Sebastian Krantz

Researcher/Job Market Candidate at the Kiel Institute for the World Economy

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Core Competencies

- Economic Research and Analysis in both Academic and Policy Contexts
- Strong Skills in Econometrics, Time Series, and Machine Learning, and Practical Experience with DSGE, CGE, and Quantitative Spatial Models
- High-Performance Statistical Software Engineering and Full-Stack Web-Application and API Development
- Experience in Macroeconomic Policy, Trade, and Infrastructure Analysis in Africa

Education

PhD in Quantitative Economics, Magna cum Laude, Kiel University (Kiel Institute).　　2021–2024
Dissertation: Africa's Economic Transformation: A Big Data Perspective (Keywords: Optimal Infrastructure Investments, Regional Integration, Macroeconomic Stabilization)
Supervisor: Prof. Tobias Heidland, *Second Reader:* Prof. Christoph Trebesch.

Master in International Economics (MIE), Geneva Graduate Institute (IHEID).　　2017–2019
Focus: Macroeconomics, Development, Econometrics, Trade. **GPA**: 5.54 of 6
Dissertation: Endogenous R&D and Technology Diffusion in a Multi-Sector RBC Economy (Keywords: DSGE, Endogenous Growth, Business Cycles, Sectoral Shocks)
Supervisor: Prof. Cédric Tille, *Second Reader*: Prof. Rahul Mukherjee.

BA. Liberal Arts and Science, Magna cum Laude, University College　　2014–2017
Roosevelt (UCR) - Liberal Arts & Sciences Honors College of Utrecht University.

Major: Economics and Social Science (Economics, Anthropology, IR, Law, History)
Minor 1: Mathematics, **Minor 2**: Statistics. **GPA**: 3.87 of 4

Honors Thesis: The Interdependence of Economic Growth, Human Development, and Political Institutions: A General Equilibrium Framework

Employment

Junior Researcher at the Kiel Institute for the World Economy　　2021–2024

The Kiel Institute for the World Economy (IfW) is a leading research institute on global economic affairs. I'm a junior researcher/fellow in the Research Center International Development and the Africa Initiative.

Research
Papers on macroeconomic stabilization, regional integration (both published), and economic returns to infrastructure/spatially optimal infrastructure investments in Africa. My first infrastructure paper builds the Africa Infrastructure Database – the largest open granular database of identified infrastructure assets, businesses, and economic geography in Africa – and uses causal ML to map local economic returns to incremental investments in 14 types of infrastructure (semi-elasticities and counterfactual predictions) at 9.7km resolution. The second paper (JMP) characterizes economically optimal investments into Africa's road network in partial and general equilibrium – calibrating spatial models to a realistic topography of the continental network incl. road construction costs, cross-border frictions, and economic geography.

Other Outputs
Developed the Africa Monitor (a macroeconomic information platform for Africa with R and Python APIs),
an open macroeconomic database and nowcasting platform for South Africa, consulted GIZ/MoF Benin
and the World Bank Africa Chief Economist's Office, and engaged in extensive software engineering.

Senior Economist (ODI Fellow) in the Macroeconomic Policy Department,   2020-2021
Ministry of Finance, Planning and Economic Development, Uganda

Analytics & Research
Macroeconometric analysis of planned increase in excise duties on petrol and diesel. Econometric
estimation of elasticity parameters for a CGE model to evaluate social policies. Development of a GDP
nowcast. COVID-19 tourism sector emergency response paper and strategy paper investigating the
potential of cultural tourism development. Worked with World Bank team to update adjusted
macroeconomic indicators for Uganda and developed a model to forecast them. Developed model to
perform disaggregated annual revenue forecasting by tax head + short-term (monthly, quarterly)
models. Started work to revise the department's main financial programming model. Research papers
on the effects of fiscal spending (SVAR + fiscal multiplier analysis) and GVCs and RVCs in the EAC.

IT and Process Innovation
Automated scraping of ~10,000 macroeconomic indicators from national sources + codes for >3000
national indicators. Developed UGATSDB: a mixed frequency time series database with monthly
updates. Developed open access online data portal and R API package for easy data retrieval. The
database facilitates analysis and powers a macroeconomic dashboard that displays the GDP nowcast
and leading economic indicators. Automated the department's monthly economic performance report
using computable documents linking to UGATSDB. Built a modern department website integrating
these services and making accessible all public (present and historical) department reports.

Teaching and Capacity Building
Structured R-based Data Science Training Programme consisting of 6 delivered 2-day intensive
courses taught in monthly intervals. Followed actively by 2 department staff which now maintain the
website, database, apps, and computable monthly report. 4+ external (UBOS) staff also attended.

Publications

Working Papers

Krantz, S. (2024). Optimal Investments in Africa's Road Network. *Kiel Working Paper and World Bank
Policy Research Working Paper.* https://github.com/SebKrantz/OptimalAfricanRoads.

Krantz, S. (2024). Mapping Africa's Infrastructure Potential with Geospatial Big Data and Causal ML.
Kiel Working Paper, 2276. https://ssrn.com/abstract=4537867.

Under Review

Krantz, S. (2024). collapse: Advanced and Fast Statistical Computing and Data Transformation in R.
Journal of Statistical Software. Revise and Resubmit. https://arxiv.org/abs/2403.05038.

Published

Krantz, S. (2024). Patterns of Global and Regional Integration in the East African Community. *Review
of World Economics*, 1-80. https://link.springer.com/article/10.1007/s10290-024-00558-0.

Krantz, S. (2023). Africa's Great Moderation. *Journal of African Economies*, *33*(5), 515-537. Oxford
University Press. https://doi.org/10.1093/jae/ejad021.

Krantz, S. (2017). The Interdependence of Economic Growth, Human Development and Political
Institutions: A General Equilibrium Framework. *Student Undergraduate Research E-journal*, *3*.

Salam, et al. (2018). [Tanzania|Indonesia] Case Study: Rapid Technological Change - Challenges and
Opportunities. *Pathways for Prosperity Comission Background Papers,* [7|8]. Oxford, UK.

Academic dissertations and unpublished research/policy papers see sebastiankrantz.com/research.

Software Engineering

I develop high-performance open-source statistical software, focusing on C/C++-based R packages (see also github.com/SebKrantz). I developed packages collapse, fastverse, dfms, osmclass, and API packages ugatsdb, africamonitor (also in Python), and samadb (also in Python and Julia). I contributed to fixest, plm, decompr, dggridR, data.table, and kit. collapse is benchmarked on windows and linux among the best-performing solutions for database-like operations (**global top 5** for laptop-grade datasets). It was downloaded **2+ million** times. An article is R&R at the Journal of Statistical Software. My latest project is OptimalTransportNetworks.jl, a Julia library to generate optimal transport networks.

Consulting

CEMAC Infrastructure Sector Assessment Program, The World Bank (Remote)   2025

Outputs: Economic modelling of optimal road network investments in the CEMAC region in partial and general equilibrium and evaluation of regional road projects – producing a short paper, spatial dataset, and presentation.

Office of the Chief Economist, Africa Region, The World Bank (Remote)   2024

Outputs: Background paper on "Africa's Regional and Global Integration" (detailed GVC and RVC analysis, predictors of integration, and economic returns) for report "Integrating Africa Forward: From Threads to Hubs".

Ministry of Economy and Finance and GIZ Benin (Cotonou, Benin)   2023

Public Finance Reform Program to achieve the SDGs and Strengthen Revenue Mobilization.

Outputs: Delivered a one-day intensive workshop on government revenue forecasting, outlining the process in Germany and presenting in detail forecasting models developed for Uganda. Attended by ~15 staff from the Ministry of Economy and Finance and the Treasury. Organized by the GIZ Benin country office in Cotonou.

Presentations

2022 – PEGNet Conference (Kampala), German Development Economics (GDE) Conference (Stuttgart), IDOS Conference (Bonn), Federal Ministry of Finance (Berlin), useR'22 (Virtual).

2023 – BBL at Stellenbosch University (Stellenbosch), Bureau for Economic Research (x2) (Stellenbosch), SEM Conference (Milan), GDE Conference (Dresden), IfW WCA Conference (Berlin), MIASA Policy Conference (Accra), Oxford Summer School (Oxford).

2024 – Global Policy Lab (Berkeley), CSAE Conference (Oxford), The World Bank (GOST - Virtual), IfW Research Seminar (Kiel), Japan International Cooperation Agency (Virtual).

Research Visits and Internships

Visiting Researcher at Stellenbosch University Economics Department   2023
Theme: Nowcasting the Economy and Measuring Inequality with Geospatial Data.

Outputs: Developed the South Africa Macroeconomic Database and the SA Nowcast. Both were presented to a broad audience (incl. Reserve Bank, Statistics South Africa, and the Treasury). Investigated potential of geospatial big data (nightlights, population, and wealth indices based on big data) to map inequality across space and time and compared estimates to Spatial Tax Panel. Presented at the department's BBL seminar.

Intern in the Chief Economists Office, Oxford Policy Management, Oxford (UK)   2018
Project: Rapid Technological Change: Challenges and Opportunities – Assessing the impact of rapid technological change on the developing world.

Outputs: Conducted country-specific case studies on Indonesia and Tanzania analyzing sectoral pattern of growth, industry structure, and the innovation system based on literature, national accounts data, and World Bank Enterprise Surveys. Developed a semi-automated R code to continue the analysis for further countries.

Intern in the Research Department, Bangladesh Rural Advancement Committee (BRAC), Kampala (Uganda). Project: Secondary Education in Uganda: New Survey Evidence – Analyzing the quality of secondary education in Uganda.   2018

Outputs: Executed a study on secondary education: Proposal, survey design + enumerator training, data collection on 500 secondary schools across the country, data cleaning, data analysis, write-up of findings. Developed a web application for semi-automated exploratory analysis and geo-visualization of surveys.

Computer and Language Skills

ANALYTICS & PROGRAMMING
- R (Advanced + C-API)
- C/C++ (Intermediate)
- Python (Intermediate)
- SQL (Intermediate)
- STATA (Intermediate)
- Julia (Intermediate)
- Mathematica (Beginner)
- Matlab & Dynare (Beginner)
- GEMPACK (Beginner)
- Linux Server + NGINX (Beginner)

OFFICE, DATA PRODUCTS, MEDIA
- MS Office & Latex (Intermediate)
- QGIS (Intermediate)
- Shiny Apps (Advanced)
- Plotly Dash Apps (Beginner)
- Simple (HTML & CSS) Websites
- R Packages (Advanced)
- Python Packages (Beginner)
- Julia Packages (Beginner)
- Photo: Lightroom & Photoshop
- Video: IMovie & Premiere Pro

LANGUAGES
- German (Native)
- English (Fluent)
- French (B1)
- Dutch (A2)
- Spanish (A1)

Other Skills Trainings

BREAD-IGC Virtual PhD Course on Urban Economics. *(9 Online Lectures)*	2024
Political Economy and Development Economics, University of Oxford. *(1 Week)*	2023
Financial Programming and Policies, Macroeconomic Forecasting, and Revenue Forecasting, IMF Institute for Capacity Building. *(MOOCs via edX)*	2020-2021
Practical CGE Modeling, CoPS - Victoria University. *(2 Week Online Course)*	2020
The Science and Art of DSGE Modeling, CIMS - University of Surrey. **Specialization**: Emerging Open Economies. *(5 Day Boot Camp)*	2018
Big Data in Macroeconomics and Finance, Kiel Institute for the World Economy (IfW). *(6 Day Intensive Summer School)*	2018
Studied several MOOCs/books on **Data Science, ML, and Algorithms**	2018-2023

Academic References

- **Prof. Tobias Heidland** (Director of the RC International Development at IfW, Main Supervisor)
- **Prof. Rainer Thiele** (Director of the Kiel Institute Africa Initiative at IfW)
- **Prof. Christoph Trebesch** (Director of the RC International Finance and Macroeconomics at IfW)
- **Prof. Cédric Tille** (Professor of Economics at IHEID [Macroeconomics], Dissertation Supervisor)
- **Prof. Ugo Panizza** (Professor of Economics at IHEID [Econometrics, Macro-Development])

Professional References

- **Dr. Albert Musisi** (Commissioner of the Macroeconomic Policy Department, Ministry of Finance, Planning and Economic Development of Uganda)
- **Dr. Stevan Lee** (Chief Economist at Oxford Policy Management)