Rent Seeking with Politically Contestable Rights to Tariff-Rate Import Quotas

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Abstract

This paper analyzes rent seeking for agricultural import quotas and the associated waste of resources when politically contestable licenses are allocated to either or both importers and exporters. In a two-stage simultaneous contest where firms rent seek for licenses and then bargain over the import/export price, it is shown that (1) rents are not dissipated completely because of uncertainty in allocation of “rights”, (2) the dissipation ratio increases if the country with a more competitive contest increases the probability of establishing licenses, (3) rent seeking may cause the market structure to change, (4) less rent is dissipated in the case of pre-existing market power, and (5) allocation of multiple licenses decreases rent-seeking outlays.
Rent Seeking with Politically Contestable Rights to Tariff-Rate Import Quotas in Agriculture

Introduction

All agricultural non-tariff trade barriers were consolidated into 1,425 two-tier tariff-rate import quotas under the Agreement on Agriculture in the Uruguay Round of trade negotiations. Even though tariffs are levied for in-quota imports, substantial quota rents still exist. Many studies have analyzed the welfare economic effects of tariff-rate import quotas in theory (Bhagwati; Shibata), in agriculture (e.g., Moschini; Skully; Boughner, de Gorter and Sheldon) and in other sectors (e.g., Krishna and Tan; Bark and de Melo). However, little formal research has been undertaken as to the potential effects of tariff-quotas on economic inefficiency through rent seeking activities.

The existence of quota rents provides incentives for importers and exporters to engage in socially wasteful rent-seeking activities in order to obtain these rents. Although several methods of quota allocation are used (see WTO 2002a,b), the quota allocation process can be categorized into the cases when licenses are used to ration the imports and the cases when no licenses are allocated like the first come first served method. Firms will expend resources to contest for licenses, while rent is dissipated through waiting in line if no licenses are allocated. However, whether licenses are allocated or not in the exporting vs importing country determines rent sharing between the two sides and subsequently affects the degree of rent seeking among the exporting vs importing firms. Furthermore, country specific export quota allocations determined at the discretion of the importing country occurs in 74 cases in agriculture (WTO 2002b). Finally, export licenses may be required by the importing country while import licenses for importing firms are also a common feature. Table 1 summarizes the cases when either or both export and import licenses are required by the importing country for the agricultural tariff-quotas in the WTO (shaded numbers) and provides examples of each category for Canada, the European Union and the United States.
The objective of this paper is to assess how factors like uncertainty, market power, degree of competitiveness and the allocation of multiple licenses affect rent dissipation. We address the implications of allocating vs not allocating ‘property rights’ of the import or export license. The impact of different market structures on rent seeking is also assessed. The degree of imperfect competition and bargaining power are shown to condition the outcome on the degree of rent seeking.

Like Krishna, McCorriston and Sheldon, McCorriston and Krishna and Tan, we focus on the implementation of import quotas in terms of the rules governing allocation and the effects on rent appropriation and rent sharing. However, we go one step further and analyze the economics of rent-seeking waste. A game theoretical framework is used in this paper where rent seeking is modeled as a contest. We specify an extensive form of a contest to capture this indirect nature of rent seeking through “rights” rent seeking. The contribution of this paper is to specify a generalized rent-seeking contest for import quota rents and analyze the rent-seeking behavior and the associated waste of resources when the rents are indirectly contestable through politically contestable licenses. Rent seeking is modeled in the context of import quotas that addresses specific issues like whether or not licenses to import and/or export are allocated.

Standard models of import quotas and rent seeking have all of the rents dissipated (Krueger; Hillman; Bredhal, Schmitz and Hillman). Contest models proposed in the literature have not attempted to reflect more complexities of the import quota environment. First, the models implicitly assume that rents can be contested directly via lobbying (Tullock; Dixit; Hillman and Riley; Nti). However, in the case of import quotas, lobbying influences the contest outcome only indirectly through allocation of property rights. Trading firms lobby for rights to rents by contesting for import/export licenses directly. Second, agents in the basic rent-seeking contest models compete for a certain prize or transfer (Tullock; Hillman and Riley; Hillman). However, the shares of the rent in the case of import quotas are uncertain at the time of decision making about rent-seeking outlays. This is because property right allocation may cause changes in the market structure and thus influence the ultimate payoff. Allocation of licenses increases the
bargaining power of the country’s trading firms vis a vis the trading firms on the other side of the world market. With uncertain rent shares, contenders compete for the expected value of the rents and fewer outlays are incurred.

The implications for property rights allocation and market structure issues include that the rent is under dissipated due to uncertain payoffs and less than perfectly competitive environment, rent seeking may cause the market structure to change, property rights allocation increases rent-seeking outlays, and less rent is dissipated when pre-existing imperfect market structure exists. In addition, allocation of multiple licenses like that required by several countries for agricultural import quotas decreases the aggregate level of rent-seeking outlays. We show that the import quota rent is not dissipated completely, and never over dissipated, even in a perfectly competitive environment. However, this dissipation ratio increases with the probability of establishing property rights in the country whose contest is more competitive. Also, less rent is wasted in the case of pre-existing market power in either of the countries.

The paper is organized as follows. The next section presents the model for multiple firms competing for an import quota rent and discusses implications for rent dissipation and property rights allocation. Section III analyzes the case of pre-existing market power. Section IV discusses allocation of multiple licenses. Section V concludes the paper and offers suggestions for future research.

**The Model**

Rent seeking is modeled as a two-stage simultaneous contest with uncertain payoffs. In stage 1, importing and exporting firms contest in their respective countries for a license to import and export. No licenses may be awarded with positive probability. Stage 1 thus represents “rights” rent seeking, where firms lobby for licenses that give them this right.iii In the process, rents are dissipated as firms waste scarce resources. Such a contest may be found when new licenses are being issued.

In stage 2, importing and exporting firms bargain for the transaction price.iv The number of licenses awarded in stage 1 determines the market structure in the world market and thus the bargaining power of
individual firms proceeding to stage 2. No waste is incurred in this stage as bargaining is assumed to be costless.

In modeling rent seeking as a contest for a prize, import quota rents, and hence the transfer, are assumed fixed as in Krueger and Krishna and Tan. Losing a contest for a prize involves losses in terms of irretrievable rent-seeking outlays, while transfers incur a cost to at least one of the losing parties in addition to the rent-seeking outlays (Hillman and Riley). Presence of a transfer introduces countervailing opposition, usually consumers (Fabella). No such opposition is modeled in this paper. As a first step to explaining the complexity of the rent seeking process for politically contestable rights to import quotas, we therefore abstract from the possibility of influencing the size of the import quota rent and consider it exogenously specified. Allowing for this possibility would involve introducing game theoretic models of interest groups based on a vote function, politician behavior and lobbying as well (Rausser and Foster; Grossman and Helpman; Swinnen; Kennedy, von Witzke and Roe; de Gorter and Tsur; Appelbaum and Katz).

The outcome of a rent-seeking contest is determined by rent-seeking outlays of each participant. The outlays influence the outcome via the probability of winning the prize, often referred to as a contest success function (CSF). The rule of assigning licenses for import quotas is imperfectly discriminating in that the probability of winning the right to import (export) increases continuously with own outlays and decreases with outlays of the other agents. For an imperfectly discriminating CSF, the rent-dissipation ratio in the basic rent-seeking contest increases in the number of competing agents and in the limit converges to one (Hillman). That is, in a competitive environment, the whole rent is dissipated through rent seeking.

Consider a world market comprised of a home country importer H and a foreign exporter F, initially endowed with n and m trading firms, respectively. The home country implements an import quota, where
the level of the quota is assumed exogenous. In addition to the well-known deadweight cost triangles, the import quota creates an excess rent to be made by exporters and/or importers.

Denote $P_H$ as the domestic price in the importing country and $P_F$ as the lower price in the foreign market. The importer desires to purchase the product at $P_F$ and the exporter desires to sell the product at $P_H$. Firms in both countries engage in rent-seeking activities to obtain the rent $R$ that is the rectangle defined by the import quota and the ensuing domestic prices in each country. Note that the firms here are trading firms only. That is, the importing firms sell to domestic wholesalers or retailers and the exporting firms buy from domestic producers. This assumption implies that their rent seeking activity does not include manipulating the price and production in the domestic market, as could be the case for STEs, and thus does not influence the size of the rent.

The rent-seeking contest proceeds in two stages. In the first stage, trading firms in each country compete for a license to import (export). The outcome of this stage determines the number of licenses in each country, $L_H$ and $L_F$, and thus the bargaining power of the firms participating in stage 2. For any given combination of property right allocations (licenses), firms in stage 2 compete for the potential rent through bargaining. That is, the combination pair $(L_H, L_F)$ establishes the market structure of importing and exporting firms and determines the nature of the bargaining game. The optimal rent-seeking outlays are solved for by backward induction.

Two distinct features characterize the contest: simultaneity of first-stage contests and uncertain payoffs. The first stage has a rights-seeking contest running simultaneously in each country. The potential share of the rent that the firms are competing for in this stage is uncertain. The source of uncertainty lies in its dependence on the outcome of the rights-seeking contest in the other country. The two contests determine the number of licenses awarded, where no license may be awarded in each country with positive probability. The market structure in the import and export market in turn determines the nature
of the bargaining game (Figure 1).\textsuperscript{vi} Note that no direct rent seeking is allowed for in the second stage. We discuss the implications of relaxing this assumption in the last section.

The probability that no licenses are allocated at all (and the number if allocated) is assumed to be exogenous. To issue a license or not is exogenous, perhaps reflecting anti-monopolistic feelings of the country’s government. Completing the first stage in one country is not sufficient to determine the potential share of the rent to be obtained in the second stage, as it depends on the outcome of the contest in the other country. The mutual dependence on the outcomes of each country’s contests makes the first stage of this rent-seeking contest a composite simultaneous game with uncertain payoffs.

We assume initially that the two countries are endowed with \( n > 1 \) and \( m > 1 \) identical importing and exporting firms, respectively. Firms are risk neutral profit maximizers with identical valuations of the total rent \( R \). Perfect information is assumed. We assume initially that if property rights (licenses) are allocated, then only one license is awarded. The case of allocating multiple licenses is analyzed subsequently. The license gives the holder an exclusive right to import (export), thus establishing a monopsony (monopoly) in the world market. If no property rights are established, a free-for-all regime prevails.\textsuperscript{vii} Therefore, four combinations of property rights allocations can emerge, \((L_H, L_F) = \{(1,1), (1,0), (0,1), (0,0)\}\), determining the world market structure. For any given market structure, importers and exporters participating in the second stage bargain for rent. No rent-seeking waste occurs in this stage as bargaining is assumed to be costless. Figure 2 summarizes payoffs to individual firms for each combination of \((L_H, L_F)\), where \(L_i^H\) and \(L_j^F\) denote firm i and j obtaining exclusive licenses in countries H and F, respectively.

\textbf{Figure 2. Stage 2 payoffs to individual firms}

<table>
<thead>
<tr>
<th>(L_i^H = 1)</th>
<th>(L_j^F = 1)</th>
<th>(L_i^H = 0)</th>
<th>(L_j^F = 0)</th>
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<tr>
<td>(\frac{1}{2} R)</td>
<td>(\frac{1}{2} R)</td>
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<td>0</td>
<td>(\frac{1}{2} R)</td>
<td>(\frac{1}{2m} R)</td>
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When both countries issue exclusive licenses to import and export, \( L_H = L_F = 1 \), bargaining between two opponents of equal power takes place. Theory of sequential bargaining predicts that the split of the rent converges to one half as time between offers goes to zero (Rubinstein). “Divide the pie” experiments confirm the result of an equal split (Davis and Holt).

If only one-sided market power is established, \( (L_H, L_F) = \{ (0, 1), (1, 0) \} \), then the multiple importing (exporting) firms compete in price for a share of the quota.\(^{\text{viii}}\) They engage in a Bertrand competition, resulting in the world price equal to the highest (lowest) possible price, \( P_H \) (\( P_F \)). Thus, assuming no capacity constraints, the entire rent accrues to the monopoly (monopsony).

If no licenses are issued in either of the country, all initial firms proceed to stage 2, where they engage in a bilateral exchange. Hong and Plott show that efficiencies of this market are reasonably high, approximately 92\%, and that the transaction price converges to the equilibrium price. Thus, we assume that each country obtains half of the rent. Given identical firms in each country, individual firms are equally likely to obtain the rent accruing to their respective countries. Thus, the expected payoff to an individual home country firm is \( \frac{1}{2n} \) and is \( \frac{1}{2m} \) for a foreign country firm. Note that this simplifying assumption does not have any qualitative effect on rent-seeking outcomes, as the payoffs for this contingency do not enter the decision for rent-seeking outlays.

The payoff matrix needs to be appropriately adjusted if rent-seeking for a specific allocation method is considered. For example, if firms lobby for allocating licenses through a lottery instead of lobbying for licenses directly, then the expected payoffs have be proportionately lowered to reflect the uncertainty of obtaining a license even if the firm is a winner. In other words, the expected rent would have to have an additional weight of \( 1/n \) and \( 1/m \) attached to it for a rent-seeking importer and exporter, respectively. Similarly, the payoff matrix would need to be augmented for each of the administration methods mentioned earlier.
Returning to the general model, in stage 1, firm i in country H chooses the level of rent-seeking outlays $x_i$ to maximize expected profit

$\Pi_i = \alpha \{ P(L_i^H) \cdot [E(V_i \mid L_i^H, L_F = k^F) - x_i] + (1 - P(L_i^H)) \cdot [E(V_i \mid L_i^H, L_F = 0) - x_i] \}$

$+ (1 - \alpha) \cdot [E(V_i \mid L_i^H = 0, L_F = k^F) - x_i],$

where $\alpha$ denotes the probability that property rights are allocated in country H, $V_i$ is the rent accruing to firm i, $L_{iH} = 0$ denotes the state of the world where no licenses are allocated in country H, $L_F = k^F$ denotes the state of the world when $k^F = \{0, 1\}$ licenses are awarded in country F, and $E$ represents an expectation operator. $P(L_i^H)$ is the probability that firm i in country H becomes a monopsony and $P(L_i^H)$ is the probability that another firm in country H obtains the exclusive import license, where both probabilities are conditional on the property rights being allocated in country H.

The term in the curly brackets denotes the expected payoff for firm i when an import license is allocated in country H. The last term in (1) is firm i’s expected payoff when no property rights (licenses) are assigned. The two payoffs are weighted by respective probabilities of establishing property rights in country H. The expected payoff to firm i, when some other firm in country H obtains the exclusive license to import, equals zero. Each expected payoff for firm i is a weighted average of payoffs in two states of the world: when foreign country allocates licenses and when it does not, each contingency being weighted by its probability of occurring.

The probability that firm i obtains an exclusive import license, $P(L_i^H)$, is specified as a logit function, continuously increasing in firm i’s own rent-seeking outlays, and decreasing in other firms’ outlays, $P(L_i^H) = \frac{x_i}{X}$, where $X = \sum_{j=1}^{n} x_j$ are the aggregate outlays in country H. An analogous result pertains for firm j in country B. This specification is a special type of a more general Tullock contest success function, $P = \frac{x'_i}{\sum_{j=1}^{n} x'_j}$, with marginal returns to rent seeking outlays $r = 1$ (Tullock). $r$ represents the
efficiency of an additional dollar spent of rent seeking and allows individual participants to receive
different returns on their investments. This simplified form permits us to focus on the implications of the
quota environment while providing the intuition for the results that extend to the cases of more complex
logit functions. Rewriting (1) yields

\[ \Pi_i = \alpha \left( \frac{x_i}{X} \right) \left[ P(L_F = 1) \cdot (V_i \mid L_i^H, L_F = 1) + P(L_F = 0) \cdot (V_i \mid L_i^H, L_F = 0) \right] - x_i \]

\[ + (1 - \alpha) \left[ P(L_F = 1) \cdot (V_i \mid L_H = 0, L_F = 1) + P(L_F = 0) \cdot (V_i \mid L_H = 0, L_F = 0) \right] - x_i \]

Denoting \( \beta = P(L_F = 1) \) as the exogenously given probability that property rights are established in
country F and substituting the second stage contingent payoffs, firm i chooses the level of rent-seeking
outlays to maximize:

\[ \max_{x_i} \Pi_i = \alpha \left( \frac{x_i}{X} \right) R \left( 1 - \frac{\beta}{2} \right) + (1 - \alpha) \left( 1 - \frac{\beta}{2} \right) R - x_i, \]

Firm j in country F maximizes

\[ \max_{y_j} \Pi_j = \beta \left( \frac{y_j}{Y} \right) R \left( 1 - \frac{\alpha}{2} \right) + (1 - \beta) \left( 1 - \frac{\alpha}{2} \right) R - y_j, \]

where \( y_j \) are firm j’s individual rent-seeking outlays and \( Y = \sum_{j} y_j \) are aggregate outlays in country F.

The first order condition yields

\[ \alpha R \left( 1 - \frac{\beta}{2} \right) \frac{X - x_i}{X^2} - 1 = 0, \]

where \( X_j = X - x_i \).
Similarly for firm $j$ in country $F$

\[(5) \quad \beta R (1 - \frac{\alpha}{2}) \frac{Y_j - y}{Y^2} - 1 = 0, \]

where $Y_j = Y - y_j$. Since firms are assumed to be identical in each country, $x_i = x$, for all $i = 1, \ldots, n$ and $y_j = y$ for all $j = 1, \ldots, m$, (4) implies

\[
\alpha (1 - \frac{\beta}{2}) (n-1) \frac{x^*}{(n)^2} R
\]

and (5) implies

\[
y^* = \frac{\beta (1 - \frac{\alpha}{2}) (m-1)}{(m)^2} R.
\]

Proposition 1. The rent is not completely dissipated and never over dissipated. The dissipation ratio increases with the initial number of firms in the two countries, but at a lower rate than in a direct one-country rent-seeking contest.

Proof:

\[
D = \frac{nx^* + my^*}{R}
\]

\[
D = \frac{\alpha (1 - \frac{\beta}{2}) (n-1)}{n} + \frac{\beta (1 - \frac{\alpha}{2}) (m-1)}{m}
\]

The rent under dissipation is a result of the smaller number of firms competing as well as uncertain payoffs. In the first stage, the firms are contesting for expected payoffs, as they are uncertain about second stage bargaining power contingent on the outcomes of the simultaneous intra-country contests. Even in a perfectly competitive environment, the rent is not always dissipated completely.
The whole rent is dissipated when the country with a large number of competing firms awards an exclusive license with certainty, and the country with lower number of firms does not allow for this possibility, i.e. \( n \to \infty, \alpha = 1, \text{and } \beta = 0 \) or \( m \to \infty, \beta = 1, \text{and } \alpha = 0 \). This occurs because the zero probability of allocating property rights in one country removes the uncertainty of the rent share accruing to the other country. The firms in the latter country operate in a perfectly competitive environment and the whole certain rent is dissipated. The rent dissipation ratio also converges to one in the limit as \( n, m \to \infty \) if one country awards an exclusive license with certainty and the other has a positive probability of doing so, \( \alpha = 1 \text{ and } 0 < \beta \leq 1 \) or \( \beta = 1 \text{ and } 0 < \alpha \leq 1 \). With a monopsony being established with certainty, the expected rent share for country H’s firms is \( R(1 - \frac{\beta}{2}) \) and is \( \frac{\beta}{2} R \) for the firms in country F. Under perfect competition in both countries, the two expected rent shares are dissipated entirely, resulting in the dissipation of the whole rent. This holds analogously for the case of a monopoly to be established with certainty in the other country.

The implications of an increase in the number of contesting firms remain the same as in Tullock’s direct rent-seeking contest, as

\[
\frac{\partial D}{\partial n} = \frac{\alpha(1 - \frac{\beta}{2})}{(n)^2} > 0 \quad \text{and} \quad \frac{\partial D}{\partial m} = \frac{\beta(1 - \frac{\alpha}{2})}{(m)^2} > 0. \text{ix}
\]

As the number of contestants increases, more rent is dissipated. The effect of an increase in aggregate outlays due to a higher number of firms dominates the effect of the decrease in individual outlays. With more firms participating in the contest, the marginal benefit of rent seeking outlays decreases because the probability that an individual firm wins the prize decreases, leading to a decrease in individual outlays. However, with more firms participating, more of the prize gets competed away, such that less is left for the agent that wins.

As a result of uncertain payoffs, the rate of increase is lower in our framework and for any number of firms competing; the rent dissipation ratio is lower.
Proposition 2: The probability of establishing market power (i.e. allocating licenses) increases rent-seeking outlays in the own country and decreases the outlays in the other country. However, the aggregate world effect is always positive with a more competitive own country contest.

Proof:

The first part of the proposition holds because \( \frac{\partial x^*}{\partial \alpha} \geq 0 \), \( \frac{\partial x^*}{\partial \beta} \leq 0 \). An increase in the probability of establishing market power increases the expected payoff for the country’s firms as there is a higher probability for them to gain more bargaining power in stage 2. The effect is opposite for the firms in the other country.

For the second part of proposition 2, consider without loss of generality

\[
\frac{\partial D}{\partial \alpha} = \frac{n-1}{n} + \beta \left( \frac{1}{2n} + \frac{1}{2m} - 1 \right).
\]

This expression is positive for \( n > m \) for all possible values of \( \beta \).

To gain intuition for the above result, consider first a scenario where \( n = m \) and \( \beta = 1 \), where the cross-country effect exactly offsets the own country effect. The marginal effect of an increase in \( \alpha \) on the expected rent share is the same for each country. With the same number of firms, the same proportion of the change in the expected rent share is dissipated.

When \( n > m \) with \( \beta = 1 \), the higher number of own country firms results in a larger proportion of the change in the expected rent share being dissipated in the own country, where the change is of the same magnitude and of opposite signs for the two countries. This result extends to \( \beta < 1 \), because in addition to the higher number of firms, an increase in \( \alpha \) causes a larger change in the expected payoff to the home country, relative to the change for the foreign country. Thus, for a more competitive contest in the home country, the aggregate world effect on rent dissipation is positive, regardless of the values of the property right allocation probability in the foreign country, \( \beta \).
With relatively more firms competing in the foreign country, the effect of an increase in $\alpha$ on rent dissipation is ambiguous and is positive for $\beta < \frac{2m(n-1)}{m(n-1) + n(m-1)}$. Q.E.D.

**Pre-existing monopsony (monopoly)**

We now relax the assumption of multiple trading firms initially and allow one country, or both, to have a pre-existing market power structure. Then, *ceteris paribus*, the game reduces to a one stage bargaining game, when both $n = 1$ and $m = 1$, and a partial two-stage contest for combinations $(n, m) = \{(1, >1), (1, 1), (>1, 1)\}$.

When both the home and foreign countries have an established import monopsony and export monopoly, respectively, no first stage contest takes place as no licenses need to be allocated. Property rights are in place at the outset and the relative bargaining power is known with certainty. The firms proceed directly to the second stage, where they engage in a bargaining game determined by the combination $(n, m) = (L_H, L_F)$ (Figure 3). Thus, the only rent-seeking waste is the one involved in bargaining for the price with the opponent from the other country, which we assume to be zero.

If one country has a pre-existing monopsonistic (monopolistic) structure while the other country’s multiple firms have to compete for a right to import (export), the contest reverts back to the two-stage contest, but with partial participation only (Figure 4). Without loss of generality, let the home country be the one with an established monopsony. Thus, $n = L_H$ is known to the foreign country at the outset. The foreign country firms engage in rent-seeking activities to obtain an export license. The home country monopsonist enters the contest in the second stage, where the outcome is determined in a bargaining game conditional on the outcome of the foreign country’s monopoly contest. Possible market structure contingencies arising in this case are $(L_H, L_F) = \{(1,1), (1,0)\}$.

In stage 1, firm $j$ in the foreign country chooses the level of rent-seeking outlays to maximize
The optimal level of rent-seeking outlays for firm $j$ is

$$y^* = \frac{\beta R (m-1)}{2 (m)^2},$$

and the rent-dissipation ratio is

$$D = \frac{\beta (m-1)}{2 m}.$$

Thus, less rent is dissipated with one-sided preexisting monopsony than in case of multiple firms contesting in both countries. The reduction in dissipation comes from two sources. First, the pre-existing monopsonist does not participate in the first-stage contest, thus incurring no rent-seeking outlays. Second, in stage 1, the foreign country exporting firms contest for a lower expected rent as they with certainty face an importing firm with market power in stage 2. In terms of social waste due to rent seeking, imperfect competition in importing/exporting should not be a primary policy concern of the WTO.\textsuperscript{x}

**Multiple licenses allocated**

Trading firms often do not lobby for licenses directly but rather through lobbying for license allocation methods. Each allocation method awards them, with certain probability, a right to a share of the quota. Usually, more than one license is granted, sometimes with trading firms subject to limitations on the number of licenses. Allocation methods currently used in practice include issuing licenses on demand, basing the allocation on historical import shares, holding auctions, and the like.

Proposition 3: *Less rent is dissipated when multiple licenses are allocated. In general, for a given value of the rent, the rent-dissipation ratio decreases with the number of licenses allocated in either of the countries.*
Proof:

Without loss of generality, assume $1 < k \leq n$ import licenses are allocated in the home country if property rights are established. The licenses entitle the holder to import $1/k$ of the quota amount. Under the original assumptions, the structure of the contest remains the same, except individual firms’ are now competing for a smaller share of the rent. The second stage retains the nature of a bargaining game. The holders of multiple licenses remain with monopsonistic bargaining power for their share of quota. With property rights established in the home country only, the payoff to an individual license holder is $\frac{1}{k}R$. If licenses are awarded in both countries, multiple opponents with equal bargaining power negotiate the price. The ‘divide the pie’ result holds and each firm obtains a half of their share of quota. The expected payoff to a license holder in country A is $\frac{1}{2k}R$. Thus, firm $i$ maximizes

$$
(7) \quad \max_{x_i} \prod_i = \alpha (1 - \frac{\beta}{2})P(L_i^H | k^H = k) \frac{R}{k} + (1 - \alpha)(1 - \beta) \frac{R}{2n} - x_i,
$$

where $P(L_i^H | k^H = k)$ is the probability that firm $i$ obtains a license given $k$ licenses are allocated.

The conditional probability in (7) is equivalent to the probability of a win in $k$ Bernoulli trials of sampling without replacement, where the size of the sample is $n$. The license allocation can be viewed as a sequence of $k$ draws from a sample of $n$ firms. Since each firm is allowed to obtain at most one license, the winner is excluded from subsequent draws. The probability that firm $i$ obtain one of $k$ licenses is thus

$$
P ( L_i^H | k^H = k ) = \frac{x_i}{X} + \sum_{t=0}^{k-2} \frac{x_i}{X} \cdot \frac{x_j}{X^{n-(t+1)}} X^{n-t}.
$$
where $X^{a_j} = \sum_{j = 1}^{n-1} x_j$ and $X_{-i}^{a_j} = \sum_{j = 1}^{n-1} x_{i-j}$ for $t = 0, 1, \ldots, k-2$. Substituting this conditional probability into (7) and solving for a symmetric Nash equilibrium yields optimal rent-seeking outlays for firm $i$ in country $H$,

$$(x^*_i | k^H = k) = \alpha(1 - \frac{\beta}{2}) R \frac{n-1}{n} \left[ \left( 1 - \sum_{s=1}^{k} \frac{k-s}{k} \cdot \frac{1}{n-s} \right) \right].$$

Analogously for firm $j$, the optimal individual outlays when $z$ licenses of equal value are allocated in country $F$ are

$$(y^*_j | k^F = z) = \beta(1 - \frac{\alpha}{2}) R \frac{m-1}{m} \left[ \left( 1 - \sum_{s=1}^{z} \frac{z-s}{z} \cdot \frac{1}{n-s} \right) \right].$$

Clark and Riis (1998) provide conditions for the existence of such symmetric equilibria.

Note that if only one license is allocated, the second term in the square brackets is zero. It follows that $D(k^H = \{0, k\}, k^F = \{0, z\}) < D(k^H = \{0, 1\}, k^F = \{0, 1\})$ and the same holds for an increase in $z$.

The result holds for any increase in the number of licenses. Without loss of generality, consider an increase in the number of licenses allocated in country $H$. The rent dissipation for $k+1$ licenses is

$$D(k^H = \{0, k+1\}, k^F = \{0, z\}) = \alpha(1 - \frac{\beta}{2}) \left[ \left( 1 - \sum_{s=1}^{k} \frac{k+1-s}{k+1} \cdot \frac{1}{n-s} \right) \right] + \beta(1 - \frac{\alpha}{2}) \left[ \left( 1 - \sum_{s=1}^{z} \frac{z-s}{z} \cdot \frac{1}{n-s} \right) \right].$$

Each term $1/(n-s)$ under the summation in the first brackets has now a larger weight attached to it $\frac{k+1-s}{k+1} > \frac{k-s}{k}$ for all $s > 0$. In addition, the negative term has an additional $(k+1)^{th}$ element under the summation. Thus, more and larger terms are subtracted from the single prize dissipation ratio when $k$ increases, resulting in a lower $D$. 


For a given quota rent value, an additional license translates into a smaller share per license, and the difference \( R(1 - \frac{k}{k+1}) \) is allocated in an additional \((k+1)^{th}\) draw. The transfer of the value to a later draw with a lower weight attached to it decreases expected gains and causes the participants to decrease their rent-seeking outlays. Q.E.D.

**Conclusions and extensions**

In this paper, we model rent-seeking behavior in the context of tariff-rate import quotas introduced by the Agreement on Agriculture and currently being re-negotiated in the WTO. Our model advances the literature on rent-seeking and import quotas by formulating an extensive form game that incorporates rent seeking through “rights” rent seeking and the uncertain nature of the payoff due to possible changes in the world market structure. In the context of rent seeking in a two-stage simultaneous contest with uncertain payoffs, we show that rents are not dissipated completely and never over dissipated. This result prevails even with perfect competition because payoffs are uncertain. There is uncertainty about bargaining power in the second stage, which is contingent on the outcomes of the simultaneous first-stage contests in the two countries. Hence, this result differs from that of Hillman and Krueger.

The implications of these contests are that the world market structure can change, thereby affecting expected payoffs. Allocating property rights in stage 1 gives firms of this country participating in stage 2 more bargaining power, thus increasing their expected payoff and in turn their rent-seeking outlays. The effect is negative for the other country’s firms. The own-country positive effect dominates the cross-country negative effect if more firms are competing relative to the other country, resulting in a positive aggregate effect. The existence of an established monopsony (monopoly) reduces rent dissipation. This reduction is a result of non-participation of the monopoly (monopsony) in the first stage “rights” rent-seeking contest as well as of lower expected payoff for the competing firms on the other side of the market. Allocation of multiple licenses decreases rent-seeking outlays. Thus, if the objective of the
government is to minimize social waste due to rent seeking, then preference should be given to the license allocation methods that award multiple licenses.

Our model analyzing rent seeking in the context of import quotas can be altered or extended to accommodate additional complexities. For example, changing the payoff matrix appropriately can incorporate special cases of the import quota environment in terms of allocation methods or additional conditions imposed by countries. Nevertheless, the results of the basic framework introduced in this paper would still hold when analyzing rent seeking and import quotas. Furthermore, direct rent seeking can be incorporated in stage 2, to reflect the rent-seeking practices in the cases when no licenses are allocated and free-for-all regime prevails. Import demand and export supply by individual firms is then accommodated on a first-come-first-serve basis. Firms compete for the rent in some non-price dimension, usually through time spent to be the first in line. The time spent waiting at the port of entry and other associated costs, e.g., product spoilage, then constitute direct rent-seeking (“rents” rent seeking) waste in stage 2.

A priority for further research would be to endogenize $a$ and $\beta$, and have it depend on domestic firms’ rent-seeking expenditures. In the current model, firms are ambiguous with respect to the establishment of a monopoly or a monopsony. For example, a firm prefers a monopoly if it becomes the monopolist. When another firm becomes the monopolist, the firm prefers no monopoly. Foreign firms benefit from the absence of a domestic monopoly and so $a$ and $\beta$ could also be specified as a function of foreign rent seeking expenditures. For example, foreign firms might be willing to expend resources to prevent the establishment of a monopsony in the home country. This would increase their bargaining power in the second stage and their expected payoff, thereby increasing their rent-seeking outlays in the first stage. Such an extension of our model could include multiple importing and/or exporting countries “rights” and “rents” rent seeking, each with one or several trading firms.
Finally, other useful extensions of this model would be to allow for imperfect competition in the product market as well (like for some state trading enterprises in agriculture), contestable transfers where the size of the rent $R$ is endogenous and quota under fill can occur, risk aversion, asymmetric valuations and perfectly discriminating contests.

Table 1. Import/Export License Allocations Imposed by Importers

<table>
<thead>
<tr>
<th>X License Required</th>
<th>M License Required</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20 Canada</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>YES</td>
<td>Beef and Veal</td>
<td>Live sheep &amp; goats</td>
<td>Live sheep</td>
</tr>
<tr>
<td></td>
<td>Sheep or goat meat</td>
<td>Sheep or goat meat</td>
<td>Mushrooms</td>
</tr>
<tr>
<td></td>
<td>Butter</td>
<td>Butter</td>
<td>Cheese for processing</td>
</tr>
<tr>
<td></td>
<td>Cheese for processing</td>
<td>Cheese for processing</td>
<td>Cheese for processing</td>
</tr>
<tr>
<td></td>
<td>Cheddar cheeses</td>
<td>Cheddar cheeses</td>
<td>Cheddar cheeses</td>
</tr>
<tr>
<td></td>
<td>Manioc</td>
<td>Manioc</td>
<td>Manioc</td>
</tr>
<tr>
<td></td>
<td>Bananas</td>
<td>Bananas</td>
<td>Bananas</td>
</tr>
<tr>
<td></td>
<td>Cane or beet sugar</td>
<td>Cane or beet sugar</td>
<td>Cane or beet sugar</td>
</tr>
<tr>
<td></td>
<td>Boneless beef</td>
<td>Boneless beef</td>
<td>Boneless beef</td>
</tr>
<tr>
<td></td>
<td>Rice</td>
<td>Rice</td>
<td>Rice</td>
</tr>
<tr>
<td></td>
<td>Live sheep</td>
<td>Live sheep</td>
<td>Live sheep</td>
</tr>
<tr>
<td></td>
<td>Mushrooms</td>
<td>Mushrooms</td>
<td>Mushrooms</td>
</tr>
<tr>
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<td>Orange juice</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>302 Cream</td>
<td>Cream</td>
<td>Cream</td>
</tr>
<tr>
<td></td>
<td>Whey</td>
<td>Whey</td>
<td>Whey</td>
</tr>
<tr>
<td></td>
<td>Other dairy</td>
<td>Other dairy</td>
<td>Other dairy</td>
</tr>
<tr>
<td></td>
<td>Margarine</td>
<td>Margarine</td>
<td>Margarine</td>
</tr>
<tr>
<td></td>
<td>Sweet potatoes</td>
<td>Sweet potatoes</td>
<td>Sweet potatoes</td>
</tr>
<tr>
<td></td>
<td>Raw cane sugar</td>
<td>Raw cane sugar</td>
<td>Raw cane sugar</td>
</tr>
<tr>
<td></td>
<td>Maize</td>
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<td>Maize</td>
</tr>
<tr>
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<tr>
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<td>Broken rice</td>
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<tr>
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<td>Maize</td>
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<td>Maize</td>
</tr>
<tr>
<td></td>
<td>Bran</td>
<td>Bran</td>
<td>Bran</td>
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<tr>
<td></td>
<td>Pigmint</td>
<td>Pigmint</td>
<td>Pigmint</td>
</tr>
<tr>
<td></td>
<td>Poultry &amp; Eggs</td>
<td>Poultry &amp; Eggs</td>
<td>Poultry &amp; Eggs</td>
</tr>
<tr>
<td></td>
<td>Skim milk powder</td>
<td>Skim milk powder</td>
<td>Skim milk powder</td>
</tr>
<tr>
<td></td>
<td>Butter</td>
<td>Butter</td>
<td>Butter</td>
</tr>
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<td></td>
<td>Cheeses</td>
<td>Cheeses</td>
<td>Cheeses</td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td>Wheat</td>
<td>Wheat</td>
</tr>
<tr>
<td></td>
<td>Oats</td>
<td>Oats</td>
<td>Oats</td>
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<td></td>
<td>Butter substitutes</td>
<td>1044</td>
<td>Meats</td>
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<tr>
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<td>Cheese</td>
<td></td>
<td>Dairy</td>
</tr>
<tr>
<td></td>
<td>Dried milk</td>
<td></td>
<td>Eggs</td>
</tr>
<tr>
<td></td>
<td>Whey</td>
<td></td>
<td>Wheat</td>
</tr>
<tr>
<td></td>
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<td>Barley</td>
</tr>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

The total number of TRQs that fall into each category are listed in the shaded boxes.
Source: WTO 2002a,b
Figure 1. 2-stage simultaneous rent-seeking contest

STAGE 1

HOME COUNTRY

\( (n > 1) \)

monopsony seeking contest

\((L_H)\)

STAGE 2

FOREIGN COUNTRY

\( (m > 1) \)

monopoly seeking contest

\((L_F)\)

Bargaining

<table>
<thead>
<tr>
<th>(L_F = 1)</th>
<th>(L_F = 0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(L_H = 1)</td>
<td>Divide the pie</td>
</tr>
<tr>
<td></td>
<td>Bertrand competition in foreign country</td>
</tr>
<tr>
<td>(L_H = 0)</td>
<td>Bertrand competition in home country</td>
</tr>
<tr>
<td></td>
<td>Bilateral exchange</td>
</tr>
</tbody>
</table>
Figure 3. Rent-seeking contest with pre-existing monopsony and monopoly - 1-stage bargaining

HOME COUNTRY
(n = 1)

STAGE 1
no contest

(L_H = 1)

FOREIGN COUNTRY
(m = 1)

STAGE 1
no contest

(L_F = 1)

Bargaining

STAGE 2

L_H = 1

1/2 R

1/2 R

L_F = 1
Figure 4. Rent-seeking contest with one-sided monopsony - 2-stage contest with partial participation

<table>
<thead>
<tr>
<th>HOME COUNTRY</th>
<th>FOREIGN COUNTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>((n = 1))</td>
<td>((m &gt; 1))</td>
</tr>
<tr>
<td>no contest</td>
<td>monopoly seeking contest</td>
</tr>
</tbody>
</table>

**STAGE 1**

- \((L_H = 1)\)
- \((L_F)\)

Bargaining

**STAGE 2**

<table>
<thead>
<tr>
<th>(L_H = 1)</th>
<th>(L_F = 1)</th>
<th>(L_F = 0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1/2 R)</td>
<td>(1/2 R)</td>
<td>(R)</td>
</tr>
<tr>
<td>(R)</td>
<td></td>
<td>(0)</td>
</tr>
</tbody>
</table>
References


World Trade Organization (WTO), 2002a Tariff and Other Quotas Background paper TN/AG/S/5 March 21.

World Trade Organization (WTO), 2002b Tariff Quota Administration Methods and Tariff Quota Fill Rate Background paper TN/AG/S/6 March 22.
There are many export licenses involved with other trade agreements as well like the MFA (see Krishna and Tan).

De Gorter et al. calculate total tariff revenues and quota rents to be in the order of $44B.

Take for example the CEO of Chiquita who spent $100,000 for a night in the Lincoln bedroom, obviously to influence the U.S. government to pursue the banana case in the WTO. Chiquita also invested in production facilities in Africa to obtain more import licenses distributed as a share of bananas imported from Africa.

As for the argument that the home country government ensures that the rent goes to domestic firms, Hornig, Boisvert and Blandford analyze the distribution of rents for U.S. cheese imports and conclude that unequal market power exists between importers and exporters. Even though both rights were assigned, exporters extracted a greater share of the rents. As the level of rents rose, exporting firms were interested only in maintaining a price-cost ratio and so allowed the importers' share to increase, approaching a more equal division of the rents.

A perfectly discriminating rule chooses the winner based on relative outlays, and the contender making the highest outlay wins with probability one (Hillman and Riley).

Imperfect competition in this paper can occur on the side of importing and/or exporting firms in the market for licenses only (not in the product market).

Any certified importing firm can try to obtain a part of the imports at the port – the quota is administered at the port on a first-com first served basis.

We assume that it is always optimal for a monopsonist (monopolist) to fill the import quota.

Tullock’s contest is defined as one country rent seeking contest where players compete for a certain prize. Thus, each player maximizes expected profit, \( \pi_j = \frac{x_j}{X} R - x_j \).

Recall however that \( R \) is fixed and there is no quota under fill so perfect competition is assumed for domestic product markets.

WTO member countries use a variety of methods to administer and allocate tariff-quotas including license on demand, first-come first-served, historical imports, auction, state trading, producer groups, or a combination of the above (WTO 2002a,b). Many countries also impose additional conditions with allocation methods described above like domestic purchase requirements and limits on the number of quota shares.