Tijdschrift voor Economie en Management
Vol. XLII, 4, 1997

A Case of Sectoral Export Promotion: Export Insurance Subsidies in Belgium

by G. DEWIT* and F. ABRAHAM*

I. INTRODUCTION

In the last decade or so, the role of export subsidies has attracted renewed interest in the current policy debate and in the literature on strategic trade policy. While the theoretical literature is very stimulating, little is known about and scarce attention is paid to the facts about export subsidization. Simplifying, in most theoretical models governments grant production subsidies to domestic firms of an industry exporting to one specific market. In practice, several official agencies may be involved in providing export credits and export insurance subsidies to many domestic sectors exporting to a wide range of export destinations. In spite of the work by Abraham (1990), Abraham et al. (1992), Ford and Suyker (1990), Jepma (1991), and the EC (1990), there is only partial information about the size of the subsidies involved and their sectoral and regional break-up. As a consequence, the subsidy structure resulting from a policy of export promotion remains unclear.

Moreover, small countries which are unable to improve domestic welfare by means of trade policy measures, usually see export subsidies as a means of maintaining the position of exporting firms in important export markets. This view is consistent with the Belgian ap-

* Department of Economics, K.U.Leuven, Leuven.
We are grateful to A. Deardorff, J. Levinsohn, R. Stern, C. De Vries, P. Van Cayseele and the participants of the international economics workshops at the University of Michigan and the Katholieke Universiteit Leuven. This research is financed by FKFO grant 2.00039.89: "Dynamische comparatieve voordelen, economische groei, onvolmaakte marktstructuren en Europese buitenlandse handel".

proach to export subsidization. Also, export subsidization is often part of a wider external policy towards third countries. Export subsidies are combined with and incorporated in development assistance schemes to cement a political and economic presence in befriended third world countries.

A final issue concerns the regulatory framework of export subsidies. The existing literature usually ignores international agreements on export subsidization. It is not considered whether actual export subsidization breaches existing regulations. Nor is there an assessment of the extent to which these regulations restrict subsidization by national governments and affect producers and consumers of the subsidized products. As a consequence, the type of global evaluation of the sectoral and country-by-country effects of trade policy, which is common in the tariff literature, is lacking.

This paper integrates these various aspects in an analysis of Belgian export insurance subsidization. The normative aspects of such a trade policy, being well discussed in the theoretical literature (Brander and Spencer (1985), Eaton and Grossman (1986), Helpman and Krugman (1985), Helpman and Krugman (1989)), are not the core issue of this analysis. Instead, the model focuses on market presence and performance of domestic exporters. Based on sectoral and regional export insurance subsidy rates, the impact of a unilateral adoption of the GATT-Subsidy-Code by the Belgian official export insurance agency is analyzed. This exercise allows to infer how non-compliance to the GATT-Code has affected Belgian government expenditures as well as the position of producers and importers of Belgian exports. It is shown that the Belgian export insurance system targets subsidies to a limited number of carefully chosen industries and regions. Although subsidies involved are not huge, they follow the preferential regional pattern of development aid provided by the Belgian government.

The paper proceeds in the following way. Section I motivates our choice of export insurance. We present data on export insurance subsidies and argue that this type of subsidization displays a sectoral as well as a regional bias. In section II, we develop a theoretical model of Belgian export insurance subsidization. In doing so, we carefully specify the institutional and regulatory aspects of export insurance subsidization. The model is used to derive the theoretical effects of an implementation of the GATT-Subsidy-Code on Belgian export insurance in section III. Section IV provides the empirical counterpart

of this theoretical exercise. The concluding section relates our results to the importance of vested interests and ends with some additional comments.

II. FACTS AND FIGURES ABOUT EXPORT INSURANCE SUBSIDIZATION

In many OECD-countries, the government is involved in organizing export insurance on risky exports at favorable conditions when compared to private insurers. The Belgian official export insurance agency is the Nationale Delcredere Dienst (NDD). It insures Belgian exports to non-EC destinations for virtually the full value of the insured export contracts. For this insurance, the NDD receives a premium income. In case of non-payment by the importer, the NDD compensates the exporters and tries to claim the payment from the importer afterwards. Only 8 % of total Belgian exports to non-EC countries is insured by the NDD.

Official export insurance is explicitly regulated in the GATT-Subsidy-Code. This code rules out long-term losses suffered by official export insurance agencies. This means that the charged premiums should be sufficient to cover expected claims over a significantly long period of time. In spite of this international agreement, EC official agencies provided a significant amount of subsidies during the 1980s (Abraham (1990) and Abraham, Couwenberg and Dewit (1992)). Table 1 presents aggregated subsidy estimates for France, the UK, Belgium and Germany. Those estimates are obtained using the GATT-definition, that is, subsidies are the difference between claims and premium income.

TABLE 1

Export insurance in France, the UK, Belgium and Germany (1982-1987[a])

	Subsidies[b] as a % of eligible export	Subsidies as a % of insured contracts
FRANCE	0.50	2.99
UK	0.69	4.18
BELGIUM	0.73	3.60
GERMANY	0.20	3.70

[a] Estimates for the UK and Germany refer to the period 1983-1987.
[b] Subsidies are estimated as the difference between accumulated claims and premiums.
Source: Abraham et al. (1991), p. 9.

From Table 1, we conclude that all four countries subsidized countries through their export insurance schemes. Expressed as a percentage share of eligible exports, subsidies seem to be insignificant (ranging between 0.20 % and 0.73 %). Still, there are no longer negligible when related to insured amounts, reaching values between 2.99 % and 4.18 %. Hence, exporting firms insuring their riskier contracts are subsidized.

In addition, subsidies are targeted to specific sectors and markets. Table 2 illustrates this point for the Belgian export insurance subsidies provided by the official export insurance agency, the Nationale Delcredere Dienst (NDD). First, sectoral subsidization rates show that the bulk of the subsidies flow to a limited number of industries, of which the Metal Articles sector and Mechanical Engineering are the main beneficiaries. Second, export insurance subsidies show a clear regional pattern. The Belgian subsidization policy systematically favors exports to Africa and Eastern Europe, while leaving insurance activities w.r.t. non-EC Western European exports in a break-even position.

The targeting of subsidies is not a typically Belgian phenomenon. On the contrary, Melitz and Messerlin (1987) provide evidence that targeting is at least as strongly present in the French and English subsidization policy. What is more, the different national agencies have been giving large subsidies to the same sectors.

III. THE MODEL

In this section, we model the effects of the export insurance subsidies granted by the Belgian official export agency. First, we develop a stylized theoretical model for Belgian export insurance. Subsequently, we analyze the impact of an increase in insurance premium rates which could be the result of an enforcement of the GATT-Subsidy-Code on Belgian export insurance.

A. *Assumptions and structure of the model*

We concentrate on the manufacturing industry consisting of a set of monopolistically competitive sectors. Each sector generates a fixed but large number of varieties of their respective basic products, implying that sectoral profits do not necessarily shrink to zero[1]. Production in each industry is distributed across countries of which the domestic

country is one (Belgium in our empirical application). Consumers are located in different countries but have identical tastes.

Firms of the domestic country are symmetric. Symmetry here refers to the fact that domestic firms have the same cost structure, are exposed to the same extent to the risk of non-payment, and behave identically under uncertainty. Price discrimination across markets is feasible. Moreover, firms consider the risk of non-payment in different markets as unrelated. Technically speaking, the distributions of risk in different markets are independent. These assumptions guarantee market segmentation. This allows us to treat each market separately and to focus exclusively on the impact of different insurance costs across destinations. As Belgian official export insurance is primarily directed towards less developed countries and Eastern Europe, the assumption of market segmentation appears acceptable.

To cover the risk of non-payment by foreign buyers, domestic firms can apply for official export insurance. The sequence of decisions can be described as a two-stage game. In a first stage, the official insurance agency decides on the premiums charged on contracts to the various export destinations and on the percentage of the contract it wants to insure. This stage is treated as exogenous in this model[2]. In a second stage, the firm determines its optimal output on the one hand, and the optimal share of risky exports to be insured on the other hand.

B. *Specification of the demand structure*

Demand for a particular variety of a specific good is derived from a two-stage optimization problem familiar from the work by Helpman and Krugman ((1985), (1989)). Let e_{ij} be expenditure in market j allocated to products of sector i. This expenditure level is derived from a global consumer utility maximization problem for a representative consumer in market j and is not considered here.

Suppose there are n firms in industry i, selling in market j. Demand in market j for a variety of industry i, x_{ij}, is found by maximizing the CES (sub)utility function U_j:

$$U_j = \left[\sum_{i=1}^{n} x_{ij}^{\beta} \right]^{1/\beta} \quad \text{with } \beta = 1 - \frac{1}{\sigma} \;, \quad \sigma > 1 \tag{1}$$

TABLE 2

Belgian export insurance: sectoral and regional subsidization rates as a % of eligible exports[a]

NACE	INDUSTRY	TOTAL	AFRICA	AMERICA	ASIA	WESTERN EUROPE	EASTERN EUROPE (EC excluded)	OTHER COUNTRIES[b]
221-223	Iron and Steel	0.57	1.58	0.77	0.29	-0.03	0.99	-0.05
224	Non-ferrous Metals	0.22	0.74	0.31	0.10	-0.02	0.44	-0.03
241-246	Building Materials	0.03	0.08	0.03	0.01	-0.00	0.04	-0.00
247	Glass	0.05	0.13	0.06	0.02	-0.00	0.13	-0.00
25	Chemical Industry	0.40	1.72	0.63	0.21	-0.02	0.55	-0.03
31	Metal Articles	3.15	5.74	5.23	1.86	-0.11	1.88	-0.53
32	Mechanical Engineering	1.26	3.59	1.59	0.65	-0.10	2.34	-0.12
33-34	Electrical Engineering	0.59	1.72	0.76	0.25	-0.05	1.39	-0.07
35-36	Transport	0.15	0.63	0.16	0.03	-0.02	1.90	-0.07
37	Instrument Engineering	0.27	0.82	0.39	0.12	-0.02	0.48	-0.05
411-423	Food	0.23	0.78	0.28	0.10	-0.02	0.66	-0.03
424-428	Beverages	0.44	1.17	0.60	0.23	-0.02	0.80	-0.02
429	Tobacco	0.01	0.03	0.01	0.01	-0.00	0.01	-0.00
43	Textiles	0.48	1.61	0.61	0.22	-0.02	1.10	-0.03
44	Leather	0.30	1.01	0.50	0.15	-0.01	0.63	-0.02
451-452	Footwear	0.00	0.00	0.00	0.00	-0.00	0.00	-0.00
453-454	Wearing Apparel	0.19	0.64	0.25	0.09	-0.01	0.39	-0.02
467	Furniture	0.26	0.79	0.39	0.13	-0.01	0.47	-0.02
473-474	Printing and Publishing	0.07	0.20	0.10	0.03	-0.01	0.12	-0.01
49	Other manufacturing industries	0.01	0.04	0.02	0.01	-0.00	0.01	-0.00
	TOTAL	0.38	1.53	0.50	0.15	-0.03	0.90	-0.06

[a] Subsidization rates are estimated as the difference between claims and premiums (1983-1988), expressed as a % share of non-EC Belgian exports.
[b] Including Australia, New Zealand and the Western Pacific islands.

Source: NDD (1983-1988), Annual Reports + own calculations.

for a given expenditure level e_{ij}. Dropping the industry subscript, we obtain demand for a representative variety in market j:

$$x_j = \frac{p_j^{-\sigma}}{P_j} e_j \qquad \text{with} \qquad P_j = \sum_{i=1}^{n} p_{ij}^{1-\sigma} \tag{2a}$$

or,

$$\ln x_j = -\sigma \ln p_j - \ln P_j + \ln e_j \tag{2b}$$

with p_j the market-specific price of a representative variety and P_j a sectoral price index of all varieties consumed in market j. If the home country is relatively small (as in the Belgian case), its national industry has no effect on the aggregate sectoral price level in market j. Therefore, it follows from (2b) that the perceived price elasticity of demand for a Belgian variety is equal to the constant elasticity of substitution in demand, σ.

C. *Decision behavior of the firm with insurance*

As mentioned earlier, only a minor part of total exports is insured. Firms thus differentiate between export contracts with "safe" and "risky" customers. Transactions with foreign buyers are considered risky if the firm is not certain to receive (full) payment for the delivered goods. Both groups of buyers are present in all export markets. For contracts with risky buyers, the firm considers whether to take insurance. No insurance is needed for export contracts with safe consumers.

1. The profit function of the individual firm with insurance

The profit maximizing objective is formulated in the same way as the hedging problem (Ethier (1973), Holthausen (1979), Katz and Paroush (1979) and Feder et al. (1980)). We introduce a stochastic variable $\tilde{\epsilon}_j$, standing for the share of the contract that will be paid. The subscript j indicates that this variable is specific for market j. e_j is uniformly distributed over the interval $[a_j,b_j]$, with $0<a_j<b_j<1$, and the boundaries of the interval are market dependent[3]. So, without insurance, profits amount to $(\tilde{\epsilon}_j P_j^r x_j^r - C_j)$, where x_j^r is the firm's risky export to market j, p_j^r is the corresponding price and C_j is the cost of pro-

duction. The production process is characterized by increasing returns to scale, or $C=a+cx_j^r$ (and a, c are constants)[4].

Firms can apply for export insurance provided by the government agency. The variable γ_j represents the share of risky contracts that is insured[5]. The insurance contract commits the agency to compensate the firm's losses incurred on the export contract, i.e., the claimed part $(1-\gamma_j)$. In return, the firm pays an insurance premium, which differs by region of export destination. So, depending on the category to which the country of destination is assigned, a different premium rate prevails. We assume that the charged premium rate (r_j, i.e., the premium rate per currency unit of risky exports) is fixed and therefore independent of the actually insured share of the risky export contract. Hence, the risky profit (p_j^r) function with insurance is equal to:

$$\tilde{\pi}_j^r = \tilde{\varepsilon}_j p_j^r x_j^r - C_j + (1-\tilde{\varepsilon}_j - r_j)\gamma_j p_j^r x_j^r \qquad (3)$$

We interpret $(1-\tilde{\epsilon}_j-r_j)$ as the net-claim rate on the insurance company, or the claim rate $(1-\tilde{\epsilon}_j)$ minus the charged premium rate (r_j).

Given a certain degree of profit variability, the firm maximizes expected profit generated by the risky exports. We adopt the following mean-variance expression for the expected utility function of the firm:

$$EV_j^r = E\tilde{\pi}_j^r - \frac{\lambda}{2} Var\tilde{\pi}_j^r \qquad \text{with}$$
$$Var\tilde{\pi}_j^r = (p_j^r x_j^r)^2 (1-\gamma_j)^2 v_j^2 \qquad (4)$$

EV_j^r and $E\tilde{\pi}_j^r$ respectively represent expected certainty-equivalent profits and expected profits, and λ stands for the firm's degree of risk aversion.

2. Optimal insurance coverage by the individual firm

Maximizing expected certainty-equivalent profits w.r.t. γ_j results in:

$$\gamma_j^* = 1 + \frac{1 - \varepsilon_j - r_j}{\lambda p_j^r x_j^r v_j^2} \tag{5}$$

We concentrate on the sign of $(1- \varepsilon_j - r_j)$ in expression (5) which determines whether the firm takes full, partial or no insurance at all. The enforcement of the GATT-Code implies an increase in the premium rate as to achieve equality with the claim rate (and thus $1-\varepsilon_j = r_j$). From (5) it is seen that when the official export insurance agency is in a break-even position (if $1-\varepsilon_j = r_j$) or when it is subsidizing exports (if $1-\varepsilon_j > r_j$), the optimum for the firm is to take full insurance [6]. For the policy experiment considered in this paper, we can therefore concentrate on the case of full insurance.

3. Price determination with insurance

To obtain the optimal pricing decision for risky contracts with full insurance, we maximize expected certainty-equivalent profits of the firm, EV_j^r, w.r.t. x_j^r. This yields:

$$p_j^r = \frac{\sigma}{\sigma - 1} \frac{c}{1 - r_j} \tag{6a}$$

or,

$$\ln p_j^r = \ln \sigma - \ln(\sigma - 1) + \ln c - \ln(1 - r_j) \tag{6b}$$

An increase in the insurance cost causes the price of insured (i.e., risky) exports to go up.

D. *Decisions of the firm for contracts without risk*

Now we turn to the firm's optimal decision w.r.t. safe contracts. Uncertainty disappears ($\tilde{\epsilon}_j = 1$) and insurance is not necessary ($\gamma_j = 0$). Hence, the firm's profit function (3) for safe contracts is reduced to

$p_j^s=(p_j^s-c)x_j^s$. The insurance cost is not relevant for the price decision of safe contracts and expression (6a) simplifies to $p_j^s=\frac{\sigma}{\sigma-1}c$.

IV. EFFECTS OF ENFORCING THE GATT-SUBSIDY-CODE

Now suppose that the GATT-Subsidy-Code is implemented and that the official insurance company is forced to raise the insurance premium rate. First, we derive the elasticity of the price of risky exports w.r.t. a one percentage point increase in the premium rate, given by:

$$\frac{d\ln p_j^r}{dr_j}=\frac{1}{1-r_j} \tag{7}$$

Next, we consider the effects on total sectoral exports to market j by home firms. In the sector considered, there are n_j^d identical domestic firms, selling x_j^r to risky buyers and x_j^s to safe buyers in market j. Defining $X_j=n_j^d(x_j^r+x_j^s)=X_j^r+X_j^s$ as total domestic exports to market j, we derive from (2b) and (7) that X_j declines when the premium rate increases:

$$\frac{d\ln X_j}{dr_j}=-\alpha_j^r\frac{\sigma}{1-r_j} \tag{8}$$

where α_j^r represents the share of risky contracts in total exports. Since only risky exports are affected by the increase in price (i.e., a_j^r % share of total contracts) and the perceived elasticity of demand is larger than one ($\sigma > 1$), the output effect dominates the price effect. Hence, an increase in the premium rate will lower sales of domestic exporting firms in market j:

$$\frac{d\ln(p_jX_j)}{dr_j}=-\alpha_j^r\frac{\sigma-1}{1-r_j} \tag{9}$$

This drop in sales is more outspoken if the share of risky exports in total contracts and the perceived price elasticity of demand are high.

Given that sales will decline as a result of an increase in the premium rate, profits will decrease as well. Since the premium rate only affects risky profits, expression (3) allows us to derive the effect on total industry profits of domestic firms exporting to market j as:

$$\frac{dE\tilde{\pi}_j}{dr_j} = \frac{dE\tilde{\pi}_j^r}{dr_j} = -p_j^r X_j^r \tag{10}$$

Finally, we define the expected subsidization cost for the government (ES_j), obtained as the subsidy per insured currency unit multiplied by insured amounts:

$$ES_j = (1-\varepsilon_j - r_j)\gamma_j p_j^r X_j^r \tag{11}$$

Knowing from (5) and (6a) that γ_j and p_j^r depend on r_j, we take the total derivative of expression (11) w.r.t. r_j and we obtain:

$$\frac{dES_j}{dr_j} = -p_j^r X_j^r \left[(1-r_j) + (\sigma - 1)\frac{1-\varepsilon_j - r_j}{1-r_j} \right] \tag{12}$$

Given that the price elasticity of demand is larger than one, a premium increase will induce a fall in the subsidization cost for the government, which will be large as the rate of subsidization and the price elasticity of demand are sufficiently high.

V. EMPIRICAL EVIDENCE ON THE EFFECTS OF BELGIAN EXPORT INSURANCE SUBSIDIZATION

In this section, we implement the model to analyze the effects of unilateral compliance of the GATT-Subsidy-Code by the Belgian official export insurance agency, NDD. In each sector and market, we raise the premium rate r_j to the level that guarantees equality between premium income and expected claims. As a measure for subsidization, we used the difference between accumulated claims and premiums for the period 1983-'88, as represented by Table 2. All variables were computed using data provided by the NDD.

The empirical implementation of the model requires estimates of the elasticity of substitution and the share of risky contracts in exports. Table 3 reflects values for both variables. As a proxy for σ, sectoral price elasticities of import demand as estimated by Deardorff and Stern ((1990), Table 3.2) are used. This choice is justified by two features of our model. First, σ measures the elasticity of substitution between (any group of) varieties of the same industry product and hence also captures the substitution between imported and home products.

Moreover, individual exporting firms perceive σ as the price elasticity for their products on third markets. The highest values for σ are noted in the Wearing Apparel sector, Metal Articles and Transport, with estimates higher than three.

In order to assess the riskiness of the selected industries, the second part of Table 3 expresses risky contracts as a percentage share of industry exports. Although in most industries risky exports do not exceed 10 % of total exports, they are vital to the Metal Articles sector, covering 65 % of all contracts. When risky contracts are regionally disaggregated, more or less the same risk categorization is revealed.

Tables 4 and 5 summarize our results. Table 4 provides a sectoral break-up of the reductions in government expenditures on the one hand, and presents sectoral changes in production and sales both for insured exporters and the industry as a whole on the other hand. Finally, Table 5 measures the changes in Belgian export sales disaggregated by region of destination.

TABLE 3

NACE	INDUSTRY	σ[a]	Risky contracts[b](%)				
			TOTAL	AFRICA	NORTH & SOUTH AMERICA	ASIA	EASTERN EUROPE
221-223	Iron and Steel	1.42	0.11	0.19	0.08	0.17	0.16
224	Non-ferrous Metals	1.38	0.04	0.08	0.04	0.06	0.08
241-246	Building Materials	2.00	0.01	0.01	0.00	0.01	0.01
247	Glass	1.60	0.01	0.02	0.01	0.02	0.01
25	Chemical Industry	2.53	0.08	0.19	0.07	0.12	0.08
31	Metal Articles	3.59	0.65	0.68	0.58	0.69	0.27
32	Mechanical Engineering	1.02	0.24	0.43	0.18	0.35	0.37
33-34	Electrical Engineering	1.00	0.13	0.25	0.09	0.20	0.21
35-36	Transport	3.28	0.04	0.10	0.02	0.08	0.41
37	Instrument Engineering	1.08	0.05	0.09	0.05	0.07	0.11
411-423	Food	1.13	0.05	0.10	0.03	0.06	0.07
424-428	Beverages	1.64	0.09	0.14	0.06	0.14	0.11
429	Tobacco	1.13	0.00	0.00	0.00	0.00	0.00
43	Textiles	1.14	0.10	0.20	0.07	0.13	0.15
44	Leather	1.58	0.06	0.12	0.05	0.09	0.10
451-452	Footwear	2.39	0.00	0.00	0.00	0.00	0.00
453-454	Wearing Apparel	3.92	0.03	0.06	0.03	0.04	0.05
467	Furniture	3.00	0.05	0.10	0.04	0.09	0.07
473-474	Printing and Publishing	2.85	0.02	0.03	0.01	0.03	0.02
49	Other manufacturing industries	2.06	0.00	0.00	0.00	0.00	0.00

[a] σ is the sectoral price elasticity of import demand as estimated by Deardorff and Stern (1990).

[b] Since subsidization implies that risky contracts are fully insured, insured contracts have been used as a proxy for risky contracts.

Source: NDD (1983-1988), Annual Reports + own calculations.

TABLE 4

Belgian export insurance: cost savings, output and sales effects[a] of a subsidy removal

NACE	INDUSTRY	GOVERNMENT		TOTAL INDUSTRY		INSURED EXPORTERS			
		Cost savings		Profit effect		Output effect	Sales effect	Output effect	Sales effect
		millions of ECU	as a % share of exports	millions of ECU	as a % share of exports	as a % share of exports		as a % share of exports	
221-223	Iron and Steel	-35.6	-0.57	-35.6	-0.57	-0.81	-0.24	-7.25	-2.14
224	Non-ferrous Metals	-5.4	-0.22	-5.4	-0.22	-0.31	-0.08	-7.11	-1.96
241-246	Building Materials	-0.0	-0.03	-0.0	-0.03	-0.05	-0.03	-9.28	-4.64
247	Glass	-0.4	-0.05	-0.4	-0.05	-0.07	-0.03	-7.54	-2.83
25	Chemical Industry	-39.3	-0.40	-39.0	-0.40	-1.01	-0.61	-13.02	-7.87
31	Metal Articles	-57.8	-3.41	-53.4	-3.41	-11.39	-8.22	-17.50	-12.62
32	Mechanical Engineering	-101.1	-1.26	-101.1	-1.26	-1.30	-0.03	-5.32	-0.10
33-34	Electrical Engineering	-23.5	-0.59	-23.5	-0.59	-0.60	-0.00	-4.66	-0.00
35-36	Transport	-12.3	-0.15	-12.2	-0.15	-0.48	-0.34	-12.65	-8.80
37	Instrument Engineering	-2.1	-0.27	-2.1	-0.27	-0.29	-0.02	-5.38	-0.40
411-423	Food	-9.8	-0.23	-9.8	-0.23	-0.27	-0.03	-5.42	-0.62
424-428	Beverages	-0.3	-0.44	-0.3	-0.44	-0.73	-0.28	-8.45	-3.30
429	Tobacco	-0.0	-0.01	-0.0	-0.01	-0.01	-0.00	-6.87	-0.79
43	Textiles	-19.6	-0.48	-19.6	-0.48	-0.55	-0.07	-5.76	-0.71
44	Leather	-0.6	-0.30	-0.6	-0.30	-0.48	-0.18	-7.78	-2.86
451-452	Footwear	-0.0	-0.00	-0.0	-0.00	-0.00	-0.00	-15.40	-8.96
453-454	Wearing Apparel	-0.6	-0.19	-0.6	-0.19	-0.76	-0.56	-21.83	-16.26
467	Furniture	-1.0	-0.26	-1.0	-0.26	-0.79	-0.53	-14.53	-9.68
473-474	Printing and Publishing	-0.2	-0.07	-0.2	-0.07	-0.21	-0.13	-13.30	-8.63
49	Other manufacturing industries	-2.4	-0.01	-2.4	-0.01	-0.02	-0.01	-9.39	-4.83
	TOTAL	-315.1	-0.39	-310.2	-0.39	-0.02	-0.01	-9.39	-4.83

[a] The output effect reflects the impact on real production, while the sales effect is the combination of price and output effects.

TABLE 5

Belgian export insurance: regional sales effects[a] of a subsidy removal (in %)

NACE	INDUSTRY	AFRICA	AMERICA	ASIA	EASTERN EUROPE
221-223	Iron and Steel	-0.67	-0.33	-0.12	-0.42
224	Non-ferrous Metals	-0.28	-0.12	-0.04	-0.17
241-246	Building Materials	-0.09	-0.03	-0.01	-0.04
247	Glass	-0.08	-0.03	-0.01	-0.08
25	Chemical Industry	-2.66	-0.97	-0.33	-0.85
31	Metal Articles	-14.99	-13.62	-4.86	-4.89
32	Mechanical Engineering	-0.07	-0.03	-0.01	-0.05
33-34	Electrical Engineering	-0.00	-0.00	-0.00	-0.00
35-36	Transport	-1.46	-0.38	-0.07	-4.41
37	Instrument Engineering	-0.07	-0.03	-0.01	-0.04
411-423	Food	-0.10	-0.04	-0.01	-0.09
424-428	Beverages	-0.75	-0.39	-0.15	-0.51
429	Tobacco	-0.00	-0.00	-0.00	-0.00
43	Textiles	-0.23	-0.09	-0.03	-0.15
44	Leather	-0.59	-0.29	-0.09	-0.37
451-452	Footwear	-0.00	-0.00	-0.00	-0.00
453-454	Wearing Apparel	-1.89	-0.72	-0.28	-1.15
467	Furniture	-1.60	-0.78	-0.25	-0.96
473-474	Printing and Publishing	-0.37	-0.19	-0.06	-0.23
49	Other manufacturing industries	-0.04	-0.02	-0.01	-0.01

a Sales effects refer to the industry as a whole.

Six interesting findings emerge from our policy experiment:

1. The subsidy policy is costly for the government. As indicated by the first column of Table 4, compliance with GATT-rules cuts the Belgian budget deficit by a total of 315 millions of ECU. In absolute amounts, the transfers to Iron and Steel, Chemicals, Metal Articles, Mechanical and Electrical Engineering would decline most and exceed 23 millions of ECU in each of those industries. Depending on the sector involved, the Belgian government would save on average 0.38 ECU on every hundred ECU exported. These figures are similar to the subsidy rates found in Table 2 but not necessarily equal as they capture both a subsidy removal on existing contracts and the decline in risky Belgian exports as a result of the higher premium rates (for instance, the difference for the Metal Articles industry).
2. The subsidy policy benefits the *insured* firms. In the third and fourth column of Table 4, we see that an elimination of subsidies would lower profits of insured exporting firms by about the same magnitude as it would reduce government expenditures. The largest profit losses are concentrated in the sectors that receive most of the NDD's export insurance subsidies (i.e., Chemicals, Metal Articles, Mechanical and Electrical Engineering). We conclude that in virtually all industries profit losses are slightly insufficiently severe to compensate the reduction in government expenditure. This is inherent to any form of trade intervention for small open economies, where subsidies only induce a deadweight loss in the form of increased exports, implying a net-welfare loss for the subsidizing economy as a whole

Yet, the provided subsidies help to preserve the position of domestic exporters in foreign markets. The output adjustments in the one but last column of Table 4 support this argument by illustrating the disruptive effects for insured exporters of a subsidy removal. In all sectors, output of insured exporting firms would decline by more than 5 %. In Chemicals, Metal Articles, Transport Equipment, Footwear, Wearing Apparel, Furniture, and Printing and Publishing, the output concentration exceeds 10 %. It is possible that output changes of this magnitude would entail major employment adjustments in exporting firms. It should be stressed that this is only true if the previously provided export insurance subsidies are not substituted by an increase in

domestic tied aid programs to these markets. If this substitution occurs, the effect on domestic exports will be less severe and so will the need for employment adjustments.

The impact on sales of insured exporters (last column of Table 4) is less pronounced because exporting firms charge higher prices after the subsidy removal, hereby compensating part of their declining market share. Nevertheless, insured exporters of the sectors indicated above experience a reduction in sales of 7.8 % or more.

3. In almost all sectors the beneficiaries of export insurance subsidies are a limited well-defined set of exporting firms with risky export contracts. This is seen by comparing the total industry output and sales effects in columns five and six of Table 4 with the impact of insured exporters only. Adjustments for the whole industry are obtained by weighing the effects for insured exporters by the share of insured contracts in total industry export contracts. In all but one sectors the industry output and sales adjustments amount to less than one and a half percent. The notable exception is the Metal Articles industry which would experience a 11.39 % output and a 8.22 % sales reduction in the event of an implementation of international agreements on Belgian export insurance. This is not surprising since this sector was characterized earlier as the main recipient of export insurance subsidies with almost two thirds of its export contracts officially insured.
4. Sectoral patterns are maintained in the regional disaggregation of the total industry sales effects presented in Table 5. Industries that benefit from subsidization in one market generally do so in other markets as well. Yet, exports to Africa and Eastern Europe would suffer more from compliance with international regulations than Belgian sales in Asia and the American continent. Note that exports to non-EC Western European countries are not considered in Table 5. As seen in Table 2, insurance premium rates on those exports suffice to cover claims so that the GATT-Subsidy-Code is respected. To the extent that premium income from these contracts is used to cross-subsidize exports to other markets, insured companies exporting to non-EC Western European countries may even advocate an enforcement of GATT-rules.
5. Specific importers of Belgian products would be hurt by an export insurance subsidy removal in Belgium. The sales effects in Table 4 and 5 measure how much consumers are paying more to buy Belgian exports. Compliance with GATT will face importers with doubt-

ful credit-ratings with rapidly rising prices for Belgian products as Belgian exporters pass through steeply increasing premium rates. Only part of these price increases can be offset by switching to substitutes produced by other than Belgian firms. High-risk importers in Africa and North and South America buying Metal Products and certain other Belgian products appear particularly vulnerable.

6. Belgian export insurance subsidization reinforces the outspoken regional targeting in official development aid. We argued earlier that export insurance schemes often are contained in the government's policy on official development assistance (ODA). Export insurance subsidies are then viewed as a form of ODA. Because exporters of each variety of manufactures have some market power in the importing country, a subsidy induced premium decrease will lower the import prices of the varieties involved (see expression (7)) and expand sales (see expression (9)). This type of ODA benefits consumers in developing countries only to the extent that they purchase the subsidized varieties. Yet, unlike tied aid, it affects sales only through the market demand prevailing in the importing country. Since they are usually designed for regions classified in the highest default of payment risk categories, insured exporters to high-risk regions are likely to experience significant gains in sales by these ODA-programs.

TABLE 6

A regional disaggregation of grant elements implied in Belgian state-to-state credits (1964-1988)

	Grants (in millions of BEF and in % shares)		Grants as a % share of state-to-state credits
Total	41887	76.09	
of which (% shares):			
Africa		29.41	78.97
Asia		55.09	76.90
Central and South America		4.24	69.74
Western Europe		0.07	37.14
Eastern Europe		11.18	68.75

Source: Abraham (1990), p. 68.

Table 6 presents regional figures on the grant elements embodied in state-to-state credits, which is a form of official development aid.

As can be seen from the first column, the regional division of grants (1964-1988) is significantly biased in favor of Asian and African countries. More specifically, grants to these countries almost cover 85 % of total grants. It has been shown that precisely these regions are also the main beneficiaries of export insurance subsidies.

VI. CONCLUSION

This paper estimated the sectoral and regional impact of Belgian official export insurance subsidies. To do so, we developed a partial equilibrium, multi-sector and multi-region model with product differentiation and market segmentation. The model pays detailed attention to the institutional and regulatory framework of export insurance. On each market, exporting firms determine prices and output and decide on the optimal insurance coverage on their risky contracts. The official insurance agency provides subsidies in the form of premia below expected claim levels. Such subsidies are not allowed under the GATT-Subsidy-Code.

Official export insurance subsidization displays some key features of the use of export subsidies. By not complying to GATT-rules, the Belgian official agency is involved in selectively subsidizing insured firms in specific industries, exporting to specific destinations. This policy is costly in budgetary terms, but significantly benefits profits, production and sales levels of the insured exporters as well as the importers of the insured Belgian export goods. The subsidy policy is however not strategic in the sense that it achieves any welfare gains. On the contrary, congruent to the theoretical literature on trade policy for small open economies, Belgian export insurance subsidization engenders a small welfare loss for the economy, due to the deadweight loss effect of the envisaged policy.

Our findings further suggest that reverting targeted subsidy policies may not be an easy task. In contrast to more general subsidization schemes, export insurance subsidies matter a lot for the selected few and therefore create vested interests. In the Belgian case, we would expect strong opposition by the Metal Articles industry supported by the officially insured companies exporting Chemicals, Transport Equipment, Footwear, Wearing Apparel, to mention just a few. This coalition is likely to be joined by representatives from the importing countries. Since the government of the importing countries usually participate in some form in officially insured export transac-

tions to Africa and Eastern Europe, a control of Belgian export insurance subsidies would easily take on a wider political dimension. The fact that state-to-state official development assistance is marked by a similar regional pattern as export insurance subsidies, only reinforces the conclusion. For all of these regions, one should not expect a voluntary unilateral compliance with the GATT-Code by the Belgian official export insurance agency in spite of the budgetary savings involved.

This leaves a multilateral enforcement in the framework of GATT, the EC or even the OECD as the way forward if subsidy control is the ultimate objective. The effects of compliance with the GATT-Subsidy-Code by all trading partners lies beyond the scope of this paper, but represents an important extension in the light of the strategic trade literature. Provided that the required data can be obtained, future work intends to address this issue.

This paper can be improved on other counts. First, market segmentation is maintained, implying independent default of payment distributions across markets. Secondly, we ignore problems of adverse selection by assuming that the agency is capable of differentiating between safe and risky export contracts. Thirdly, a full general equilibrium analysis is lacking. Finally, the behavior of the official export insurance agency was treated as exogenous. Interactions between the official agency and the firm taking insurance are therefore not considered.

NOTES

1. The main purpose of this model is to determine how dramatic an export insurance subsidy ban is for each sector. If entry is considered, this effect is translated into a change in market shares of domestic exporting industries. If, like in our model, the number of varieties produced in each sector is fixed, a subsidy removal affects export profits of domestic firms. Although not perfectly equivalent, the relative order of magnitude should be the same in both scenarios.
2. Endogenizing this stage would redirect the attention from the positive analysis of export insurance subsidization to the normative question of optimal premium rating, which is an issue surpassing the scope of this paper.
3. Alternatively, the stochastic variable could also be captured by a truncated normal distribution on $]a_j,b_j[$ with $N(e_j,v_j^2)$.
4. Together with the assumption of independent default of payment distributions, the fact that the marginal cost of production, c, is constant, allows us to solve our problem for complete market segmentation, which makes consumer surplus in the domestic country irrelevant to our solution.
5. We only consider one risk category of export contracts. Differentiating between various risk categories by assuming a regional distribution of default of payment distributions would introduce a problem of adverse selection into our model, disabling us from calculating the expected sectoral effects of a non-subsidization regime.

6. Even if $1 - \varepsilon_j > r_j$, $\gamma^*_j = 1$, because $0 \leq \gamma_j \leq 1$. Still, this would not be the case if the insurance market would be incomplete due to information asymmetries, such as problems of adverse selection and moral hazard. Since the purpose of this paper lies not in the study of the effects of such asymmetries on export prices, a perfectly efficient export insurance market is assumed.

REFERENCES

Abraham, F., 1990, The Effect on Intra-Community Competition of Export Subsidies to Third Countries. The Case of Export Credits, Export Insurance and Official Development Assistance, (Commission of the European Communities), 138.

Abraham, F., Couwenberg, I. and Dewit, G., 1992, Towards an EC Policy on Export Financing Subsidies: Lessons from the 1980's and Prospects for Future Reform, *World Economy*, 15, 3, 389-405.

Brander, A.J. and Spencer, B.J., 1985, Export Subsidies and International Market Share Rivalry, *Journal of International Economics*, 18, 83-100.

Commission of the European Communities 1990, Second Survey on State Aids in the European Communities, (Brussels).

Deardorff, A.V. and Stern, R.M., 1990, Computational Analysis of Global Trading Arrangements, (University of Michigan Press, Ann Arbor), 389.

Dixit, A.K., 1988, Optimal Trade and Industrial Policies for the US Automobile Industry", in Feenstra, R., 1988, Empirical Methods for International Trade, (MIT Press), 322.

Eaton, J. and Grossman, R.M., 1986, Optimal Trade and Industrial Policy under Oligopoly, *Quarterly Journal of Economics*, 386-406.

Ethier, W., 1973, International Trade and the Forward Exchange Market, *American Economic Review*, 63, 494-503.

Feder, R.E. and Schmitz, A., 1980, Futures Markets and the Theory of the Firm under Uncertainty, *Quarterly Journal of Economics*, 94, 317-328.

Ford, R. and Suyker, W., 1990, Industrial Subsidies in the OECD Economies, OECD Economics and Statistics Department Working Papers.

Gasiorek, M., Smith, A. and Venables, A.J., 1991, Completing the Internal Market in the EC: Factor Demands and Comparative Advantage, in Winters, L.A. and Venables, A.J., 1991, European Integration: Trade and Industry, (Cambridge University Press), 9-29.

Helpman, A. and Krugman, P., 1985, Market Structure and Foreign Trade. Increasing Returns, Imperfect Competition, and the International Economy, (MIT Press), 271.

Helpman, A. and Krugman, P., 1989, Trade Policy and Market Structure, (MIT Press), 191.

Holthausen, D.M., 1979, Hedging and the Competitive Firm and Price Competition", *American Economic Review*, 69, 989-995.

Jepma, C.J., 1991, EC-Wide Untying, International Development Economics, (Groningen), 78.

Katz, E. and Paroush, J., 1979, The Effect of Forward Markets on Exporting Firms, *Economic Letters*, 4, 271-274.

Krishna, K., Hogan, K. and Swagel, Ph., 1989, The Non-Optimality of Optimal Trade Policies: the US Automobile Industry Revisited, 1979-1985, NBER Working Paper no 3118, 36.

Melitz, J. and Messerlin, P., 1987, Subventions à l' exportation et objectifs macro-économiques: la France et la Grande-Bretagne, *Revue française d' économie*, autumn 1987, II, 4.

Richardson, J.D., 1992, New Trade Theory and Policy a Decade Old: Assessment in a Pacific Context, NBER Working Paper 4042.