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Working Paper

Measuring national interests in the international coffee agreement

Kiel Working Papers, No. 288

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Suggested citation: Herrmann, Roland (1987) : Measuring national interests in the international coffee agreement, Kiel Working Papers, No. 288, <http://hdl.handle.net/10419/47195>

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Kieler Arbeitspapiere Kiel Working Papers

Working Paper No. 288

Measuring National Interests in the
International Coffee Agreement

by

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ISSN 0342 - 0787

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May 1987

A 91910/87
Weltwirtschaft
Kiel

- * Research underlying this article was mainly carried out while the author was a visiting scholar at the Food Research Institute, Stanford University. Thanks are due to the participants of the Food Research Institute Seminar for very helpful comments on first results on the subject.
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1. Introduction

Many studies on international commodity market intervention concentrate on the policy's impact on country groups, such as the exporting countries or the developing countries (e.g. Behrman, 1978a; Behrman, 1978b; Nguyen, 1980). Only a few studies emphasize that national impacts may differ significantly from the aggregate impact (for exceptions, see Koester, 1979; Lord, 1981; Newbery/Stiglitz, 1981, section 20). These studies, however, focus only on buffer stocks and on a purely price-stabilizing mechanism. Moreover, they analyze national impacts from a theoretical ex-ante point of view. In assuming a hypothetically functioning stabilization agreement, they do not provide sufficient insight into the economics of existing commodity agreements. The International Coffee Agreement (ICA), which is analyzed here, is not a pure stabilization mechanism but raises prices and includes redistributive elements. Additionally, it is based on export quotas and not on buffer stocks.

This article shows how national interests in price-changing international commodity agreements can be measured. Two approaches are distinguished. Firstly, changes in national interests can be measured that are caused by the introduction of an international commodity agreement in an otherwise unregulated world market. This approach is based on a comparison of the situations with and without a commodity agreement. It represents a positive approach to measuring national interests. Secondly, changes in national interests can be measured that result from the individual country's decision to participate in the agreement or to stay outside. This approach compares the situation of participation with that of non-participation in an existing commodity agreement. As the consequences of a national decision are analyzed, it is a normative or decision-oriented approach to measuring national interests. The ICA is a particularly interesting scheme to show the two approaches, as some countries participate in the agreement while others do not. This has led to the co-existence of a controlled and an uncontrolled market with different prices.

The article is organized as follows. Section 2 gives some basic information about the rules of the ICA. Section 3 presents the theoretical basis for the positive and the decision-oriented approach of measuring national interests in this agreement. In section 4, national interests of individual importing member countries, importing non-member countries and exporting member countries in the ICA are computed using data for 1982 and 1983. In section 5, the sensitivity of the results with respect to various assumptions is discussed. The results are summarized in section 6, where proposals for future research are given, too.

2. Basic Rules of the 1983 International Coffee Agreement

The ICA of 1983 has the same stated objectives as the preceding agreements¹. It is supposed, among other objectives, to

- avoid excessive fluctuations in the levels of world supplies, stocks and prices which are harmful to both producers and consumers (Art. 1, § 2);
- increase the purchasing power of coffee-exporting countries (Art. 1, § 4).

Hereby, a stabilizing and a redistributive function is attributed to the ICA. The redistributive element is to be created by increasing consumption and by realizing prices that are remunerative to producers, fair to consumers and lead to a long-term equilibrium between production and consumption (Art. 1, §§ 1 and 4).

With respect to its long lifetime, the ICA is often evaluated as rather successful (e.g., Vogt 1984, p. 25). This positive evaluation is based on the stabilizing role of the agreement. However, the ICA is based on an export quota policy which is suitable for price support rather than for pure price stabilization. It includes a mechanism to increase prices, as exports in the regulated market can be restricted. It does not include, however, a mechanism for lowering prices in boom periods. There is no instrument available to enforce export quantities in the coffee market that are higher than voluntary exports. Therefore, the quota scheme is not a price-stabilization device that can reduce price fluctuations in both directions around an equilibrium price², but is mainly a redistributive policy instrument that increases the world market price in periods of depression³.

Chart 1 contains detailed information on the major rules of the 1983 ICA. The basic elements of the export quota policy are:

Chart 1: Major Provisions of the Export Quota Scheme in the 1983 International Coffee Agreement^a

| Subject | Provisions |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Setting of quotas: | <p>If the quota rule is in effect, the Coffee Council will set an annual global quota for all the exporting member countries. Annual country quotas are also set according to the following rule. The quotas for exporting member countries entitled to a basic quota shall have a fixed and a variable part (Art. 35, § 2). The fixed part shall correspond to 70% of the global annual quota and the variable part to 30%. The fixed part of the national quota, the basic quota, is fixed by the International Coffee Council (Art. 30, § 2). The variable part shall be distributed over exporting members in the proportion of verified national stocks to the total verified stocks of all exporting member countries (Art. 35, § 2). Some smaller exporting members are not entitled to a basic quota. The sum of their annual quotas shall be 4.2% of the annual global export quota and the shares for national quotas are fixed (Art. 31, § 2; Annex 2). Burundi and Rwanda have annual export quotas fixed in absolute terms (Art. 31, § 6).</p> |
| Price rules: | <p>Quotas continue to be in effect and are suspended according to the difference between the composite indicator price and target prices fixed by the Coffee Council (Art. 33, §§ 1,2; Art. 38, §§ 1,2). The composite indicator price is defined as the arithmetic mean of the indicator prices for other Arabicas and Robustas, e.g. quotas continue to be in effect at the commencement of the coffee year if the fifteen-day moving average of the composite indicator price is at or below the highest price for the upward adjustment of quotas in the price range established for the preceding coffee year.</p> |
| Control of the quota system: | <p>The quota regulations are controlled at the border of the importing member country. Each export of coffee by members shall be covered by a valid certificate of origin (Art. 43, § 1). Re-exports have to be covered by a valid certificate of re-export (Art. 43, § 2). If quotas are in effect, members shall prohibit the import of any shipment of coffee which is not accompanied by a valid certificate of origin (Art. 47, § 7). Exempt from this rule is the so-called "tourist coffee" (Art. 47, § 8).</p> |
| Region of validity of the quota scheme: | <p>The world coffee market is separated into a member market and a non-member market (Art. 29). There are no quotas for exporting members in the non-member market (Art. 44, § 1). Whenever quotas are in effect, each member shall limit its annual imports from non-member countries to an average level of past years (Art. 45, § 1).</p> |

^a The provisions are supposed to show a broad picture of the ICA from 1983. There are qualifications to be made on individual rules which can be found in the agreement's text.

Source: Own compilation on the basis of International Coffee Organization (1982), *passim*.

1. The International Coffee Council will set a global annual export quota as well as annual and quarterly export quotas for exporting member countries, if the composite price for coffee is lower than a specified price level. The quotas are valid for the market of the importing member countries. The importing member countries control the export quota scheme at their borders on the basis of certificates of origin.

2. The international coffee market is separated by the quota regulation into a controlled and an uncontrolled market. No quota rule is enforced for the market of non-member importing countries. There is only an indirect sanction for selling oversupply to the uncontrolled market as these deals lower, *ceteris paribus*, the future variable part of the export quota in the regulated market.

3. Theoretical Basis for Measuring National Interests in a Price-changing Commodity Agreement

If national interests in an international commodity agreement are to be measured, the determinants of national interests have to be specified first. It is assumed here that national interests will be influenced if the realization of national economic objectives is affected by the agreement. National interests will be identified in welfare terms and in financial terms. Firstly, it is assumed that the national interests of a country will be positively (negatively) influenced if its economic welfare increases (decreases) due to the agreement. Secondly, it is assumed that the national interests of a country will be positively (negatively) influenced if its import expenditures decrease (increase) or its export earnings increase (decrease). Only those welfare and financial impacts are taken into account which arise from the agreement's effect on the price level and the consequential effects on trade of the regulated commodity.

3.1 A positive approach to measuring national interests

International commodity agreements in which only some countries participate lead to a market separation between a controlled and an uncontrolled market, usually with different market prices. Abstracting from quality and transport cost differences, a hypothetical situation without agreement would be characterized by a uniform world market price. The positive approach to measuring national interests compares these situations with and without the commodity agreement from a national point of view.

Let us analyze the national interests of three different countries: an importing member country, an importing non-member country, and an exporting member country. The welfare impact⁴ of an international commodity agreement on the importing member country can be measured as

$$(1) \quad \Delta W_i = \int_{p_M}^{p^*} ID_i(p) dp \quad \geq 0, \text{ if } p_M \leq p^*.$$

The welfare impact on the importing non-member country is

$$(2) \quad \Delta W_j = \int_{p_N}^{p^*} ID_j(p) dp \quad \geq 0, \text{ if } p_N \leq p^*,$$

and the welfare impact on the exporting member country is

$$(3) \quad \Delta W_k = (p_M - p^*) \bar{q}_k - \int_{p_M, \bar{q}_k}^{p^*} \{ES_{Mk}^*(p) - \bar{q}_k\} dp \\ + \int_{p_M, \bar{q}_k}^{p_N} \{ES_{Nk}(p)\} dp.$$

ΔW symbolizes the absolute change in economic welfare, M the member market, and N the non-member market. i indicates an individual importing member country, j an individual importing non-member country, and k an individual exporting country. p is a price, \bar{q}_k is the fixed national export quota, ID is an import demand curve, and ES is an export supply curve. * symbolizes the hypothetical situation without agreement. p_M, \bar{q}_k is the market price at which the exporting country would supply the national export quota voluntarily.

The financial impact of the agreement on the importing member country is

$$(4) \quad \Delta I_i = p_M q_i^{ID} - p^* q_i^{ID*},$$

and the impact on the importing non-member country is

$$(5) \quad \Delta I_j = p_N q_j^{ID} - p^* q_j^{ID*}.$$

The financial impact on the exporting country which sells both to the controlled and the uncontrolled market is:

$$(6) \quad \Delta E_k = p_M \bar{q}_k + p_N q_{Nk}^{ES} - p^* q_k^{ES*}.$$

I is import expenditures, E is export earnings, q^{ID} is the imported quantity, and q^{ES} is the exported quantity. All other symbols remain unchanged.

The positive approach to measuring national interests in international commodity agreements compares the situation with agreement with the hypothetical situation without agreement. It is the traditional way of measuring national impacts of an international policy measure. However, the traditional approach mostly does not contain the relevant comparison from a decision-oriented point of view of an individual country. Given an existing international commodity agreement, a country cannot usually restore the situation of a liberalized world market by itself. Analogously, in the case of a liberalized world market, the individual country will usually not be in the position of introducing an international commodity agreement by itself. Hence, the positive approach is mainly a tool of descriptive policy analysis by comparing an existing situation with a hypothetical situation that is exogenous to the country.

3.2 A decision-oriented approach to measuring national interests

The second approach to measuring national interests takes a decision-oriented viewpoint. Given an existing international commodity agreement, a country can decide whether it wants to participate in the agreement or not. The decision-oriented approach compares the realization of national objectives with and without participation in the agreement.

The welfare impact arising from the decision to participate in the agreement for the importing member country i can be measured as

$$(7) \quad \Delta W_i = \int_{p_M}^{p_N^*} ID_i(p) dp \quad \geq 0, \text{ if } p_M \leq p_N^* .$$

The financial impact of the decision to participate is for this country:

$$(8) \quad \Delta I_i = p_M q_{Mi}^{ID} - p_N^* q_{Ni}^{ID*} .$$

p_N^* is the hypothetical price in the non-member market which would have been valid if the importing member country left the agreement and entered the non-member market. q_{Ni}^{ID*} is the corresponding quantity which would have been imported by the member country i if it left the agreement.

For the importing non-member country, the welfare impact arising from the decision to stay outside the agreement compared with an entry is characterized by

$$(9) \quad \Delta W_j = \int_{p_N}^{p_M^*} ID_j(p) dp \geq 0, \text{ if } p_N \leq p_M^* .$$

The financial impact of the decision for an outsider status is for this country

$$(10) \quad \Delta I_j = p_N q_{Nj}^{ID} - p_M^* q_{Mj}^{ID*} .$$

p_M^* is the hypothetical price in the member market which would have been valid if the importing non-member country joined the agreement. q_{Mj}^{ID*} is the corresponding quantity which the non-member country j would have imported in the case of joining the agreement.

The welfare effect for an exporting member country k arising from its decision to participate in the agreement can be measured as:

$$(11) \quad \Delta W_k = \int_{p_{Mk}}^{p_M} ES_{Mk}(p) dp + \int_{p_M, \bar{q}_k}^{p_N} ES_{Nk}(p) dp - \int_{p_{Mk}}^{p_{Nk}^*} ES_{Nk}^*(p) dp .$$

The financial impact of the decision to participate in the agreement is for the exporting member country:

$$(12) \Delta E_k = p_M \bar{q}_k + p_N q_{Nk}^{ES} - p_{Nk}^* q_{Nk}^{ES*} .$$

p_{Mk} is the minimum export price at which the exporting member country starts to export the commodity. p_{Nk}^* is the hypothetical price in the non-member market which would have occurred if the exporting member country left the agreement and offered its total export supply on the non-member market. ES_{Nk}^* is the export supply curve and q_{Nk}^{ES*} the exported quantity of country k on the non-member market in this hypothetical situation.

In order to measure national interests from the equations (1) to (12), it is additionally necessary to specify supply and demand functions for the market under quotas. The following empirical analysis is based on the assumption of loglinear supply and demand functions.

4. Identifying National Interests in the International Coffee Agreement: Empirical Results for 1982 and 1983

The theoretical approach to measuring national interests in the ICA will now be quantified for 1982 and 1983. These years have been chosen because (i) the parallel-market problem showed up in the 1980's, and (ii) 1982 and 1983 were the first years in which the quota regulation prevailed permanently⁵. The equations (1) to (12) form the basis for the empirical analysis. These equations contain observables as well as unobservables. Generally, the variables characterizing the existing situation with agreement can be taken from published sources (FAO; International Coffee Organization 1983, 1985). However, the prices and quantities in the hypothetical situations (marked by *) cannot. Some of the unobservable variables are taken from an empirical study on the aggregate impacts of the ICA on the world market price, world trade, world import expenditures and export earnings (Herrmann, 1986). One basic result of this study is that the price in the controlled coffee market increased due to policy by 47.4% in 1982 and by 16.7% in 1983. The actual price in the uncontrolled was generally lower than in the controlled market. It was higher by 11.3% than the hypothetical world market price in 1982, whereas it was lower by 27.2% than the hypothetical price in 1983⁶. The calculated hypothetical price in a liberalized world coffee market is taken from this study and will be used in the positive approach for all countries. Moreover, the average prices in the member market and in the non-member market are used as actual prices for all countries in the positive and in the decision-oriented approach. This procedure implies that the law of one price is imposed on price formation in the coffee market.

4.1 Importing non-member countries

The measurement of national interests in the ICA is based on the equations (2), (5), (9) and (10) for the importing non-member countries. In these equations, the unobservables q_j^{ID*} , p_M^* and q_{Mj}^{ID*} have to be quantified besides p^* . The hypothetical import demand (q_j^{ID*} , q_{Mj}^{ID*}) is calculated on the basis of point estimates

for price elasticities of import demand that are taken from our own econometric estimations of import demand functions⁷. For p_M^* , the following assumption is made: $p_M^* = p^*$. This implies that the current price in the controlled coffee market would still be valid if the importing non-member country joined the agreement. The assumption characterizes an export quota policy that is used as a means for realizing a target price⁸.

The empirical analysis shows that the results are significantly influenced by the approach to measuring national interests in the ICA. This holds true for the measurement of national interests in financial and in welfare terms. The following major results can be derived from Tables 1 and 2:

1. On average for 1982 and 1983, the importing non-member countries that imported in both years gained in economic welfare due to the ICA compared with a hypothetical non-quota situation. In 1982 and 1983, all the importing non-member countries increased economic welfare by their decisions to stay outside instead of joining the agreement. As the price elasticity of import demand is absolutely lower than unity for most non-member countries, import expenditures of these countries were reduced on average for both years. This result holds true independently of the measurement approach. Despite these similarities in the results, the magnitudes of median impacts differ strongly between the two approaches. In financial terms, the export quota policy influenced national interests of most importing non-member countries more positively from a decision-oriented than from a positive point of view. On average for 1982 and 1983, a cross-country comparison shows a median decrease in import expenditures compared with a liberalized world market by 1.6 mill.\$ or 6.5%. The median decrease in import expenditures compared with the hypothetical situation of participating in the ICA was more than three times as high: -5.8 mill.\$ or -25.6%. The magnitude of the welfare impact was again much higher on the basis of the decision-oriented as against the positive approach. On average for 1982 and 1983, the cross-country

Table 1: National Interests of Importing Non-member Countries in the International Coffee Agreement with Respect to Import Expenditures, 1982 and 1983 (mill. \$)^a

| Non-member Countries | Positive Approach: The Agreement's Influence | | | | Decision-oriented Approach: The Influence of Non-membership | | | |
|----------------------------|----------------------------------------------|----------------|-----------|-------|-------------------------------------------------------------|----------------|-----------|-------|
| | 1982 | 1983 | ∅ 1982/83 | | 1982 | 1983 | ∅ 1982/83 | |
| | | | abs. | % | | | abs. | % |
| <u>Europe:</u> | | | | | | | | |
| Czechoslovakia | +7.7 | -22.8 | -7.5 | -8.1 | -23.7 | -36.2 | -29.9 | -26.0 |
| German Democratic Republic | +18.8 | -60.0 | -20.6 | -10.7 | -59.7 | -96.8 | -78.3 | -31.2 |
| Hungary | +4.9 | -23.8 | -9.4 | -14.5 | -15.5 | -38.4 | -26.9 | -32.6 |
| Poland | +2.5 | -14.4 | -6.0 | -12.2 | -7.6 | -22.8 | -15.2 | -26.1 |
| Romania | +3.6 | -8.0 | -2.2 | -7.3 | -11.3 | -12.9 | -12.1 | -30.1 |
| U.S.S.R. | +6.7 | -14.8 | -4.1 | -4.6 | -19.8 | -23.2 | -21.5 | -20.2 |
| <u>Africa:</u> | | | | | | | | |
| Algeria | +10.8 | -58.8 | -24.0 | -15.4 | -34.2 | -95.0 | -64.6 | -32.9 |
| Egypt | +1.7 | -11.0 | -4.6 | -16.7 | -5.5 | -17.7 | -11.6 | -33.4 |
| Libya | +0.4 | -1.4 | -0.5 | -11.6 | -1.3 | -2.3 | -1.8 | -31.6 |
| Morocco | +1.5 | -4.8 | -1.6 | -4.7 | -4.3 | -7.4 | -5.8 | -15.0 |
| Senegal | +0.5 | -2.5 | -1.0 | -14.8 | -1.6 | -4.1 | -2.8 | -32.7 |
| Somalia ^b | -0.3 | - ^c | -0.2 | -1.4 | +3.1 | - ^c | +1.5 | +19.8 |
| South Africa | +0.9 | -4.7 | -1.9 | -11.5 | -2.7 | -7.5 | -5.1 | -25.6 |
| Sudan ^b | +0.8 | -1.1 | -0.2 | -1.0 | -1.0 | -0.7 | -0.9 | -5.5 |
| Tunisia ^b | +0.8 | -0.9 | -0.2 | -1.0 | -2.0 | -1.2 | -1.6 | -17.1 |
| <u>Asia:</u> | | | | | | | | |
| Hongkong | +0.1 | -0.4 | -0.2 | -1.7 | -0.3 | -0.7 | -0.5 | -4.6 |
| Israel | +1.2 | -5.6 | -2.2 | -7.4 | -3.4 | -8.7 | -6.0 | -18.0 |
| Jordan | +1.3 | -2.9 | -0.8 | -2.7 | -3.7 | -4.4 | -4.0 | -12.5 |
| Korea, P.D.R. of | -0.9 | +2.5 | -0.7 | -3.3 | +2.2 | +3.7 | +2.9 | +11.9 |
| Lebanon ^b | +2.0 | -4.6 | -1.3 | -5.8 | -5.7 | -6.9 | -6.3 | -22.9 |
| Saudi-Arabia | +5.6 | -10.8 | -2.6 | -5.8 | -17.8 | -17.4 | -17.6 | -29.6 |
| Syria | +1.5 | -2.3 | -0.4 | -3.5 | -4.8 | -3.6 | -4.2 | -28.8 |
| Turkey | -0.2 | +0.3 | +0.1 | +1.5 | +0.4 | +0.5 | +0.4 | +7.5 |
| <u>South America:</u> | | | | | | | | |
| Argentina ^b | +4.3 | -13.0 | -4.4 | -6.5 | -10.0 | -18.5 | -14.3 | -18.5 |
| Chile | +1.6 | -3.4 | -0.9 | -6.8 | -5.1 | -5.5 | -5.3 | -29.9 |
| Median impact: | +1.5 | -4.8 | -1.6 | -6.5 | -4.8 | -7.5 | -5.8 | -25.6 |

^a The calculation is based on equation (5) for the positive approach and on (10) for the decision-oriented approach. The price elasticities of import demand, underlying the calculation of the hypothetical imports, were taken from loglinear import demand functions which were estimated econometrically. The price elasticities used are: -1.30 (Korea, P.D.R. of); -1.20 (Turkey); -0.88 (Hongkong); -0.63 (Jordan); -0.57 (Morocco); -0.50 (South Africa, Israel); -0.37 (U.S.S.R.); -0.25 (Poland); -0.19 (Czechoslovakia); 0 (German Democratic Republic, Hungary, Romania, Algeria, Egypt, Libya, Senegal, Saudi-Arabia, Syria, Chile).

^b For these countries, the price coefficients of linear import demand functions were used to calculate imports in the hypothetical situation. The price coefficients used are: -3.5106 (Somalia); -2.4010 (Sudan); -0.6823 (Tunisia); -1.2654 (Lebanon); -6.0685 (Argentina).

^c No imports recorded.

Source: Own calculations with data from FAO and International Coffee Organization (1983, 1985) by use of the method described in the text.

comparison shows a median increase in economic welfare of 2.6 mill.\$ in the quota situation compared with a hypothetical liberalized world market. The median welfare increase compared with a hypothetical participation is about four times as high: +10.9 mill.\$.

2. The empirical analysis not only shows that the measurement approach may influence the magnitude of the observed impacts on national economic objectives. It also shows that the signs of the policy impact may differ due to the measurement approach. One approach may indicate that national interests are positively affected, whereas the other approach may indicate the reverse. The results for 1982 illustrate the point. In 1982, a liberalized world market would have been depressed by a huge oversupply and the world price would have been even lower than the existing price in the uncontrolled coffee market. Hence, the median importing non-member country realized an increase in import expenditures of 1.5 mill. \$ and a decrease in economic welfare of 2.6 mill.\$ compared with the free-trade situation. It realized, however, a decrease in import expenditures of 4.8 mill.\$ and an increase in economic welfare of 7.4 mill.\$ as a consequence of staying outside instead of joining the agreement. The positive approach indicates a negative impact on national interests of the median importing non-member country, whereas the decision-oriented approach indicates a positive effect.
3. An analysis of the individual country cases makes the importance of the measurement approach even more obvious. Both approaches agree that the national impacts are the highest for some "large" coffee-importing countries among the non-members like the German Democratic Republic, Algeria, Czechoslovakia and Hungary. However, the magnitudes of the impacts differ widely according to the measurement approach. On average for 1982 and 1983, the decision-oriented approach shows the highest welfare gains and the strongest decrease in import expenditures, of 78.3 mill.\$ respectively, for the

Table 2: National Interests of Importing Non-member Countries in the International Coffee Agreement with Respect to Economic Welfare, 1982 and 1983 (mill. \$)^a

| Non-member Countries | Positive Approach: The Agreement's Influence | | | Decision-oriented Approach: The Influence of Non-membership | | |
|----------------------------|----------------------------------------------|----------------|-----------|-------------------------------------------------------------|----------------|-----------|
| | 1982 | 1983 | ∅ 1982/83 | 1982 | 1983 | ∅ 1982/83 |
| <u>Europe:</u> | | | | | | |
| Czechoslovakia | -9.6 | +28.1 | +9.3 | +29.2 | +44.7 | +37.0 |
| German Democratic Republic | -18.8 | +60.0 | +20.6 | +59.7 | +96.8 | +78.3 |
| Hungary | -4.9 | +23.8 | +9.4 | +15.5 | +38.4 | +26.9 |
| Poland | -3.3 | +19.2 | +8.0 | +10.1 | +30.4 | +20.2 |
| Romania | -3.6 | +8.0 | +2.2 | +11.3 | +12.9 | +12.1 |
| U.S.S.R. | -10.6 | +23.5 | +6.4 | +31.4 | +36.8 | +34.1 |
| <u>Africa:</u> | | | | | | |
| Algeria | -10.8 | +58.8 | +24.0 | +34.2 | +95.0 | +64.6 |
| Egypt | -1.7 | +11.0 | +4.6 | +5.5 | +17.7 | +11.6 |
| Libya | -0.4 | +1.4 | +0.5 | +1.3 | +2.3 | +1.8 |
| Morocco | -3.5 | +11.2 | +3.8 | +10.0 | +17.2 | +13.6 |
| Senegal | -0.5 | +2.5 | +1.0 | +1.6 | +4.1 | +2.8 |
| Somalia ^b | -1.2 | - ^c | -0.6 | +2.7 | - ^c | +1.3 |
| South Africa | -1.2 | +6.4 | +2.6 | +3.6 | +10.1 | +6.8 |
| Sudan ^b | -1.8 | +4.3 | +1.3 | +4.9 | +6.4 | +5.7 |
| Tunisia ^b | -1.0 | +1.8 | +0.4 | +3.1 | +2.8 | +2.9 |
| <u>Asia:</u> | | | | | | |
| Hongkong | -0.9 | +3.7 | +1.4 | +2.4 | +5.6 | +4.0 |
| Israel | -2.4 | +11.2 | +4.4 | +6.8 | +17.3 | +12.0 |
| Jordan | -3.5 | +7.8 | +2.2 | +9.9 | +12.0 | +10.9 |
| Korea, P.D.R. of | -3.0 | +8.4 | +2.7 | +7.4 | +12.3 | +9.8 |
| Lebanon ^b | -2.6 | +6.3 | +1.9 | +7.7 | +9.9 | +8.8 |
| Saudi-Arabia | -5.6 | +10.8 | +2.6 | +17.8 | +17.4 | +17.6 |
| Syria | -1.5 | +2.3 | +0.4 | +4.8 | +3.6 | +4.2 |
| Turkey | -0.8 | +1.7 | +0.5 | +1.9 | +2.5 | +2.2 |
| <u>South America:</u> | | | | | | |
| Argentina ^b | -6.9 | +21.1 | +7.1 | +20.0 | +32.9 | +26.4 |
| Chile | -1.6 | +3.4 | +0.9 | +5.1 | +5.5 | +5.3 |
| Median impact: | -2.6 | +8.2 | +2.6 | +7.4 | +12.6 | +10.9 |

^a The calculation is based on equation (2) for the positive approach and (9) for the decision-oriented approach. The price elasticities given in footnote (a) of Table 1 were used.

^b For these countries, the price coefficients of linear import demand functions given in footnote (b) of Table 1 were used to calculate hypothetical imports.

^c No imports recorded.

Source: Own calculations with data from FAO and International Coffee Organization (1983, 1985) by use of the method described in the text.

German Democratic Republic. The national interests of this country are much less influenced according to the positive approach. The German Democratic Republic realized a policy-induced welfare gain of "only" 20.6 mill.\$ and a fall in import expenditures of the same amount, compared with a liberalized world market. This extreme case shows that the change in the benchmark situation leads to a difference in the observed financial and welfare impacts that amounts to nearly 60 mill.\$.

4.2 Importing member countries

The measurement of the importing member countries' national interests in the ICA is based on the equations (1), (4), (7) and (8). In these equations, the unobservables q_i^{ID*} , p_N^* and q_{Ni}^{ID*} have to be quantified besides p^* . The hypothetical import demand is again calculated on the basis of point estimates of import demand taken from econometrically estimated import demand functions⁷. A methodological problem is the calculation of p_N^* . A withdrawal of the importing country i will shift the import demand curve in the controlled coffee market to the left and in the uncontrolled market by the same amount to the right. Given a fixed target price under the quota system, quotas have to be lowered in the controlled market due to the withdrawal. Oversupply in the controlled market increases. It is assumed that a given share of the additional oversupply will be transmitted to the uncontrolled market and shift the export supply curve to the right. As the import-demand shift will be stronger than the export-supply shift, p_N^* will exceed p_N . It is assumed that the International Coffee Organization would have the means to separate the market segments in each case, so that the hypothetical price in the uncontrolled market could even rise above the controlled market's price. Based on this theoretical background, p_N^* is calculated for each importing member country with the Newton-Raphson algorithm⁹.

The empirical results are shown in Tables 3 and 4. The calculated national interests in the ICA are again strongly affected by the measurement approach. The following major results can be derived:

Table 3: National Interests of Importing Member Countries in the International Coffee Agreement with Respect to Import Expenditures, 1982 and 1983 (mill. \$)^a

| Non-Member Countries | Positive Approach: The Agreement's Influence | | | | Decision-oriented Approach: The Membership's Influence ^b | | | |
|--------------------------------|----------------------------------------------|--------|-----------|-------|---------------------------------------------------------------------|-----------|-------------|-----------|
| | 1982 | 1983 | ∅ 1982/83 | | 1982 | 1983 | ∅ 1982/83 | |
| | | | abs. | % | | | abs. | % |
| <u>Europe:</u> | | | | | | | | |
| Austria | +38.5 | +19.8 | +29.1 | +20.6 | -12.8 | +28.4 | +7.8 | +4.8 |
| Belgium | +66.7 | +30.6 | +48.7 | +20.8 | -77.8 | +23.0 | -27.4 | -8.8 |
| Cyprus | +1.3 | +2.2 | +1.7 | +22.0 | +0.9 | +5.5 | +3.2 | +51.2 |
| Denmark | +44.4 | +18.8 | +31.6 | +23.5 | -19.6 | +30.4 | +5.4 | +3.4 |
| Finland | +57.2 | +25.2 | +41.2 | +30.4 | -35.2 | +42.2 | +3.5 | 2.0 |
| F.R. Germany | +430.8 | +191.2 | +311.0 | +27.2 | ((-14170.6)) | (-1761.0) | ((-7965.8)) | ((-84.6)) |
| France | +269.2 | +120.3 | +194.8 | +26.9 | ((-3247.6)) | -475.0 | ((-1861.3)) | ((-66.9)) |
| Greece | +11.9 | +5.4 | +8.6 | +18.1 | +4.3 | +12.3 | +8.3 | +17.4 |
| Ireland | +0.6 | +0.3 | +0.4 | +29.1 | +0.4 | +0.8 | +0.6 | +45.6 |
| Italy | +183.0 | +80.9 | +132.0 | +23.9 | (-958.7) | -135.9 | -547.3 | -44.5 |
| Netherlands | +94.3 | +43.0 | +68.6 | +19.9 | -187.8 | -1.9 | -94.8 | -18.7 |
| Norway | +30.5 | +14.3 | +22.4 | +24.3 | -0.5 | +27.6 | +13.6 | +13.4 |
| Portugal | +10.5 | +4.3 | +7.4 | +17.3 | +4.0 | +10.1 | +7.1 | +16.4 |
| Spain | +100.6 | +55.7 | +78.1 | +28.7 | -222.8 | +12.3 | -105.2 | -23.1 |
| Sweden | +61.2 | +26.3 | +43.7 | +19.9 | -64.3 | +23.6 | -20.3 | -7.2 |
| Switzerland | +33.5 | +15.1 | +24.3 | +17.2 | -11.3 | +22.0 | +5.3 | +3.3 |
| United Kingdom | +72.4 | +34.1 | +53.2 | +24.5 | -88.8 | +30.5 | -29.2 | -9.7 |
| Yugoslavia | +21.2 | +13.8 | +17.5 | +27.5 | +6.9 | +29.4 | +18.2 | +28.9 |
| <u>Other member countries:</u> | | | | | | | | |
| Australia | +23.7 | +9.6 | +16.7 | +22.1 | +2.3 | +20.1 | +11.2 | +13.8 |
| Canada | +64.5 | +29.1 | +123.2 | +29.5 | -66.5 | +30.0 | -18.2 | -6.8 |
| Japan | +164.9 | +81.5 | +46.8 | +23.2 | (-996.3) | -109.3 | (-552.8) | (-50.5) |
| New Zealand | +4.3 | +1.7 | +3.0 | +18.0 | +2.6 | +4.5 | +3.5 | +21.8 |
| USA | +617.1 | +250.3 | +433.7 | +17.9 | ((-7249.6)) | -1435.6 | (-4342.6) | (-60.3) |
| Median impact: | +57.2 | +25.2 | +41.2 | +23.2 | -35.2 | +12.3 | +0.6 | +2.0 |

^a The calculation is based on equation (4) for the positive approach and on (9) for the decision-oriented approach. The price elasticities of import demand, underlying the calculation of imports in the hypothetical situation, were taken from own econometric estimates of loglinear import demand functions. The price elasticities used are: -0.41 (Portugal); -0.40 (Switzerland); -0.39 (New Zealand, USA); -0.37 (Greece); -0.32 (Sweden); -0.31 (Netherlands); -0.28 (Belgium); -0.27 (Austria); -0.26 (Australia); -0.21 (Denmark, Canada); -0.19 (Italy); -0.17 (Norway); -0.16 (United Kingdom); -0.10 (France); -0.09 (F.R. Germany); 0 (Cyprus, Finland, Ireland, Spain, Yugoslavia, Japan).

^b The parentheses indicate the strongest changes in import expenditures on the basis of the decision-oriented approach. These values are shown primarily for illustrative purposes, as it cannot be expected that under a withdrawal of the major importers the assumed model would remain unchanged. () and (() indicate that the import expenditures under the hypothetical situation of a withdrawal from the ICA would be more than double (three times as high as) the existing import expenditures in the case of the country's participation in the ICA.

Source: Own calculations with data from FAO and International Coffee Organization (1983, 1985), by use of the method described in the text.

1. The positive approach shows a uniformly negative influence of the ICA on the national interests of importing member countries. As coffee prices on the controlled market were raised above the liberalized world market price, economic welfare decreased in 1982 and 1983 for all importing member countries. Moreover, the export quota policy raised import expenditures, since import demand of the member countries is price-inelastic. The results of a decision-oriented approach are less uniform. Under the model's assumptions, the price in the uncontrolled market rises if an importing member country withdraws from the ICA. For some large countries, the price increase would have been so strong that the hypothetical price in the uncontrolled market exceeded the existing price in the controlled market. 16 (6) countries lowered their import expenditures and increased economic welfare in 1982 (1983) by participating in the ICA instead of leaving it. For 7 (17) countries, the reverse holds true. On average for 1982 and 1983, 11 countries experienced a positive and 12 countries a negative impact on national interests due to their membership decision. On average for 1982 and 1983, the importing member countries experienced an increase in import expenditures and a loss in economic welfare of 41.2 mill.\$ as a median impact according to the positive approach. The median impact on import expenditures in percentage terms was +23.2%. On the basis of the decision-oriented approach, the median impact is much smaller, with an increase in import expenditures and a decrease in economic welfare of 0.6 mill.\$. The median impacts are crucially different for 1982 and 1983, with an increase in economic welfare and a decrease in import expenditures of 35.2 mill.\$ in 1982 and a fall in economic welfare of 19.5 mill.\$ and a rise in import expenditures of 12.3 mill.\$ in 1983.

2. From analyzing the national differences between the positive and the decision-oriented approach, it can be seen that the aggregate results for 1982 and 1983 move in the same (oppo-

Table 4: National Interests of Importing Member Countries in the International Coffee Agreement with Respect to Economic Welfare, 1982 and 1983 (mill. \$)^a

| Non-Member Countries | Positive Approach: The Agreement's Influence | | | Decision-oriented Approach: The Membership's Influence | | |
|--------------------------------|----------------------------------------------|--------|-----------|--------------------------------------------------------|---------|-----------|
| | 1982 | 1983 | ∅ 1982/83 | 1982 | 1983 | ∅ 1982/83 |
| <u>Europe:</u> | | | | | | |
| Austria | -52.7 | -27.1 | -39.9 | +17.6 | -38.8 | -10.6 |
| Belgium | -92.7 | -42.5 | -67.6 | -108.0 | -32.0 | +38.0 |
| Cyprus | -1.3 | -2.2 | -1.7 | -0.9 | -5.5 | -3.2 |
| Denmark | -56.2 | -23.8 | -40.0 | +24.8 | -38.4 | -6.8 |
| Finland | -57.2 | -25.2 | -41.2 | +35.2 | -42.2 | -3.5 |
| F.R. Germany | -473.4 | -210.2 | -341.8 | (+15572.1) | +1935.2 | (+8753.6) |
| France | -299.1 | -133.7 | -216.4 | (+3608.4) | +527.8 | +2068.1 |
| Greece | -18.8 | -8.5 | -13.7 | -6.9 | -19.5 | -13.2 |
| Ireland | -0.6 | -0.3 | -0.4 | -0.4 | -0.8 | -0.6 |
| Italy | -226.0 | -99.9 | -162.9 | +1183.5 | +167.7 | +675.6 |
| Netherlands | -136.6 | -62.3 | -99.5 | +272.1 | +2.7 | +137.4 |
| Norway | -36.8 | -17.2 | -27.0 | +0.6 | -33.2 | -16.3 |
| Portugal | -17.9 | -7.3 | -12.6 | -6.8 | -17.2 | -12.0 |
| Spain | -100.6 | -55.7 | -78.1 | +222.8 | -12.3 | +105.2 |
| Sweden | -90.0 | -38.6 | -64.3 | +94.5 | -34.8 | +29.9 |
| Switzerland | -55.8 | -25.2 | -40.5 | +18.8 | -36.6 | -8.9 |
| United Kingdom | -86.2 | -40.6 | -63.4 | +105.7 | -36.3 | +34.7 |
| Yugoslavia | -21.2 | -13.8 | -17.5 | -6.9 | -29.4 | -18.2 |
| <u>Other member countries:</u> | | | | | | |
| Australia | -32.1 | -13.0 | -22.6 | -3.1 | -27.2 | -15.1 |
| Canada | -81.7 | -36.9 | -59.3 | +84.1 | -38.0 | +23.0 |
| Japan | -164.9 | -81.5 | -123.2 | +996.3 | +109.3 | +552.8 |
| New Zealand | -7.0 | -2.8 | -4.9 | -4.2 | -7.3 | -5.8 |
| USA | -1011.7 | -410.4 | -711.0 | (+11884.7) | +2353.5 | +7119.1 |
| Median impact: | -57.2 | -27.1 | -41.2 | +35.2 | -19.5 | -0.6 |

^a The calculation is based on equation (1) for the positive approach and on (7) for the decision-oriented approach. The price elasticities given in footnote (a) of Table 3 were used.

^b The parentheses indicate the strongest changes in economic welfare on the basis of the decision-oriented approach. These values are shown primarily for illustrative purposes, as it cannot be expected that the model would remain unchanged in the case a withdrawal by the major importers. () indicates that the change in economic welfare due to a withdrawal of the importing country from the ICA would be more than double the import expenditures in the existing situation of a membership in the ICA.

Source: Own calculations with data from FAO and International Coffee Organization (1983, 1985) by use of the method described in the text.

site) direction for 12 (13) countries. Each importing member country is negatively affected in financial and welfare terms according to the positive approach. The highest welfare losses accrued to the largest coffee importers, i.e. the USA (-711 mill.\$), the FR Germany (-342 mill.\$), France (-216 mill.\$), Italy (-163 mill.\$) and Japan (-123 mill.\$). On the basis of the decision-oriented approach, 12 countries again experienced negative impacts on their national interests. The highest welfare losses were realized by Yugoslavia (-18 mill.\$), followed by Norway, Australia, Greece, Portugal, Austria, Switzerland, Denmark, New Zealand, Finland, Cyprus and Ireland. These countries lost in economic welfare not only as a consequence of the ICA compared with a liberalized world market but also due to their decisions to stay inside instead of leaving the ICA. The other 13 countries, however, gained in economic welfare due to their membership decisions although the ICA worsened their welfare positions compared with the situation of a liberalized world market. The largest member countries, having the highest welfare losses according to the positive approach, realized the highest welfare gains according to the decision-oriented approach.

An important conclusion from the empirical analysis is that some importing members of the ICA gained from their decision to participate in the price-raising agreement, independently of the welfare-decreasing impact of the agreement's introduction on an otherwise liberalized world market.

4.3 Exporting member countries

The measurement of the exporting member countries' national interests in the ICA is based on the equations (3), (6), (9) and (12). In these equations, the unobservables $q_k^{ES^*}$, $q_{Nk}^{ES^*}$ and p_{Nk}^* had to be quantified besides p^* . An additional difficulty in the exporting countries' case is that no point on the planned export supply curve will be realized if the quota policy is binding. Therefore, the export supply function in the hypothetical situ-

ation without quota policy has to be computed, too. Generally, the results of empirical analyses did not seem reliable enough for use in modeling these hypothetical export supply functions or for providing price elasticities of export supply. Hence, it is assumed that the short-run price elasticity of export supply is zero and that each individual country exported the difference between planned aggregate export supply and the export quota to the non-member market. This implies that the policy-induced welfare changes are equal to the changes in export earnings¹⁰. As the indirect sanctioning of sales to the non-member market possibly reduced exports of the individual countries below free-trade exports, the sum of exports to the two market segments indicates the minimum export supply in the hypothetical non-quota situation. Therefore, possible welfare losses from limiting planned aggregate supply are excluded, and the resulting welfare changes must be regarded as maximum welfare gains or minimum welfare losses. Based on these assumptions, p_{Nk}^* is calculated with the Newton-Raphson algorithm⁹.

The empirical results are shown in Table 5 for 46 exporting member countries of the ICA. Again, the calculated national interests are strongly influenced by the measurement approach. The main results are:

1. On average for 1982 and 1983, each individual exporting member country increased its export earnings and its economic welfare as a consequence of the ICA. Moreover, each exporting member gained in both years from its decision to participate in the agreement instead of leaving it. Had it left the agreement, it would have caused a price fall for those exports that were actually covered by the export quota scheme. Although the median impacts according to the positive and the decision-oriented approach moved in the same direction in 1982 and 1983, the impact shown by the decision-oriented approach was much stronger than that documented by the positive approach. On average for 1982 and 1983, the median exporting member country realized an increase in

Table 5: National Interests of Exporting Member Countries in the International Coffee Agreement with Respect to Export Earnings and Economic Welfare^a, 1982 and 1983 (mill. \$)

| Non-Member Countries | Positive Approach: The Agreement's Influence | | | | Decision-oriented Approach: The Membership's Influence | | | |
|--------------------------|----------------------------------------------|--------|-----------|-------|--------------------------------------------------------|---------|-----------|----------|
| | 1982 | 1983 | ∅ 1982/83 | | 1982 | 1983 | ∅ 1982/83 | |
| | | | abs. | % | | | abs. | % |
| Angola | +20.6 | -2.2 | +9.2 | +12.3 | +23.8 | +20.4 | +22.1 | +35.8 |
| Benin | +2.2 | +1.2 | +1.7 | +28.2 | +1.8 | +3.4 | +2.6 | +49.7 |
| Bolivia | +6.0 | +2.6 | +4.3 | +30.2 | +5.4 | +7.6 | +6.5 | +53.1 |
| Brazil | +788.0 | +375.1 | +581.6 | +30.0 | +2447.4 | +2615.5 | +2531.5 | +70876.7 |
| Burundi | +24.1 | +9.9 | +17.0 | +29.2 | +30.9 | +34.2 | +32.6 | +76.5 |
| Cameroon | +68.0 | +31.7 | +49.8 | +29.9 | +130.7 | +149.8 | +140.2 | +184.5 |
| Central African Republic | +13.9 | +5.7 | +9.8 | +27.8 | +15.0 | +20.5 | +17.7 | +64.7 |
| Colombia | +450.1 | +213.8 | +332.0 | +29.2 | +1412.5 | +1483.3 | +1447.9 | +7279.7 |
| Congo | +2.1 | +0.9 | +1.5 | +30.4 | +1.7 | +2.5 | +2.1 | +47.9 |
| Costa Rica | +66.9 | +4.4 | +35.7 | +16.3 | +138.5 | +159.6 | +149.1 | +140.6 |
| Dominican Republic | +28.4 | +11.9 | +20.1 | +29.0 | +38.9 | +42.7 | +40.8 | +83.6 |
| Ecuador | +59.6 | +26.2 | +42.9 | +27.0 | +111.7 | +133.5 | +122.6 | +155.4 |
| El Salvador | +122.7 | +51.9 | +87.3 | +27.1 | +299.0 | +349.0 | +324.0 | +378.6 |
| Ethiopia | +70.9 | +29.1 | +50.0 | +26.4 | +141.2 | +171.7 | +156.4 | +188.0 |
| Gabon | +0.8 | +0.3 | +0.5 | +31.9 | +0.6 | +0.7 | +0.7 | +44.6 |
| Ghana | +0.7 | +0.3 | +0.5 | +26.7 | +0.5 | +0.7 | +0.6 | +35.0 |
| Guatemala | +101.8 | +26.8 | +64.3 | +21.2 | +251.4 | +271.0 | +261.2 | +246.0 |
| Guinea | +2.6 | +2.6 | +2.6 | +24.6 | +2.1 | +7.5 | +4.8 | +57.6 |
| Haiti | +13.0 | +9.6 | +11.3 | +26.6 | +13.7 | +32.9 | +23.3 | +76.4 |
| Honduras | +44.6 | +2.4 | +23.5 | +16.2 | +74.7 | +95.6 | +85.2 | +102.4 |
| India | +46.3 | -3.7 | +21.3 | +12.8 | +83.9 | +78.1 | +81.0 | +76.0 |
| Indonesia | +141.2 | +1.0 | +71.1 | +14.2 | +424.5 | +453.9 | +439.2 | +331.7 |
| Ivory Coast | +213.0 | +89.1 | +151.0 | +29.0 | +643.2 | +556.4 | +599.8 | +824.8 |
| Jamaica | +1.0 | +0.4 | +0.7 | +30.1 | +0.8 | +1.2 | +1.0 | +46.5 |
| Kenya | +73.9 | +27.2 | +50.5 | +24.9 | +157.6 | +163.7 | +160.6 | +173.5 |
| Liberia | +3.9 | -2.4 | +0.8 | +4.2 | +2.3 | +2.7 | +2.5 | +15.1 |
| Madagascar | +41.8 | +20.4 | +31.1 | +27.9 | +67.7 | +84.6 | +76.2 | +114.6 |
| Malawi | +0.1 | +0.4 | +0.3 | +19.7 | +0.1 | +1.1 | +0.6 | +57.5 |
| Mexico | +102.1 | +5.9 | +54.0 | +15.9 | +239.6 | +328.4 | +284.0 | +261.0 |
| Nicaragua | +38.4 | +7.7 | +23.0 | +19.2 | +61.4 | +73.2 | +67.3 | +88.9 |
| Nigeria | +1.7 | +0.9 | +1.3 | +28.8 | +1.4 | +2.5 | +2.0 | +49.1 |
| Panama | +3.9 | +1.2 | +2.5 | +22.8 | +3.3 | +5.4 | +4.3 | +46.9 |
| Papua New Guinea | +32.9 | +6.3 | +19.6 | +19.4 | +47.7 | +65.8 | +56.8 | +88.6 |
| Peru | +35.8 | +9.0 | +22.4 | +21.4 | +52.9 | +75.1 | +64.0 | +101.4 |
| Philippines | +21.8 | +8.6 | +15.2 | +31.2 | +26.8 | +28.8 | +27.8 | +77.0 |
| Rwanda | +23.3 | +11.7 | +17.5 | +29.0 | +29.3 | +41.7 | +35.5 | +84.3 |
| Sierra Leone | +7.6 | +1.2 | +4.4 | +37.7 | +7.1 | +3.4 | +5.3 | +48.4 |
| Sri Lanka | +2.6 | +1.2 | +1.9 | +29.7 | +2.1 | +3.4 | +2.8 | +49.4 |
| Tanzania | +40.9 | +14.8 | +27.8 | +25.0 | +66.1 | +74.9 | +70.5 | +102.9 |
| Thailand | +7.4 | +1.3 | +4.4 | +21.1 | +6.9 | +9.6 | +8.2 | +48.9 |
| Togo | +8.5 | +2.3 | +5.4 | +33.9 | +8.1 | +6.7 | +7.4 | +53.0 |
| Trinidad/Tobago | +1.0 | -0.3 | +0.4 | +16.7 | +0.8 | +0.3 | +0.6 | +27.9 |
| Uganda | +131.2 | +57.6 | +94.4 | +28.1 | +350.9 | +324.9 | +337.9 | +365.9 |
| Venezuela | +0.9 | +0.8 | +0.8 | +25.3 | +0.7 | +2.1 | +1.4 | +51.9 |
| Zaire | +59.3 | +28.0 | +43.7 | +29.6 | +108.4 | +127.6 | +118.0 | +161.4 |
| Zimbabwe | +5.2 | +1.3 | +3.3 | +21.3 | +4.4 | +6.6 | +5.5 | +41.8 |
| Median impact | +23.7 | +5.1 | +17.3 | +26.9 | +30.1 | +38.0 | +34.1 | +76.8 |

^a The calculations are based on equations (6) for the positive approach and on (12) for the decision-oriented approach. The assumed short-run price elasticities of export supply are zero and it is assumed for each individual country that the actual exports to the member and the non-member market would be equal to the hypothetical exports in the situation without quotas. Therefore, the calculations also indicate maximum welfare gains (minimum welfare losses) with respect to the equations (3) and (9).

Source: Own calculations with data from FAO and International Coffee Organization (1983, 1985) by use of the method described in the text.

export earnings and economic welfare of 17.3 mill.\$ compared with a liberalized world-market situation. In contrast, the median exporter raised its export earnings and its economic welfare due to the decision to participate in the agreement by nearly double: +34.1 mill.\$. The median impacts in percentage terms are +26.9 and +76.9% respectively. This strong difference between the decision-oriented and the positive approach was mainly caused by the results for 1983¹¹. In this year, the actual price in the non-member market was lower than the hypothetical price in a uniform world market. If an exporter leaves the agreement in such a situation, this will further depress prices in the non-member market. The gain in export earnings and economic welfare as a consequence of staying inside the agreement will become higher than the gains which arise from the ICA compared with a non-quota situation.

2. The results at the national level show that large exporting member countries realized the highest absolute gains in export earnings and economic welfare due to the ICA. Brazil, Colombia, Ivory Coast, Uganda and El Salvador ranked highest on average for 1982 and 1983. These were also the countries realizing the highest welfare gains from their decisions to participate instead of leaving the agreement. Generally, the difference in the calculated national impact between the positive and the decision-oriented approach is much higher for the large coffee exporters than for the smaller ones. The reason is that a withdrawal by a large coffee exporter would depress the price in the thin non-member market so much that p_{NK}^* would be much lower than for small exporters. This leads to a relatively large dispersion of hypothetical prices according to the decision-oriented approach, whereas a uniform hypothetical world market price in the non-quota situation underlies the positive approach. Two interesting results have to be added at the national level. Firstly, the welfare impacts of the ICA are negative for some exporting member countries, even in the short-run framework of the

presented approach. The cases of Angola, India and Liberia, whose quotas covered only a small share of their exports in 1983, illustrate the point. Secondly, the impact shown by the decision-oriented approach may be less favourable than under the positive approach, if the hypothetical price in a uniform world market is lower than the actual price in the non-member market. The case of small exporters like Bolivia, for which p_{Nk}^* would still have been lower than p^* in 1982, is an example.

5. On the Sensitivity of the Results

Sensitivity analyses for the importing countries show that the presented results are relatively stable when plausible alternative price elasticities and functional forms of import demand functions are taken into account¹². Generally, the welfare impacts are less sensitive than the impacts on import expenditures.

Another assumption influences the calculation of national interests in the ICA more strongly: the law of one price. The presented results are based on this assumption. A uniform price is assumed for the member and the non-member market in the existing quota situation and for the hypothetical unified world market in the non-quota situation. This implies that the calculated impacts of the ICA are unbiased for the "average" country, but not necessarily for each individual country. It is well-known that different coffee qualities are sold at different prices. In tendency, the prices of an importer who buys high-quality (low-quality) coffee will be above (below) average. The calculated policy impacts may be affected by ignoring these quality differences. Table 6 shows sensitivity results for the two largest coffee importers, the USA and the FR Germany, that take deviations from the law of one price into account. The USA (FR Germany) usually buys coffee at a lower (higher) price than the average world import price. Considering this, the impacts are weaker for the USA and higher for the FR Germany compared with the basic model that assumes the law of one price. On average for 1982 and 1983, the ICA-induced increase in U.S. import expenditures was 433.7 instead of 478.7 mill.\$, for the FR Germany 311.0 instead of 256.1 mill.\$. The welfare loss for the USA was 711 compared with 784.8 mill.\$ under the law-of-one-price assumption, for the FR Germany 341.8 compared with 281.4 mill.\$. Of course, the general conclusion that the ICA caused substantial resource transfers away from the importing member countries remains valid.

The sensitivity analysis suggests that it would be an important step to further improve the presented approach by explicitly introducing the different coffee qualities into the model. Then, national interests in the ICA could be derived in a refined way by taking into account quality-induced national price differences.

Table 6: Sensitivity Analysis about the Impact of the ICA on Import Expenditures and Welfare in the USA and the FR Germany, ϕ 1982/83 (Positive Approach to Measuring National Interests)

| Model Country/Economic Variable | Model 1 ^a | Model 2 ^b | Model 1/ Model 2 (%) |
|--------------------------------------------------|----------------------|----------------------|----------------------------|
| <u>USA:</u> | | | |
| Impact of the ICA on import expenditures: | | | |
| - in mill.\$: | +478.7 | +433.7 | 110.4 |
| - in %: | +21.6 | +17.9 | 120.7 |
| Impact of the ICA on economic welfare (mill.\$): | -784.8 | -711.0 | 110.4 |
| <u>FR Germany:</u> | | | |
| Impact of the ICA on import expenditures: | | | |
| - in mill.\$: | +256.1 | +311.0 | 82.3 |
| - in %: | +20.5 | +27.2 | 75.4 |
| Impact of the ICA on economic welfare (mill.\$): | -281.4 | -341.8 | 82.3 |

^a Model 1 is the basic model assuming the law of one price.

^b Model 2 takes into account that national import prices may deviate from average import prices, e.g. due to quality differences. The actual prices are taken from FAO statistics and the hypothetical prices are calculated with a regression function between national (p_i) and world import prices (p_w) estimated for 1966-81:

$$\text{USA: } \ln \hat{p}_i = -1.8051 + 1.2214 \ln \hat{p}_w;$$

$$\text{FR Germany: } \ln \hat{p}_i = 0.7303 + 0.9170 \ln \hat{p}_w.$$

Sources: Own calculations with data from the sources cited in Tables 3 and 4.

6. Summary and Conclusions

This article has presented a methodological basis for measuring national interests in a price-raising international commodity agreement. A positive and a decision-oriented approach were distinguished and used to measure national interests of importing member and non-member countries and of exporting member countries in the ICA. National interests in the ICA differ significantly due to the measurement approach. On average for 1982 and 1983, the main results are:

1. The ICA led to a welfare loss for the importing member countries compared with a hypothetical free-market situation, whereas the exporting member countries received a welfare gain as well as the importing non-member countries. Import expenditures increased for member countries and decreased for most non-member countries. Export earnings of member countries increased due to the ICA.
2. From a decision-oriented point of view, the actual decision of most countries on their participation or non-participation in the ICA could be justified. All importing non-member countries gained from their decision to stay outside the ICA; all exporting countries gained from their decision to participate. In the case of importing member countries, some large members realized welfare gains due to their decision to participate, smaller members would have increased economic welfare by leaving the agreement.

In future research, the presented approach can be extended in various directions. National interests could be measured in terms of multiple objective functions, including more economic goals than economic welfare and financial criteria as well as non-economic goals. Impacts of the ICA on price stability could be taken into account and impacts on other sectors of the economy. The method could be elaborated from an ex-post to an ex-ante approach under uncertainty. In the decision-oriented approach, the reac-

tions of other countries to decisions by those leaving or joining the agreement could be modeled by use of game theory. Finally, the method could be applied for measuring national interests in other commodity agreements and other instruments of international economic policy.

Footnotes

- 1 On the structure of the world coffee market, see Marshall (1983), pp. 8 et seq. For a description of the International Coffee Agreement, see International Coffee Organization (1982) and Gordon-Ashworth (1984), pp. 205 et seq. For an overview on the history of coffee control, see Fisher (1972). A recent analysis of the world coffee economy, including a discussion of the dual-market problem under the 1983 International Coffee Agreement, is provided by Economist Intelligence Unit (1987).
- 2 A purely terms-of-trade stabilizing export quota scheme, which differs crucially from the rules of the International Coffee Agreement, was recommended in the Kaldor plan. See Kaldor (1964), pp. 112 et seq.
- 3 One could argue that a price-increasing effect will not necessarily exist in the medium-run, as oversupply from the depressed period with quotas will enter the market in the unregulated boom period. The average price could then remain unaltered compared with a free-trade situation. However, the outward shift of the export supply curve in the boom period will be lower than the inward shift in the depressed period. This is due to the fact that parts of oversupply in coffee are shifted to the unregulated market in the depression period and are not stored for a boom period. Hence, the International Coffee Agreement is also price-increasing over time.
- 4 The measurement of welfare impacts is based on the traditional surplus concept that is presented and extended in Just/Hueth/Schmitz (1982).
- 5 In the 1970's, the quota mechanism was not used, as market prices were higher than the agreement's target prices. The rules were in force, however, in the 1960's. For a description of international coffee policy in the 1960's, see Fisher (1972). The more recent development of intervention in the coffee market is described in FAO, Commodity Review and Outlook, Rome, various years.
- 6 It can be shown theoretically that a quota policy in a controlled market may increase or decrease the market price in an uncontrolled market compared with the situation of a liberalized uniform market. For a proof, see Herrmann (1987a).
- 7 The estimated import demand functions for non-member countries and member countries are reported in Herrmann (1987b).
- 8 Such an export quota policy implies that the global quota in the controlled market has to be increased by the amount the new member country demands additionally at the target price.

- 9 A description of the Newton-Raphson algorithm is given in Barnett/Ziegler (1985), pp. 668 et seq. The methodological procedure is shown in detail in Herrmann (1987b), section 3.2.4 for the importing member countries.
- 10 It can be shown in this special case that equation (3) reduces to (6) and equation (9) to (12). The proof is available from the author upon request.
- 11 If the actual price in the non-member market is higher than the hypothetical world market price ($p_N > p^*$), it is possible that the hypothetical price p_{Nk}^* would be higher or lower than p^* . The results for 1982 are an example. There was $p_{Nk}^* > p^*$ for small exporters and $p_{Nk}^* < p^*$ for large exporters. Had a large coffee exporter withdrawn from the ICA, it would have depressed the price in the thin non-member market below the level of the hypothetical world market price in the non-quota situation.
- 12 For a detailed analysis, see Herrmann (1987b), section 3.2.6.

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