

# Algorithmic Audit of Italian Car Insurance: Evidence of Unfairness in Access and Pricing

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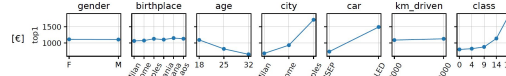


## Goal & Research Questions

**GOAL:** To audit the algorithms responsible for access and pricing in the Italian car insurance industry (Responsabilità Civile Autoveicoli - RCA).

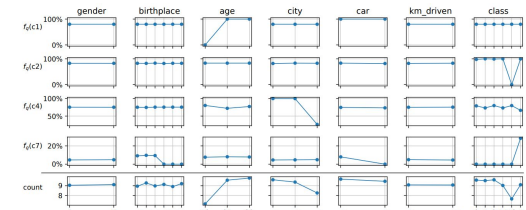
- RQ1.** What are the factors that play a major role in setting RCA premiums?
- RQ2.** Do gender and birthplace directly influence quoted premiums?
- RQ3.** Do riskier driver profiles see fewer quotes on comparison websites (*output variability*)?

## Most Important Factors



- Mean effect of factors on cheapest quote (top1).
- Age, city, car and class are confirmed to strongly influence prices.
- Equivalent results with top5 (avg. of 5 cheapest quotes) omitted.

## Output Variability



Influence of each factor on frequency of appearance in result pages for company c1 (row 1), c2 (row 2), c4 (row 3), c7 (row 4) and total number of quotes (row 5).

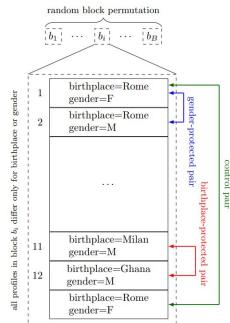
- Strong patterns, compatible with strategic choices are visible for factors age, city and class.

## Background Summary

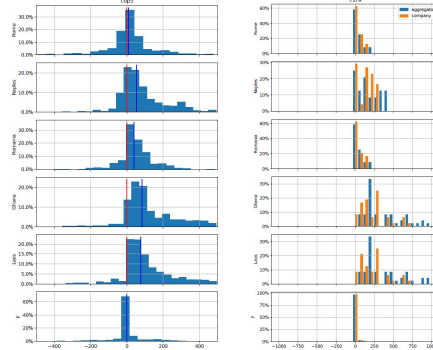
- Gender and birthplace are protected factors in this context [1,2] (→ Fairness Through Unawareness - FTU).
- Aggregators are a primary point of access to RCA market [3].
- The Italian insurance regulator found anecdotal evidence of output variability in aggregators: some profiles see fewer quotes. Problematic for opacity and unequal opportunity [4].

## DOE & Data Collection

- We gather quotes from 9 companies on a popular aggregator.
- We vary several factors deemed important plus protected ones.
- Protected pairs* only differ for 1 protected factor.
- Control pairs* account for noise.
- Overall: 19,608 quotes.



## Protected Factors



Protected pairs: histogram of difference in average of 5 cheapest quotes (left) and quote provided by a specific company (right).

- Systematic discrimination based on birthplace (rows 1-5).
- Sizeable price differences for gender, centered around 0 (row 6).

Attribute	Pairs	Ttest	$\eta_{\text{acc}}(\hat{\theta})$	$\eta_{\text{acc}}(\hat{\theta})$	$m(\hat{\theta})$	$p$
birthplace	Rome vs Milan	5%	-202 €	240 €	7 €	3.0e-04
birthplace	Naples vs Milan	6%	-50 €	331 €	53 €	7.9e-31
birthplace	Romania vs Milan	9%	-86 €	225 €	39 €	6.8e-27
birthplace	Ghana vs Milan	5%	-48 €	521 €	84 €	2.6e-01
birthplace	Laos vs Milan	6%	-60 €	437 €	78 €	2.0e-58
gender	F vs M	39%	-173 €	187 €	0 €	2.1e-01
noise control		89%	-6 €	11 €	0 €	5.0e-01

FTU does not hold.

## Conclusions

- RQ1.** Driver age, city, vehicle and claim history are important factors for RCA pricing.
- RQ2.** Both gender and birthplace have a direct influence on the quotes offered to users. In extreme cases, a driver born in Laos/Ghana can pay 1,000€ more than one born in Milan.
- RQ3.** Strategic choices seem to be in place, providing users of comparison websites with unequal opportunity and access to products based on their risk profile.

## Essential Bibliography

- [1] EC - European Commission. 2012. Guidelines on the application of Council Directive 2004/113/EC to insurance, in the light of the judgment of the Court of Justice of the European Union in Case C-236/09 (Test-Achats) C-11/1
- [2] IVASS - Institute for the Supervision of Insurance. 2014. Lettera al mercato prot. n. 45-14-007503, 26 novembre 2014
- [3] Simon Kaesler, Johannes-Tobias Lorenz, and Felix Schollmeier. 2018. Friends or foes: The rise of European aggregators and their impact on traditional insurers
- [4] IVASS - Institute for the Supervision of Insurance. 2014. Investigation into comparison websites in the Italian insurance market.