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Ctirad Slavík
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CONTACT INFORMATION

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EDUCATION

CERGE-EI, PhD in Economics and Econometrics *2022 - 2026*
MIT, Visiting PhD student *2025*
CEMFI, Visiting PhD student *2023*
CERGE-EI, MA in Economic Research *2020 - 2022*

RESEARCH INTEREST

Econometrics, Microeconometrics, Causal Inference

PUBLICATIONS

Anatolyev, S., & Smirnov, M. (2024). Off-diagonal elements of projection matrices and dimension asymptotics. Economics Letters, 239, 111761.

RESEARCH IN PROGRESS

"Treatment Effects Identification and Testing via Reduced Form Projections"
"Many instruments estimation and inference under clustered dependence", *with Stanislav Anatolyev*
"Asymptotics of large-dimensional projection matrices", *with Stanislav Anatolyev*

JOB MARKET PAPER

Treatment Effects Identification and Testing via Reduced Form Projections
I study a nonparametric instrumental variable (IV) model with a binary treatment and develop new methods for testing treatment effect heterogeneity. In particular, I propose tests for (i) constant marginal treatment effects (MTE) and (ii) monotone decreasing MTE curves. The analysis builds on a novel identification result showing that the average second derivative of a regression function can be recovered via a quadratic projection. This result enables identification of the average slope of the MTE curve through a reduced-form projection. Building on these insights, I construct simple, projection-based tests for constant and monotone MTEs that are easy to implement and have direct implications for policy evaluation and welfare maximization. Monte Carlo simulations and an empirical application demonstrate the tests' finite-sample performance and practical relevance.

REFERENCES

Stanislav Anatolyev	stanislav.anatolyev@cerge-ei.cz	CERGE-EI
Dmitry Arkhangelsky	darkhangel@cemfi.es	CEMFI
Anna Mikusheva	amikushe@mit.edu	MIT
Nikolas Mittag	nikolas.mittag@cerge-ei.cz	CERGE-EI

PRESENTATIONS

2025	MIT Econometrics Lunch, Annual Meeting of Armenian Economic Association, Annual Meeting of Spanish Economic Association, European Winter Meeting of the Econometric Society, $(EC)^2$ Conference (poster)
2024	Annual Meeting of European Association of Young Economists, Slovak Economic Association Meeting, Annual Meeting of Spanish Economic Association, Biennial Conference of the Czech Economic Society

GRANTS AND RECOGNITION

Charles University Grant Agency student grant	*2024 - 2026*
Excellence student scholarship	*2020 - 2025*

ABSTRACTS

Many instruments estimation and inference under clustered dependence *(with Stanislav Anatolyev)*

The literature on many weak instruments in a heteroskedastic environment under data independence is largely developed. When data dependence, in particular clustering, is present, it poses difficulties in making correct and convenient inferences about structural parameters. We show that clustering either deems the conventional jackknife instrumental variables estimation inconsistent or makes its inferences distorted. We suggest an alternative approach to the estimation of and making inferences about structural parameters, which is computationally attractive and allows general structures of intra-cluster correlations, presence of many instruments and possibly weak identification. We use the natural extension of jackknifing, the leave-cluster-out methodology, applied to the instrument projection matrix, which allows one to dispose of the cross-cluster dependencies in the influence function of the structural parameter estimate. We further weigh the observations by inverse cluster sizes to flexibly adjust for cluster size heterogeneity, which relaxes the usual requirements on the maximal cluster size growth and facilitates derivation of asymptotic properties. We set out a formal asymptotic framework to analyze the proposed weighted leave-cluster-out instrumental variables (WLCOIV) estimator, with an increasing number of clusters, possibly increasing cluster sizes, and presence of many possibly weak instruments. We prove a central limit theorem for the influence function embedded in the WLCOIV estimator under both strong and weak identification, and show consistency of the associated WLCOIV variance estimator. Finally, we run a small simulation experiment and illustrate with the celebrated Angrist and Krueger (1991) dataset, comparing the WLCOIV estimator to other estimators.

Off-diagonal elements of projection matrices and dimension asymptotics *(with Stanislav Anatolyev)*

We provide insights on asymptotic behavior of the off-diagonal elements of projection matrices in settings, where the dimension of underlying vectors grows with the sample size. Under designs favorable to application of the random matrix theory, the off-diagonal elements are asymptotically normal with a simple variance expression. We also discuss the robustness of the result to deviations of the design from the ideal setup.

Asymptotics of large-dimensional projection matrices ***(with Stanislav Anatolyev)***
We characterize the joint asymptotic behavior of diagonal and off-diagonal elements of projection matrices, say $P = Z(Z'Z)^{-1}Z'$, whose underlying dimension ℓ is asymptotically proportional to sample size n, that is, $\ell/n \to \alpha$ as $n \to \infty$, with the aspect ratio $\alpha \in (0, 1)$, under the rotated i.i.d. assumption for elements of Z. The rate of convergence is $\sqrt{n}$, and the limiting distribution is multivariate centered Gaussian. The formulas for the asymptotic variances and covariances are expressed as functions of α and moments of elements of Z. The instrumental tools in deriving the asymptotic results are the Woodbury matrix identity, CLT for quadratic and bilinear forms, and elements of the random matrix theory such as the Marchenko-Pastur law.

RESEARCH EXPERIENCE

Research Assistant, for S. Anatolyev	*2024 - 2025*
Research Assistant, Center for Market Studies and Spatial Economics (CMSSE)	*2018 - 2019*

TEACHING EXPERIENCE

Complementary Mathematics (graduate level), instructor	*2022 - 2023*
Econometrics I (graduate level, S. Anatolyev), TA	*2022 - 2024*
Time Series Econometrics (graduate level, S. Anatolyev), TA	*2022 - 2023*
Dynamic Systems in Economics (undergraduate level, T. Alexeeva), TA	*2019*

SKILLS

Programming Languages	R, Python, Julia
Software & Tools	LaTeX, Excel, Mathematica, Stata, Matlab
Languages	Russian (Native), English (C1), Catalan (A1), Czech (A1)