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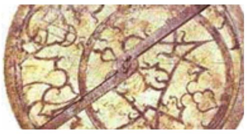

EU Trade Barriers in the Agri-food Sector: When Protection Breeds Dependence[±]

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Abstract

This paper looks for firm-level evidence that high rates of protection breed concentration of firm activities into highly protected sectors, endogenously generating vested interests in the maintenance of protection. We combine data on the EU's trade protection for food and agricultural products measured by ad-valorem equivalents AVEs) with survey data on France's agri-food sector to show that indeed, small and mid-size firms and cooperatives in that sector are heavily concentrated in product lines protected by tariff-rate quotas (TRQs) at high rates. Those firms and cooperatives can be expected to be at the forefront of resistance to multilateral tariff cuts, in particular in the meat and dairy sectors. Overcoming their resistance would call for targeted adjustment assistance.

Keywords: agriculture, trade protection, concentration

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1. Introduction

From Seattle to Hong-Kong, multilateral negotiations on the next “round” have been laborious. Agriculture is by no means the only stumbling block: the “Singapore issues”, for instance, contributed to failure at Cancún as much as agriculture. But it remains that the developed countries’ reluctance to open up their agricultural markets is high on the list of developing-country grievances and partly explains their own unwillingness to yield much in other areas. The stalemate in multilateral negotiations leaves future rules for agricultural trade uncertain: After the end of the Uruguay Round’s “peace clause”, they might end up being written by the WTO’s Appellate Body rather than by negotiators, with results that are difficult to forecast.

The EU, which historically was in no position to negotiate concessions in agriculture because of the Common Agricultural Policy’s straightjacket, has made substantial progress in making the CAP more WTO-friendly. On the issue of agricultural subsidies, in particular, the EU has, through its own reform process, moved some of CAP spending out of the most distortionary “amber box” category. However things are less clear on market access. By reducing internal guaranteed prices and market interventions, the CAP’s reforms have, in fact, left intact or even raised the importance of border protection. As a result, EU proposals for cuts in protection levels have typically featured “sensitive products” clauses that made it unclear by how much market access would really improve.

Much ink has been spilled on the political-economy of agricultural market access, in particular in the EU; some of the literature is descriptive (see e.g. Mahé and Roe 1996 or Moyer and Josling 2002), some of it more model-based (Jean et al. 2005, Pokrivak et al. 2006).[1] The literature, however, has left the firm-level aspects of the political economy largely untouched. Border protection of agri-food products does not only protect the farm sector: it also protects the companies and cooperatives that buy from farmers and sell products like meat or milk to wholesalers and supermarket buyers. Large, diversified

1 Jean et al. 2005, for instance, grounded their analysis of sensitive products on a common-agency model, the workhorse model of the political-economy of trade.

multinationals like Nestlé, Unilever or Danone may not care much about EU border protection at the product level because they have geographically and sectorally diversified portfolios of activities. But mid-size cooperatives and local agri-food firms, because they are less diversified, are more likely to find themselves over-exposed to sectors that would lose massively from formula cuts in tariffs. When those companies have the ear of local politicians, they may be able to leverage their local clout to higher levels through influential MPs and political parties and contribute to rigid negotiating positions.

In order to look for evidence of vulnerability –and hence political resistance– to tariff cuts, this paper explores firm-level correlates of trade protection levels in the French agri-food sector. We are particularly interested in exploring the vulnerability of incumbent firms to negotiated reductions in protection levels. "Vulnerability" can take, inter alia, two forms: downward inflexibility of costs or lack of diversification.

Consider the former. At the industry level, economic logic suggests that reducing protection would reduce output levels and raise import-penetration ratios. In general, we don't know whether the output cuts implied by tariff reductions would take the form of individual output cuts by incumbent firms or of exit by some of them. However, if firms are heterogeneous in their cost structures, the latter would be more likely than the former. In the presence of sunk costs of entry and exit, incumbent firms would find it optimal to spend resources lobbying against concessions in agricultural negotiations in order to reduce the probability of exit.

As for the latter, the argument is less direct. Lack of diversification by itself does not make a firm more vulnerable to tariff cuts if those cuts follow a linear formula. Nor does it if the formula is progressive like Harbinson's. To see this, compare a diversified firm that is active in two sectors, a highly-protected and a weakly-protected one; and a non-diversified firm that is active in a medium-protection sector. Harbinson's formula involving progressive cuts as a function of existing tariffs, by Jensen's inequality, the average cut would be higher for the former than for the latter: diversification would actually *raise* vulnerability. Thus, the problem with lack of diversification is slightly more complex. In the long run, uneven protection has the effect of attracting capital to highly-protected activities, and once there, it is trapped by entry and exit costs. Thus, lack of diversification is a problem –i.e. a factor of lobbying and induced political resistance– if it is combined with presence in highly protected sectors. We explore empirically in this paper whether lack of diversification within the agro-industrial sector and high protection are correlated or not, and if yes who are the most vulnerable firms and activities in terms of this combination (and other firm characteristics).

We find that high concentration of firm activities across branches has a U-shaped relationship with rates of protection, with a turning point around 100% of ad-valorem equivalent rate. Thus, NAF branches with high average rates of protection are also characterized by lack of diversification of the firms and cooperatives that operate in those branches. Firms protected by tariff-rate quotas (TRQs) also tend to be undiversified, as are the cooperatives. Meat and dairy products, in particular, feature heavily undiversified cooperatives and companies protected by TRQs at high ad-valorem equivalents. Those cooperatives and companies can be expected to be at the forefront of political resistance to agricultural market-access improvements.

The paper is organized as follows. Section 2 summarizes the state of play in agricultural negotiations. Section 3 presents the data and the estimation results. Section 4 concludes.

2. Doha agricultural negotiations: The state of play

2.1 Agriculture in the multilateral negotiations

The Uruguay Round's final agreement contained a commitment to start multilateral negotiations on services and agriculture, where much remained to be done, by the end of 1999. The Seattle Ministerial was meant to get those negotiations started but failed in the midst of riots which kick-started instead an anti-globalization movement that has remained buoyant to this day. In November 2001, the Doha Ministerial launched a new process with a limited agenda focused on development. A March 2003 deadline to agree on modalities was broken with no agreement, but in August of that year, the US and EU tabled a joint proposal in preparation for the Cancún Ministerial. The Ministerial, however, ended up in confrontation between industrial countries and the newly formed "G20" group of developing countries. As Anania (2007) remarked, Cancún's failure owed more to disagreement on the Singapore issues than to agriculture, although had it reached agriculture down the agenda, it would have probably stalled on it anyway.

After Cancún, a group of five "interested parties" (the US, the EU, Australia, Brazil and India) attempted to overcome the disagreements, starting with agriculture which, by comparison with the Singapore issues, looked almost like a promising area of convergence. The push made a "framework agreement" possible at the WTO's 2004 General Council meeting in Geneva. Agricultural negotiations went through difficult moments in the Summer of 2005, but by the Fall some progress was made. In October, the EU tabled a proposal including 70% cuts in so-called "amber box" support, asking the US to cut its own by 60%. The EU proposal[2] included exceptions for sensitive product covering 8% of the tariff lines. Defining their coverage in terms of tariff lines rather than trade volume created of course considerable uncertainty as to the real scope of those "exceptions". There was also a bit of posturing in the EU's offer since the demand for matching cuts by the US was fully understood to be politically unacceptable in the run-up to a difficult mid-term election. In the end, the December 2005 Hong Kong Ministerial failed to reach agreement on agricultural issues; in order to avoid the political fallout from an open failure, the final Ministerial declaration merely included a clause whereby all agricultural export subsidies would have to be phased out by 2013 (WTO 2005).

The stalemate in multilateral negotiations leaves future rules for agricultural trade in an uncertain state. In December 2003, the Uruguay Round agreement's so-called "peace clause", which had hitherto kept agriculture out of the WTO's dispute-settlement system, lapsed. It remains to be seen if and how rapidly the number of cases brought to the WTO will grow; but there is a clear possibility that, in the absence of a negotiated agreement, the rules would end up being made by the Appellate Body's jurisprudence, with a result that is difficult to forecast.[3] The possibility of using the WTO's dispute-settlement mechanism also raises the "reservation utility" of developing countries in the negotiations, making them unwilling to accept the consolidation of distorting measures that could be fought through complaints (see the discussion in Bureau, Decreux and Gohin 2007).

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[2] See MEMO/05/537, Statement of EU conditional negotiating proposals –with explanatory annotations.

[3] For instance, where the Appellate Body would draw the exact boundaries of the "Green box" is not clear. On this, see the background papers of ICTSD's April conference (www.ictsd.org).

2.2 EU agricultural trade protection

2.2.1 The CAP's evolution

In contrast with the stalemate in multilateral negotiations, the EU's Common Agricultural Policy has undergone deep changes over the last 15 years. In a landmark 1992 reform under Commissioner MacSharry, price support for beef and a number of crops was reduced and the principle of "decoupling" was introduced. Decoupling meant cutting the link between payments and production and replacing it by a link between payments and land use. The so-called "Agenda 2000", adopted in 1999, pushed the MacSharry reforms one step further with new cuts in beef price support and more decoupling. It also introduced the principle of future increases in milk quotas and reductions in price support for dairy products. A mid-term review of Agenda 2000 led to a further round of deep reforms in June 2003 under Commissioner Franz Fischler. The 2003 reform introduced the principle of a largely decoupled "Single Farm Payment" (SFP) based on past (grandfathered) rather than current output. By the WTO's 2013 deadline, the SFP is expected to absorb over 90% of CAP spending for market/income support (the CAP's "pillar I").

Thus, it is fair to say that the CAP is no longer the monolithic stumbling block to agricultural negotiations that it used to be before the reforms. But it is too early to judge by how much market access has been improved as a result of the Fischler reforms.[4] The EU's insistence on keeping a substantial proportion of tariff lines in the "sensitive-products" category certainly suggests that the issue remains real. Indeed, ad-valorem equivalents (AVEs) of border protection measures remain very high in some sectors, as shown in the next section.

2.2.2 EU border protection: stylized facts

As briefly discussed in the previous section, EU support of agricultural and food products takes a variety of forms, an increasing share of which is "decoupled" from production decisions. We consider here only border protection, the instrument that is arguably most directly up for negotiation at the WTO. We have combined tariffs as notified by the EU and

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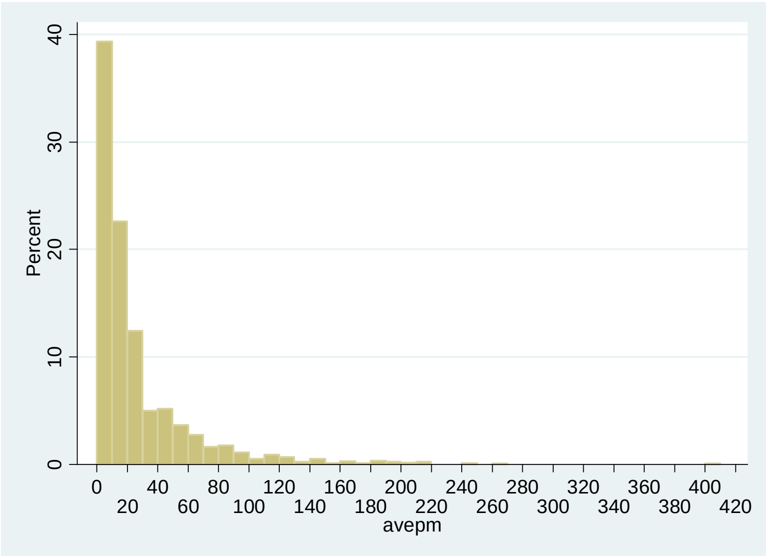
[4] Assessing the real extent of market access is anyway a difficult task given the EU's web of preferential agreements; on this, see e.g. Gallezot (2003).

reported by the TRAINS database with ad-valorem equivalents (AVEs) for products whose border protection takes more complex forms than ad-valorem tariffs. Food and agricultural products, in particular, are affected by specific tariffs whose conversion to AVEs requires assumptions about pre-tariff border prices. Figure 1 shows the distribution of the AVEs in our sample, which covers only food and agricultural products.[5]

Figure 1

Distribution of ad-valorem equivalents



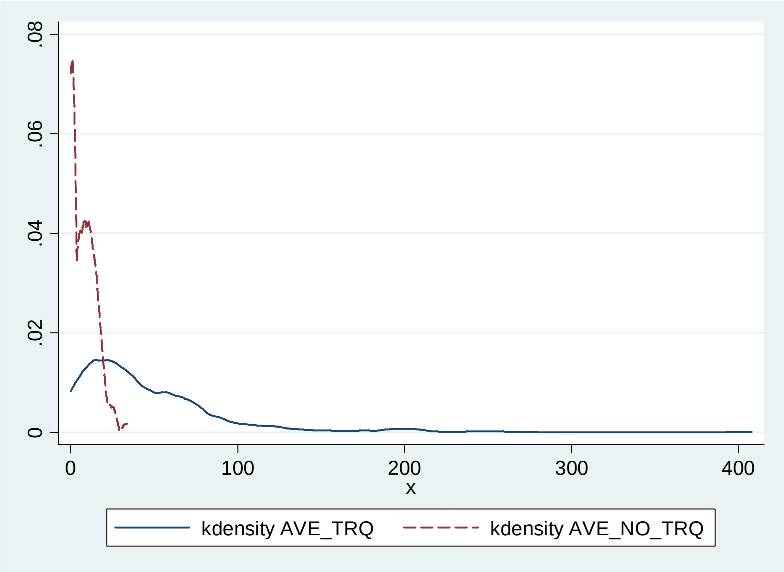
Source: Authors' calculations

It can be seen that the distribution is very skewed, with 40% of the tariff lines[6] below 10% but a long tail extending all the way to 420% for certain beef products. About a tenth of them are covered by tariff-rate quotas (TRQs) which specify one tariff rate up to a certain quantity and a different one (usually much higher) beyond that quantity. Those are typically characterized by much higher AVEs, as shown in Figure 2.

[5] In the Harmonized System's nomenclature, our products of interest are, at the HS6 level, 010111 to 230910.

[6] In what follows we will use the term "tariff lines" to designate HS6 lines; those are somewhat more aggregated than what is conventionally taken as the "tariff line" which is at the HS 8 level.

Figure 2
Distribution of AVEs by type : TRQs vs. no TRQs

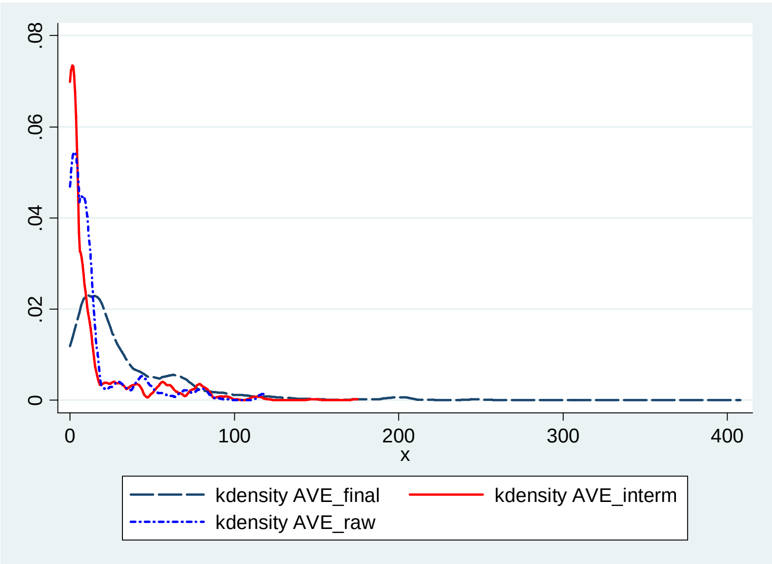


Source: Authors' calculations

Tariff escalation is also apparent in the structure of the EU's AVEs. Classifying products by degree of processing into "raw", "intermediate" and "final" generates sharply different distributions of AVEs, in particular for final products whose tail extends far to the right.

Figure 3

Distribution of AVEs by type of product



Source: Authors' calculations

Tariff escalation is a feature of many border protection systems –although more so in developing countries– but it also suggests an important observation. Namely, that border protection of agricultural and food products is not so much about protecting farmers, since those produce essentially raw rather than final products, as agri-food firms that operate downstream of the agricultural sector. This motivates our focus on the relationship between border protection and firm type.

3. Tariffs, products, and firms

3.1 Data

Our sample consists of 341 firms in the French agri-food sector, together with ad-valorem equivalents of import protection measures applied by the EU as of 2005. We generated this original database by merging data from several sources.

The firm data originates from a survey, the *Enquête Annuelle d'Entreprise- Industries Agro-Alimentaires* (EAE-IAA), conducted in the agri-food sector by the *Service Central des Enquêtes et Etudes Statistiques* (SCEES) of France's Agricultural Ministry. The survey essentially covers firms whose main activity belongs to the agri-food sector but includes also firms with only *some* activity in that sector. Firms in the survey can have several establishments, but establishment accounts are consolidated at the firm level; so what we have is firm turnover by branch.[7] Data scattered in the survey's various tables was merged by the firms' identifier, (SIREN), the product NAF code,[8] and the year. We selected two years, 2004 and 2005, and averaged all variables over those two years in order to smooth random year-to-year shocks. The EAE also contains firm status, which makes it possible to identify cooperatives.

We merged this data with customs data giving imports by firm and product, at the HS8 level, using two concordance tables: one between the NAF and CPF6 product nomenclatures, and one between CPF6 and HS8 (there is no direct concordance table between NAF and HS8).

[7] Firms are also identified by their *main* NAF sector (code APE).
[8] The NAF nomenclature (700 branches in the level of disaggregation we used here) is close to though not quite identical with NACE.

Finally, we merged the resulting database with data on the ad-valorem equivalent of EU agricultural protection measures at the HS6 level,[9] including a dummy variable for tariff-rate quotas (TRQs) and a rough classification of products into raw, semi-finished (bulk) and final. Descriptive statistics for the database's variables are given in Table 1.

Table 1

Descriptive statistics

Variable	*Obs*	Mean	Std. Dev.	Min	Max
Firm sales	*341*	128'517	236'416	1'524	1'996'930
Firm sales by NAF brancl	*341*	52'552	101'003	268	836'956
Firm imports (value)	*341*	1'674	7'500	1.02	83'189
Ad-valorem equivalent	*341*	35	43	0	223
Import ratio	*341*	0.06	0.80	0.00	14.81
Dummy for cooperative	*341*	0.06	0.37	0.00	1.00
Tariff-rate quota	*341*	0.67	0.45	0.00	1.00
Tariff peak	*244*	0.60	0.48	0.00	1.00
Sensitive product	*244*	0.27	0.41	0.00	1.00

Notes: Unit of observation: firm identified by its SIREN code. Mean of dummy for cooperative is proportion of firms meeting criterion. Tariff-rate quota, tariff peak and sensitive products are binary variables defined at the NAF level and averaged by firm.
Firm sales are in thousand Euros.
Source: author calculations; sensitive products dummy is from Jean et al. (2005).

Note that the range of AVEs is now narrower than in the histogram of Figure 1. The reason is that the AVEs appearing in Table 1 are (simple) averages by NAF branches whereas the AVEs of Figure 1 were at the HS6 level. Averaging smoothes out the peaks, which reduces the maximum value from 407.8% to 220%.

3.2 Size and diversification

As indicated in the introduction, heterogeneity in firm costs would imply that aggregate –industry-level– output cuts following a reduction in trade protection measures would take the form of exit by relatively inefficient firms. In the presence of sunk entry and exit costs, those firms would lobby against concessions in agricultural market-access negotiations.

[9] We are grateful to Patrick Messerlin for making this data available to us.

Our sample has no cost data from which we could directly "read" a probability of exit, but it has sales data from which we can indirectly get a glimpse of the heterogeneity of incumbent firms. The data is shown in Table 2.

Table 2
Distribution of firm size and concentration

Percentiles	Sales value (euros)	Herfindahl
10%	6'874	0.01
25%	14'835	0.05
50% (median)	52'437	0.25
75%	150'908	0.93
90%	432'238	1.00
99%	1'996'930	
Mean	*128'517*	*0.44*
St. dev.	*236'416*	*0.40*

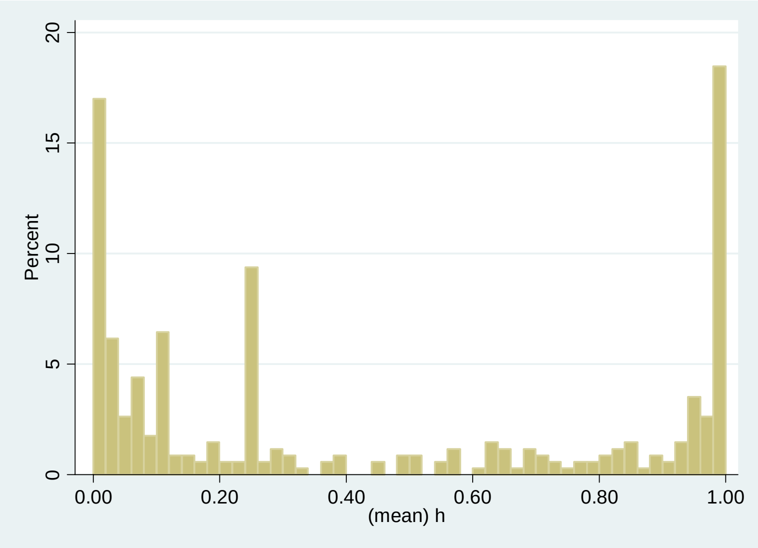
Source: author calculations

The sample's heterogeneity is apparent in both the large variance (the coefficient of variation is over two) and the large difference between the mean turnover (K€128'517 of annual sales over 2004-5) and the median (K€52'437). There is only limited information in this, as the size heterogeneity may be a composition effect driven by differences in optimal scales in the various activities spanned by our sample rather than by differences in firm cost structures. This said, inasmuch as size differences are driven by cost differences, the sample is, prima facie, suggestive of heterogeneous firms. If true, this implies that aggregate (industry) output cuts would more likely take the form of exit than proportional output cuts across incumbent firms.

The second dimension of vulnerability is, as already discussed, lack of diversification when combined with presence in highly protected sectors. We calculated two measures of concentration/diversification at the firm level: the number of NAF branches in which each firm is active, c, and the Herfindahl index calculated on each firm's NAF sales shares, h. The average number of active NAF branches is 1.2, with a standard deviation of 0.65 and a maximum of 8. Thus, the bulk of our sample (296 firms out of 341) is active in only one branch, with a small tail of firms with multiple NAF activities.

The distribution of Herfindahl indices in our sample is shown in Figure 3.

Figure 3
Distribution of firm concentration indices



Source: Authors' calculations

The proportion of firms with Herfindahl indices at or close to one is 18%, much lower than the proportion of firms active in only one NAF sector. This is because many firms in our sample are also active in out-of-sample (non-agri-food) sectors, which reduces the Herfindahl index but not the count of active branches.[10] Overall, the histogram is suggestive of a bimodal distribution with very low values of h (although of course no firm in our sample can have an h value of exactly zero) corresponding to low shares of agri-food sales in total firm sales, and values at or close to one corresponding to only one agri-food NAF sector.

Cooperatives are, in our sample, slightly less diversified in their activities than other firms (Herfindahl index of 0.47 against 0.43 for other firms). We will see in the parametric analysis of the next section that this difference is significant when other firm-level characteristics are controlled for.

[10] To see this, consider a firm with €100'000 in total sales, out of which €20'000 are in the agri-food sector. Suppose further that those €20'000 are split in half between two NAF branches. Our Herfindahl index will be calculated as $h = (0.1)^2+(0.1)^2 = 0.02$. Thus, it is a *partial* index. Recalculating it by treating "residual" (out of sample) firm activities (here, €80'000) as one branch would generate very high index values for firms with little exposition to agri-food sectors. For instance, in our example the index would become $h' = (0.1)^2+(0.1)^2+(0.8)^2 = 0.66$. This would run counter to our interpretation of high index values as meaning potential vulnerability to food tariff cuts when combined with high AVEs.

3.3 Estimation and results

In this section, we test for the existence of a systematic relationship between the degree of concentration in the cross-product portfolio of our firms and the highest level of trade protection among the branches where they are active, controlling for firm characteristics available in the survey. We fit a quadratic polynomial in order to pick up a potentially non-monotone relationship between concentration and protection. That is, we run the following equation:

$$\begin{aligned} h_i = \alpha_0 + \alpha_1 \max\left\{t_1,\dots,t_{n^i}\right\} + \alpha_2 \left[\max\left\{t_1,\dots,t_{n^i}\right\}\right]^2 \\ +\alpha_3 TRQ_i + \alpha_4 COOP_i + \alpha_5 M_i + u_i \end{aligned} \qquad (0.1)$$

where $t_k, \quad k = 1,\dots,n^i$, is the AVE applied in each of the NAF branches where firm *i* is active, $COOP_i$ is a dummy variable if firm *i* is a cooperative, TRQ_i is a real variable in [0,1] measuring the incidence of tariff-rate quotas in the NAF branches where firm *i* is active, M_i is the ratio of firm i's imports to its value added, and u_i is an error term. Because over 15% of the observations have Herfindahl indices at one, we report both OLS and right-censored tobit estimates. Tobit marginal effects (not reported) turn out to be very close to OLS estimates, so we use the latter to generate predicted-concentration curves. We report White-corrected standard errors in order to account for possible heteroskedasticity in the error term.

With ad-valorem equivalents of border protection levels on the right-hand side, one may be concerned by the possibility of an endogeneity problem if political-economy forces make protection endogenous to industry or firm characteristics. In our case, endogeneity would be a problem if there was reverse causation from firm concentration to the intensity of lobbying. There are several counter-arguments, however. First, the firm characteristics we observe in the sample are for 2004-5, that is, ten years after the negotiations that shaped the AVEs. Considering the latter as predetermined to concentration levels is thus natural.[11] Second, if one were to insist on a political-economy linkage, it should be kept in mind that in the widely-used common-agency model of endogenous protection, the power of the incentives faced by governments is equal to the level of output of domestic firms.[12] It bears no univocal relationship with the level of concentration *per se*, as shown in the fictitious example of Table 3. Table 3 gives the distribution of firm output by sector (firms are in columns and sectors in rows) and shows how radically different patterns of firm concentration across sectors can generate identical political incentives. In a common-agency model, the power of the incentives[13] that producer lobbies offer to the government (to induce it to protect them) is given by total output, which is, for each sector, the sum of the cell entries in the sector's row. The Herfindahl index of sectoral concentration is indicated, for each firm, in the last line.

Table 3
Concentration and output: Fictitious exmple
(a) Concentrated firms

	Firm 1	firm 2	*Power of incentives*
Sector 1	0.95	0.05	*1*
Sector 2	0.05	0.95	*1*
Output	*1*	*1*	
h	*0.905*	*0.905*	

(b) Diversified firms

	Firm 1	firm 2	*Power of incentives*
Sector 1	0.5	0.5	*1*
Sector 2	0.5	0.5	*1*
Output	*1*	*1*	
h	*0.5*	*0.5*	

Table entries are levels of output, with the last column giving the industry total (each firm is active in two sectors). In table (a), both firms are very concentrated, in table (2), their outputs are evenly distributed. Industry outputs are unchanged even though Herfindahl indices, given in the last rows, are far apart.

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[11] AVEs vary from year to year, but those fluctuations are largely the mechanical result of fluctuations in world prices (for instance, the AVE of specific tariffs goes up when the world price goes down). Those fluctuations are not discretionary and thus can be taken –at least as a first approximation– as exogenous.

[12] In the truthful Nash equilibrium of a common-agency game, the power of the incentives (the derivative of the contribution functions from producer lobbies) is equal to the derivative of the producers' profit function provided that those lobbies are sufficiently concentrated. By Hotelling's lemma, this derivative is just the level of output.

[13] In contract theory, the "power of incentives" is the slope of the function that relates the agent's effort (here the level of trade protection) to its reward (here, say, campaign contributions from lobbies).

In panel (a), both firms are concentrated (one in sector 1 and the other in sector 2). In panel (b), they are identically diversified (both spread their output evenly across both sectors). But these starkly different patterns of concentration (reflected in the Herfindahl index values) are consistent with exactly identical power of incentives. Thus, the link from concentration to lobbying (and hence to tariffs) is not mechanical. All in all, it is difficult to think of a reverse-causality problem serious enough to bias estimates in (0.1).

Estimation results are shown in Table 4. The regression equations differ by the estimator and by the form of the AVE used on the right-hand side. Columns (1), (3), (4) and (6) report OLS results. Columns (2) and (5) report right-censored Tobit results. The right-censoring comes from the clustering of 18% of our firms at Herfindahl values of one. Although the histogram of Figure 3 gives the impression that there is left-censoring as well, this is due to aggregation into histogram bars as no firm can have a Herfindahl exactly equal to zero. As for the nature of the AVE, in all cases AVEs were aggregated across HS6 lines into simple averages at the NAF level, which is the level at which firm branch activities are recorded. In the regressions of columns (1)-(3), we used, for each firm, the highest AVE level across the branches in which the firm is active. In those of columns (4)-(6), we used the average AVE level instead. Finally, equations (2) and (4) use the AVEs in log form rather than in linear form in order to reduce their dispersion.

In spite of the small sample size, most estimates are significant and have the expected sign. Orders of magnitude are fairly robust across specifications (1)-(6). Protection levels have a U-shaped relationship with concentration, with a negative linear effect and a positive quadratic one (although significant at 10% only).

Table 4
Regression results for firm concentration indices

	(1)	(2)	(3)	(4)	(5)	(6)
Estimator	OLS	Tobit	OLS	OLS	Tobit	OLS
Type of AVE	Max	Max	Max	Average	Average	Average
AVE a/	-0.003	-0.004		-0.003	-0.004	
	(2.15)**	(2.31)**		(2.21)**	(2.38)**	
AVE squared	0.000	0.000		0.000	0.000	
	(1.63)	(1.74)*		(1.68)*	(1.80)*	
ln AVE			-0.160			-0.021
			(2.34)**			(2.34)**
ln AVE squared			0.019			0.000
			(1.52)			(2.05)**
Tariff-rate quota	0.170	0.189	0.149	0.172	0.191	0.710
	(3.08)***	(3.05)***	(2.53)**	(3.12)***	(3.08)***	(2.62)***
Dummy Cooperative	0.191	0.207	0.181	0.192	0.208	0.777
	(8.64)***	(3.09)***	(8.91)***	(8.67)***	(3.10)***	(8.71)***
Import ratio	-0.035	-0.037	-0.031	-0.035	-0.038	-0.280
	(3.79)***	(1.29)	(4.74)***	(3.79)***	(1.29)	(6.90)***
Firm sales (euros)	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(3.95)***	(3.11)***	(3.71)***	(4.20)***	(3.22)***	(2.20)**
Constant	0.423	0.455	0.638	0.424	0.456	-1.786
	(10.07)***	(10.09)***	(6.01)***	(10.09)***	(10.11)***	(9.07)***
Observations	*341*	*341*	*341*	*341*	*341*	*341*
R-squared	*0.08*		*0.11*	*0.08*		*0.07*

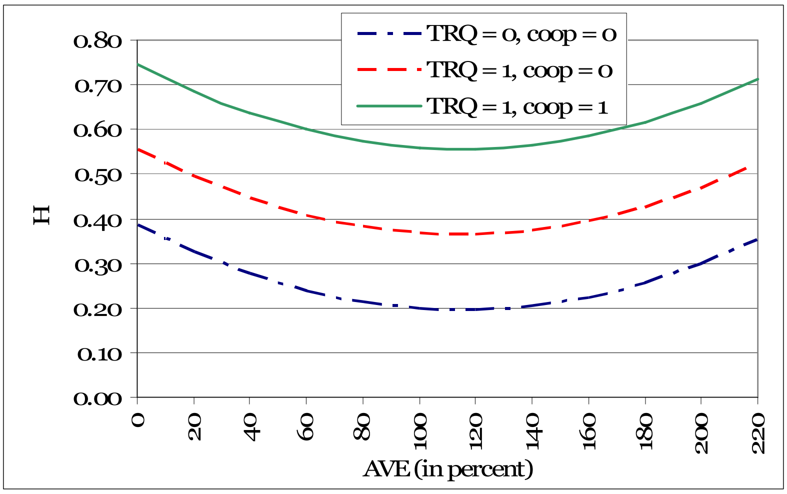
Notes:
a/ Highest per firm in regs (1)-(3), mean in regs (4)-(6)
Dependent variable: Herfindahl index ; regressions (2) and (6) are right-censored tobit; others are OLS. Parameter estimates for squared AVE nonzero at the fourth decimal.
Robust t-statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Figure 4 illustrates this non-monotonicity by plotting the predicted Herfindahl index, $\hat{h}$, against *t*, the ad-valorem equivalent of EU border measures. The predicted Herfindahl index is determined by the following equation:

$$\hat{h} = \hat{\alpha}_0 + \sum_k \hat{\alpha}_k x_k + \hat{\beta}_1 t + \hat{\beta}_2 t^2 \qquad (0.2)$$

where x_k stands for all other regressors and $\hat{\alpha}_k$ and $\hat{\beta}_k$ parameter estimates from regression (1) in Table 3. The regressors labeled x_k include COOP, the dummy variables for cooperatives, and TRQ, the variable measuring TRQs incidence by firm. Setting the value of those regressors at different levels shifts the entire Herfindahl curve vertically, up or down depending on the coefficient's sign. For instance, changing the value of the dummy for cooperatives from zero to one raises the curve by 0.191 using the coefficient in column (1) of Table 4. Similarly, changing the value of the TRQ incidence variable from zero to one (the two extremes of the interval) raises the curve by 0.17. These curves are shown in Figure 4.

Figure 4
Predicted firm concentration indices against AVE rates



Notes:
Value predicted by reg. results from eq. (1) in Table 4, evaluated at mean value of other regressors except TRQ and coop; TRQ=0 means no TRQ in the firm's active NAF branches; coop = 0 means that the firm is not a cooperative.
Source: Authors' calculations

The turning point is at an ad-valorem equivalent of 120%. Up to that point, higher AVEs are associated with lower firm concentration indices. However, the relationship becomes positive thereafter and up to the upper bound of AVEs in our sample, 220%.[14]

The curves in Figure 4 show that the effect of TRQs is more clearcut: sectors with a high incidence of TRQs are indeed associated with more concentration of activities at the firm level at any level of protection. Figure 4 shows that this effect is not only statistically significant (at the 1% level) but also very large. The lower dotted curve corresponds to the predicted concentration level of a firm that operates only in sectors unaffected by TRQs. The middle curve corresponds to the predicted concentration of a firm operating only in sectors affected by TRQs. The predicted concentration level rises by 0.17. To see what that

[14] Recall that this upper bound is for NAF averages, not for HS6 AVEs (themselves aggregated from the tariff-line level).

means, consider the illustrative calculations shown in Table 5, whose entries are sectoral (branch-level) shares in firm turnover. Firms are in columns, grouped by pairs defined by the number of branches in which they are active. Branches with their shares in total firm turnover are in lines. Herfindahl indices are calculated for each firm in the last line.

Table 5
Herfindahl index : Illustrative calculations

	Firms					
Branches	*1a*	*1b*	*2a*	*2b*	*3a*	*3b*
1	0.50	**0.79**	0.33	0.33	0.25	0.18
2	0.50	0.21	0.33	**0.62**	0.25	0.18
3			0.33	0.05	0.25	**0.59**
4					0.25	0.05
Herfindahl	*0.50*	*0.67*	*0.33*	*0.50*	*0.25*	*0.42*

Source: author calculations

Firms 1a and 1b are both active in two branches, but firm 1a, having an even distribution of sales, has a Herfindahl of 0.5. Raising h to 0.67 (the estimated effect of having TRQs in all of the firm's activities is 0.17) would mean shifting the firm's distribution of sales to something close to 80%/20%, a very drastic change in portfolio composition. With three branches, the change from a symmetric portfolio is no longer uniquely determined but one possibility would be a 62%/33%/5% distribution. Again, this would be a very substantial change. As the number of active branches grows, the portfolio change required to raise h by 0.17 is less drastic, but recall that most firms in our sample are active in only one or two branches. Thus, TRQs seem to be associated with a much higher concentration of firm activities across branches.

Cooperatives seem also to be less diversified than other firms *once other firm characteristics are controlled for* (since raw descriptive statistics show only a small difference in average concentration between cooperatives and non-cooperatives), with a coefficient of 0.19 (upper plain curve in Figure 4). By contrast, larger firm size is associated with lower concentration, and so is the amount that a firm imports.

As a robustness check, we looked at the number of active branches instead of the Herfindahl index as the dependent variable. Because the number of active sectors is a count variable, a different estimation technique assuming a Poisson or negative binomial distribution of the error term is required.[15] Table 6 shows the results.

Table 6
Regression results, number of active branches

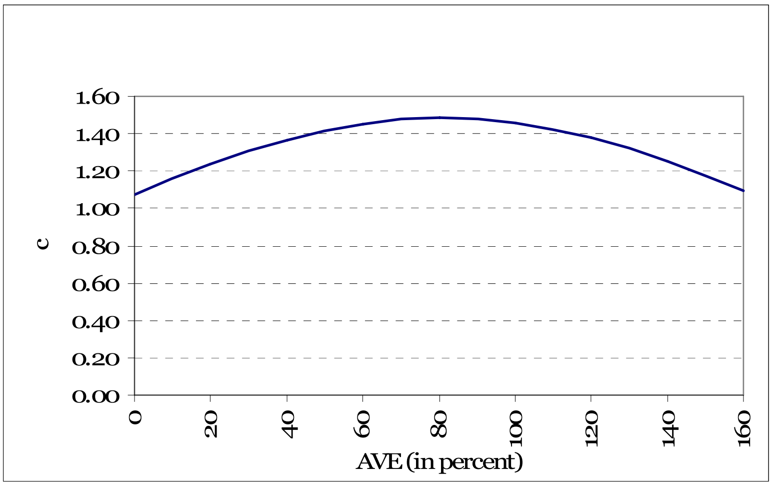
	(1)
AVE	0.007
	(3.14)***
AVE squared	-0.000
	(3.52)***
Tariff-rate quota	0.037
	(0.74)
Dummy Cooperative	-0.028
	(0.46)
Import ratio	-0.002
	(0.89)
Firm sales (euros)	0.000
	(2.68)***
Constant	-0.038
	(1.22)
Observations	341

Notes :
Negative binomial estimator. Coefficients in standard form (not incidence-rate ratios).
Robust z-statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

We find the expected pattern: higher AVEs first raise the number of active branches (reduce concentration) and then reduce it (raise concentration), as shown in Figure 5. The turning point is at 80%, somewhat lower than when the Herfindahl is taken as the measure of concentration.

[15] For a count variable, the error term cannot take on negative values and thus cannot be centered around zero.

Figure 5
Predicted count of active NAF branches



Notes:
Value predicted by reg. results from eq. (1) in Table 5, evaluated at the mean of other regressors using a negbin estimator. Coefficients on TRQ, COOP and import ratio were set at zero because not significant.

As we discussed in the introduction, the firms that face the highest uncertainty in the advent of a formula-based reduction in agricultural protection –in particular with so-called "tiered" formulae implying larger cuts for higher AVEs– are the ones whose activity is concentrated in highly protected branches. In our sample, those are meat-sector cooperatives enjoying AVEs of 142% and tariff-rate quotas. With annual sales between €1 million and €2.5 million, these cooperatives are medium-sized firms (and larger than our sample mean) and are typically highly undiversified in their activities, with Herfindahl indices above 0.9. Dairy firms, typically not cooperatives in our sample, enjoy AVEs between 80% and 100% (again because of a TRQ) and are, for some of them, similarly concentrated. Sugar firms, typically not cooperatives in our sample, enjoy very high AVEs (above 200%, also because of a TRQ) but appear relatively diversified, although at this stage we cannot tell whether this is a feature of our sample only.

4. Concluding remarks

Most models of trade protection are short-run models that do not account for the fact that, in the long run, the allocation of capital reacts to the policy environment. When protection levels are highly variable, capital migrates to highly protected sectors. When this process has gone on for a sufficiently long time, firms will find themselves with product portfolios characterized by a combination of concentration and over-dependence on the most protected sectors. In the presence of entry and exit costs, these firms, so to speak, "paint themselves into a corner" and end up vulnerable to negotiated tariff cuts. They will accordingly invest resources into lobbying against policy changes.

While the reasoning is clear, there was so far little empirical evidence that it was real. The agri-food sector is a good one to look for it since it has enjoyed nonstop protection for many decades in Europe and elsewhere. This paper's results suggest the effect is indeed statistically traceable in France's food and agriculture sector. Our results seem to confirm a widespread perception that firms and cooperatives in the meat and dairy sectors are highly specialized in activities that stand to lose drastically from trade liberalization, whether it take the form of tariff-rate quota enlargements or negotiated cuts in AVEs. Reducing adjustment costs for that sector through targeted assistance and mitigation measures could unlock a key bottleneck in the political acceptability of agricultural liberalization.

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