Assessing EU Merger Control
through Compensating Efficiencies

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Welfare effects of horizontal mergers is the balance of two forces
– Unilateral incentive to increase prices/restrict output vs efficiency gain
– **Compensating efficiencies**: critical level of efficiency gains that exactly compensates unilateral effects (Farrell & Shapiro, AER 1990; Werden, JIE 1996; Nocke & Whinston, AER 2022)

Sizeable literature on anti-competitive effects of mergers but little evidence on the size of *actual* efficiencies
– Some studies find (small) positive efficiencies or productivity increases (Bitzan & Wilson, RIO 2007, Braguinsky et al. AER 2015, Grieco et al. IJIO 2018, Yan et al. IJIO 2019)

– Some studies find **no efficiencies** (e.g. Blonigen & Pierce, 2016; Piechucka, IJIO 2021)

Most mergers are unconditionally cleared worldwide
– US (2003–2012): **3.1% of the mergers were 2nd request** and fewer blocked (Kwocka, 2014)
– EU (1990–2014): 94% of mergers cleared w/o remedies, 6% remedied, **less than 0.5% blocked** (Affeldt et al. 2018)

Presumption that these mergers generated efficiency gains that compensate unilateral effects?

Our paper

Research questions: How large would efficiencies need to be to compensate mergers' potential harm to consumers in the EU? Was the EU Commission effectively enforcing merger policy?

Our approach: Application of novel database to theoretical framework
- **Theoretical framework**: Theoretical framework to define compensating efficiencies (Nocke & Whinston, AER 2022)
- **Novel database**: Merger decisions by DG COMP of the EU during 1990–2018

Our contribution:
- Empirically derive compensating efficiency gains
- Decompose compensating efficiencies as a function of observable merger and market characteristics
- Assess EU merger control in terms of type I and type II "discrepancies"

A theoretical framework to define compensating efficiencies
Nocke & Whinston (AER 2022)

Compensating efficiencies

Cournot Model with asymmetric firms, general demand with elasticity ϵ (Nocke & Whinston, AER 2022: Corollary 1):

$$CE = \frac{c_M - \overline{c}_M}{c_M} = \frac{\Delta HHI}{s_M(\epsilon - s_M) + \Delta HHI} \tag{1}$$

c_M = output-weighted pre-merger marginal cost
$\overline{c}_M$ = is the post-merger marginal cost
s_M = naive post-merger combined market share
ΔHHI = naive post-merger change in HHI
ϵ elasticity of demand

This can be generalized to models of **differentiated goods and multi-product price competition** Generalization

Novel database on mergers in the EU

EU merger database

Merger decisions by DG Comp of the EU Commission during **1990–2020** (extension of Affeldt et al., 2018)

– Publicly accessible reports on merger cases published by DG Comp on the EC's webpage
– Each merger affects one or more product/geographic markets
– Full database: 6,429 merger decisions affecting 42,453 antitrust markets

Key information

– Compensating efficiencies: market shares of merging parties, ΔHHI
– Correlates: merger & market characteristics, e.g. N players, entry barriers, product and geographic market

Sample selection

– Only observations with separate market shares for merging parties
– Drop if geographic market definition left open
– Drop if vertical/conglomerate
– Final sample: **1,076 mergers affecting 13,480 markets**

Preliminary statistics

Screening thresholds *vs.* Commission decision at merger level

Source: Our elaboration on EU merger data.
Note: An additional threshold concerns naive post-merger joint market share at the level of 50%.

Empirical results

Compensating efficiencies are heterogenous across markets and sensitive to (ϵ)

Table: Summary statistics of compensating type synergies (in %)

| Commission decision	Statistic	Cournot: $\epsilon = 1.6$	CES: $\sigma = 2.5$, s0 = 40%	MNL: s0 = 40%
Market level variable				
Overall	Mean	8.15	5.94	12.01
	SD	6.73	6.44	15.78
No concern	Mean	6.41	4.34	8.24
	SD	4.57	3.93	8.86
Concern	Mean	14.47	11.77	25.76
	SD	9.11	9.66	25.10
Merger level variable				
Overall	Mean	6.50	4.56	8.90
	SD	4.25	3.75	8.56
Phase 1 – Clear w/o remedies	Mean	5.06	3.32	6.13
	SD	2.90	2.39	5.21
Phase 2 – Clear w/o remedies	Mean	9.74	7.09	13.85
	SD	5.25	4.58	9.92
Phase 1 – Clear w/ remedies	Mean	9.06	6.72	13.70
	SD	4.22	3.82	8.82
Phase 2 – Clear w/ remedies	Mean	11.07	8.55	17.83
	SD	5.18	5.01	11.93
Phase 2 – Prohibit	Mean	17.52	15.14	34.97
	SD	6.91	7.49	19.46

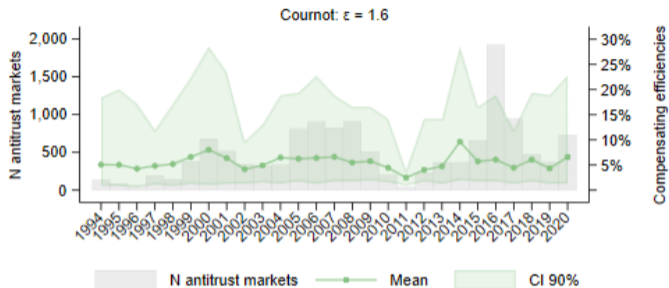Source: Our elaboration on EU merger data.

Kernel density of compensating cost efficiency – comparison across models
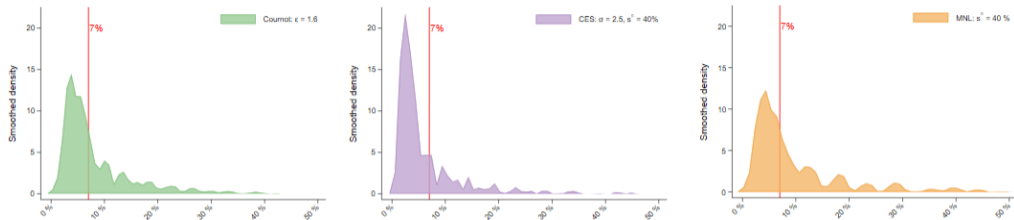
Source: Our elaboration on EU merger data.
Note: For purpose of visual clarity, the x-axis is limited to values not exceeding 50%.

Calibrated compensating efficiencies over time

Cournot: ε = 1.6

CES: σ = 2.5, s⁰ = 40%

MNL: s⁰ = 40%
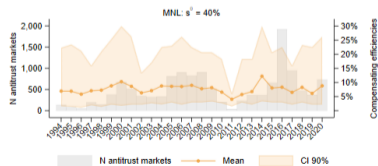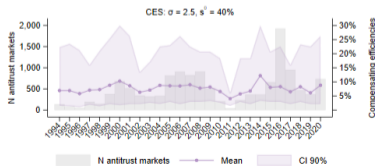
Source: Our elaboration on EU merger data.

Decomposing compensating efficiencies

What (market) characteristics correlate with the variation in compensating efficiencies?

– Market structure / number of firms (actual competition)

– Extent of entry barriers (potential competition)

– Other characteristics: geographic market definition, industry & sector of activity, country of acquirer, cross-border,...

$$CEff_{ijt} = \alpha_0 + \alpha_1 Nfirms_{ijt} + \alpha_2 Barriers_{ijt} + \alpha_3 GeoMarket_{ijt} + \alpha_7 X_{ijt} + \eta_j + \eta_t + \varepsilon_{ijt} \quad (2)$$

$Nfirms_{ijt}$ dummies for three-to-two, four-to-three, five-to-four mergers, five or more (base)

$Barriers_{ijt}$ dummy indicating the existence of barriers to entry

$GeoMarket_{ijt}$ dummy worldwide markets, EU-wide, national (base)

X_{ijt} matrix dummy for the manufacturing sector, dummies for the acquirer's country, and a cross-border dummy

η_j and η_t broad-product market and time fixed effects

ε_{ijt} assumed to be correlated either at the industry or at the merger level

Cournot model, conservative demand elasticity of 1.6
 – Conditional mean of compensating efficiencies: 4.4%
 – 4-to-3 merger, no entry barriers: $4.4 + 3.5 = 7.9\%$
 – 4-to-3 merger, entry barriers: $4.4 + 3.5 + 5.4 = 13.3\%$

Results with different models
 – Similar in sign, significance, & size
 – CES ($\sigma = 2.5$, MS outside good $= 40$): 4-to-3 merger, entry barriers: 11% compensating cost efficiencies
 – MNL (MS of outside good 40%): 4-to-3 merger, entry barriers: 24.2% compensating type efficiencies

Relaxing the assumption of equal elasticities
 – For each market randomly draw 1,000 elasticity from given distribution in [1-3.5]
 – 3 distributions: uniform, u-shaped, inverted u-shaped
 – Distribution of estimated coefficients bounded by the estimates from the table above

Policy implications

Was the Commission too tough or too lenient?

Assessment of the EC's decision in terms of potential Type I /Type II "discrepancies"
- Presumption: **CS-decreasing merger** if compensating efficiencies are "very" large (e.g. $> 7\%$)
- Presumption: **CS-increasing merger** if compensating efficiencies are "very" low (e.g. $< 3\%$)
- Presumption: **CS-neutral merger** if compensating efficiencies are in the middle

Contrast EC decision to the presumption
- Type I discrepancy (*too strict*): Intervention when compensating efficiencies $\leq 3\%$
- Type II discrepancy (*too lax*): No intervention when compensating efficiencies $> 7\%$:

Was the Commission too tough or too lenient?

Table: Assessment of EU merger decisions at merger level – compensating efficiencies and intervention matrix

Model	Intervention	N	≤ 3% % T	% C	N	Prediction 3–7% % T	% C	N	> 7% % T	% C
Cournot: $\epsilon = 1.6$	0	141	0.13	0.95	500	0.46	0.86	146	0.14	0.42
Cournot: $\epsilon = 1.6$	1	8	0.01	0.05	81	0.08	0.14	200	0.19	0.58
CES: $\sigma = 2.5$, s0 = 40%	0	420	0.39	0.93	314	0.29	0.70	53	0.05	0.29
CES: $\sigma = 2.5$, s0 = 40%	1	30	0.03	0.07	132	0.12	0.30	127	0.12	0.71
MNL: s0 = 40%	0	108	0.10	0.96	447	0.42	0.90	232	0.22	0.49
MNL: s0 = 40%	1	5	0.00	0.04	47	0.04	0.10	237	0.22	0.51

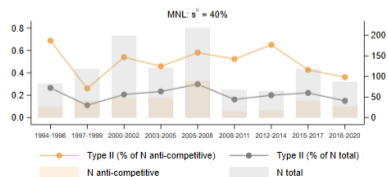Source: Our elaboration on EU merger data. Interpretation: % T refers to the total N of observations. % C refers to the total N of observations within range of compensating efficiencies.

Incidence type II discrepancies > incidence type I discrepancies for all parametrizations
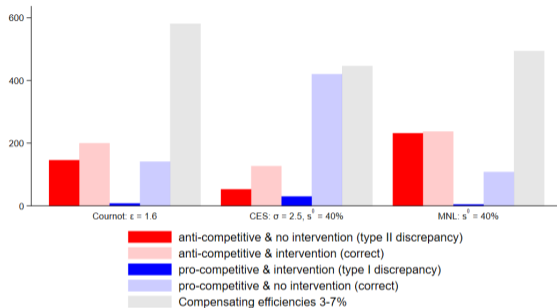
Source: Our elaboration on EU merger data. ϵ denotes demand elasticity and eff cost efficiencies thresholds.

Incidence type II discrepancies over time
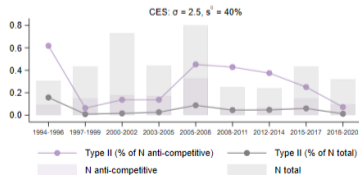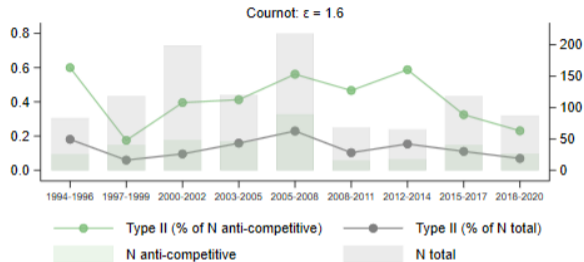
Cournot: ε = 1.6

CES: σ = 2.5, s⁰ = 40%

MNL: s⁰ = 40%

Source: Our elaboration on EU merger data. ϵ denotes demand elasticity and eff cost efficiencies thresholds.

Type II discrepancies (cleared mergers with large CE on average) are lower in mergers with
 – .. large dispersion in CE across markets
 – .. large share of markets with competitive concerns
   – Large fraction of markets with dominance (join MS>50%)
   – Large fraction of markets with entry barriers
   – Phase two mergers
   – Smaller markets (national or EU)

Results with different models are again consistent

Conclusions

Apply the theoretical framework of Nocke and Whinston (AER 2022) to a database on EU merger decisions
- Derive compensating efficiencies for different models of competition
- Identify observable merger and market characteristics that correlate with the size of compensating efficiencies
- Assess EU merger control – potential type I and type II discrepancies

Main results
- Calculated compensating efficiencies are sizeable: many mergers with CE> 7%
- The degree of actual and competition accounts for a large portion of CE
- EU Commission's decisions consistent with the theoretical counterfactual, but possibly too lax rather than too tough

Appendix

Market shares & HHI: preliminary statistics

Table: Summary statistics of compensating cost efficiencies – comparison across models and explanatory variables used in the econometric model

Variable	Mean	Median	SD	Min.	Max.	N
Concentration measures						
Post-merger MS (%)	37.41	30.00	21.25	0.41	99.00	13,480
Post-merger HHI	2,590.05	2,150.00	2,124.15	1.06	9,876.55	13,480
Δ HHI	48.06	25.00	62.77	0.01	450.00	13,480
Compensating cost efficiencies (%)						
Cournot: $\epsilon = 1.6$	8.15	6.02	6.73	0.04	42.15	13,480
CES: $\sigma = 2.5$, s0 = 40%	5.94	3.81	6.44	0.02	51.45	13,480
MNL: s0 = 40%	12.01	6.81	15.78	0.04	152.03	13,480
Market structure						
3 to 2 merger	0.08	0.00	0.27	0.00	1.00	13,480
4 to 3 merger	0.16	0.00	0.37	0.00	1.00	13,480
5 to 4 merger	0.16	0.00	0.37	0.00	1.00	13,480
5 or more firms post-merger	0.28	0.00	0.45	0.00	1.00	13,480
No INFO on competitors × Phase 1 merger	0.26	0.00	0.44	0.00	1.00	13,480
No INFO on competitors × Phase 2 merger	0.04	0.00	0.19	0.00	1.00	13,480
Entry barriers	0.14	0.00	0.35	0.00	1.00	13,480
Geographic market						
National and regional	0.75	1.00	0.43	0.00	1.00	13,480
EU-wide	0.17	0.00	0.37	0.00	1.00	13,480
Worldwide	0.08	0.00	0.28	0.00	1.00	13,480
Industry						
Services	0.26	0.00	0.44	0.00	1.00	13,480
Manufacturing	0.74	1.00	0.44	0.00	1.00	13,480

Source: Our elaboration on EU merger data. Industry is defined at the merger level, where Manufacturing encompasses NACE Rev. 2 sections A-D and Services encompasses NACE Rev. 2 sections E-T. In our empirical model, we also consider broadmarket industry dummies defined at the market level. Details on the two industry definitions are provided in Appendix ??.

Back

Generalization: aggregative games

Aggregative games: the strategic choices of competitors only enter the profit function of the focal firm(s) through a one-dimensional 'aggregator'

- – Property is intuitive in the Cournot model
- – It holds for models of oligopolistic price competition with **multiproduct firms and CES and MNL demand systems** (Nocke & Schutz, E'trica 2018)

Two types of *compensating* efficiencies for these two alternative models (Nocke & Whinston, AER 2021)

- – Cost synergies (no product repositioning/quality improvement)
- – **'Type' synergies**: a non-linear combination of cost reduction and quality increase

Main drivers of compensating efficiencies

- – **Market shares of the merging parties**
- – Elasticity of substitution (CES) & share of the outside good (CES, MNL)

Back

Compensating efficiencies in a model of multiproduct price competition and CES demand

Cost synergies:

$$\phi = 1 - \left(\frac{s_M \left(\sigma + \frac{s_M}{1-s_M} \right)^{\sigma-1}}{s_m \left(\sigma + \frac{s_m}{1-s_m} \right)^{\sigma-1} + s_n \left(\sigma + \frac{s_n}{1-s_n} \right)^{\sigma-1}} \right)^{1/(1-\sigma)} \tag{3}$$

Type synergies:

$$\frac{\overline{T}_M}{T_m + T_n} = \frac{s_M \left(\sigma + \frac{s_M}{1-s_M} \right)^{\sigma-1}}{s_m \left(\sigma + \frac{s_m}{1-s_m} \right)^{\sigma-1} + s_n \left(\sigma + \frac{s_n}{1-s_n} \right)^{\sigma-1}} \tag{4}$$

Back

Decomposing compensating efficiencies Back

Table: Linear regression – compensating efficiencies – results across models of competition

	Cournot $\epsilon = 1.6$	CES $\sigma = 2.5$, s0 = 40%	MNL s0 = 40%
3 to 2 merger	0.045	0.042	0.10
	[0.014]***	[0.011]***	[0.021]***
4 to 3 merger	0.035	0.030	0.068
	[0.012]***	[0.0090]***	[0.017]***
5 to 4 merger	0.029	0.025	0.055
	[0.013]**	[0.0094]***	[0.018]***
5 or more firms post-merger	0.026	0.021	0.044
	[0.012]**	[0.0086]**	[0.016]***
Entry barriers	0.054	0.051	0.12
	[0.0051]***	[0.0048]***	[0.011]***
Market = EU-wide	−0.0075	−0.0066	−0.016
	[0.0031]**	[0.0027]**	[0.0063]**
Market = Worldwide	−0.00091	−0.0012	−0.0037
	[0.0037]	[0.0032]	[0.0076]
Manufacturing	0.0068	0.0056	0.014
	[0.0044]	[0.0041]	[0.0095]
No INFO on competitors × Phase 1 merger	0.011	0.010	0.026
	[0.012]	[0.0084]	[0.016]*
No INFO on competitors × Phase 2 merger	0.026	0.026	0.068
	[0.023]	[0.018]	[0.037]*
Constant	0.044	0.029	0.054
	[0.019]**	[0.016]*	[0.035]
Year dummies	X	X	X
Broadmarket ind. dummies	X	X	X
Country dummies	X	X	X
Cross-border dummy	X	X	X
Clustered SE	X	X	X
Observations	13,480	13,480	13,480
R2	0.21	0.19	0.18

Table: Probit regression – type II error (threshold 7%) – mean compensating efficiencies across markets within merger – comparison across models

	Cournot: $\epsilon = 1.6$		CES: $\sigma = 2.5$, s0 = 40%		MNL: s0 = 40%	
	M1	M2	M3	M4	M5	M6
Fraction of markets w/ concern	-3.40		-2.78		-3.99	
	[0.41]***		[0.55]***		[0.42]***	
N antitrust markets	-0.020	-0.021	-0.018	-0.014	-0.0046	-0.0029
	[0.0065]***	[0.0068]***	[0.011]	[0.011]	[0.0024]*	[0.0023]
Dispersion (p95–p5)	-5.82	-6.03	-6.06	-6.05	-2.49	-2.72
	[1.28]***	[1.20]***	[1.77]***	[1.77]***	[0.42]***	[0.40]***
Fraction of market w/ joint MS above 0.5		-1.16		-1.31		-0.83
		[0.39]***		[0.65]**		[0.30]***
Phase II		-0.65		-0.40		-0.52
		[0.28]**		[0.45]		[0.23]**
Fraction of markets w/ barriers to entry		-1.49		-1.71		-1.70
		[0.41]***		[0.59]***		[0.32]***
Fraction of 2 to 1 markets		-0.13		-0.26		-0.021
		[0.52]		[0.90]		[0.43]
Fraction of 3 to 2 markets		-0.62		-0.20		-0.20
		[0.48]		[0.74]		[0.34]
Fraction of 4 to 3 markets		-0.56		-0.81		-0.41
		[0.38]		[0.82]		[0.30]
Fraction of worlwide markets		1.33		0.96		0.86
		[0.39]***		[0.55]*		[0.30]***
Fraction of european markets		0.18		-0.20		0.28
		[0.25]		[0.46]		[0.20]
Constant	3.27	2.89	2.89	3.06	3.73	2.73
	[0.62]***	[0.57]***	[0.72]***	[0.80]***	[0.60]***	[0.52]***
Year FE	X	X	X	X	X	X
Observations	337	337	149	149	463	463

Notes: Standard errors clustered at the broadmarket industry – geographic market group level in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Facing a small number of observations for the years 1990–1994 (73 in total), we regroup observations prior to 1995 as one year dummy. Broadmarket industry dummies refer to market-level industry dummies. Country dummies are constructed by considering the country of acquirer and only those countries for which there are at least 100 observations (USA, Germany, France, Netherlands, UK, Switzerland, Sweden, Japan), creating a category "Other" for those countries accounting for fewer observations. Cross-border dummy refers to a cross-border merger where the target and acquirer are from different countries.