# Ruiqi (Rachel) Sun

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## Research interests

International Trade, AI/Digital Economics, IO, Macroeconomics
with a particular focus on trade and competition in digital services

## Employment

**University of Toronto** — Toronto, Canada
Postdoctoral Fellow (pre-job market) — 01/2023–06/2025
*Supervisor: Prof. Daniel Trefler*

## Education

**Tsinghua University** — Beijing, China
Ph.D. in Economics — 09/2017–01/2023
*Supervisor: Prof. Xiaodong Zhu*

**University of Toronto** — Toronto, Canada
Visiting Ph.D. student — 01/2020–06/2020, 09/2021–09/2022

**Central University of Finance and Economics** — Beijing, China
B.A in Economics — 09/2013 – 07/2017
**Victoria University** (*dual program*) — Melbourne, Australia
B.A in Business — 09/2015 – 07/2017

## Working Papers

**Blocking the Giants: Theory and Evidence from the Great Firewall** ***(Job Market Paper)***
*Presentations*: NABE Tech Economics Conference 2024 (@Seattle), Trade Brownbag Seminar (UofT), Macro Seminar (UofT), EAP IO Seminar (UofT)

**The Impact of AI and Cross-Border Data Regulation on International Trade in Digital Services**, with Daniel Trefler
under review at ***American Economic Review***
*Presentations*: EITI Conference 2024 (@Jakarta), AI and Economics Conference (@Hang Zhou), Trade Seminar (HKU), Trade Brownbag Seminar (UofT), CDL LLM Workshop, Trade Mini Workshop (UBC)

## Publications

**The Effect of Migration Costs on Growth, Structural Change and Inequality in China**, with Tongtong Hao, Trevor Tombe, Xiaodong Zhu
***Journal of Monetary Economic****, 2020*
*Presentations*: Carnegie-Rochester-NYU Conference*, Macro BrownBag Seminar (UofT), NSE Winter Camp (PKU), Chengfu Rd Macro BrownBag Seminar (Tsinghua), Labor&Macro Reading Group

**AI, Trade, and Creative Destruction: A First Look**, with Daniel Trefler in ***Robots and AI: A New Economic Era*** edited by Lili Yan Ing and Gene Grossman, *Routledge, 2022*
*Presentations*: IES Summer Trade Workshop*, Economic Society European Meeting 2021*, VITM Seminar*

∗ indicates presentation by coauthors

## Work in progress

**Gravity in Digital Service Trade: Culture and Trust**, with Vanya Georgieva, Myeongwan Kim, and Daniel Trefler
**Adoption of AI: Evidence from on-Device Deep Learning** , with Allyson Cui, Daniel Trefler and Zhuang Liu

## Honors, award, grant and fellowship

| | |
|---|---|
| Finalist for the Contemporary Economics Doctoral Innovation Fellowship (National Economic Foundation of China) | 2023 |
| Pilot Rotman Postdoctoral Fellow Funding | 2023 |
| Jiang Nanling Fellowship (10 recipients university-wide) | 2021 |
| Annual Top Ten Young Scholar Awards (10 recipients university-wide) | 2020 |
| Liu Hongru Special Doctoral Fellowship | 2020 |
| Beijing Outstanding Undergraduate Award | 2017 |
| China National Scholarship – Ministry of Education (×2) | 2014, 2015 |

## Professional

**Research Assistant**

| | |
|---|---|
| Prof. Daniel Trefler, University of Toronto | 2020-2021 |
| Prof. Xiaodong Zhu, University of Toronto | 2019-2020 |
| Prof. Jiandong Ju, Tsinghua University | 2019-2020 |
| Prof. Yi Lu, Tsinghua University | 2019 |

**Teaching Assistant**

| | |
|---|---|
| Topics on China's Macroeconomics, with Prof. Xiaodong Zhu | 2019-2020 |
| International Economics I, with Prof. Yi Lu | 2019-2020 |
| Undergraduate International Trade, with Prof. Jiandong Ju | 2019 |
| Graduate Corporate Finance, with Prof. Xuan Tian | 2018 |

**Computational Lectures**

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|---|---|
| Solving Quantitative Spatial Models | 2019, 2020 |
| Quantitative Method for Macroeconomics | 2020 |
| Prompt Engineering with LLMs in Economics | 2023 |

**Referee Services**

American Economic Journal: Microeconomics, Journal of Economic Dynamics and Control, Journal of Industrial Economics, Economic Inquiry, Open Economies Review, Journal of International Development, Pacific Economic Review

## Skills

**Programming**
Proficient in Python, Matlab, Stata, SQL, LaTeX

Proficient in LLMs (e.g., ChatGPT/OpenAI, BERT/Google, Cohere/Cohere, InternLM/OpenMMLab) and Machine Learning in Economics

**Languages**
Chinese (native), English (fluent)

References

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# Abstracts

1. **Blocking the Giants: Theory and Evidence from the Great Firewall** (Job Market Paper)

   Bans on the digital products from foreign tech giants (e.g., Google Chrome in China, TikTok in India) have become a policy staple. Yet the welfare implications of these bans are unknown. Banned products typically have a vast user base (granularity) and a differentiated mix of hedonic attributes (product differentiation), leading to complex substitutability patterns with domestic competitors. This complexity makes detailed knowledge of pairwise elasticities of substitution essential for welfare analysis. I develop a model in which large, single-product firms with heterogeneous productivities and hedonic attributes engage in Bertrand oligopolistic competition. The model is purpose-built to exploit textual product descriptions and large language models: pairwise cosine similarities between product descriptions are proportional to pairwise elasticities of substitution. I externally validate my approach with an event study on India's 2020 ban of Chinese apps. The resulting estimates are fed into a general equilibrium model that I use to evaluate the impact of China's Great Firewall (GFW) policy. GFW increased Chinese real incomes by shifting profits away from foreign firms (a 4% welfare gain), but this benefit was more than offset by the leisure utility loss from using inferior domestic products, e.g., replacing Chrome with Baidu. My model and estimation strategy are easily implemented and widely applicable where rich text is available.

2. **The Impact of AI and Cross-Border Data Regulation on International Trade in Digital Services**, with Daniel Trefler

   The rise of artificial intelligence (AI) and of cross-border restrictions on data flows has created a host of new questions and related policy dilemmas. This paper addresses two questions: How is digital service trade shaped by (1) AI algorithms and (2) by the interplay between AI algorithms and discriminatory cross-border restrictions on data flows? We have 2015–2020 usage data for the most popular 27,727 mobile apps and, to quantify the AI deployed in each of these apps, we use a large language model (LLM) to link each app to each of the app developer's AI patents. Armed with data on app usage by country, with AI deployed in each app, and with an instrument for AI (a Heckscher-Ohlin cost-shifter), we answer our two questions. (1) On average, AI causally raises an app's number of foreign users by 1.26 log points or by more than threefold. (2) The impact of AI on foreign users is halved when the foreign users are in a country with strong restrictions on cross-border data flows. These countries are usually autocracies.

3. **The Effect of Migration Costs on Growth, Structural Change and Inequality in China**, with Tongtong Hao, Trevor Tombe, Xiaodong Zhu

   Between 2000 and 2015, China's aggregate income quadrupled, its provincial income inequality fell by a third, and its share of employment in agriculture fell by a half. Internal

migration is central to this transformation, with the number of internal migrant workers reaching 300 million by 2015. Combining rich data on migration with a spatial general equilibrium model of China's economy, we quantify the size and the impact of internal migration cost reductions in China between 2000 and 2015. During the 15-year period, China's internal migration costs fell by forty-five percent. In addition to contributing substantially to growth, these migration cost changes account for the majority of the reallocation of workers out of agriculture and the drop in regional inequality. We compare the effect of migration policy changes with other important economic changes, including changes in trade costs, capital market distortions, average cost of capital, and productivity. While each contributes meaningfully to growth, migration policy changes are central to China's structural change and regional income convergence. We also find that the recent slow-down in aggregate economic growth between 2010 and 2015 is associated with smaller reduction in inter-provincial migration costs and a larger role of capital accumulation.

4. **AI, Trade, and Creative Destruction: A First Look**, with Daniel Trefler

   Artificial Intelligence is a powerful new technology that will likely have large impacts on the size, direction and composition of international trade flows. Yet almost nothing is known empirically about this. One AI-enabled set of services that can be tracked resides in the palm of our hands: the Mobile Apps used by half the world's population. To analyze the impact of AI on international trade in mobile App services we merge 2014–2020 data on international downloads of mobile Apps with data on the AI patents held by each App's parent company. From this we build a measure of AI deployment. We instrument AI deployment using cost-shifters from the theory of comparative advantage: Countries with a large stock of AI expertise will have a comparative advantage producing AI-intensive Apps. We show the following IV results. (1) *Bilateral Trade*: AI deployment increases App downloads by a factor of six. (2) *Variety Effects*: AI deployment doubles the number of exported App varieties. (3) *Creative Destruction*: AI deployment increases creative destruction and in 2020 the net effect was an increase in welfare of between 2.5% and 10.6%, depending on whether the elasticity of substitution between Apps is high (5) or low (2).