Pesticide Regulatory Homogeneity and Firms' Import Decisions

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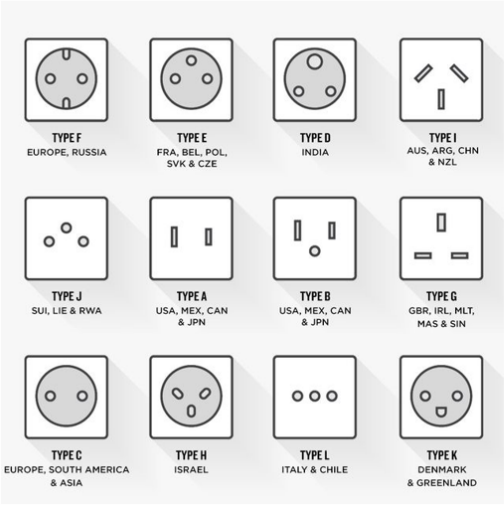
There is nothing “standard” about standards



A common charger: better for consumers and the environment

The EU plans to make life easier for consumers and reduce waste by making USB-C the common charger for smartphones and other mobile devices.

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One charger to rule them all ©AdobeStock/WESTOCK

Even in the agricultural and food sectors

Table 1: Maximum Residue Limits on selected products in 2018 (Source: Homologa)

Active element	Product	CHE	EU	Japan	USA	Canada	China	Codex
Carbaryl	Mandarins	0.01	0.01	7	10	10		15
Captan	Apple	3	10	5	25	5	15	15
Fenbutatin-Oxide	Apple	2	2	5	15	3	5	5
Acetamiprid	Apple	0.8	0.8	2	1	1	0.8	0.8
Azoxystrobin	Tomatoes	3	3	3	0.2	0.2	3	3
Folpet	Avocado	0.02	0.03	30	25	25		

Notes: MRLs are measured in parts-per-million (ppm).

This paper: pesticide regulatory homogeneity and firm-level import decisions

1. Examine the effects of regulatory homogeneity on imports

2. Assess the different economic channels that explain the trade effects of regulatory homogeneity in the agricultural sector.

Case study: EU – Swiss agri-trade and pesticide regulations

- Over 2017-19, 61% of Swiss merchandise imports were sourced from the EU27 on average while Switzerland supplied 5.5% of extra-EU imports of goods.
- While geographic and cultural proximity matter for Swiss-EU trade, close alignment, mutual recognition, and equivalence of product standards between the two partners - an outcome of years of intense negotiations - is also a strong determinant in a near-zero-tariff environment.
- EU-Swiss agri-trade has been liberalized under Bilaterals I (2002) and Bilaterals II (2005) via reduction in tariffs & export subsidies, and mutual recognition of agri-standards.
- Even so, there is more preferential access for agri-food products exported from Switzerland to the EU than vice versa (Copenhagen Economics, 2016).

Data: pesticide regulations from the Global Crop Protection database

Table 2: Comparison of maximum residue limits on selected products in 2018

Active element	Product	Switzerland	EU
Carbaryl	Mandarins	0.01	0.01
Captan	Apple	3	10
Fenbutatin-Oxide	Apple	2	2
Acetamiprid	Apple	0.8	0.8
Azoxystrobin	Tomatoes	3	3
Folpet	Avocado	0.02	0.03

Data: firm-level import data from Swiss Impex

Table 3: Characteristics of importing firms

	Firms	Products	Products per firm	Import value per firm (CHF)	Import volume per firm (kg)	Unit values per firm (CHF/kg)
Years						
2016	1,326	92	60	71,480	81,677	17
2017	1,339	92	60	67,101	82,845	14
2018	1,392	93	59	68,801	82,215	19
Firm size						
Large	141	83	9	343,303	343,751	22
Small	1,904	98	79	45,322	60,706	16

Notes: The number of observations across years does not equal the number of observations across firm sizes because, for some firms, the dataset does not record information on firm size defined as the number of employees.

Summary statistics

Table 4: Descriptive statistics for import margins by MRL homogeneity status of crop-pesticide pairs

Outcome variables	$SAME_{kpt}$ = 0 (N = 28,014)	$SAME_{kpt}$ = 1 (N = 127,486)	T-test
Import values (mln CHF)	12.474	11.300	<0.001***
Number of firms	139.557	134.799	<0.001***
Number of products	3.374	4.106	<0.001***
Import values per product per firm ('000 CHF)	32.789	71.250	<0.001***
Import volume (mln kg)	8.622	10.517	<0.001***
Unit values (CHF/kg)	0.245	0.229	0.003**

Decompose firm-level imports into extensive and intensive margins

$$\underbrace{V_{pkt}}_{\text{Import values}} = \underbrace{N_{pkt}}_{\text{Products}} \times \underbrace{F_{pkt}}_{\text{Firms}} \times \underbrace{\bar{V}_{fpkt} = (Q_{fpkt} \times UV_{fpkt})}_{\text{average imports per product per firm}} \quad (1)$$

- where p = pesticide, k = product, t = years and f = firms

Model specification: reduced-form gravity model

$$\ln X_{pkt} = \beta_1 \text{SAME}_{pkt} + \beta_2 \ln(1 + \text{Tariff}_{kt}) + \mu_{pk} + \gamma_t + \epsilon_{pkt} \quad (2)$$

- X_{pkt} = margins of import adjustment ($V_{pkt}, N_{pkt}, F_{pkt}, \bar{V}_{fpkt}, Q_{fpkt}, UV_{fpkt}$)
- SAME_{pkt} = dummy variable equal 1 for pesticide-product combinations where the Swiss MRL equals the EU MRL, and 0 otherwise.
- Tariff_{kt} = product-specific applied tariffs
- μ_{pk} = pesticide-product fixed effects
- γ_t = year fixed effects

Theoretical predictions

Table 5: The expected effects of regulatory homogeneity on trade margins

	(1)	(2)	(3)	(4)	(5)	(6)
	δV_{pkt}	δN_{pkt}	δF_{pkt}	$\delta \bar{V}_{fpkt}$	δQ_{fpkt}	δUV_{fpkt}
$\delta SAME_{kpt}$	+	+	+	+	+	−
$\delta Tariff_{kt}$	−	−	−	−	−	+

Results: Homogeneity increases imports and decreases import prices

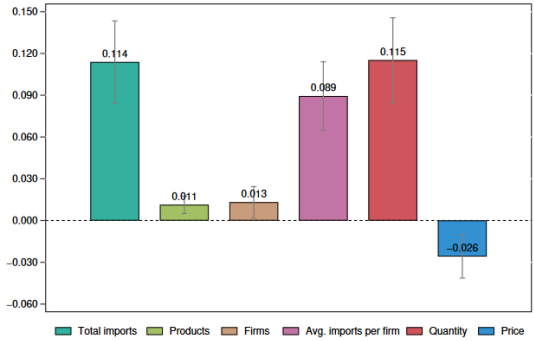
Table 6: The effect of pesticide regulatory homogeneity on product-level import margins

	Total	Extensive margin		Intensive margin		
Dependent variable (log)	Imports X_{pkt}	Products N_{pkt}	Firms F_{pkt}	Average imports $\bar{X}_{fpkt}$	Quantity Q_{fpkt}	Prices UV_{fpkt}
	(1)	(2)	(3)	(4)	(5)	(6)
$SAME_{kpt}$	0.097***	0.014***	0.006	0.077***	0.094***	−0.016**
	(0.015)	(0.003)	(0.005)	(0.013)	(0.017)	(0.008)
Log (1 + $Tariff_{kt}$)	−0.373***	0.182***	0.090***	−0.645***	−0.161***	−0.484***
	(0.009)	(0.004)	(0.007)	(0.007)	(0.007)	(0.008)
FE (μ_{pk}, γ_t)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	155,000	155,000	155,000	155,000	155,000	155,000

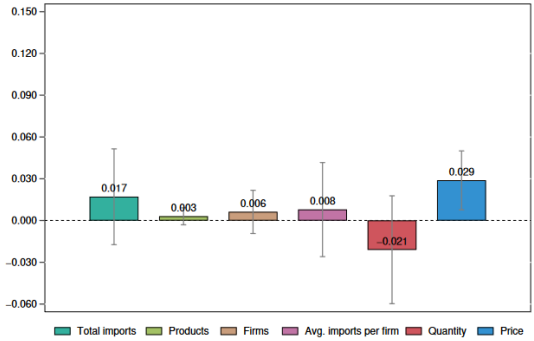
Notes: ***, ** and * denote significance at 1%, 5%, and 10% respectively. Intercepts included but not reported. Standard errors are clustered at the product-chemical-year level. X_{pkt} is total Swiss imports—summed across all firms, and HS8-digit products—of product k on which active element p is applied in year t. F_{pkt} is the number of firms importing in year t, N_{pkt} is the number of products imported in year t and $\bar{X}_{fpt}$ is the import value per product per firm in year t. The coefficients in columns (2) to (4) sum up to those in column (1). The coefficients in columns (5) and (6) also sum up to those in column (4).

… more so for smaller firms

Figure 1: The effect of pesticide regulatory homogeneity on import margins by firm size



(a) Small firms



(b) Large firms

We confirm similar effects at the firm-product level

Table 7: The effect of pesticide regulatory heterogeneity on import values and quantities

Dependent variable	Import values		Import quantity	
	(1)	(2)		
$SAME_{kpt}$	0.004	0.783***	0.013*	0.329***
	(0.006)	(0.048)	(0.007)	(0.052)
$SAME_{kpt} \times \log Size_{ft}$		−0.035***		−0.014***
		(0.002)		(0.002)
Log (1 + $Tariff_{kt}$)	−0.104**	−0.108**	−0.131***	−0.132***
	(0.042)	(0.042)	(0.032)	(0.032)
Firm-year FE	Yes	Yes	Yes	Yes
Product-pesticide FE	Yes	Yes	Yes	Yes
Observations	8,150,500	8,150,500	8,150,500	8,150,500

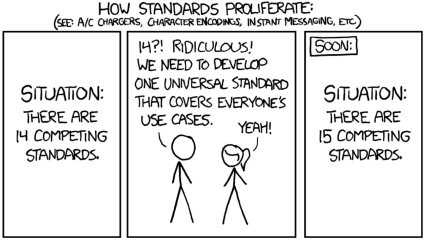
Notes: The dependent variable in column (1) is import values of firm f of HS8-digit product k—on which pesticide p is applied —in year t. The dependent variable in column (2) is import quantities of firm f of HS8-digit product k—on which pesticide p is applied —in year t. All models are estimated using the Poisson pseudo maximum likelihood estimator. p values are in parentheses. ***, ** and * denote significance at 1%, 5% and 10%.

Table 8: The effect of pesticide regulatory heterogeneity on import values across quantiles of the MRL difference

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$SAME_{kpt}$	0.488***	0.507***	0.718***	−0.126	1.059***	0.972***	1.496***
	(0.122)	(0.129)	(0.073)	(0.165)	(0.125)	(0.126)	(0.136)
$SAME_{kpt} \times \log Size_{ft}$	−0.022***	−0.023***	−0.033***	0.008	−0.045***	−0.041***	−0.067***
	(0.005)	(0.006)	(0.003)	(0.008)	(0.005)	(0.006)	(0.006)
Log (1 + $Tariff_{kt}$)	−0.155***	−0.156***	−0.138***	−0.163***	−0.156***	−0.156***	−0.157***
	(0.041)	(0.041)	(0.042)	(0.041)	(0.041)	(0.041)	(0.041)
Firm-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product-pesticide FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6974818	6984500	7301143	6906485	6930067	6949386	6928714
Average difference in MRL	0.009	0.028	0.040	0.050	0.091	0.458	9.199

Notes: The dependent variable is import values of firm f of HS8-digit product k—on which pesticide p is applied —in year t. All models are estimated using the Poisson pseudo maximum likelihood estimator. p

Implications for policy



What is the policy goal?

- Regulatory convergence $\rightarrow$ efficiency gains
- Here we show the benefit of regulatory convergence
- Open question is whose standard becomes the "standard"?

Concluding remarks and main takeaways

- When pesticide regulations converge there is a positive effect on the total value of Swiss agri-food imports from the EU at lower prices.
- More pronounced effects for smaller firms ⇒ promotes inclusive supply chains

[1] Image source: https://www.arc2020.eu

Thank you for your attention