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Redistributive Implications of a Tariff-rate Quota Policy: How Market Structure and Conduct Matter*

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REDISTRIBUTIVE IMPLICATIONS OF A TARIFF-RATE QUOTA POLICY:
HOW MARKET STRUCTURE AND CONDUCT MATTER

CONTENTS

1 Introduction

Tariff-rate quotas have become one of the major agricultural trade policies. In some industrialized countries like the USA and Japan, tariff-rate quotas have been prominent agricultural policy instruments for many years. In other countries or country groups, like the EU, tariff-rate quotas were increasingly introduced after the successful completion of the Uruguay round. They are typically constructed as a two-tier tariff, with a lower tariff rate effective up to a certain import quantity and a higher tariff rate above this quantity. Thus, a tariff rate quota includes a tariff component - i.e. the two tariff rates - and a non-tariff component, i.e. the quantitative restriction. Independent of whether the tariff or the non-tariff components determine the import price, tariff-rate quotas are regarded as a tariff policy in the international trade negotiations and in the policy review by international organizations [OECD (1996, 1997)] and not as a nontariff trade barrier. This makes tariff-rate quotas an interesting option for policy-makers in the adjustment process towards further trade liberalization.

Despite being regarded as a tariff policy, tariff-rate quotas often include a prohibitive tariff above the trigger quantity. The policy becomes similar to an import quota in these cases and represents a nontariff trade barrier in economic terms. Like typical nontariff barriers, such tariff-rate quotas cause quota rents and provide an incentive towards rent-seeking. We will analyze in this paper the redistributive implications of a tariff-rate quota and outline that welfare and redistributive effects depend crucially on the market structure. The argument will be shown theoretically first and then founded empirically for the introduction of the European banana market policy on the German banana market. A tariff-rate quota with a prohibitive upper tariff rate was introduced there on a formerly fully liberalized market. The general argument stressed here is not only that market conduct matters for the redistributive impact of nontariff barriers, but also that determining market conduct empirically may be very difficult. A detailed institutional and quantitative market analysis, which is usually time-consuming and often not provided in trade policy analysis, is crucial for getting the assumptions of a model and the conclusions right.

Given this background, the objectives of this paper are threefold. We try to

(i) analyze and measure the impact of the European banana trade regime on the German banana market under alternative assumptions on market structure and conduct;

(ii) empirically test and economically evaluate the possible assumptions on market structure and conduct on the German import market for bananas;

(iii) elaborate how a tariff-rate quota affects aggregate welfare and distribution depending on whether perfect competition - either with the small- or large-country assumption - or imperfect competition occurs.

2 The Case Study: A Move from Free Trade to a Tariff-rate Quota for Germany Under the Common European Banana Policy

The European banana sector has been a major element of the world banana economy for many years. Whereas major features of the world banana economy have been elaborated in much detail elsewhere [ARTHUR/HOUCK/BECKFORD (1968); VALLES (1968); FAO (1985)], we concentrate here on the banana sector of the European Union prior to and after the Common European Banana Market Policy in 1993.

Up to 1992, no uniform EU policy on bananas had existed although there had been a Common External Tariff of 20% on banana imports and a general exemption from this tariff for all ACP countries. Only five EU members had been subject to these two trade policies alone: Netherlands, Belgium, Luxembourg, Denmark and Ireland. All other EU countries, with the exception of Germany, had restricted banana imports by additional measures. The objective of the additional trade restrictions had been to protect domestic banana producers like in Spain, Portugal and Greece or associate producer countries or regions as in the cases of the UK, France and Italy. The details of these earlier trade restrictions in bananas are reported elsewhere [BEHR/ELLINGER (1993); BORRELL/YANG (1992); MATTHEWS (1992)].

What makes the German banana market most interesting for an analysis of the new policy is that it had been the most liberal one within the EU. Therefore, strong impacts of the tariff-rate quota can be expected. In Protocol No.6 to the Treaty of Rome, Germany had received a duty-free import quota which was supposed to meet domestic needs. This meant that the duty-free quota had been extended over time, also following reunification, from 632,000 mt to 984,000 mt for the unified Germany [MATTHEWS (1992)]. Traditionally, Germany has also been the most important market segment of the EU, with a market share being 33% in 1992.

The diverging national banana market policies had been clearly inconsistent with the spirit of the European Single Market and a uniform market policy was laid down and introduced on July 1, 1993. The discussion on the new European Banana Policy had been very controversial prior to the introduction of the new policy and has remained so until today. In order to clarify the institutional framework for the analysis in the following sections, the original European Banana Policy after 1993 and the modified regulations of the FRAMEWORK Agreement are briefly reviewed now.

2.1 A Brief Sketch of the German Banana Economy

The market structure in the marketing and distribution channel for bananas in Germany has been described in detail by BEHR/ELLINGER (1993). Hence, only a few major features of the German market for bananas are outlined[1)].

In the formerly unregulated market, Germany imported almost exclusively dollar bananas, i.e. bananas with an origin in Central and South America. In 1992, 99.7% of imports came from

dollar-banana exporters and only 0.3% were bananas from ACP countries or the EU [ZMP (1994)]. This structure of banana imports is very different from the EU's structure of banana imports, where the shares of dollar, ACP and EU bananas were 67.1%, 16.6% and 15.9% respectively.

Most of the German banana imports arrive at three German ports (Hamburg, Bremerhaven, Rostock) or via Belgian ports (Antwerpen, Zeebrügge). Important actors in the German banana economy are importers, ripeners, wholesalers, retail traders and - of course - consumers. A rather strong market concentration is given at the level of importers and ripeners. Contractual arrangements and/or vertical intregration are common. About ten importers had been active on the German market prior to the new banana policy. Some of these, like Chiquita or Dole Fresh Fruit Company, are German branches of multinational firms which are already involved in the producing countries and the export business. Others are independent German import firms. Some of the importers, e.g. Cobana, are also ripeners, but most are not. The largest ripener is Atlanta with a market share of about 40%. Atlanta is heavily involved in the ripening and distribution of Chiquita bananas.

Price formation on the European banana market in general occurs weekly between importers and ripeners at the import level. In some publications [e.g. BEHR/ELLINGER (1993)] and by banana traders it is argued that the price Chiquita charges is a guideline for the price policy of other importers in the respective week. This suggests some form of imperfect-competition price formation with Chiquita being a price-leader.

At the wholesale and retail level, bananas are usually distributed and marketed under brandnames. Brands partly carry the name of multinational firms engaged already in producing countries and export. Chiquita, Dole or Del Monte are cases in point. Other brandnames were introduced by those firms, too, like Bonita. Brands were also created by importers, e.g. Onkel Tuca, or by ripeners, e.g. Cobana.

Table 1 gives some evidence on the trends and structure of banana consumption in Germany. Over the long run, banana consumption has strongly increased from 1.5 kg in 1950/51 in the former Federal Republic of Germany (FRG) to 14.9 kg in 1992/93 in the unified Germany on a per-capita basis. Data for 1993 and later are not presented here as they are already affected by the new European Banana Policy. After German unification, banana consumption in East Germany rose strongly and reached levels clearly beyond those in the former FRG. Consumption data from household surveys are generally lower than those derived from aggregate market data. Results from a major household survey show that banana consumption does not significantly rise or fall with age. A peak consumption level is given in the age group of the 19-24 years old. With the presented high levels of per-capita consumption, bananas are the second-most important fruit consumed by Germans now behind apples.

Table 1: Banana Consumption in Germany, 1950/51-1992/93 (kg/capita and year)[a)]

Economic Variables	Former FRG	Former East Germany	Germany
Per-capita Demand (derived from market data)[a)]:			
1950/51:	1.5		
1960/61:	7.7		
1970/71:	8.6		
1980/81:	8.1		
1988/89:	11.3	3.1[b)]	
1989/90:	13.2	3.9[b)]	
1990/91:		18.1[b)]	14.5
1991/92:		22.5[b)]	15.5
1992/93:		21.5[b)]	14.9
Per-capita Demand (derived from household panel)[b)]:			
1989:	9.8		
1990:	9.8		
1991:	10.0	16.5	
1992:	10.1	15.5	
Per-capita Demand Depending on Age (grams/day), 1987[c)]:			
Age: 14-18:	37.9		
19-24:	43.3		
25-50:	38.9		
51-64:	38.2		
> 64:	39.0		

a) Market data on imports are used to derive per-capita consumption.- b) The household data from STATISTISCHES BUNDESAMT for Household 2 are used to derive per-capita demand. Household 2 is a 4-person household with middle income level.- c) Household data from the „Nationale Verzehrsstudie“ are used to derive per-capita demand.

Sources: BUNDESMINISTERIUM FÜR ERNÄHRUNG, LANDWIRTSCHAFT UND FORSTEN; ZMP (1994); RÖDER (1998).

A distinctive feature of the German banana market is its seasonality with regard to consumption and prices. Price peaks in consumer and import prices occurred in Germany from March to June during the period 1973-92, price busts from October to January [WEIß (1995)], and the consumer prices follow the import prices with a lag of about one month. The seasonal price pattern is often rationalized with seasonal fluctuations of demand due to a varying degree of available other fruits over the year. The banana supply is, on the other hand, rather stable thus implying that seasonal demand fluctuations transmit into seasonal price fluctuations.

Based on this brief information on the German banana economy, we can illustrate the marketing channel for bananas with the market models in Appendices 1 and 2. Both Appendices start from a competitive market, where Germany is a small country in Appendix 1 and a large country in

Appendix 2. Demand for bananas at the various stages of the marketing channel are derived from the consumers' demand for bananas (D_C). Supply of bananas on the German market is derived from the supply curve in the banana-producing exporting countries (S_E)[2)]. All other supply functions at the following marketing stages are derived from S_E by adding marginal costs of transportation and processing (in particular ripening) of bananas.

We distinguish four stages of price formation: (i) the export level, where foreign suppliers in the producing countries typically meet multinational banana firms on the demand side; (ii) the import level, where multinational firms typically offer bananas to ripeners and wholesalers; (iii) the wholesale level, where ripeners and wholesalers sell bananas to retailers; (iv) the consumers' level, where the consumers buy the final product from retailers. The major difference between Appendices 1 and 2 is that the supply functions are perfectly elastic if Germany is a small country on the banana import market and upward-sloping in the large-country case. Although various deviations from this stylized model occur in practice, the stylized presentation of the marketing channel captures major structures and provides the theoretical background for the later market and policy analysis in the competitive situation.

2.2 The Initial European Banana Policy After 1993

Two major policy changes characterized the initial EU banana policy after the policy change. On the internal EU market, a deficiency payment system for EU banana producers was introduced. This deficiency payment system was supposed to cover earnings shortfalls due to the new policy. Payments to producers cover the whole difference between historical reference earnings and the actual earnings from banana production. They were limited to a maximum quantity of 854,000 metric tons of bananas in the traditional banana-producing EU regions (including Guadeloupe and Martinique).

With regard to external trade, a tariff quota and import licensing system was put into force. The basic rules are the following. The quota was as high as 2 million metric tons of bananas either imported from third countries or as non-traditional ACP exports to the EU. A tariff of 100 ECU per metric ton was imposed on banana imports from third countries within this quota; non-traditional ACP banana exports to the EU market within the quota are duty-free (Art.18). The quota could be raised or lowered in principle, depending on forecasts of banana 'needs' in the EU. In 1994, the quota was already increased to 2.1 million metric tons. For exports exceeding the quota, a prohibitive tariff of 750 ECU/mt for non-traditional ACP banana exports to the EU and of 850 ECU/mt for imports from third countries was set.

A further distinctive feature of the tariff quota policy was the initial distribution of import licences (Art.19). In general, banana imports had to be covered by import licences. Only 66.5% of the whole quota were allocated to market participants who had marketed dollar bananas and/or non-traditional ACP bananas (so called A-licences). 30 percent of the import licences were given to market participants who had marketed EU and/or traditional ACP bananas (so

called B-licences). The residual 3.5% of the quota were reserved for beginners who had started to sell non-traditional ACP or third-country bananas in the EU. The allocation of licences within the two major groups was further regulated according to the function of a firm in the distribution channel: 57% went to primary importers, 15% to secondary importers and 28% to ripeners [THAGESEN/MATTHEWS (1997), p.617]. The relevant benchmark quantities were computed by a moving average of the relevant exports in the last three years. The licences were generally tradeable.

These initial regulations of the New European Banana Policy are considered when its economic impacts for the years 1993 and 1994 are measured.

2.3 The European Banana Policy of the FRAMEWORK Agreement and in the Recent Past

The original Common European Banana Policy, as laid down in Council Regulation No.404/93 [COMMISSION OF THE EU (1993)], was disputed heavily from the very beginning. A GATT Panel concluded in January 1994 that it was inconsistent with various GATT rules [THAGESEN/MATTHEWS (1997)]. Despite this critical view of the GATT Panel, the EU reached an agreement for 1995 with four of the five countries which had initiated this and an earlier GATT Panel[3)]. The agreement is known as the FRAMEWORK Agreement and laid down in Council Regulation 3290/94 of 22 December 1994.

The major change in the FRAMEWORK Agreement was a new distribution of the quota rights away from the pure allocation of import licences. 49.4% of the overall quota were allocated to the four Latin American countries Costa Rica (23.4%), Colombia (21%), Nicaragua (3%) and Venezuela (2%). They were allowed to issue export certificates for up to 70 percent of the national quotas. Among importers, there was still the restriction that the 66.5:30:3.5% rule was valid. An additional quota of 90,000 metric tons was issued for the Dominican Republic (55,000 mt), Belize (15,000 mt), Côte d' Ivoire (7,500 mt), Cameroon (7,500 mt) and other countries (5,000 mt). The residual share was mainly provided by Latin American exporters not participating in the export quota distribution, i.e. Ecuador, Panama, Honduras and Guatemala.

A further general change in the FRAMEWORK Agreement was the reduction of the within-quota tariff rate from 100 to 75 ECU/mt and a rise in the tariff quota from 2.1 to 2.2 million tons. With an additional quota for the new EU member countries Austria, Sweden and Finland, the overall quota was raised by 353,000 metric tons to 2,553 million metric tons in 1996.

After the introduction of the FRAMEWORK Agreement, a dispute settlement procedure in the WTO was initiated by the USA, Guatemala, Honduras and Mexico in September 1995. The Dispute Settlement Panel concluded in March 1997 that the European Banana Policy is not consistent with several GATT and GATS rules. Although the EU appealed against this conclu-

sion, the decision was confirmed in September 1997. The EU has to develop a modified policy now until the end of 1998.

The discussion on this reform has been burdened with dissension among EU member countries and conflicting views of market participants inside and outside the EU. Despite this, the Council of the EU Agricultural Ministers decided in June 1998 about a policy change that will probably be disputed further under the WTO. The EU Commission's proposal sticks to the tariff-rate quota of 2.2 million tonnes plus the additional 353,000 tons as a consequence of EU enlargement. The tariff-free quota for ACP exporters remains valid, too, as does the within-quota tariff of 75 ECU/mt.

Important changes refer to the licensing system, which had been the main focus of the WTO decision. The distinction between A, B and C licences was suspended. The Commission distinguishes now traditional and new market participants on the basis of the period 1994-96. No export licences are involved any more. The European Supreme Court had already annulled in March 1998 the rule of the FRAMEWORK Agreement that group B importers were exempt from the obligation to acquire export licences. The Court had interpreted this as a discrimination against group A importers.

3 The Influence of Market Structure and Conduct on the Redistributive Implications of a Tariff-rate Quota Policy

In the following, we will analyze theoretically how a tariff-rate quota affects prices, trade and economic welfare under different assumptions on market conduct. Having the introduction of the European Banana Policy on the German market in mind, we will stress the situation where a common policy is introduced in a customs union and where the pre-policy regime was free trade. It will be argued that different forms of market conduct are, in principle, justifiable for an empirical analysis of the German banana market. Analyses on the banana economy in the literature have been based on either perfect competition, on the basis of the small-country or the large-country assumption, or any form of imperfect competition. HERRMANN (1999) analyzes the impacts of the European Banana Market Regime on the German banana market for the first two years of operation based on a perfect-competition model and the assumption that Germany faces a perfectly elastic export supply. WEIß (1995) provides a thorough analysis of price transmission in the marketing channel of the German banana economy. He basically shows a very strong price transmission from the world market to the German banana market, whereas the German banana market was not integrated with more restricted markets like France and United Kingdom prior to the introduction of the Common European Banana Policy. WEIß did not explicitly test for imperfect competition and did not analyze the Common Policy's economic impacts. DEODHAR and SHELDON (1995) also refer to the German banana market and estimate a conjectural variation coefficient from a structural model of the market at the retail level. They conclude that firms demonstrated Cournot-Nash behaviour, i.e. are marking up prices above marginal

costs, and that the German market for banana imports has not been perfectly competitive. Other recent studies on the European Banana Policy had a wider regional coverage of topics and dealt in less detail with the German banana market. GUYOMARD et al. (1996) analyze likely price, trade, consumption and welfare effects of the European Banana Policy in the EU and the world banana economy. They utilize a multi-region partial equilibrium model of the world banana market with elasticities mainly calibrated from the literature. Whether individual countries are small or large, i.e. affect the world price, depends implicitly on the relative size of the country. Further empirical studies, using an ex-ante approach with data before 1993 and stressing European and worldwide aspects, are KERSTEN (1995) and BORRELL (1997 and earlier studies cited therein).

In order to measure the effects of the tariff-rate quota, it is important to model the hypothetical situation without the introduction of the policy. With regard to import prices, we posit that the same price transmission between the export market and the German import market would occur as in the pre-policy situation. On this basis, the hypothetical import price may be modelled with an estimated price transmission equation. The import price and the underlying price transmission may have been the outcome of different market structures and conducts, however. Perfect competition as well as imperfect competition, e.g. an oligopoly on the German import market, may have been valid. In the perfect-competition case, either the small-country or the large-country assumption may hold. The pure observation of historical prices and quantities may be compatible with all these very different forms of market conduct. Therefore, our empirical analysis is also targeted at determining which assumption is valid in the situation without policy and, hence, which set of empirical estimates of policy impacts is the most realistic one.

3.1 Market-structure Framework 1: Perfect Competition, Small-country Case

The first possible market structure one might posit for the German banana market is a perfectly competive market with Germany being a small country. In this case, the export supply curve of foreign suppliers to the domestic banana market would be perfectly elastic. One major argument for the assumption of perfect competition could be the result of earlier studies indicating a quick and nearly full price transmission of world prices to the German banana market [WEIß (1995)]. We know that this is more likely under perfect than imperfect competition [MCCORRISTON/ MORGAN/RAYNER (1998]. The small-country assumption has to be founded on market-share arguments. The German share of the world banana market was slightly above 10% in most of the years in the period 1960-92 and thus not insignificant [FAO(a)]. It cannot be said, however, that Germany is a dominant market participant on the world banana market. Compared to the U.S., which reached a market share around 40% in most years of the period 1960-92, Germany is a comparatively small country on the market. Moreover, Germany does not act as one country but individual importers are the decision units with market shares being clearly less than 10% of the world market.

3.1.1 *Theoretical Analysis*

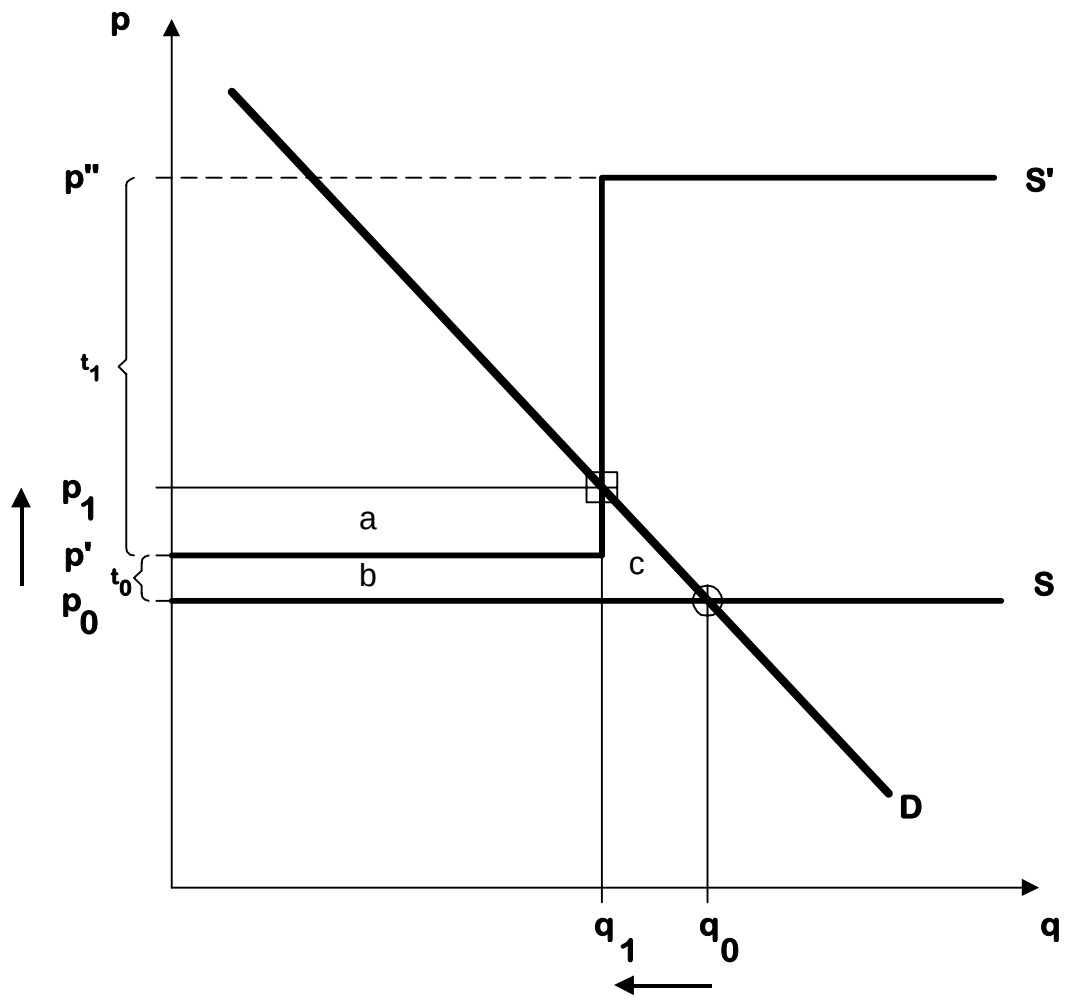
The following theoretical analysis of the introduction of a tariff-rate quota in a customs union under Framework 1 draws heavily upon HERRMANN (1999) whose argumentation is only briefly summarized here. The economic impacts are closely related to those of voluntary export restraints as explained in the general trade literature [FEENSTRA (1992); HILLMAN (1989); HILLMAN (1991); VOUSDEN (1990)]. They differ, however, from these impacts by the fact that a tariff and a non-tariff element are combined here and that the redistributive impacts of the Common Financial System of the EU has to be considered here in a welfare analysis.

In Framework 1, the export supply curve of dollar-banana exporters on the German banana market (S) is totally elastic at the world price level. We concentrate on the supply of dollar bananas, as more than 95% of all consumed bananas on the German market are dollar bananas in the situations with and without the European Banana Regime. A sizeable substitution between dollar and ACP or EU bananas has not occurred. The German import demand curve is D and under free trade, the pre-policy situation, this results in an equilibrium import price p_o and German banana imports of q_o.

A tariff-rate quota is now introduced under the Common European Banana Policy. A quota is fixed at the European level, of which Germany receives q_1. Licences for the quotas are allocated to importers in the original European Banana Policy thus leading to quota rents for importers. A two-part tariff is introduced: t_o on all imports up to the quota and $(t_o + t_1)$ as a prohibitive tariff rate above the quota. This leads to the kinked export supply curve S' with a vertical part between p' and p''. S' intersects now D at p_1. Thus, the tariff-rate quota raises the import price from p_o to p_1 and restricts imports from q_o to q_1.

It has been explained in detail in HERRMANN (1999) that the European and the German point of view have to be distinguished in a welfare analysis of the tariff-quota impacts on the German banana market. This is due to the existence of the Common Financial System in the EU and has been shown first by KOESTER (1977) for the Common Agricultural Policy in general. **The welfare analysis from the European point of view** has to incorporate welfare effects on EU consumers, EU traders and the EU budget on the market under question. Consumers on the German market for banana imports lose the area (a + b + c) in consumer surplus[4)] as a consequence of rising prices. A part of the price rise is due to the introduction of the tariff t_o. A budgetary gain by the area b arises at the EU level. Additionally, quota rents occur on the German market for EU traders in the magnitude of the area a. Prices rise stronger than in the pure tariff case and, as importers received the licenses for q_1 under the original policy rules, the restricted quantity can be sold at the highest bid, i.e. at p_1 rather than p'. From the European point of view, the losses of EU consumers overcompensate gains by EU traders and the EU budget on the German banana market and a net welfare loss of area c occurs. Area c represents a deadweight loss since consumption on the German banana market falls below the socially optimal level due to the new policy.

Figure 1: Economic Implications of the Tariff-rate Quota Policy on the German Banana Market (Small-country Assumption)



The welfare analysis from the German point of view has to consider German consumers, German traders and the national government's budget. Again, the welfare loss for consumers on the German banana market is the area (a + b + c), since domestic consumers are affected by the price rise. The other two groups of the society are, however, affected less positively than their EU counterparts. Due to the existence of a customs union, the new tariff raises revenues at the EU level. It only increases the national tax revenue if the national contributions to the EU budget are lowered consequentially. The budgetary gain from the German point of view is thus $\alpha \cdot b$ with $0 \leq \alpha \leq 1$. German traders will get only a share of the total quota rent on the German banana market. As licences have been partly allocated to traders, who marketed ACP and EU bananas, a share of the quota rent will go to non-German EU traders. German traders' welfare gain is $ß \cdot a$ with $0 \leq \beta \leq 1$. When we aggregate welfare impacts from the German point of view, a net welfare loss by the area $\{c + a (1 - ß) + b (1 - \alpha)\}$ occurs due to the introduction of the tariff-rate quota on the German banana market. The size of the welfare loss is higher than from the European point of view.

3.1.2 *Empirical Results*

The price, quantity, expenditure and welfare effects shown by Figure 1 will now be measured empirically. As Figure 1 refers to the original European Banana Policy after 1993, the empirical results refer to 1993 and 1994 when this original policy was in force. The computations for Framework 1 follow HERRMANN (1999) but consider more recently available data and also go beyond that analysis by additional econometric demand estimates and by providing tests of the model assumptions.

We present econometric evidence on important market parameters first and then the computed policy impacts on the basis of those parameters.

3.1.2.1 *Econometric Results on Price Formation and Import Demand Behaviour*

In principle, the price/quantity combinations p_1/q_1 of Figure 1 can be derived from official statistics. Not observable is, in periods after the introduction of a tariff-rate quota, the hypothetical price/quantity combination in the situation of free trade. In order to model the hypothetical import price, we utilize the historical price transmission from the export market to the German import market. For computing hypothetical imports, we need to estimate the slope of the import demand function for identifying the equilibrium point between the modelled exogenous price and demand, i.e. the S curve and the D curve.

A comprehensive specification search, which is not shown here in detail, yielded the following price transmission equation:

(1) $\ln p = 0.1212 + 0.9212^{***} \ln p_w + 0.8746^{***} \ln e$
(1.78) (12.53) (6.82)

($\bar{R}^2 = 0.89$; F = 90.42***; DW = 1.32)

Equation (1) describes the long-run price transmission from the world market, defined as the for-price for South and Middle American bananas of class I in New York (p_w), to the German import market. The world price is measured in US-$, the German import price (p) in DM, and e is the exchange rate expressed as the price of one US-$ in DM[5)].

Equation (1) allows for a differential impact of the world price and the exchange rate on the German import price for bananas. The world price and exchange rate transmission elasticities are close to unity. This indicates that alterations in world prices and exchange rates were nearly completely transmitted to the German market within the individual years of the period 1970-92. The corrected coefficient of determination shows that about 90% of the total variation in logarithms of German import prices can be explained by the price-transmission equation. Additionally, the t-values in parentheses show that both explanatory variables are statistically significant at the 99.9%-level.

This strong price transmission under the free-trade situation may have been the outcome of alternative market structures, either a perfectly or imperfectly competitive market. Independent of the market conduct, which is not directly observable, we posit here that German import prices for bananas would have followed the pattern of price and exchange rate transmission as indicated by equation (1). Thus, equation (1) is utilized for modelling hypothetical import prices after the introduction of the new European Banana Regime.

Hypothetical imports have to be modelled then on the basis of estimated import demand functions for bananas. Under Framework 1, the import price can be treated as exogenous in the econometric estimates of import demand. Foreign exporters supply bananas at the German border for the given international price. This assumption justifies OLS estimates of German import demand.

Table 2 gives an overview of selected estimates of German banana import demand functions. A comprehensive specification search was performed on the basis of the following theoretical considerations and with data for the period 1960-92. Standard microeconomic theory suggests that banana import demand (q) depends on the import price of bananas (p), the import price of a major substitute (p^S) in consumption and the income level (Y):
(2) $q = f(p, p^S, Y)$.

The expected signs of the first derivatives of equation (2) are positive with regard to p^S and Y and negative with regard to p. p and p^S are expressed in domestic currency as is income. It has been shown in earlier trade studies that the reaction in import demand might be different due to changes in the world price, expressed in an international currency like the US-$ ($p^{\$}$), and the exchange rate (e), i.e. the price of the US-$ in domestic currency units [WILSON/TAKACS (1979)]. Equation (2) can address this when it is estimated as
(3) $q = g(p^{\$}, p^{S,\$}, e, Y)$.

Equation (3) allows for a differential response of import demand to world prices, denominated in international currency, and the exchange rate. Previous studies on the fruit market suggest that the major substitute in consumption for bananas is apples [WEIß (1995)]. If the world apple price (p_w^A) is introduced and we consider a dummy variable for the effects of German unification (D), formula (3) changes to
(4) $q = h(p^{\$}, p^{A,\$}, e, Y, D)$.

Model (4) was a starting point for the specification search, and various functional forms of this relationship were estimated for the period 1960-92 and various subperiods. Models were estimated as aggregate market demand and as per-capita demand functions and either nominal or deflated variables were used. The analysis contained also a comprehensive analysis of cointegration with the estimates of error-correction models, some of which are reported elsewhere [HERRMANN (1999)]. We will not concentrate on cointegration analysis here since this would

Table 2: The German Import Demand Behaviour for Bananas, 1977-92 and 1960-92: Selected Econometric Results (Framework 1: Small-country Case)[a]

Models (Estimation Period)	Estimated Equations and Test Statistics
Market Demand Models:	
(1) (1977-92)	$q = -3.7164 - 0.3490 \cdot 10^{-3}{***}\ p_R^{DM} + 0.4544 \cdot 10^{-4}\ p_R^{A,\,DM}$ (-1.08) (-4.87) (0.47) $+ 0.7337 \cdot 10^{-2}{***}\ Y_R + 1.5046\ D$ (5.70) (1.88) ($\bar{R}^2 = 0.98$; F = 194.39***; DW = 1.98; Ramsey's RESET 2 = $0.83 \cdot 10^{-6}$)
(2) (1977-92)	$\ln q = -7.9335 - 0.5673{**}\ \ln p_R^{DM} + 0.0887\ \ln p_R^{A,\,DM}$ (-1.58) (-4.49) (0.48) $+ 1.8928{**}\ \ln Y_R + 0.0573\ D$ (4.53) (0.44) ($\bar{R}^2 = 0.96$; F = 86.48***; DW = 1.31; Ramsey's RESET 2 = 2.17)
(3) (1977-92)	$q = 3.7797{*} - 0.4031 \cdot 10^{-3}{**}\ p^{DM} - 0.4163 \cdot 10^{-5}\ p^{A,\,DM}$ (3.13) (-6.04) (-0.23) $+ 0.3940 \cdot 10^{-2}{***}\ Y + 2.2488{**}\ D$ (8.81) (3.50) ($\bar{R}^2 = 0.98$; F = 168.77***; DW = 2.09; Ramsey's RESET 2 = 0.63) Own price, income and unification elasticities of import demand, evaluated at mean values: $\varepsilon\, p^{DM} = -0.55$; $\mu = 1.01$; $\varepsilon_D = 0.30$
(4) (1977-92)	$q = 8.2662{*} - 2.0065{*}\ e - 0.8727 \cdot 10^{-3}{**}\ p^{\$}$ (3.18) (-3.18) (-3.72) $- 0.1486 \cdot 10^{-3}\ p^{A,\$} + 0.4143 \cdot 10^{-2}{***}\ Y + 2.6077{**}\ D$ (-0.53) (6.33) (3.35) ($\bar{R}^2 = 0.97$; F = 106.78***; DW = 1.93; Ramsey's RESET 2 = 0.78)
(5) (1960-92)	$q = 5.2418{*} - 0.2187 \cdot 10^{-3}{*}\ p_R^{DM} + 0.7357\ p_R^{A,\,DM}$ (2.05) (2.59) (0.74) $+ 0.1437 \cdot 10^{-2}\ Y_R + 5.3576{***}\ D$ (5.36) (7.65) ($\bar{R}^2 = 0.90$; F = 71.49***; DW = 1.01; Ramsey's RESET 2 = 2.21)

Table 2 continued: The German Import Demand Behaviour for Bananas, 1977-92 and 1960-92: Selected Econometric Results (Framework 1: Small-country Case)

Models (Estimation Period)	Estimated Equations and Test Statistics
Per-capita Demand Models:	
(6) (1977-92)	$q^C = \underset{(-1.04)}{-5.6561} \underset{(-5.46)}{- 5.8171***}\ p_R^{DM} \underset{(0.46)}{+ 0.7029}\ p_R^{A,DM} + \underset{(5.72)}{0.7261 \cdot 10^{-3}***}\ Y_R^C \underset{(8.87)}{+ 4.1880***}\ D$ ($\bar{R}^2 = 0.96$; F = 87.01***; DW = 1.94; Ramsey's RESET 2 = 0.02)
(7) (1977-92)	$\ln q^C = \underset{(-4.26)}{-18.0843**} \underset{(-4.78)}{- 0.5751**}\ \ln p_R^{DM} \underset{(0.65)}{+ 0.1169}\ \ln p_R^{A,DM} + \underset{(4.81)}{1.9850**}\ \ln Y_R^C \underset{(5.45)}{+ 0.2905***}\ D$ ($\bar{R}^2 = 0.93$; F = 49.37***; DW = 1.40; Ramsey's RESET 2 = 1.76)
(8) (1977-92)	$q^C = \underset{(3.32)}{6.1724**} \underset{(-6.34)}{- 6.6128***}\ p^{DM} \underset{(-0.24)}{- 0.3894}\ p^{A,DM} + \underset{(9.01)}{0.3948 \cdot 10^{-3}***}\ Y^C \underset{(4.26)}{+ 2.9708**}\ D$ ($\bar{R}^2 = 0.95$; F = 73.66***; DW = 1.94; Ramsey's RESET 2 = 1.06)
(9) (1977-92)	$q^C = \underset{(3.37)}{13.4488**} \underset{(-3.37)}{- 3.2752**}\ e \underset{(-3.80)}{- 14.4413**}\ p^{DM} \underset{(-0.54)}{- 2.3062}\ p^{A,DM} + \underset{(6.32)}{0.4172 \cdot 10^{-3}***}\ Y^C \underset{(3.50)}{+ 3.7541**}\ D$ ($\bar{R}^2 = 0.94$; F = 45.54; DW = 1.81; Ramsey's RESET 2 = 1.31)

a) The variables are defined as follows: q is defined as the German import demand for bananas, measured in 100 000 metric tons in the market demand functions and in kilograms in the per-capita demand functions. p (p^A) is the German import unit value for bananas (apples), measured in US-$ per 10 metric tons in the market demand functions and per kilogram in the per-capita demand functions. The superscript DM indicates that prices are denominated in German marks rather than in US-$. Y is the German gross domestic product in billion DM and e is the exchange rate expressed as the price of one US-$ in DM. D is a dummy variable for German unification with one for the period 1990-92 and zero in all other years. The superscript C stands for per-capita, the subscript R for real values. Real values are computed by deflating with the German consumer price index, where 1985=100. Values in parentheses are t-values. $\bar{R}^2$ is the corrected coefficient of determination, F the F-value and DW the Durbin/Watson coefficient. Ramsey's RESET 2 is a Lagrange multiplier test of functional form, where the residuals are regressed on the independent variables and the square of the fitted dependent variable [HALL/CUMMINS (1997), p.31]. ***, ** and * represent the 99.9%-, 99%- and 95%-levels of statistical significance.

Source: Own computations with data taken from WEIß (1995), DEUTSCHE BUNDESBANK, FAO(b) and STATISTISCHES BUNDESAMT.

substantially increase the empirical part of this paper without adding much to the economic argument. Moreover, due to the availability of annual data, the length of the time series is very short for a serious analysis of cointegration testing and the formulation of error-correction models. The relevant time series do seem to be cointegrated, however, so that we can interpret all presented import demand functions as cointegrating regressions in the sense of ENGLE and GRANGER (1987) revealing the long-run relationship between independent and dependent variables.

The results of Table 2 can be summarized as follows. In general, a very large share of variations in market demand or per-capita demand for German banana imports can be explained after a careful specification search. The best models of aggregate as well as per-capita import demand explain more than 95% of demand variations with highly significant explanatory variables and no indication of autocorrelation or misspecification.

The estimation period has a major influence on the modelling results and 1977-92 is chosen here. There seem to be structural changes in banana import behaviour over the long run. All econometric import demand models for the whole period 1960-92 remained somewhat unsatisfactory. In particular, some autocorrelation remained in all these models as the Durbin/Watson coefficient for equation (5) in Table 2 shows. A comparison of estimates for subperiods indicates that the role of the substitutive good apples diminished and that estimated coefficients were not stable over the long period 1960-92. This must lead to some form of misspecification when a uniform functional form is imposed on the model for the whole period. The estimated results for the subperiod 1977-92 were consistently superior and point to a clear pattern of import demand behaviour in the second subperiod. This can be seen by comparing the equivalent model specifications (1) and (5) in Table 2.

What are the important determinants of German import demand for bananas in the period 1977-92? Equation (1) in Table 2 shows that aggregate German import demand for bananas increased significantly with

- a falling real import price, measured in German mark,
- an increasing real income in Germany,

but not with a rising real import price for apples. It is a consistent result in all estimated models for 1977-92 that apples are not regarded as substitute for bananas anymore. Some of the models for 1960-92 and nearly all models for 1960-76, which are not presented here, still show the opposite. The variable D is only statistically significant at the 90%-level in equation (1), but various other models in Table 2 reveal that German unification raised aggregate import demand as well as, very clearly, per-capita imports of bananas.

A further general pattern visible in the specification search was that market demand as well as per-capita demand followed a linear rather than loglinear functional form. This can be seen by comparing the functions (1) and (2) as well as the functions (6) and (7). It is not so much the corrected coefficient of determination, which is generally high and not directly comparable for

the two functional forms, but especially the better value of the Durbin/Watson coefficient for the linear model that leaves doubt with regard to the functional specification of the loglinear model.

Table 2 contains models where the explanatory variables are deflated, i.e. real models, as well as models where prices and income are measured in current values, i.e. nominal models. A further interesting result is that the nominal models have a high explanatory power, too, and show statistically significant influences of all explanatory variables except the import price for apples. The comparative performance of nominal models can be seen by comparing the market demand equation (3) in Table 2 with equation (1) and the per-capita demand model (8) with (6). In equations (3), (6) and (8), we see a highly significant and positive influence of German unification on aggregate import demand and per-capita demand for bananas. The Durbin/Watson coefficients are again close to two and do not indicate any autocorrelation. Moreover, Ramsey's Reset test does not indicate any functional misspecification of the model. In general, Ramsey's Reset test is not significant at the 95%-level for any model of Table 2 and the test statistic does exceed a value of two only in model (5) for the total period 1960-92.

Equations (4) and (9) in Table 2 cover the fully specified models which distinguish between import prices in US-$ and the exchange rate. The exchange rate expressed in DM per US-$, has the expected negative effect on aggregate German import demand for bananas as well as on per-capita import demand. The world price variable, expressed in US-$, is significantly negative as expected. It is obvious from the comparison of equations (4) and (5) as well as of equations (8) and (9), however, that the additional introduction of the exchange rate does not contribute anything to the explanatory power of the more parsimoneous models (4) and (8). Moreover, the exchange rate and world price elasticity of import demand were very similar so that no differential impact of the world price and the exchange rate on demand could be detected. Hence, the models introducing the import price variable in DM were preferred.

All the per-capita import demand models are specified in kg and prices per kg and, therefore, the detailed analysis of one equation may be instructive. According to equation (6),

- an increase of the real banana import price by 0.10 DM per kg will lower banana imports per capita by 0.581 kg;
- an increase of real per-capita income by 1000 DM annually will raise banana imports per capita by 0.726 kg;
- German unification increased per-capita banana imports by 4.19 kg.

Although the effects of German unification seem especially strong in this equation, we can generalize from equations (6) to (9) that the unification had a major effect on per-capita banana imports in 1990-92. The percentage change in per-capita imports due to unification was 29% according to the estimated equation (7). Own price and income elasticities of per-capita import demand are -0.58 and 1.99 respectively in the same equation. Again, the statistical criteria were very satisfactory in the per-capita models and in no case did the Ramsey test indicate any significant misspecification.

Among all the models shown in Table 2, we select equation (3) for the following policy analysis. The price coefficient of import demand from this equation is utilized for measuring impacts of the new European Banana Policy on trade, consumption, import expenditures and welfare on the German banana market. As nominal, real models and per-capita models performed equally well, equation (3) is preferred since it allows to model immediately with data from the banana market without using further macroeconomic data as in the real and the per-capita models.

One major argument against equation (3) or an alternative model of Table 2 could be that the world banana price might be endogenous rather than exogenous. This would be identical with the large-country rather than the small-country assumption, i.e. the main assumption of Framework 2 to be dealt with later. The standard approach to test for simultaneity is to perform a HAUSMAN specification test [HAUSMAN (1978)][6]. In our context of equation (3) in Table 2, it is necessary to test whether the explanatory variable p_w^{DM} is correlated with the disturbance term.[7] This basically equivalent to a test whether the two-stage least squares estimates are significantly different from the OLS estimates. The result of a HAUSMAN specification test lends clear support to the small-country assumption implicit in equation (3). If we specify a plausible alternative and simultaneous model of the German import market for bananas[8] this yields the following reduced form for the price variable:

$$\begin{array}{lccccc} (5)\ \hat{p}^{DM} = -3023.85 + 3679.22^{**}e - 0.1569\, p^{A,DM} + 3.8782^{**}Y - 2246.32\, D \\ \qquad\qquad\quad (-0.77) \quad (3.95) \quad (-0.51) \quad (3.41) \quad (-1.28) \end{array}$$

$$(\bar{R}^2 = 0.58;\ F = 6.13^{**};\ DW = 1.43)$$

All variables and all test statistics are defined as in Table 2. When we enter the estimated values (marked by ^) of the price variable additionally into the preferred import demand equation (3) of Table 2, we get:

$$\begin{array}{lccccc} (6)\ \hat{q} = 3.5942^{*} - 0.4599\cdot 10^{-3}{}^{**}\, p^{DM} - 0.2381\, p^{A,DM} + 0.3808\cdot 10^{-2}{}^{***}Y \\ \qquad\quad (2.84) \quad (-4.32) \quad (-0.22) \quad (7.68) \\ \qquad + 2.4134^{**}D + 0.9668\cdot 10^{-4}\, \hat{p}^{DM} \\ \qquad\quad (3.45) \quad (0.70) \end{array}$$

$$(\bar{R}^2 = 0.98;\ F = 128.78;\ DW = 2.11;\ \text{Ramsey's RESET 2} = 1.57)$$

HAUSMAN's specification test focuses on whether the regression coefficient of the additional, estimated variable $\hat{p}^{DM}$ is statistically different from zero or not. The first result would indicate a misspecification due to simultaneity bias; the second result would not point to any such misspecification. The regression coefficient of $\hat{p}^{DM}$ is clearly insignificant. This suggests that the banana import price is not an endogenous variable on the German import market and that we can start from the small-country assumption.

3.1.2.2 *Empirical Results on the Policy Impacts*

Based on the theoretical analysis and the econometric estimates presented above, actual impacts of the new European banana market policy are elaborated in the following for the first two years, 1993 and 1994. The price transmission equation (1) is utilized first for modelling the hypothetical import price under the influence of the new policy. Actual import prices are taken from published sources [STATISTISCHES BUNDESAMT]. The comparison between hypothetical and actual import prices yields the policy's price impact. Based on the econometrically estimated price coefficients of import demand in equation (3) of Table 2, additional impacts on trade, import expenditures and economic welfare are computed. The results are shown in Table 3.

The new banana policy raised the German import price for bananas substantially. In 1994, the import price was 1.57 DM/kg under the new policy compared with 0.83 DM/kg without the policy change. Due to the policy change, the import price for bananas nearly doubled. German banana imports were reduced by 21% in 1994. Import expenditures increased by 49%, as the rise in prices was stronger than the decrease in quantities in percentage terms. The consequential loss in consumer surplus on the import market was substantial, too, at 938 mill. DM in 1994.

From the European point of view, changes in the German banana economy affect the German consumers, traders from EU countries on the German banana market and the EU budget. As expected, German consumers lose due to the new banana policy, and a deterioration in economic welfare occurs from the aggregate European point of view. There are, however, strong redistributive impacts involved under the new banana regime. The loss in consumer surplus of 938 mill. DM is by far larger than the aggregate welfare loss of 109 mill. DM from the EU's aggregate point of view. The newly introduced banana import taxes on the German market improves the EU budget by 220 mill. DM in 1994 but - above all - quota rents were created for European traders with a magnitude of 609 mill. DM.

A welfare evaluation from the German point of view of the new banana market policy on the German banana market yields rather different findings from the European point of view. Again, consumers on the German import market are most negatively affected. Additionally, their welfare losses of 938 mill. DM are to a much lesser extent compensated by welfare gains of other social groups than from the EU's point of view. We assume that 70% of the import licences for the German banana market are allocated to German traders. This implies that 426 mill. DM of the total quota rent were captured in 1994 by German banana traders. With regard to the German budget, it is not evident that a direct reduction of the national budget flows to the EU will occur. New expenditures, e.g. for deficiency payments to EU banana producers, are the consequence of the new policy and a reduction of financial contributions to the EU is unlikely. It is posited in Table 3 that the policy change on the German banana market is budget neutral. Consequently, adding up the welfare changes for the individual groups yields a national welfare loss of 512 mill. DM. This deterioration of economic welfare due to the new protectionism on

the German banana market is several times higher from the German than from the EU's point of view.

Table 3: Economic Effects of the New European Banana Trade Regime in Germany, 1993 and 1994 (Framework 1)[a)]

Economic Variables	1993	1994
Import price for bananas (DM/kg):	1.256	1.569
Hypothetical import price for bananas (DM/kg):	0.856	0.834
Policy-induced impact on the import price for bananas (%):	+46.8	+88.1
Imports of bananas (mt):	1186391	1128320
Hypothetical imports of bananas (mt):	1347801	1424456
Policy-induced impact on imports of bananas (%):	-12.0	-20.8
Import expenditures for bananas (mill. DM):	1490.11	1770.33
Hypothetical expenditures for bananas (mill. DM):	1153.11	1188.43
Policy-induced impact on import expenditures for bananas (%):	+29.2	+49.0
Welfare effects of the new banana trade regime (the **European view** of the German market):		
(i) Consumers of imported bananas (mill. DM):	-507.4	-937.8
(ii) European traders (quota rents in mill. DM):	+358.8	+609.0
(iii) EU budget (tax income in mill. DM):	+116.3	+220.0
Aggregate welfare change, European point of view (mill. DM):	-32.3	-108.8
Welfare effects of the new banana trade regime (the **German view** of the German market):		
(i) Consumers of imported bananas (mill. DM):	-507.4	-937.8
(ii) German traders (quota rents in mill. DM):	+251.2	+426.3
(iii) German budget:	-	-
Aggregate welfare change, German point of view (mill. DM):	-256.2	-511.5

a) The computations are based on the theoretical framework explained in Section 3.1. Major assumptions of the model are: (i) the price transmission from the world banana market to the German import market shown in equation (1) in the text; (ii) a price coefficient of German import demand for bananas as shown in equation (3) of Table 3; (iii) a share of 70% of all import licences for the German banana market allocated to German traders (after the official distribution and trading of the distributed licences); (iv) budget neutrality of the new European banana trade regime from the German point of view.

Source: Own computations with data of FAO (a, b); STATISTISCHES BUNDESAMT; DEUTSCHE BUNDESBANK; IMF (1994), International Financial Statistics: Yearbook 1994. Washington, D.C.

3.1.3 *Conclusions*

It was the objective of this Section to show how a tariff-quota system in the EU affects prices, trade and welfare under the assumptions of perfect competition and the small-country case. In the welfare analysis of the market regulation in an EU country, the European and the national points of view were distinguished. The introduction of the European Banana Policy on the German market was the case study. If Germany is a small country on the world market, import demand functions can be estimated with OLS. Various tests of misspecification did not raise doubt about the validity of the perfect-competition and small-country assumptions and very satisfactory estimations of import demand behaviour were received. The quantitative results showed a welfare loss due to the introduction of the European Banana Policy on the German

market. This welfare loss is significantly higher from the German than from the European point of view. Untargeted redistributive effects and deadweight losses occurred due to the new policy. Consumers were major losers as a consequence of the price rise. Traders are the major beneficiaries of the new system due to quota rents. Strong incentives for rent-seeking to protect those traders' benefits were created.

3.2 Market-structure Framework 2: Perfect Competition, Large-country Case

Given the fact that the German share of the world banana market was about 10% in the period 1960-92, the small-country assumption could be doubted. It might well be that changes in German import demand affect the German import price. This possibility is captured in Framework 2, where we posit a competitive market and the large-country assumption for Gemany. In this case, the export supply of foreign suppliers to the German banana market is upward-sloping. It will be shown first theoretically how a tariff-rate quota as in the European Banana Policy will affect prices, trade and welfare on the German market based on the large-country assumption. Differential impacts under Framework 2 and Framework 1 will be stressed. Additional econometric evidence will then be shown for the German import market for bananas which is consistent with Framework 2. Economic effects of the European Banana Policy will then be elaborated on the basis of coefficients from the econometric model and Framework 2.

3.2.1 *Theoretical Analysis*

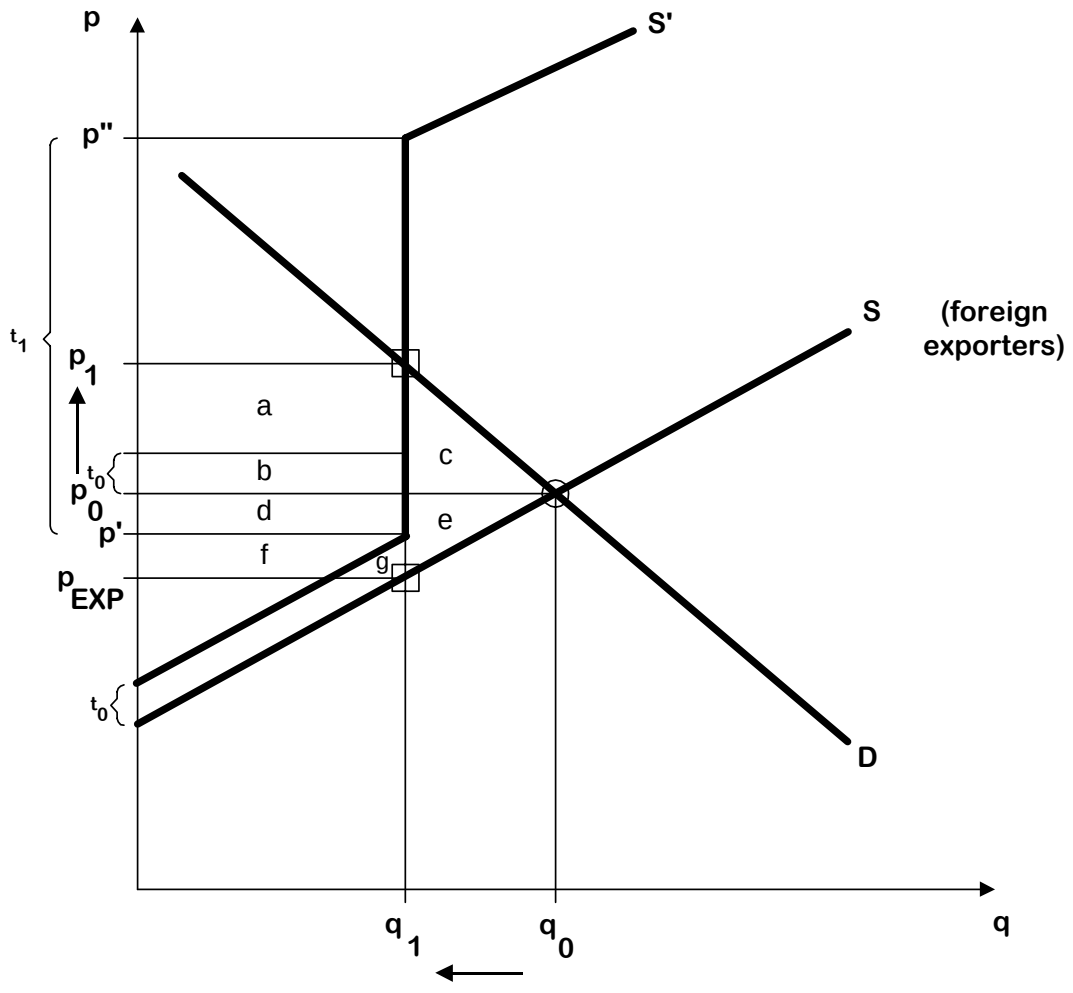
Under perfect competition and the large-country case, the German import demand curve (D) and the export supply curve of dollar-banana exporters at the German border (S) determine the German import price for bananas. The export supply curve is upward-sloping and, in a multi-regional market model [TWEETEN (1992)], would be derived as the excess supply curve of the rest of the world for bananas. The equilibrium import price in the free-trade situation is p_o and German banana imports are q_o. We again posit that the German market for banana imports consists exclusively of dollar bananas. The small portion of the market in which EU and ACP bananas are traded is ignored.

A tariff-rate quota is now introduced under Framework 2 as in the Common European Banana Policy. A quota is fixed at the European level, of which Germany receives q_1. A two-part tariff is introduced: t_o on all imports up to the quota, and $(t_o + t_1)$ as a prohibitive tariff rate above the quota. This leads to the kinked export supply curve S' with a vertical part between p' and p''. S' intersects now D at p_1. Thus, the tariff-rate quota raises the import price from p_o to p_1 and restricts imports from q_o to q_1.

The price and trade impacts are thus similar to Framework 1 with the exception that the export supply curve under the policy influence remains upward-sloping with a kink at the quota level. This latter difference implies, however, that the exporting countries are affected differently by the new banana policy under Frameworks 1 and 2. Whereas the exporting country's price was p_o in Figure 1, it is now p_{EXP} in Figure 2. The upward-sloping export supply curve implies that the

marginal costs of exporting to the German market are smaller at lower export levels. In a competitive market, the exporting countries' price equals marginal costs. Therefore, exporting countries are worse off on the German banana market since prices decline under the new policy whereas they do not under Framework 1, i.e. the small-country case. Importers capture the quota rent as in Framework 1, but the amount of the quota rent increases when the export price declines to p_{EXP} compared with the small-country case.

Figure 2: Economic Impacts of the Tariff-rate Quota Policy on the German Market for Banana Imports (Competition; Large-country Assumption)



Again, the welfare economic evaluation has to distinguish between the European and the German points of view. Welfare effects on EU consumers, EU traders and the EU budget are to be covered from the **European point of view**. Due to the Common European Banana Policy, consumers on the German market for banana imports lose the area (a + b+ c) in consumer surplus

under Framework 2. A part of the underlying price rise from p_o to p_1 is a consequence of the introduction of the tariff t_o. A budgetary gain of the area (f +g), which is equal to area b, arises at the EU level. The quota raises the import price more than in the pure tariff case: Traders may use their import licences to sell dollar bananas to consumers at p_1. If exporting countries do not participate in the policy-induced price rise and their export price falls to p_{EXP}, EU traders earn a quota rent on the German market which is equal to (a + b+d). Thus, the high import price p_1 includes the exporting countries' price (p_{EXP}), the tariff (p' - p_{EXP}) and a quota rent for importers per imported unit of (p_1 - p'). On aggregate, the consumers' welfare loss may or may not exceed the sum of welfare gains by EU traders and the EU budget. The net welfare impact of the tariff-quota policy under Framework 2 is (-c + b + d) from the European point of view.

It is remarkable that the redistributive implications of the Common European Banana Policy differ quite substantially depending on the market structure of the model. Although perfect competition is still assumed, the net welfare effect may change due to the introduction of the large-country assumption and the size of the quota rent is strongly affected, too. The quota rent is higher under Framework 2 than under Framework 1, and the additional quota rent under Framework 2 is paid for by suppliers from exporting countries. Non-EU exporters lose the area (d + e+ f +g) in producer surplus on the German banana market as a consequence of the new policy[9)].

When the net welfare effects from the European and third countries' points of view are aggregated, we can conclude that the **aggregate welfare impact** on the German banana market due to the new European Banana Policy is negative. A net welfare loss by the area (c + e) arises. This is a typical deadweight loss as trade is restricted below the socially optimal level q_o.

The welfare impact on the German banana market from the **German point of view** is again more negative than from the European point of view. There is again the welfare loss of German consumers due to the policy-induced price rise by area (a + b + c). The other groups of the society are unaffected or gain less - as under Framework 1 - than their counterparts at the European level:

(i) The introduction of the external tariff on German banana imports leads only to an improvement of the EU's budget situation. It does not improve the budget situation or only partly, by $\{\alpha \cdot (f + g)\}$ with $0 \leq \alpha < 1$.

(ii) Only a part of the quota rent on the German banana market is again realized by German traders, as import licences have been allocated partly to foreign traders. I.e., only a share of the area (a + b +d) occurs as a welfare gain. However, due to the declining export price for foreign exporters, this amounts to a clearly higher gain of German traders under Framework 2 than under Framework 1.

Given the large-country situation, the introduction of the new European Banana Policy may thus affect aggregate welfare from the German point of view positively or negatively. If the welfare effect is positive, this occurs as a consequence of the quota rent which is higher under the large-

country than the small-country case. Importers will gain a higher quota rent at the expense of foreign exporters who lose due to a price fall for their export commodity. In any case, the welfare impacts are more negative from the German compared with the European point of view.

3.2.2 *Empirical Analysis*

Econometric estimations of German import demand behaviour within a simultaneous import market model are presented first. Estimated coefficients are then used to quantify the policy impacts in the large-country case.

3.2.2.1 *Econometric Results on Import Demand and Export Supply Behaviour*

HAUSMAN's specification test, shown in Section 3.1.1.1, had provided evidence in favour of the small- rather than the large-country assumption. A more direct test of the possibility that Germany affects its import price for bananas is to investigate whether export supply to the German market is less than infinitely price-elastic. This is feasible within an equilibrium model for the German banana import market containing an import demand function, an export supply function and an equilibrium condition. An important information from this model would be the size and significance of the price coefficient of export supply.

Table 4 shows various models of this type from the specification search. In a competitive multi-regional model, the export supply curve of bananas to the German import market is a residual supply curve. Hence, the demand and supply shifters in all other regions of the world should enter the export supply curve on the German market. Although being theoretically plausible, this yields strong econometric problems. Many shifters, like income variables in the major banana-consuming countries and import prices of major substitutes, are strongly correlated. All econometric models, which included various of these variables in the export supply function[10)], suffered from severe multicollinearity problems. We selected, therefore, a very parsimoneous specification of the export supply curve where the exchange rate, measured as the price of the US-$ in German Mark, entered as a major determinant of export supply on the German market. The rationale is as follows: Import demand has been specified very much in accordance with the estimates under Framework 1. Prices were introduced there in German Mark as importers, retailers and consumers in Germany plan in the national currency. In an equilibrium model under Framework 2, which consequently explains the market price in DM, the exchange rate has to be included in the export supply function additionally as foreign exporters plan in the international currency, i.e. the import price in DM times the reciprocal value of the exchange rate (1/e). Microeconomic theory suggests that foreign suppliers raise banana exports to the German market if

- the import price, denominated in DM, increases;
- the exchange rate, i.e. the price of the US-$ in DM, declines.

Table 4: Export Supply and Import Demand Behaviour on the German Import Market for Bananas, 1977-92: Selected Econometric Results (Framework 2: Perfect Competition, Large-country Case)[a]

Models	Theoretical Model, Estimated Equations and Test Statistics
Market Model 1:	
Reduced form:	(1) $p^{DM} = f(p^{A,DM}; Y; e; D)$
Import demand:	(2) $q^{D} = 3.5942^{**} - 0.3632 \cdot 10^{-3***} \hat{p}^{DM} - 0.2381 \cdot 10^{-4} p^{A,DM}$ (2.86) (-4.10) (-0.22) $+ 0.3808 \cdot 10^{-2***} Y + 2.4134^{**} D$ (7.74) (3.48)
	($\bar{R}^2 = 0.98$; DW = 1.96)
Export supply:	(3) $q^{S} = 7.7552^{**} + 0.6153 \cdot 10^{-3} \hat{p}^{DM} - 3.5618^{*} e + 4.99671^{***} D$ (3.22) (1.94) (-2.47) (4.23)
	($\bar{R}^2 = 0.79$; DW = 1.46)
Market Model 2:	
Reduced form:	(4) $p^{DM} = f(Y; e; D)$
Import demand:	(5) $q^{D} = 2.3512^{***} - 0.3655 \cdot 10^{-3***} \hat{p}^{DM} + 0.3807 \cdot 10^{-2} Y + 2.3512^{***} D$ (3.75) (-4.28) (8.09) (3.75)
	($\bar{R}^2 = 0.98$; DW = 1.95)
Export supply:	(6) $q^{S} = 7.7012 + 0.6340 \cdot 10^{-3} \hat{p}^{DM} - 3.6228^{*} e + 4.9668^{***} D$ (3.14) (1.94) (-2.46) (4.13)
	($\bar{R}^2 = 0.79$; DW = 1.44)
Market Model 3:	
Reduced form:	(7) $p^{DM} = f(Y^{C}; e; D)$
Import demand:	(8) $q^{D,C} = 5.5641^{***} - 5.9861^{***} \hat{p}^{DM} + 0.3801 \cdot 10^{-3***} Y^{C} + 3.0049^{***} D$ (4.88) (-4.56) (8.19) (5.17)
	($\bar{R}^2 = 0.95$; DW = 1.77)
Export supply:	(9) $q^{S,C} = 12.7405^{***} + 9.2166^{*} \hat{p}^{DM} - 5.4811^{*} e + 3.3261 D$ (3.56) (2.00) (-2.59) (1.99)
	($\bar{R}^2 = 0.58$; DW = 1.38)

a) Models 1 and 2 are aggregate market models and model 3 is a per-capita market model. The variables are defined as follows: q^{D} is defined as the German import demand for bananas, measured in 100 000 metric tons in the market demand functions and in kilograms in the per-capita demand functions. q^{S} stands for the corresponding quantities supplied to the German market. In order to provide an equilibrium, import data are used for q^{D} and q^{S}. p (p^{A}) is the German import unit value for bananas (apples), measured in US-$ per 10 metric tons in the market demand functions and per kilogram in the per-capita demand functions. The superscript DM indicates that prices are denominated in German marks rather than in US-$. Y is the German gross domestic product in billion DM and e is the exchange rate expressed as the price of one US-$ in DM. D is a dummy variable for German unification with one for the period 1990-92 and zero in all other years. The superscript C stands for per-capita values. ^ stands for estimated values from the first stage. All presented equations are estimated with the two-stage least-squares method. $\bar{R}^2$ is the corrected coefficient of determination and DW the Durbin/Watson coefficient. ***, ** and * represent the 99.9%-, 99%- and 95%-levels of statistical significance respectively.

Source: Own computations with the data sources mentioned in Table 2.

Furthermore, we posit that export supply rises due to German unification since former export supply on a third-country market is now diverted to the larger German market. Import demand captures, similar to the estimations in Table 2, the banana import price, the income variable and German unification as major determinants. In one equation, the world price of apples is also introduced but it is again insignificant. In all cases, import demand and export supply functions of the market models were estimated by two-stage least squares. The t-values are those of the structural model and not the second stage, which would be obtained by doing two-stage least squares literally in two stages [HALL/CUMMINS (1997), p.32]. Two market models, i.e. models 1 and 2, are estimated for market demand and supply whereas model 3 is formulated on a per-capita basis.

The most surprising finding of Table 4 is that there is some support for the theoretical hypothesis of a simultaneous market model of the German import market for bananas. Surprising is this finding as HAUSMAN's specification test had not indicated any misspecification due to simultaneity under the small-country assumption of Table 2. Although the statistical test criteria are better for the import demand than the export supply functions of Table 4, the signs of all coefficients of the export supply functions are plausible and the statistical significance level is 95% or higher in all cases except the price coefficients in equations (3) and (6). Those two price coefficients of export supply are positive and statistically different from zero at the 90%-level.

Table 4 strongly confirms the magnitude and direction of the influence of determinants of German import demand for bananas from the estimates of Table 2. More than 95% of variations in import demand can be explained in the simultaneous market models, too, by the import price denominated in German currency, the income variable and German unification, whereas equation (2) shows that the price of the substitutive good, apples, is again not significant. Clearly, aggregate (per-capita) import demand for bananas rose with

- a falling import price expressed in DM;
- an increasing GDP (GDP per capita) in Germany;
- the event of German unification.

The arguments of the export supply functions in models 1 and 2 are identical; only the demand specification differs. In both cases, the results reveal that export supply from foreign exporters to the German banana market increased with

- a rising import price for bananas on the German market, denominated in DM;
- a declining exchange rate, measured as the price of one US-$ in DM, and thus with a revaluation of the German mark;
- the event of German unification.

The direct comparison of the German unification dummies in the import demand and export supply function indicates that foreign exporters shifted their export supply to Germany stronger than import demand shifted.

Appendix 3 shows for individual years and the whole period 1977-92 computations of the price, income and exchange rate elasticities of the Market Model 2. Generally, the magnitude and signs of the elasticities are very plausible. The price elasticity of import demand is on average -0.56, the income elasticity 1.02. Thus, both elasticities are of similar size as in the earlier econometric estimations featuring the small-country assumption. For an individual segment of the world banana market like the German market, one would expect rather high price and exchange rate elasticities of supply in absolute terms. This is verified by Appendix 3. The mean price elasticity of export supply on the German banana market is 0.97 and the exchange rate elasticity of export supply is -1.19 for the period 1977-92.

If these estimates are viewed separately from the evidence under Framework 1 and 3, the conclusion seems safe that importers on the German banana market face an upward-sloping export supply curve. Shifts in import demand would then affect the German import price for bananas, i.e. Germany cannot be regarded as a price-taker on the world banana market.

3.2.2.2 *Redistributive Impacts in the Large-Country Case*

The question arises now how the new European Banana Market Policy affected prices, trade, import expenditures and welfare if the large-country assumption is introduced. Also relevant is of course the question how the computed policy impacts on allocation and redistribution are affected by the large-country compared with the small-country assumption. The basis for the quantitative analysis is a theoretical model following Figure 2 and empirical information from the simultaneous market models in Table 4.

We get identical impacts of the tariff-rate quota on the import price, imports, import expenditures and consumer welfare under the small- and large-country assumptions. This is due to the approach taken in the quantitative analysis. We posit that hypothetical import prices in the situation without policy would follow the same price pattern as observed and analyzed for the pre-policy period. Hence, hypothetical import prices are modelled with the price-transmission equation (1) shown in the text. This holds true for Frameworks 1 and 2. Under Framework 1, the structural model behind this price pattern would be that German import demand intersects the perfectly price-elastic export supply curve at the hypothetical import price pictured by the price-transmission model. Under Framework 2, the structural model would be that German import demand and an upward-sloping export supply curve intersect exactly at this price level. I.e., p_o in Figure 1 and 2 are at the same level. The quantities are also at the same level, since we use observed quantities for the situation with policy and we model the hypothetical quantities in the situation without policy with the same price coefficient of demand under the large- and small-country assumptions[11)].

We necessarily confirm, therefore, that the introduction of the European Banana Market Policy has substantially raised German import prices, lowered imports, increased import expenditures and caused a substantial loss of consumer surplus on the German market.

Table 5: Economic Effects of the New European Banana Trade Regime in Germany, 1993 and 1994 (Framework 2)[a]

Economic Variables	1993	1994
Import price for bananas (DM/kg):	1.256	1.569
Hypothetical import price for bananas (DM/kg):	0.856	0.834
Policy-induced impact on the import price for bananas (%):	+46.8	+88.1
Export price of bananas for third-country exporters (DM/kg):	0.601	0.367
Hypothetical export price (DM/kg):	0.856	0.834
Policy-induced impact on the export price for bananas (%):	-29.8	-56.0
Imports (and exports) of bananas (mt):	1186391	1128320
Hypothetical imports of bananas (mt):	1347801	1424456
Policy-induced impact on imports for bananas (%):	-12.0	-20.8
Import expenditures for bananas (mill. DM):	1490.11	1770.33
Hypothetical expenditures for bananas (mill. DM):	1153.11	1188.43
Policy-induced impact on import expenditures for bananas (%):	+29.2	+49.0
Welfare effects of the new banana trade regime:		
a) **European view** of the German market:		
(i) Consumers of imported bananas (mill. DM):	-507.4	-937.8
(ii) European traders (quota rents in mill. DM):	+660.9	+1136.0
(iii) EU budget (tax income in mill. DM):	+116.3	+220.0
(1) **Aggregate welfare change, European point of view** (mill. DM):	+269.7	+418.3
(2) Welfare effects for third-country exporters at the German market (mill. DM):	-322.6	-596.2
b) **Worldwide view** of the German market: (aggregate welfare change from the European and third-country exporters' points of view) (= (1) + (2))	-52.9	-177.9
c) **German view** of the German market:		
(i) Consumers of imported bananas (mill. DM):	-507.4	-937.8
(ii) German traders (quota rents in mill. DM):	+462.6	+795.2
(iii) German budget:	-	-
Aggregate welfare change, German point of view (mill. DM):	-44.8	-142.6

a) The computations are based on the theoretical methodology explained in the text. Major assumptions of the model are: (i) the price transmission from the world banana market to the German import market shown in equation (1) in the text; (ii) a price coefficient of German import demand for bananas as in Table 2 (the estimates of the simultaneous market models were not statistically different); (iii) a price coefficient of export supply on the German market for bananas as shown in equation (6) of Table 3; (iv) the assumptions (iii) and (iv) as in the footnote of Table 1.

Source: Authors' computations with the data sources mentioned in Table 2.

From the **European point of view**, however, the welfare implications are now substantially different from the small-country assumption. As the export price declines for foreign exporters when import licences are allocated to importers, substantial quota rents occur for European banana traders on the German market. The magnitude of these quota rents is 1136 mill. DM in 1994 and it overcompensates the consumers' welfare loss of 938 mill. DM. When the European budgetary gain on the German market of 220 mill. DM is added, we can conclude from Table 5 that the introduction of the European Banana Policy led to welfare gains from the European point of view on the German banana market. Note that this major conclusion depends on (i) the large-country assumption and on (ii) the fact that import licences are allocated to importers and, therefore, the additional assumption that (iii) quota rents are fully captured by importers.

The welfare gain from the European point of view is associated with a burden for foreign exporters. The latter is higher than the aggregate European welfare gain. In 1994, the welfare loss for third-country exporters on the German market was 596 mill. DM thus leading to an aggregate welfare loss from the **'worldwide' point of view** of 178 mill. DM.

The **German point of view** shows that the quota rent of German traders is now larger than under the small-country assumption, but it still does not compensate the high welfare losses of consumers. In 1994, a net welfare loss of 143 mill. DM remains due to the introduction of the European Banana Policy on the German market.

The comparison of Framework 2 with Framework 1, i.e. Tables 5 and 3, reveals that the sign of the welfare change from the European point of view changes, but not from the German point of view. Redistributive implications of the new banana policy are strongly affected by the introduction of the large-country assumption. From the European and German points of view, the high quota rent as a consequence of the new policy makes the welfare implications more positive in the large-country case, at the expense of foreign exporters. In the large- as well as small-country case, the welfare implications of the policy on the German banana market are more positive from the European than the German point of view.

3.2.3 *Conclusions*

It was shown in this Section how a tariff-quota system affects prices, trade and welfare in the competitive situation under the large-country assumption. Moreover, it was tested empirically within a simultaneous market model of the German import market for bananas whether the large-country assumption is confirmed.

If the large-country assumption is valid, the price elasticity of export supply would be expected to range between zero and infinity. Although no indication was found in Section 3.1.1 for the large-country case, the empirical evidence of this Section provides some support. There is a significant and positive price elasticity of export supply on the German banana market at least under some plausible model specifications. In the large-country case, even higher quota rents occur on the German banana market than in the small-country case. The redistributive conse-

quences are strongly affected by this assumption. European traders gain more than in the small-country case, at the expense of foreign exporters. This leads to a net welfare gain rather than a loss from the European point of view when the large-country assumption is introduced. The welfare impacts from the German point of view remain negative as is the case from the world-wide point of view.

In general, we know that market situations may often be explained well with alternative modelling approaches. However, it is striking here that models which assume very different market structures, i.e. the large-country versus the small-country case, perform reasonably well. Of course, the question arises which is the 'correct' model. At this point, the simultaneous econometric model has to be regarded with more doubts than the estimations in Section 3.1.1. The export supply function is much more difficult to specify and to estimate reliably in a simultaneous framework. The price and exchange rate elasticities of export supply are not statistically significant in all specifications and the magnitude is also not very stable across model specifications.

3.3 Market-structure Framework 3: Imperfect Competition

Most of the recent contributions on the impacts of the European Banana Policy start from perfect-competition models [BORRELL (1997); GUYOMARD et al. (1996); BEHR/ELLINGER (1993)]. There are, however, several contributions in the literature which cast some doubt on the relevance of the perfect-competition hypothesis [DEODHAR/SHELDON (1995); MCCORRISTON/SHELDON (1996)]. Empirical information on market shares clearly support these doubts. MCCORRISTON/SHELDON (1996) report that three multinational firms - United Brands (Chiquita), Standard Fruit (Dole) and Del Monte - capture 70 percent of the world market in bananas and 66 percent of the European market. Three firms (United Brands, Standard Fruit and Noboa) account for 72 percent of the German banana market. In market reports of banana firms, market shares are rather presented for brands than for firms. These are lower than firm shares as firms offer typically more than one brand. The market shares of the three largest brands (Chiquita, Dole, Cobana) in quantity terms were still as high as 36.9% [DOLE (1997)] and will be clearly higher in value terms.

It seems also that this concentrated market structure is associated with political influence. PEDLER (1994) shows in a detailed political-economy analysis that the fruit companies were very active players in lobbying prior to the introduction of the European Banana Market Policy. Those companies which favoured a restrictionist policy have been very successful in their lobbying activities.

Given this background, we will analyze in this Section how the assumption of imperfect competition affects the theoretical conclusions on the influence of a tariff-rate quota policy. It will then be tested whether the German import market for bananas was actually imperfectly compe-

titive. Based on the result of the market power test, we will provide new estimates of price, trade and welfare impacts of the European Banana Market Policy on the German market.

3.3.1 *Theoretical Analysis*

The theoretical analysis in Section 3.1.1 and 3.1.2 on the impacts of a tariff-rate quota on an otherwise unprotected German banana import market were based on the hypothesis of perfect competion. In reality, it is not directly observable on the market whether perfect or imperfect competition occurred in the free trade situation. Observed combinations of price and quantity could well be the result of an imperfect competition solution rather than a market equilibrium under perfect competition.

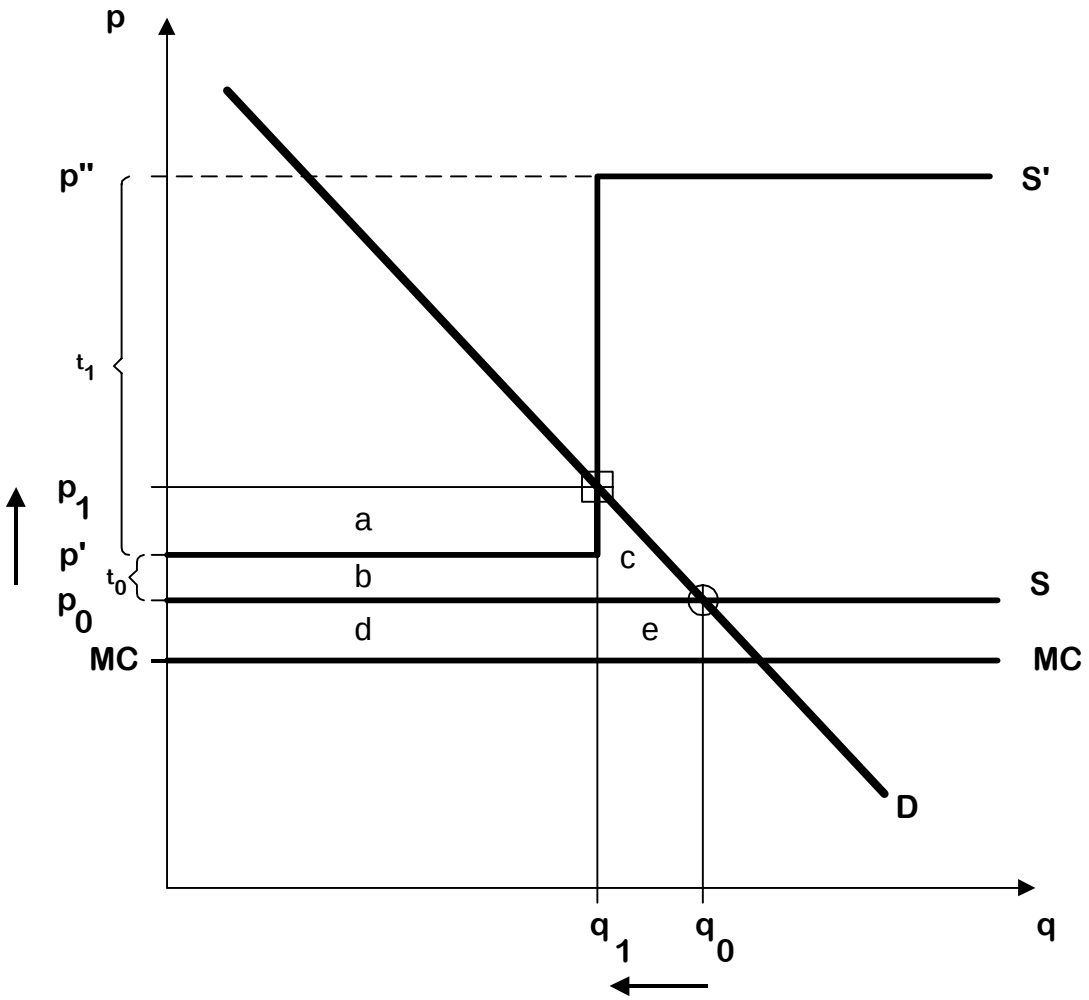
In Figure 3, the small-country assumption is made as in Figure 1. A major difference is, however, that Figure 3 posits that prices at the import level are marked up above marginal costs by suppliers. The difference between p_o and MC, expressed as a percentage of p_o, is the well-known Lerner index. It measures the degree of market power on the supply side. The price/quantity combination p_o and q_o in the free-trade situation had been interpreted under Framework 1 as a perfect-competition equilibrium. If market power was prevalent prior to the introduction of a tariff quota, p_o indicates that the import price was marked up above marginal import costs. p_o and q_o is the price/quantity relationship under imperfect competition. In the initial situation, multinational firms typically sell bananas at the import stage to wholesalers and ripeners. In doing this, they realize an additional profit in the magnitude of the area (d + e), which does not occur under perfect competition.

The impacts of the Common European Banana Policy on price and imports are now identical under imperfect and perfect competition. The only difference is that we interpret the observed situation prior to the introduction of the policy as the outcome of either perfect competition (Framework 1) or imperfect competition (Framework 3). Again, a quota is fixed at the European level and Germany receives q_1 of it. A two-part tariff is introduced: t_o on all imports up to the quota and (t_o + t_1) as a prohibitive tariff rate above the quota. If importers use the new market situation with quotas to raise the market price further, as far as demand allows, we get the kinked supply function S'. The kinked supply function intersects D at p_1 and the tariff-rate quota raises the import price from p_o to p_1. Imports are restricted from q_o to q_1.

In order to avoid a misunderstanding: We do not say that prices and quantities in the non-policy case are equal under perfect and imperfect competition. Of course, they are not. We see in Figure 3 that the market equilibrium would be the intersection of the MC and the D curves under perfect competition. This implies a lower price and a higher quantity than under imperfect competition. Our argument is that a price/quantity combination p_o and q_o could be observed in the situation prior to the new policy. We do not know a priori whether this market equilibrium was the outcome of perfect competition (Framework 1) or imperfect competition (Framework 3). The welfare and redistributive implications of the policy, as will be shown next, differ substan-

tially according to the market structure which is utilized to explain the observed price and quantity combination. The price and trade impacts do not differ, however, with regard to the market structure used to explain p_o and q_o.

Figure 3: Economic Impacts of the Tariff-rate Quota Policy on the German Banana Market (Small-country Assumption; Market Power)



Which welfare implications has the introduction of a tariff-rate quota on the German banana market under imperfect competition? The ***welfare analysis from the European point of view*** has to consider EU consumers and traders on that market and the EU budget. Consumers lose the area (a + b +c) in consumer surplus as the import price increases. A part of the price rise is due to the tariff to and this leads to a budgetary gain at the EU level by area b. This is analogous to Figure 1. EU traders, however, are affected differently if the original situation without policy was non-competitive. They gain the area a as a quota rent, when import licences are allocated to EU traders, but they lose the area e of their profits in the non-policy situation. The latter area is the original gain EU traders on the German market realized under free trade by marking up prices for (q_o - q_1) above marginal costs. The impacts on the groups result in an aggregate welfare loss from the European point of view by area (c + e). The measured aggregate welfare loss from the European point of view is larger in Figure 3 than in Figure 1. The rationale is that EU

traders gain less from the introduction of the tariff-quota scheme when the initial situation without policy implied some oligopolistic market power. Traders lose then some of their power-related extra profits as the quantity is restricted below the tariff-rate quota.

The ***welfare analysis from the German point of view*** under imperfect competition has to consider German consumers and traders and the national budget. For consumers, the European and German points of view are again identical: Consumers lose the area (a + b +c) due to the price increase on the German banana market. The other two groups realize smaller net effects than their counterparts at the European level. The new tariff on the German market improves the EU budget; the national budget is only improved if national contributions to the EU budget are lowered. The national budgetary gain is $\alpha \cdot b$ with $0 \leq \alpha < 1$. German traders will get only a share of the quota rent on the German banana market as only a part of the import licences is allocated to them. Their share of the quota rent is $(\beta \cdot a)$ with $0 < \beta \leq 1$. Under imperfect competition, they will additionally realize a welfare loss since their sales decrease due to the new policy by $(q_o - q_1)$. This causes smaller power-related profits as the additional imports in the situation without policy had been marked up by $(p_o - MC)$ above marginal costs per imported unit. If this loss is fully attributed to German traders[12)], it amounts to area e and the welfare effect for German traders is $(\beta \cdot a - e)$. Under imperfect competition as under perfect competition, the aggregate welfare loss from the German point of view is clearly higher than from the European point of view. In a comparison between Frameworks 1 and 3, it is the net welfare impact on traders which is more negative if the initial free-trade situation is explained by an imperfect rather than by a perfect competition model.

How the introduction of the tariff-rate quota policy affected prices, trade and welfare on the German banana market, when market power of importers is prevalent and the large-country assumption holds for Germany, is shown graphically in Appendix 4.

3.3.2 *Empirical Results*

A major share of the New Industrial Economics literature deals with price and market analysis under imperfect competition. Within this literature, an increasing number of studies analyzes how market power can be measured empirically and it is tested for market power in selected markets. This literature is surveyed comprehensively in a general review by BRESNAHAN (1989) and, for applications in agricultural economics, by SEXTON/LAVOIE (1998).

We will investigate now whether the German market for imported bananas is imperfectly competitive. Two methodological approaches will be chosen. First, we discuss the existing results and approach by DEODHAR/SHELDON (1995) who found market power in the German banana market. We concentrate on the question how the economic model, estimated by DEODHAR/ SHELDON, affects their results. Secondly, we apply BRESNAHAN's rotation method to test for market power in the German market for import bananas. We argue that German unification can be interpreted as a cause for a rotation of the import demand function for bananas. Following

BRESNAHAN (1982), such demand rotation allows to distinguish perfect from imperfect competition on the supply side.

3.3.2.1 *Econometric Results on Import Demand, Price Formation and Market Power*

α) *Market Power on the German Banana Import Market? A Reconsideration of DEODHAR/SHELDON*

The only available study in which the existence of market power was tested for the German banana economy, is DEODHAR/SHELDON (1995). DEODHAR and SHELDON (1995) analyzed the German banana market on the basis of an imperfect competition model. They estimated a structural model of the German market for banana imports and deduced a conjectural variation coefficient from this. DEODHAR and SHELDON conclude that the German market for banana imports has been neither perfectly competitive nor contestable in the period 1970-92. It is concluded that firms demonstrate Cournot-Nash behaviour, i.e. are marking up prices above marginal cost. The authors argue that the markup strategy by firms has not been affected much by the tariff quota policy and, thus, they suppose that the quota-induced price rise has probably not raised the German import price above what would have happened under an equivalent tariff.

Some questions arise with regard to the methodology of DEODHAR/SHELDON and, consequently, to the conclusions drawn from their analysis. The authors derive their market-power coefficient from an estimated econometric model of the German banana market and, therefore, the validity of the market-power test depends on the 'correct' specification of the econometric model. Two points are critical here:

(i) The hypothesis of imperfect competition is not tested at the import stage, but at the retail level. There is no rationale given why the model tests for market power at that level. It is the import level where multinational firms, which act in exporting and importing countries, typically supply bananas to wholesalers and ripeners and where the first stage of price formation for banana occurs. Some market power could be suspected there given the oligopolistic market structure on the supply side. At the retail level, there is certainly also concentration but we know, too, that discounters with a general low-price policy are very active at that level.

(ii) DEODHAR/SHELDON specify then a demand model where banana demand is age-dependent and a function of trend variables. Given the empirical facts on the age dependence of banana consumption and our own econometric results, there seems to be some misspecification in the DEODHAR/SHELDON estimates.

In order to show the importance of the second point, the theoretical model by DEODHAR/SHELDON shall be summarized with some slight modifications. Starting from a profit-maximization approach for the individual firm, DEODHAR/SHELDON derived a familiar maximization condition which nests various forms of market behaviour. Considering all firms on the market, aggregate

marginal revenue will be equal to aggregate marginal costs:
(7) $P_t + \lambda\, Q_t\, [dP_t/dQ_t] = MC_t$

The expression on the left-hand side of equation (7) is the marginal revenue. All variables refer to period t. P is the market price, Q is market demand (supply). MC stands for marginal costs. λ is a market power coefficient which influences the amount by which the market price exceeds marginal costs. The major determinant of this market power coefficient is the conjectural variation parameter indicating how the output of one firm changes as a consequence of a one-unit change of another firm. Under duopoly, the market power coefficient is $\lambda = (1 + dq_2/dq_1)$ with dq_2/dq_1 being the conjectural variation coefficient. λ is an aggregate measure of market power and it ranges between 0 and 1. Under perfect competition, λ and the conjectural variation parameter are zero, and under monopoly, λ and the conjectural variation coefficient are unity. The higher the value of λ, the higher is the market power exerted by suppliers on a market.

For the empirical analysis, DEODHAR/SHELDON specify a demand function
(8) $Q_t = \alpha_o + \alpha_1\, P_t + \alpha_2\, Z_t + \varepsilon_1$

and a marginal cost function

(9) $MC_t = \gamma_o + \gamma_1\, W_t + \gamma_2\, T.$

Q is the quantity of bananas sold at the retail level, P stands for retail prices and Z is a vector of exogenous variables. ε_1 is a normally distributed error term. Marginal costs at the retail level, which are assumed to be independent of output, depend on the import price of bananas (W_t) and other cost components like storage costs, subsumed under a trend variable (T). When (9) is introduced in (7), DEODHAR/SHELDON derive their price equation to be estimated as
(10) $P_t = \gamma_o + \gamma_1\, W_t + \gamma_2\, T + \gamma_3\, Q_t + \varepsilon_2$

with $\gamma_3 = -\lambda\, [dP_t/dQ_t]$, or after differentiating (8), $\gamma_3 = -\lambda \cdot (1/\alpha_1)$. This means that the estimated coefficient γ_3 .contains the market power coefficient λ. We can see that λ can be computed from two estimated regression coefficients as $\lambda = -\alpha_1 \cdot \gamma_3$.

DEODHAR/SHELDON follow exactly this procedure and present a market power coefficient of -0.29, which is significantly different from 0 and 1 according to their bootstrap procedure. They conclude that the German banana import market is not perfectly competitive: „In fact, firms demonstrate Cournot-Nash behaviour, and hence, are marking up prices above marginal cost“ [ibid., p.346]. The estimated market power coefficient is calculated with α_1 and γ_3 from a simultaneous econometric model consisting of equations (8) and (10).

There seems to be some misspecification prevalent, in particular in equation (8). DEODHAR/SHELDON choose the German population at age 65 and above, a time trend and a squared time trend as exogenous determinants of demand. They argue, referring to a report of the 1970s, „that bananas are regarded as a health food, and they are an important part of the diet of the sick

and very old“. The statement, however, that banana consumption in Germany increases with age, is not conform with the facts. When we look at results of the German Nationale Verzehrs-studie, we see very clearly that per-capita consumption of bananas does not rise with age. Germany has a high per-capita consumption and this is valid at all ages. Table 1 had already indicated, e.g., that the per-capita consumption of the 19-24 years old exceed that of the more than 64 years old. This implies that the microfoundation of the demand specification, including the trend variables, is not convincing and the Durbin-Watson coefficient is also not high enough to exclude autocorrelation at a conventional level. The question arises whether the misspecification of the demand function may drive the econometric result that market power does exist on the German banana import market.

We will test now the main economic hypothesis again on the basis of an econometric model which avoids the misspecification of an age-dependence of banana demand. The econometric analysis builds on the type of demand model which was already formulated in Sections 3.1 and 3.2. The hypothesis of market power is, different from DEODHAR/SHELDON, tested at the import level. This seems consistent since (i) the import price, which DEODHAR/SHELDON also use, is the relevant price variable only at the import level and not at the retail level as in their study; (ii) the import level is the stage of the marketing channel where price formation for the raw commodity occurs first on the domestic market. It is, like in DEODHAR/SHELDON, only tested for market power at the supply and not at the demand level. Moreover, we restrict the analysis in this section to the case of a constant marginal cost function like DEODHAR/SHELDON. This is consistent with the small-country case as explained in Section 3.1.

At the import stage, multinational firms typically sell bananas to wholesalers and ripeners[12)]. When market power at the supply side is allowed for, the profit-maximization conditon (7) must hold again but is now interpreted for the import stage:

(11) = (7) $P_t + \lambda\, Q_t\, [dP_t/dQ_t] = MC_t$

Suppliers set prices such that marginal revenue equals marginal costs. If market power is prevalent, prices are set above marginal costs. All symbols are defined as in equation (7).

Equation (8) is reformulated here. Import demand at the import stage is, according to the theory and econometric evidence shown in Section 3.1 and 3.2, modelled as:

(12) $Q_t = \alpha_o + \alpha_1 P_t + \alpha_2 Y_t + \alpha_3 D_t + \varepsilon_1$

Q is the quantity of bananas sold at the German import level, P stands for the German import prices, Y is the German income level and D is the dummy for German unification with D = 1 for 1990 and following years and D = 0 for all other years. ε_1 is an error term. As explained in Section 3.1 and 3.2, the theoretical hypotheses for the coefficients are: $\alpha_1 < 0$, $\alpha_2 > 0$, $\alpha_3 > 0$.

The marginal cost function is also reformulated, compared with DEODHAR/SHELDON, now for the import stage:

(13) $MC_t = \gamma_o + \gamma_1 \ P_t^{EX} \ + \gamma_2 \ D.$

Marginal costs depend on the costs of the raw product at the previous marketing stage, i.e. the export price of bananas (P^{EX}). Furthermore, we posit that German unification led to an additional supply - not only a shift in demand - to the enlarged country. In the small-country case, marginal costs are independent of Q. The theoretical hypotheses on the coefficients are: $\gamma_1 > 0$, $\gamma_2 > 0$.

When equation (13) is introduced in (11), the following price equation to be estimated can be derived:

(14) $P_t = \gamma_o + \gamma_1 \ P_t^{EX} \ + \gamma_2 \ D_t + \gamma_3 \ Q_t + \varepsilon_2,$

with $\gamma_3 = (- \lambda/\alpha_1)$. The market power coefficient λ is then contained implicitly in the regression coefficient γ_3: $\lambda = - (\gamma_3 \cdot \alpha_1)$. The simultaneous equation system (12) and (14) can be estimated with 2SLS and λ can be derived residually. This is shown in Table 6. A direct estimation of the market power coefficient is possible, as suggested by BRESNAHAN (1982), if equation (14) is substituted by

(15) $P_t = \gamma_o + \gamma_1 \ P_t^{EX} \ + \gamma_2 \ D_t + \lambda \ Q_t^* + \varepsilon_2,$

with

(16) $Q_t^* = - (1/\alpha_1) \ Q_t.$

The model (12) and (15) is estimated separately from the model (12) and (14), and results of the estimated equations (12), (14) and (15) are presented in Table 6.

The first striking result is that the demand specification shows again the highly significant influence of the import price, income and German unification on German imports of bananas. The explanatory power of the demand equation is in all models high and there is again no indication of autocorrelation. The specification of the demand side seems to be superior to that of DEODHAR/SHELDON in all specifications.

The second striking result is that the market power coefficient is very low: When the coefficient is calibrated from the demand and price equation as a point estimate, it is 0.08 in Model 1 and 0.13 in Model 2. When Q* rather than Q is utilized in the price equation, a direct estimation of λ as a regression coefficient is possible. We get again low values with 0.10 and 0.13 in Models 1 and 2 respectively and they are not significantly different from zero at conventional levels. The coefficient is somewhat higher in Model 3, but the separate introduction of the world export price in US-$ and the exchange rate leads to a rather low $\overline{R}^2$ of that model. Again, the market power coefficient is insignificant in Model 3. The results suggest that suppliers at the import stage do not mark up prices over marginal costs. When an improved demand specification is utilized, i.e. with a more reliable price coefficient of demand, and the analysis is performed at the import level, no significant market power is exerted. Although the market structure indicates

Table 6: Export Supply and Import Demand Behaviour on the German Import Market for Bananas, 1977-92: Selected Tests for Market Power[a] (Framework 3: Imperfect Competition)

Models	Estimated Equations and Test Statistics
Market Model 1:	
Import demand:	(1) $Q = 3.4617^{***} - 0.3817 \cdot 10^{-3***} \hat{P} + 0.3860 \cdot 10^{-2***} Y + 2.2836^{***} D$ (4.69) (-4.70) (8.40) (3.72) ($\bar{R}^2 = 0.98$; DW = 2.02)
Price equation:	(2) $P = 1185.44 + 201.80 \hat{Q} + 0.9055^{***} P^{EX} - 1978.55 \cdot D$ (0.39) (0.52) (4.45) (-0.70) ($\bar{R}^2 = 0.51$; DW = 1.44) Point estimate of the market power coefficient[b]: $\lambda = 0.077$
Modified price equation (direct estimate of λ):	(3) $P = 772.21 + 0.1013 \cdot \hat{Q}^* + 0.9084^{***} P^{EX} - 2417.43 \cdot D$ (0.24) (0.66) (4.36) (-0.83) ($\bar{R}^2 = 0.49$; DW = 1.49)
Market Model 2:	
Import demand:	(4) $Q^C = 5.8109^{***} - 6.6031^{***} \hat{P} + 0.3938 \cdot 10^{-3***} Y^C + 2.8750^{***} D$ (5.12) (-4.84) (8.43) (4.96) ($\bar{R}^2 = 0.95$; DW = 1.92)
Price equation:	(5) $P = 0.0436 + 0.0196 \hat{Q}^C + 0.9088^{***} P^{EX} - 0.1815 D$ (0.13) (0.75) (4.30) (-0.96) ($\bar{R}^2 = 0.47$; DW = 1.48) Point estimate of the market power coefficient[b]: $\lambda = 0.1296$
Modified price equation (direct estimate of λ):	(6) $P = 0.0436 + 0.1296 \hat{Q}^C + 0.9088^{***} P^{EX} - 0.1815 D$ (0.13) (0.75) (4.30) (-0.96) ($\bar{R}^2 = 0.47$; DW = 1.48)

Table 6 continued: Export Supply and Import Demand Behaviour on the German Import Market for Bananas, 1977-92: Selected Tests for Market Power[a] (Framework 3: Imperfect Competition)

Models	Estimated Equations and Test Statistics
Market Model 3:	
Import demand:	(7) $Q = 3.4465^{**} - 0.3827 \cdot 10^{-3}{}^{***}\ \hat{P} - 0.8479 \cdot P^{A} + 0.3925 \cdot 10^{-2}{}^{***}\ Y$ (3.06) (-4.92) (-0.09) (9.11) $+ 0.2277 \cdot 10^{-3}{}^{***} D \cdot \hat{P}$ (3.72) ($\bar{R}^2 = 0.98$; DW = 1.85)
Price equation:	(8) $P = -10127.1 + 873.534\ \hat{Q} + 1.0067\ P^{EX,\$} + 4983.13^{***}\ e - 4973.51\ D$ (-1.53) (1.15) (1.24) (3.04) (-1.17) ($\bar{R}^2 = 0.26$; DW = 1.57) Point estimate of the market power coefficient[b]: $\lambda = 0.33$ (without unification); $\lambda = 0.14$ (after unification)
Modified price equation (direct estimate of λ):	(9) $P = -8418.33 + 0.2184\ \hat{Q}^{*} + 1.2560\ P^{EX,\$} + 4610.61^{**}\ e - 14401.0\ D$ (-1.57) (1.20) (1.83) (3.28) (-1.23) ($\bar{R}^2 = 0.30$; DW = 1.77)

a) Models 1 and 3 are aggregate market models and model 2 is a per-capita market model. The variables are defined as follows: Q is defined as the German import demand for bananas, measured in 100,000 metric tons in the market demand functions and in kilograms in the per-capita demand functions. In order to provide an equilibrium, import data are used for the demand and supply quantities where the latter are relevant in the price equations. $P(P^A)$ is the German import unit value for bananas (apples), measured in US-$ per 10 metric ton in the market demand functions and per kilogram in the per-capita demand functions. All prices are expressed in DM. Y is the German gross domestic product in billion DM and e is the exchange rate expressed as the price of one US-$ in DM. D is a dummy variable for German unification with one for the period 1990-92 and zero in all other years. Q* is a reformulation of the quantity term, as explained in the text, in order to allow for a direct estimation of the market power coefficient. The superscript C stands for per-capita values. ^ stands for estimated values from the first stage. All presented equations are estimated with the two-stage least-squares method. $\bar{R}^2$ is the corrected coefficient of determination and DW the Durbin/Watson coefficient. ***, ** and * represent the 99.9%-, 99%- and 95%-levels of statistical significance respectively.- b) The market power coefficient is computed as $\lambda = -(\gamma_3 \cdot \alpha_1)$ in the terminology of equations (11) to (14) in the text. In equation (8), it is computed as $\lambda = (-\gamma_3) \cdot (\alpha_1 + \alpha_4 D)$ in terms of equations (18) and (19) in the text.

Source: Own computations with the data sources mentioned in Table 2.

market power, as a few multinational firms are dominating banana supply at the import level to ripeners and wholesalers, the import stage of the German banana market seems to be very competitive.

These results, which are qualitatively different from DEODHAR/SHELDON (1995), imply that some policy conclusions from the literature cannot be confirmed, too. DEODHAR/SHELDON argue that the introduction of the quota on the German banana market has not made the market less

competitive. This refers to a theoretical contribution by HWANG and MAI (1988) saying that the introduction of a quota lowers competition when firms were initially acting more competitive than under Cournot behaviour. As their analysis tentatively confirms Cournot behaviour on the German banana market prior to the new policy, it is concluded by DEODHAR/SHELDON that the market was not made less competitive. Our results, on the basis of the HWANG/MAI arguments, clearly suggests that the German banana market became less competitive.

Some related work in the literature suggests, furthermore, that either a quota or a tariff would be introduced on the German banana market and those two options are compared on the basis of simulations [MCCORRISTON/SHELDON/HIRSCHBERG (1993)]. This is very different from the existing policy as a tariff-cum-quota policy was actually introduced with a tariff equivalent being much above the 20%-tariff assumed in the literature and leading to substantial quota rents.

b) *A More Generalized Test Based on BRESNAHAN's Rotation Method*

The approach applied by DEODHAR/SHELDON and in our modified concept still refers to a special case: Marginal costs at the banana import level are constant. In trade theory, this is consistent with the small-country assumption where an importing country's import demand does not affect the import price.

In some model specifications of Section 3.2, however, a positive price coefficient of export supply was found although this result was not very robust. A positive price coefficient of the export supply curve would imply rising marginal costs and it is consistent with the large-country case. If we do not posit constant marginal costs a priori, the detection of market power is more difficult than in the previous section. It has been shown in the literature that, with 'normal' demand and supply curves, the nature of the shift in either supply or demand is crucial for whether imperfect competition can be distinguished from competition. JUST and CHERN (1980) have shown that a rotation rather than a parallel shift of supply can help to distinguish a competitive market conduct from a market with oligoponsony power. They applied their concept to California's tomato processing industry, and MUTH/WOHLGENANT (1997) provided a further application to the U.S. beef packing industry.

The case which is relevant here is the oligopoly situation. BRESNAHAN (1982) showed theoretically that oligopoly power can be identified analogously when a rotation rather than a parallel shift of the demand curve occurs on a market. MUTH (1996) applied the approach to a test of oligopoly power in the U.S. beef industry.

The basic idea of BRESNAHAN's oligopoly solution concept can be illustrated with Appendix 5. Suppose that the original observed equilibrium on a market is point A with the quantity q_o and the price p_o. The underlying market conduct is not visible. Point A might be a competitive equilibrium where a marginal cost function under competition (MC_c) intersects the demand function D_o. A could also be a monopoly; the quantity under a monopoly would be derived from the intersection of the marginal revenue curve (MR_o) with the marginal cost function of the mono-

polist (MC_M). The corresponding optimal price would be p_o as derived from the Cournot solution, i.e. point A. A ***parallel shift*** of demand to D_1 would still yield an observationally equivalent situation. The new equilibrium could again be a competitive equilibrium, i.e. the intersection of the competitors' marginal cost function with the new demand curve. It could also be the Cournot solution of a monopoly, with an optimal quantity q_1, where the monopolist's marginal cost curve cuts the new marginal revenue curve (MR_1). The corresponding price is p_1 according to the new Cournot solution.

In the case of a ***rotating demand curve***, however, the two different market conducts can be distinguished. Again, the original observed equilibrium is point A with the price p_o and the quantity q_o. A could be a competitive as well as an imperfectly competitive situation. With a shifting demand curve, which rotates from D_o to D_1 around the equilibrium, A would still be the competitive equilibrium. Under a monopoly, however, the new equilibrium would be point C. The quantity would decline to q_2, where the monopolist's marginal cost function intersects the new marginal revenue curve (MR_2). The price would rise to p_2, according to the new profit maximum on the demand curve, i.e. point C.

Apparently, rotating demand curves help to detect market power on the supply side. The question arises whether a plausible argument exists in our case for a demand rotation of the German import demand curve for bananas. The answer is yes and it has to do with German unification.

Up to now, almost all econometric estimates of the import demand curve have not contained an economic determinant that was multiplicatively associated with the import price. Equation (7) in Table 6, however, has already shown that the explanatory power of the demand model is very high when the dummy variable for German unification is introduced as a slope dummy affecting the price coefficient. We know from all other specifications that German unification raised overall and per-capita import demand significantly. The slope dummy implies that German unification did not affect import demand directly, as suggested by an intercept dummy, but by changing the price elasticity of demand on the German market. There are strong arguments for such a demand rotation in our case:

1. Bananas had been a luxury in the former German Democratic Republic (see Table 1). In most periods, banana supply in this socialist country had been limited. Per-capita consumption was below 4 kg per capita and year before unification, whereas it was 11.3 (1988/89) or 13.2 kg (1989/90) in former West Germany.
2. After unification, fruit consumption in general and, in particular, banana and mandarin consumption increased strongly. The household type 2, a four-person household with a medium income level, consumed 22.5 kg per capita in 1991/92 and this was the peak consumption level of bananas in Europe. The hypothesis can be stated that the price elasticity of demand for bananas was lower in absolute terms in East than in West Germany. After having missed

this food for many years, East German consumers will have had a very price-inelastic demand under abundance in the unified Germany.

We regard German unification as an ideal and plausible argument for the application of BRESNAHAN's rotation method. Theoretically, the model shown in the reformulated DEODHAR/SHELDON approach has to be generalized by allowing for non-constant marginal costs at the import level. This would be consistent with the large-country case. We follow BRESNAHAN (1982) and introduce the rotating import demand curve for bananas in Germany to his approach. Again, the profit-maximization condition for sellers at the import stage is:

(17) = (7) $P_t + \lambda_t Q_t [dP_t/dQ_t] = MC_t$

Suppliers set prices such that marginal revenue equals marginal costs. If market power exists, prices are set above marginal costs. Import demand for bananas is now modelled with a slope dummy due to German unification:

(18) $Q_t = \alpha_0 + \alpha_1 P_t + \alpha_2 P_t^A + \alpha_3 Y_t + \alpha_4 D_t \cdot P_t + \varepsilon_1$.

P_t^A is the import price level for a major substitute - apples - and all other variables are defined as before. The theoretical hypotheses for the coefficients are: $\alpha_1 < 0$, $\alpha_2 > 0$, $\alpha_3 > 0$, $\alpha_4 > 0$.

The marginal cost function is now for the import stage:

(19) $MC_t = \gamma_0 + \gamma_1 P_t^{EX} + \gamma_2 D_t + \gamma_3 Q_t$.

Marginal costs depend, as before, on the costs of the raw product at the previous marketing stage, and on whether unification had already occurred. In the large-country case, marginal costs depend on Q. The theoretical hypotheses on the coefficients are: $\gamma_1 > 0$, $\gamma_2 > 0$, $\gamma_3 > 0$.

When equation (19) is introduced in (17), the price equation can be rewritten as:

(20) $P_t = \gamma_0 + \gamma_1 P_t^{EX} + \gamma_2 D_t + \gamma_3 Q_t - \lambda Q_t [dP_t/dQ_t]$.

For the expression $[dP_t/dQ_t]$, it follows from the demand function (18) after reformulation:

(21) $dP_t/dQ_t = 1/(\alpha_1 + \alpha_4 D)$.

When (21) is considered in (20), the following price equation to be estimated can be derived:

(22) $P_t = \gamma_0 + \gamma_1 P_t^{EX} + \gamma_2 D_t + \gamma_3^* Q_t + \varepsilon_2$,

with $\gamma_3^* = (\gamma_3 - \lambda/(\alpha_1 + \alpha_4 D))$. The market power coefficient λ is contained implicitly in the regression coefficient γ_3^* : $\lambda = (\gamma_3 - \gamma_3^*) \cdot (\alpha_1 + \alpha_2 D)$. The simultaneous equation system (18) and (22) can be estimated with 2SLS. In the large-country case, however, λ can only be derived residually if extraneous information is available on the magnitude of γ_3.

If γ_3 is unknown, and this is the typical case, BRESNAHAN has suggested to divide the influence of Q on P into two components. One component measures the market power coefficient directly and the other one captures γ_3, i.e. the influence of Q on P according to the rising marginal cost function.

The price equation suggested for estimation by BRESNAHAN would then be in our case:

(23) $P_t = \gamma_0 + \gamma_1 \; P_t^{EX} + \gamma_2 \, D_t + \gamma_3 \, Q_t + \lambda \, Q_t^* + \varepsilon_3$,

with $Q^* = (-Q) / (\alpha_1 + \alpha_4 \, D)$. Equation (23) includes a direct estimate of the market power coefficient λ and the simultaneous market model (18) and (23) can be estimated with the 2SLS approach.

Table 7 presents quantitative results on the basis of BRESNAHAN's rotation method. Model 1 is a direct and simultaneous estimation of equations (18) and (23), whereas Model 2 relaxes the large-country assumption again and uses constant marginal costs. Model 1 was estimated in the following way: First, a simultaneous market model was estimated with 2SLS along the lines of equations (18) and (22) in the text. The regression coefficients were taken from this model to construct the variable Q*. Then, equations (18) and (23) were estimated simultaneously; Model 1 of Table 7 shows the results.

We can conclude from the import demand function that the specification with a demand rotation explains nearly the whole variance in banana import demand. The $\overline{R}^2$ is 0.98 and the Durbin/ Watson coefficient is practically at the ideal value. The coefficient of the slope dummy can be interpreted as follows:

(i) The price coefficient of German import demand for bananas prior to German unification is $-0.4197 \cdot 10^{-3}$.

(ii) After unification, it is raised by $0.2156 \cdot 10^{-3}$. In absolute terms, this means that our theoretical hypothesis is clearly confirmed: East German consumers have had a lower absolute value of the price elasticity of import demand for bananas than their West German counterparts, thus driving the elasticity down after unification.

The market power coefficient is again statistically insignificant. No oligopoly or monopoly power is present on the German import market for bananas. There is one apparent problem in the application of equation (23), however. Q and Q* are highly correlated in our case, thus making the separate interpretion of the estimated coefficients of Q and Q* very difficult. The magnitudes and t-values of the coefficients may be affected by strong multicollinearity. This might well be a general problem of the application of the BRESNAHAN approach. Another empirical application by MUTH (1996) reached a similar result, namely an insignificant market power coefficient for the U.S. beef packing industry.

Of course, this multicollinearity problem does no longer exist if we reduce the rotation method to the small-country case. This is done in Model 2 of Table 7. We can clearly confirm there the result of the last section: The market power coefficient is low (0.09) and statistically insignificant.

Table 7: Export Supply and Import Demand Behaviour on the German Import Market for Bananas, 1977-92: A Test for Market Power with BRESNAHAN's Rotation Method[a] (Framework 3: Imperfect Competition)

Models	Estimated Equations and Test Statistics
Market Model 1: BRESNAHAN's demand rotation; non-constant marginal costs:	
Import demand:	(1) $Q = 3.6752^{**} - 0.4197\cdot10^{-3}{}^{***}\ \hat{P} - 0.1205\cdot10^{-4}\ P^{A} + 0.4030\cdot10^{-2}{}^{***}Y$ (3.25) (-5.24) (-0.12) (9.35) $+ 0.2156\cdot10^{-3}{}^{***}\ D\cdot\hat{P}$ (3.54) ($\bar{R}^2 = 0.98$; DW = 1.99)
Price equation (direct estimate of λ):	(2) $P = 2611.56 + 0.9387^{***}P^{EX} - 28695.2\ D - 2158.46\cdot\hat{Q} + 0.8736\cdot\hat{Q}^{*}$ (0.40) (3.61) (-0.36) (-0.29) (0.33) ($\bar{R}^2 = 0.35$; DW = 2.07)
Market Model 2: BRESNAHAN's demand rotation; constant marginal costs:	
Import demand:	(3) same estimation as in equation (1) above
Price equation:	(4) $P = 852.96 + 252.93\ \hat{Q} + 0.9078^{***}P^{EX} - 2331.67\ D$ (0.27) (0.64) (4.38) (-0.81) ($\bar{R}^2 = 0.49$; DW = 1.48) Point estimate of the market power coefficient[b] : $\lambda = 0.106$ (before unification); $\lambda = 0.052$ (after unification)
Modified price equation (direct estimate of λ):	(5) $P = 988.039 + 0.0947\cdot\hat{Q}^{*} + 0.9115^{***}P^{EX} - 5249.53\ D$ (0.34) (0.66) (4.41) (-0.74) ($\bar{R}^2 = 0.49$; DW = 1.57)

a) Both models are aggregated market models. The variables are defined as follows: Q is defined as the German import demand for bananas, measured in 100,000 metric tons. In order to provide an equilibrium, import data are used for the demand and supply quantities where the latter are relevant in the price equations. P (P^A) is the German import unit value for bananas (apples), measured in US-$ per metric ton. All prices are expressed in DM. Y is the German gross domestic product in billion DM and e is the exchange rate expressed as the price of one US-$ in DM. D is a dummy variable for German unification with one for the period 1990-92 and zero in all other years. Q* is a reformulation of the quantity term, as explained in the text, in order to allow for a direct estimation of the market power coefficient. ^ stands for estimated values from the first stage. All presented equations are estimated with the two-stage least-squares method. $\bar{R}^2$ is the corrected coefficient of determination and DW the Durbin/Watson coefficient. ***, ** and * represent the 99.9%-, 99%- and 95%-levels of statistical significance respectively.- b) The market power coefficient is computed as $\lambda = -(\gamma_3 \cdot \alpha_1)$ in the terminology of equations (11) to (14) in the text.

Source: Own computations with the data sources mentioned in Table 2.

3.3.2.2 *Welfare Implications under Imperfect Competition*

How did the new European Banana Market Policy affect prices, trade, import expenditures and welfare if the assumption of perfect competition is dropped? Important is also the question how the computed welfare and redistributive implications of the policy differ in the imperfect and perfect competition cases. The quantitative analysis is based on Figure 3 and empirical information from the simultaneous market models in Table 6, which were used to test for market power.

The models in Table 6 had indicated that there is no statistically significant deviation from perfect competition. Furthermore, the magnitude of the market power coefficient on the German import market for bananas was relatively low, e.g. 0.1013 in equation (3) of Table 6. The following results should be interpreted as empirical illustrations how the introduction of market power influences the computed redistributive and welfare impacts of the European Banana Policy. No judgement is intended, given the results of Table 6, that market power has to be considered necessarily in an analysis of the German banana economy. The calculated market power coefficient $\lambda = 0.1013$ is utilized in the computations.

In order to be able to compare the welfare implications of the market structure on the computed economic unpacts, it is attempted to keep other determinants of the policy impacts constant for Frameworks 1, 2 and 3. We realize this by the joint presumption that hypothetical import prices in the non-policy situation would follow the same pattern as in the pre-policy period. They are modelled with the price-transmission equation (1) shown in the text. We also stick to the price coefficient of import demand computed in the OLS estimate of equation (3) of Table 2[13)]. This implies that the explanation of hypothetical prices and quantities in the non-policy situation is not affected by the market structure. Hence, the policy impact on prices, trade and import expenditures are equal under Frameworks 1, 2 and 3. Under Framework 3, price formation in the hypothetical situation without policy would be explained as follows: The price equation of the price-setting firms at the import level intersects the (inverse) import demand function p_o. The price equation is based on a strategy where the price is marked up above marginal costs according to the market power coefficient λ.

Consequently, the introduction of the European Banana Market Policy has substantially raised German import prices, lowered imports, increased import expenditures and caused a substantial loss of consumer surplus on the German market under Framework 3 as under Framework 1 and 2.

If the pre-policy situation was imperfectly competitive and some market power existed on the supply side of the import market, this affects the welfare implications of the European Banana Policy from the European and German points of view. Compared with perfect competition, the economic gains for traders are now lower. Due to the quantity restrictions, they lose some market-power related gains which had existed in the pre-policy situation. This effect is captured by area e in Figure 3. This lowers their welfare gain and the policy-induced quota rent, i.e. area a,

is reduced by e. The change is, however, limited in quantitative terms since the market power coefficient is low. The empirical findings are shown in Table 8.

Table 8: Economic Effects of the New European Banana Trade Regime in Germany, 1993 and 1994 (Framework 3)[a]

Economic Variables	1993	1994
Price for bananas at the import level (DM/kg):	1.256	1.569
Hypothetical price for bananas at the import level (DM/kg):	0.856	0.834
Marginal costs of bananas at the import level (DM/kg):	0.697	0.679
Policy-induced impact on the import price for bananas at the import level (%):	+46.8	+88.1
Imports of bananas (mt):	1186391	1128320
Hypothetical imports of bananas (mt):	1347801	1424456
Policy-induced impact on imports of bananas (%):	-12.0	-20.8
Import expenditures for bananas (mill. DM):	1490.11	1770.33
Hypothetical expenditures for bananas (mill. DM):	1153.11	1188.43
Policy-induced impact on import expenditures for bananas (%):	+29.2	+49.0
Welfare effects of the new banana trade regime (the **European view** of the German market):		
(i) Consumers of imported bananas (mill. DM):	-507.4	-937.8
(ii) European traders (quota rents in mill. DM):	+333.2	+563.0
(iii) EU budget (tax income in mill. DM):	+116.3	+220.0
Aggregate welfare change, European point of view (mill. DM):	-58.0	-154.7
Welfare effects of the new banana trade regime (the **German view** of the German market):		
(i) Consumers of imported bananas (mill. DM):	-507.4	-937.8
(ii) German traders (quota rents in mill. DM):	+225.5	+380.4
(iii) German budget:	-	-
Aggregate welfare change, German point of view (mill. DM):	-281.9	-557.4

a) The computations are based on the theoretical framework explained in the text. Major assumptions of the model are: (i) the price transmission from the world banana market to the German import market shown in equation (1) in the text; (ii) a price coefficient of German import demand for bananas as shown in equation (3) of Table 3; (iii) the market power coefficient estimated in equation (3) of Table 6; (iv) a share of 70% of all import licences for the German banana market allocated to German traders (after the official distribution and trading of the distributed licences); (v) budget neutrality of the new European banana trade regime from the German point of view.

Source: Own computations with data of FAO (a, b); STATISTISCHES BUNDESAMT; DEUTSCHE BUNDESBANK; IMF (1994), International Financial Statistics: Yearbook 1994. Washington, D.C.

From the ***European point of view***, traders gained 563 mill. DM in 1994 due to the new policy, whereas they gained 609 mill. DM under Framework 1, i.e. perfect competition and the small-country case. The move from perfect to imperfect competition in the explanation of the situation without policy thus leads to a reduction of welfare gains by 7.6%. The aggregate welfare loss from the European point of view was raised in 1994 from 109 to 155 mill. DM, i.e. by 42% and thus a significantly higher percentage. Still, the loss of consumers clearly overcompensated the gains of EU traders and the EU budget from the change on the German banana market.

From the ***German point of view***, the welfare gain of German traders on the German market is also smaller than under perfect competition (Framework 1). We posit that the loss of market-power related gains from the pre-policy situation accrues fully to German traders. They then gain 380.4 mill. DM in 1994 under imperfect competition compared with 426.3 mill. DM under perfect competition. Their policy-induced quota rents were thus diminished by 10.8%. This led in 1994 to a national welfare loss of 557.4 mill. DM compared with 511.5 mill. DM under perfect competition. If market power existed, the aggregate welfare loss from the German point of view was further increased by 9.0% compared with perfect competition.

Of course, the general result remains valid that the welfare implications of the policy on the German banana market are more positive from the European than the German point of view.

3.3.3 *Conclusions*

It was analyzed in this section how a tariff-quota system affects prices, trade and welfare under imperfect competition at the import stage. Furthermore, it was tested empirically within various econometric modelling approaches whether some oligopoly power was present on the German import market for bananas.

The theoretical analysis shows that the redistributive and welfare impacts of a tariff-quota system differ clearly under imperfect and perfect competition. It is much less obvious that banana importers will gain from the introduction of a tariff-quota system, when import licences are allocated to them. If they had market power prior to the new policy, the quota-induced price rise will lead to a quota rent but welfare losses arise due to the restriction on quantities for which they had already marked up prices above marginal costs. The net effect is ambiguous.

An earlier study by DEODHAR/SHELDON had indicated market power on the German banana import market. We cannot confirm this result. When misspecifications in their demand model are avoided within a more carefully specified model, in particular the postulated age-dependence of banana consumption, no market power remains. The market power coefficient is low (around 0.1) and not statistically different from zero. It can be concluded that markets with a high supply concentration may well be competitive.

The quantitative analysis of the Common European Banana Market Policy, based on an estimated low market power coefficient, yields a higher net welfare loss from the European as well as the German points of view than under perfect competition. The rationale is that traders' gains decline because they had already marked up prices above marginal costs to a certain degree. The quota-induced welfare gains are lower than under perfect competition, but the difference is not strong given the low market power coefficient.

4 Summary

Under the Common European Banana Policy, a tariff-rate quota system was introduced on the EU market. The EU market had been governed by very different regulations prior to the new policy, and the most liberal situation had existed in Germany with a free-trade situation. It was the objective of this paper to analyze theoretically and empirically the price, trade and welfare impacts of the European banana trade regime on the German banana market. As the market may have been competitive or imperfectly competitive in the situation without policy, the influence of market structure and conduct on the policy impacts has been elaborated. Furthermore, it was tested empirically which market conduct existed in the situation before the policy change. The major findings are the following:

1. The redistributive and welfare effects of a tariff-rate quota depend on whether perfect or imperfect competition existed prior to the introduction of the new policy. The impacts are also influenced by the assumption of the small-country or the large-country case respectively. In particular, the size of the traders' quota rent and the total welfare impacts are affected by the market structure.

2. If the welfare impacts of the Common European Banana Policy on the German banana are investigated, the European and the German viewpoints are to be distinguished. This result holds true for a perfect as well as an imperfect market situation. The rationale is that (i) a common financing system exists for all Common Agricultural Policies and (ii) import licences - and thus quota rents - are allocated to German and non-German traders.

3. In measuring the economic impacts of the European banana policy on the German market, the modelling of hypothetical prices in the benchmark situation is crucial. We assume that the same price transmission between the export market and the German import market as in the pre-policy period would have taken place. This price transmission might have been associated with different market structures. Therefore, the policy's impacts on price and, due to a uniform import price elasticity of demand, on trade and import expenditures were uniform across market structures. The effects of the European Banana Policy were very strong: In 1994, e.g., the German import price rose by 88%, imports declined by 21% and import expenditures increased by 49%. Consequently, the welfare loss of German consumers was also high and reached a magnitude of 938 mill. DM.

4. The welfare effects on traders and the aggregate welfare effects were clearly affected by the market structure. European traders were major beneficiaries of the new policy and their gains were the highest under Framework 2 (large-country case and competition) and lowest under Framework 3 (imperfect competition). In each case, the new policy led to an aggregate welfare loss from the worldwide point of view. The European point of view exhibited an aggregate welfare gain under Framework 2, but the gain was clearly overcompensated by a loss of exporting countries whose export price diminished in this large-country case. In all other cases, the net welfare effect from the European point of view was negative, too.

5. Generally, the introduction of the tariff-rate quota caused a misallocation of resources and redistributive impacts that are not consistent with any stated redistributive objective. In all cases, the welfare changes were more negative from the German than the European point of view.

6. Interesting results could be found in the empirical tests of the market conduct. The econometric analysis under all market structures shows very consistently that German import demand for bananas can be explained very well; the estimates are very robust. HAUSMAN's test did not indicate any misspecification of the best OLS models of import demand, i.e. the small-country assumption. There were, however, simultaneous model specifications which could indicate an upward-sloping export supply function, i.e. that Germany is a large country on the world banana market. This result, however, is not robust across model specifications.

7. Various tests for market power on the German import market for bananas were performed. Consistently, a reestimation of the DEODHAR/SHELDON approach and the application of BRESNAHAN's rotation method did not indicate oligopolistic or monopolistic market power on the supply side at the import stage of the German market. Interestingly, a high concentration of supply by multinational enterprises does not mean here that price formation is non-competitive. The often-presented argument, competitive models would not be appropriate to show the effects of the European Banana Policy, is apparently not justified.

Although being comprehensive with regard to the assumptions on market structure, the analysis has not covered all relevant aspects of the European Banana Policy. We concentrated on the initial new banana policy and not on the FRAMEWORK agreement. Export licences were additionally distributed in 1995 and 1996 and this will have changed the redistributive impacts. Moreover, it was only tested for market power at one stage of the marketing channel. Market power could certainly exist, either as oligopolistic or oligopsonistic power, at other stages of the marketing channel. Extensions of our analysis would be necessary to cover these important issues.

Notes

1) The following sketch of the German banana market closely follows BEHR/ELLINGER (1993).

2) This is closely related to the literature on determinants of the farm-retail price spread, as discussed by GARDNER (1975) for the competitive case and by HOLLOWAY (1991) for imperfect competition.

3) The four countries are Colombia, Costa Rica, Nicaragua and Venezuela. Guatemala, which had also initiated the GATT Panels, did not agree.

4) Strictly speaking, this is only valid if the marginal costs of marketing bananas between the import demand and the retail level are constant. Then, the consumers' welfare loss showing up at the retail level may be derived directly from the import demand curve for bananas. We will assume that in this part of the analysis.

5) Data are taken from the sources given in Table 2.

6) Of course, there are other possibilities to test for simultaneity, i.e. the validity of the small-country assumption. An alternative approach would be to specify a simultaneous model and to test whether the price coefficient of the export supply function is significantly different from zero. This is applied in Section 3.2.2.1. A further approach is proposed by APPELBAUM/ KOHLI (1979), which tests for imperfect competition and indirectly for deviations from the small-country hypothesis.

7) Similar applications are discussed, e.g., in BERNDT (1990), pp.379 et seq.

8) A simultaneous market model of the German import market for bananas is consistent with the view of an impact of German import demand on the import price, i.e. the large-country case. A competitive model would then include an import demand and an export supply function for bananas on the German market and an equilibrium condition. We posit for the HAUSMAN specification test here the following simultaneous market model:

(a) $q^D = f(p_w^{DM}, p_W^{A,DM}, Y, D)$ (import demand)

(b) $q^S = f(p_w^{DM}, e)$ (export supply)

(c) $q^D = q^S$ (equilibrium condition)

q^D (q^S) is the demand (supply) quantity on the German import market for bananas. All other variables are defined as in equation (2) to (4). (b) is a very parsimoneous specification of the export supply curve of foreign suppliers on the German market. It takes the major argument into account that German importers and foreign suppliers typically plan in different currencies. Foreign suppliers do not plan in German Mark and, thus, will take the exchange rate into account to transform DM prices into prices in the international currency, the US-$. A more detailed discussion of this specification and others can be found in Section 3.2.

9) Strictly speaking, the export supply curve at the import level does not directly refer to producers in the exporting countries. Typically, multinational banana firms deliver bananas to the importing countries and sell the bananas at the import stage to wholesalers or ripeners. Marginal transport costs from the exporting country to the importing country have to be subtracted from the S-curve in Figure 2 to arrive at the supply function of producers in the exporting country. As far as these marginal transport costs are constant, however, the loss of non-EU exporters can be read directly as the area (d + e + f + g) in Figure 2.

10) We experimented, e.g., with income variables for the most important banana importer in the world (USA) and the second-most important dollar-banana importer in the EU (the Netherlands).

11) The price coefficient of German import demand for bananas is taken from equation (3) of Table 2 under Frameworks 1 and 2 in order to make the situations more comparable. The assumption seems unproblematic since the estimated price coefficient in equation (5) of Table 4, e.g., does not significantly differ from this estimated price coefficient of import demand.

12) In a competitive market, this is the setting which leads to the equilibrium price p_I and the equilibrium quantity q_I in Appendix 1.

13) To assume the same price coefficient of import demand for the imperfect-competition case seems unproblematic. Equation (1), e.g., in Table 6 yields a very similar magnitude for the price coefficient of import demand within the imperfect-competition model.

Literature

APPELBAUM, E. and U.R.KOHLI (1979), Canada-United States Trade: Tests for the Small-open-economy Hypothesis. „Canadian Journal of Economics“, Vol.XII, No.1, pp.1-14.

ARTHUR, H.B., J.P. HOUCK and G.L. BECKFORD (1968), Tropical Agribusiness Structures and Adjustments-Bananas. (Division of Research Graduate School of Business Administration, Harvard University), Boston.

BEHR, H.-C. and W. ELLINGER (1993), Die Bananenmarktordnung und ihre Folgen. (Materialien zur Marktberichterstattung, Band 1), Zentrale Markt- und Preisberichtstelle, Bonn.

BERNDT, E.R. (1990), The Practice of Econometrics: Classic and Contemporary. Addison-Wesley Publishing Company.

BORRELL, B. (1997), Policy-Making in the EU: The Bananarama Story, the WTO and Policy Transparency. „Australian Journal of Agricultural Economics“, Vol.41, No.2, pp.263-276.

BORRELL, B. and M.-C. YANG (1992), EC Bananarama 1992. The Sequel. The EC Commission Proposal. (Policy Research Working Papers, WPS 958, International Economics Department, The World Bank), Washington, D.C.

BRESNAHAN, T.F. (1982), The Oligopoly Solution Concept Is Identified. „Economics Letters“, Vol.10, pp.87-92.

BRESNAHAN, T.F. (1989), Empirical Studies of Industries with Market Power. In: SCHMALENSEE, R. und R.D. WILLIG (eds.), Handbook of Industrial Organization. Volume II. Amsterdam u.a.: North-Holland, Chapter 17.

BUNDESMINISTERIUM FÜR ERNÄHRUNG, LANDWIRTSCHAFT UND FORSTEN (ed.), Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten. Münster-Hiltrup: Landwirtschaftsverlag, various years.

CARLTON, D.W. and J.M. PERLOFF (1994), Modern Industrial Organization. Second edition, New York: Harper Collins.

COMMISSION OF THE EU (1993), Verordnung (EWS) Nr.404/93 des Rates vom 13. Februar 1993 über die gemeinsame Marktorganisation für Bananen. „Amtsblatt der Europäischen Gemeinschaften“, Nr.L 47/1, October 25.

DEODHAR, S.Y. and I.M. SHELDON (1995), Is Foreign Trade (Im)perfectly Competitive?: An Analysis of the German Market for Banana Imports. „Journal of Agricultural Economics“, Vol.46, No.3, pp.336-348.

DEUTSCHE BUNDESBANK, Devisenkursstatistik. Statistische Beihefte zu den Monatsberichten. Frankfurt/Main, various years, various issues.

DOLE (1997), Unpublished statistics on the banana market. Hamburg.

ENGLE, R.E. and C.W.J. GRANGER (1987), Cointegration and Error-Correction: Representation, Estimation, and Testing. „Econometrica“, Vol.55, pp.251-276.

FAO(a), FAO Trade Yearbook. Rome, various years.

FAO(b), Quaterly Bulletin of Statistics. Rome, various years, various issues.

FAO (1986), The World Banana Economy 1970-1984. Structure, Performance and Prospects. (FAO Economic and Social Development Paper 57), Rome.

FEENSTRA, R.C. (1992), How Costly is Protectionism? „Journal of Economic Perspectives“, Vol.6, No.3, pp.159-178.

GARDNER, B.L. (1975), The Farm-Retail Price Spread in a Competitive Food Industry. „American Journal of Agricultural Economics“, Vol.57, pp.399-409.

GUYOMARD, H., N. HERRARD, C. LAROCHE and C. LEMOUËL (1996), L'Organisation Commune de Marché de la Banane dans I'Union Européenne: Impact de la Taille du Contingent Tarifaire Appliqués aux Bananes Dollar et Non Traditionelles ACP. Paper presented at the VIIIth Congress of the European Association of Agricultural Economists. „Redefining the Roles for Agriculture“, Edinburgh, Scotland, 3-7 September.

HALL, B.H. and C. CUMMINS (1997), Time Series Processor Version 4.4. User's Guide Including an Introductory Guide. Palo Alto, CA.

HAUSMAN, J.A. (1978), Specification Tests in Econometrics. „Econometrica", Vol.46, No.6, pp.1251-1272.

HERRMANN, R. (1999), Economic Impacts of the New European Banana Market Regime: The Case of Germany. „Jahrbücher für Nationalökonomie und Statistik", Vol.218, Nos.1 and 2, pp.63-84.

HILLMAN, A.L. (1989), The Political Economy of Trade Policy. New York: Harwood Academic Publishers.

HILLMAN, J.S. (1991), Technical Barriers to Agricultural Trade. Boulder: Westview Press.

HOLLOWAY, G. (1991), The Farm-Retail Price Spread in an Imperfectly Competitive Food Industry. „American Journal of Agricultural Economics", Vol.73, No.4, pp.979-987.

HWANG, H. and C. MAI (1988), On the Equivalence of Tariffs and Quotas Under Duopoly. „Journal of International Economics", Vol.24, pp.373-380.

INTERNATIONAL MONETARY FUND (IMF), International Financial Statistics: Yearbook. Washington, D.C., various years.

JUST, R.E. and W.S. CHERN (1980), Tomatoes, Technology, and Oligopsony. „Bell Journal of Economics", Vol.11, pp.584-602.

KERSTEN, L. (1995), Impacts of the EU Banana Market Regulation on International Competition, Trade and Welfare. „European Review of Agricultural Economics", Vol.22, No.3, pp.321-335.

KOESTER, U. (1977), The Redistributional Effects of the Common Agricultural Financial System. „European Review of Agricultural Economics", Vol.4, No.4, pp.321-345.

MATTHEWS, A. (1992), The European Community's Banana Policy after 1992. (Discussion Papers in Agricultural Economics, No.13), University of Giessen.

MCCORRISTON, S. and I.M. SHELDON (1996), Incorporating Industrial Organization into Agricultural Trade Modelling. In: MARTIMORT, D. (ed.), Agricultural Markets: Mechanisms, Failures and Regulations. Amsterdam: Elsevier, pp.313-330.

MCCORRISTON, S., C.W. MORGAN and A.J. RAYNER (1998), Processing Technology, Market Power and Price Transmission. „Journal of Agricultural Economics", Vol.49, No.2, pp.185-201.

MCCORRISTON, S., I.M. SHELDON and J.G. HIRSCHBERG (1993), Simulating Changes in Conjectural Variations: Tariff and Quota Nonequivalence in Food Processing. „American Journal of Agricultural Economics", Vol.75, No.5, pp.1221-1225.

MCCORRISTON, S., I.M. SHELDON and J.G. HIRSCHBERG (1993), Simulating Changes in Conjectural Variations: Tariff and Quota Nonequivalence in Food Processing. „American Journal of Agricultural Economics", Vol.75, No.5, pp.1221-1225.

MUTH, M.K. (1996), Identifying the Degree of Oligopoly Power in the Beef Packing Industry. Unpublished manuscript, North Carolina State University, Raleigh.

MUTH, M.K. and M.K. WOHLGENANT (1997), Identifying the Degree of Oligopsony Power in the Beef Packing Industry with Variable Proportions Technology. Unpublished manuscript, North Carolina State University, Raleigh.

OECD (1996), Indicators of Tariff and Non-tariff Trade Barriers. Paris.

OECD (1997), Indicators of Tariff and Non-tariff Barriers. Update 1997. Paris.

PEDLER, R.H. (1994), The Fruit Companies and the Banana Trade Regime (BTR). In: PEDLER, R.H. and M.P.C.M. VAN SCHENDELEN (eds.), Lobbying the European Union: Companies, Trade Associations and Issue Groups. Aldershot, Hants: Dartmouth, pp.67-91.

RÖDER, C. (1998), Unpublished information on banana consumption by age from „Nationale Verzehrsstudie". Gießen.

SEXTON, R.J. and N. LAVOIE (1998), Food Processing and Distribution: An Industrial Organization Approach. In: GARDNER, B.L. and G.C. RAUSSER (eds.), Handbook of Agricultural Economics. Forthcoming.

STATISTISCHES BUNDESAMT, Fachserie 17: Preise. Reihe 11: Preise und Preisindizes im Ausland. Wiesbaden, various years.

THAGESEN, R. and A. MATTHEWS (1997), The EU's Common Banana Regime. An Initial Evaluation. „Journal of Common Market Studies", Vol.35, No.4, 9. pp.315-327.

TWEETEN, L. (1992), Agricultural Trade: Principles and Policies. Boulder, CO: Westview Press.

VALLES, J.-P. (1968), The World Market for Bananas, 1964-72. Outlook for Demand, Supply, and Prices. (Praeger Special Studies in International Economics and Development), New York, Washington, London: Praeger Publishers.

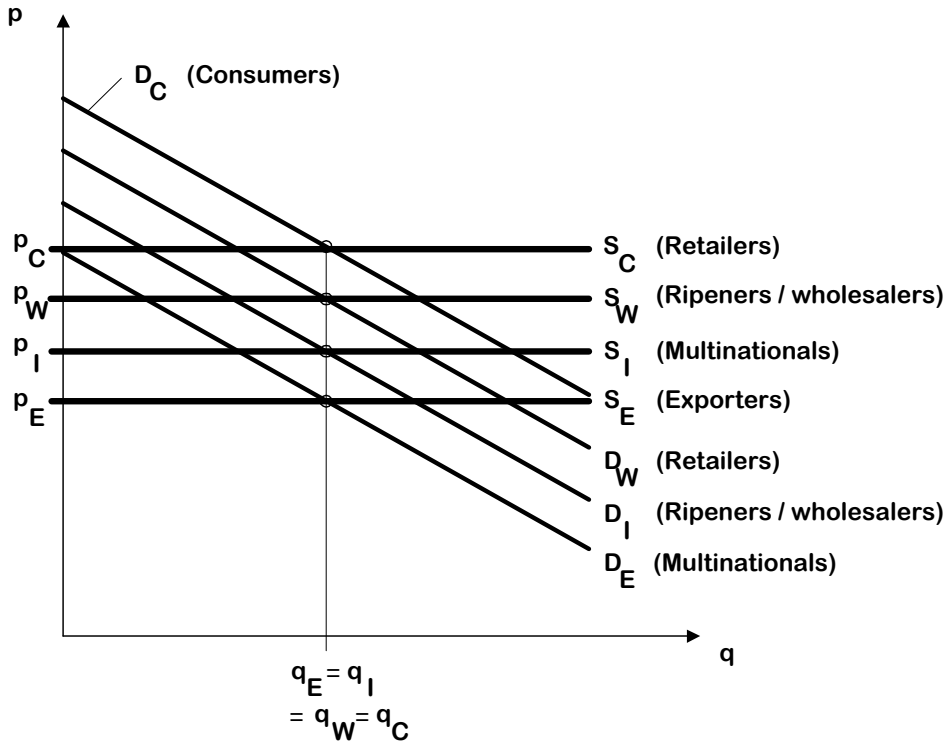
VOUSDEN, N. (1990), The Economics of Trade Protection. Cambridge: Cambridge University Press.

WEIß, D. (1995), Preis- und Wechselkurstransmission auf Märkten der Agrar- und Ernährungswirtschaft - Theoretische Analyse und empirische Zusammenhänge am Beispiel des Bananenmarktes. Gießen: Wissenschaftlicher Fachverlag.

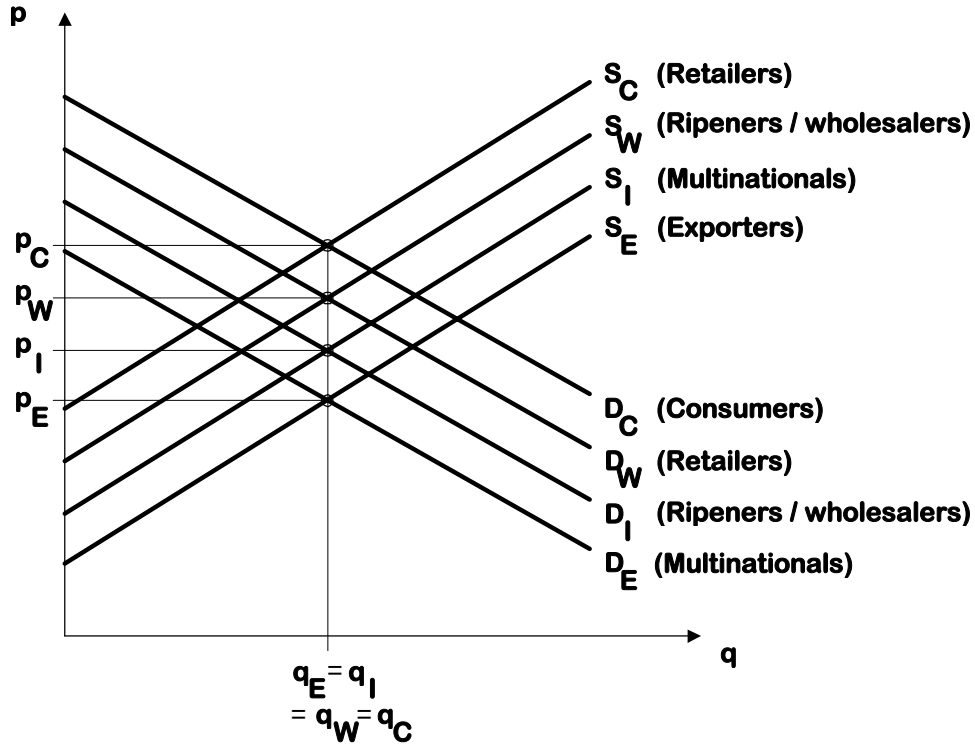
WILSON, J-F. and W.E. TAKACS (1979), Differential Responses to Price and Exchange Rate Influences in the Foreign Trade of Selected Industrial Countries. „The Review of Economics and Statistics", Vol.LXI, pp.267-279.

ZMP (Zentrale Markt- und Preisberichtstelle), ZMP-Bilanz Obst. Bonn, various years.

Appendix 1: **A Stylized Model of the German Banana Economy under Free Trade and Perfect Competition (Small-country Assumption)**



Appendix 2: **A Stylized Model of the German Banana Economy under Free Trade and Perfect Competition (Large-country Assumption)**



Appendix 3: **Price, Income and Exchange Rate Elasticities on the German Market for Bananas (Import Level)**

Years	Estimated Elasticities[a)]			
	Price Elasticity of Import Demand	Income Elasticity of Import Demand	Price Elasticity of Export Supply	Exchange Rate Elasticity of Export Supply
1977	-0.4504	0.7794	0.7812	-1.4414
1978	-0.3835	0.7921	0.6653	-1.1796
1979	-0.4195	0.8757	0.7277	-1.1007
1980	-0.6248	1.0501	1.0837	-1.2344
1981	-0.7712	1.1174	1.3378	-1.5659
1982	-0.7750	1.1946	1.3444	-1.7377
1983	-0.9675	1.3826	1.6782	-2.0130
1984	-0.8315	1.2139	1.4423	-1.8779
1985	-0.8123	1.1780	1.4090	-1.8106
1986	-0.6263	1.1091	1.0864	-1.1911
1987	-0.5872	1.0849	1.0186	-0.9319
1988	-0.4939	1.0399	0.8567	-0.8292
1989	-0.3802	0.9719	0.6595	-0.7819
1990	-0.3108	0.8509	0.5391	-0.4997
1991	-0.2818	0.8016	0.4888	-0.4438
1992	-0.2357	0.8495	0.4088	-0.4106
1977-92:				
$\bar{x}$ =	-0.5595	1.0182	0.9705	-1.1906
s =	0.2233	0.1800	0.3873	0.5199

a) The underlying price, quantitaty, income and exchange rate data are defined and measured as explained in Table 2.

Source: Authors' computations with the Market Model 2 in Table 2.

Appendix 4: **Price, Trade and Welfare Impacts of the Tariff-rate Quota Policy on the German Market for Banana Imports in the Large-country Case with Market Power**

Figure 4 in this Appendix illustrates how the introduction of a tariff-rate quota like the European Banana Regime affected prices, trade and welfare on the German banana market under two major assumptions:

(i) Importers, who sell bananas at the import stage to wholesalers or ripeners, have some market power.

(ii) Germany is a large country which affects the world price with its banana import demand.

In the situation without policy, the market equilibrium is given by the price p_o and the quantity q_o. Due to market power on the supply side, aggregate marginal revenues are equal to aggregate marginal costs and lead to the quantity q_o. Prices are then marked up above marginal costs to p_o, i.e. the highest price wholesalers and ripeners are willing to pay for the quantity q_o. The marginal revenue curve is pictured flatter than in the monopoly case in order to indicate a conjectural variation coefficient between 0 and 1. This indicates some oligopoly power of suppliers at the import stage. The aggregate marginal cost function is upward-sloping in the large-country case and it would be derived in a multiregional market model as excess supply curve for bananas in the rest of the world.

In the initial situation, sellers at the import stage realize a profit in the magnitude (d + e + f + g + h + i + j + k + l). The area (d + e + i + j) is the power-related profit, which arises due to marking up the price over marginal costs (p_o-MC_o) times the quantity q_o.

A tariff-rate quota is now introduced as in the Common European Banana Policy. A quota is fixed at the European level, and Germany receives q_1 of that European quota. A two-part tariff is introduced: t_o on all imports up to the quota, and (t_o + t_1) as a prohibitive tariff rate above the quota. This leads to the kinked export supply curve S' which has a vertical part between MC_o and p_2. S' intersects now the marginal revenue curve so that the price p_1 is charged according to the demand curve D. Thus, the tariff-rate quota raises the import price from p_o to p_1 and restricts imports from q_o to q_1 under imperfect competition and the large-country case.

Which are the welfare impacts of the introduction of the introduction of the Common European Banana Policy on the German market if the initial situation involved market power at the import stage and the large-country case? From the European point of view, impacts on European consumers, traders and the EU budget are relevant. Due to the tariff-quota policy, consumers on the German import market for bananas lose the area (a + b + c) in consumer surplus. The impacts on European traders are much less clear than under perfect competition. Like under perfect competition, the price charged at the import level increases and quota rents occur. However, the net effect on traders is not necessarily positive as they had already marked up prices above

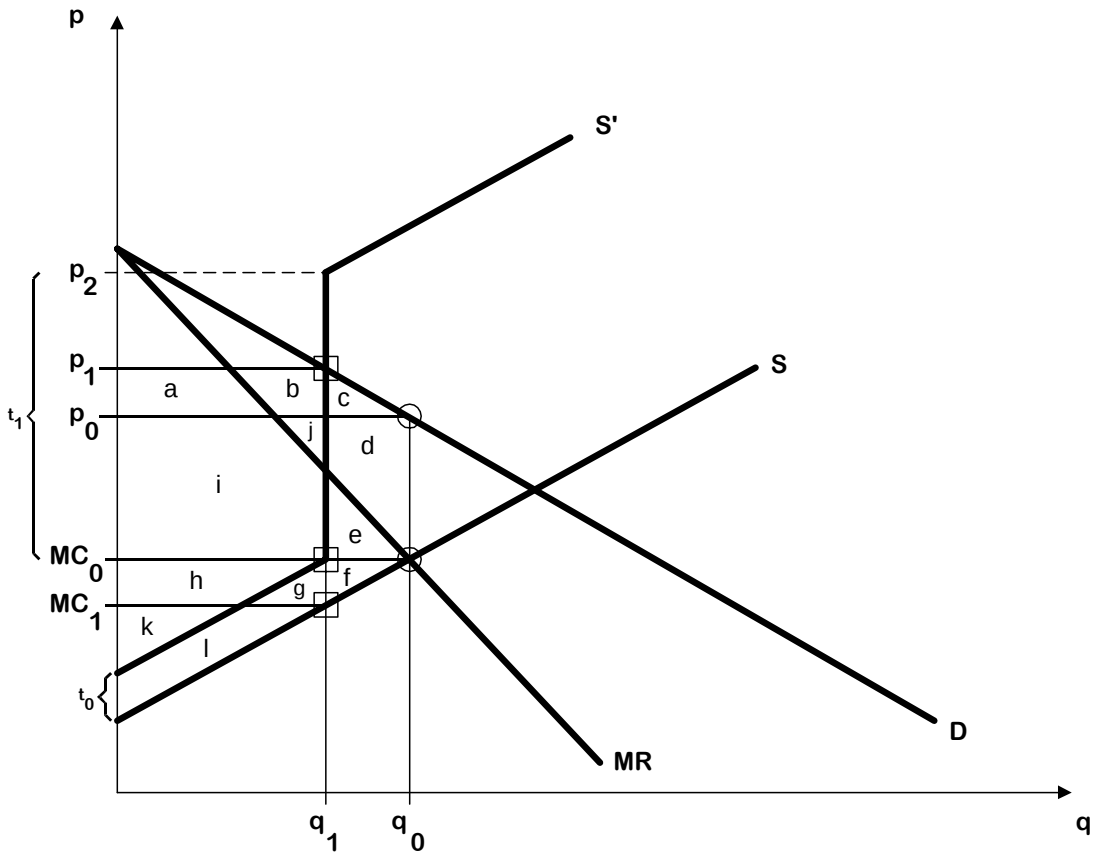
marginal costs in the situation without policy and were able to sell a higher quantity. The European traders realize an aggregate welfare effect due to the Common European Banana Policy of (a + b - d - e -f - g - h). The area (a + b) is an additional gain due to the policy-induced price rise. The area (- d -e) is a loss for European traders as a consequence of the policy-induced restriction on imports. The area (- f - g - h) indicates that a part of profits from the non-policy case are redistributed towards the EU budget due to the new tariff. The EU budget improves by the area (g + h). Overall, under market power and the large-country case, a net welfare loss occurs on the German banana market due to the new policy, by the area (c + d + e + f).

As far as licences are allocated to importers, the importers get the quota rent and prices paid to exporters will decline from MC_o to MC_1.[1)] A welfare loss for exporting countries follows, by the area (f + g + h). Hence, when the European and third-country points of view are aggregated to a worldwide evaluation of the changes on the German banana market, the net welfare loss following the new banana policy increases to the area (c + d + e + 2f + g + h).

The welfare evaluation from the German point of view is not shown here. It can be derived from the European point of view with the same arguments provided, e.g., in the context of Figure 2 in the text.

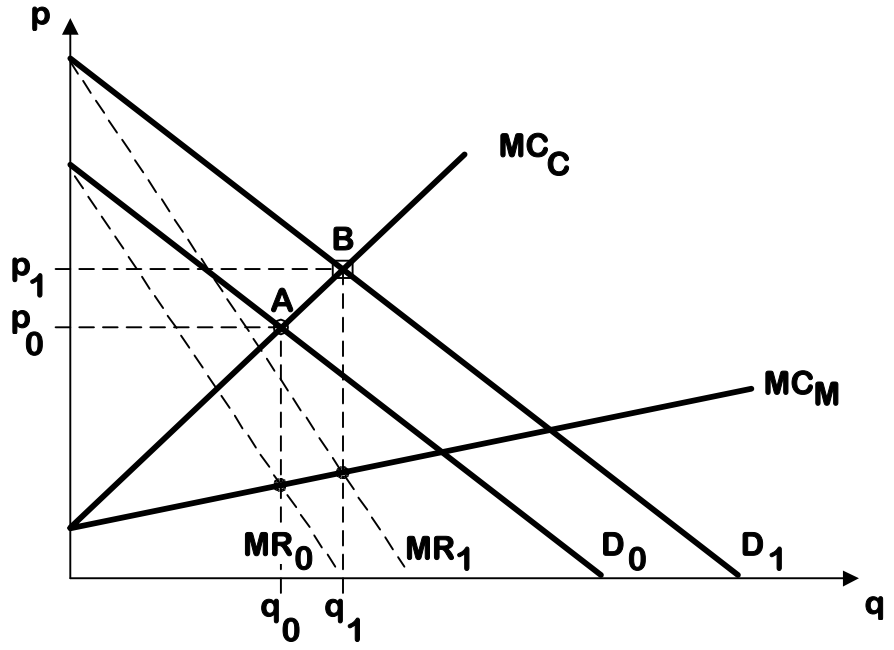
[1)] Strictly speaking, marginal marketing costs from the exporting country to the German border would have to be subtracted from MC_o and MC_1 in order to get the price for exporters in the exporting countries. As far as the marginal marketing costs are constant, however, welfare effects for exporters can be derived immediately from Figure 5.

Figure 4: Economic Impacts of the Tariff-rate Quota Policy on the German Market for Banana Imports (Market Power; Large-country Assumption)

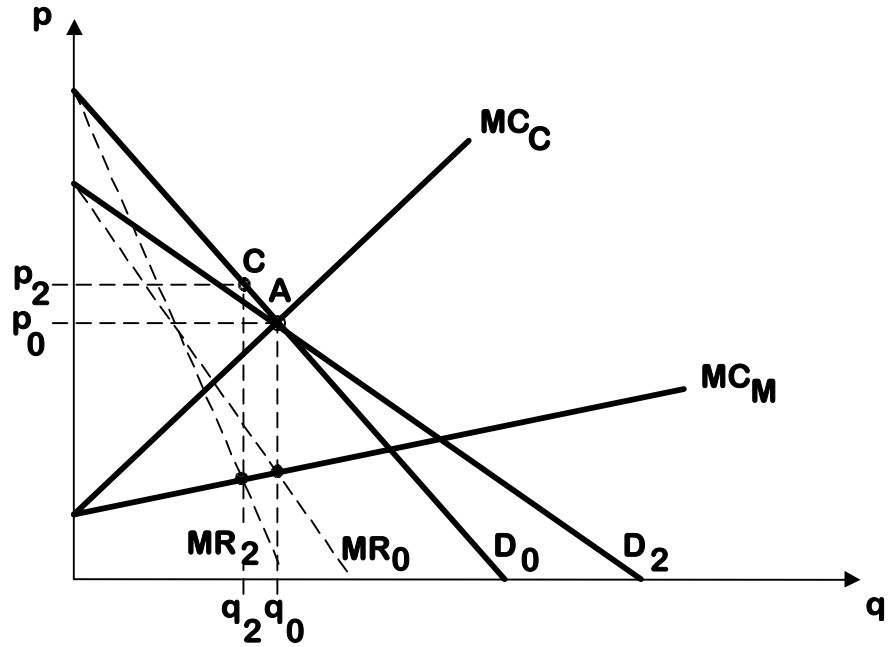


Appendix 5: **An Illustration of BRESNAHAN's Oligopoly Solution Concept**

(i) Parallel Shift of the Demand Curve



(ii) Rotation of the Demand Curve



Source: Modified presentation of CARLTON/PERLOFF (1994), pp. 378 and 379.

AGRARÖKONOMISCHE DISKUSSIONSBEITRÄGE

- DISCUSSION PAPERS IN AGRICULTURAL ECONOMICS -

1. Roland HERRMANN, The Differential Impact of Prices and Exchange Rates on Food Imports: An Econometric Analysis for Peru. Januar 1990, 16 Seiten.
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   (gekürzte Fassung erschienen in SCHULZ, M. (Hrsg.), ACP-EEC: Partners in Cooperation. Breitenbach-Verlag, Saarbrücken, Fort Lauderdale, 1991, S.99-143)
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   (etwas geänderte Fassung erschienen in "Journal of Economic Development", Vol.17 (1992), H.1 , S.71-98)
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8. Roland HERRMANN, Werturteile und wissenschaftliche Agrarpolitik. April 1991, 22 Seiten.
   (etwas geänderte Fassung erschienen in "Agrarwirtschaft", Jg.40 (1991), H.7, S.199-206)
9. Michael FINUS, Ansätze zur Messung des Wertes von Umweltgütern in der Landwirtschaft: Methodische Grundlagen und einige Gedanken zur Anwendbarkeit in der Agrarpolitik. Juni 1991, 26 Seiten.
   (veränderte Fassung erschienen in "Agrarwirtschaft", Jg.41 (1992), H.12, S.367-374)
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    (veränderte Fassung ist erschienen unter Patricia GORN in "Konjunkturpolitik", Jg.38 (1992), H.2, S.86-112)
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    (revidierte und stark gekürzte Fassung ist erschienen unter dem Titel "The Pattern of Protection for Food Crops and Cash Crops in Developing Countries" in "European Review of Agricultural Economics", Vol.20 (1993), H.2, S.291-314)
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(veränderte Fassung erschienen in "Zeitschrift für Kanada-Studien", Jg.14 (1994), H.1, S.139-152)

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(überarbeitete und stark gekürzte Fassung erschienen unter dem Titel "Agrarpolitik in Kanada - Beschreibung, Wirkungsanalyse und Lehre aus den dortigen Erfahrungen für die agrarpolitische Reformdiskussion" in "Berichte über Landwirtschaft", Jg.72 (1994), S.295-326)

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(veränderte und gekürzte Fassung erschienen in "The Journal of Development Studies", Vol.31 (1995), No.6, S.918-941)

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(etwas geänderte Fassung erschienen in "WiSu - Das Wirtschaftsstudium", Jg.23 (1994), H.4, S.377-386)

26. Patricia GORN, Der politische Markt für Agrarprotektion - Theoretische Erklärung und empirische Schätzungen im internationalen Querschnittsvergleich. Juli 1994, 27 Seiten.
(eine veränderte und gekürzte Fassung erschienen in "Agrarwirtschaft", Jg.43 (1994), H.12, S.430-442)

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(leicht veränderte Fassung erschienen in "Quarterly Journal of International Agriculture (Zeitschrift für ausländische Landwirtschaft)", Vol.34 (1995), No.1, S.6-31)

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(etwas veränderte und gekürzte Fassung erschienen in "Agrarwirtschaft", Jg.45 (1996), H.4/5, S.186-196)

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(ein Teil wurde veröffentlicht unter dem Titel "Cocoa Crop Protection: An Expert Forecast on Future Progress, Research Priorities and Policy with the Help of the Delphi Survey" in "Crop Protection", Vol.16 (1997), No.3, S.227-233)

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(etwas veränderte Fassung erschienen in "Agribusiness - An International Journal", Vol.13 (1997), No.3 (May/June), S.319-334)

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(als erweiterte Fassung erschienen unter dem Titel "Wie beeinflußt die allgemeine Wirtschaftspolitik die Landwirtschaft? Transmissionsmechanismen und ihre quantitative Bedeutung" in "Berichte über Landwirtschaft", Band 75 (1997), Heft 4, S.515-538)

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(gekürzte und geänderte Fassung erschienen unter dem Titel "Ernährungsinformationen und Nahrungsmittelkonsum: Theoretische Überlegungen und empirische Analyse am Beispiel des deutschen Buttermarktes" in "Agrarwirtschaft", Jg.46 (1997), Heft 8/9, S.283-293)

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(überarbeitete Fassung erschienen in „Australian Journal of Agricultural and Resource Economics“, Vol.42, No.4, 1998, S.341-367)

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(ein Teil wird in stark veränderter Form unter dem Titel "Market Conduct and Its Importance for Trade Policy Analysis: The European Banana Case" veröffentlicht in: MOSS, C., G. RAUSSER, A. SCHMITZ, T. TAYLOR und D. ZILBERMAN (eds.) (2001), Agricultural Globalization, Trade and the Environment. Dordrecht: Kluwer Academic Press)