Modeling the interactions of complex tariff regimes

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PRELIMINARY DRAFT – DO NOT QUOTE

1. INTRODUCTION

Complex tariff structures impose challenges to model-based policy analysis. In many analyses, ad valorem equivalent tariffs (AVEs) are used to sum up the effects of different sorts of tariffs. Real-world tariff structures, on the other hand, are rather complex, as Narayanan and Villoria (2013) pointed out, with not only ad valorem tariffs in place but also specific tariffs as well as tariff-rate quotas (TRQs). While ad valorem tariffs express the duty as a percentage share of the value (i.e. 7%), specific tariffs add an absolute value to be paid per volume, quantity, fat content, or other property (i.e. 10€/ton). Tariff-rate quotas are two-tied systems that offer a reduced tariff for a certain contingent, i.e. 3000 tons of duty-free exports, while a higher tariff is applied to all imports beyond those first 3000 tons. Depending on the fill-rate of the quota and the unit value of the imported commodities, all these protective measures can be recalculated into an ad valorem equivalent tariff, which is then much easier to handle and aggregate in multiregional and multisectoral equilibrium models such as the standard GTAP (Global Trade Analysis Project) model. As the effect of these tariffs on import quantities, welfare, and trade distortion can however differ and not all these differences are captured within the ad valorem equivalent tariff, modeling their precise mechanisms would be worthwhile. The matter becomes even more complex when TRQs, ad valorem tariffs, and specific tariffs interact.

Tariff-rate quotas combine the preferential access of a low in-quota tariff with the restrictiveness of a quota quantity and have therefore become a common element for the protection of the most sensitive commodities in several bilateral trade agreements. When a country grants access to a market via a TRQ, a low tariff is imposed until a certain quota quantity is reached. All imports beyond that point face a much higher out-of-quota tariff rate. The access to the TRQ is often not limited to just one homogeneous commodity and country: For instance, Canada protects its sensitive dairy market in the CETA trade agreement with the help of two tariff-rate quotas for cheese. Within one of these quotas, different European countries can export different kinds of cheeses free of duty up to a quantity of 16,000 metric tons. Frankly, cheeses from Switzerland, France, the Netherlands, or Bulgaria cannot be seen as homogeneous commodities, nor do they compete at the same price level. Once all quota licenses have been distributed, all additional imports need to be exported at a high tariff of 245.5% (but not less than $4.52/kg) – thereby combining an ad valorem tariff with a cap in the shape of a specific tariff. All these properties of the quota – the heterogeneity of the included tariff lines and the ad valorem and specific tariffs outside the quota - affect the distribution of quota licenses.

So far in the literature, there is empirical support for quantitative import restrictions causing a rise in import prices (Falvey, 1979; Feenstra, 1984; Aw and Roberts, 1986), some theoretical reasoning on license prices in imperfect competition (Harris, 1985; Krishna, 1989) and at least one source that elaborates on the theoretical effects of quotas with either ad valorem or specific tariffs (Vousden, 1992). Yet, to the best of our knowledge, even studies that specifically address the modelling of tariff-rate quotas (such as Jafari *et al.*, 2021) do not include an endogenous quota license allocation within a complex tariff structure.

To see the market mechanisms of tariff-rate quotas with both, ad valorem and specific tariffs, in action, we integrate a disaggregation of commodities with quota access into the framework of the multiregional and multisectoral CGE Modell GTAP and determine the allocation of quota licenses endogenously with a mixed complementarity problem framework. For this, we add code to the CGEbox, a flexible, extendable, and modular code basis for CGE modeling in GAMS drawing on the GTAP database provided by the University of Bonn. Additional to the GTAP database, we will add trade data at the tariff line level, particularly quantities and unit values given by the CEPII and tariffs by the MAcMaps database.

2. DATA AND RESEARCH METHODOLOGY

To illustrate this, let us imagine a market where four heterogeneous commodities face an ad valorem equivalent tariff of 100% (Figure 1).

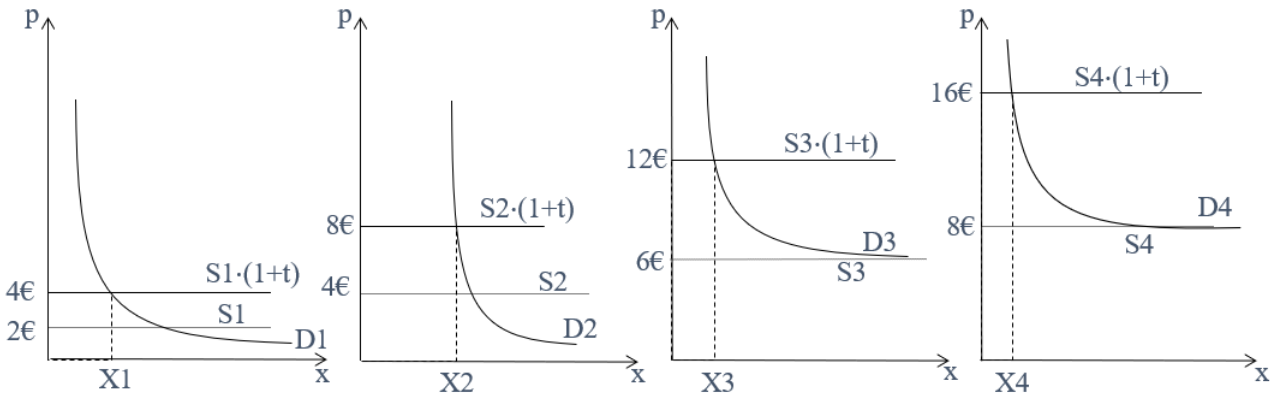

Figure 1: Four heterogeneous commodities with supply curves at different price levels (S1-S4) and differently behaving demands (D1-D4), all raised by (1+t), where t=100%

Now, a duty-free quota of four units is introduced and all four commodities gain access to it and gain some share of the quota licenses. Licenses are distributed among all four commodities (Figure 2), whereby a kink is added to the supply curve at the point where the individual licenses are used up and the commodity is sold at the high tariff outside the quota. Commodities 1 to 3 are still sold outside the quota – their quantity and import price have not changed through the implementation of the quota. However, since a portion of their trade takes place without the application of a duty, they benefit from a quota rent (hatched area). Commodity 4 can actually increase its exports through the quota license and has an equilibrium import price that is lower than before, adding a quota rent of only 6€. The premium reflects the shadow value of a license to the supplier. As we can see, the shadow value of a license ranges from 2€ to 6€. The supplier of commodity 1, who saves on a comparably small absolute tariff burden, has an incentive to sell his license to one of the other suppliers, who would all be willing to pay more for it.

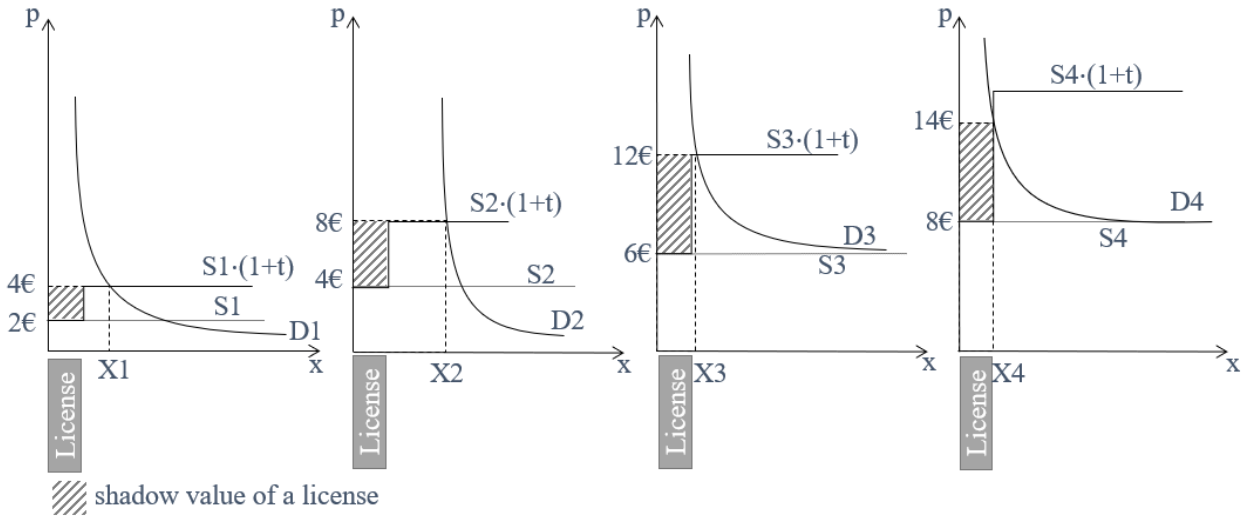

Figure 2: All commodities gain a license at the size of one unit.

If the secondary market for licenses works efficiently, an equilibrium is reached where the price of a license is equal to the shadow value that each supplier attributes to its licenses (Figure 3). The equilibrium price of a license lies at 4€. Supplier 1 will not hold any licenses at this license price, as paying the tariff costs and exporting outside the quota is cheaper for this commodity. Supplier 3 and 4 export just the right amounts that their quota premium can compensate for their license purchase. Supplier 2 is indifferent between buying a license or exporting outside the quota since both will cost 4€. Supplier 2 thereby functions as a marginal supplier who consumes the licenses that are still available in the market.

The image illustrates why cheaper exporters are less likely to export inside the quota when ad valorem tariffs apply outside the quota – it is simply not worthwhile to them to afford an expensive license. More expensive exporters have higher opportunity costs of not owning a license, as their absolute tariff burden is high if they have to export outside the quota. However, depending on the features of the demand for their commodity, a high price alone is no guarantee for holding the most licenses in equilibrium, as the comparison of the licenses held by supplier 3 and 4 shows.

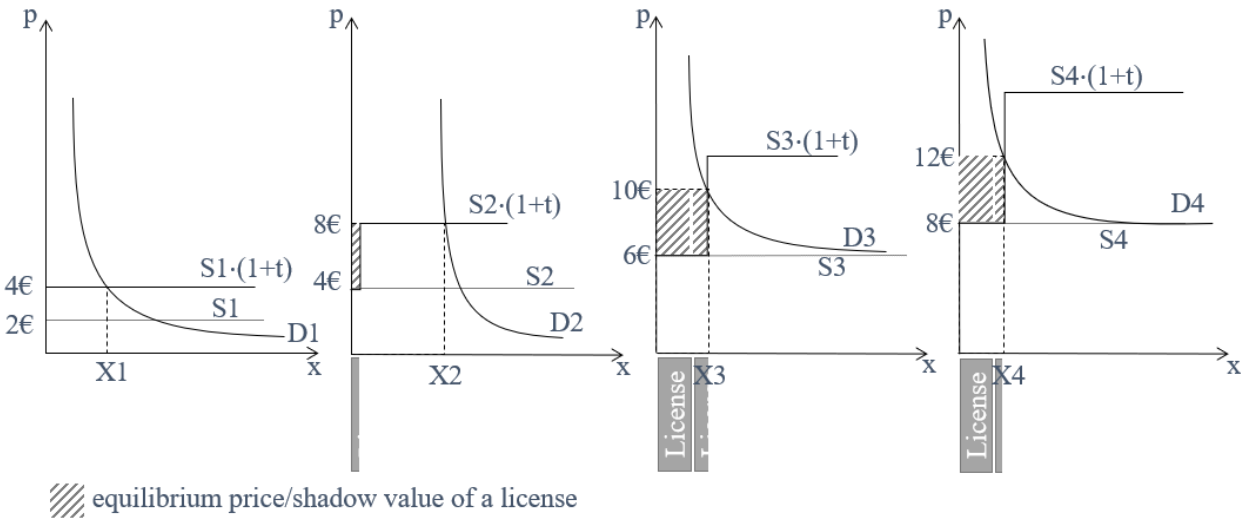

Figure 3: equilibrium state of the license market

With specific tariffs applying outside the quota, the story is an entirely different one (Figure 4): this time, all suppliers face a tariff of 4€ per unit, independently of their price level. With identical shadow values of their licenses, the four suppliers do not have any incentive to trade and will stick to their initial distribution.

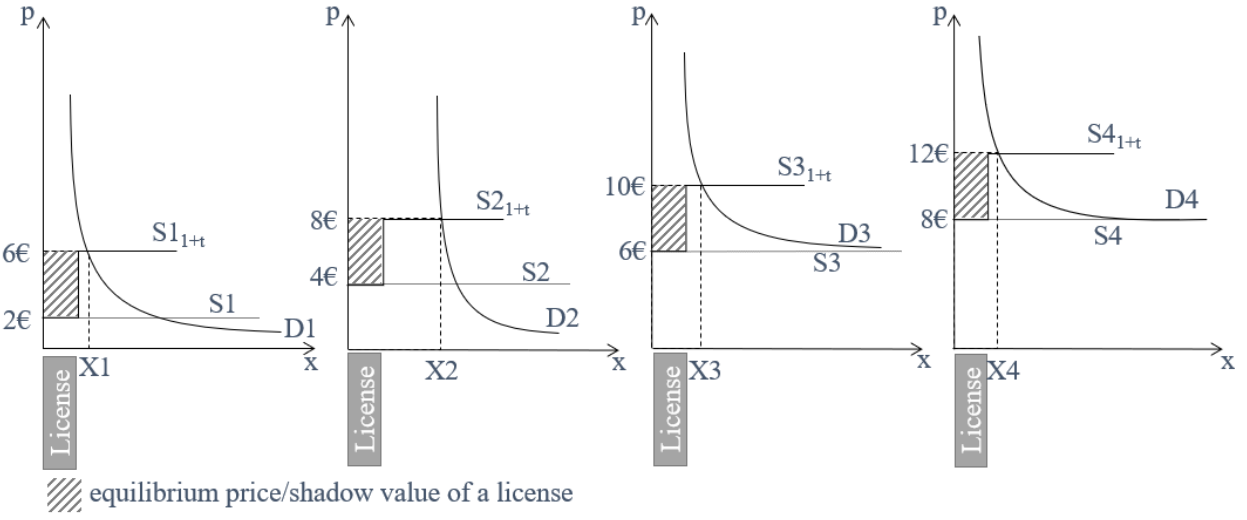

Figure 4: licenses in a market where all commodities face the same specific tariff of 4€ per unit

However, a redistribution of licenses could also occur with specific tariffs. If the demand curves were to intersect with the supply at slightly different points (Figure 5), commodities 1 and 3 would add a quota premium of only 2.5€ respectively 3€, which would make the holding on a license less valuable to them.

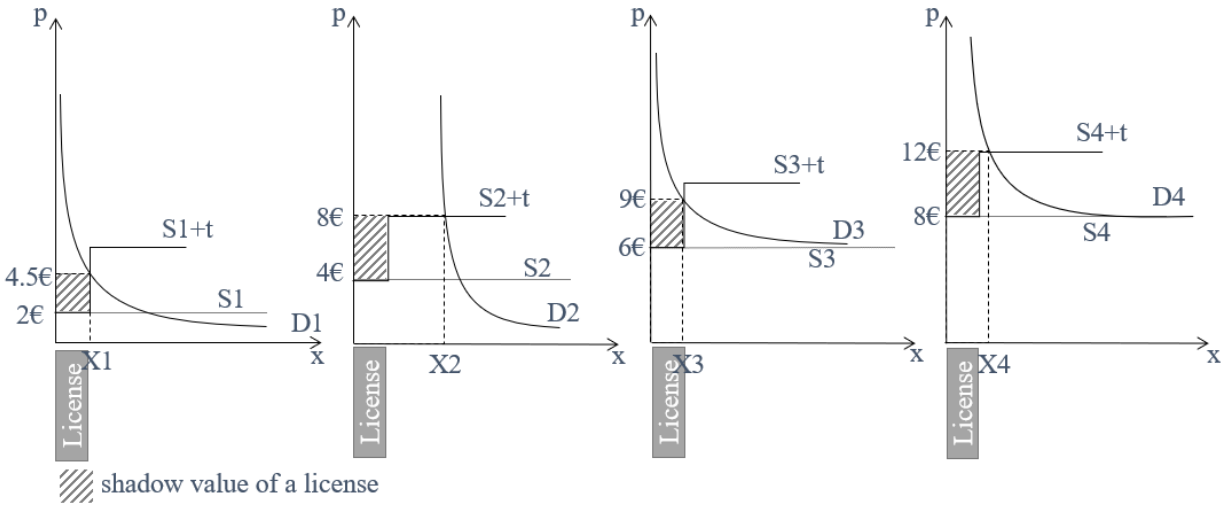

Figure 5: a quota with specific tariffs outside the quota, but with shifted demands for commodity 1 and 3 to show a non-equilibrium in the license market

They would then sell the license to members of the market who are willing to pay a higher price to them, such as supplier 2 or 4, up to the point where their shadow value equals to the shadow value of every other supplier, leading to equilibrium such as the one in Figure 6.

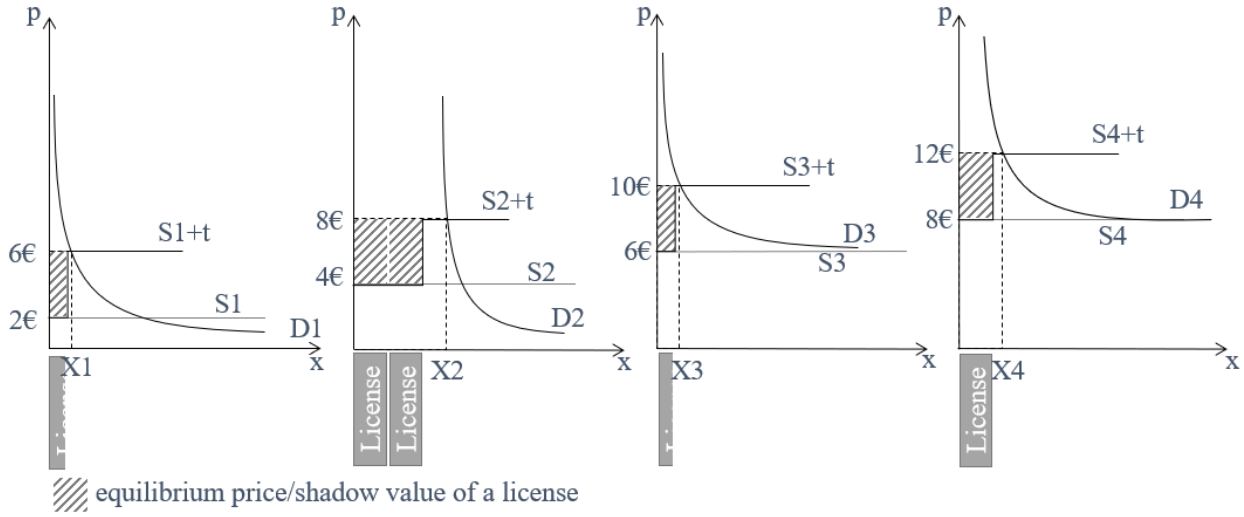

Figure 6: equilibrium state of the license market with specific tariffs. Notice how this is only one possible equilibrium of the license allocation.

Notice how, in both cases, the market is biased towards more expensive commodities, albeit for different reasons. In a market with ad valorem tariffs outside the quota, cheap suppliers are unlikely to afford licenses and will not benefit from the preferential quota access. In a market with specific tariffs outside the quota, cheap exporters may gain access to a quota license, but the high tariff burden – which can multiply their prices with a much higher factor than expensive commodities – is likely to impede their competitiveness. Yet, in both cases, high priced commodities are not guaranteed to gain the highest quota access. In a market with ad valorem tariffs outside the quota, suppliers of expensive commodities face the highest tariff burden when they cannot get hold of a license, but their incentive to purchase licenses also depends on the demand. In a market with specific tariffs outside the quota, they face a lower relative tariff burden than their competitors, but their ability to pay for quota licenses is the same as other suppliers'. Due to their bias towards expensive commodities, quotas have sometimes

been compared to specific tariffs – this, however, again fails to capture the entirety of the mechanisms; among other reasons, because a quota with ad valorem tariffs favors expensive commodities in their access to quota licenses, while the commodities outside the quota operate under a non-distorting ad valorem tariff.

To implement this logic into the CGEbox, we will build upon the existing tariff line module which already introduces quantities and CIF unit values, which we will refer to as XWTL and CIF here. Beyond that, we introduce four new variables at the tariff line level.

3. DISCUSSION OF RESULTS

As a case study, we will compare the allocation of different tariff-rate quotas in the CETA agreement, for which the imports outside the quota are all subject to different mixes of ad valorem and specific tariffs.

4. MAIN CONCLUSIONS

We hope to find proof for the hypothesis that the posited access granted by a quota can differ widely from the de facto access that certain countries have with the commodities they export, depending on the tariff structure that is applied outside the quota.

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