Online Appendix

Industrial policies for multi-stage production: The battle for battery-powered vehicles
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O.A   Additional empirical results

O.A.1   Stage-level regression results

Table O.A1: Cell Sourcing decision

Dependent Variable:				Cell sourcing decision				
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Border	-1.73^a	-1.72^a	-1.61^a	-1.52^a	-1.57^a	-0.953^a	-0.494	
	(0.331)	(0.331)	(0.331)	(0.362)	(0.345)	(0.319)	(0.354)	
Border_As								-0.421
								(0.344)
Border_Am								-1.62^c
								(0.871)
Border_Eu								-1.59^a
								(0.555)
log distance	-0.258^a	-0.262^a	-0.236^a	-0.233^a	-0.235^a	-0.382^a	-0.358^a	-0.363^a
	(0.035)	(0.035)	(0.029)	(0.033)	(0.029)	(0.021)	(0.039)	(0.014)
RTA	1.14^a	1.14^a	0.689^b	0.653^b	0.672^b	0.458	-0.076	0.075
	(0.270)	(0.271)	(0.288)	(0.303)	(0.290)	(0.320)	(0.365)	(0.362)
log GDP per capita		0.147^a	0.167^a	0.322^a	0.167^a	0.213^c	0.700^a	0.234^c
		(0.035)	(0.059)	(0.059)	(0.059)	(0.118)	(0.197)	(0.121)
log(1+tariff)	-4.38^c	-4.40^b	-7.43^a	-6.87^b	-7.20^b	-8.49^a	-15.0^a	-10.0^a
	(2.24)	(2.24)	(2.71)	(3.45)	(2.80)	(2.34)	(4.96)	(2.46)
Observations	25,526	25,526	14,518	10,929	14,485	7,945	4,624	7,945
Squared Correlation	0.237	0.236	0.376	0.344	0.375	0.322	0.302	0.323
Sample	all	all	all	all	all	Majors (f)	Majors (m)	

All specifications include origin country fixed effects. Columns (1) and (2) activate a cell plant if it supplies that vehicle maker in the current year. Column (3)–(7) require the cell plant to supply the vehicle maker with the material (NCM, LFP, Others) and shape (Cylinder, Prismatic, Pouch) required for the considered car model. Column (3)–(7) estimate a common fixed effect for France and Germany (since France is not in the largest connected set). Column (4) constrains the set of choosers to be car models with positive sales (strictly defined). Column (5) constrains suppliers to be on the "White List" (see text). Column (6) further constrains the sample to the set of 24 major countries and 15 major firms. Column (7) reduces the sample to the 138 major models of those 15 firms. Clustered (dyad) standard-errors in parentheses, Signif. Codes: a: 0.01, b: 0.05, c: 0.1.

Table 4 in the main text provides results for our benchmark specifications of both cell and vehicle sourcing regressions. In this appendix, we provide supplementary regressions using different specifications and samples. The first two columns of the cell sourcing Table O.A1 use as choice set for each chooser all the plants that supply the vehicle maker of this car model in the current year. Crossing national borders and longer distances to the assembly plant where the cells are used both reduce strongly the probability of being chosen. An active RTA raises it while tariffs have the expected negative sign. Columns (3) to (7) restricts the choice set to the plants that produce the required grouping of cells g_1 for this car model. The most important change is that the tariff elasticity rises while the RTA effects is reduced. Column (6) reduces the sample to the set of

major firms, and column (7) to the set of major models. Unfortunately, the number of observations drops quite drastically with this last specification, making it hard to statistically assess the distinct effects of tariffs, national borders and RTAs. Column (6) is our baseline.

Table O.A2: BEV Sourcing decision

Dependent Variable:				BEV sourcing decision			
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Border	-1.25^a	-0.896^a	-0.894^a	-0.648^a	-1.04^a	-1.07^a	
	(0.355)	(0.266)	(0.280)	(0.172)	(0.254)	(0.261)	
Border_As							-2.00^a
							(0.635)
Border_Am							-1.55^b
							(0.728)
Border_Eu							-0.027
							(0.169)
log distance	-0.123^a	-0.091^b	-0.092^b	-0.115^a	-0.112^c	-0.109	-0.135^b
	(0.041)	(0.042)	(0.044)	(0.041)	(0.062)	(0.068)	(0.066)
RTA	0.697^a	0.382^a	0.384^a	0.520^a	0.869^a	0.937^a	0.483^a
	(0.147)	(0.117)	(0.120)	(0.142)	(0.214)	(0.222)	(0.168)
Inc. cost of cells		-0.140^a	-0.151^a	-0.046	-0.234^a	-0.340^a	-0.242^a
		(0.042)	(0.045)	(0.044)	(0.084)	(0.095)	(0.085)
log GDP per capita			0.589^a	0.247^a	0.206^b	0.282^b	0.203^b
			(0.102)	(0.072)	(0.087)	(0.131)	(0.088)
log(1+tariff)		-4.75^a	-4.85^a	-10.8^a	-8.56^a	-7.99^a	-6.91^a
		(1.57)	(1.60)	(1.52)	(1.74)	(1.65)	(2.16)
Observations	92,332	92,332	92,332	63,607	15,793	14,120	15,793
Squared Correlation	0.114	0.117	0.121	0.117	0.265	0.273	0.267
Sample	all	all	all	Majors (f)	Majors (f)	Majors (m)	

Clustered (dyad) standard-errors in parentheses, Signif. Codes: a: 0.01, b: 0.05, c: 0.1. All specifications include origin country fixed effects. "Majors" sample imposes the filters detailed in section 6.3. Columns (5) and (6) restrict choice sets based on vehicle platforms.
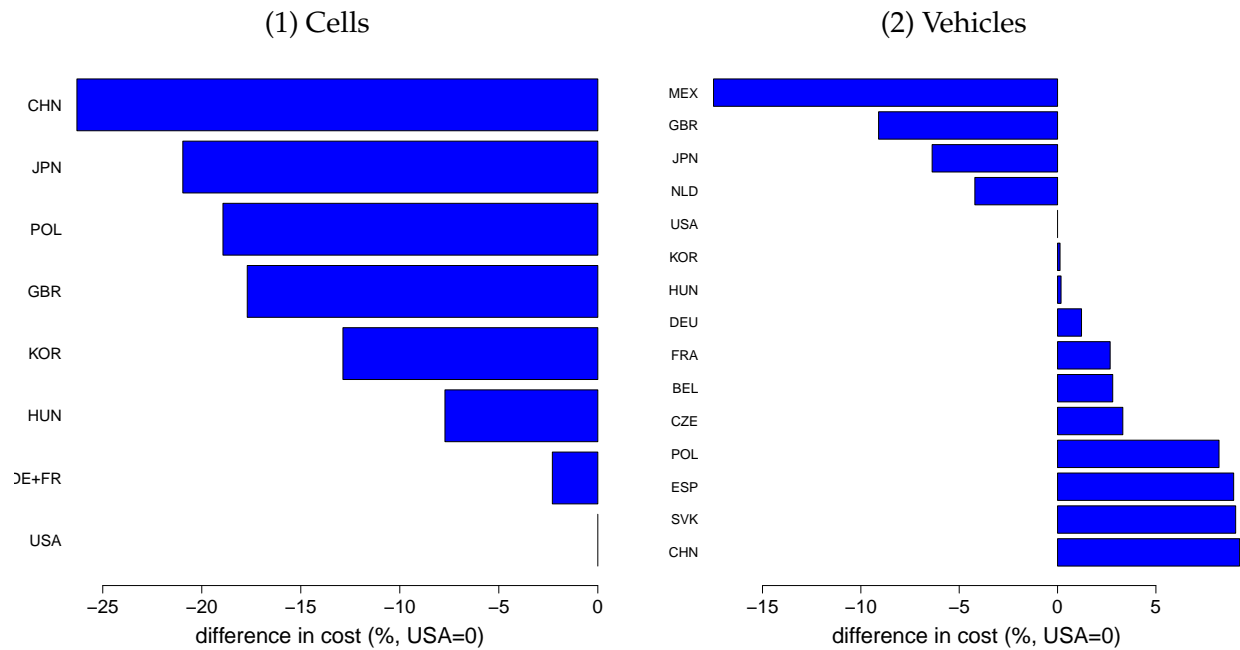
Results of vehicle sourcing are in Table O.A2. Column (1) reports results for the three geographical frictions with expected signs. The tariffs and inclusive costs of cells are introduced in column (2). Both substantially reduce the probability for an assembly plant to be chosen as our model predicts. The sign of income per capita (conditional on country FEs) reported in column (3) is positive as for cell sourcing. The restriction to major countries and firms reinforces strongly the effect of tariffs. Column (5), restricting choice sets to plants using the right platform, is parallel to column (6) of the cell sourcing regression table, and is therefore our baseline regression.

O.A.2 Country-level fixed effects in the BEV sourcing regression

Figure O.A1 uses the estimates of country fixed effects from our baseline regression (column 2 of Table 4 in the main text) to reveal relative costs for each stage. This is obtained as $w_{\ell_k} = -\mathrm{FE}_{\ell_k}/\theta_k$, and normalized with respect to the USA in each k.[1] The competitiveness of China is visible for cells. The United States ranks at the bottom of the list. Polish and British-made cells are revealed to be slightly less competitive than the Japanese ones. Mexico, Great-Britain, and Japan are identified

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[1]This is a slight abuse of notation, since in practice we estimate a fixed effect for the country where plant ℓ_k is located. Some of those country fixed effects cannot be meaningfully identified in our sourcing regressions: a fixed effect can be unavailable because 1) that country is never chosen (Canada in our sample), 2) none of our chosen models choose it (Italy after excluding commercial vans), or 3) the FE is in a disconnected set (France for cells produced only for the Bolloré Bluecar at the beginning of our sample). In this case we create a FE by pooling the country in the disconnected set with one that is in the connected set (Germany in this case).
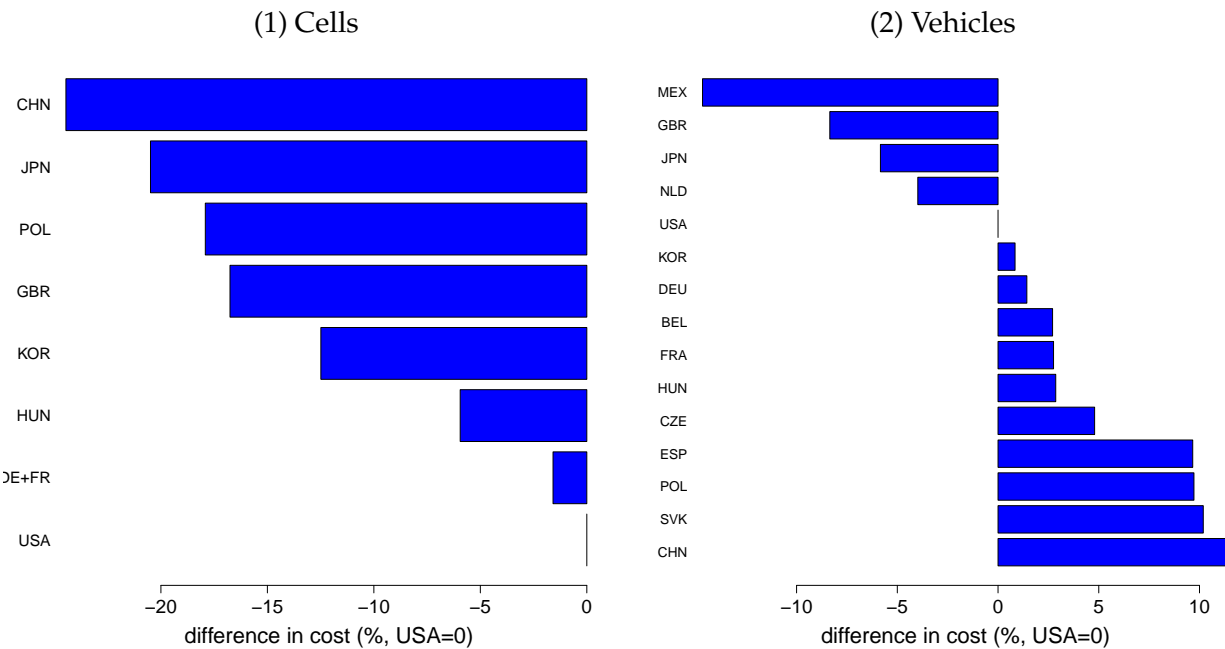
Figure O.A1: Relative costs in the value chain of BEVs

(1) Cells   (2) Vehicles

as very good places for EV assembly as opposed to China, which is revealed as the least cost competitive country for EV assembly. The low costs attributed to Mexico reflect the fact that the model (the Ford Mustang Mach-E) assembled there sell in many places in the world (not only in North America). In contrast, the vast majority of Chinese-assembled EVs are only sold locally. Regarding China, we can take the example of the Volkswagen electric SUV ID.4. In 2022, it is produced in 4 plants: 2 in Germany, 1 in the USA, 2 in China. Each of the German plants serves at least 29 markets, the US plant 2 markets, and the 2 Chinese plants serve *only China*. Those FE estimates reflect those patterns: while the situation is evolving rapidly, in our sample most of the Chinese plants still serve only China: in 2023, 47% of Chinese plants served only China; but this number was as high as 83% in 2020, and even 96% in 2017. The average number of destinations in 2023 was 6.6 for Chinese plants, 55.5 for Belgian ones. Other consumers in the world prefer to source their BEVs from alternative plants, which translates into high estimated costs.

Figure O.A2 reproduces figure O.A1 but accounts for the fact that our estimation includes productivity effects through income per capita.

Figure O.A2: Relative costs in the value chain of BEVs - including productivity effects

O.B Additional Counterfactual Results

1. **Subsidy to EV buyers:** The government subsidizes EV purchases regardless of the locations of assembly and battery manufacture.

2. **Subsidy conditional on domestic assembly:** Only cars assembled in the same continent as the buyer are eligible for the subsidy.

3. **Subsidy conditional on domestic cell-vehicle supply chain:** To qualify, both cell and vehicle must be produced in the same continent as the buyer.

4. **Production subsidy for domestically produced cells:** We denote the combination of production subsidies with the contingent consumer subsidy policy 3 as "3+4".

5. **Tariffs on imported cells and vehicles:** Tariff on both imported cells and vehicles are policy 5. A variant ("5V") restricts the tariff to vehicles.

O.B.1 Variation in policy outcomes across simulations and bootstrap replications

Table O.B3: Variation in counterfactual production lines (European policy)

Policy	EV prod. lines (#)				Cell prod. lines (#)				EV expenditure (%)			
	Sim		Boot		Sim		Boot		Sim		Boot	
	Q1	Q3	Q1	Q3	Q1	Q3	Q1	Q3	Q1	Q3	Q1	Q3
Europe												
1: Unconditional	3	5	3.5	4.2	0	2	1.2	1.5	58.2	67.7	61.2	64.8
2: Continental V	8	11	6.5	10.0	1	3	1.5	1.8	42.6	53.0	45.9	49.7
3: Continental V+C	4	7	4.2	6.2	2	5	2.9	3.9	25.0	36.5	31.3	35.3
Asia												
1: Unconditional	1	5	2.0	2.6	2	4	2.2	2.7	0.4	2.6	1.6	2.0
2: Continental V	-10	-6	-8.8	-4.7	0	2	0.7	1.2	-0.2	1.5	0.4	0.9
3: Continental V+C	-7	-3	-6.0	-3.0	-6	-3	-5.5	-4.2	-0.5	0.8	-0.1	0.4
Americas												
1: Unconditional	0	1	0.6	0.9	0	1	0.3	0.6	0.3	3.2	2.1	2.9
2: Continental V	-2	0	-1.6	-0.9	0	1	0.2	0.4	-0.4	1.2	0.5	1.4
3: Continental V+C	-2	0	-1.2	-0.7	-1	0	-0.9	-0.5	-0.4	1.0	0.1	0.7

Sim: Figures obtained from the variation over simulation draws of counterfactual outcomes with benchmark parameter estimates.
Boot: Figures obtained from the variation over bootstraped estimates for mean outcome over simulations.

O.B.2 Dyadic results

Dyadic results are shown in figure O.B3 for North American policies (panels a and b) and Europe (panels c and d). The underlying numbers are contained in Tables O.B4.

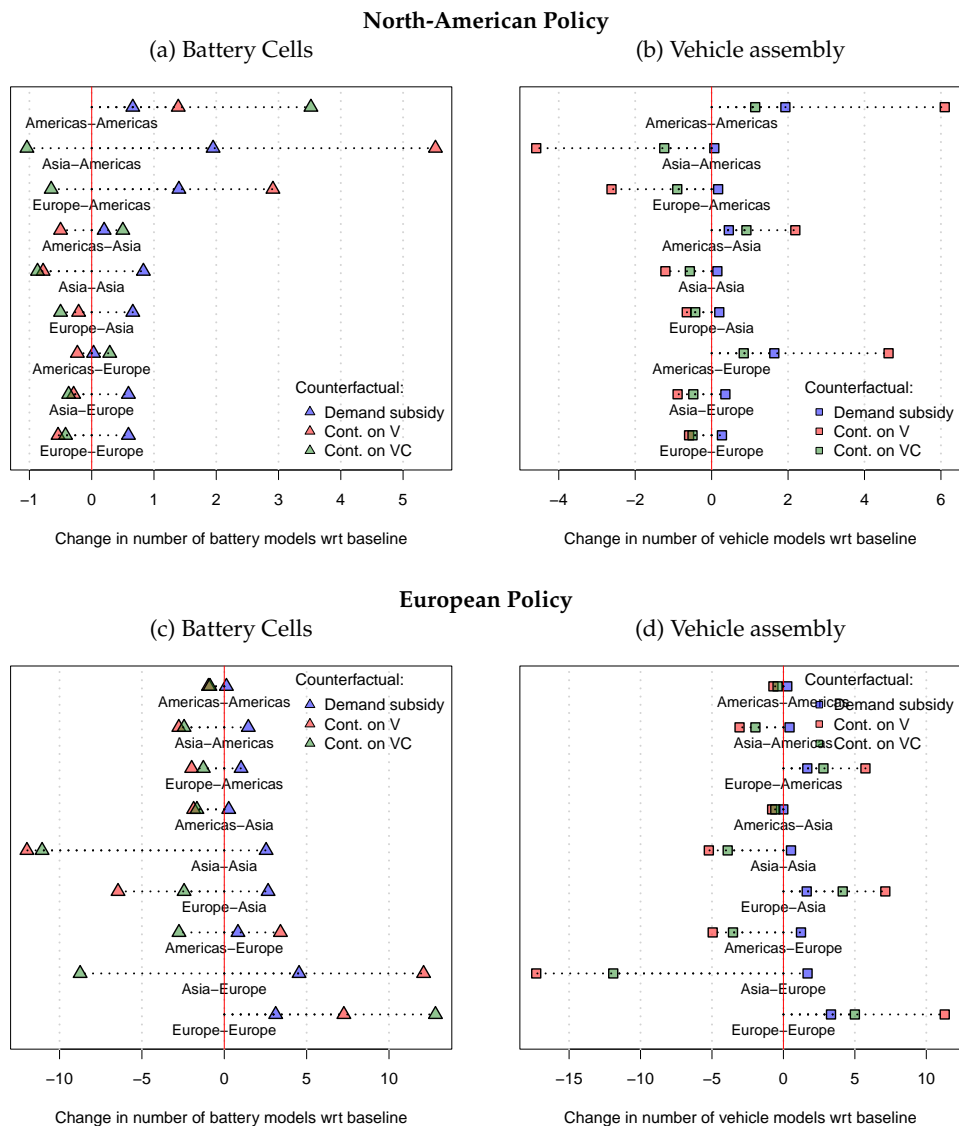Figure O.B3: Counterfactual results with 20% subsidy: by origin-destination

Table O.B4: Count of models imported by origin-destination continent

Origin–Destination	0	1	2	3	4	3+4	5V	5
North-American Policy								
				Vehicles				
Americas-Americas	12.9	14.8	19.0	14.0	13.3	14.6	15.7	14.1
Asia-Americas	21.3	21.4	16.7	20.1	21.2	19.6	18.3	19.3
Europe-Americas	14.6	14.8	12.0	13.7	14.4	13.5	12.7	13.2
Americas-Asia	10.4	10.8	12.6	11.3	10.8	11.9	11.6	10.1
Asia-Asia	75.1	75.2	73.9	74.5	75.0	74.3	74.1	74.8
Europe-Asia	21.5	21.7	20.8	21.1	21.4	20.9	20.9	21.3
Americas-Europe	14.9	16.5	19.5	15.7	15.4	16.5	16.8	13.5
Asia-Europe	52.4	52.7	51.5	51.9	52.4	51.8	51.5	52.0
Europe-Europe	41.3	41.5	40.7	40.8	41.1	40.7	40.4	40.6
				Cells				
Americas-Americas	8.0	8.7	9.4	11.5	10.1	13.5	8.7	9.0
Asia-Americas	12	13.9	17.5	11.0	11.5	10.3	14.1	10.9
Europe-Americas	6.3	7.7	9.2	5.6	6.1	5.3	7.1	4.9
Americas-Asia	7.6	7.8	7.1	8.1	11.4	11.9	7.1	7.4
Asia-Asia	81.1	81.9	80.3	80.2	79.8	78.5	80.1	80.7
Europe-Asia	21.6	22.3	21.4	21.1	21.3	20.6	21.1	21.2
Americas-Europe	5.9	6.0	5.7	6.2	9.1	9.6	5.6	5.8
Asia-Europe	34.5	35.1	34.2	34.1	33.8	33.4	33.9	34.3
Europe-Europe	26.4	27	25.9	26.0	26.0	25.5	25.7	25.7
European Policy								
				Vehicles				
Americas-Americas	12.9	13.1	12.2	12.5	13.1	12.3	12.3	12.5
Asia-Americas	21.3	21.8	18.2	19.4	21.2	18.8	18.9	20.0
Europe-Americas	14.6	16.3	20.4	17.4	15.1	18.4	17.6	15.7
Americas-Asia	10.4	10.4	9.6	9.8	10.6	9.7	9.8	10.0
Asia-Asia	75.1	75.6	69.9	71.2	74.6	70.5	70.9	72.4
Europe-Asia	21.5	23.1	28.6	25.6	22.3	26.9	25.4	23.2
Americas-Europe	14.9	16.1	9.9	11.3	15.2	11.1	10.6	11.0
Asia-Europe	52.4	54.0	35.0	40.4	51.9	38.3	38.8	40.8
Europe-Europe	41.3	44.6	52.6	46.3	42.1	47.6	47.5	45.4
				Cells				
Americas-Americas	8.0	8.1	7.0	7.1	7.3	6.4	7.1	7.1
Asia-Americas	12	13.5	9.2	9.6	11.5	8.9	9.4	9.5
Europe-Americas	6.3	7.3	4.3	5	8.1	5.9	4.2	4.3
Americas-Asia	7.6	7.8	5.7	5.9	6.6	5.2	5.8	6.1
Asia-Asia	81.1	83.6	69.1	70	76.9	64.9	71.2	72.3
Europe-Asia	21.6	24.3	15.2	19.2	28.1	23.9	14.8	16.4
Americas-Europe	5.9	6.8	9.3	3.2	5.2	2.6	7.5	6.0
Asia-Europe	34.5	39.0	46.6	25.7	32.1	21.8	40.5	35.8
Europe-Europe	26.4	29.5	33.7	39.2	30.2	42.1	29.4	30.7

Policies defined at the beginning of section O.B. Policy 0 is the baseline.

O.B.3 Decomposition for All Policies and Continents

Tables O.B5 and O.B6 report decomposition results for all policy counterfactuals and all affected regions.

Table O.B5: Cost and expenditure changes : North-American policies

| Policy | Eligible share | | Cost index change | | Shifters | | EV Exp. change |
| | path | revenue | subsidy | costs | variety | demand | |
			$\tilde{t}_{\mathcal{N}}$	$\tilde{c}_{\mathcal{N}}$	$\bar{s}_{\mathcal{N}}^{\text{EV}}$	$\hat{A}_{\mathcal{N}}$	$\bar{\hat{R}}_{\mathcal{N}}^{\text{EV}}$
				Americas			
1: Unconditional	100.0	100.0	-20.0	-4.5	2.5	-16.5	86.4
2: Continental V	43.4	90.5	-17.4	-3.4	1.9	-13.6	71.1
3: Continental V+C	21.5	68.3	-14.7	2.2	0.8	-6.2	32.3
4: Subsidy C	18.3	46.0	-2.7	0.5	0.9	-1.0	5.1
3+4	28.1	77.9	-19.2	3.2	1.2	-8.8	46.2
5V: Tariff V	63.1	12.5	3.1	1.1	-0.9	1.9	-9.8
5: Tariff V+C	85.5	53.9	4.8	1.7	-1.2	3.1	-16.1
				Europe			
1: Unconditional	0.0	0.0	0.0	-0.5	1.0	-0.5	1.6
2: Continental V	0.0	0.0	0.0	-0.1	0.3	-0.2	0.5
3: Continental V+C	0.0	0.0	0.0	0.3	0.1	0.2	-0.5
4: Subsidy C	11.2	12.3	-0.9	0.1	0.3	-0.4	1.2
3+4	13.1	14.3	-1.1	0.5	0.3	-0.2	0.7
5V: Tariff V	0.0	0.0	0.0	0.2	-0.6	0.3	-0.8
5: Tariff V+C	4.6	4.9	0.2	0.4	-0.8	0.6	-1.7
				Asia			
1: Unconditional	0.0	0.0	0.0	-0.4	0.4	-0.2	1.4
2: Continental V	0.0	0.0	0.0	-0.3	0.1	-0.1	0.8
3: Continental V+C	0.0	0.0	0.0	0.2	0.1	0.0	-0.3
4: Subsidy C	9.4	15.2	-1.1	0.1	0.2	-0.3	1.9
3+4	11.0	17.4	-1.3	0.5	0.2	-0.1	1.1
5V: Tariff V	0.0	0.0	0.0	0.1	-0.2	0.0	-0.3
5: Tariff V+C	3.3	4.1	0.2	0.1	-0.4	0.1	-1.1

Policies defined at the beginning of section O.B. Policy 0 is the baseline. Policies are applied in the Americas, and outcomes are for the Americas. For each column $X_{\mathcal{N}}$, defined in text, the number reported is the percentage difference in that variable between the policy scenario and baseline.

Table O.B6: Cost and expenditure changes: European policies

| Policy | Eligible share | | Cost index change | | Shifters | | EV Exp. |
| | path | revenue | subsidy | costs | variety | demand | change |
			$\tilde{\hat{t}}_{\mathcal{N}}$	$\tilde{\hat{c}}_{\mathcal{N}}$	$\bar{s}_{\mathcal{N}}^{\text{EV}}$	$\hat{A}_{\mathcal{N}}$	$\tilde{\hat{R}}_{\mathcal{N}}^{\text{EV}}$
				Europe			
1: Unconditional	100.0	100.0	-20.0	-3.0	1.9	-20.1	62.6
2: Continental V	68.4	85.3	-15.8	-1.6	1.3	-15.3	47.6
3: Continental V+C	47.3	66.8	-12.1	0.2	0.6	-9.9	30.6
4: Subsidy C	38.4	46.3	-2.2	-0.4	0.4	-2.0	6.3
3+4	58.8	78.0	-16.3	0.3	0.6	-13.9	43.2
5V: Tariff V	37.4	20.7	5.5	0.9	-0.5	3.7	-10.6
5: Tariff V+C	69.0	57.4	7.5	1.0	-0.8	5.0	-14.7
				Americas			
1: Unconditional	0.0	0.0	0.0	-0.3	1.6	-0.4	2.2
2: Continental V	0.0	0.0	0.0	0.1	0.9	-0.1	0.6
3: Continental V+C	0.0	0.0	0.0	0.0	0.5	-0.1	0.5
4: Subsidy C	29.9	28.8	-1.3	-0.8	0.5	-1.2	6.2
3+4	38.9	32.3	-1.5	-0.5	0.5	-1.1	5.9
5V: Tariff V	0.0	0.0	0.0	0.3	-0.5	0.2	-1.2
5: Tariff V+C	13.2	4.7	0.2	0.3	-0.7	0.3	-1.8
				Asia			
1: Unconditional	0.0	0.0	0.0	-0.4	0.9	-0.3	1.9
2: Continental V	0.0	0.0	0.0	-0.1	0.7	-0.1	0.8
3: Continental V+C	0.0	0.0	0.0	0.1	0.4	-0.0	0.1
4: Subsidy C	24.8	25.4	-1.2	-0.2	0.3	-0.6	4.3
3+4	32.3	28.0	-1.3	-0.2	0.5	-0.6	4.7
5V: Tariff V	0.0	0.0	0.0	0.3	-0.1	0.1	-0.8
5: Tariff V+C	9.0	3.5	0.2	0.2	-0.2	0.2	-1.3

Policies defined at the beginning of section O.B. Policy 0 is the baseline. Policies are applied in Europe, and outcomes are for Europe. For each column $X_{\mathcal{N}}$, defined in text, the number reported is the percentage difference in that variable between the policy scenario and baseline.