



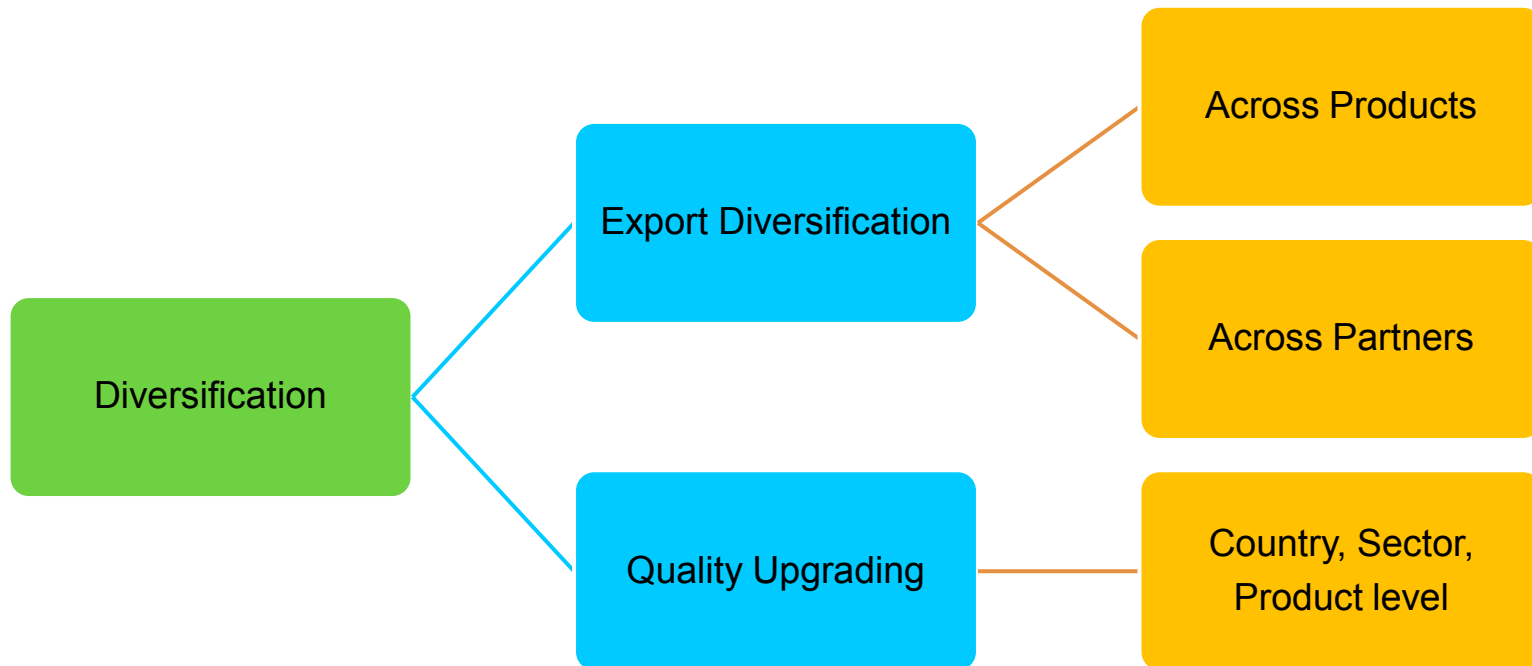
Export Diversification and Quality Upgrading: Evidence from a New Dataset

Chris Papageorgiou *IMF*

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The main diversification work team also comprises Sarwat Jahan, Giang Ho, Lisa Kolovich, under the overall guidance of Seán Nolan and Catherine Pattillo (SPR). We would like to thank for the support from Rich Amster, Qin Liu, Bindu Napa, Hua Zhang (TGS), Houda Berrada, Christopher Coakley, Jacqueline Deslauriers, Travis Wei (COM), Christian Henn (World Trade Organization), and Nikola Spatafora, Jose Romero (World Bank) to develop the toolkit.

Dimensions of Diversification



Export Diversification

Export Diversification Dataset

- **Diversification Index** (measured by Theil Index).

$$Theil = \frac{1}{N} \sum_{i=1}^N \frac{x_i}{\bar{x}} \cdot \ln \frac{x_i}{\bar{x}} = T_B + T_W$$

where x_i is the export value of product i , N is the number of products and \bar{x} is their average dollar value.

- **Extensive Margin** (measured by Between Theil).

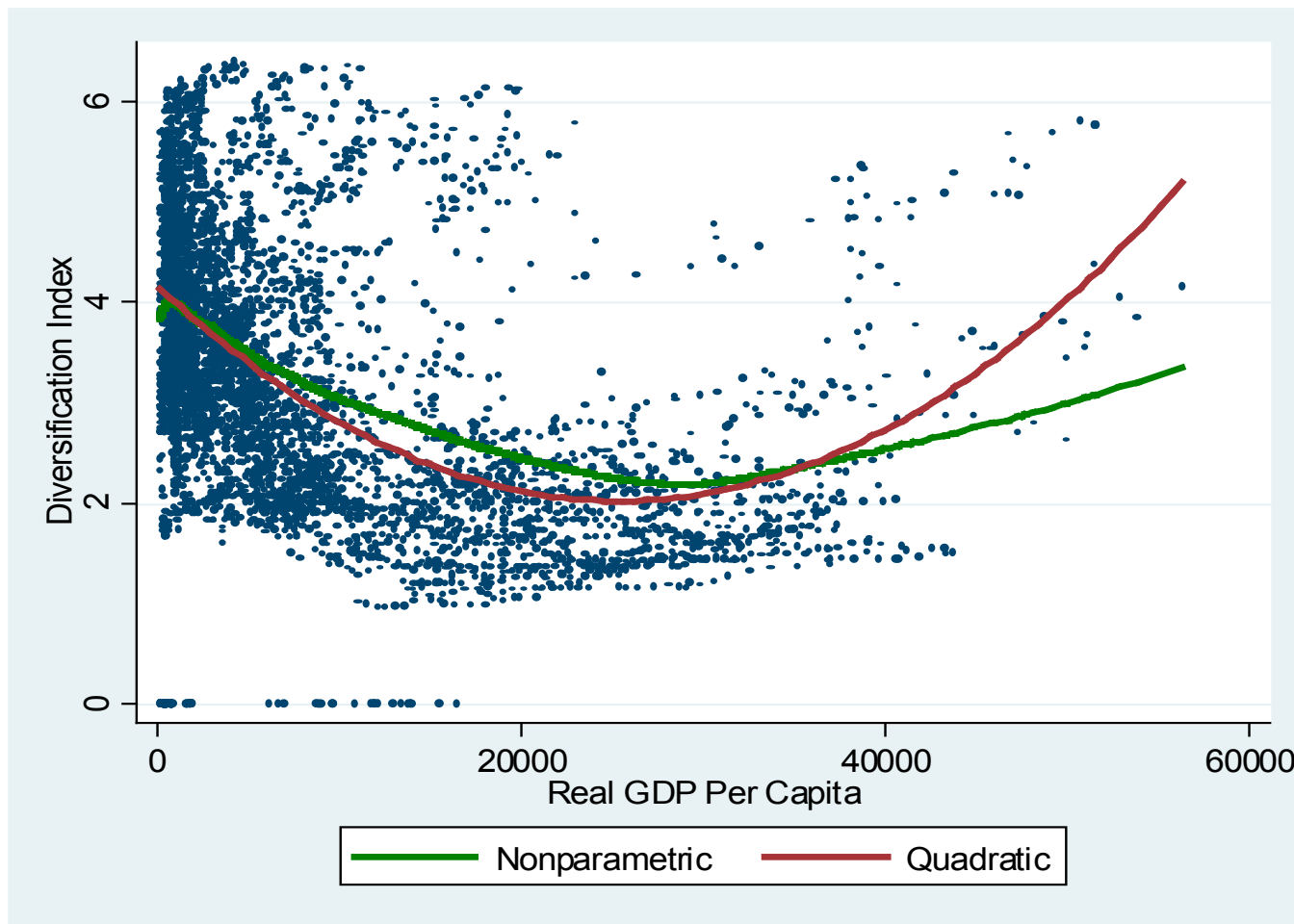
$$T_B = \sum_k (N_k/N) (\mu_k/\mu) \ln(\mu_k/\mu)$$

where k represents each group (traditional, new, and non-traded), N_k is the total number of products exported in each group, and μ_k/μ is the relative mean of exports in each group.

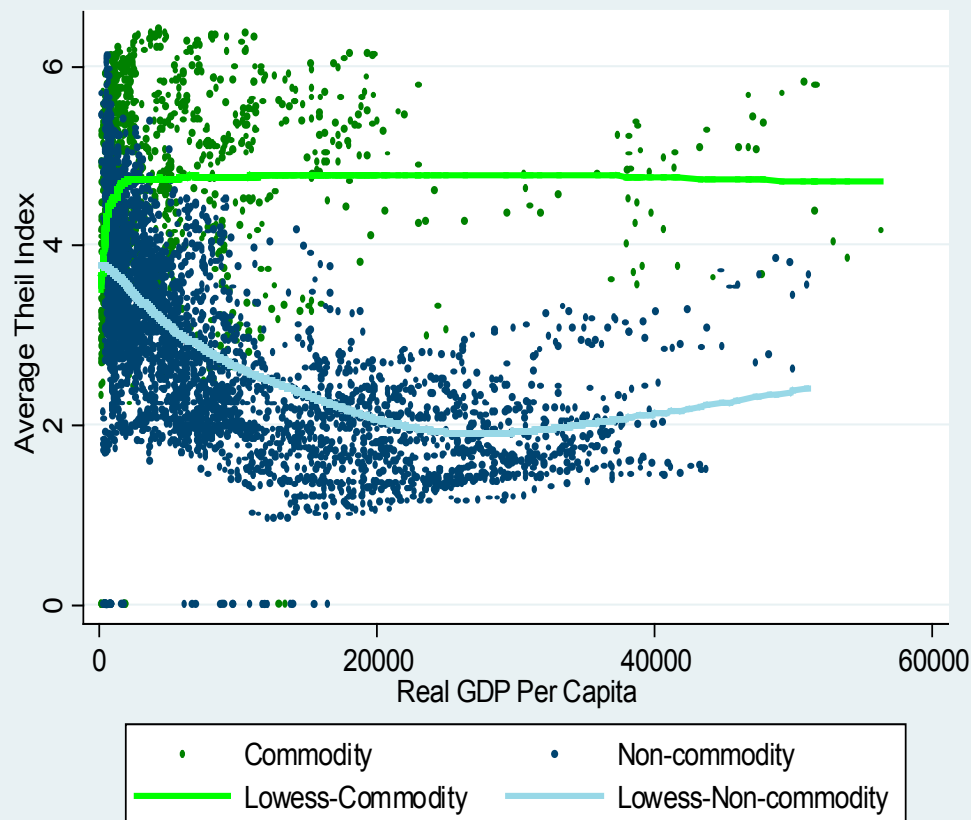
- **Intensive Margin** (measured by Within Theil).

$$T_W = \sum_k (N_k/N) (\mu_k/\mu) \{ (1/N_k) \sum_{i \in I_k} (x_i/\mu_k) \ln(x_i/\mu_k) \}$$

Export Diversification: Cross-Country



Trade Diversification vs. Per Capita Income



- Commodity exporters are characterized by high concentration...
- Commodity exporters are relatively undiversified.
- While diversification is clearly a desired strategy, the comparative advantage in primary commodities poses a challenge to deciding when to start the process of diversification to other activities.

Export Quality Dataset

Measures of Quality

Deriving a quality measure in 4 steps

1. **Motivation:** Construct a large export quality dataset that can also adequately reflect developing countries.
 - Latest-generation quality literature models demand (and supply) from microfoundations, but data requirements high:
 - Khandelwal (2010, REStud): based on US imports only
 - Hallak and Schott (2011, QJE): 43 “top” exporters 1989-2003
 - Feenstra and Romalis (2014, QJE): back to 1984 only and requiring detailed tariff data often not available

Measures of Quality

Deriving a quality measure in 4 steps

2. Estimation: Estimate a quality-augmented gravity equation, adapted from Hallak (2006), separately for 851 sectors. Objective is to adjust unit values for factors other than quality:

- High prices may also be an indicator of high production costs. Quality is high when high prices are accompanied by high market shares.
- Selection bias: only higher priced items shipped to far-away destinations.

Estimation Methodology

Deriving quality measures

Our methodology follows closely Hallak (2006, JIE).

- We specify a quality–augmented gravity equation, for each of 851 ISIC 4 digit products because preference for quality and trade costs vary by product.

$$\ln(Imports)_{mxt} = ImFE + ExFE + \alpha \ln Dist_{mx} + \beta I_{mxt} + \delta \ln \theta_{mxt} \ln y_{mt} + \varepsilon_{mxt} \quad (1)$$

- Then, unit values p are postulated to depend on quality θ , production technology (proxied by GDP p.c.), and distance:

$$\ln p_{mxt} = \zeta_0 + \zeta_1 \ln \theta_{xt} + \zeta_2 \ln y_{xt} + \zeta_3 \ln Dist_{mx} + \xi_{mxt} \quad (2)$$

- By rearranging (2) for quality θ , and plugging back into (1), we can eliminate unobservable quality and obtain the estimation eqn.

Estimation Methodology

Deriving quality measures

- Estimation equation:

$$\ln(Imports)_{mxt} = ImFE + ExFE + \alpha \ln Dist_{mx} + \beta I_{mxt} + \zeta'_1 \ln p_{mxt} \ln y_{mt} + \zeta'_2 \ln y_{xt} \ln y_{mt} + \zeta'_3 \ln Dist_{mx} \ln y_{mt} + \xi'_{mxt}$$

$$\text{where } \zeta'_1 = \frac{\delta}{\zeta_1} \quad \zeta'_2 = -\frac{\delta \zeta_2}{\zeta_1} \quad \zeta'_3 = -\frac{\delta \zeta_3}{\zeta_1} \quad \xi'_{mxt} = -\frac{\delta \zeta'_0 + \delta \xi_{mxt}}{\zeta_1} \ln y_{mt} + \varepsilon_{mxt}$$

We obtain estimates by two stage least squares, because ξ_{mxt} is a component of p_{xmt} , so that the regressor $\ln p_{xmt} \ln y_{mt}$ is correlated with the disturbance term ξ'_{mxt} . We thus use $\ln p_{xmt-1} \ln y_{mt}$ as an instrument for $\ln p_{xmt} \ln y_{mt}$.

Export Quality Dataset

Rearranging the price equation (2), we use the parameter estimates from our quality augmented gravity equation to calculate a comprehensive set of quality estimates for each of 851 products:

$$\text{Quality estimate}_{mxt} = \delta \ln \theta_{mxt} = \zeta_1' \ln p_{mxt} + \zeta_2' \ln y_{xt} + \zeta_3' \ln \text{Dist}_{mx}$$

where the subscripts m , x , and t denote, respectively, importer, exporter, and time period.

Prices reflect three factors.

- First, unobservable quality θ_{mxt}
- Second, exporter income per capita y_{xt}
- Third, the distance between importer and exporter, Dist_{mx}

For further reference on construction of index and applications see:

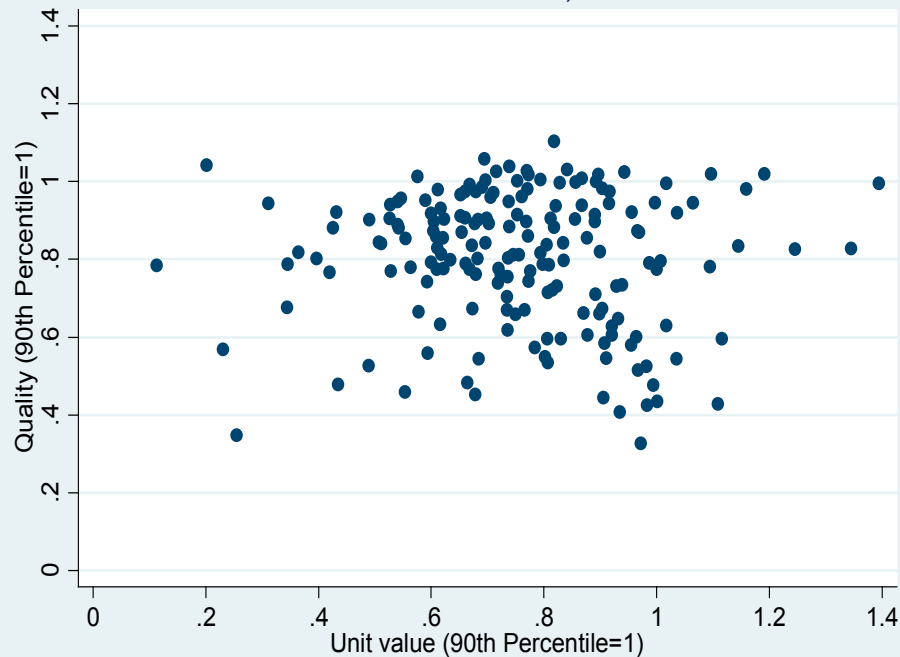
“Export Quality in Developing Countries”. IMF Working Paper by Henn, Papageorgiou, and Spatafora (2013)

Unit Values vs Quality

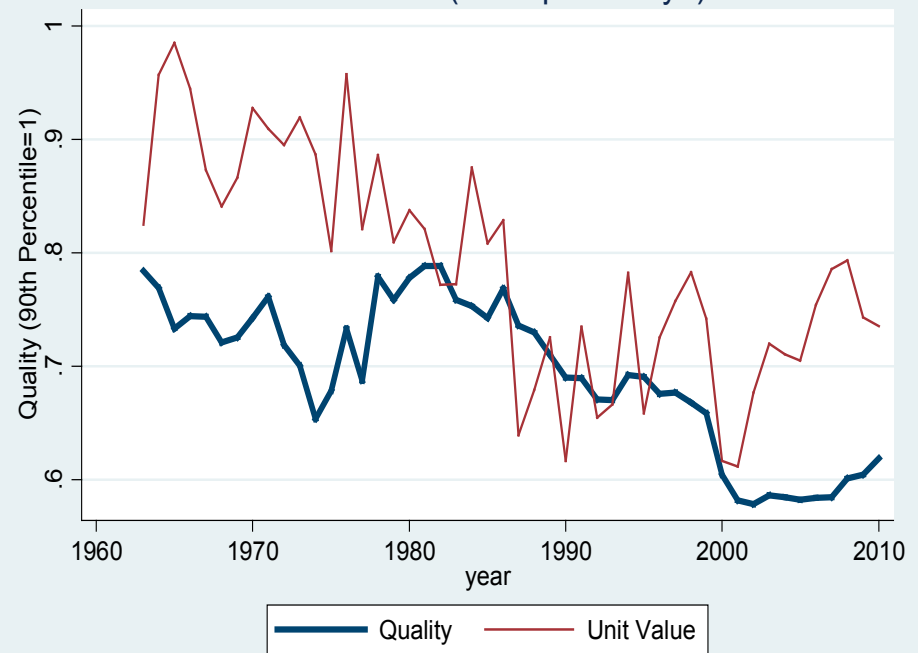
A comparison

- Unit values are a lot more dispersed across countries and volatile across time than quality estimates.
- Quality generally evolves gradually over time.

Across countries, 2010



Across time (Example: Kenya)



Quality Upgrading Illustrating the Toolkit

The Toolkit

- Broadest set of quality estimates to date covering 178 countries during 1962-2010. More than 21 million quality estimates at 'importer-exporter-year-product-unit of measurement' level.
- Toolkit is publicly available at IMF website and contains exporter country totals and 3 different breakdowns:
 - **SITC 4, 3, 2, 1 digit**
 - Over 1.5 million quality estimates available at the SITC 4-digit level (after aggregating over importers and units of measurement)
 - **BEC 3, 2, 1 digit**
 - BEC1: Useful breakdown into intermediate products, capital goods and consumer goods
 - BEC2: Distinguishes e.g. (i) between primary and processed varieties and (ii) consumer durables and non-durables.
 - **3 broad custom categories**
 - Manufactures, Agriculture, and Natural Resources

Export Quality Database

- Broadest set of quality estimates to date covering **178 countries during 1962-2010**. Roughly 21 million quality estimates at ‘importer-exporter-year-product-unit of measurement’ level.
- Quality Indicators are available at different product classifications and sectoral levels:

SITC

(Overall Index;
1 to 4 digit levels)

- **SITC 0: TOTAL : All commodities**
- **SITC 1 digit (SITC1)**
 - 0 : Food and live animals
 - 1 : Beverages and tobacco
 - 2 : Crude materials, inedible, except fuels
 - 3 : Mineral fuels, lubricants and related materials
 - 4 : Animal and vegetable oils and fats
 - 5 : Chemicals
 - 6 : Manufacture goods classified chiefly by material
 - 7 : Machinery and transport equipment
 - 8 : Miscellaneous manufactured articles
 - 9 : Other

ACM

(1 to 2 digit levels)

- **ACM 1 digit (acm1)**
 - agriculture
 - commodities
 - manufactures
- **ACM 2 digit (acm2)**
 - agricultural food and live animals
 - agricultural raw materials
 - non-fuel (non-ag) commodities
 - fuel (non-ag) commodities
 - manufactures

BEC

(1 to 3 digit levels)

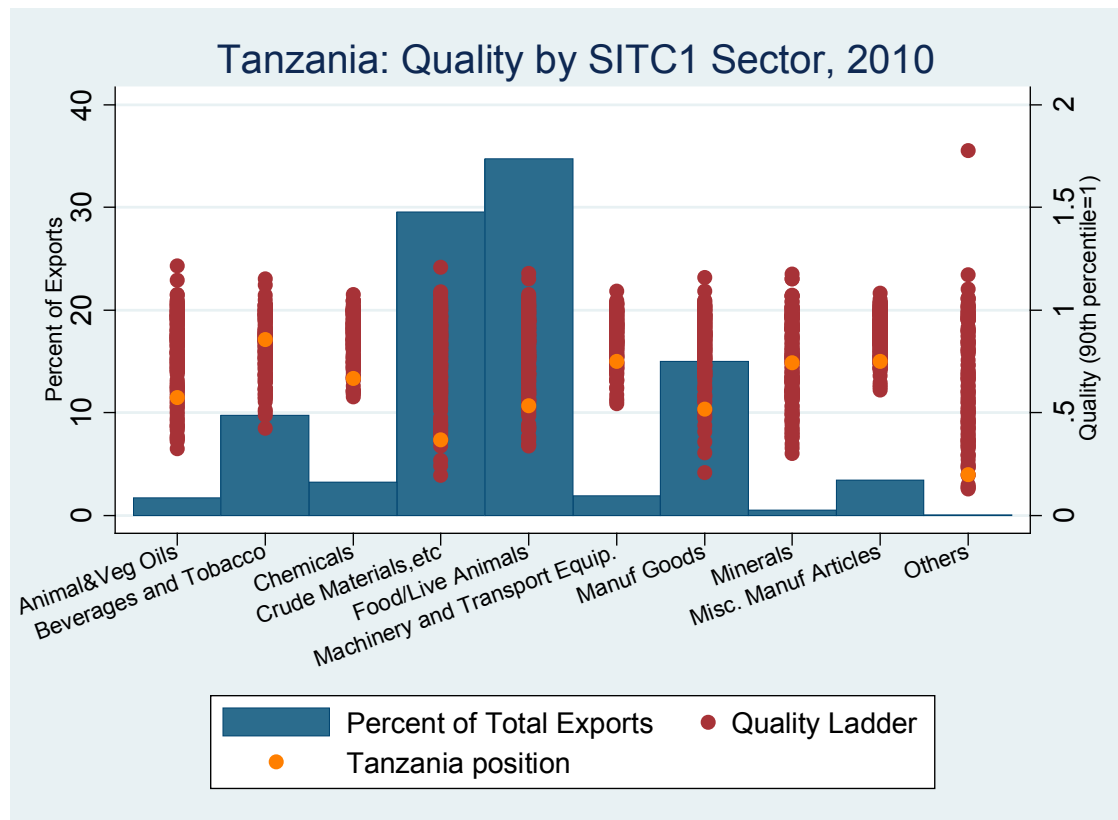
- **BEC 1 digit (bec1)**
 - 1: Food and Beverages
 - 2: Industrial Supplies
 - 3: Fuels and lubricants
 - 4: Capital goods
 - 5: Transport equipment
 - 6: Consumer goods
 - 7: Goods not elsewhere specified

Quality Ladders

Quality Ladders

Tanzania

- Given its concentration in agricultural products and crude materials, Tanzania has potential for horizontal diversification but also for quality upgrading in agriculture.



Quality Ladders

What is next for China?

- China has some additional potential for quality upgrading, but may also aim to diversify further across products and upgrade the tasks it performs.



Quality Ladders

China: zooming into subsectors

- Within its two strongest SITC1 sectors, China's exports seem tilted towards less sophisticated products, e.g. transport equipment is lagging behind other machinery.



Quality Ladders

China: zooming into subsectors

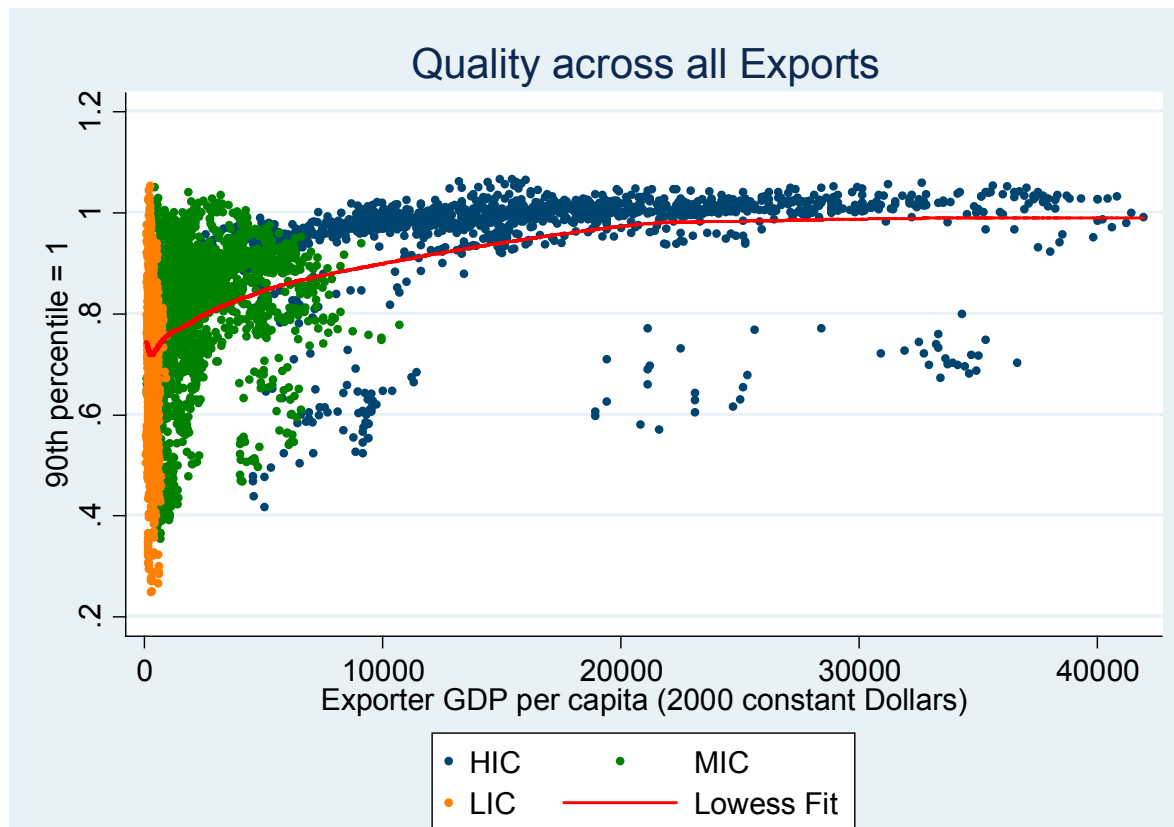
- Likewise clothing still dominates within Miscellaneous Manufactures.



Quality Upgrading Cross-country Stylized Facts

Export Quality and Development

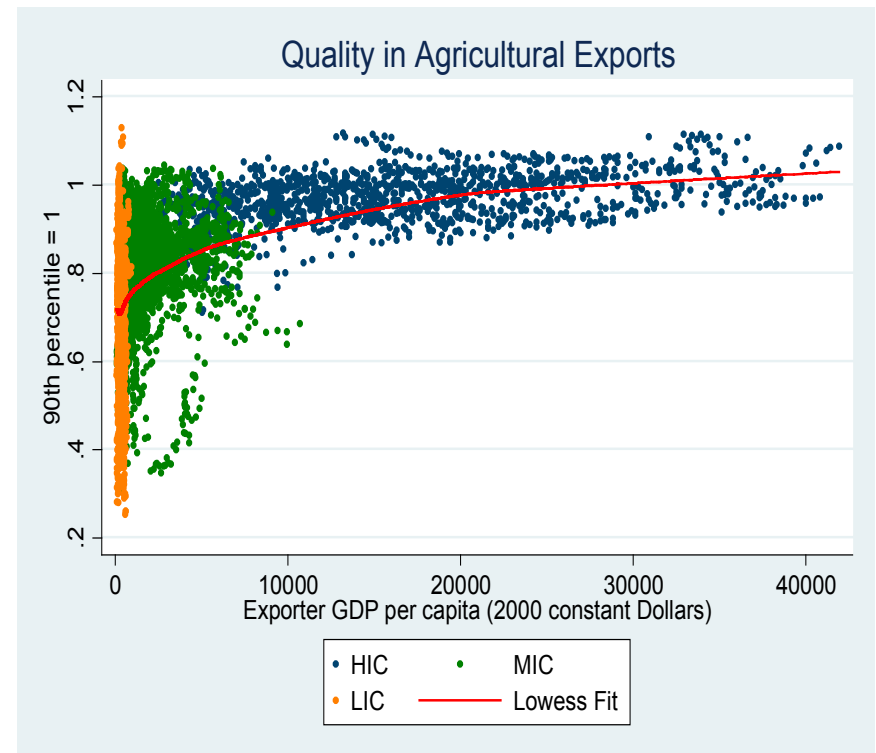
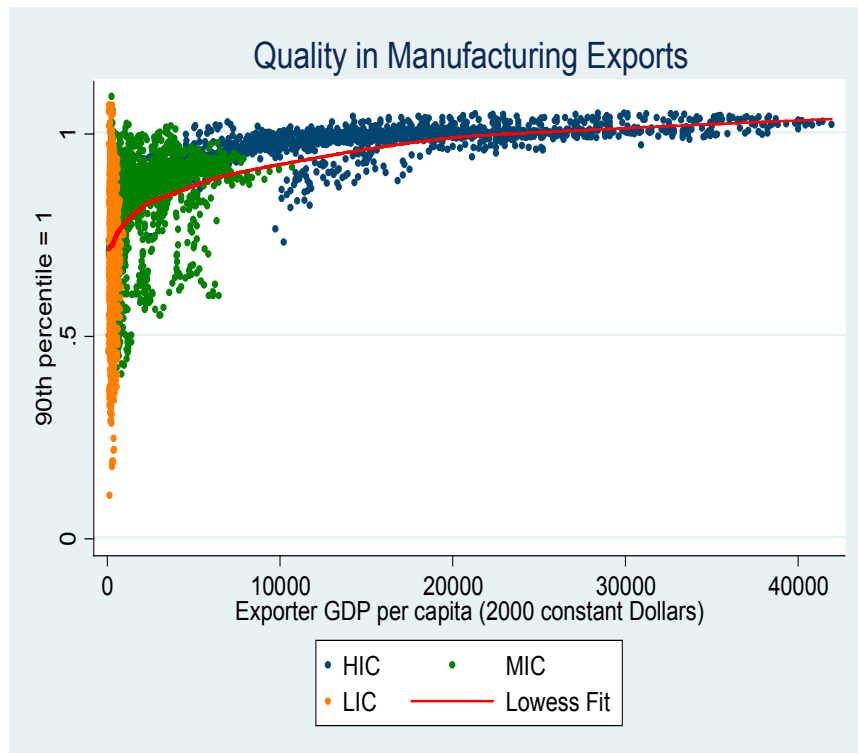
- Quality upgrading is a crucial component of development, particularly when trying to move to upper middle-income status
 - Opportunities in manufacturing, but also agriculture
- Some countries need diversification, others need quality upgrading.



Export Quality and Development

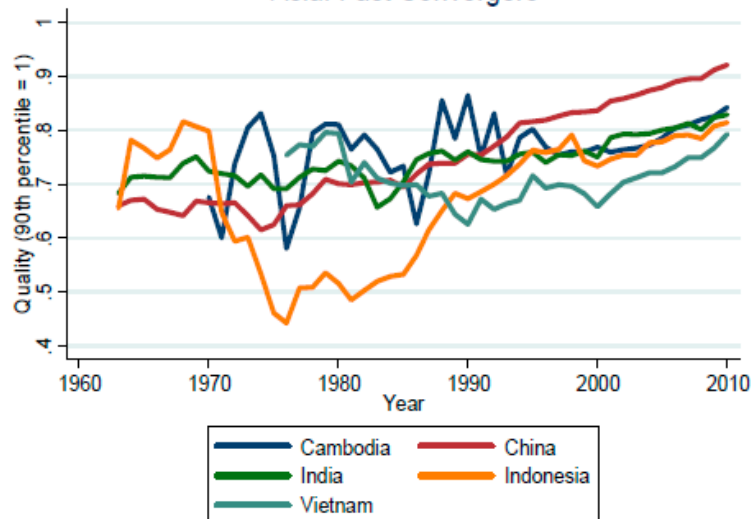
Manufacturing and Agriculture

- There seems to be potential to also quality upgrade in agriculture, though it may be more constrained by soil and climate conditions.

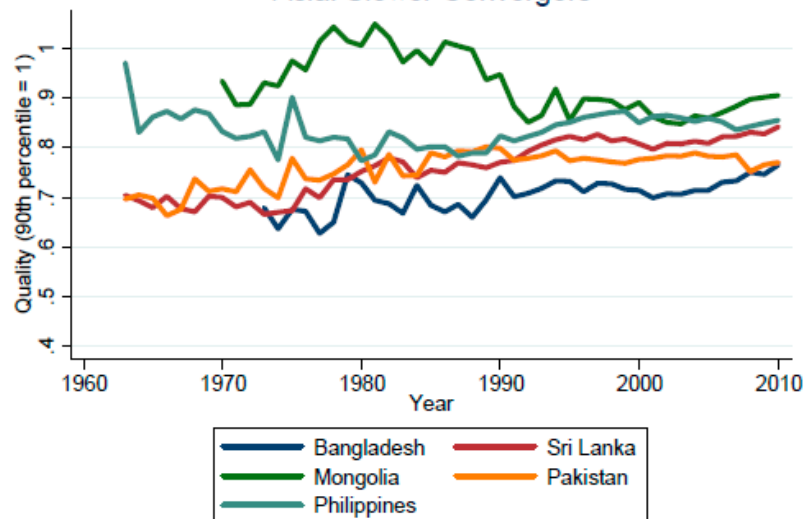


Cross-country Heterogeneity

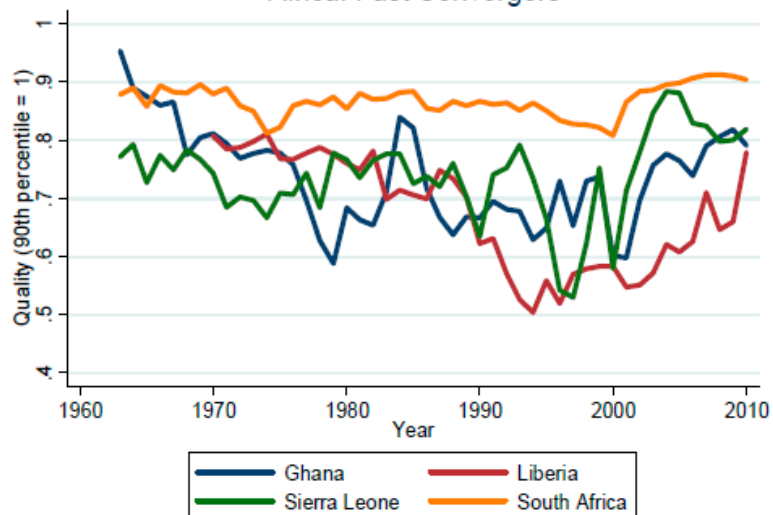
Asia: Fast Convergers



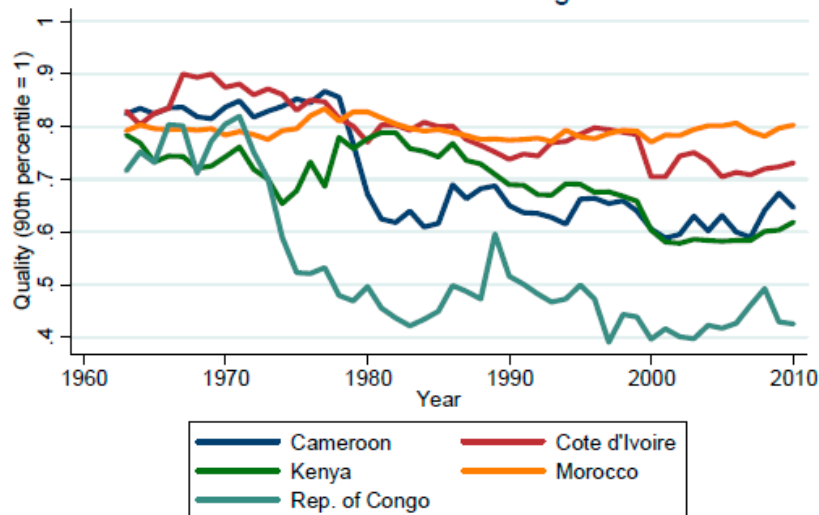
Asia: Slower Convergers



Africa: Fast Convergers



Africa: Slower Convergers



Note: Countries with quality convergence of at least 0.05 between the 1994–96 and 2008–10 periods are assigned to the fast converger group

Potential for Quality Upgrading

- Quality demanded in destination markets is not an apparent constraint. Policy may thus aim at encouraging domestic quality upgrading itself, rather than on helping domestic firms enter higher quality export markets.



Determinants of Quality

Empirical strategy

Panel analysis

- Dependent variable: Growth Rate of Quality.
- One observation per exporter-4-digit-product-time period.
- Focus on 10-year averages.
- Independent variables:
 - * Initial Quality Levels
 - * GDP per Capita
 - * Institutional Quality
 - * Trade, Agricultural, and Financial Liberalization indices
 - * Human Capital
- 2 sets of fixed effects:
 - * Country, product, and time (basic specific.)
 - * Country-product and product-time (preferred specific.)

Results

	Preferred specification 2/		
	Manufacturing	Agriculture	Natural Res.
Ln(Initial Quality)	-13.9*** (0.12)	-13.9*** (0.17)	-13.4*** (0.34)
Ln(Initial GDP p.c.)	0.319*** (0.0305)	0.355*** (0.0877)	-0.0626 (0.1560)
Initial Institutional Quality	0.0048*** (0.0009)	0.0077*** (0.0023)	0.0048 (0.0046)
Initial Human Capital	0.0059*** (0.0018)	0.0053 (0.0050)	-0.0071 (0.0094)
Initial FDI inflows	0.0062** (0.0028)	0.0070 (0.0073)	0.0596*** (0.0152)
Initial Trade Lib.	0.3950*** (0.0657)	0.8000*** (0.1890)	0.2390 (0.3440)
Initial Agric. Lib.		0.0435 (0.1380)	
Observations	98,746	29,802	8,365
R-squared	0.838	0.839	0.834

Notes: All equations estimated using observations averaged of 10-year non-overlapping periods. The dependent variables is the annualized growth rate of product quality. *, **, and *** denote statistical significance at the 10 percent, 5 percent and 1 percent level,

1/ Includes country, product and time fixed effects.

2/ Includes country-product and product-time fixed effects.

- Strong within-product **quality convergence** is most important determinant:
 - Applies across all sectors
 - But subject to country-product specific obstacles (captured by FEs)
- Quality upgrading in ag. & mfg. is underpinned by:
 - Higher income (and likely associated network effects)
 - Institutions
 - Liberal trade policies
- Human capital and FDI matter for mfg.
- For natural resources, only FDI is important

[To basic spec](#) →

IMF website: <https://www.imf.org/external/np/res/dfidimf/diversification.htm>

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About Quality Index

IMF Policy Paper on Export Diversification

Background Notes

Macro Research for Development: An IMF-DFID Collaboration

Growth through Diversification

Contact us

diversification@imf.org

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MACRO RESEARCH FOR DEVELOPMENT: AN IMF-DFID COLLABORATION

The Export Diversification and Quality Databases (Spring 2014)

Last Updated: May 23, 2014

About the databases

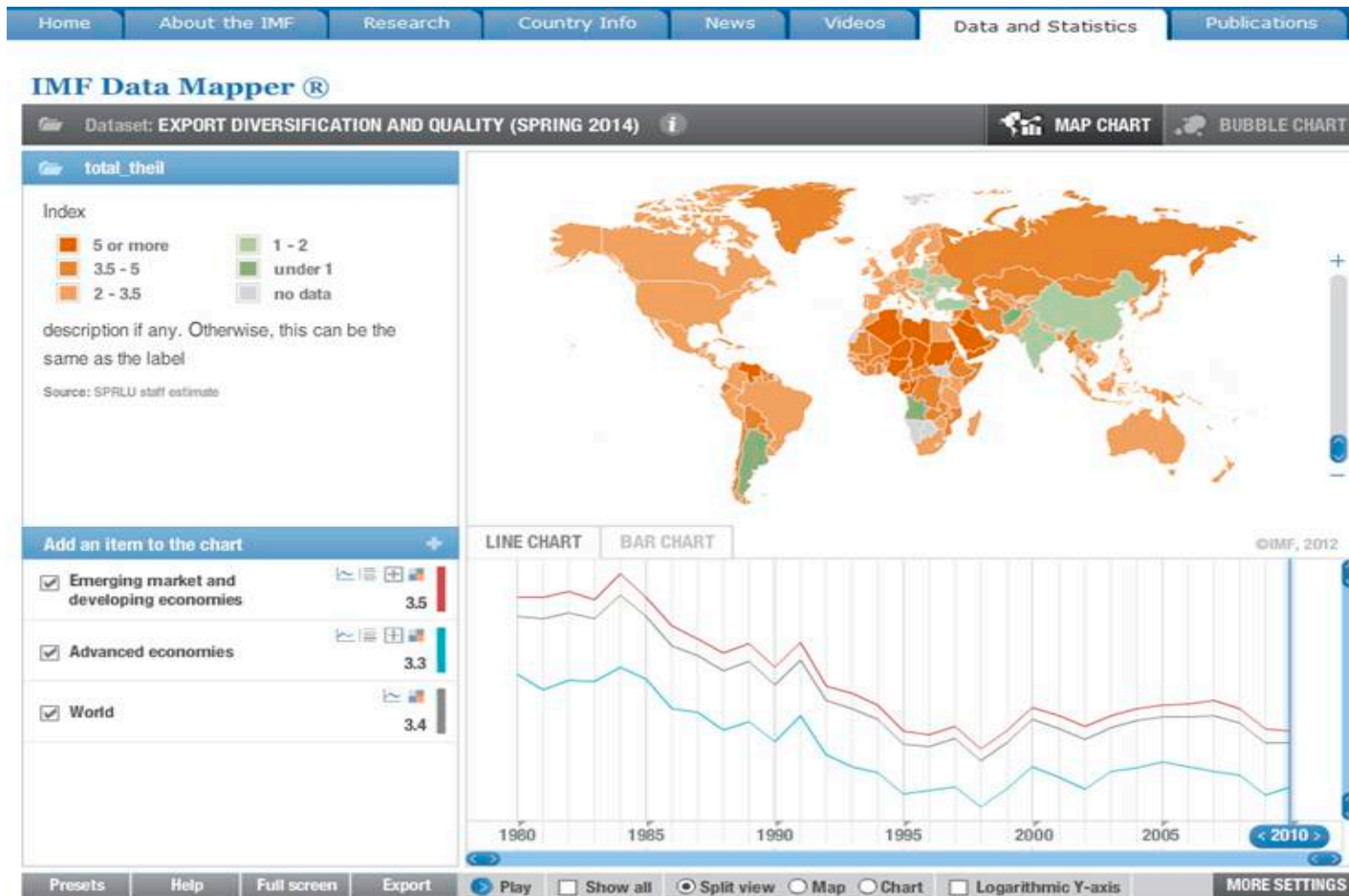
Covering 187 countries including most low-income countries, the toolkit provides indicators on export product diversification and export product quality from 1962-2010. The measures in this toolkit are based on an updated version of the UN-NBER dataset, which harmonizes COMTRADE bilateral trade flow data at the 4-digit SITC (Rev. 1) level. The export diversification and quality database was developed by IMF staff under an IMF-DFID research collaboration.

The Export Diversification Database has three main indicators: the Export Diversification Index, the Extensive Margin, and the Intensive Margin. Higher values for the all three indices indicate lower diversification. The Export Quality Database contains export quality measures across different aggregation levels of export products. Higher values for the quality indices indicate higher quality levels.

Download the entire databases (Excel/CSV format)

- Export Diversification Database
Size: 265 Kb
- Export Quality Database
 - Quality Index: Overall and 1 digit level
Size: 858 Kb
 - Quality Index: 2 digit level
Size: 4 MB

IMF Data Mapper



Summary of Findings

- Development is strongly associated with export quality.
 - Exploiting the quality margin may be as important for development in early stages as moving into new higher-value-added products.
 - Agriculture also holds quality improvement potential.
- Evidence of within-product quality convergence suggests that entrance into 'long-quality-ladder' sectors today may partly determine longer run growth.
- Strong quality convergence found for many development success stories (e.g. East Asia).

Policy implications

- Creating favorable conditions for quality upgrading can likely underpin development:
 - Institutional development, liberal trade policies and education seem to favor quality upgrading.
 - Meanwhile, absorption potential of destination markets for higher quality products is generally not a constraint.
 - However, each country is different, requiring a customized strategy.
 - For some quality upgrading holds great promise, while others may need to diversify first into other sectors to build quality upgrading potential.



Thank You