Improving Market Access: The Role of Auctions in Converting Tariff-Rate Quotas into Single Tariffs

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ABSTRACT

Market access in the WTO is highly fragmented due to exceptions from GATT principles. Tariff-rate quotas (TRQs) stand in contradiction to the principle of the GATT, according to which all quantitative restrictions in international trade should be eliminated. Bhagwati's theorem of the non-equivalence of tariffs and quotas leads to the conclusion that under imperfect competition, market access can be improved by converting TRQs into single tariffs. In order to find the 'new' tariff, Bergsten (1987) proposed to auction quotas and to use the realized auction price for setting the equivalent tariff. There is empirical evidence from auctions of TRQs in Switzerland that the observed auction prices are below the equivalent tariffs. This is in line with the analysis of McAfee et al. (1999) that auction prices are considered as a useful lower bound for determining the equivalent tariffs. A change from quotas to tariffs will hardly raise protection but it may reduce price support by the new tariff. As a consequence, a country which replaces TRQs by single tariffs through auctions, in so doing, has already reduced tariffs to some extent. Finally, it is important that auctions are competitive and collusion among bidders can be prevented. In this regard, Lengwiler (1999) recommends the 'variable supply' auction format which resists collusion. This anti-collusive mechanism ensures competitive auctions in the event of high buyer's concentration and imperfect competition.

JEL-Classification: Q17, F13, D44
Keywords: WTO, Market Access, Imperfect Competition, Auctions.

1. INTRODUCTION

Tariff-rate quotas (TRQs) are an essential problem in relation to market access for agricultural products. TRQs stand in contradiction to the principle of the GATT 1947, according to which all quantitative restrictions in international trade should be eliminated. This principle resulted from the experience of crude protectionism during the 1930s. With the galloping inflation at the time import protection by tariffs was diminished and this is why countries switched to quotas. After World War II import quotas for non-agricultural goods were eliminated. Over several rounds of negotiations tariffs have been reduced significantly and have led to a moderate level of protection for non-agricultural goods. Yet, in agricultural product trade, which was for the first time included in the multilateral trade negotiations in the Uruguay Round (1986-1994), import quotas were not eliminated or phased out but replaced by TRQs. As most of the out-quota tariffs are prohibitive, TRQs have a restrictive effect on trade similar to that of the previous quotas.

It is one of the oldest insights that quantitative restrictions such as import quotas aggravate market power in protected markets. Bhagwati (1965) demonstrated that quotas create more market power than tariffs and therefore, the change from quotas to tariffs, is welfare improving. The ignorance of this important insight for trade policy has to do with the rather naive assumption of most trade models that agricultural markets are competitive. Under imperfect competition, tariffs and quotas do not have identical effects on market access. In section 2, the effects of a change from TRQs to single tariffs on market access are shown. The core problem of replacing TRQs with single tariffs is linked to what procedure should be used to determine the new equivalent tariffs. One of the first approaches was the concept by Bergsten et al. (1987) to auction quotas and to use the realized auction prices for setting the equivalent tariff. In that context the danger of collusion among bidders could become a problem. In section 3, the design of an anti-collusive auction mechanism (‘variable supply’) which was proposed by Lengwiler (1999), is explained. Section 4 contains the results of the Swiss TRQ auctions in recent time and section 5 provides conclusions and implications.

2. TRADE DISTORTING EFFECTS OF TARIFF-RATE QUOTAS: ANALYSIS UNDER IMPERFECT COMPETITION

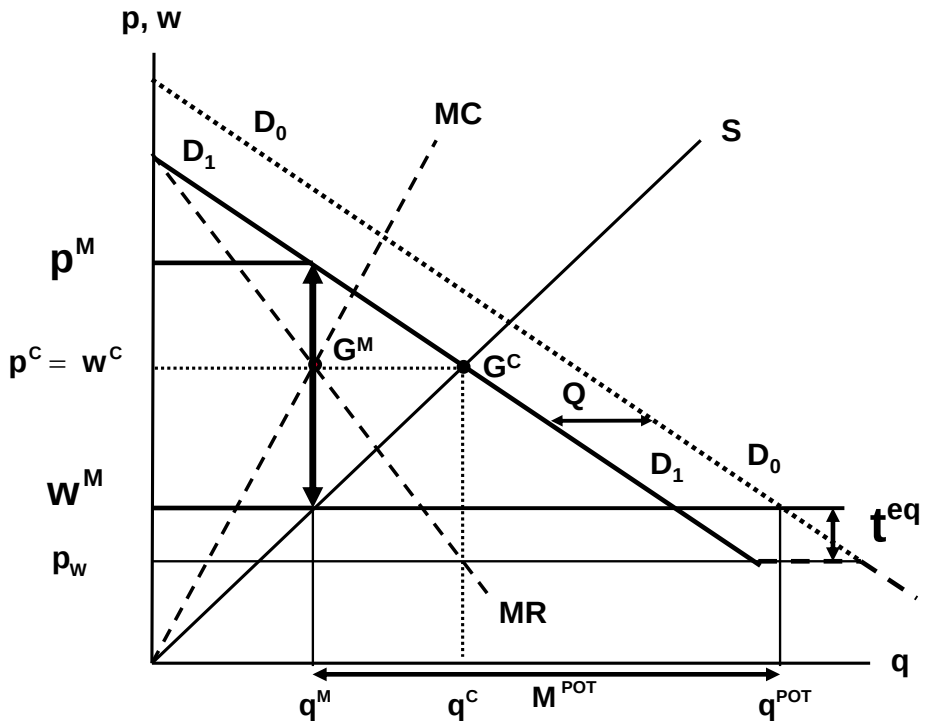
Following the approach by Helpman and Krugman (1992) the effects of quotas and tariffs under imperfect competition are compared. A simple market structure is assumed where a dominant firm buys products from farmers and sells them to consumers. It is the extreme case where the dominant firm exerts monopoly and monopsony power. To keep the model simple it is assumed that the in-quota tariff is "minimal", that is, equal to zero. The out-quota tariff is relatively high and has a prohibitive effect on imports. In order to compare the effects of quotas and tariffs on market access (Fig.1) a certain quantity Q for the import quota is fixed and the demand for domestic products is derived $D_1 = D_0 - Q$. D_1 is the relevant demand for the monopolist and S represents the farmers' supply. In the absence of any competition the dominant firm reaches the maximum profit where the marginal revenue (MR) is equal to the marginal cost (MC); it is the equilibrium of G^M.[1] The wedge between the price farmers receive (w^M) and the price consumers have to pay (p^M) indicates the distortion caused by the absence of competition. As a consequence, market power generates disadvantages for both farmers and consumers. This is the result of quota protection under imperfect competition. Alternatively, the price w^M could be realized by raising an equivalent tariff t^{eq}. The change from the quota protection to a single equivalent tariff will reduce the consumers' burden without worsening farmers' revenues. Using tariffs will eliminate market power because the dominant firm is not able anymore to set prices above $p_W + t^{eq}$. Consequently, it would be possible to import the quantity M^{POT}, which is larger than the quota Q. Under imperfect competition, the change from quotas to tariffs leads to better market access without creating any disadvantages for farmers, they still receive w^M.

The assumption of a combination of a monopoly and a monopsony reflects the 'worst case' and it is clear that the reality is characterized by less extreme forms of imperfect competition. The consequence is that the wedge between the farm and consumer price is

[1] For the sake of simplicity all other costs of the dominant firm are set equal to zero.

smaller and trade is less distorted. In the case of a competitive market the price wedge disappears ($p^C = w^C$); tariffs and quotas have equivalent effects.

Figure 1. Market access: comparing tariffs and quotas under imperfect competition



In all other cases of imperfect competition quotas and tariffs create different effects. This was demonstrated by Bhagwati (1965) in his seminal article "On the equivalence of tariffs and quotas". Whenever imperfect competition occurs, the change from TRQs to single tariffs improves market access, holding farmers' surplus constant. Put differently, improvements in market access can be reached in an efficient way by eliminating TRQs and by setting equivalent tariffs. Assessing the intensity of competition and the degree of trade distortion is a matter of empirical work.

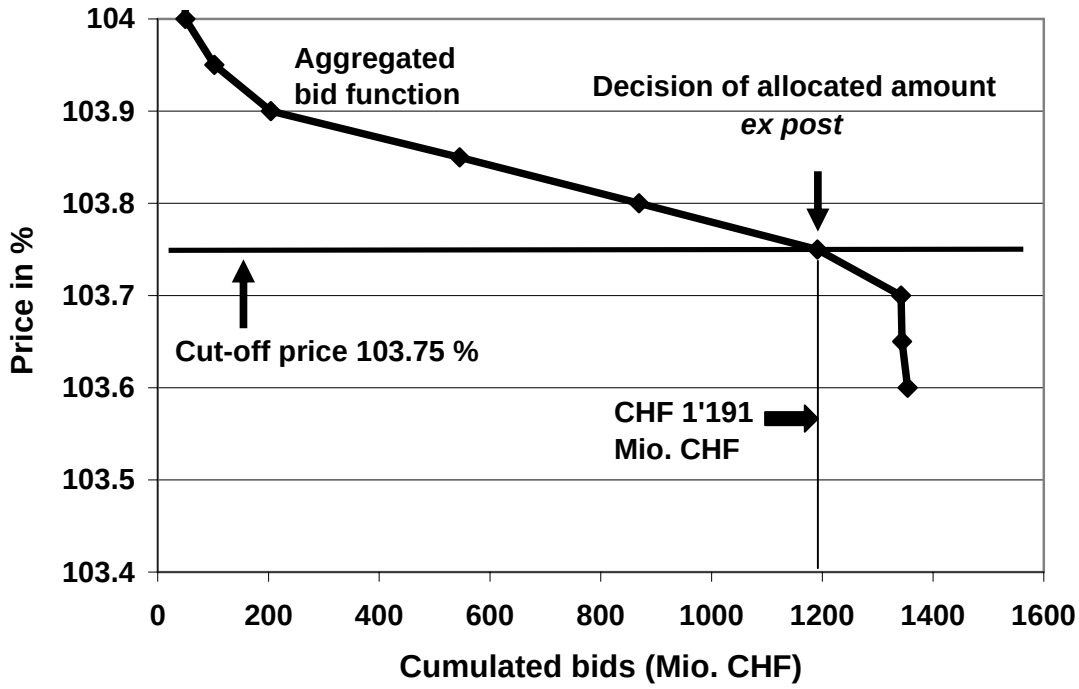
3. FROM TARIFF-RATE QUOTAS TO SINGLE TARIFFS: THE ROLE OF AUCTIONS

The problem of imperfect competition in agricultural markets and the negative impact of quota protection on market access are evident. Hence, the question arises *how* TRQs can be replaced by single tariffs. The core problem of replacing TRQs with single tariffs is linked to what procedure should be used to determine the new equivalent tariffs. One of the first approaches was the concept by Bergsten et al. (1987) to auction quotas and to use the realized auction prices for setting the equivalent tariffs. Skepticism emerged from two sides: the exporting countries feared that the new tariffs would raise the level of protection whereas importing countries worried about the opposite effect on protection. Only when McAfee et al. (1999) analyzed the relationship between equivalent tariffs and auction prices for auctions with resale could this question be answered. With reference to the New Zealand's quota auctions during the 1980s they found several reasons why auction prices are lower than the implicit tariffs of the quotas. The results suggest that auction data offer a "useful lower bound on the tariff equivalent of a quota" (McAfee et al., 1999, p. 175). An important conclusion for trade policy is the fact that a change from quotas to tariffs will hardly raise protection but it may reduce price support by the new tariff.

In this context another concern emerges: determining equivalent tariffs by auctions will fail if the auctions are not competitive. Potential collusion in auctions is an obvious problem, especially in markets with few bidders. The most famous case of a breakdown of competition happened in the May 1991 auction of US treasury bonds. Salomon Brothers was able to acquire control over 94 % of the bonds, and squeezed out large amounts of money after the auction from traders that had gone short prior to the issue (Jegadeesh, 1993). Most of the research in this field focuses on auctions of an ex ante fixed supply where collusion might occur under specific conditions. With reference to the auctions of the Swiss treasury bonds, Lengwiler (1999) analyzed the Swiss system of 'variable supply' where the volume of bonds is determined only *after* observing the bids. A later study by Heller and Lengwiler (2001) suggests that there is no evidence of collusion and excessive profits of some bidders. For Finland, that applies a similar system as Switzerland, Keloharju et al. (2002) came to the same result. As a conclusion, the experience in both

of these countries suggests that the ability to collude in systems of variable supply is lower than in auctions with an ex ante fixed supply. The fact that the quantity is determined only after the bids are submitted has far reaching strategic effects; it is a potent measure against collusion. The lack of collusion may be surprising because the two largest banks (Union Bank of Switzerland and Credit Suisse) regularly acquire a large share of the total issue. The fact that the sold quantity is not known in advance makes it difficult to find a common strategy to manipulate the auction. Treasury bond auctions in Switzerland take place on a bimonthly basis. The bidders are invited to submit as many price-quantity bids as they wish. After all the bids have been submitted, the Treasury determines the cut-off price. With this price, the Treasury also decides simultaneously on the quantity that is sold. Figure 2 depicts the aggregate bid function of a sample treasury bond auction: the treasury typically chooses a point on the bid function where it is at its flattest, or perhaps one price tick below. The system automatically adapts the supply to the demand of the bidders.

Figure 2. Auctions with 'variable supply': Auction of Swiss treasury bonds (Example: February 2002).



Source: Swiss National Bank, Berne.

The properties of the system of 'variable supply' are of particular interest for the application in agricultural markets: in the case of imperfect competition it is important to use a system that resists collusion.

4. AUCTIONS OF TARFF-RATE QUOTAS: EXPERIENCE OF SWITZERLAND

Due to the positive features of auctions with regard to the allocation of TRQs, the Swiss Parliament decided to start auctioning TRQs in meat as of 2005. For politicians, it was important that the auction system would lead to more transparency and that the state would collect the quota rents (Joerin, Lengwiler, 2004). The regulation contains two auction formats: first, the most usual auctions, for which the amount is disclosed to the bidders in advance. Second, auctions with 'variable supply' which are to be used if there are only few firms bidding, i.e., if the risk of collusion is high. Observations so far suggest that there is competition among the bidders. Therefore, the auction with variable supply has not yet been employed. However, this might change in the future in the event of growing concentration on markets.

Of interest now are the results obtained by auctions in the meat market with a view to converting TRQs into single tariffs. For the purpose of interpretation, it is helpful to use the simple TRQ model as a benchmark (Figure 3). In this model, both tariffs – the in-quota tariff and the out-of quota tariff – build the staircase-shaped import supply function (ES). The domestic price is supported at the level of the intersection of the import demand function (ED) and the ES. Three cases can be distinguished:

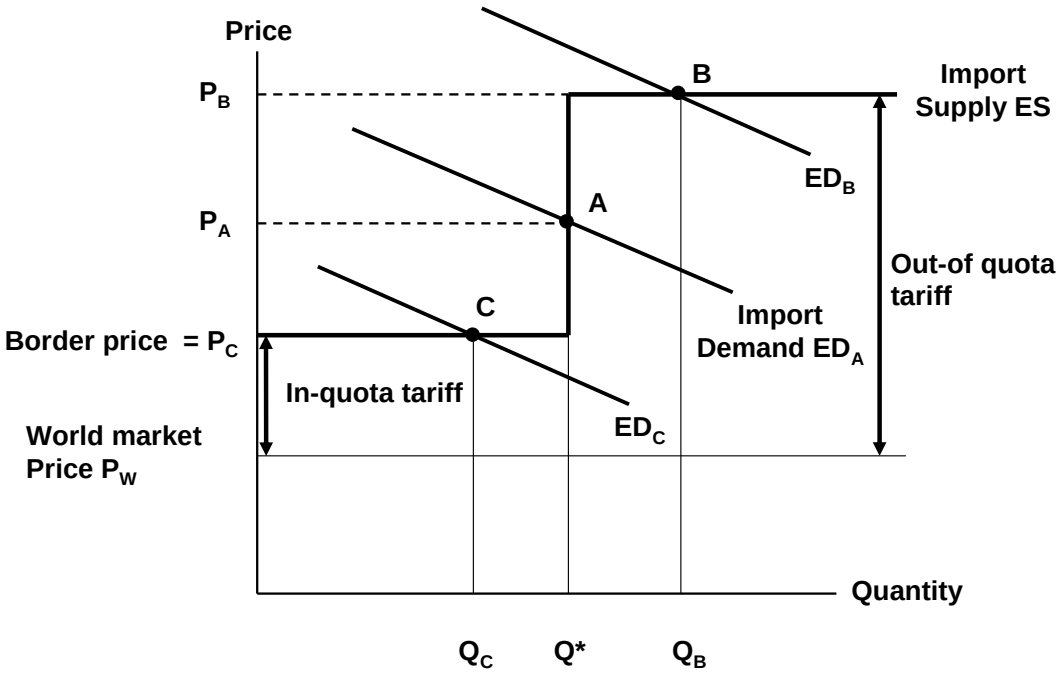
Case A: The ED intersects the ES at a point where the latter is vertical. This represents the regular case. The TRQ is binding and the quota fill rate is 100 %. Here, the auction price plus the in-quota tariff can be used to determine the equivalent tariff.

Case B: The ED intersects the ES in the upper branch of the out-of quota tariff. The TRQ is not binding anymore, and out-of quota imports are generated (quota fill above 100 %).

In this case, the TRQ can be eliminated and the out-of quota tariff corresponds to the equivalent tariff.

Case C: The ED intersects the ES in the lower branch of the in-quota tariff. The TRQ is not binding, which results in a quota underfill. In this case, firms only bid very small amounts because the import quotas are no longer scarce. The TRQ can be eliminated and the in-quota tariff corresponds to the equivalent tariff.

Figure 3. Tariff rate quotas: Different cases of quota fill



In general, auctions take place monthly. They are conducted quarterly in the case of poultry, and yearly for meat products (dried meat, sausages, etc.). Each bidder can submit different bids, and the quotas are awarded to the highest bidder. The firms pay the price which they bid ('pay as you bid'). Since every firm registered in Switzerland is admitted to the auctions, access is simple. Hence, auctions have led to more competition in the domestic market, and marketing margins have declined. Auction opponents – those who have been quota holders hitherto – fear that just a few firms could buy the whole lot. This

has not been the case. Of course, auctions are not popular with incumbent firms because it is now the state that collects the quota rent (in 2008: 195 Mio. Swiss francs, 165 Mio. US $). Therefore, the auction system has stopped the former rent-seeking behavior.

Table 1 contains the results of the TRQ auctions for which the quota is binding (case A). This is the regular case for meat imports (i.e., occurring in 90 % of the cases). The quotas are filled 100 %.

Table 1. Auctions of TRQs with binding quotas 2007, quota-fill 100%

Meat categories	Quota auctioned kg	Bidding firms number	Average bids CHF/kg
Poultry	43 200 000	57	1.83
Pork (carcasses)	5 725 000	31	0.57
Mutton	5 490 000	57	3.61
Horsemeat	5 175 000	21	0.75
Manufacturing beef (carcasses)	4 365 000	24	0.79
Manufacturing beef	787 500	27	2.38
High quality-beef	3 757 500	77	10.92
Veal	922 500	37	3.96
Beef for dried meat	350 000	26	10.57
Processed ham	71 500	25	7.09
Sausages from Italy*	2 856 000	73	2.07
Sausages from France*	125 000	14	1.31
Sausages from Germany*	103 000	18	2.40
Sausages from Hungary*	64 000	10	0.39
Other meat products	2 755 400	10	0.40
1 Swiss Franc (CHF) ~ 0.84 US $ * country specific quotas eliminated in 2008			

Source: Federal Office for Agriculture, Berne

The Federal Office for Agriculture has the possibility, in years of high import demand, to expand the TRQs beyond the required WTO commitments. The largest TRQ in place is in

poultry. More than 50 % of Switzerland's poultry consumption relies on imports. The average bid rates suggest that the firms' willingness to pay varies significantly: bids are higher for processed products than for raw products. In the case of top grade meat, such as high quality beef, bids are higher than for sausages or pork meat in carcasses. Of particular interest now is the question of how well average bids indicate the level of the equivalent tariff. Examining the auctions in the case B provides us with some evidence. Here, the domestic price is supported by the out-of quota tariff, which corresponds to the equivalent tariff. Furthermore, as is shown in Table 2, average bids are well below the out-of quota tariffs. This observation is in line with the above-mentioned study by McAfee et al. (1999, p. 175), who refers to auction bids as „lower bound on the tariff equivalent of a quota". Accordingly, a tariff that is determined by auctions leads to lower protection. In other words, a country which replaces TRQs by single tariffs through auctions, in so doing, has already reduced tariffs to some extent.

Table 2. Auctions of TRQs with out-of quota imports 2007; quota-fill above 100 %

TRQ auctions in 2007 (non-binding quotas, quota-fill above 100%)			
	Units	Dried ham (EU) (Parma & Span. Ham)	Dried meat (EU) (Bresaola)
Imported quantity	kg	1 628 000	694 000
In-quota imports	kg	1 100 000	220 000
Out-of quota imports	kg	528 000	474 000
Quota-fill	%	148	315
In-quota tariff	CHF/kg	0	0
Out-of quota tariff (lowest tariff line)	CHF/kg	9.35	11.90
Average accepted bid	CHF/kg	7.69	9.04
Average accepted bid in % of over-quota tariff	%	82	76
Bidding firms	number	81	57

Source: Federal Office for Agriculture, Berne

5. CONCLUSIONS AND IMPLICATIONS

The Uruguay Round implemented TRQs, but they were not meant to become permanent trade instruments. Based on the insights of Bhagwati's theorem of the non-equivalence of tariffs and quotas, the analysis of the impact of imperfect competition on market access leads to the following conclusion: under imperfect competition the change from quotas to tariffs results in a better market access without lowering farm price support. The higher the degree of imperfect competition, the larger the gain of market access when TRQs are replaced by single tariffs. The core problem is how to find the new tariff which leads to the equivalent support as under the quota regime.

Two ways to eliminate TRQs can be identified, a direct way and an indirect way. Depending on the level of the in-quota tariff, the out-of quota tariff and the TRQ situation (binding or not binding), three different cases can be distinguished to reestablish single tariff systems:

A) In the case of a binding TRQ where the in-quota tariff is relatively low and the out-of quota tariff high (Figure 3) an indirect path has to be chosen because the level of the single tariff is not known. As described in section 3 auctions can help to determine the level of the tariffs. Auctions are the only way to elicit from quota holders their willingness to pay for imports. Once the per unit willingness to pay is known, the out-of quota tariff could be reduced to the level of the in-quota tariff plus the per unit auction payment to establish the equivalent single tariff with the same level of protection. The in-quota tariff line would have to be suspended altogether. In case of high buyer's concentration or imperfect competition the variable supply auction format would prevent collusion among bidders and ensures a transparent and non-discriminatory allocation of quota shares.

B) If out-of quota imports occur, the out-of quota tariff can be used as the single tariff, and the in-quota tariff can be suspended. The TRQs can be eliminated directly. In such a case, auctions show if the per unit auction price is indeed approximately as

high as the difference between the out-of quota and the in-quota tariff. There is some evidence that auction prices are lower than the out-of quota tariff which corresponds to the equivalent tariff. This is in line with the analysis of McAfee et al. (1999) where auction prices are considered as a useful lower bound for determining the equivalent tariffs. An important conclusion for trade policy is the fact that a change from quotas to tariffs will hardly raise protection but it may reduce price support by the new tariff.

C) Not binding TRQs with a quota underfill and a relatively high in-quota tariff rate can be eliminated directly. In such a case, the in-quota tariff can be used as the single tariff. TRQs with a permanent underfill do not make sense at all.

The fact that the new tariffs determined by auctions are below the equivalent tariff contains the following implication: a country which replaces TRQs by single tariffs through auctions, in so doing, has already reduced tariffs to some extent. Consequently, market access is improved and more transparency is achieved.

Finally, it is important that auctions are competitive and collusion among bidders can be prevented. The ‘variable supply’ auction format, recommended by Lengwiler (2001), resists collusion. This anti-collusive mechanism ensures competitive auctions in the event of high buyer’s concentration and imperfect competition.

REFERENCES

BERGSTEN, C. FRED, KIMBERLY ANN ELLIOT, JEFFREY J. SCHOTT, and WENDY E. TAKACS (1987), *Auction Quotas and United States Trade Policy*, Institute for International Economics, Washington D.C.

BHAGWATI, JAGDISH N. (1965), *On the Equivalence of Tariffs and Quotas*, in: Baldwin, R.E. *et al.* (eds.), Trade Growth and the Balance of Payments, Chicago.

HELLER, DANIEL and YVAN LENGWILER (2001), "Should the Treasury Price-Discriminate? — A Procedure for Computing Hypothetical Bid Functions," *Journal of Institutional and Theoretical Economics*, 157, 413–429.

HELPMAN, ELHANAN and PAUL R. KRUGMAN (1992), *Trade Policy and Market Structure*, MIT Press Cambridge MA.

JEGADEESH, NARASIMHAN (1993), "Treasury Auctions Bids and the Salomon Squeeze," *Journal of Finance*, 48, 1403–1419.

JOERIN, ROBERT and YVAN LENGWILER (2004), "Learning from Financial Markets: Auctioning Tarif-Rate Quotas in Agricultural Trade," *Swiss Journal of Economics and Statistics*, 140 (4), 521-541.

KELOHARJU, MATTI, KJELL G. NYBORG, and KRISTIAN RYDQVIST (2002), "Strategic Behavior and Underpricing in Uniform Price Auctions — Evidence from Finnish Treasury Auctions," Nota di Lavoro 25.2003, Fondazione Eni Enrico Mattei [papers.ssrn.com/sol3/papers.cfm?abstract_id=301922].

LENGWILER, YVAN (1999), "The Multiple Unit Auction with Variable Supply," *Economic Theory*, 14, 373–392.

MCAFEE, PRESTEN R., WENDY TACACS AND DANIEL R. VINCENT (1999), "Tariffying Auctions," *RAND Journal of Economics*, 30, 158-179.