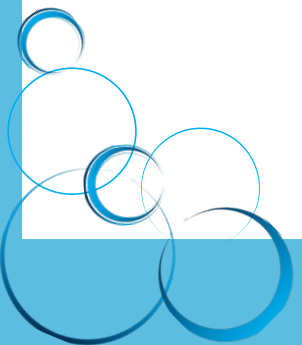
Evolution of Knowledge on Trade and International Integration

June 1, 2023

Daria Taglioni (DECTI) and Florence Kondylis (DIME)

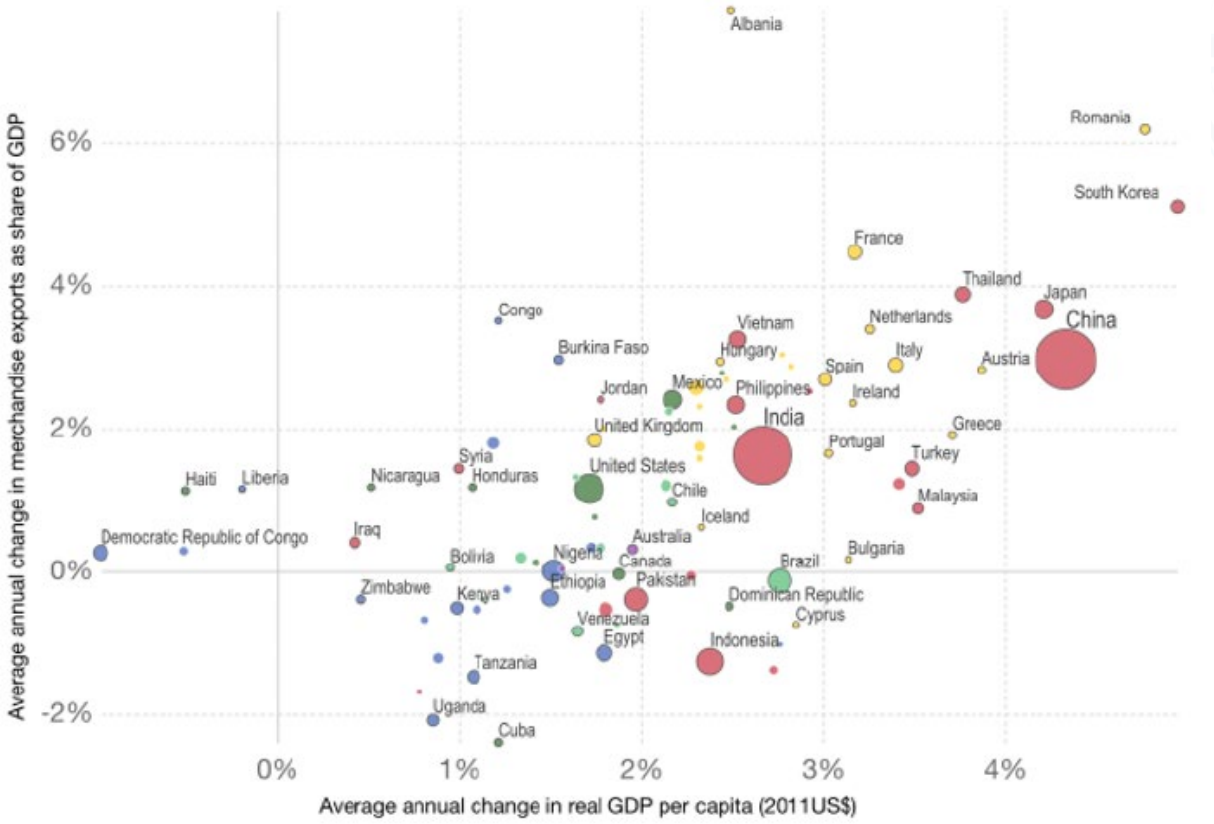


Part 1: Trade and International Integration

Daria Taglioni, Research Manager, DECTI

Why it matters: evidence of export-led growth, 1945-2014

Economic literature finds sizable causal effects of trade on growth (Freyer, 2019; Buera and Oberfield, 2020)



Source: CEPII imports - Two Centuries of Bilateral Trade and Gravity Data: 1827-2014 (2016), Maddison Project Database (2018)

But trade gains are distributed unequally across and within countries

- Rising markups and profits for large multinational firms (De Loecker, Goldberg, Khandelwal and Pavcnik, 2016).
- Supplier firms in developing countries are being squeezed (World Bank's WDR 2020).
- Declining labor share within countries (Reshef and Santoni, 2023).
- Reward to skilled over unskilled workers, also in developing countries (Artuc, Lopez-Acevedo, Robertson, and Samaan 2019).
- Women and youth are generally found in lower value-added segments (World Bank's WDR 2020).
- Raising tax revenues is more challenging: harder to tax winners and compensate losers(Egger, Nigai and Strecker 2019)

And public worries about trade externalities are on the rise

- **Riskiness**: excessive dependence on foreign suppliers and vulnerability to foreign shocks (e.g. Barrot and Sauvagnat 2016).

- **Resource-depletion**: unsustainable production (e.g. of tropical timber), unsustainable shipping (e.g. by polluting ships and planes), undermining national climate action.

- **Rivalry**: Trade is increasingly seen as zero-sum rather than win-win.

Evolution of knowledge: a 20-year journey into heterogeneity

POLICIES

FIRMS

INCOMES AND HOUSEHOLDS

Evolution of knowledge: a 20-year journey into heterogeneity

POLICIES

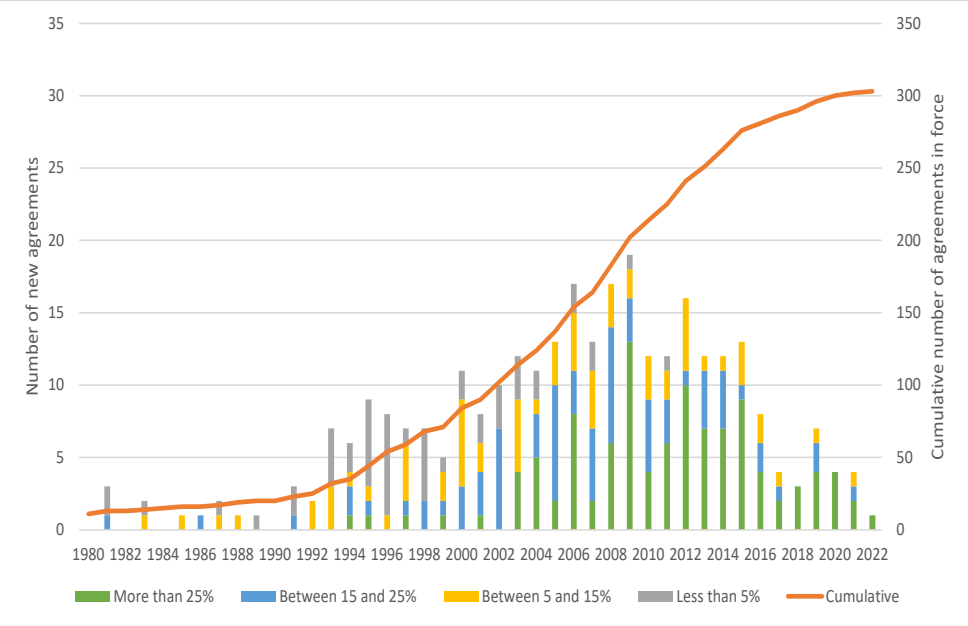
FIRMS

INCOMES AND HOUSEHOLDS

Trade policy is increasingly heterogeneous and deep

Traditional metrics of market access are no longer adequate to capture the impacts of policies on trade, welfare, and development.

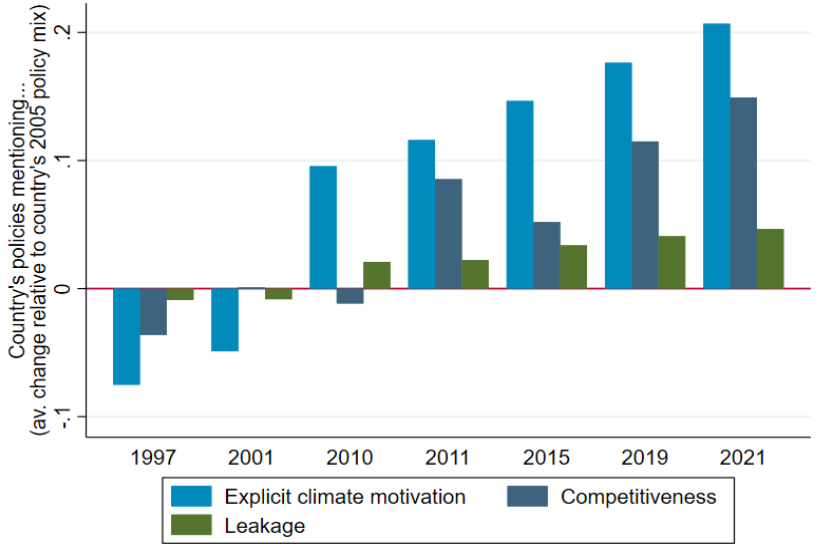
Number of preferential trade agreements and coverage ratio of provisions



Note: Years refer to entry into force date. Coverage ratio refers to the share of provisions contained in a given agreement relative to the maximum number of provisions. UK agreements post Brexit are excluded.

Source: Mattoo, Rocha, Ruta (2020) using 2023 version of DTA database.

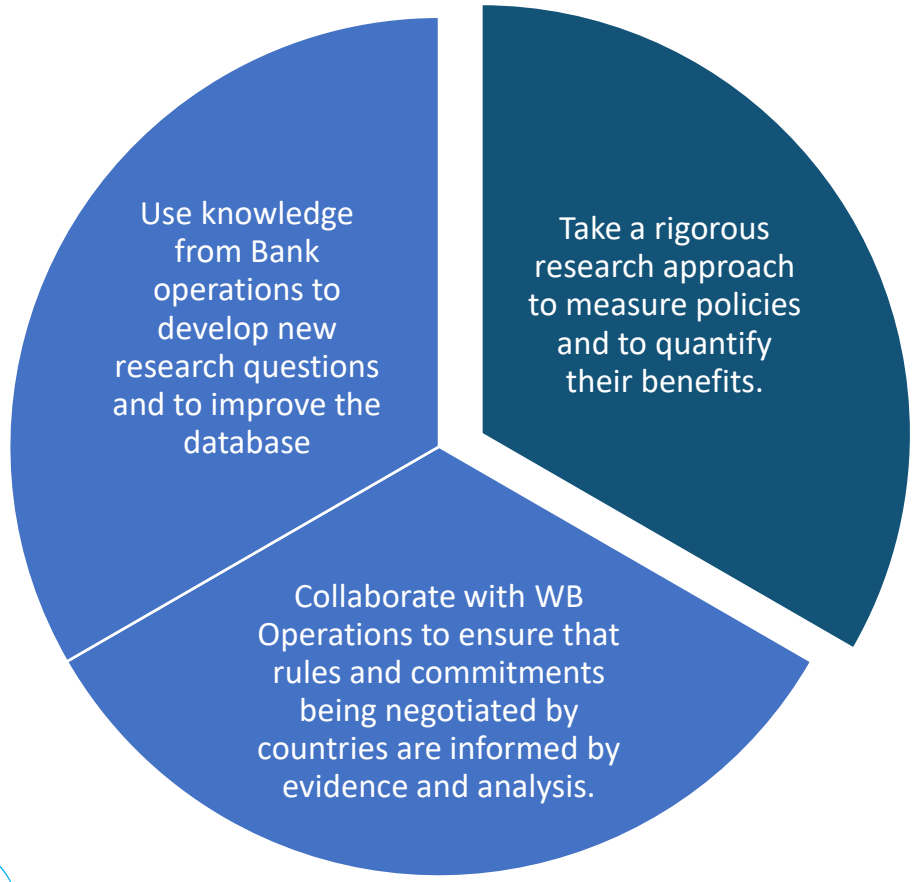
Number of trade-related climate policies increased exponentially in G20 countries



Notes: New WB-ANU Climate Policies Database containing 1800 distinct policies surveyed in G20 countries, with >1500 in force as of March 2023 (>50 variables on policy timing, evolution, administration, scope, objectives and drivers, approach, and impact). Selected dates on x-axis mark COP meetings and other notable events (Kyoto, Bonn COP, Cancun COP, Paris, Trade War, Post Covid)

Source: Aisbett, Beck, Fernandes, Fisher, Sam Martim and Taglioni "The Implications of Climate Policy for Trade: Evidence from the Trade-related Climate Policy Database" work in progress

WB research is contributing to global understanding of important dimensions of international trade policy



- Example: DTAs
  - 23 working papers produced
  - 2 ebooks (with 23 + 5 chapters), one avail. In 06/23
  - 37 of most recognized scholars on trade and trade policy contributed to the ebooks
  - 22 scholars provided comments
- Database companion handbook
  - Number of Downloads: 23,164
  - Number of Citations: 106
- Used for policy guidance on quantifying benefits of DTAs, benchmarking and identifying best practices for policies. See dedicated website and toolkit.

Connecting past, present, and future: knowledge gaps

Better and more data and analysis are needed, especially at a time of great change in trade and trade policies:

- Tariffs
- NTMs
- Services Trade Restrictiveness
- DTAs
- Subsidies, domestic and trade-related
- Regulation in other areas having an impact on trade (climate, energy transition, security)

Old and new questions, examples:

- Which policies are a source of resilience in the current world trading system for members, non-members, and for the global trading system?
  - Support to more discriminatory practices by serving strategic or non-trade objectives?
  - Help to navigating uncertain trade environments?
- What will govern the trade relationships of global giants (China, EU, US)?
  - What combination of enforceable WTO rules, DTAs, and bilateral negotiations?
  - With what outcomes?

Evolution of knowledge: a 20-year journey into heterogeneity

POLICIES

FIRMS

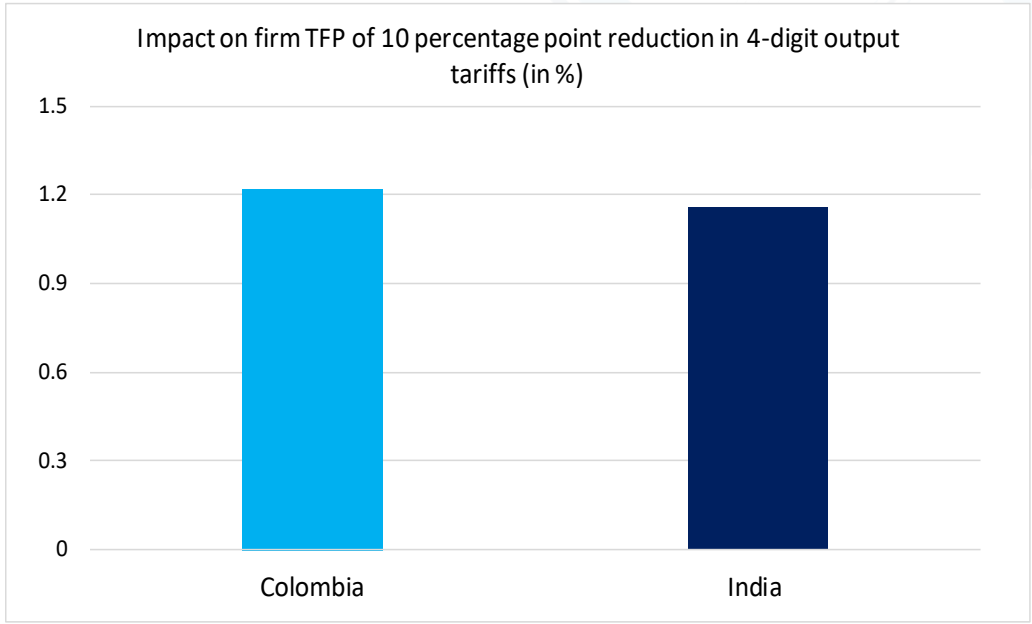
INCOMES AND HOUSEHOLDS

Paradigm shift: from the representative firm to heterogeneous firms, along multiple dimensions

- **20 years ago**: All firms have the same production function and input sourcing patterns.
- **Now**: increasingly nuanced understanding of the firm's role in trade patterns and policy outcomes.
- **Move to heterogeneous firm models**: firms differ in productivity, and this leads to important market reallocation effects when trade liberalization takes place (Melitz, 2003; Bernard et al, 2003)
- **Further innovations**: additional layers of firm-level heterogeneity, including multi-product firms (Bernard, Redding and Schott, 2011) and global sourcing decisions (Antras, 2003 and Antras and Helpman, 2004).
- KCP-supported contributions:
  - KCP II:
    - Exporter Dynamics Database (Fernandes, Freund, and Pierola 2016)
    - FDI spillovers to local economy: HL Kee (2015)
  - KCP III: World Development Report 2020
  - KCP IV: International Trade is not one of the priority areas

Firms exposed to trade perform better

- Trade liberalization increases firm productivity: evidence for Colombia and India
- Similar results for Chile, Indonesia, and China
  (Pavcnik, 2002; Amiti and Konings, 2007; Brandt, Van Biesebroeck, Wang, Zhang, 2017)
- Exposure to trade increases firm technology upgrading and innovation
  (e.g., Bustos, 2011; Fernandes and Paunov, 2013)

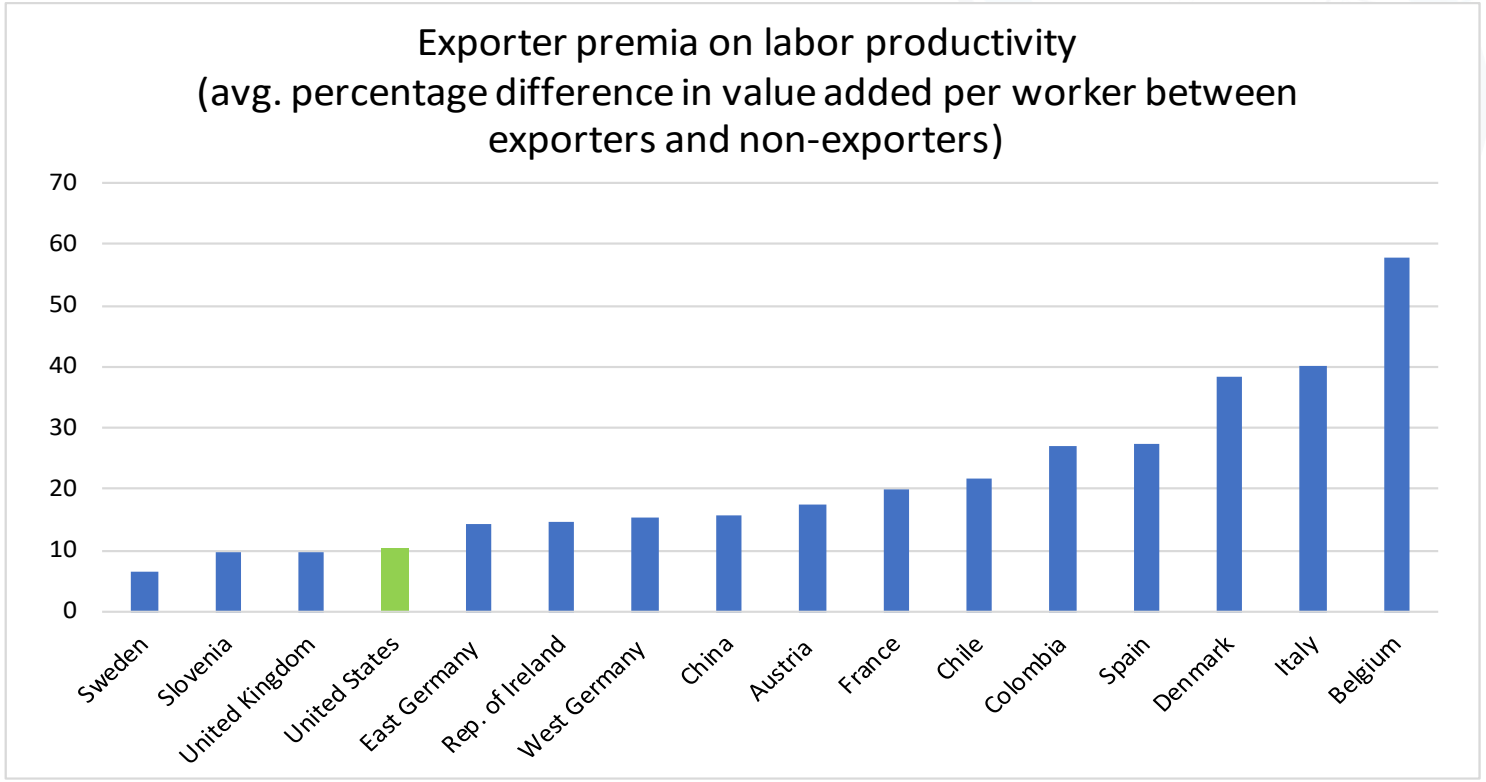


Source: for Colombia Fernandes (2007) and for India Topalova and Khandelwal (2011).
Note: firm TFP accounts for endogeneity of tariffs following modified Levisohn and Petrin (2003) estimation.

back

Exporting firms perform better

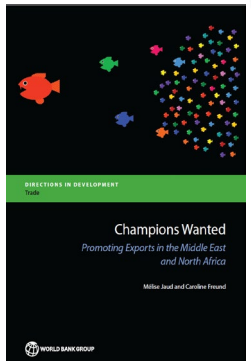
- Within industries, exporting firms are more productive …
- … and more innovative, pay higher wages, use more skills and capital, and are less likely to exit
- Interesting debate on self-selection versus learning-by-exporting

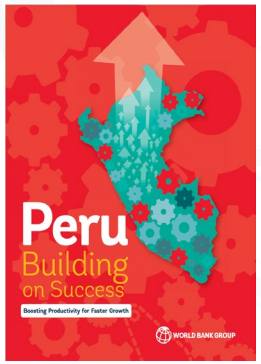


Source: for United States Bernard, Jensen, Redding, and Schott (2007) and for other 14 countries International Study Group on Exports and Productivity (2008).

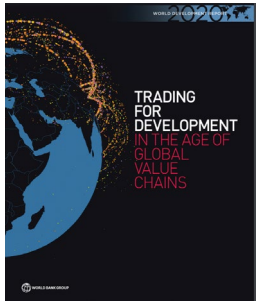
EDD is used extensively for WB policy advice on trade and competitiveness

- EDD data has been used in WB reports for Bangladesh, Brazil, Dom. Republic, Ethiopia, Georgia, Malawi, Peru, South Africa, Turkey, Uruguay, Africa, Middle East, Latin America regions

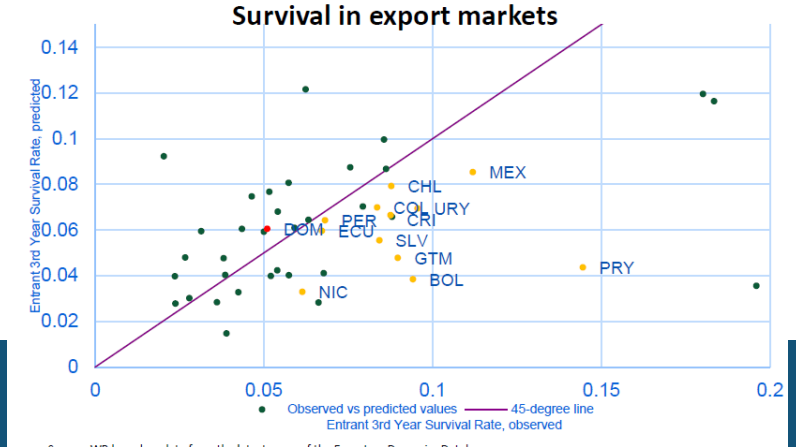




- EDD data used in World Development Report 2020
  - Share of firms engaged in exporting and importing captures country GVC participation

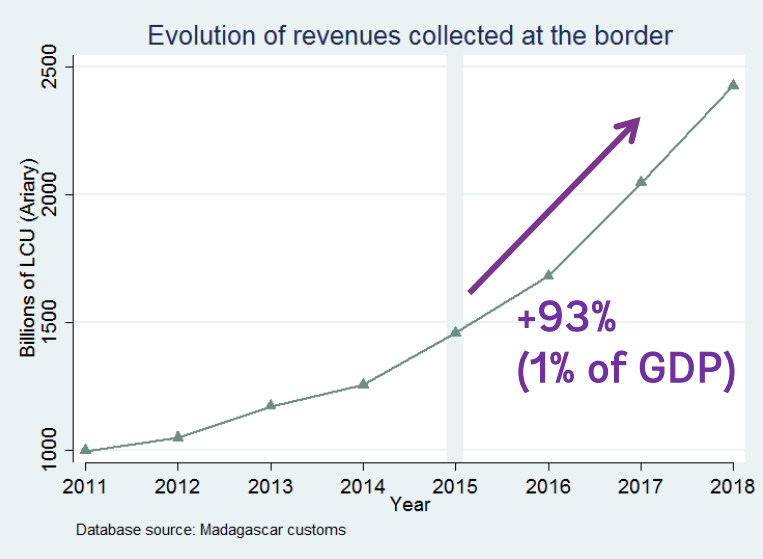


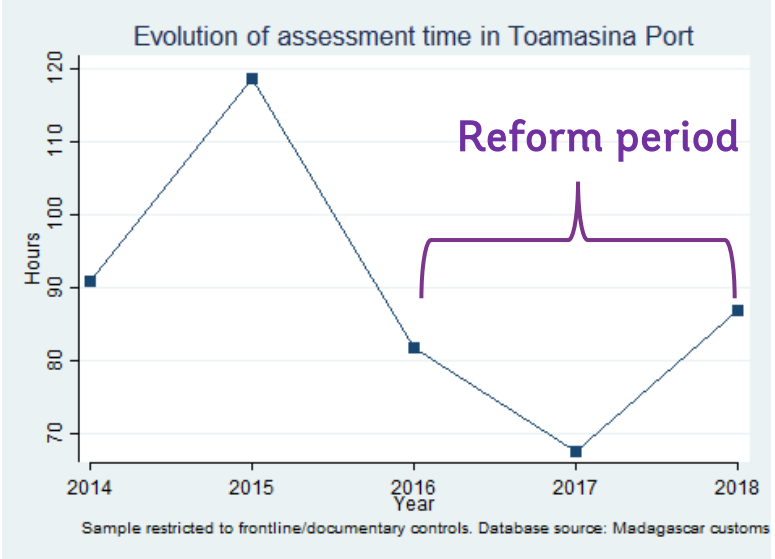
- EDD indicators support WB country strategies: e.g., competitiveness challenges in Dom. Republic
  - low survival in export markets and low levels of backward linkages
  - need to level playing field between SEZs and domestic firms



Impact on policy (example): Detecting Collusion in Madagascar Customs

Dramatic Improvements in Revenue Collection & Reduction in Clearance Times at Madagascar Customs - Based on a risk management experiment informed by World Bank research





Source: [Chalendard, Fernandes, Raballand and Rijkers (QJE, 2023)]

Lessons learned: **investment in knowledge and relationships is critical**

- Impossible to know ex-ante what the critical constraints are
- Taking risk is needed:
  - Risk management experiment in MDG led to raise revenues by 1% of GDP.
  - Replication in high-risk engagements in difficult countries (Kenya, Niger, Croatia).
- Active engagement and partnership with local custom management is important for local ownership and for access to data.

Connecting past, present, and future: knowledge gaps

Data…

- Country specific data and RCT generated data useful for some applications, but need to be complemented with major effort to build and refine global datasets continuously.
- Increase global coverage of customs data for both imports and exports.
- Connect firm-level customs data with data (often available from private sources only) on:
  - Performance
  - Firm to firm linkages
  - Price data at a very disaggregated level
  - Carbon emissions
  - Product-centric meso-data (that track the value and supply chain of entire products at a very granular level)
- Compute measures of value added and GVC participation that aggregate up very granular data to overcome limits of country-sector input-output data.
- Measures of diversification and concentration connecting the firm, market, and product dimension in a single consistent framework.

..facilitating understanding of many new areas requiring in-depth analysis, e.g.

- **Microeconomics of trade, effects on value chains, influence of politics on firm trade decisions**. Broad areas critical to understanding macroeconomic phenomena, and policy relevant issues such as trade-off between short-term benefits of political support and long-term uncertainties.
- **Energy and digital transition**:
  - If the domestic political economy of climate policy requires favoring domestic firms, is it worth the price in terms of lower efficiency if the alternative is to do nothing?
  - will new green and digital technologies born out of the new industrial policy-focused approach become global public goods?
- **Costs of diversification**: are the fixed costs and/or the opportunity costs of diversification too high?

Evolution of knowledge: a 20-year journey into heterogeneity

POLICIES

FIRMS

INCOMES AND HOUSEHOLDS

Motivation: growing interest in the distribution of gains

- Growing interest in the **distribution of gains**
  - Shift of focus to regional inequality and mobility frictions:
    - Workers cannot adjust immediately (Autor, Dorn and Hansen; Pierce and Schott; Dix-Carneiro and Kovak, Topalova; Artuc, Chaudhuri and McLaren)
    - All dimensions of worker mobility are correlated, but geographical moving costs most damaging:
    - Worker welfare increases significantly more than when reducing sectoral moving costs (Artuc, Bastos and Lee, 2022) .
  - Effects on development are long-lasting and wide-ranging:
    - High adjustment costs prevent efficient allocation of factors and reduce growth rates, employment, and wages while increasing informality.
    - Adverse effects also on education, child labor, crime, investment in physical and human capital.
- KCP-supported project: **assess the income gains relative to the inequality costs** of **trade policy**

The Household Impacts of Tariffs Database

- **Harmonized household survey data**
  - Africa (29), Asia (17), Europe (4), and Latin America (4)
  - Representative of 1.6 billion people
- Very **disaggregated** income and expenditure data
- Publicly available: https://www.worldbank.org/en/research/brief/hit

THE WORLD BANK IBRD • IDA

WHO WE ARE | WHAT WE DO | WHERE WE WORK | UNDERSTANDING POVERTY | WORK WITH US | COVID-19

Research & Outlook

BRIEF

Household Impacts of Tariffs (HIT)

TWEET | SHARE | SHARE | +

About the Household Impacts of Tariffs (HIT) Simulation Tool

The Household Impacts of Tariffs (HIT) simulation tool enables users to simulate how changes in import tariffs impact the incomes of households across the income distribution. The website provides estimates of (i) price changes induced by tariff reforms, and (ii) the resulting impact on the real income of households in different percentiles of the income distribution via their impact on (iii) the cost of consumption and (iv) their incomes using detailed data on households' income and consumption portfolios derived from representative household surveys harmonized with tariff data.

There are two versions of the tool:

- A basic version in which users can select one proportional tariff change for all products, which is ideal for assessing the impacts of tariff reform for a particular product group, an across-the-board reduction in tariffs, or full-scale import tariff liberalization.
- In addition, there is an advanced version in which users can select different tariff changes for as many as 53 different agricultural products. This version is suitable for users who wish to simulate the impacts of more elaborate tariff reforms.

Access the basic version »

Access the advanced version »

RELATED

POLICY RESEARCH WORKING PAPER

Household Impacts of Tariffs: Data and Results from Agricultural Trade Protection

Development Research Group

WAR-INDUCED FOOD PRICE INFLATION IMPERILS THE POOR

The conflict in Ukraine has led to a surge in food prices, particularly wheat and corn. This column uses a newly developed toolkit to analyze the welfare impacts of food price inflation on households in developing countries. Average household welfare decreases in 43 of 53 countries in the sample, with an average real income loss of -1.5%. This impact varies substantially both across and within countries, with poorer households suffering systematically larger welfare losses. Protracted price increases will have long-term consequences for prosperity in many of these countries, exacerbating issues of poverty and inequality.

Read the VoxEU column »

SIMULATION APPS

Note that World Bank employees can access additional Simulation Apps designed for policy analysis using HIT when connected to the World Bank's intranet: http://wbgmsmtlb005/. The web server hosting the apps is not available outside the World Bank intranet. Please establish a VPN connection to the World Bank's intranet before using the apps. An offline version of these tools and source codes for replication are available here for users outside the World Bank intranet.

TEAM MEMBERS

Erhan Artuc, Senior Economist
eartuc@worldbank.org

Guido G. Porto, Professor of Economics
guido.g.porto@gmail.com

Bob Rijkers, Senior Economist
brijkers@worldbank.org

Mechanisms

- Trade Liberalization → **prices of traded goods change**

- Household welfare changes due to
  - **Reduction in Income**
    - Income from traded goods – farms and firms
    - Wages
    - Government transfers
  - **Increased (Real) Expenditure**
    - Traded Goods

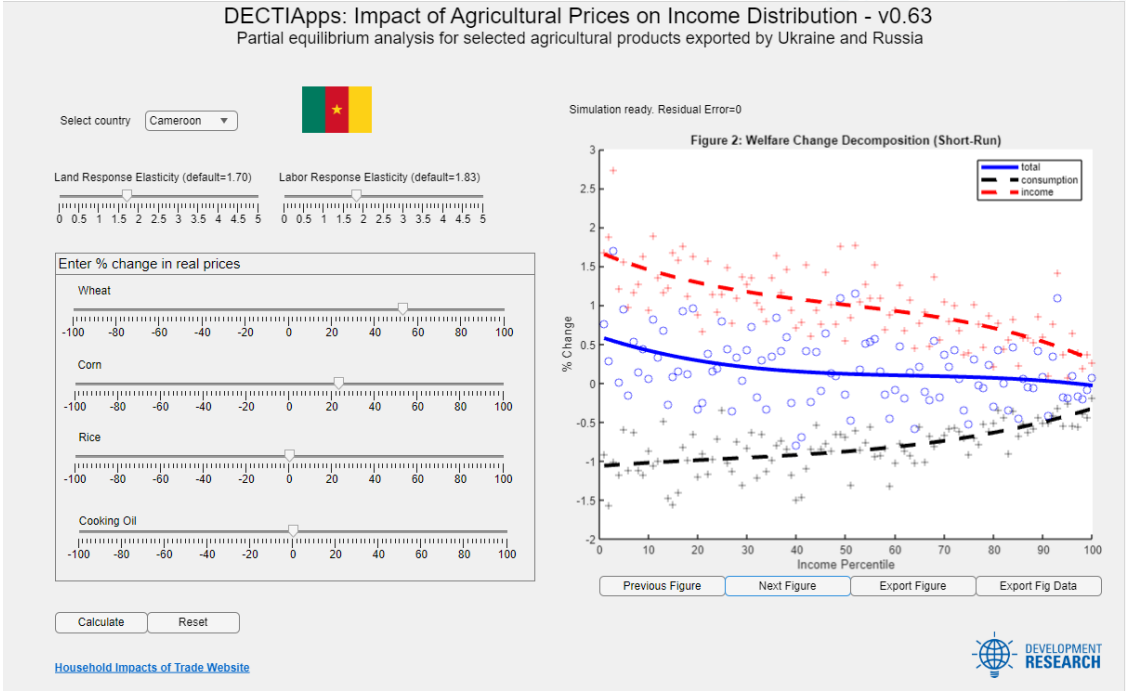
- Net effect on **depends on initial consumption and income portfolios**

Findings and applications to policy

KCP-supported research: Artuc, Porto and Rijkers (forthcoming)

- Trade off between income gains and inequality costs of trade in 54 countries
  - Very detailed data on income and expenditure effects
  - Model allowing rich range of impacts
- **Overwhelming evidence of gains from trade**
  - 44 countries gain, 10 countries lose
  - On average, countries gain 1.8%
- **These real income gains are inversely correlated with equality gains**
  - consumption gains are evenly spread whereas income losses tend to be concentrated
- Yet, **the trade-off typically resolves in favor of liberalization**

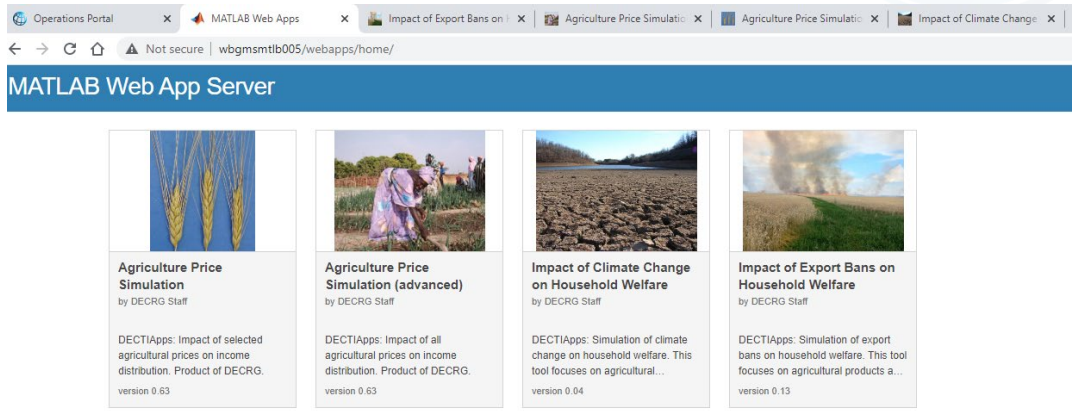
Tool to allow policy analysts to do own analysis online on a increasing number of topics



http://wbgmsmtlb005/webapps/home/

Connecting past, present, and future: persistent puzzles and knowledge gaps

- Increase coverage of countries and sectors.
- Connect more systematically to main sources of cross-country household data
- Connect to different types of data to analyze effects of other shocks
  - Trade protection
  - Price inflation
  - War
  - Climate-related shocks

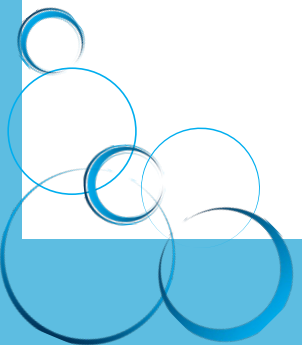


Main Messages: International Trade Requires Special Attention due to its Global Good/Global Welfare Dimension

- **Data Complexity and Management:**
  - Heterogeneity in firms, incomes, households, locations, and policies requires thorough mapping and analysis across borders.
  - Detailed information on the production of goods, such as exact input mixes, is often lacking, calling for a revamp of data collection practices.
- **Global Monitoring and Analysis:**
  - Large-scale changes in policies and trade patterns necessitate monitoring at a global level.
  - Country-by-country approach useful only if it is balanced with cross-border studies to understand the comprehensive impact of externalities, spillovers, and spillbacks.
- **Methodological Concerns in Policy Evaluation:**
  - RCTs are not suitable for a large chunk of international trade analysis.
  - Policy evaluations based on counterfactual analysis and simulations may risk overfitting without the integration of case-study analysis using new, granular data.
- **Data-related concerns:**
  - Comprehensive, long-term data collection is vital yet costly.
  - Cross-border mapping poses challenges.
  - Private providers hold key data on prices and firm linkages.
  - Non-trade targeted policies significantly influence trade, necessitating in-depth analysis.
  - Data-science and AI tools offer opportunities but also present issues with cost, representativeness, and estimation quality.

Part 2: Knowledge at the intersection of tax and trade

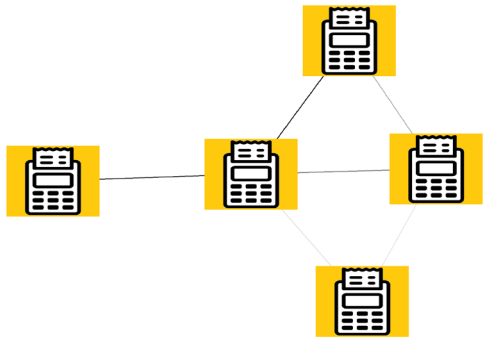
Florence Kondylis, Research Manager DIME1



Tax data is trade data

- Using data from customs to understand trade flows is a key innovation
  - Exporter Dynamics Database (Cebeci, Fernandes, Freund, Pierola, 2012)
- KCP advances the knowledge and policy practice frontier by enabling researchers and governments to leverage micro-data on firms
  - Taking advantages of new datasets generated by an explosion of eFiscal Devices
- These partnerships are promising avenues for more policy-impactful research

In practice, E-Fiscal Devices go from transactions …



SHOP NAME
KIGALI
TIN: 999999999

Hainiken 0,3l 1x 950,00 B
Wine S.Africa 1 l 1x 7000,00 B

Total 7950,00
Total B-18% 6737,29
TAX TAX B 1212,71

Cash 7950,00
Items number 2

SDC Information:
Date: 25/5/2012 Time: 11:07:35
SDC ID: SDC001000001
RECEIPT NUMBER: 168/258 NS
Internal Data:
TE68-SLA2-34J5-EAV3-N569-88LJ-Q7
Receipt Signature:
V249-J39C-EJ48-HE2W

RECEIPT NUMBER: 152
DATE: 25/5/2012 TIME: 11:09:32
MRC: AAACC123456

Tax Identification

Item or service

VAT

Real Time Clock

Sales Data Controller s/n

Consecutive receipt number

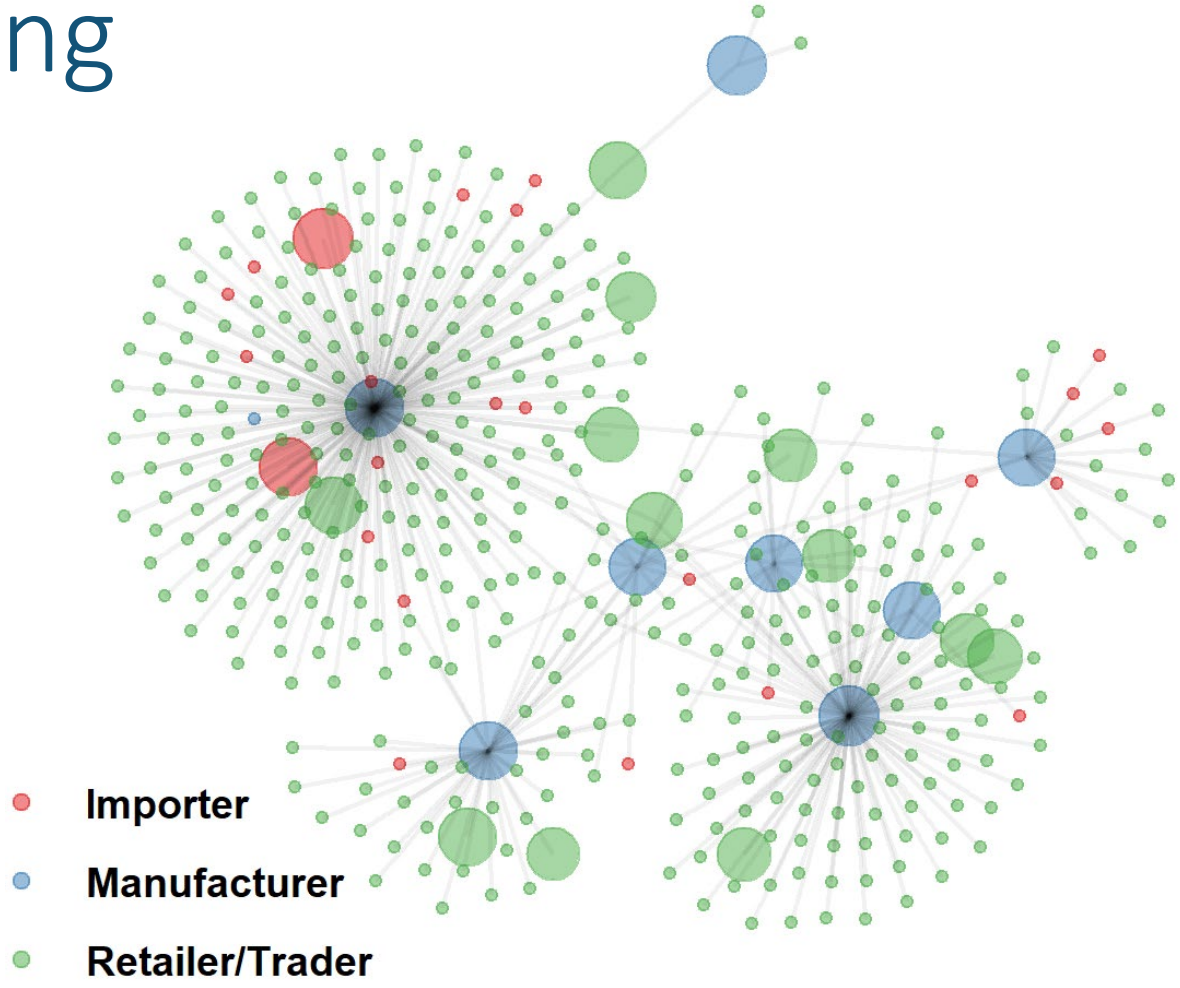
Internal Data (only RRA can verify)

Receipt Signature (only RRA can verify)

Machine Registration Code

… to sector-wide mapping

- Electronic Billing Machine data offers promising avenues for future research in trade.
- Domestic trade micro-data both within and across sectors for specific products

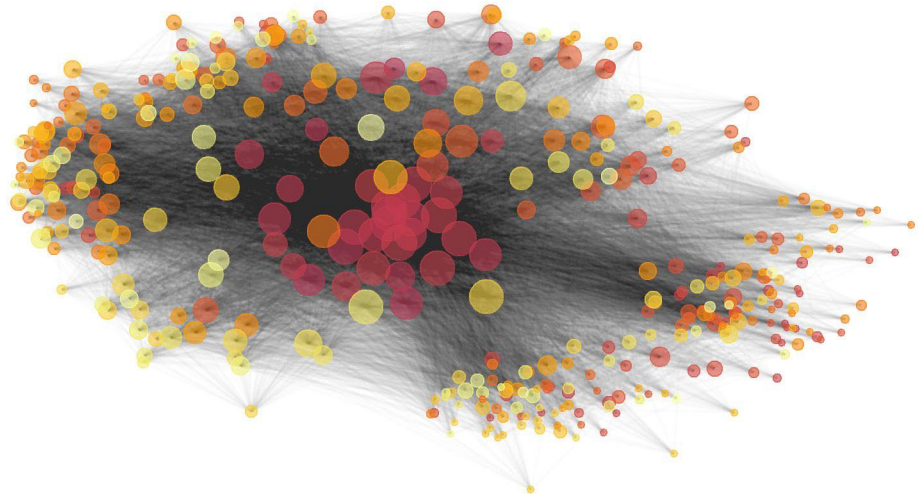


Example: Domestic mask manufacturing in Rwanda A Few Good Masks, Byrne et al, 2022

… to the whole formal economy

Potential to describe production networks in WB client countries (ongoing in Rwanda and Honduras)

Comprehensive coverage of the formal economy across regions, allowing for sub-regional economic analysis



Trade network of all 416 sub-districts in Rwanda, size proportional to centrality

KCP finances formative policy-relevant research that leverages these transaction data

FISCAL SPACE

STATE CAPACITY

FIRMS

KCP finances formative policy-relevant research that leverages these transaction data

FISCAL SPACE

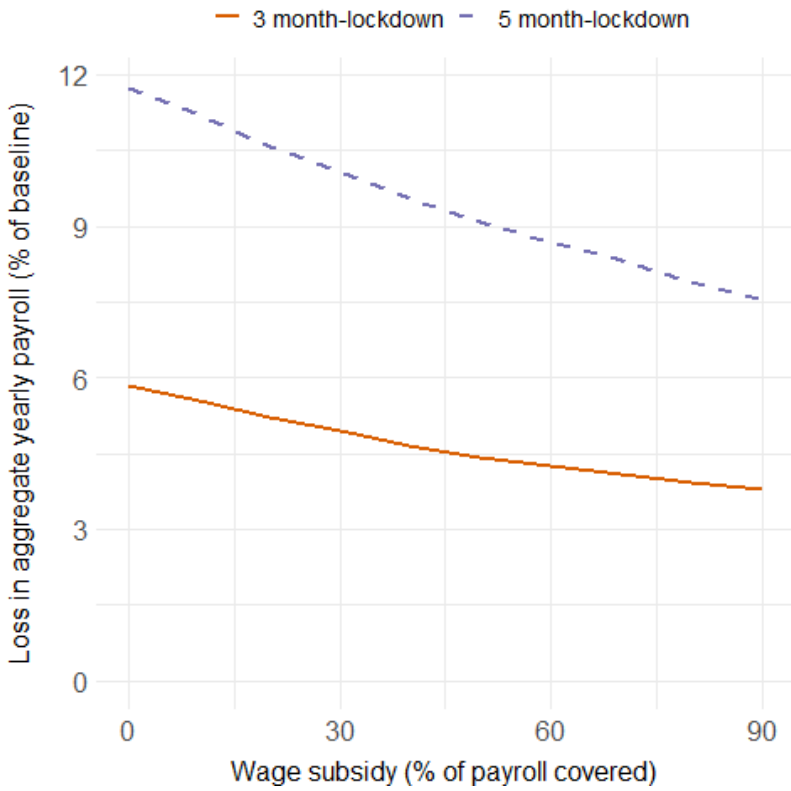
STATE CAPACITY

FIRMS

Informing tax policy during the COVID-19 shock

- Quantify the impact of COVID-19 on firm profitability, show large payroll losses
- Can wage subsidies mitigate payroll losses?
- How deep is the hole?
  - E.g., VAT and CIT tax contributions to fiscal crisis

→ Bottom line: Better policies in times of crisis



Average Payroll Loss by Subsidy Generosity
(Bachas, Brockmeyer, Semelet 2020)

High-frequency transaction data offers accurate picture of the economy (Rwanda)

- ***How did sectors respond differently to the COVID-19 shock?***

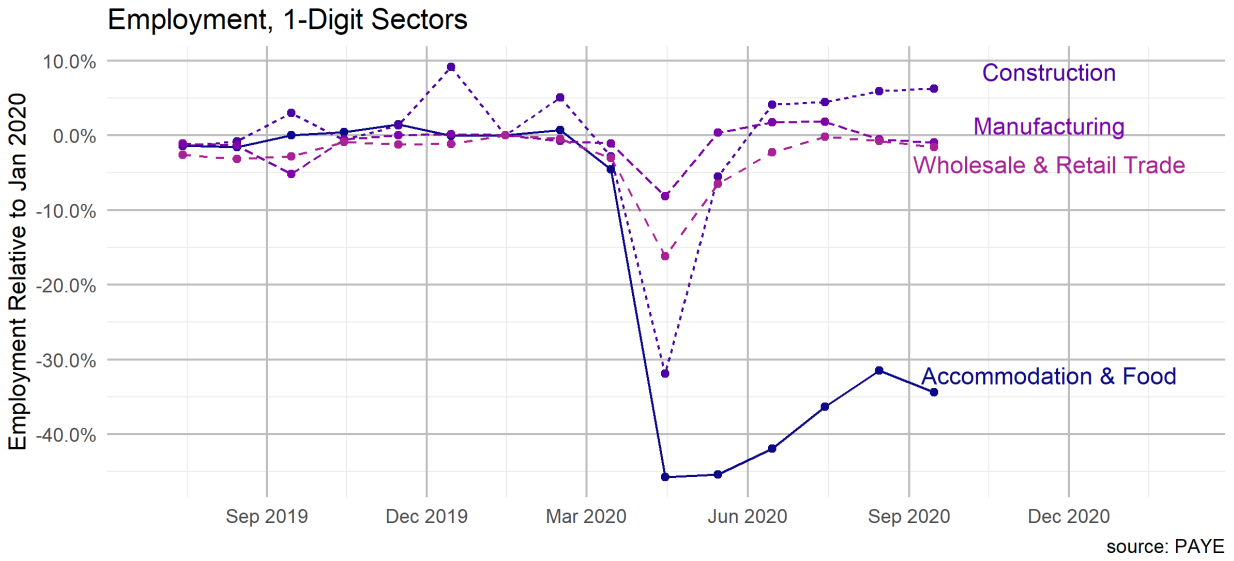
  Approach

  - High-frequency tax administration data document spillovers of lockdown supply shock from urban to rural sector
  - Documented how internal trade barriers increase price of staples

  Results

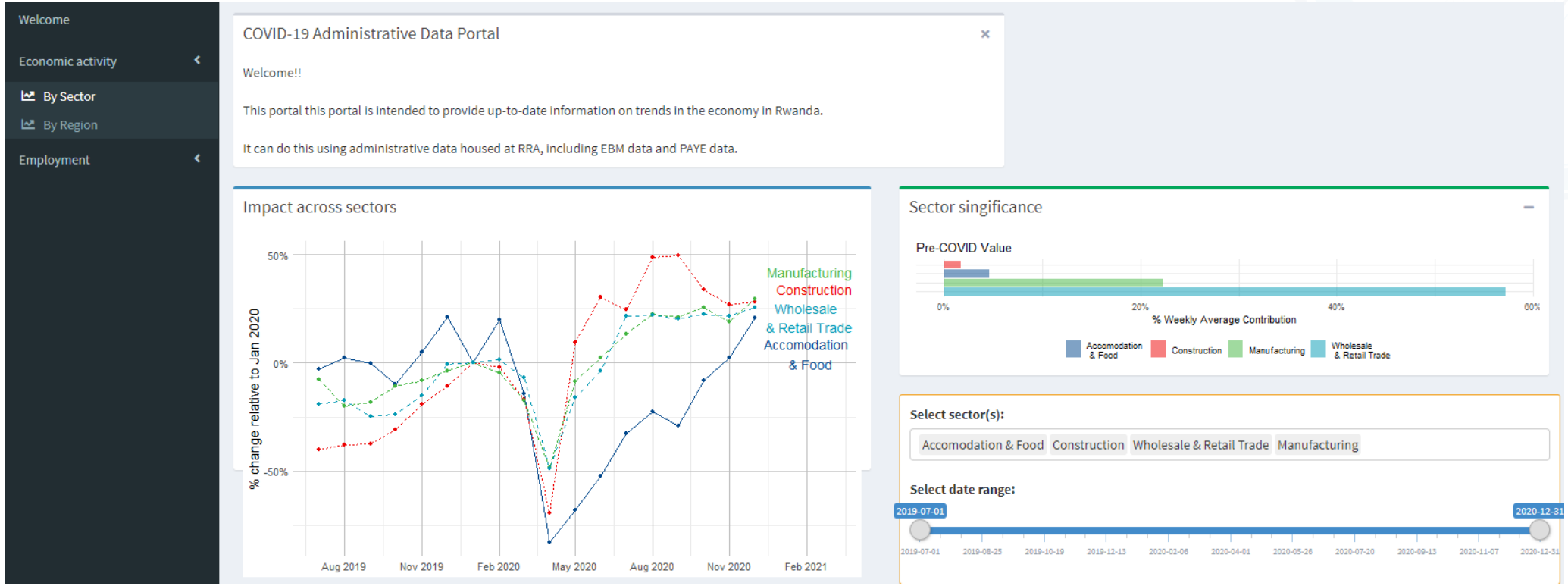
  - Results dashboard used to formulate fiscal policy response with consideration for sectoral heterogeneity: incentives and tax relief extended to the hospitality sector (including income tax waivers, and employment tax holidays)

- ***"Contact" industries experienced a deeper and more persistent shock***



→ Bottom line: Better policies in times of crisis

Dashboards for real-time policy diagnostics



→ Bottom line: Better policies in times of crisis

KCP finances formative policy-relevant research that leverages these transaction data

FISCAL SPACE

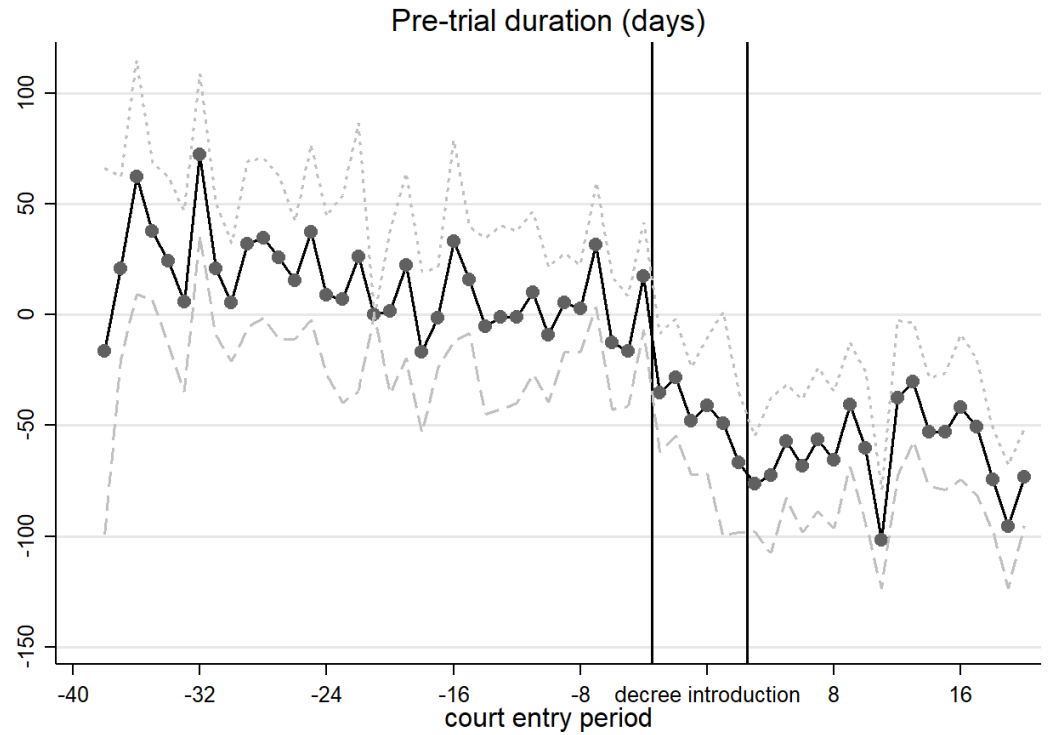
STATE CAPACITY

FIRMS

Granular tax data to evaluate regulatory reforms

- **Faster justice**: pre-trial duration went down by 46 days, the number of hearings is reduced, and judges impose more deadlines. This **did not negatively impact quality** of decisions
- Firm monthly revenues drop by 8-11 percent upon entering pre-trial, and decline by 3.2-5.0 percent for every 100 days spent in pre-trial
- **Firms** reported being **willing to pay for faster adjudication**

→ Bottome line **-30%**

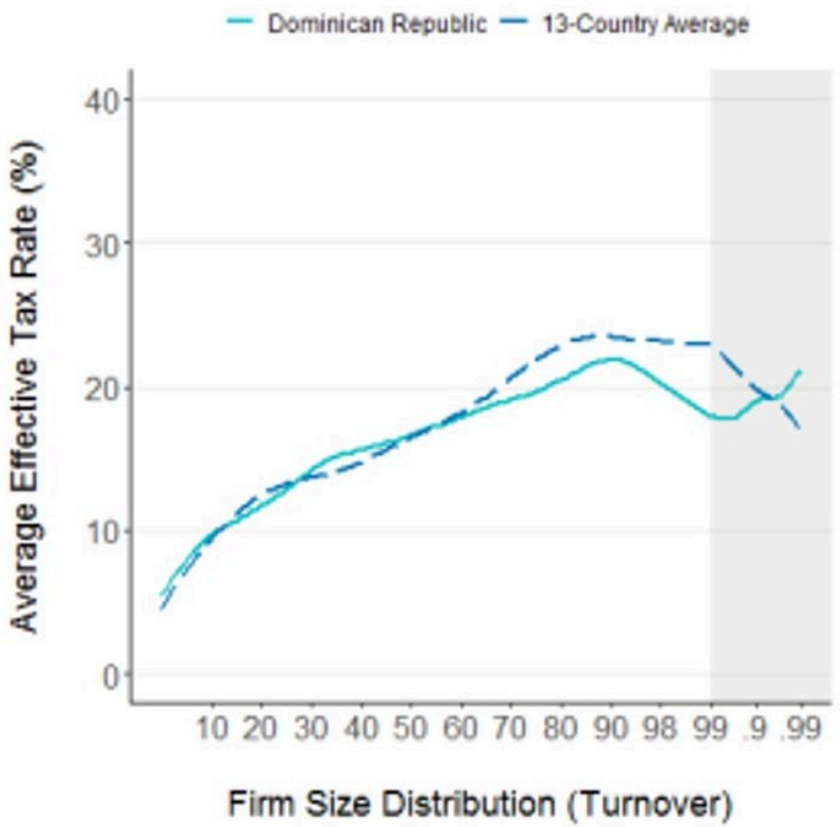


Source: Kondylis, Florence; Stein, Mattea. 2023. The Speed of Justice, *Review of Economics and Statistics*.

Huge amounts of heterogeneity in firms' relationship to the state

- Firm size predicts a firm-specific effective tax rate
  - Bachas, Brockmeyer, Dom & Semelet (2023)
- In certain contexts, political connection associated with higher propensity to evade taxes
  - Rijkers, Baghdadi and Raballand (2015)
- Tax incentive design can improve access to high-skilled labor
  - Carpio, Ozden, Testaverde, Wagner (2016)

→ Bottom line: better policy designs



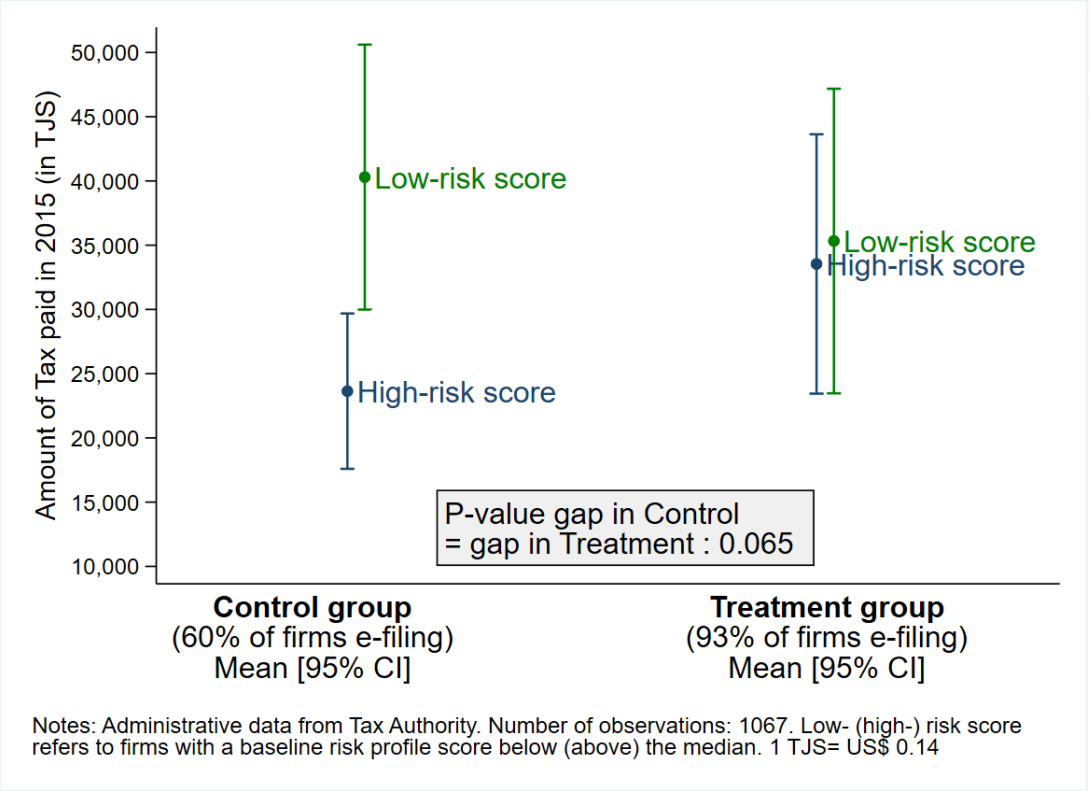
E-filing increases tax compliance and reduces bribes

E-filing closes the revenue gap between firms likely to be evading taxes and those not likely to be evading taxes!

Oyebola Okunogbe and Victor Pouliquen (2022)

→Bottom line:

- →e-tax systems may be even more important in environments with low state capacity
- →better policy designs



Notes: Administrative data from Tax Authority. Number of observations: 1067. Low- (high-) risk score refers to firms with a baseline risk profile score below (above) the median. 1 TJS= US$ 0.14

Partnerships are the cornerstone of KCP-financed research on tax and trade

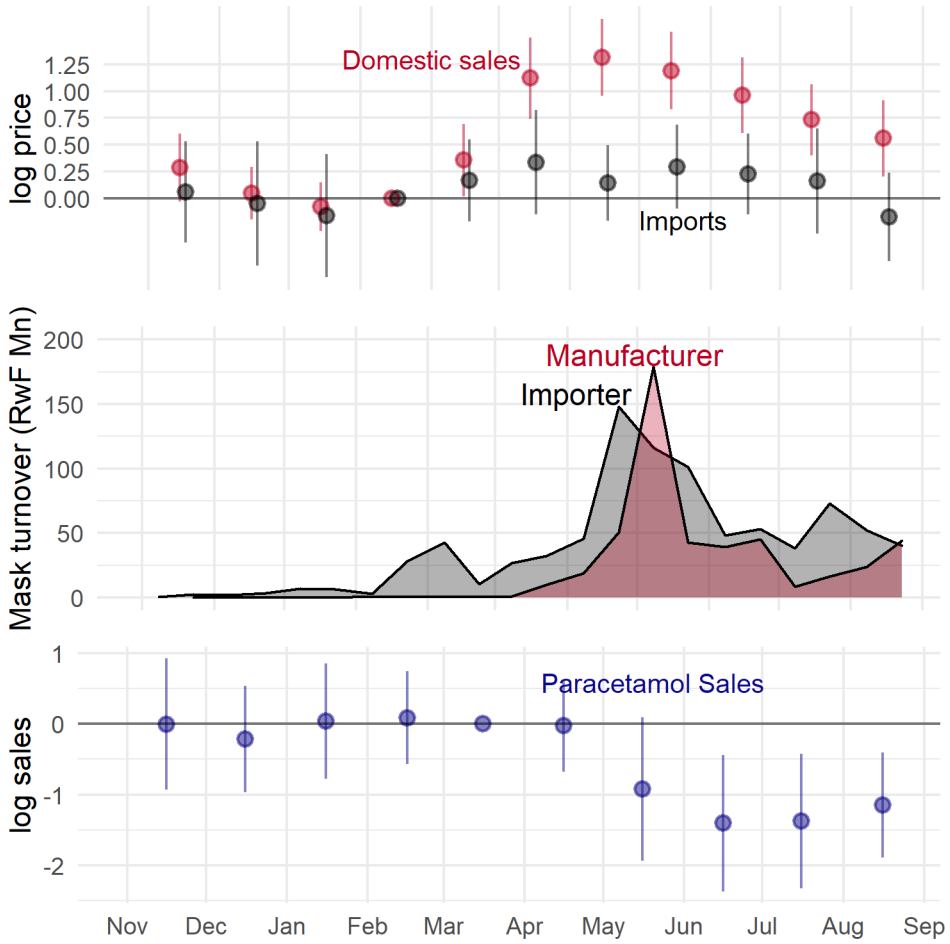
Administrative micro-data access predicated on meaningful partnerships

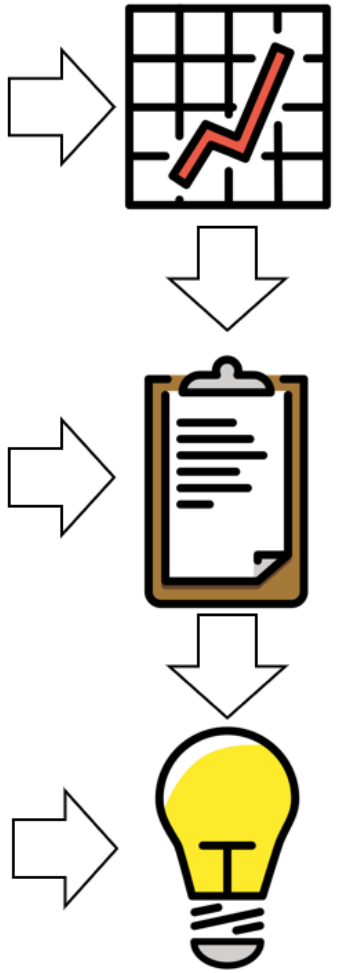
- **Collaboration & communication:** Close workplace collaboration (e.g., integration) can allow relationships to form. With infrequent mission travel, an open hybrid dialogue is crucial. A local champion can help!
- **An agreed workplan:** Buy-in from senior leadership usually facilitated by ensuring the **projects are mutually beneficial**
- **Data security:** Creates **trust** by demonstrating respect for sensitive taxpayer data & the value of the asset

→ Bottom line: KCP funding for capacity building is crucial

An instructive guide in this WB blog-post.

Value of collaboration: Impact





Analysts
Beneficiaries of joint analytical work: frequency capacity building training, *on-the-job* support

Co-owned and co-authored with management
Presentations in Rwanda made jointly by DIME team.

High-level dissemination to policy-makers
Presentation to Chief Economists at the Ministry of Finance, Central Bank and Executive organ of the Rwanda Revenue Authority

→ Bottom line: KCP-funded research informed pandemic-era policy

KCP finances formative policy-relevant research that leverages these transaction data

FISCAL SPACE

STATE CAPACITY

FIRMS

Incentives to formalize?

- Formalization encumbered by concerns about current land assets and future taxation
  - De Mel, McKenzie & Woodruff (2012)
- Informal firms that are more “formal-like” are more likely to respond to a tax incentive to formalize (others do not)
  - Benhassine, McKenzie, Santini and Pouliquen (2016)

→ Bottom line: We don’t know yet whether formalization and tax-registration status determine differences in production networks?

Can trade networks shed light on firms' incentives to formalize?

Policy: Large firms face mandated share (73%) of **income-tax** purchases to be validated using Electronic Billing Machines in Rwanda

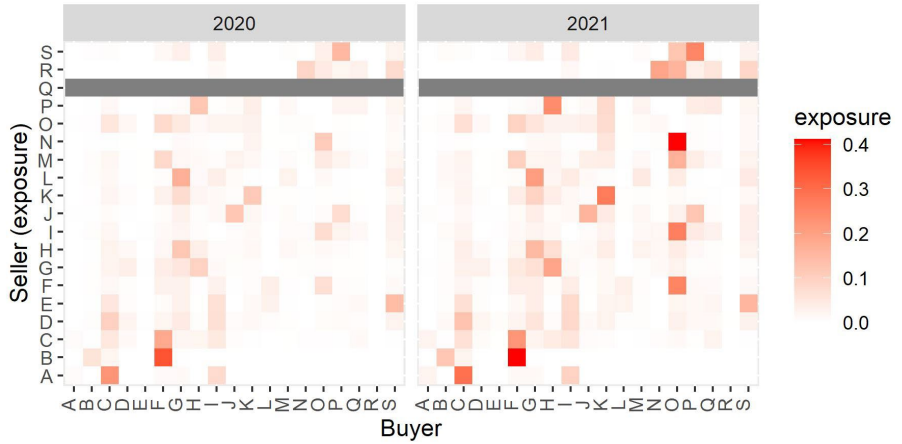
Approach: Incentives propagate to small suppliers through firm network (exposure design)

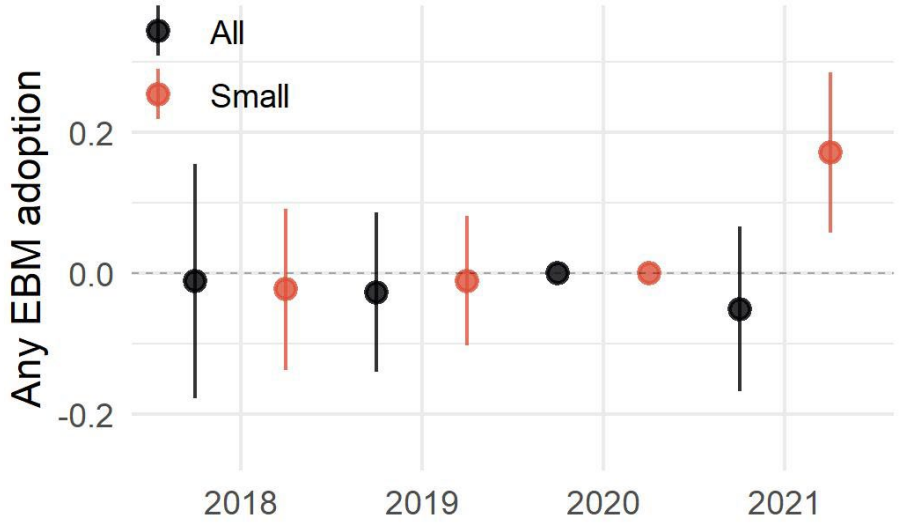
Results:

1. At mean exposure, adoption by small firms increases by approximately 6% in first year
2. Model suggests macro trade-off between encouraging formality and deterring trade

→ **Bottom line:** The optimal validation share may not be the mandated one

→This research can help re-target the policy





Bachas, Byrne, Kondylis & Zavala (ongoing)

Up next: The geography of production networks in East Africa and Central America

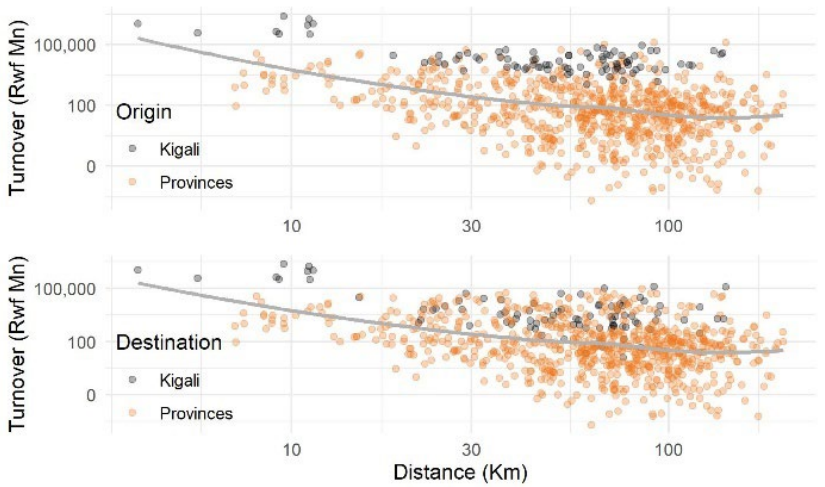
Characterization of

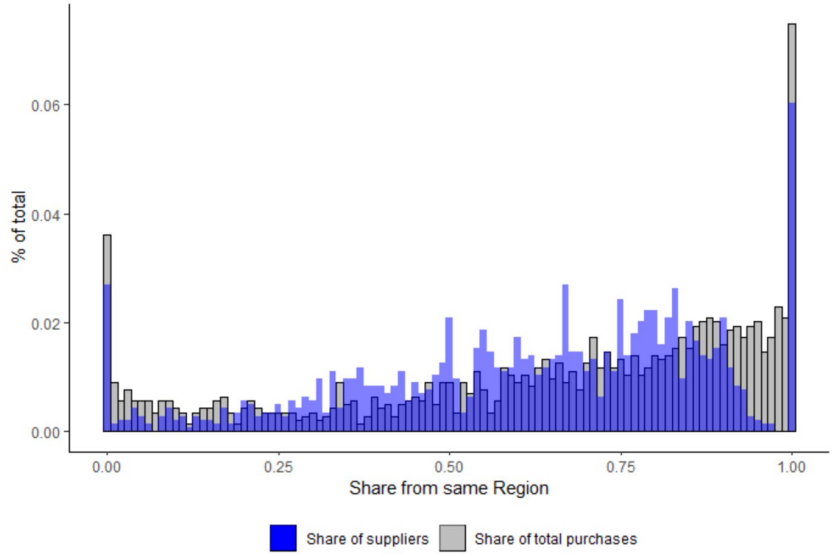
- - Geographic inequity within low and middle-income countries
- - Trade and production networks with the potential to ease inequality

Future KCP-research on trade:

- 1. IE of large infrastructure projects (182 feeder roads, 130km transport corridor)
- 2. Experimental evidence on agricultural trade subsidies

Research builds on established data infrastructure, including road monitoring data, the Establishment Census, survey data and administrative survey data





Enabling the future of tax and trade research

Integrated approach to knowledge creation

- Administrative data reveal micro-responses
- Aggregate to measure macro-implications

Deep engagement with government partners

- Build data systems and analytical capacity
- Understand policy levers and outcomes

Impact at multiple levels

- Invest in individual team partnerships
- Scale up to public goods across teams

KCP work in Rwanda embodies this vision

- Tax Authority data lab and comprehensive database of formal transactions and taxes
- From understanding firm responses to quantifying the optimal level of formality
- Blueprint for research on firm networks and tax incentives in middle income countries

→ **KCP is uniquely placed to enable this future**