Merger of Complements: Empirical Evidence from the Eyewear Industry

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Introduction

- We study the merger of Essilor, manufacturer of opthalmic lenses, and Luxottica, manufacturer of eyewear frames, in 2018 – **merger of complements**.
- Research question: What are the **effects** of this merger on **prices and quantities** and do these effects align with the theory behind a merger of complements – ex-post merger analysis.

Introduction

Related Literature

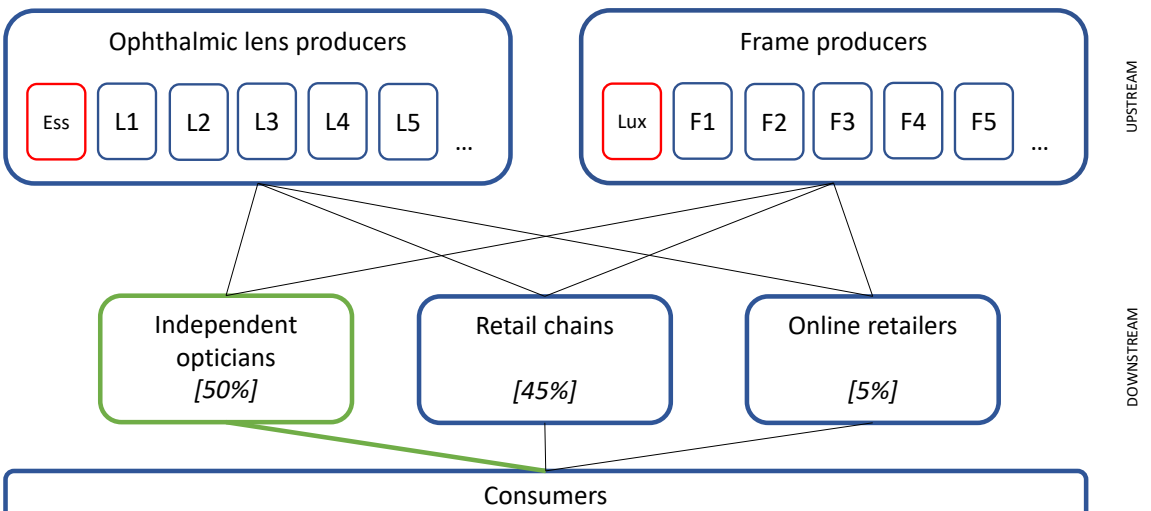
- Theory behind price effects of a merger of complements in an oligopolistic industry is laid out in Choi (2008). The merger should **reduce prices** of the merging parties – **'Cournot-effect'**.
- Empirical research regarding complements and 'Cournot-effect' is scarce. Alexandrov et al. (2018) and Vélez-Velásquez (2019) both look at complementary relationships, but so far only weak empirical evidence for 'Cournot-effect'.
- Our empirical strategy builds on ex-post merger analyses of horizontal mergers, such as Ashenfelter et al. (2013), Argentesi et al. (2021) and Rickert et al. (2021).

Industry Background

Merger Information

- Essilor and Luxottica merged in October 2018 with a combined market value of 46 billion euro.
- Both companies are **global market leaders** in businesses: Essilor in ophthalmic lens, Luxottica in eyewear manufacturing - upstream.
- Their **main business** is **supplying optician stores** - downstream.

Industry Background



Industry Background

- The German optical retail market had a turnover of 6.3 billion euro in 2018.
- **Competition between opticians** is generally **local**.
- Opticians sell most of their corrective lenses and frames combined as corrective glasses – **frames and corrective lenses are complements**.
- Opticians present frames from a dozen suppliers in their shops, while they typically have contracts with no more than three corrective lens suppliers.

Theoretical Results

- A pair of glasses is a system assembled at downstream level by combining two different components, eyewear frames and corrective glasses.
- We use model laid out in Choi (2008), minus bundling part. The **merger should decrease the price** of systems including components from one or both merging parties, caused by an **internalisation of externalities**. The price of corrective lenses also affects the demand for frames and vice versa due to the complementary relationship.
- We need to consider four different types of systems:

		Luxottica Frame	
		Yes	No
Essilor Lens	Yes	*EL* --	*EX* -
	No	*XL* -	*XX* +/-

Data

- We have a panel of **400 independent opticians between January 2015 and March 2021**, provided by Euronet Software AG.
- Our data covered 3.4 percent of the entire brick-and-mortar optician retail market turnover in Germany in 2018 and offers around 250,000 observations per year with one observation is one pair of glasses sold.
- Product-specific information included in the data is the retail price invoiced to the customer, the combination of frames and lenses sold as glasses, as well as product brand, supplier and characteristics.
- Optician-specific information included in the data is an anonymized optician ID associated with its sales and the most common customer ZIP code.
- Customer-specific information included is the customer gender, age at time of sale and if the customer has purchased at that optician before.

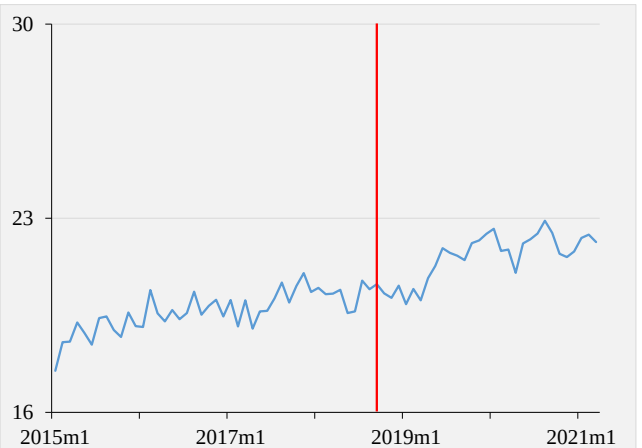
Preliminary Analysis

Prices

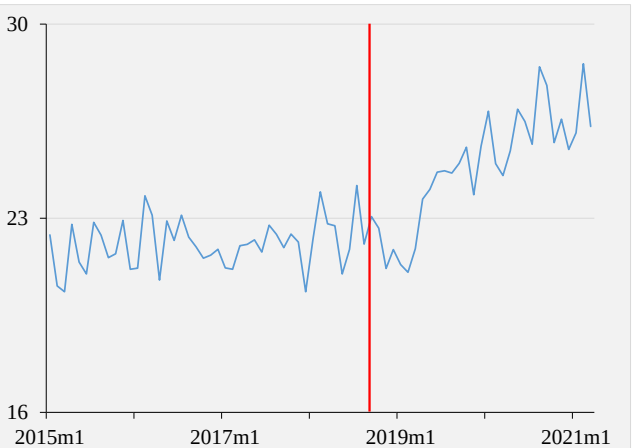
Change in mean log price compared to January 2015, conditional on product and customer characteristics.

Preliminary Analysis

Quantities



Share of glasses sold with Essilor lenses in percent



Share of glasses sold with Essilor lenses among glasses sold with Luxottica frames in percent

Empirical Approach

Prices

- Our empirical approach consists in a difference-in-differences (DiD) regression. We thus need to compare appropriately chosen treatment and control groups.
- We use systems assembled only with components by upstream **competitors (XX)** of both merging parties **as control groups** and estimate this regression:

$$\begin{aligned}\log(p_{ijt}) = \beta_1 \cdot post_t \times EL_i + \beta_2 \cdot post_t \times EX_i + \beta_3 \cdot post_t \times XL_i + \Gamma \cdot post_t \\ + \delta_1 \cdot EL_i + \delta_2 \cdot EX_i + \delta_3 \cdot XL_i + \gamma \cdot Y_i + \nu_j + \lambda \cdot t + \theta \cdot \eta_t + \epsilon_{ijt}\end{aligned}$$

- Dependent variable is the (log) invoiced price of glasses i by optician j at month t.
- The most **interesting parameter is β**, denoting the **effect of the merger on the three treated systems**.

Empirical Approach

Prices

- Need to make sure that competitors used as control group are unaffected by the merger. We see and test for three potential issues:

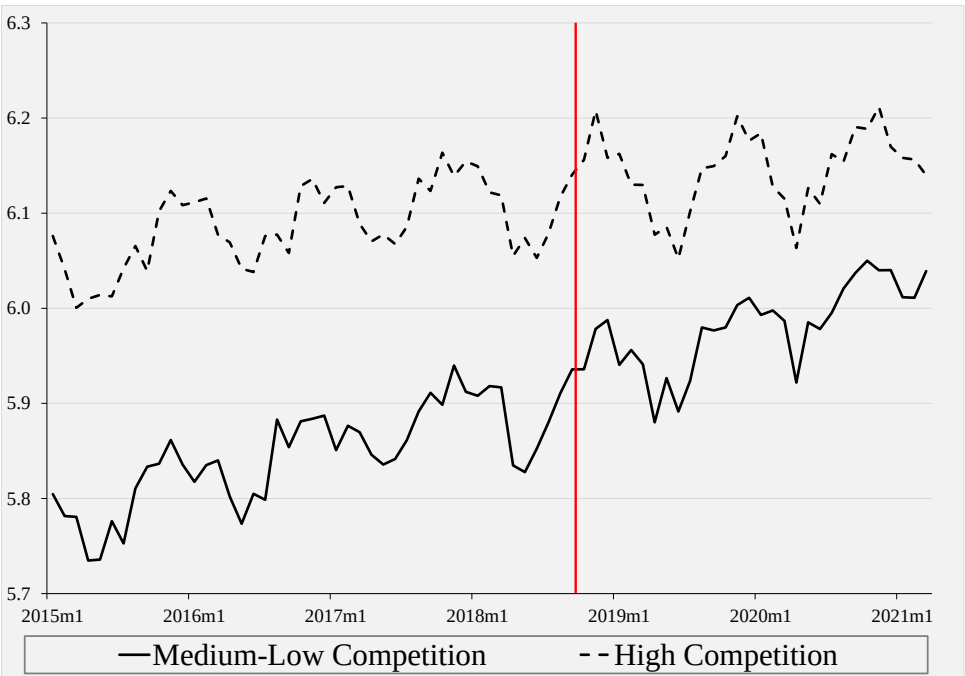
1. **Upstream competitors' reaction**: Upstream competitors might adjust their prices in response to a price decrease caused by a merger of complements. We test this and find the upstream competitors reaction to only be a minor concern. ✓

2. **Downstream competitors' reaction**: Downstream retailers may compete with each other and consequently the pricing be affected by the competitive pressure from other retailers. We test this using the local competition intensity faced by the opticians and find differences in the pricing behaviour post-merger, thus **downstream competition should be considered** when using competitors as control group. X

3. **Portfolio effect**: Opticians who are customers of the merging parties may adjust the pricing of all of the products in their portfolio, even for products that are not purchased from the merging parties. We test this and find the portfolio effect to only be a minor concern. ✓

Empirical Approach

Prices



Mean log prices of glasses sold by all competitors by their local degree of competition.

Empirical Approach

Prices

- Using all *XX* systems as control group is not robust to placebo mergers.
- To **identify suitable *XX* systems as control groups**, we use a two-step procedure.
- As a first step, we allow for a **test of prior trends** for the 5 largest non-Essilor corrective lens suppliers and non-Luxottica frame suppliers. The test of prior trends allows for a common time trend and independent time trends for the three system types including the merging parties' components. We dismiss *XX* systems with statistically significant independent time trends.
- As a second step, we estimate **three placebo mergers** for all systems that passed the first step. We dismiss competitors that show statistically significant results for one of the placebo mergers.

Empirical Approach

Prices

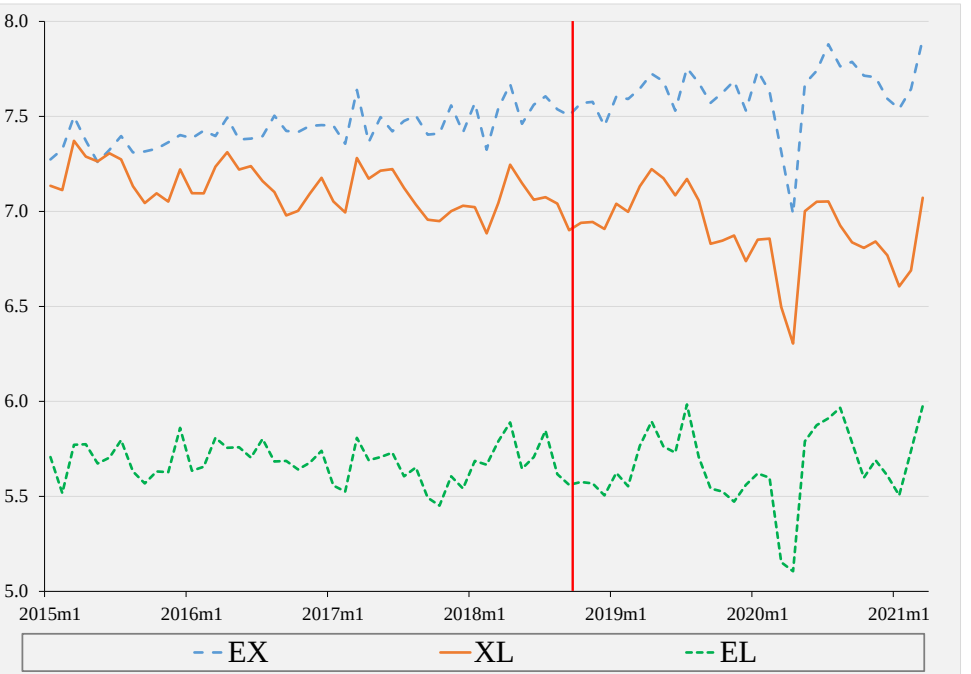
- We find with statistical significance **price decreases of 5 percent for *EL* and *XL* systems** and **no effect** of the merger **on *EX* systems** in medium-low competition areas.

	Medium-Low Competition	High Competition
$post \times (Essilor \,\&\, Luxottica)$	-0.0531^{***}	-0.0187
	(0.0175)	(0.0184)
$post \times (Essilor \,\&\, others)$	-0.0071	-0.0200
	(0.0156)	(0.0189)
$post \times (others \,\&\, Luxottica)$	-0.0472^{***}	-0.0335^{*}
	(0.0134)	(0.0176)
R^2	0.5892	0.5948
Observations	367,525	231,679
Number of opticians	226	175

Notes: Standard errors are clustered at the optician level and are reported in parentheses. The symbols ***, ** and * represent significance at the 1%, 5% and 10% level, respectively.

Empirical Approach

Quantities



Empirical Approach

Quantities

- Quantity results only partially align with price results.

	Medium-Low Competition			High Competition	
	EL	*EX*	*XL*	*EL* & *XL*	*EX*
	Control Group			Control Group	
post × (*Essilor* & *Luxottica*)	0.0843***	−0.0373	0.0503*	0.1504***	−0.2370***
	(0.0316)	(0.0370)	(0.0333)	(0.0310)	(0.0360)
post × (*Essilor* & *others*)	0.2896***	0.1712***	0.2561***	0.3250***	−0.0907***
	(0.0260)	(0.0269)	(0.0490)	(0.0324)	(0.0246)
post × (*others* & *Luxottica*)	−0.1036***	−0.2514***	−0.1632***	−0.0092	−0.3801***
	(0.0311)	(0.0400)	(0.0344)	(0.0334)	(0.0314)
R^2	0.3698	0.2345	0.3320	0.3306	0.1810
Observations	7,872	7,812	7,868	7,612	7,632
Number of opticians	224	226	223	175	175

Notes: Standard errors are clustered at the optician level and are reported in parentheses. The symbols ***, ** and * represent significance at the 1%, 5% and 10% level, respectively.

Discussion

- **Results only partially align** with theoretical model.
- Prices: **Asymmetric price decrease** compared to control group found for systems including Luxottica in medium-low competition. No significant results for high competition. 'Cournot-effect' seems to depend on degree of competition downstream.
- Asymmetric price decrease might relate to different **component characteristics** and customer knowledge. Customers are better informed about frames than lenses and can compare prices more easily for frames.
- Might also origin in different number of suppliers opticians have for both components – **different optician-supplier relationships**.
- Quantities: Several possible reasons for non aligned results, such as quantity substitution or increased ease of dealing with merged firm.

Conclusion

- We study the 2018 merger of Essilor and Luxottica, a merger of complements using data from 400 opticians over 6 years.
- Research question: What are the effects of the merger on prices and quantities and do these fit with the theorized 'Cournot-effect'.
- Using systems only with competitors' components as control groups, we find an asymmetric price decrease.
- Asymmetric price decrease might originate in different component characteristics or optician-supplier relationship.

Appendix

All *XX* Control Group

Placebo Merger Date	2016-01	2016-07	2017-01
post × (*Essilor* & *Luxottica*)	−0.0489***	−0.0336**	−0.0322**
	(0.0135)	(0.0139)	(0.0136)
post × (*Essilor* & *others*)	−0.0248**	−0.0181	−0.0199*
	(0.0124)	(0.0115)	(0.0107)
post × (*others* & *Luxottica*)	−0.0388***	−0.0322***	−0.0316***
	(0.0069)	(0.0062)	(0.0062)
R^2	0.6036	0.6039	0.6025
Observations	812,343	808,129	810,127
Number of opticians	399	399	399

Notes: Standard errors are clustered at the optician level and are reported in parentheses. The symbols ***, ** and * represent significance at the 1%, 5% and 10% level, respectively.

Appendix

Test of Prior Trends

Top 5 Lens Suppliers	L1	L2	L3	L4	L5
$LTT \times (Essilor \,\&\, Luxottica)$	-0.0009^{*}	0.0023^{***}	-0.0004	-0.0017	-0.0011
	(0.0005)	(0.0009)	(0.0008)	(0.0011)	(0.0023)
$LTT \times (Essilor \,\&\, others)$	-0.0002	0.0030^{***}	0.0003	-0.0009	-0.0004
	(0.0006)	(0.0009)	(0.0009)	(0.0011)	(0.0024)
$LTT \times (others \,\&\, Luxottica)$	-0.0008^{*}	0.0023^{***}	-0.0005	-0.0017	-0.0013
	(0.0004)	(0.0008)	(0.0007)	(0.0010)	(0.0023)
LTT	0.0015^{***}	-0.0017^{**}	0.0011	0.0023^{**}	0.0018
	(0.0002)	(0.0008)	(0.0007)	(0.0009)	(0.0023)
R^2	0.6104	0.6027	0.5795	0.6093	0.5907
Observations	256,267	191,057	171,965	161,991	142,931
Number of opticians	222	220	217	216	216

Notes: Standard errors are clustered at the optician level and are reported in parentheses. The symbols ***, ** and * represent significance at the 1%, 5% and 10% level, respectively.

Appendix

Placebo Mergers

	L3			L4		
Placebo Merger	(1)	(2)	(3)	(1)	(2)	(3)
post × (*Essilor* & *Luxottica*)	−0.0176	0.0025	−0.0075	−0.0645*	−0.0363	−0.0338
	(0.0263)	(0.0289)	(0.0223)	(0.0328)	(0.0251)	(0.0208)
post × (*Essilor* & *others*)	0.0069	0.0166	0.0050	−0.0389	−0.0222	−0.0212
	(0.0283)	(0.0293)	(0.0223)	(0.0351)	(0.0262)	(0.0209)
post × (*others* & *Luxottica*)	−0.0059	−0.0011	−0.0132	−0.0552*	−0.0412*	−0.0417**
	(0.0235)	(0.0266)	(0.0203)	(0.0317)	(0.0233)	(0.0189)
R^2	0.5807	0.5809	0.5773	0.6102	0.6099	0.6084
Observations	161,783	160,193	160,073	150,858	149,911	150,401
Number of opticians	217	217	217	216	216	216

Notes: (1), (2) and (3) respectively denote the following hypothetical merger dates: January 2016, July 2016 and January 2017. Standard errors are clustered at the optician level and are reported in parentheses. The symbols ***, ** and * represent significance at the 1%, 5% and 10% level, respectively.