

ANDRES MENA

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SUMMARY

PhD Economist — Econometrics, Causal Inference, & Machine Learning

Economist on the Amazon Prime Economics team, developing causal-inference and structural models that turn experimental and observational data into strategic, multi-billion-dollar decisions. Deployed Double ML, DiD, Synthetic Control, and Semiparametric IV into production at Amazon and Microsoft to inform pricing, membership value, supply chain experimentation, and operations at global scale.

- **Impact: Amazon Prime:** combine causal estimation with structural demand models to simulate counterfactual scenarios informing Prime pricing and benefits decisions; **Amazon SCOT:** novel semiparametric IV estimator supporting 300+ experiments/yr; **Amazon PXT:** scaled automated temperature-impact pipeline to 1,600+ sites in 22 countries; **Microsoft:** developed Constrained Synthetic Control delivering ~40% narrower CIs and 15% lower MSE for price-elasticity estimation.
- **Methods:** Causal ML, Experimental Design, Policy Learning, DiD, Synthetic Control, Semiparametric IV, Panel Data.
- **Stack:** Python, R, Stata, SQL; AWS (SageMaker, EMR, S3); Azure (Databricks, Synapse); Git.

EXPERIENCE

Amazon | *Economist II (L5), Prime Economics — Prime Tech* Jun 2026 – Present

- Applied econometrician on the Prime Economics team, building causal-inference and structural models that inform strategic, multi-billion-dollar decisions on Prime membership value, pricing, and benefits.
- Combine causal effect estimation with structural demand modeling (e.g., Prime Structural Demand Model) to simulate counterfactual scenarios—new benefits, content improvements, and price changes—from the perspective of both customers and Amazon.
- Partner with Finance, Product, and Engineering to scope high-impact econometric questions and productionize insight generation at scale.

IDB Invest | *Consultant, Development Effectiveness (Part-time)* Apr 2018 – Apr 2020

- Internal economic-advisory role for the Economic & Productive Development area across Latin America, specializing in firm competitiveness, productivity, and exports.
- Designed and led impact evaluations and causal-inference studies on firm productivity to inform development-finance decisions and program design. Washington, DC.
- Supervisors: Alessandro Maffioli & Lucas Figal Garone.

INTERNSHIPS

Amazon | *PXT* Summer 2025

- Designed a causal framework to analyze temperature effects on key metrics across 1,600+ sites; quantified \$77M/yr potential gains.
- Integrated the framework into an automated evaluation tool delivering region-specific ROI analyses for infrastructure investments; reduced approval times 50% and enabled a 2025 global rollout to 22 countries.
- Developed a comprehensive data pipeline (SQL, Python, Stata) consolidating multiple data sources into a user-friendly QuickSight dashboard with site-level recommendations.

Amazon | *SCOT* Fall 2024

- Developed a novel *Semiparametric Instrumental Variables* estimator addressing imperfect compliance and ratio metrics; applied *Double Debiased Machine Learning* to handle high-dimensional covariates, correcting up to 5× underestimation and delivering unbiased level/ratio treatment effects.
- Productionized at SCOT Lab in SageMaker (R/Python/SQL), processing 60M+ observations across 200+ metrics at the ASIN level; supports 300+ supply-chain experiments annually and slated for Minerva integration.
- Business impact: projected \$8M annual impact. Recognition: **Amazon's Consumer Science Summit Best Statistics Paper Award (2025)**

Microsoft | *Office of the Chief Economist* Summer 2024

- Developed a *Constrained Synthetic Control (CSC)* method for demand estimation, imposing economic constraints (downward-sloping demand, positive cross-elasticities) and delivering ~40% narrower CIs and 15% lower MSE.
- Designed a block-based inference alternative to traditional permutation tests with sample-splitting and cross-fitting—to increase statistical power and robustness.
- Simulated estimator performance using Databricks, R, and SQL; delivered an automated price-elasticity estimation tool ready for production deployment.

EDUCATION

PhD in Economics May 2026

Brown University

PhD in Humanities May 2025

Universidad Nacional de Tucuman

MA in Economics May 2023

Brown University

MA in Economics Mar 2018

Universidad de San Andres

BA in Economics Mar 2015

Universidad Nacional de Tucuman

TEACHING & RESEARCH EXPERIENCE

Brown University | *Research & Teaching Assistant*

2021 – 2026

- **Research Assistant** to Prof. Jonathan Roth (R package `didFF` for the Functional Form Test of Roth & Sant’Anna, 2023), Prof. Susanne Schennach (post-model-selection inference and weak asymptotics), and Prof. Neil Thakral (public-housing allocation simulation).
- **Teaching Assistant** — **PhD Econometrics**: Applied Microeconometrics I (Prof. Toru Kitagawa) & II (Prof. Peter Hull), the doctoral core econometrics sequence; also Theory of Market Design (undergraduate; Prof. Bobby Pakzad-Hurson).

Universidad Nacional de Tucuman | *Lecturer & Teaching Assistant*

2011 – Present

- **Lecturer**: Macroeconomics I (undergraduate, 2017–Present); Causal Inference Using Machine Learning (graduate, 2024).
- **Teaching Assistant**: Macroeconomics (2011–2016).

Universidad de San Andres | *Teaching Assistant*

2019 – 2020

- Macroeconomics for Business (Prof. Jose Fanelli).

RESEARCH

WORKING PAPERS

Semiparametric Instrumental Variable Estimator for Ratio and Level Metrics (with Pedro Sant’Anna & Dimitri Szerman).

We develop a Semiparametric Instrumental Variables (SIV) estimator that recovers the Average Treatment Effect on the Treated under imperfect (one-sided) compliance for both level and ratio metrics. The estimator corrects the attenuation bias of Intent-to-Treat estimates, handles ratio metrics with near-zero or undefined denominators where 2SLS fails, and incorporates high-dimensional covariates via Double Debiased Machine Learning without introducing the negative-weight bias documented for covariate-adjusted 2SLS. Deployed in Amazon SCOT’s Minerva platform, it corrects up to $5\times$ underestimation and delivers unbiased level and ratio treatment effects across 300+ supply-chain experiments annually, with projected business impact exceeding \$8M/yr. *Winner, Amazon Consumer Science Summit Best Statistics Paper Award (2025)*.

Distributional Policy Learning via Influence Functions

Policy learning turns A/B experimental evidence into individualized treatment rules: instead of reporting only an average treatment effect, it asks *who* should receive treatment to best advance the decision-maker’s objective. This project extends policy learning beyond mean outcomes to *multiple welfare criteria*. Using Influence Function representations, I show that objectives such as maximizing average outcomes, protecting the bottom quintile, limiting dispersion, or combining efficiency with equity can all be estimated and optimized within a single empirical welfare maximization framework, with finite-sample regret guarantees

$OP! \left(C\nu\sqrt{V(\Pi_n)/n} \right)$. The key contribution is that the same experiment can support different optimal rules depending on which welfare criterion policymakers or firms care about. **Rental Platform Application:** Rental markets exhibit long-tail distributions in listing prices, revenues, and time-to-book, so policies based solely on mean revenue can be fragile and overly influenced by a small number of superstar listings. In practice, platforms also care about booking volume, guest experience, host-side stability, and fairness across listings—objectives that are inherently distributional. Using a pricing A/B test, I show how alternative welfare criteria lead to different pricing policies, making the trade-offs between revenue, lower-tail protection, and stability explicit.

Synthetic Control Estimation Under Economic and Statistical Constraints (with James Brand, Connor Finucane, and Patrick Hummel).

We introduce Constrained Synthetic Control (CSC), which embeds economic and statistical knowledge—such as sign restrictions (downward-sloping demand), bounds on volatility, and cumulative-effect constraints—directly into the SCM weight-selection problem. To avoid bias from using post-treatment information in constraints, we propose block K -fold cross-fitting with an explicit pre-treatment debiasing term, and we deliver valid inference via a sign-permutation randomization test that is robust to donor heterogeneity and boundary constraints where the bootstrap can fail. A Bayesian implementation with reflective HMC enforces constraints in the posterior, enabling inference on period-by-period effects. In noisy, high-correlation donor settings typical of price changes, CSC regularizes the feasible space, curbs overfitting and researcher degrees of freedom, and achieves sizable variance and MSE reductions relative to elastic-net SCM—yielding more plausible and precise elasticity estimates from single-unit interventions.

Double debiased Machine learning for Fuzzy Differences in Differences

This paper provides an orthogonal extension of the semiparametric fuzzy difference-in-differences estimators proposed by De Chaisemartin & D’Haultfouille (2018). The proposed estimator enjoys the so-called Neyman orthogonality (Chernozhukov et al., 2018), and thus it allows researchers to flexibly use a rich set of machine learning methods in the first-step estimation. It is particularly useful when researchers confront a high-dimensional data set in which the number of potential control variables is larger than the sample size and the conventional nonparametric estimation methods, such as kernel and sieve estimators, do not apply.

High Wage Collective Bargaining Units: The Effect of Unions on Firm Pay and Inequality (with Santiago Hermo & Bruno Cardinale).

Using secured Argentine employer–employee data linking workers, firms, and sectoral CBA coverage, we extend the AKM framework to include firm–CBA effects and exploit representation disputes that induce *firm switches across CBAs* to identify causal impacts in an event–study mover design. Preliminary estimates indicate that incorporating CBAs raises the workplace share of explained wage variance by about 20%, that 13–19% of firm pay differences are directly attributable to CBAs, and that unions increase overall wage inequality by roughly 7% (of log–wage variance). We complement these results by digitizing and parsing 1,500+ agreements with NLP/LLMs to build high-dimensional measures of non-wage clauses (tenure bonuses, employment security, benefits), enabling a structured analysis of contractual features driving wage premia and dispersion—actionable insight for compensation policy and labor–relations strategy.

PUBLICATIONS

“Density estimation using bootstrap quantile variance and quantile-mean covariance”. Montes-Rojas, G., & Mena, A. (2021). *Communications in Statistics – Simulation and Computation*. Vol 52, Issue 4. Available at: doi.org/10.1080/03610918.2021.1884717

“COVID-19 a nivel local: SEIR+ un modelo para proyectar escenarios epidemiologicos y demandas hacia el sistema sanitario”. Danon, A., Mena, A., & Ramasco, A. (2021). *Ensayos de Política Económica*. Vol III, Nro 3. Available at: econpapers.repec.org/article/atwepecon/

SELECTED CONFERENCE PRESENTATIONS

Szerman, D., Sant’Anna, P., & Mena, A. (2025). “Semiparametric Instrumental Variable Estimator for Ratio and Level Metrics.” *Amazon Consumer Science Summit* (CSS), Technical Talk — **Best Statistics & Experimentation Paper Award** (Seattle, WA, 2025).¹

Heymann, D., & Mena, A. (2019). “Business cycles with mixed expectations and heterogeneous agents: A computational and theoretical experiment.” *II Conferencia Anual de Egresados* (Tucuman, Argentina, Dec 2019).

Mena, A. (2019). “A Random Forest Diff-in-Diff Approach for Causal Identification.” *XLVII Coloquio Argentino de Estadística*, Argentinian Statistical Society (SAE) (Tucuman, Argentina, Oct 2019).

Montes-Rojas, G., & Mena, A. (2019). “Density estimation using bootstrap quantile variance and quantile-mean covariance.” *XLVII Coloquio Argentino de Estadística* (SAE) (Tucuman, Argentina, Oct 2019).

Bernini, F., Figal-Garone, L., Maffioli, A., & Mena, A. (2019). “Quality certification: A growth opportunity for small businesses? Evidence from LAC.” *Red de Seminarios de Investigación en Economía y Finanzas* (UBB–UdeC–UCSC) (Concepcion, Chile, Jun 2019).

Mena, A. (2018). “Capital Social, Capital Humano y Desempleo: Un analisis espacial para Latinoamerica.” *LIII Reunion Anual de la Asociacion Argentina de Economia Politica (AAEP)* (La Plata, Argentina, Nov 2018).

Montes-Rojas, G., & Mena, A. (2018). “Density estimation using bootstrap quantile variance and quantile-mean covariance.” *IV Jornadas Argentinas de Econometria* (UBA) (Buenos Aires, Argentina, Sep 2018).

Mena, A. (2018). “Formacion de Expectativas y Fallas de Coordinacion en la Macroeconomia.” *XXIV Jornadas de Epistemologia de las Ciencias Economicas* (UBA) (Buenos Aires, Argentina, Sep 2018).

Mena, A. (2017). “Etica Neoclasica: Un contraste entre el pensamiento de Amartya Sen y Enrique Dussel.” *XXIII Jornadas de Epistemologia de las Ciencias Economicas* (UBA) (Buenos Aires, Argentina, Sep 2017).

Mena, A. (2016). “Can Studying Economics Make People More Selfish? Evidence from a Classroom Experiment.” *SoFiA: Latin American School and Workshop on Data Analysis and Mathematical Modeling of Social Sciences* (Buenos Aires, Argentina, Nov 2016).

Mena, A. (2016). “Local Community Development at Northwest Argentina.” *International Symposium: Latin America–United States, Bridges of Understanding*, CLACSO / New School University (New York, USA, May 2016).

ACHIEVEMENTS

Statistics & Experimentation Best Paper Award | *Amazon Consumer Science Summit* May 2025

- “Semiparametric Instrumental Variable Estimator for Ratio and Level Metrics.” Best Paper among **611 submissions (28% acceptance)**, co-authored with Pedro Sant’Anna and Dimitri Szerman.

Best Conference Poster | *Argentinean Statistical Society* Oct 2019

- “A Random Forest Diff-in-Diff Approach for Causal Identification.” XLVII Argentine Colloquium of Statistics.

Founder & Director | *LAPDE (lapde.unt.edu.ar)* 2020 – Present

- Founder and Director of LAPDE — *Laboratorio de Políticas Publicas para el Desarrollo Humano Equitativo* at the Facultad de Ciencias Economicas, Universidad Nacional de Tucuman (FACE-UNT); direct applied policy research and strategic guidance for Tucuman’s provincial government, the energy regulator, local firms, and NGOs across economic development, gender, environment, and distributional economics.

PhD Grant | *CONICET* Apr 2016 – Mar 2021

- 5 Years PhD Grant from Argentina’s National Scientific and Technical Research Council.

REFERENCES

INDUSTRY REFERENCES

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James Brand

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Pedro Sant’Anna

Amazon Scholar
Emory University & Amazon
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Liza Pronkina

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¹ Amazon Consumer Science Summit 2025: overall acceptance rate 28% (172 of 611 submissions accepted; 52 technical talks, 9%). Presenter: Dimitri Szerman.

ACADEMIC REFERENCES

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