved, the cost of exporting Bolivian soybeans and meal to Venezuela falls.

UN data suggest that since the beginning of significant trade in 1994, Bolivian exports to Venezuela shifted to the processed and higher valued soybean meal from unprocessed soybeans. In 1994, Bolivia exported only soybeans to Venezuela; by 2002, Bolivia exported no soybeans and only soybean meal, according to data of the UN. Nearly all Bolivian exports of soybeans and meal go to the other Andean Pact countries, Venezuela, Colombia, Ecuador, Bolivia, and Peru.[34]

Effect of a Mercosur-Andean RTA on U.S. Exports of Soybeans and Meal to Venezuela

Given that Venezuela's tariffs on soybeans and soybean meal are to go to zero under the Mercosur-Andean RTA, an important question is how these preferential tariff changes will likely affect U.S. exports of these products to Venezuela. In this section, we specify a graphical framework and a partial equilibrium simulation model to provide a range of possible simulated effects of implementing a Mercosur-Andean RTA. The economic framework and analysis is based on the assumption that Venezuela's current tariff protection for soybeans and soybean meal on third-country imports is a variable levy which reverts to the Andean CET (15 percent ad valorem) when world prices are high and the variable component is zero. Under a Mercosur-Andean RTA, Venezuela's imports of soybeans and soybean meal from Brazil and Argentina will be allowed to enter duty-free, whereas U.S. imports will be subject to the CET plus the variable component as determined by world prices.

Economic Framework (Graphical)

This section provides a graphical analysis of the impact on third-country (U.S.) exports of soybeans and meal to Venezuela following the removal of Venezuela's variable levy on imports from Mercosur countries, particularly from Brazil and Argentina. Figure 4 provides the analysis' graphics. The following number of assumptions are made here to simplify the graphic presentation without changing the qualitative results of the analysis:

1. First, Venezuela is assumed to consider Mercosur and non-Mercosur (primarily U.S.) consignments of soybeans and meal as reasonably high substitutes.

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[32]The State of Mato Grosso supplied 28 percent of the entire Brazilian soybean crop in 2002/03; USDA, FAS, *Brazil Oilseeds and Products Annual 2003*, GAIN Report No. BR3003, Mar. 10, 2003, p. 29.

[33]The Amazon River port at Itacoatiara is about 160 miles east of Manaus, Brazil, and serves ocean-going vessels up to 50,000 metric tons; the port of Santarem, is also several hundred miles east of Manaus, with deep port capacity. See USDA, FAS, *Brazil Oilseeds and Products Annual 2004*, GAIN Report No. BR4611, May 13, 2004, pp. 39-40; and Randall Schnepf, Erik Dohlman, and Christine Bolling, ERS, USDA, *Agriculture in Brazil and Argentina*, ERS report No. WRS013, Dec. 2001, pp. 47-49.

[34]USDA, FAS, GAIN Report No. BL4001, Feb. 6, 2004, p. 3; ISTA Mielke (2004, p. 544).

2. Second, Venezuela's modest production is excluded from the analysis and assumed zero.
3. Third, the initial situation is assumed to be where the Andean floor price exceeds world price, thus a variable tariff confronts Mercosur exporters to Venezuela.
4. Fourth, the variable Venezuelan tariff on Mercosur products is assumed zero, rendering the world price as the Venezuelan import price from Brazil and Argentina after the implementation of an RTA.

Initially, when Venezuela imposes a variable levy of VL on Mercosur: Mercosur exports ($0QSM^{v}$ – $0QDM^{v}$) to Venezuela, while domestically consuming $0QDM^{v}$ and producing $0QSM^{v}$, as P2 clears the Mercosur market. Under the variable levy, the world price would be P2, below the world price (PWORLD) without the variable levy, as the market must absorb the difference between the greater trade without the variable levy, denoted as $0QDV^{o}$ and the trade with the variable levy, denoted $0QDV^{v}$.

Removal of the variable levy of VL (assuming a zero tariff) would raise Venezuelan demand and imports from $0QDV^{v}$ to $0QDV^{o}$, and the market-clearing price in Venezuela would fall to PWORLD. The relevant Mercosur price would rise from P2 to PWORLD, which in turn would raise Mercosur production by ($0QSM^{o}$ – $0QSM^{v}$); decrease domestic Mercosur consumption by ($0QDM^{v}$ – $0QDM^{o}$); and render the increased quantity for export to Venezuela. Under the assumption of high levels of Venezuelan substitutability among Mercosur and non-Mercosur (primarily U.S.) soybeans and meal, much of the increased Mercosur exports to Venezuela, ($0QDV^{0}$ – $0QDV^{v}$), would likely be lost U.S. sales in the market.

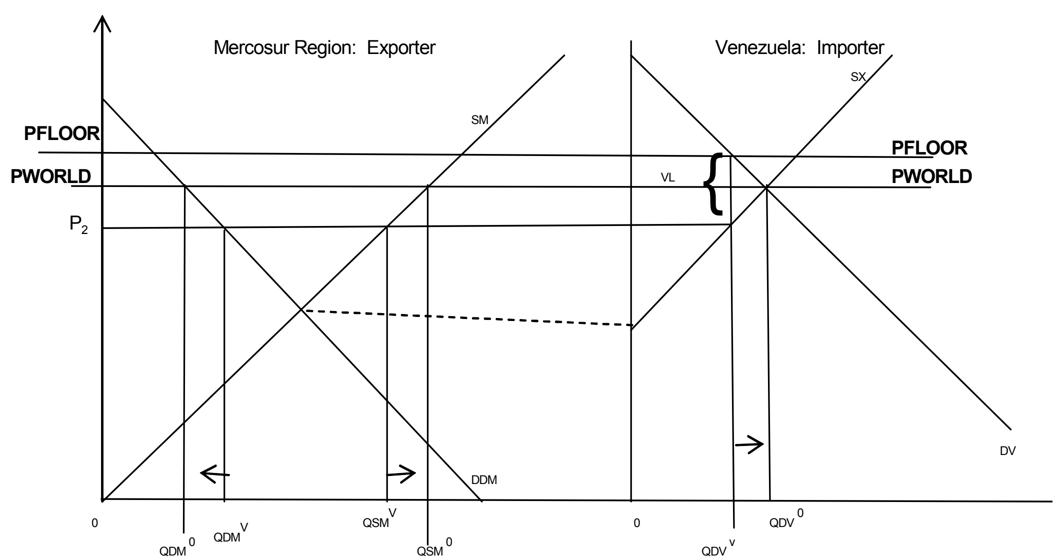

Figure 4. Effects on Venezuela's imports of Mercosur soybeans and meal of removing the Andean variable levy: The case of the floor price exceeding world price.

Partial Equilibrium Model Analysis

The goal is to specify a partial equilibrium simulation model of the Venezuelan import market for soybeans and meal, and then estimate (counterfactually) the effects on Venezuela's multi-sourced array of purchases from the decrease in Venezuela's import protection levels on Mercosur-sourced soybean and meal as the Mercosur and Andean regions are merged into an RTA. Throughout this analysis, the traded quantities of "soybeans and meal" are the meal-equivalent of soy meal and soybeans defined earlier. Results should reflect a rise in Mercosur sales of soybeans and meal at the expense of U.S. and other suppliers' exports to this market, as shown and/or implied in the graphical analysis above. We concentrate on two scenarios that have recently occurred: (1) where the world price exceeds the reference price and the tariff equals the CET, and (2) where the world price in Venezuela is below the domestic reference price and the variable levy is positive.

For the simulations, we applied the multi-market, multi-region, and Armington-type partial equilibrium model documented in Babula, Fry, Hall, and Jabara (BFHJ 2001). Summarized in the technical appendix, the BFHJ model was modified to capture Venezuela's demand for its domestically produced product and of imports from four other sources: the United States, Mercosur region, (non-Venezuelan) Andean region, and a residual rest of the world or ROW.

Each of the two sets of simulation results were compared with results from the model under a baseline of market conditions before the Mercosur-Andean RTA, taken as average 2000-2001 conditions.[35] For each of the four source-differentiated quantities of soybeans and meal imported into Venezuela, an ad valorem equivalent or AVE was calculated for the combined protection of Venezuela's import tariff and the variable levy: the relatively smaller AVE level with a zero variable levy component during 2003/04 when the world price exceeded the Andean reference price and a relatively larger AVE with a positive variable levy component reported during 1998/99 through 2001/02 when world price fell below the Andean reference price.[36] Methods by which these AVE values were calculated are outlined in the technical appendix's material which follows documentation of the BFHJ model. Under the two scenarios, the shock to the model entails a decrease in the relevant Venezuelan AVE on Mercosur-sourced soybeans and meal to zero. Table 4 provides these AVE values for the estimated AVE's levied on the variously-sourced soybeans and meal imported into Venezuela.

[35]We chose this baseline because average 2000-2001 conditions were deemed the most recent that best approximated conditions before the Mercosur-Andean RTA.

[36]World prices for soybeans rose by about 74 percent and for soybean meal by 63 percent from 2001/02, a year with low prices to 2003/04, a year with the highest prices in two decades. World prices for soybeans in 2001/02 averaged $181 per mt for Brazilian and Argentine soybeans, and $174 per mt for U.S. soybeans. In 2003/04, Brazilian/Argentine soybeans averaged $317 per mt, and U.S. soybeans, $303 per mt. Soybean meal prices followed a similar trend with Brazilian/Argentine soybean meal rising from an average $165 per mt in 2001/02 to $269 per mt in 2003/04. USDA, FAS (2004, table 20).

Table 4. Estimated ad valorem equivalents of tariffs and variable levies on Venezuela-bound imports

Source of soybeans and meal	Scenario 1 (high world price, 2003/04 situation): zero variable levy (world price above reference price)	Scenario 2 (low world price, 1998/99 to 2001/02 situation): positive variable levy (world price below reference price)
	Percent	
Mercosur region	11.1	46.1
Andean region	0.0	0.0
United States	15.0	48.0
Other	15.0	48.0

Source: Calculations of the authors. See technical appendix, table A-2 and related discussion.

In addition to the price wedges provided in table 4, it is evident from the technical appendix's documentation of the BFHJ model that the model requires an array of assumptions concerning baseline data on Venezuela's production and trade in soybeans and meal, various price elasticities of demand and supply for soybeans and meal, elasticities of substitution, among others. The technical appendix following this paper, particularly table A-3, provides values and assumptions for such parameters.[37] The alternative scenarios under which a Mercosur/Andean RTA are modeled are as follows:

> Scenario 1, High world soybean prices (the 2003/04 situation) and a zero variable levy component when the reference price was below the world price: the AVE of 11.1 percent imposed on Venezuela's imports of Mercosur-sourced product zero (table 4) is decreased to zero.
>
> Scenario 2, Low world soybean prices (the 1998/99 to 2001/02 situation) and a positive variable levy with the reference price above the world price: the AVE of 41.6 percent (table 4) imposed on Venezuela's imports of Mercosur-sourced product is decreased to zero.

The other non-Mercosur AVEs remain unchanged under both scenarios. A number of explanatory comments follow concerning table 4's ad valorem equivalents (AVEs) of Venezuelan tariffs and variable levies placed on imports of soybeans and meal from the Mercosur region: 11.1 percent and 41.6 percent. Each is a trade-weighted average of Venezuelan AVE's placed on imports from the four individual Mercosur countries (Argentina, Brazil, Paraguay, and Uruguay). The two sets of individual nation AVEs placed on Venezuelan imports of soybeans and meal are estimated and presented in the technical appendix (table A-1). Each of the two sets of four Mersocur country AVEs were then weighted by its national share of baseline (2000-2001) Venezuelan imports of Mercosur-sourced soybeans and meal, and then summed into a Mercosur-wide AVE price wedge:

[37]Many of these table A-3 parameters are developed and derived in tables A-1 and A-2, and in related appendix discussion.

11.1 percent for scenario 1 and 41.6 percent for scenario 2. The technical appendix (table A-1 and A-2 and related discussion) fully derives and calculates these two wedges.

In both scenarios, the price wedges include Venezuela's current preferences on soybeans and meal imports from Brazil and Argentina. In both sets of simulation results, Venezuela's duty on U.S. exports of soybeans and meal remain unchanged. Results of both scenarios are in table 5. Generally, one would expect results which qualitatively reflect those of the more simplified graphical analysis using figure 4, and this is what emerged from the simulations.[38] And also in line with intuition and expectations, the degree of the rise in Mercosur sales to Venezuela, the magnitude of price changes, and the degree of the decline in U.S. and other non-Mercosur sales to Venezuela when the Mercosur/Andean RTA is implemented is positively correlated with the size of the eliminated AVE price wedge on Venezuela's Mercosur-sourced imports.

Scenario 1: Elimination of Venezuela's 11.1 Percent AVE on Mercosur Soybeans and Meal

In 2003/04, world prices of soybeans and meal were high and generally above the Andean reference prices, which rendered a zero variable tariff component on Venezuela's imports of soybean and meal.[39] The combined tariff and variable protection on Mercosur product imported into Venezuela is lower than under cases when world prices are low and there is a positive variable levy component. The case of high world prices and a zero variable levy component for 2003/04 market conditions were estimated and render a 11.1 AVE imposed by Venezuela on Mercosur-sourced soybeans and meal (see technical appendix). Results of eliminating this 11.1 percent AVE price wedge (scenario 1, table 5) suggest that Mercosur supplier countries would noticeably increase sales at the expense of not only the United States and other non-Mercosur suppliers, but also at the expense of Venezuela soybean and meal producers and producers from fellow Andean member supplier nations, particularly Bolivia. Mercosur suppliers (presumably Argentina and Brazil particularly) would increase Venezuela sales by 28.5 percent to about 235,000 metric tons, at the expense of non-Mercosur export suppliers, whose sales would decline by 5.4 percent.[40]

In particular, U.S. export sales to Venezuela would drop by 5.4 percent, a loss amounting to 12,000 mt. A Mercosur/Andean RTA under this setting would displace domestic Venezuelan production by about 7,300 mt (3.3 percent), and by a far more substantial 17,000 mt (5.4 percent) for fellow Andean pact suppliers, primarily Bolivia. Prices from all sources would fall in Venezuela: from a 7 percent decline in prices for the directly benefitted Mercosur exports, to 1 percent for product from other sources. Venezuelan exports (not shown in table 5) would fall by nearly a percent to about 129,000 mt.

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[38]Note that for ease of reader comprehension, assumptions were imposed in order to simplify the graphical analysis from the model analysis. But generally, both the graphical and model analyses generated qualitatively similar results.

[39]During 1998/99 to 2001/02, U.S. soybean prices (No. 1, yellow, Central Illinois) averaged $174 per mt; they then rose to $232 per mt in 2002/03, and eventually reached a near-record high $303 per mt in 2003/04. USDA, FAS (2004, table 20).

[40]When rounded to the first decimal place, the percent declines in non-Mercosur export sales to Venezuela all seem equal in this and the following scenario, although they are not identically the same.

Table 5. Results of eliminating Venezuela's AVE on Mercosur soybeans and meal: Cases of a zero and positive variable levy

Item	Domestic production, Venezuela	Imports of Andean product	Imports of Mercosur product	Imports of U.S. product	Imports of residual ROW product
Baseline scenario: Average 2000-2001 conditions before a Mercosur/Andean customs union					
Baseline Venezuelan imports (mt)	223,000	313,184	182,814	217,267	30,324
Scenario 1, A zero variable levy and a high world price: Elimination of 11.1% AVE on Mercosur product					
Venezuelan production/imports (mt)	215,717	296,163	235,003	205,459	28,676
Percent change from baseline	-3.3	-5.4	+28.5	-5.4	-5.4
Percent change, price in Venezuela	-1.0	-1.0	-7.0	-1.0	-1.0
Scenario 2, A positive variable levy and a low world price: Elimination of 41.6% AVE on Mercosur product					
Venezuelan production/imports (mt)	193,699	249,095	401,029	172,806	24,119
Percent change from baseline	-13.1	-20.5	+119.4	-20.5	-20.5
Percent change, price in Venezuela Venezuela	-5.0	-3.0	-21.0	-3.0	-3.0

Source: Results of BFHJ model simulations and calculations by authors.

Notes.—Production of Venezuelan soybean meal is from imported soybeans. Venezuelan imports are the total of soybeans and soybean meal in soybean meal equivalents.

Scenario 2: Elimination of Venezuela's 41.6 Percent AVE on Mercosur Soybeans and Meal

During 1998/99 until 2001/02, world prices of soybeans and meal were low and generally below the Andean reference prices, such that imposed variable levies on Venezuelan imports were positive. Thus, the Andean AVE of the combined tariff and variable levy protection on Mercosur product slated for Venezuela is higher than scenario 1's case. The case of low world prices and zero variable levies estimated for then-prevailing market conditions rendered a 41.6 percent AVE imposed by Venezuela on Mercosur-sourced soybeans and meal (see the technical appendix).

Results of eliminating this 41.6 percent AVE price wedge (scenario 2, table 5) suggest that Mercosur supplier countries would qualitatively mirror the results generated under scenario 1, but results would be more pronounced. Mercosur sales (presumably sourced primarily from Argentina and Brazil) to Venezuela would more than double, and rise 119 percent to 401,000 mt, at the expense of domestic production and non-Mercosur (including U.S.) export sales. All other foreign export suppliers would lose about a fifth of their business in Venezuela, and this would amount to a decline of about 44,000 mt for the United States. More specifically, the Mercosur/Andean union would adversely affect domestic producers and other fellow Andean pact suppliers (primarily Bolivia): consumption of domestic production would fall 29,000 mt or by 13 percent, Venezuelan exports (not in table 5) would fall 4,500 mt or 3.4 percent, while export sales to Venezuela by other Andean countries (primarily Bolivia) would fall a substantial 64,000 mt or 20.5 percent. Prices of all sources of product would fall: from a 21 percent decline for the Mercosur product, to a 5 percent decline for domestic product, and to a 3 percent decline for the U.S. and other non-Mercosur suppliers.

SUMMARY AND CONCLUSIONS

With regard to imports entering from countries outside the Andean Pact, Venezuela applies a Common External Tariff (CET) and requires licenses and sanitary and phytosanitary import certifications for non-Andean soybean imports. In conjunction with the CET, Andean Pact members use a price band system as a price stability mechanism for certain commodities, including soybeans, and in effect, a variable surcharge depending on prevailing world prices relative to the domestic Andean reference price added to the CET.

Under the Andean Pact, the source of Venezuelan soybean and meal imports shifted from lower cost U.S. and Brazilian to otherwise higher cost Andean Pact (primarily Bolivian) product. With the duty-free trade, total commodity imports into Venezuela from Bolivia rose from $4 million to $164 million during 1994-2002, with soybean and meal imports from Bolivia rising by $89 million. The duty-free treatment for goods traded among the Andean Pact countries encouraged substantial trade among these adjacent countries that straddle the rugged Andes Mountains and the vast Amazon River basin in northern South America.

The United States is a major supplier of soybeans and soybean meal to the world and to Venezuela. As well, South American suppliers such as Brazil, Argentina, Paraguay, and Bolivia compete with the United States for soybeans and soybean meal exports to Venezuela. Owing to business ties, geographical proximity, and competitive ocean freight rates, the United States had dominated the Venezuelan import market for soybeans and meal for many decades, accounting for 82 percent of its imports in 1997. U.S. exports of soybeans and meal to Venezuela in 1997 amounted to $200 million, but then dropped to $40 million by 2003 based on (U.S. Department of Commerce data, figure 1). During 1998-2002, imports into Venezuela of U.S. soybean and meal fell 85 percent from 477,000 mt to 71,000 mt (table 3), Bolivian exports of soybeans and meal rose from 29,000 mt to 385,000 mt.

As illustrative exercises, a partial equilibrium, deterministic, and Armington-type model of the Venezuelan market for soybeans and meal was formulated and simulated under two scenarios. Both scenarios summarized the protection levels afforded by Venezuela’s import tariffs and the Andean price band variable levy into an ad valorem equivalent or AVE price wedge for Venezuelan imports of soybeans and meal from the Mercosur region, other Andean nations as a region, the United States, and the residual ROW.

Scenario 1 estimated these AVE price wedges under 2003/04 conditions when world prices exceeded Andean reference prices and variable levies on Venezuelan imports were zero. The import price wedge is relatively small as are the market impacts of its removal.

Scenario 2 estimated the AVE price wedges under conditions during 1998/99 to 2001/02 when world prices fell below the Andean reference price and Andean variable levies on imports were positive. This scenario's larger price wedge generates markedly more pronounced market impacts.

Generally, the model results suggest that implementation of a Mercosur/Andean RTA under either scenario would noticeably benefit Mercosur suppliers at the expense of U.S. and other export sales to Venezuela. Also of note, the RTA under either scenario would adversely affect domestic Venezuelan soybean processors and other fellow Andean pact member suppliers (particularly Bolivia). Prices within Venezuela would fall for soybeans and meal from all sources.

Model results estimate that a Mercosur/Andean RTA would elicit declines in U.S. sales to Venezuela ranging from 12,000 mt under high world prices (such as during 2003/04) and a zero Andean variable levy, to 44,000 mt under conditions (such as during 1998/99 to 2001/02) with low world prices and a positive Andean variable levy.

A Mercosur and Andean customs union would adversely affect Andean suppliers. Sales to Venezuela by other Andean pact members, particularly Bolivia, would fall by nearly 17,000 mt under conditions of low prices and a zero variable levy, and by as much as 64,000 mt under conditions of higher world prices and a positive variable levy. Venezuelan export sales and domestic prices suffer under both scenarios: exports and domestic price both fall by one percent under scenario 1 while exports fall by about three percent and domestic price by as much as five percent under scenario 2.

Technical Modeling Appendix: Model Specification and Assumptions of Parameters and Baseline Data

This technical modeling appendix is comprised of four sections. The first presents the model. The second provides the nation-specific ad valorem equivalents of the combined protection levels from tariffs and the Andean price band variable levy placed on Venezuela-bound soybeans and soy meal from the four individual Mercosur countries, the United States, and the rest of the world. Table A-1 provides these parameters for both scenarios as defined in this paper's text. The third section develops and calculates the Mercosur region AVE price wedges for a composite soybean and meal product. These Mercosur region AVEs are trade-weighted averages of the protection levels placed on a soybean and meal product or average "composite" product under scenarios 1 and 2. Basically, trade weighted averages of the Mercosur wedges in table A-1 are calculated in table A-2. And fourth, there is a section providing assumed data and parameters needed to service the model under the two assumed scenarios. Table A-3 provides a summary of these assumptions.

The Partial Equilibrium, Armington Model Framework[41]

For our simulations, we developed a multi-market, multi-region partial equilibrium model. Under fairly common Armington-type assumptions, differentiated products from different regions are assumed to compete in the Venezuelan domestic market for soybeans and meal.[42] In addition to some domestic production, Venezuela imports soybeans and meal from the Mercosur region, other Andean Pact countries, the United States, and a residual rest of the world or ROW. In addition to competing against imports, Venezuelan producers also purchase intermediate inputs from domestic markets. The output is then sold in both Venezuela and a single aggregate ROW region. The multi-market, multi-region nature of the model allows us to simultaneously model the effect of three kinds types of Venezuelan support policies:

1) import tariffs on competing soybeans and meal and other policy levers which can be summarized into a product price wedge;
2) any subsidies (or subsidy equivalents) applied directly to domestic soybeans and meal production, which are not herein considered; and
3) subsidies (or subsidy equivalents) applied to the production of intermediate inputs into soybeans and meal, which are also not herein considered.

Multi-market, multi-region partial equilibrium models, with varying specifications, have been applied to agricultural products many times. Major agricultural products are often marketed globally and government support programs often impact agricultural products both directly and indirectly through related product markets. For a presentation of a simple version of such a model and a discussion of previous uses of multi-market, multi-region models see Roningen (1997).

Specifically, the model reflects and/or assumes the following:

1. Two factor markets for a soybeans and meal composite product are assumed not to be totally fixed in supply, and are assumed as imperfect substitutes in the production of the single final good. Production is assumed to occur under a constant elasticity of substitution (CES) technology.[43] Venezuela is assumed to be a profit maximizer.
2. The single final good, soybeans and meal (as defined in the text), is assumed to compete in the domestic Venezuelan market with imports from the Mercosur region, the rest of the Andean region, the United States, and a residual ROW.
3. Venezuela is a modest exporter of soybeans and meal to an aggregate ROW export market under the assumption that Venezuela-produced product for domestic use and for export are perfect substitutes in production.

[41]The modeling documentation closely follows that provided by Babula, Fry, Hall, and Jabara (2001).

[42]The original citation for models of this type is Armington (1969). In Armington-type models, final products are grouped by country/region of production and assumed to be imperfectly substitutable in consumption with each other in a single domestic market.

[43]Only the production of Venezuelan soybeans and meal is explicitly modeled. Normally, the factors are generally grouped to match Venezuelan policy instruments affecting the cost of production of soybeans and meal. But since the wedges on the prices of these factors are not changing, and hence not an issue in this study, the pre- and post- shock wedges are equal in all simulated scenarios. Two generic factors with production cost shares adding to 100 percent are assumed, and do not influence the results.

Soybeans and Meal Demand

We assume a system of non-linear demand equations where Venezuelan and imported consignments of soybeans and meal compete in the Venezuelan market. Using Armington assumptions, we define composite good, y, as a Constant Elasticity of Substitution (CES) function of Venezuelan soybeans and meal sold domestically, y_d, and all imports, y_m [44]. The prices of the domestically packed and imported products are p_d and p_m, respectively. Demand for the domestic good and the imported goods are therefore (respectively):

$$y_d = \left[\frac{\alpha_d}{p_d}\right]^{\sigma} P^{\sigma-1} y \tag{1}$$

and

$$y_m = \left[\frac{\alpha_m}{p_m}\right]^{\sigma} P^{\sigma-1} y \tag{2}$$

where P is the price index for the composite good as follows:[45]

$$P = \left[\alpha_d^{\sigma} p_d^{1-\sigma} + \alpha_m^{\sigma} p_m^{1-\sigma}\right]^{1-1/\rho} \tag{3}$$

Assuming a constant demand elasticity (CDE) form for aggregate industry demand, industry expenditures may be represented as:

$$y = AP^{\eta+1} \tag{4}$$

where η is the aggregate elasticity of demand for the industry.[46]

We allow two-way trade, so Venezuelan producers are assumed to also export an identical product (that is, goods for the domestic market are perfectly substitutable in production with goods sold domestically) to aggregate export markets with a CDE demand:

$$y_x = \alpha_x \, p_d^{\eta_x} \tag{5}$$

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[44] Therefore, we have $y = \left[\alpha_d y_d^{\rho} + \alpha_m y_m^{\rho}\right]^{\frac{1}{\rho}}$ where ρ is the substitution parameter (ρ=1-1/σ for elasticity of substitution σ).

[45] The constants in the final goods market are calibrated by scaling the initial quantities ($\overline{y}_d$ and $\overline{y}_m$) so that initial prices are one (including the price index). The constants above are therefore initialized as follows: $\alpha_d^{\sigma} = \left(\frac{\overline{y}_d}{\overline{y}}\right)$ and $\alpha_m^{\sigma} = \left(\frac{\overline{y}_m}{\overline{y}}\right)$.

[46] Constant A is calibrated (by the quantity scaling above) as the initial industry expenditures $\overline{y}$

where η_x is the aggregate elasticity of demand for the domestically produced final goods in export markets.[47]

Import Supply

On the supply side, the import supply function y_m is assumed to have Constant Supply Elasticity (CSE) form so that eliminating the ad valorem import tariff uses:

$$y_m = ks_m \, p_m^{\varepsilon_m} \tag{6}$$

where ε_m is the elasticity of import supply to the domestic market, and the constant is

$$ks_m = \left(\frac{\overline{y}_m}{1 + t_m} \right)^{\varepsilon_m}$$

where t_m is the Venezuelan ad valorem (equivalent) import tariff.

Intermediate Input Markets

This portion of the model is not engaged or relevant for this analysis, insofar as there are no changes in the price wedges corresponding to the factor set: wedges on both factors are unchanged in all scenarios. The ensuing material is provided for completeness of model documentation.

Total Venezuelan production, y_{vz} is sold in both domestic and export markets

$$y_{vz} = y_d + y_x \tag{7}$$

and is assumed to have CES technology and employ intermediate inputs of two types: variable inputs (x_v), and fixed inputs (x_f). We will use a calibrated share form of the CES function that takes the form:

$$y_{vz} = \overline{y}_{vz} \left[\theta_v \left(\frac{x_v}{\overline{x}_v} \right)^{\mu} + \theta_f \left(\frac{x_f}{\overline{x}_f} \right)^{\mu} \right]^{\frac{1}{\mu}} \tag{8}$$

and where μ is the substitution parameter where μ=1-1/τ for elasticity of substitution in production r_j, and the r_j are factor prices.[48] Demands for the intermediate products therefore take the form:

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[47] Constant α_x is set at the initial value of exports, $\overline{y}_x$ (through the quantity scaling).

[48] Each constant is therefore set at $\theta_j = \dfrac{\overline{r}_j \overline{x}_j}{\overline{r}_v \overline{x}_v + \overline{r}_f \overline{x}_f} \; for \; j = v, f$.

$$x_j = \bar{x}_j \frac{y_{vz}}{\bar{y}_{vz}} \left(\frac{c\bar{r}_j}{\bar{c} r_j} \right)^{\tau} \quad for\ j = v, f \tag{9}$$

where v, and f are subscripts denoting variable and fixed factors, respectively, and the unit cost of production scaled to the initial cost of production takes the form:

$$\frac{c}{\bar{c}} = \left[\sum_{j=1}^{m} \theta_j \left(\frac{r_j}{\bar{r}_j} \right)^{1-\tau} \right]^{\frac{1}{1-\tau}}. \tag{10}$$

The zero profit condition is

$$p_d = \frac{c}{1 + sp_{vz}} \tag{11}$$

where sp_{vz} is the ad valorem production subsidy. The factor supply functions are:

$$x_j = k_j \left(\frac{r_j}{\bar{r}_j} \right)^{\varepsilon_{sj}} \quad for\ j = v, f \tag{12}$$

where ε_{sj} is the elasticity of supply of the intermediate good j, and

$$k_j = \left(\frac{\bar{x}_j}{1 + s_j} \right)^{\varepsilon_j} \quad for\ j = v, f$$

where s_j is are the ad valorem subsidy on intermediate good j.

Equilibrium

The model is solved by finding factor prices r_v, and r_f and soybeans and meal prices p_d and p_m such that supply equals demand simultaneously in both factor markets and the soybeans and meal markets. This is done by setting equation (12) equal to equation (9),

$$k_j \left(\frac{r_j}{\bar{r}_j} \right)^{\varepsilon_{sj}} = \frac{y_{vz}}{\bar{y}_{vz}} \left(\frac{c\bar{r}_j}{\bar{c} r_j} \right)^{\tau} \quad for\ j = v, f$$

substituting equations (1) and (5) into equation (7) and setting it equal to equation (8),

$$\bar{y}_{vz}\left[\theta_v\left(\frac{x_v}{\bar{x}_v}\right)^{\mu}+\theta_f\left(\frac{x_f}{\bar{x}_f}\right)^{\mu}\right]^{\frac{1}{\mu}}=\left(\frac{\alpha_d}{p_d}\right)^{\sigma}P^{\sigma-1}y+\alpha_x p_d^{\eta_{xx}}$$

and setting equation (6) equal to equation (2)

$$ks_m\, p_m^{\;\varepsilon_m}=\left(\frac{\alpha_m}{p_m}\right)^{\sigma}P^{\sigma-1}y$$

Policies generally enter the model through price wedges. A factor subsidy enters the model as a wedge between the price at which the factor is supplied and the price the producer would pay, without the subsidy. This wedge on factor price may be converted to an output price wedge equivalent through multiplication of the factor price wedge by the factor's share of Venezuela's final product production costs. Output price supports, hereinafter denoted as output subsidies, enter the model as a wedge between supply price at which the producer offers the commodity and the price at which consumers demand the product. An import tariff is reflected as a wedge between domestic and world prices.

Generally, the model employs the "equilibrium displacement" method by combining demand, supply, and equilibrium conditions of the output and factor markets, and then calibrating the system to approximate conditions of a chosen, observed period -- hereafter the base period (OECD 2000, p. 9). An exogenous shock is imposed on the base run, and the model solves for post-shock values of own-product consumption, prices, implied trade levels, and input prices and quantities.

The chosen partial equilibrium modeling methodology is an effective way to combine economic theory with observed (baseline) conditions to build a framework to approximate actual market conditions. The model is useful in simulating hypothesized market shocks (e.g., specific policy eliminations) to generate "what if" scenarios. That is, the model is able to approximate what would have occurred in the Venezuelan soybean and meal market, under assumed baseline conditions, had the simulated shocks actually occurred.

However, there are three qualifications to using the modeling framework which should also be noted. First, the model compares pre-shock (base run) and post-shock values that arise from an imposed shock, but does not illuminate the dynamics of the how the variables adjust from the old into the new equilibrium. Second, as with all deterministic models, there is uncertainty about the true values of the assumed parameter and elasticity values needed to service the model (OECD 2000, pp. 8-9).

Third, these types of models are most effectively simulated for "small" changes in policy instruments (Gardner 1987, chapter 4). This is because theory underlying such models generally employs "marginal" analysis, that is "small" changes on the margin, where assumed parameters and elasticities are time-invariant (Gardner 1987, p. 93; OECD 2000, pp. 9-10). A large change, perhaps a complete overhaul or even total elimination of a large production aid or price support policy, may induce structural change in all assumed parameters. So caution should be used in interpreting model results from what readers consider to be "large" or regime-changing policy alterations (Gardner 1987, p. 93; OECD 2000, pp. 9-10).

Calculation of Nation-Specific Ad Valorem Equivalents of Combined Protection: Venezuela Tariffs and Andean Price Band Variable Levy on Soybeans and Soy Meal, 2002 and 2003

Scenario 1 reflects the 2003/04 situation, when world prices of soybeans and soy meal were higher than the Andean reference (import) price, and when the Andean variable levy under the price band system was zero. Scenario 2 reflects the 1998/99 to 2001/02 situation when world prices of soybeans and soy meal were lower than the Andean reference (import) price, and when the Andean variable levy under the price band system was positive. Table A-1 provides estimates of the ad valorem equivalents or AVEs placed on Venezuela-slated exports of soybeans and soy meal from Mercosur countries, the United States, and other rest of the world countries under scenarios 1 and 2 defined above. This section documents the estimation of these AVE estimates for the two scenarios.

Table A-1. Ad valorem equivalent estimates of combined protection on Venezuela-bound soybeans and soy meal exports of Venezuela's tariff and the Andean variable levy under two scenarios

Item/country	Paraguay	Uruguay	Brazil	Argentina	United States	Rest of world
	Percent					
Scenario 1: High world prices above the Andean reference prices with a zero Andean variable levies						
Soybeans	15.0	15.0	9.0	9.0	15.0	15.0
Soy meal	3.75	15.0	9.75	9.75	15.0	15.0
Scenario 2: Low world prices below the Andean reference prices with a positive Andean variable levies						
Soybeans	48.0	48.0	28.8	28.8	48.0	48.0
Soy meal	12.0	48.0	31.2	31.2	48.0	48.0

The data have been taken from various reports of the Foreign Agricultural Service for the conditions prevailing in 2002 and in 2003/04.[49]

Calculation of Ad Valorem Equivalent of the Protection Levels Placed on Venezuela-Bound. Exports of a Mercosur-Sourced Soybean and Meal Composite Product

The purpose of this appendix subsection is to construct an AVE price wedge equivalent to estimate, as a price wedge, the combined protection levels placed on exports of Mercosur consignements of a soybean and meal composite product bound for Venezuela. The Mercosur

[49] U.S. Department of Agriculture, Foreign Agricultural Service (USDA, FAS). *Venezuela: Oilseeds and Products Annual*, 2004, p. 7. See also USDA, FAS *Venezuela: Oilseeds and Products Annual*, 2002, p. 6.

region price wedges or AVEs are calculated for scenarios 1 and 2 defined above, and are trade-weighted averages of Venezuela-bound soybean and meal exports by the four individual Mercosur regions. The Mercosur AVEs or price wedges are calculated in table A-2 below using the individual country wedges of the four Mercosur country exporters of soybeans and soy meal to Venezuela as presented in table A-1 above.

The final page of this appendix is table A-3. This table summarizes the data and parameters needed to service the model under its various scenarios.

Table A-2. Calculation of a Mercosur region price wedge for protection placed on Venezuela-bound Mercosur exports of a composite soybean and meal composite product

	C1 Paraguay	C2 Brazil	C3 Argentina	C4 Uruguay	C5 Mercosur region	Algebraic calculations and explanations
RA: 2000 Exports to Venezuela (mt)	63,722	68,001	8,142	67,213	207,078	
RB: 2001 Exports to Venezuela (mt)	30,597	55,305	25,971	46,677	158,550	
RC: Baseline: 2000-01 average exports to Venezuela (mt)	47,159.5	61,653	17,056.5	56,945	182,814	
RD: Mercosur member trade weights for baseline (proportions)	0.258	0.337	0.093	0.311	n/r	RD is a row of trade weights and are obtained for columns C1 through C5 as follows: RC/(182,814).
RE: Scenario 1, AVE, soybeans exports to Venezuela (percent)	15.0	9.0	9.0	15.0	n/r	
RF: Scenario 1, AVE, soy meal exports to Venezuela (percent)	3.75	9.75	9.75	15.0	n/r	
RG: Scenario 1, AVE, soybeans and meal composite (percent)	9.375	9.375	9.375	15.0	n/r	RG is a row of average AVEs for soybeans and soy meal. For columns C1 through C4, RG calculated as (RE+RF)/2.
RH: Scenario 1, trade- weighted nation-specific AVEs (percent)	2.419	3.159	0.872	4.665	n/r	RH for columns C1 through C4 are calculated as follows: RD*RG.

Table A-2. Continued

	C1 Paraguay	C2 Brazil	C3 Argentina	C4 Uruguay	C5 Mercosur region	Algebraic calculations and explanations
RI: Mercosur region trade weighted AVE, scenario 1, for composite soybean and meal product (percent)	n/r	n/r	n/r	n/r	11.1	C5 value on RI is only relevant calculation and is a sum of columns C1 through C5 along RH.
RJ: Scenario 2, AVE, soybeans exports to Venezuela (percent)	48.0	48.0	28.8	48.0	n/r	
RK: Scenario 2, AVE, soy meal exports to Venezuela (percent)	12.0	48.0	31.2	48.0	n/r	
RL: Scenario 2, AVE, soybeans and meal composite (percent)	30.0	48.0	30.0	48.0	n/r	RL is a row of average AVEs for soybeans and soy meal. For columns C1 through C4, RL calculated as (RJ+RK)/2.
RM: Scenario 2, trade-weighted nation-specific AVEs (percent)	7.74	16.176	2.79	14.928	n/r	RM for columns C1 through C4 are calculated as RD*RL
RI: Mercosur region trade weighted AVE, scenario 2, for composite soybean and meal product (percent)	n/r	n/r	n/r	n/r	41.6	C5 value on RI is only relevant calculation and is a sum of columns C1 through C5 along RM.

Notes.—The term “n/r” means not relevant. Note that the algebraic calculation column utilizes the row and column labels next to each relevant item. Each labeled row (denoted =RA, RB, etc) and each labeled column (C1, C2, etc) are identified above.

Sources: Sources and calculations for soybean export AVEs in rows RE and RJ and soy meal export AVEs in rows RF and RK are provided above in table A-2 and related discussion. All trade data in the table are taken from the data base provided by the United Nations Statistical Office. The trade weights in row RD are author-calculated.

Table A-3. Venezuela soybean and meal model: Base data, assumed parameters for two scenarios, and data sources

Item assumed/calculated	Value entered into model	Source and explanation
Apparent Venezuelan consumption of domestic product, baseline	223,000 mt	Average of Venezuela's 1999/2000 production of 295,000 mt and 2000/01 production of 150,000 mt. FAS.
Venezuela AVE price "tariff" wedge on imports of non-Venezuela Andean product	0.0	Andean product enters Venezuela at zero tariff. Assumed to be Bolivian product.
Venezuela AVE price "tariff" wedge on imports on Mercosur product	scenario 1: 11.1% scenario 2: 41.6%	See tables A-1 and A-2 and discussion.
Venezuela AVE price "tariff" wedge on imports of U.S. product	scenario 1: 15.0% scenario 2: 48.0%	See table A-1 and discussion.
Venezuela AVE price "tariff" wedge on imports from residual ROW	scenario 1: 15% scenario 2: 48%	See table A-1 and discussion.
Venezuelan baseline imports of other Andean product	313,184 mt	Assumed as imports of Bolivian product. Average of 2000-2001 data from U.N. Statistical Office database.
Venezuelan baseline imports of Mercosur region product	182,814 mt	2000-2001 average data for 4 Mercosur countries. U.N. Statistical Office database.
Venezuelan baseline imports of U.S. product	217,267 mt	2000-2001 average data for U.S. exports. U.S. Department of Commerce, official trade statistics.
Venezuelan baseline exports to world	130,000 mt	2000-2001 average data. U.N. Statistical Office database.
Venezuelan elasticity of substitution among alternatively sourced product	5.0	Assumed as "high." Value of 3.0 would be medium.
Venezuelan aggregate price elasticity of product demand	-0.6	Estimate price of Venezuelan demand for soymeal by W. Gardiner, V. Roningen, K. Liu, "Elasticities in the Trade Liberalization Database." Economic Research Service, May, 1989, p. 51.
Price elasticity of world demand for Venezuelan product exports	-0.3	Assumed at low levels.
Price elasticities of supply to Venezuelan market: for other Andean region, Mercosur region, United States, and residual ROW	7.0 for each region.	Assumed at "moderate to high" levels following R. Babula, J. Fry, H.K. Hall, and C. Jabara, "A Comparative Static Analysis of European Union Tariff and Support Policies for Canned Pears," *Journal of International Food and Agribus. Mktg*., vol 13, no. 2/3, 2001, p. 55.

Notes.—"Product" refers to a soybean and meal composite. Baseline data are averages of 1999/2000 and 2000/2001 market years and/or 2000 and 2001 calendar years, depending on data availability. FAS denotes U.S. Department of Agriculture, Foreign Agricultural Service. Scenario 1 is the case of world soy product prices being higher than the Andean reference prices, a zero Andean variable levy, and where the AVE on Venezuelan imports of Mercosur product falls from 11.1% to zero. Scenario 2 is the case of world soy product prices being lower than the Andean reference prices, a positive Andean variable levy, and where the AVE on Venezuelan imports of Mercosur product falls from 41.6% to zero.

REFERENCES CITED

Armington, Paul. "A Theory of Demand for Products Distinguished by Place of Production," *International Monetary Fund Staff Papers*, vol. 16 (1969), pp. 159-79.

Babula, Ronald A., John Fry, H. Keith Hall, and Cathy Jabara, "A Comparative Static Analysis of European Union Tariff and Support Policies for Canned Pears," *Journal of International Food and Agribusiness Marketing*, vol. 12 (2001), no. 2/3, pp. 29-58.

Burfisher, Mary, and Steven Zahniser, ERS, USDA, "Multilateralism and Regionalism: Dual Strategies for Trade Reform," *Amber Waves*, September 2003, p. 1, www.ers.usda.gov/amerberwaves.

Gardner, Bruce, *The Economics of Agricultural Policies* (New York: Macmillan, 1987).

Hasha, Gene, *European Trade Arrangements in Fruits and Vegetables*, July 2004, Electronic Outlook Report, http://www.ers.usda.gov/publications/VGS/Jul04/vgs30301.

International Grains Council, *Grain Market Report*, June 30, 2004.

ISTA Mielke GmbH. *Oil World Weekly: World Supply, Demand, and Price for Oilseeds, Oils, and Meals*, vol. 47, no. 52, December 23, 2004.

Organization for Economic Cooperation and Development (OECD). *A Matrix Approach to Evaluating Policy: Preliminary Findings from PEM Pilot Studies of Crop Policy in the EU, the U.S., Canada, and Mexico* (Paris, France: OECD, 2000), p. 9.

Raney, Terri and Julieta Urgaz-Peredea, USDA, ERS, "Chile Moves Ahead with Regional Trade Agreements, *International Agriculture and Trade Reports: NAFTA Situation and Outlook Series*, September 1996.

Roningen, Vernon "Multimarket and Multi-Region partial Equilibrium Modeling." In J. Francois and K. Reinert, eds., *Applied Methods for Trade Policy Analysis, A Handbook* (London, UK: Cambridge University Press, 1997), pp. 231-257

Taccone, Juan J., and Uziel Nogueira, editors, *Andean Report 1*. vol. 1, *2002*, pp. I-ii, and 19.

Published by the Institute for the Integration of Latin America and the Caribbean (INTAL), Inter-American Development Bank, 2002.

United Nations, Statistical Office, Trade Database, 2004.

U.S. Department of Agriculture (USDA), *World Agricultural Supply and Demand Estimates,* Washington DC, Aug. 12, 2004.

U.S. Department of Agriculture, Foreign Agricultural Service (USDA, FAS). *Oilseeds: World Markets and Trade*, Sept. 2004, table 20.

U.S. Department of Commerce. Official trade statistics, 2004 database.

U.S. Department of State, *Commercial Guide, Venezuela*. (Washington DC: U.S. Department of State, various annual issues, 2001-2003).

USITC, *The Year In Trade 2003*, USITC publication 3700, July 2004, p. 5-26, *www.usitc.gov/http://itc_-central.usitc.gov/intranet/test/intranet.htm*.

U.S. Trade Representative (USTR). *2004 National Trade Estimate Report on Foreign Trade Barriers*. Found at http://www.ustr.gov/Document_Library/Reports_Publications/2004/2004_NTE_Report/Section_Index.html on January 12, 2005.

U.S. Trade Representative (USTR). *2003 National Trade Estimate Report on Foreign Trade Barriers*. Found at http://www.ustr.gov/Document_Library/Reports_Publications/2003/2003_NTE_Report/Section_Index.html on January 12, 2005.

Zahniser, Steven, and John Link, ERS, USDA, *Effects of North American Free Trade Agreement on Agriculture and the Rural Economy,* July 2002, p. ii., Electronic Outlook Report, Agriculture and Trade Reports, www.ers.usda.gov/publications/so/view.asp?f=-international/wrs_bb/2002.