Agricultural Development for Food Security: Addressing Challenges to Technological Transformation, Sustainability, and Good Governance.
In Honor of Cristina C. David
6 November, 2024, ADB

Rural Transformation in China and Other Developing Asian Countries

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I dedicate this presentation to my esteemed mentor Dr. Cristina C. David

- **to honor her important contributions to agricultural development and food policy, and**
- **to thank her for nurturing me:**
  - **Guiding me in writing academic papers**, for examples:
    - Huang, Jikun, **Cristina c. David**, and Bart Duff. 1991. Rice in Asia: Is It Becoming An Inferior Good? Comment, ***American Journal of Agricultural Economics***, 73 (1991): 515-521.
    - Huang, Jikun and **Cristina C. David**. 1993. Demand for Cereal Grains in Asia: the Effect of Urbanization, ***Agricultural Economics***, 8 (1993): 107-124.
  - **Guiding me working for agricultural and food policy**
    - **David, Cristina C**. and Jikun Huang. 1996. Political Economy of Rice Price Protection in Asia, ***Economic Development and Cultural Change***, 44 (1996): 463-483.
  -

Outline of presentation

- **Agricultural growth, rural transformation and major driving forces in China**
- **Major challenges and recent policy responses in China**
- **International comparison of rural transformation: China and other Asian developing countries**
- **Concluding remarks**

Percentages of China's population and natural resources in the world

- **Population:** 18%
- **Fresh water:** 6%
- **Cultivated land:** 9%

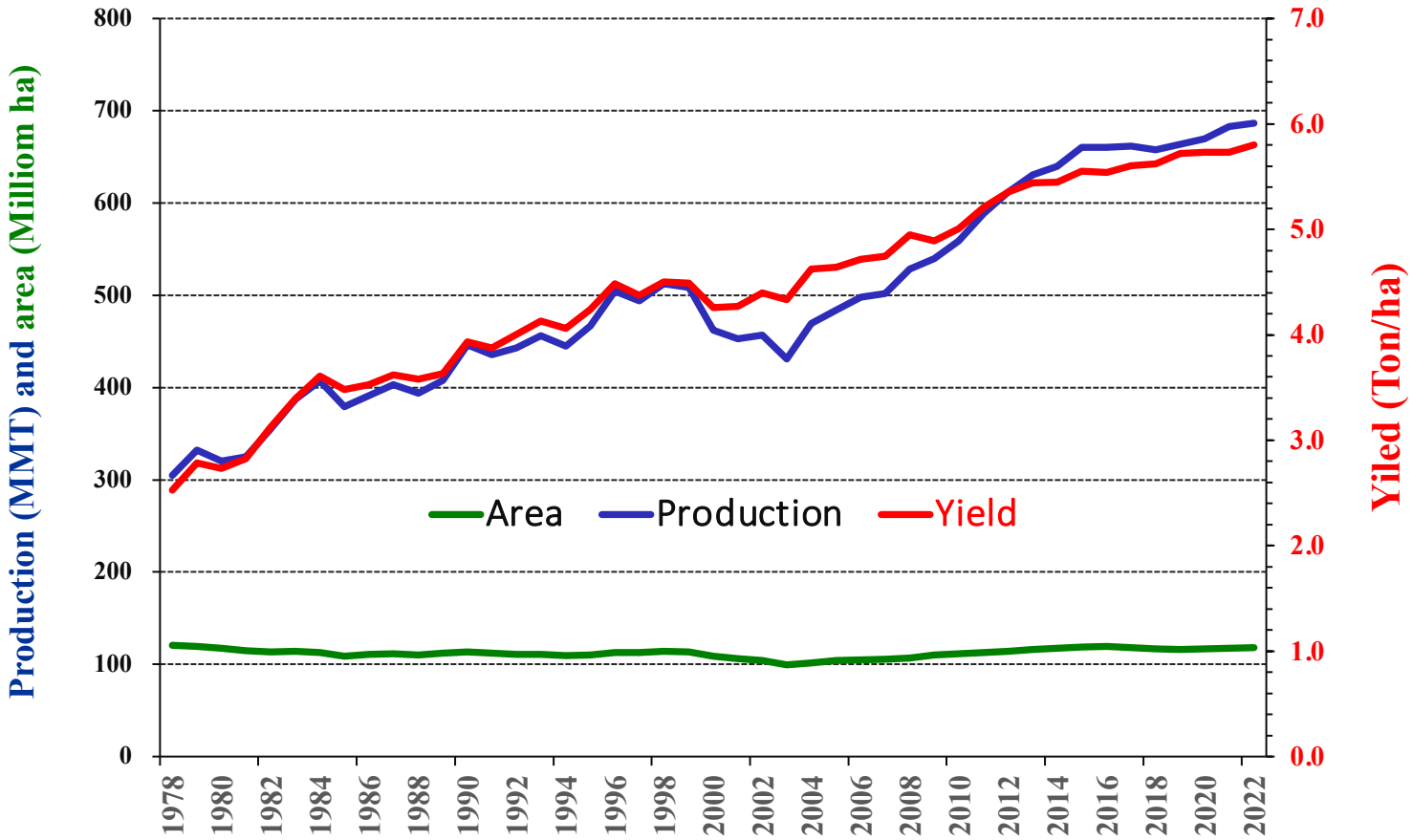
Food security and poverty in China

- **Undernourished population:** 23% in 1990 → <2.5% in 2020
- **Stunting rate under the age of five :** 32% in 1992 → 3.3% in 2020
- **Rural poverty incidence:** 98% in 1978 → ≈ 0% in 2020

✓ **Annual growth rate of agricultural value in past 4 decades > 5%**

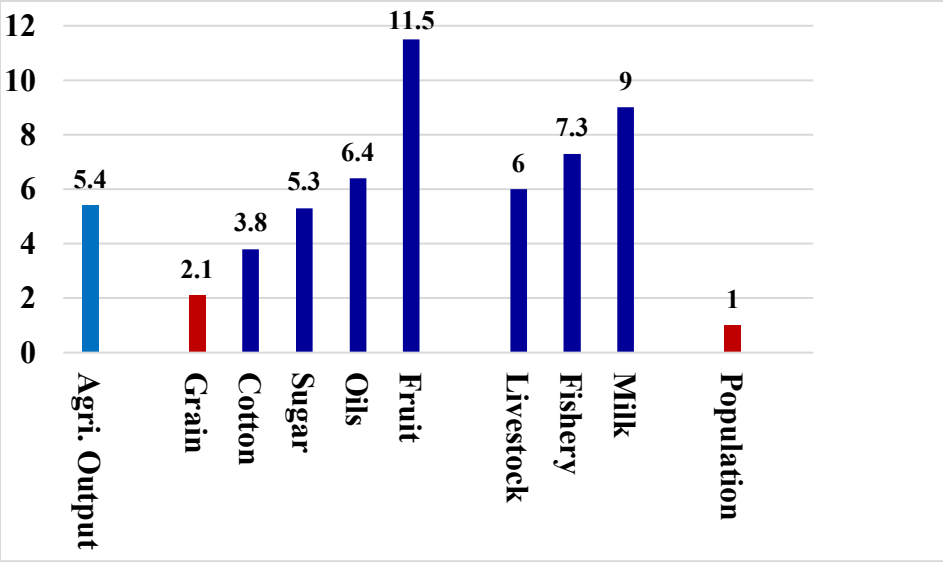
✓ **Rapid and inclusive rural transformation**

Grain area, yield and production in 1978-2022

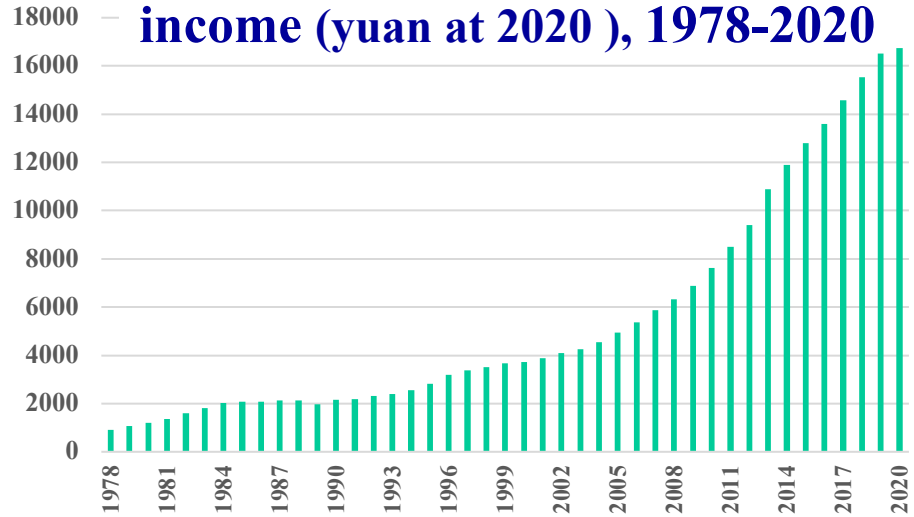


	Grain area/total crop area %
1978	80
2022	70

Annual growth of agriculture and population in the past 4 decades, %



Rural household per capita income (yuan at 2020), 1978-2020



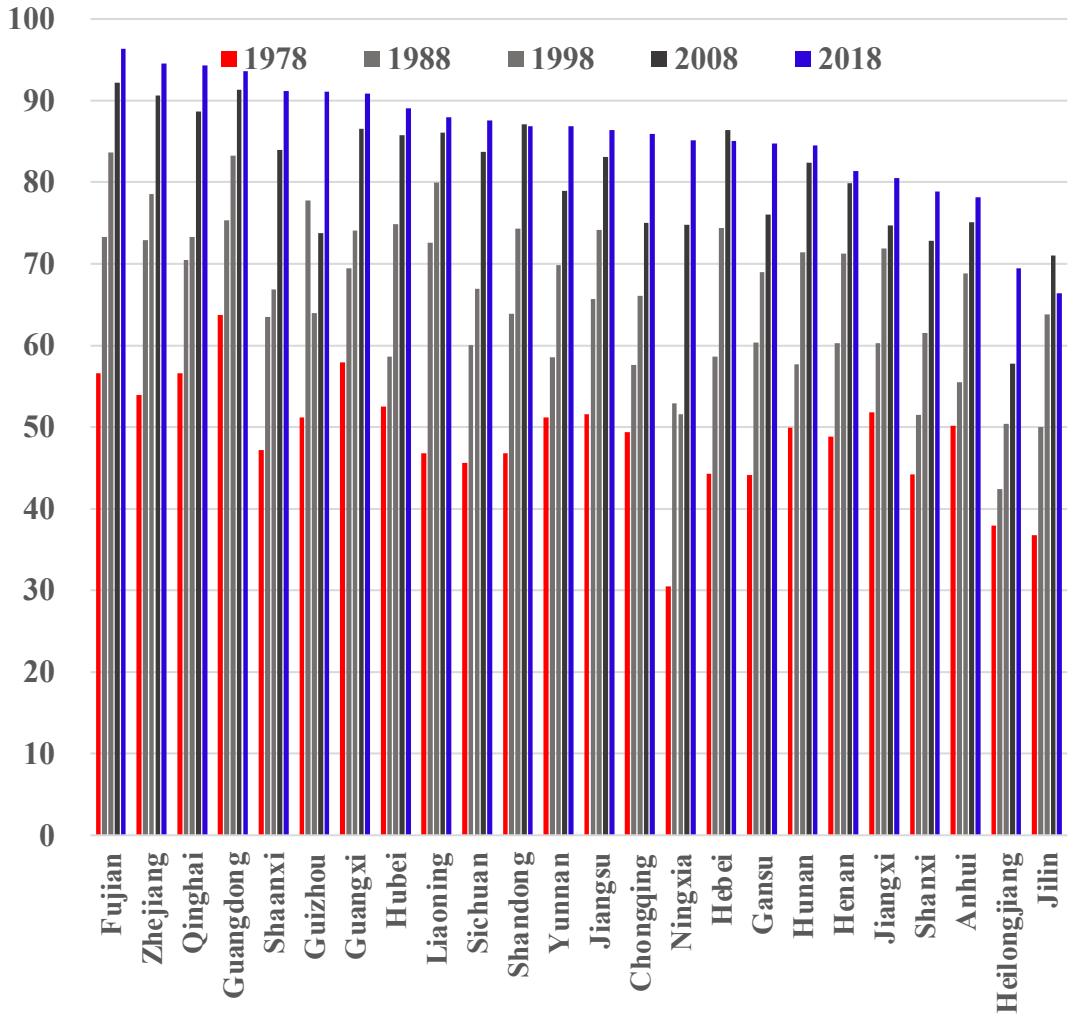
Rural labor transformation

Share of rural labor with full or part-time **non-farm works**

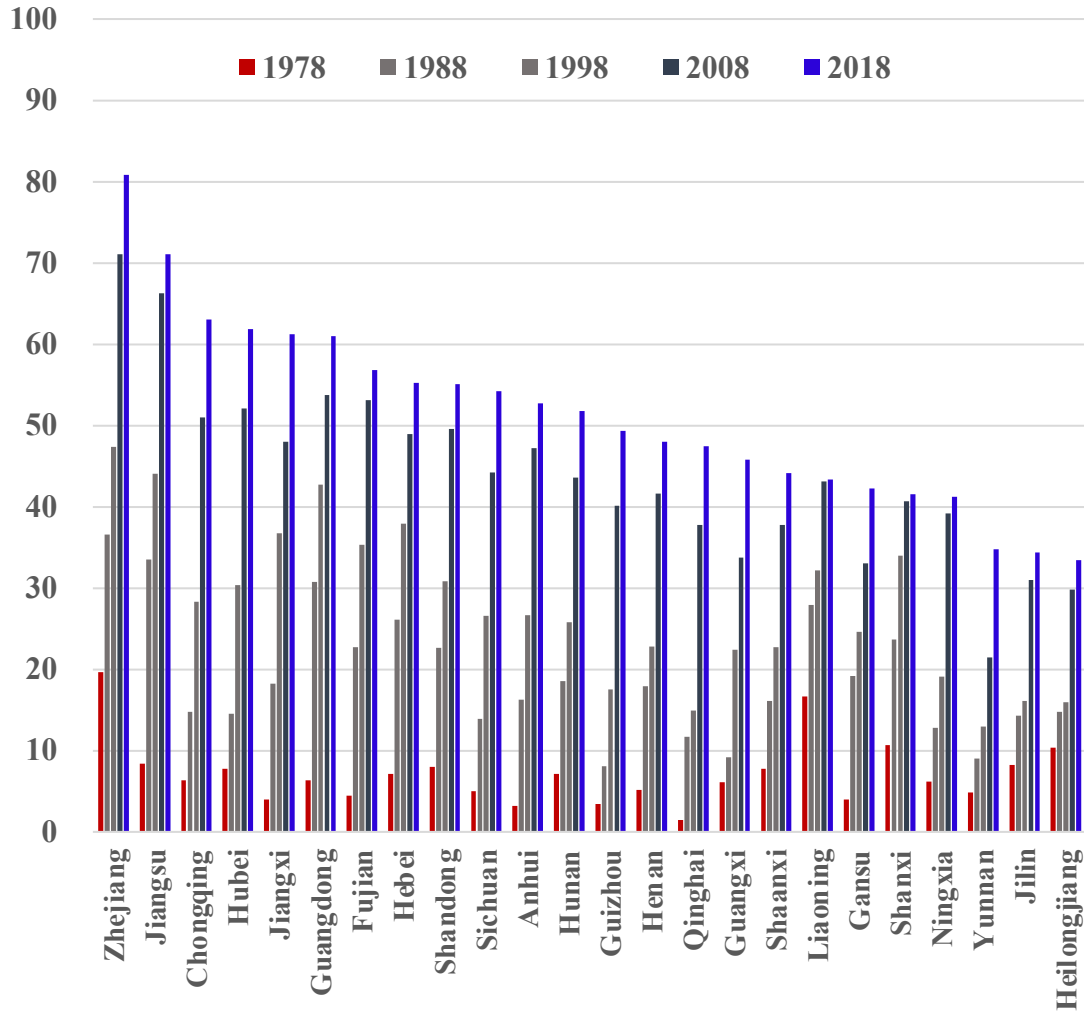
- **1978: 9%**
- **2020: 85%**

Agricultural growth + non-farm work
→ Income growth
→ improve national & household food security

Rural transformation within agriculture (RT1): Share of high-value agriculture (non-grain) in 1978-2018

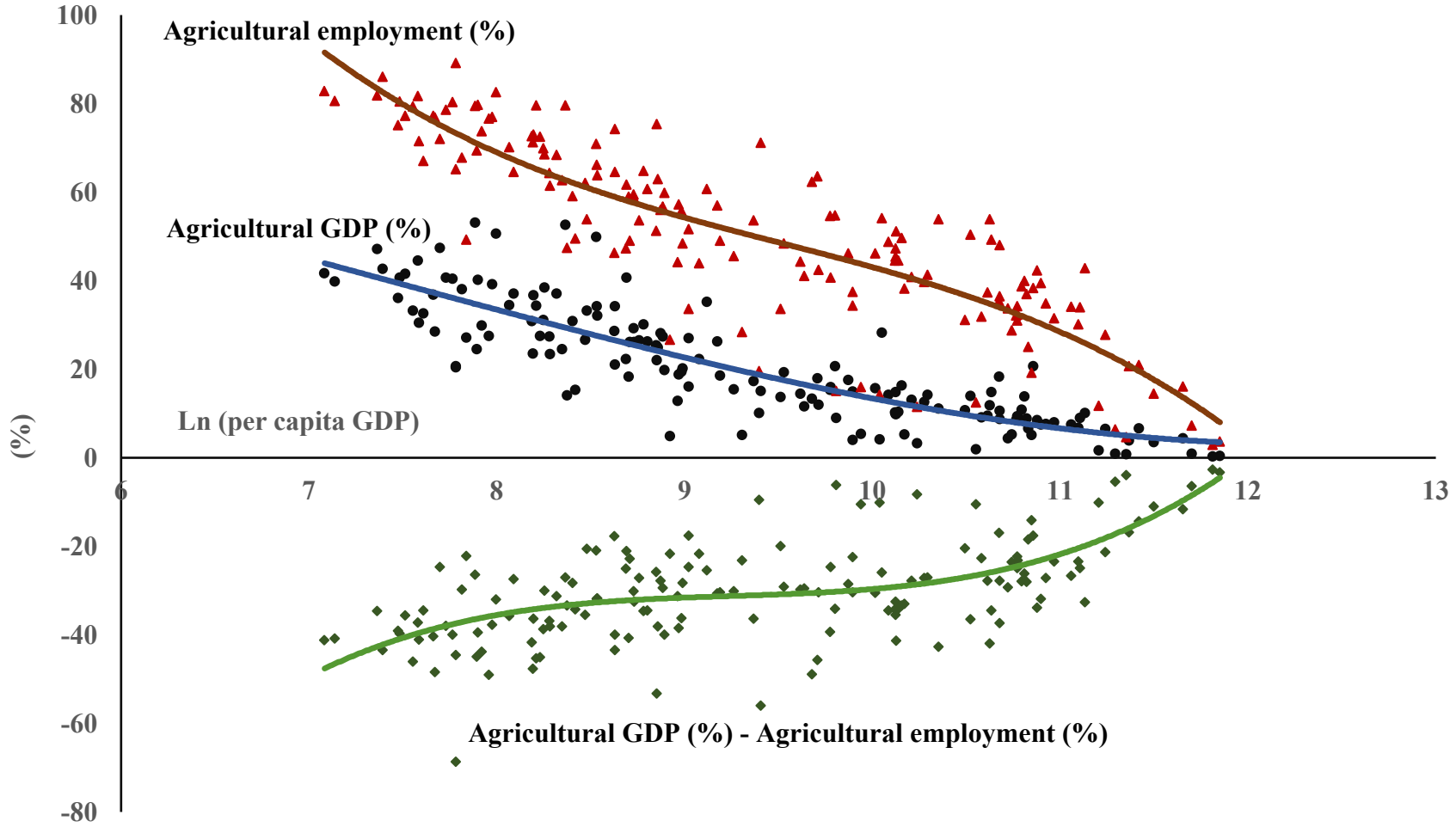


Rural transformation of employment (RT2): Share of rural labor in non-farm employment in 1978-2018



Structural transformation (ST) in China

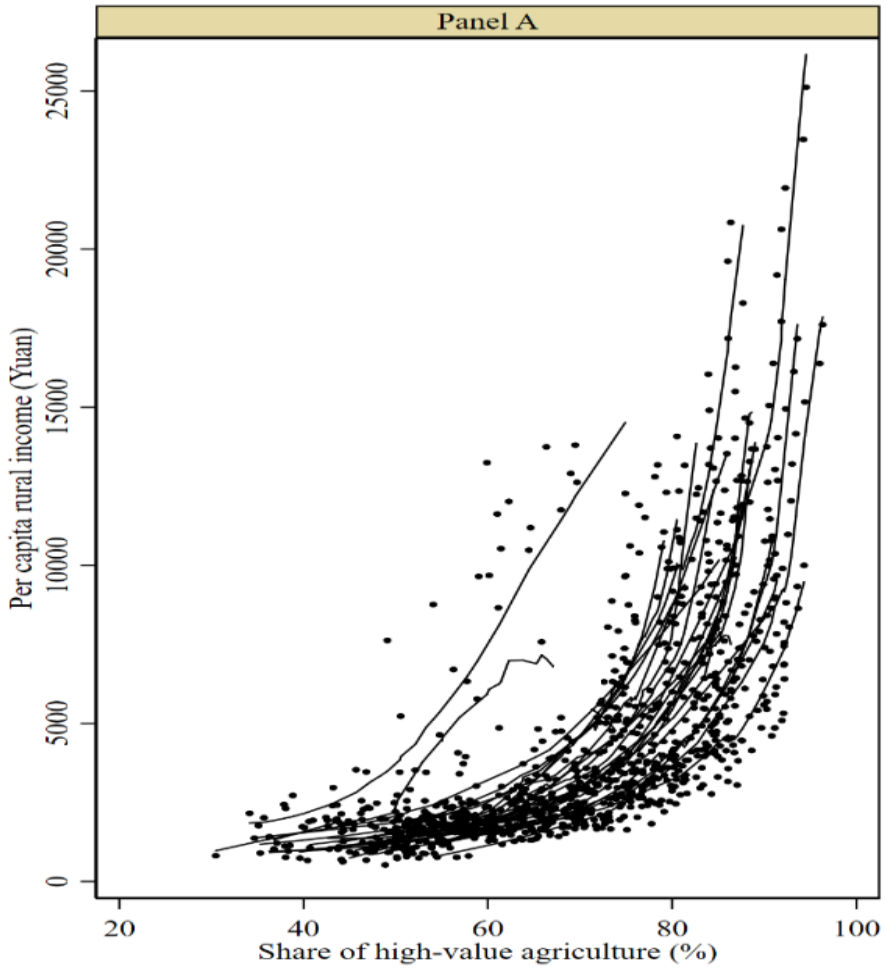
Convergence of shares of agricultural GDP and employment by province in 1978-2018

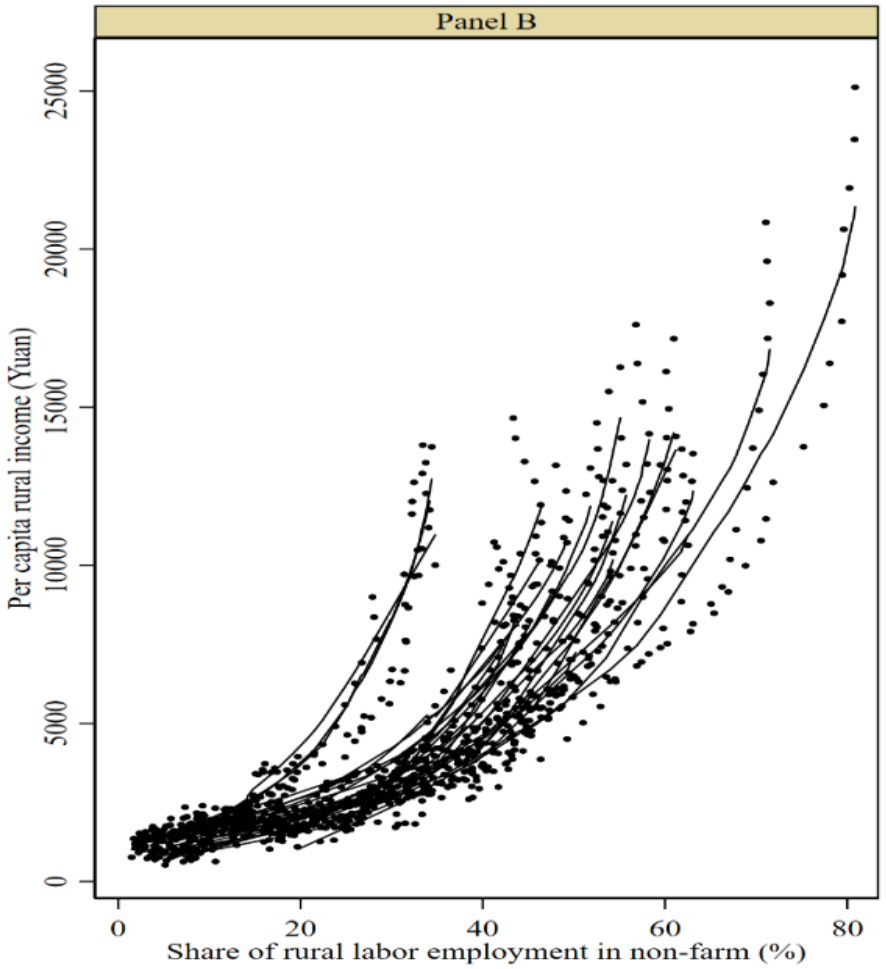


Pathway of rural transformations in China

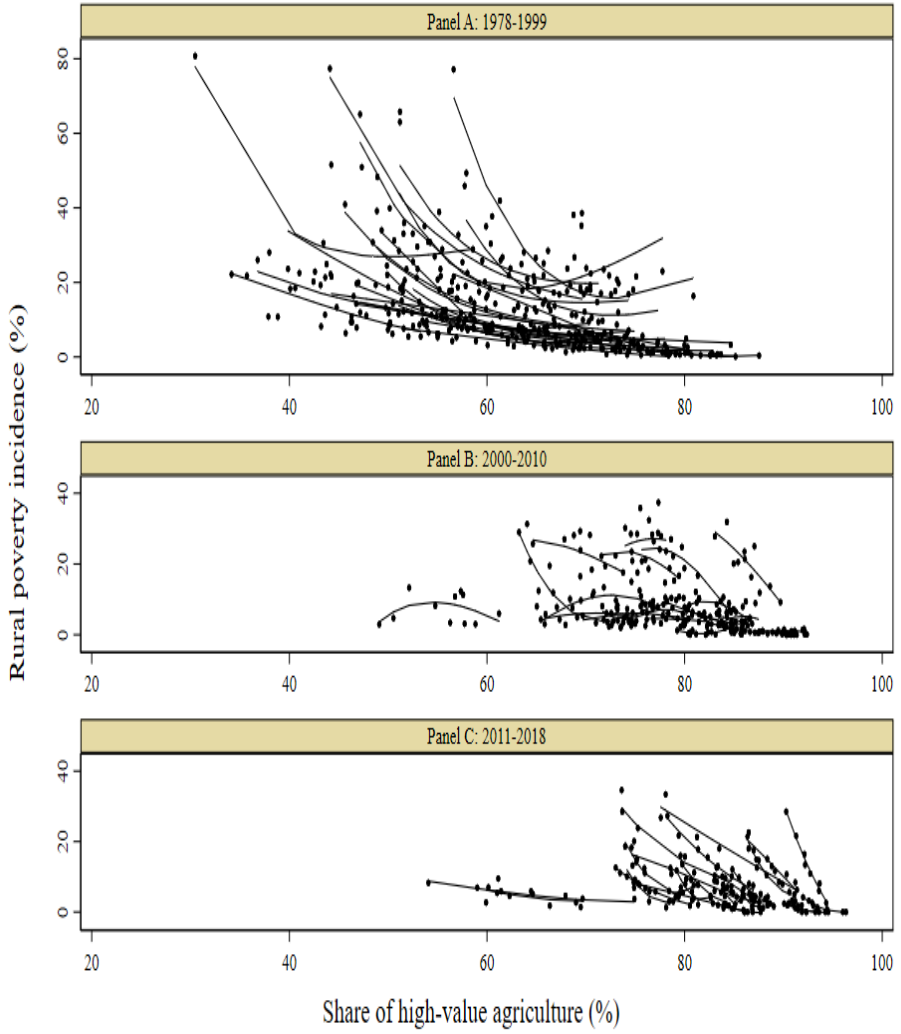
	Paths of Transformation
1	**Primary on staple food production:** before the early 1990s
2	**Diversification/commercialization:** since the early 1990s
3	**Farming + part time off-farm:** since the middle 1990s **Mechanization + full time off-farm:** since the late 1990s
4	**Grain security + high value agriculture**: since 2000 **Integrated urban-rural:** since the middle 2000s **Green agriculture:** since the middle 2010s

Rural transformation and per capita rural income by province in 1978–2018

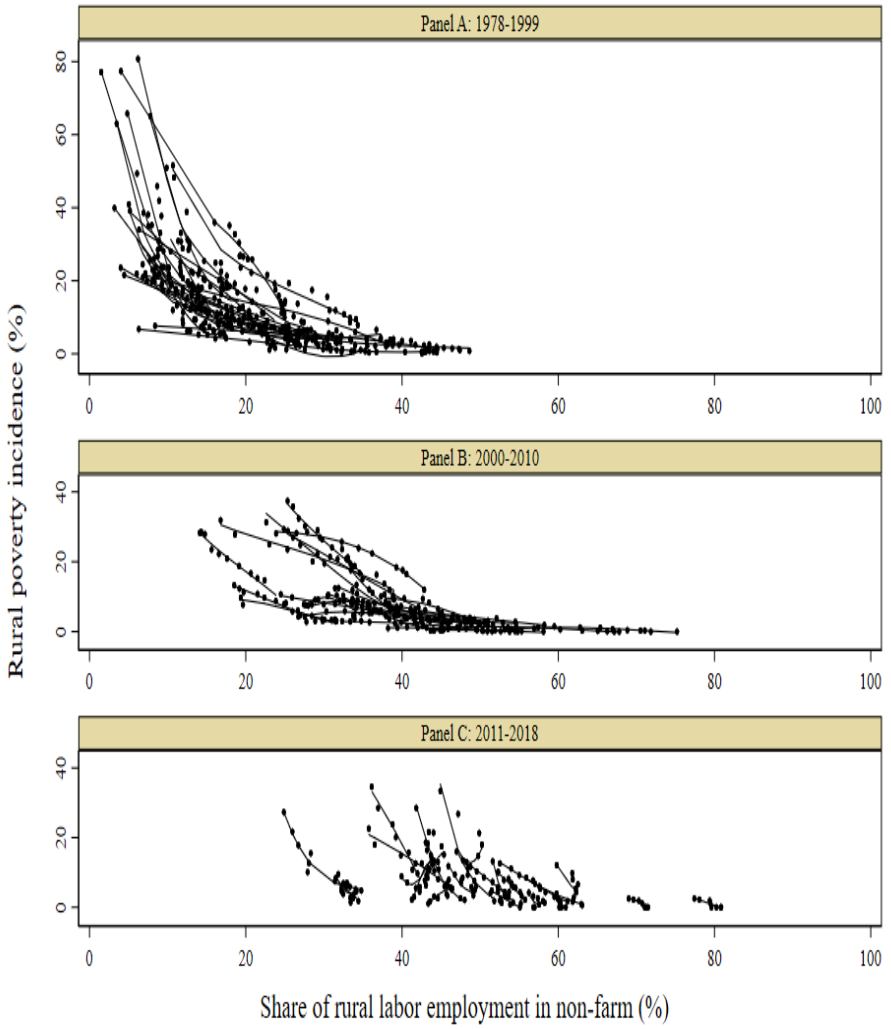




High-value agriculture and poverty incidence by province in 1978–1999, 2000–2010, and 2011–2018



Rural labor non-farm employment and poverty incidence by province in 1978–1999, 2000–2010, and 2011–2018

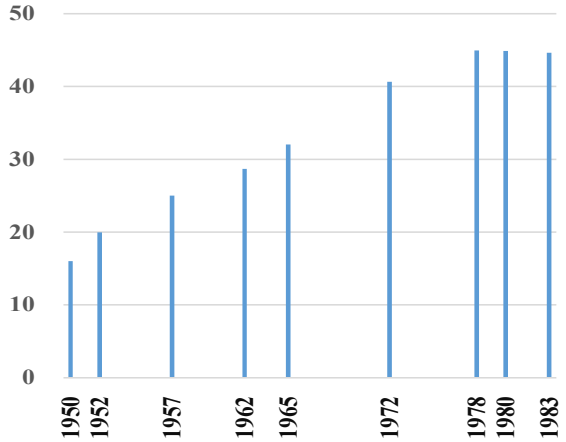


How has rural been transformed?

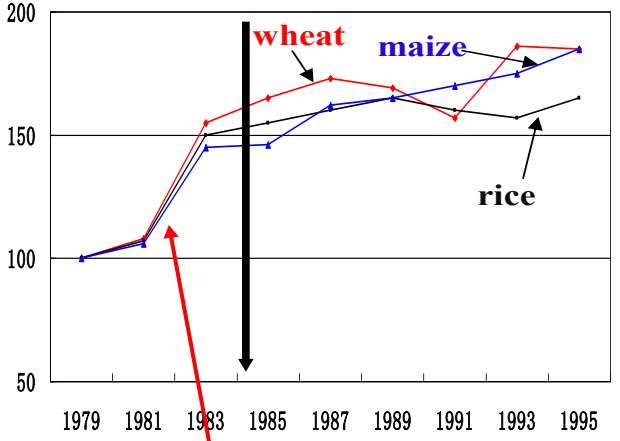
Pathway and the roles of IPIs

	Paths of Transformation	Major Institution, Policy and Investment (IPIs)
1	**Primary on staple food production**	**Institutions** (e.g., land) **+ irrigation + tech-1** (e.g., modern variety)
2		
3		
4		

National irrigated land (*Million ha*)



Total factor productivity (1979-1995)



China's Green Revolution (1960~1980s)

Major technologies:

- **Hybrid rice**
- **Semi-dwarf wheat**
- **High-yield hybrid maize**
- **Chemical fertilizer**

Institutional change (HRS: allocated land equally to rural households in each village) **was a major source of growth in 1978-1984**.

How have agri. & rural been transformed?

Pathway and the roles of IPIs

	Paths of Transformation	Major Institution, Policy and Investment (IPIs)
1	**Primary on staple food production**	**Institutions** (e.g., land) **+ irrigation + tech-1** (e.g., modern variety)
2	**Diversification/commercialization**	**Plus agri. mkt + mkt/road infrastructure + tech-2** (e.g., high-value agri tech)
3		
4		

Wholesale market in 1990s and early 2000s:

- **Consolidation and specialization had also been occurred**
- **Linking between small farms and markets**

How have agri. & rural been transformed?

Pathway and the roles of IPIs

	Paths of Transformation	Major IPIs
1	Primary on staple food production	**Institutions** (e.g., land) **+ irrigation + tech-1** (e.g., modern variety)
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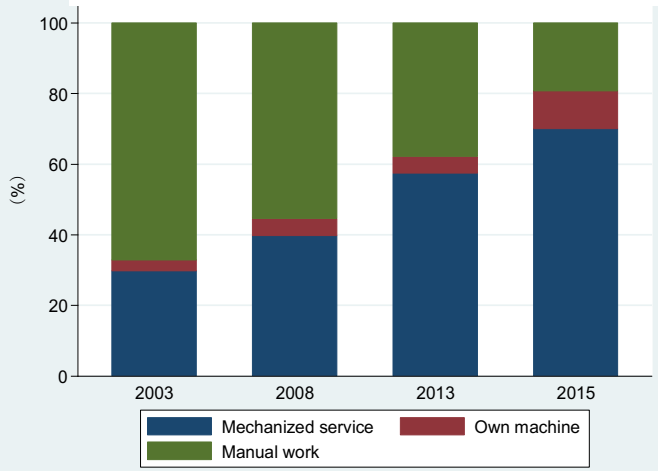
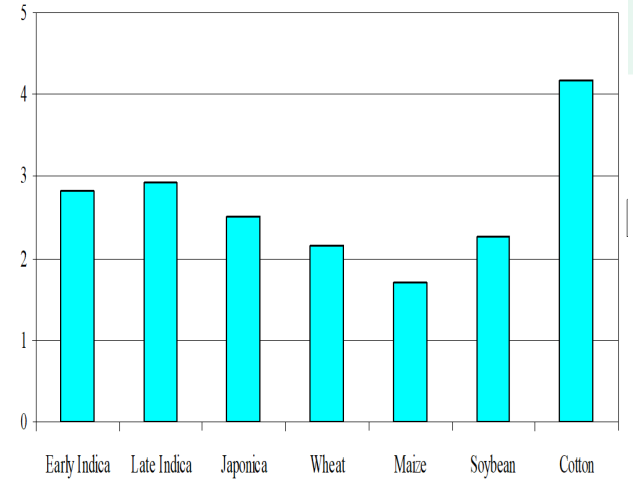
3	Farming + part time off-farm → Mechanization + full time off-farm	**Plus labor mkt + local land mkt & consolidation + custom services + tech-3** (e.g., labor saving tech)
4		

Township and village enterprise development + township expansion

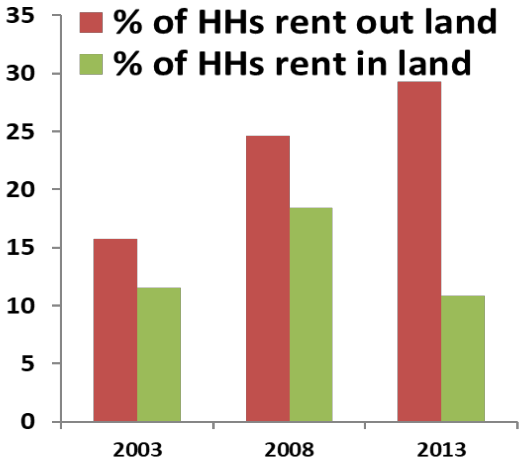
Grain harvest area share in Northern China, 2003-2015



Annual TFP growth: grain & cotton, 1995-2004

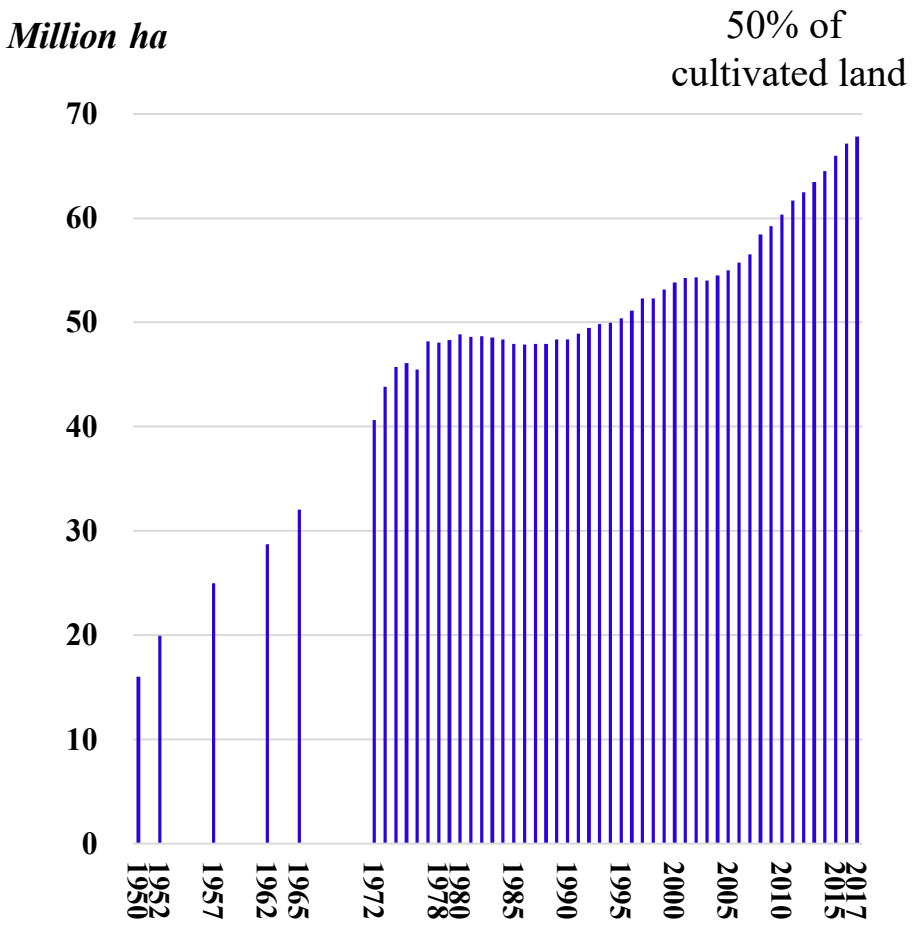


Source: Jin et al. (2002 and 2009)

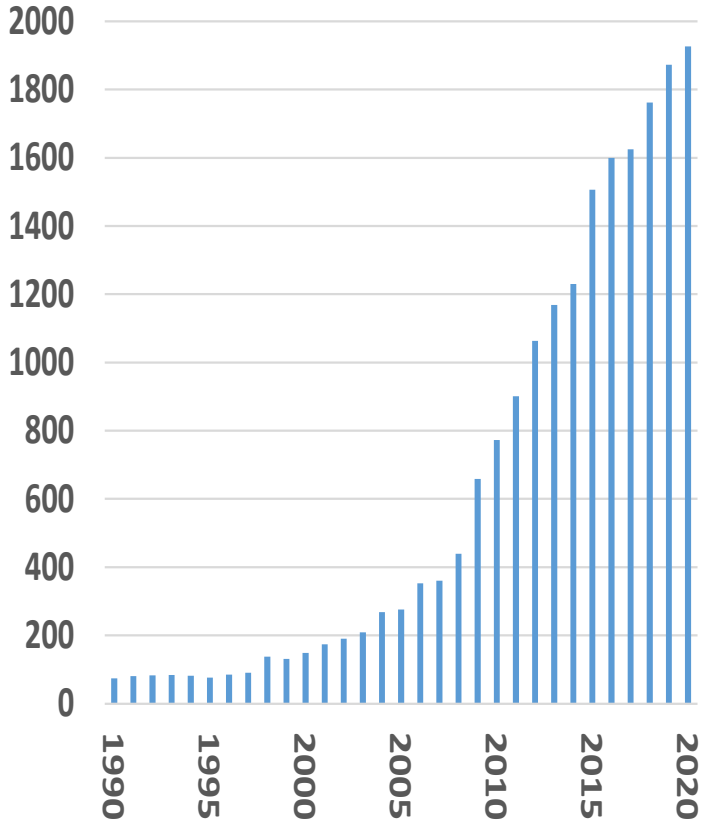


Investment in agriculture → productivity

Expansion of irrigated land in China



Government budget for agriculture
(billion yuan in 2008 prices)



4 major sources of agricultural growth and RT

- **制度创新 Institution innovation**
- **技术进步 Technology change**
- **市场改革 Market reform policy**
- **农业投入 Investment in agriculture**

Huang (2018), Forty Years of China's Agricultural Development and Reform and the Way forward in the Future, *Journal of Arotechnical Economics,* No. 3(2018): 4-15

Path, consequences and IPIs of RT since 1978 in China

	Paths of Transformation	Major Institution, Policy and Investment (IPIs)
1	**Primary on staple food production**	**Institutions** (e.g., land) **+ irrigation + tech-1** (e.g., modern variety)
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3	**Farming + part time off-farm → Mechanization + full time off-farm**	**Plus labor mkt + local land mkt & consolidation + custom services + tech-3** (e.g., labor saving tech)
4	**Grain security + high value + green agriculture; integrated urban-rural**	**Since the middle 2010s → Rural revitalization**

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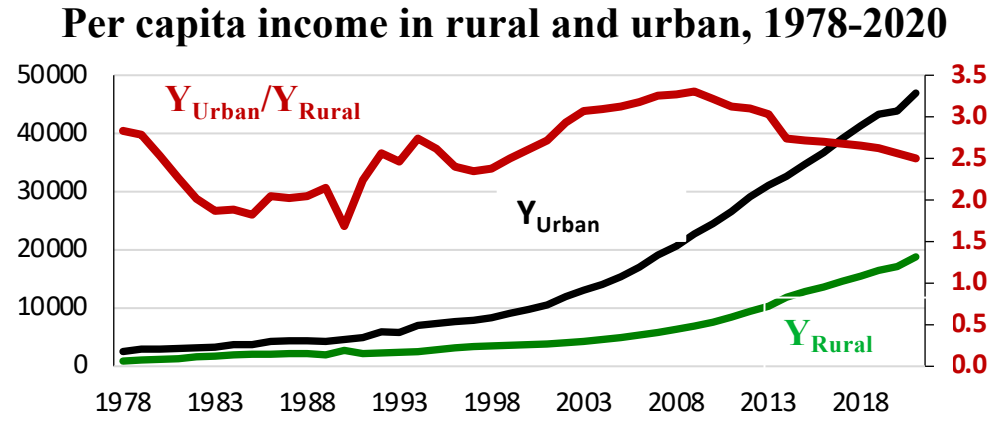
4	**Grain security + high value + green agriculture; integrated urban-rural**	**Since the middle 2010s → Rural revitalization**

Three big challenges

- **Farmer's income:** Despite rural income increased (18.8 times) more than urban (17.2 times), rural-urban income gap remains high.

- **Food security:** Despite rapid growth of agricultural production in the past, feed and food imports have been rising since the early 2000s.

- **Environmental degradation and sustainability:** Past production growth has been at the expense of resource and environmental degradation.

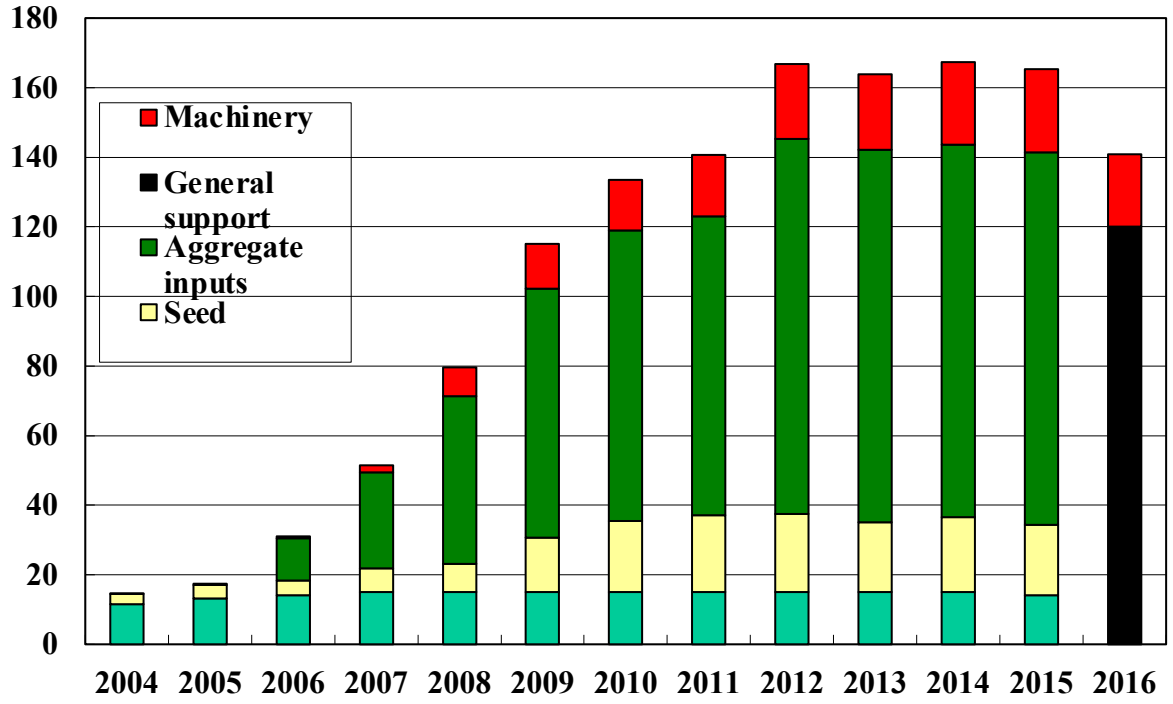


- **Falling groundwater table**
- **Soil deterioration**
- **Non-point pollution**
- **Rising ecological stress**
- **…**

Policy Responses:
Moving from taxing to subsidizing agriculture

- **Eliminated agricultural tax in 2004/2006 and thereafter (√)**
- **Started agricultural subsidies since 2004 (√/?)**

Agricultural direct subsidies (billion yuan)



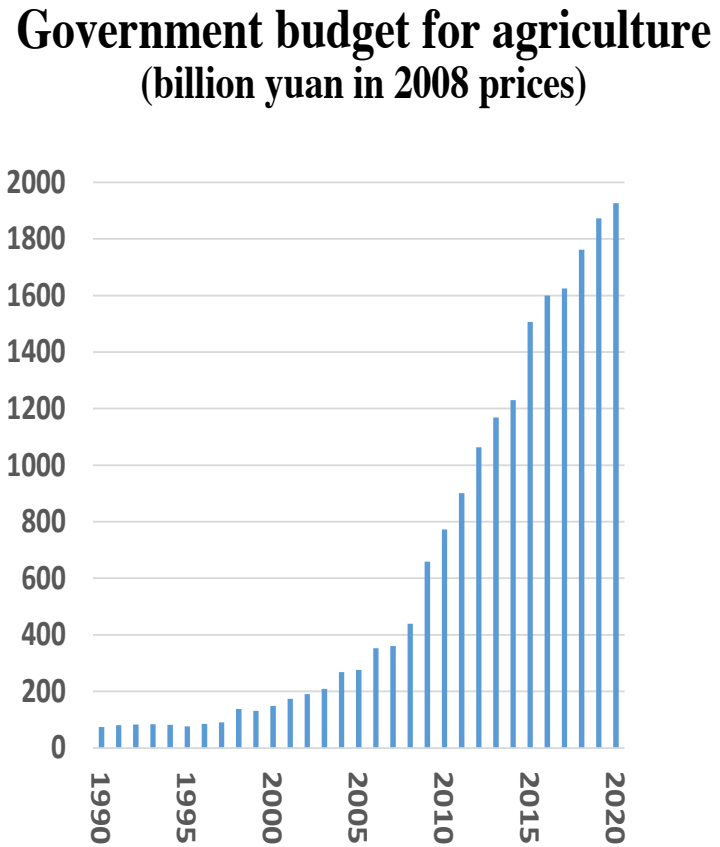
Total subsidy in 2012 was 164.3 billion yuan (26.1 billion US$), about 3.13% of agricultural GDP. But most are decoupled.

Source: Huang et al., Food Policy (2013) and various recent government policy documents

Policy Responses:
Moving from taxing to subsidizing agriculture

- Eliminated agricultural tax in 2004/2006 and thereafter (√)
- Started agricultural subsidies in since 2004 (√/?)
- Market intervention started in 2004 (?) but re-reformed since the middle 2010s (√)
- Investing agriculture (√)

  - But grain security is still a major concern by government



National strategies and policies: Food security

- **"Store Grains (Food) in Technology" Strategy 藏粮于技战略**
  - **Enhancing R&D innovation capacity, particular biotech & breeding program (种业振兴) and digital tech**
  - **Public agri. R&D expenditure: USD$ 4.1 billion in 2015, ranking the top in the world, and has continued to increase significantly since 2015**

- **" Store Grains (Food) in Land " Strategy 藏粮于地战略**
  - **Set a red line of cultivated land: 1.8 billion mu (120 million ha)**
  - **Improve soil quality: the Construction of High-Standard Farmland** (highly resilience to drought and flood, water saving, stable and high yield, and ecological friendliness)**:**
    - **400 million mu in 2015**
    - **800 million mu in 2020**
    - **1.08 billion mu in 2025 under the national plan**
    - **1.20 billion mu in 2030 under the national plan**

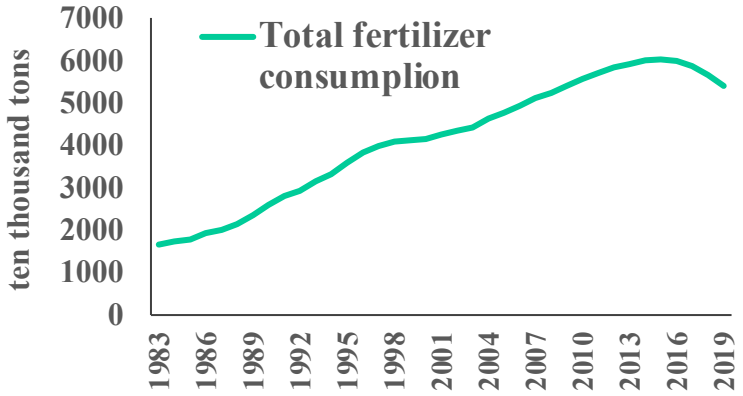
- **Anti-Food Waste Law in 2021:** aimed to reduce food losses and waste by law
- **Grain Security Law in 2024《中华人民共和国粮食安全法》**

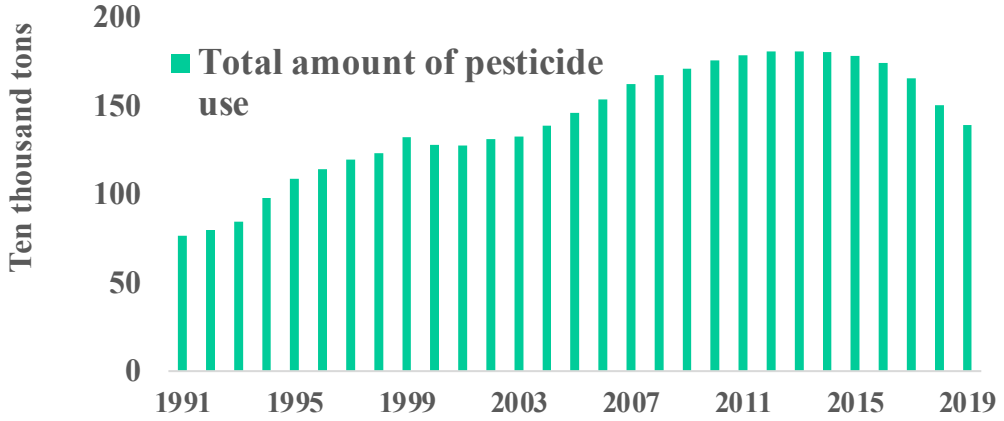
Three big challenges

- **Farmer's income**
- **Grain/food security**
- **Sustainability:**
  - **农业绿色发展 Greener agriculture**

National strategies and policies: Greener agriculture

1. **Grain for Green Program by converting the sloped farmland to forest (or grass) land** (pilots → national) **since 1999**
   - Moer than 500 billion yuan (6.9 ￥ = 1 US$ in 2019) and covered >33 million ha in 1999-2018
2. **Protecting Natural Forest Resource Program by completely stopping commercial logging** (pilots → national) **since 1999**
   - 1999-2018 : >380 billion yuan, covered 2,966 million mu (or 64% of China's forest area)
3. **Ecological Compensation Program to reduce grazing intensity through compensation** (pilots → national) **since 2011**
   - 2011-2020 : >171 billion yuan, Covered all grassland rich provinces
4. **Zero-growth plan of chemical uses: a** special S&T project to reduce chemical uses





National strategies and policies: Greener agriculture

5. More greener development since 2017

- **2017:** "the Opinions on Innovating Systems and Mechanisms to Promote Green Agricultural Development"
- **2018:** The Technical Guidelines on Green Agricultural Development in 2018-2030. Establish an efficient, safe, low-carbon, circular, intelligent and integrated technology system for greener agricultural development, and promote greener agricultural S&T innovations
- **2020:** Implement a 10-year plan to ban fishing in the Yangtze River
- **2021:** The Green Development Plan for Agriculture during the 14th Five-Year Plan (2021-2025)
- **2023: Mainstream agriculture into climate change** to reduce emission and increase carbon sink in agriculture
- …

Path, consequences and IPIs of RT since 1978 in China

	Paths of Transformation	Major Institution, Policy and Investment (IPIs)
1	**Primary on staple food production**	**Institutions** (e.g., land) **+ irrigation + tech-1** (e.g., modern variety)
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4	**Grain security + high value and green agriculture; integrated urban-rural**	• **4 driving forces or new IPIs: New Institutions, New Policies (e.g., tech., market reform, supporting policies, etc.) and New Investment**

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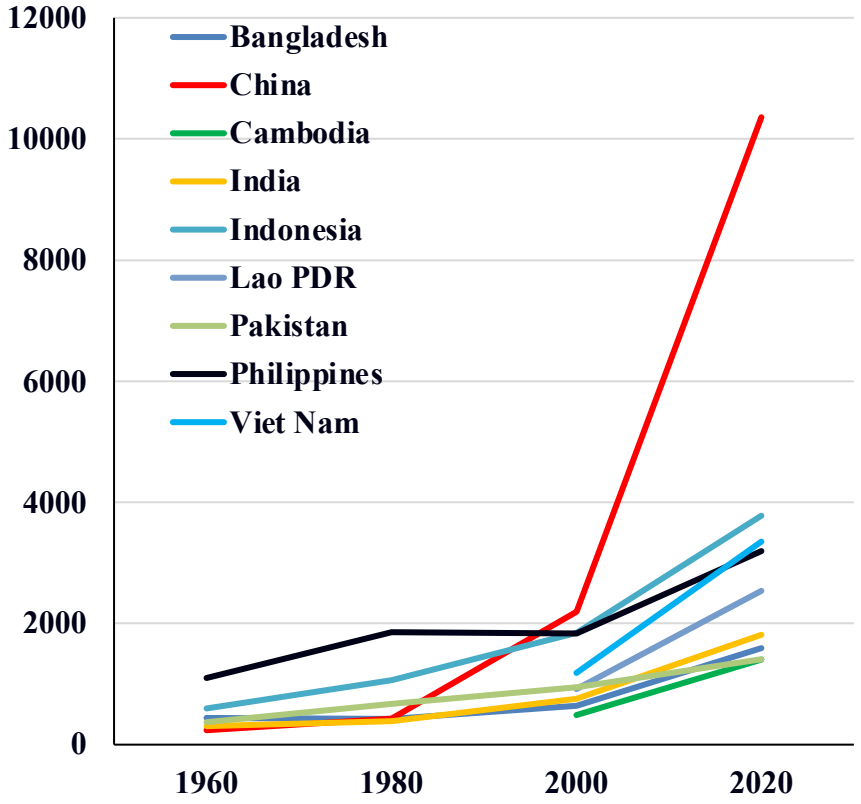
Rural transformation in Asian developing countries: background

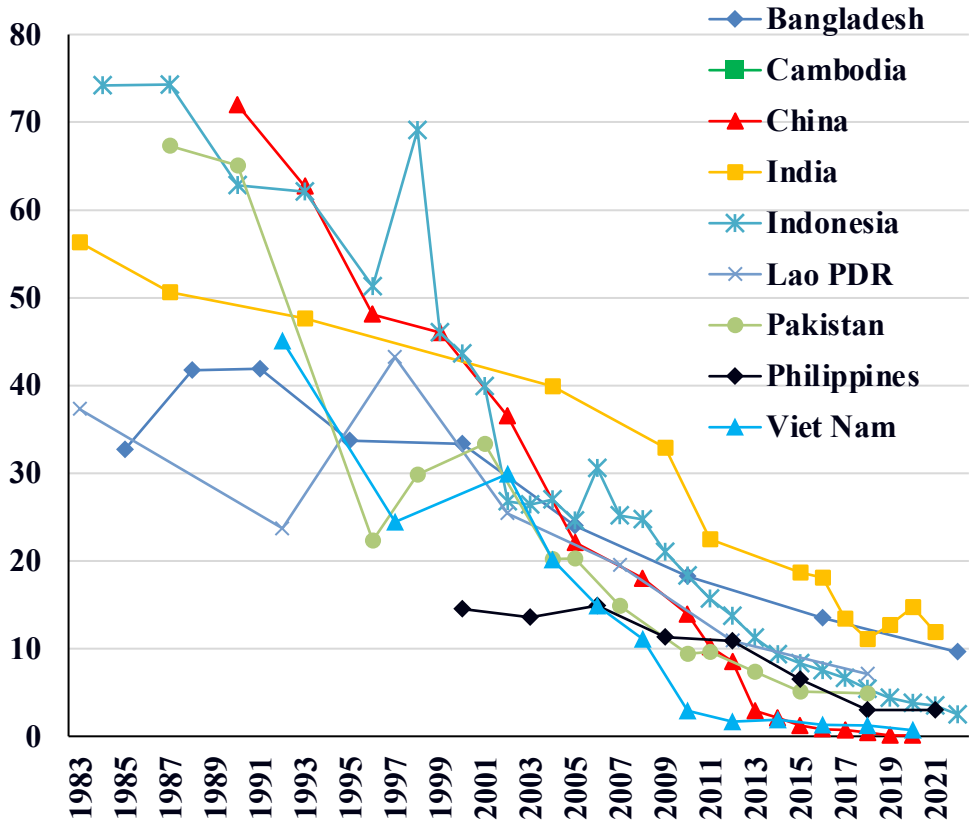
1960s: Asian developing countries had similar low income with high poverty incidence

Now : Ended with larger income gap and varying successfulness in poverty reduction

GDP per capita (constant 2015 US$), 1960-2020



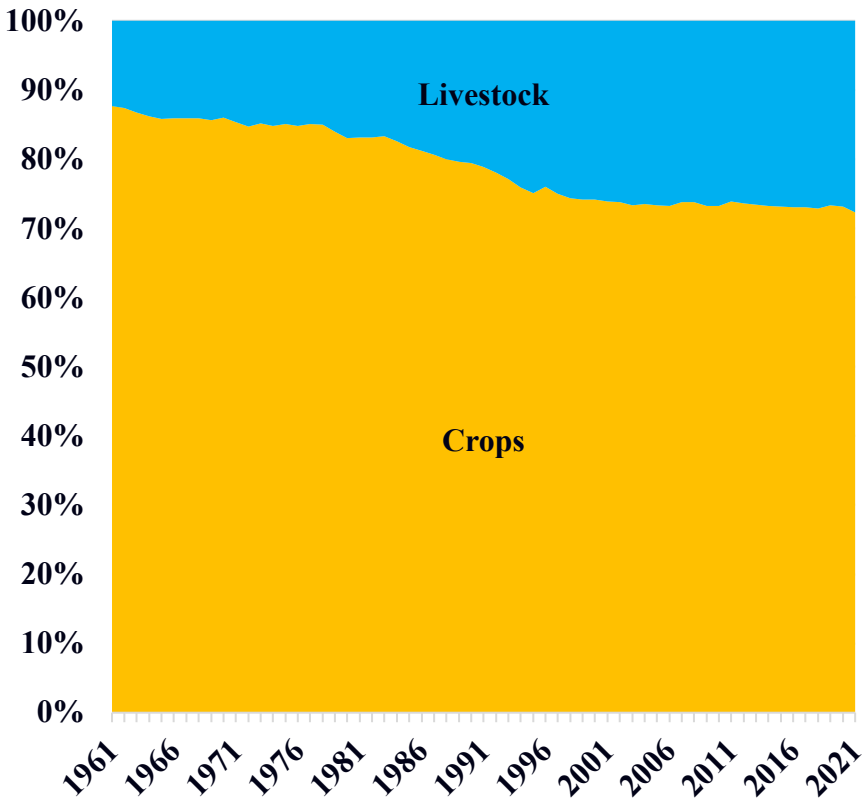
Poverty incidence at $2.15 a day (2017 PPP) (%)



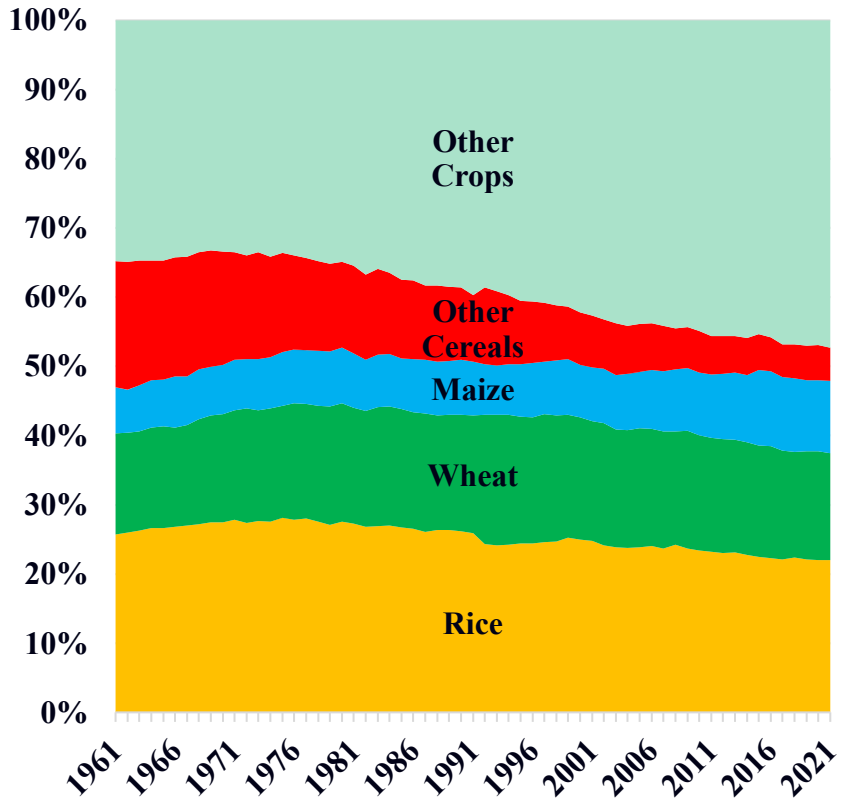
Source: World Bank (2023), WDI

Asian Rural Transformation: within agriculture

Crop and livestock: value share



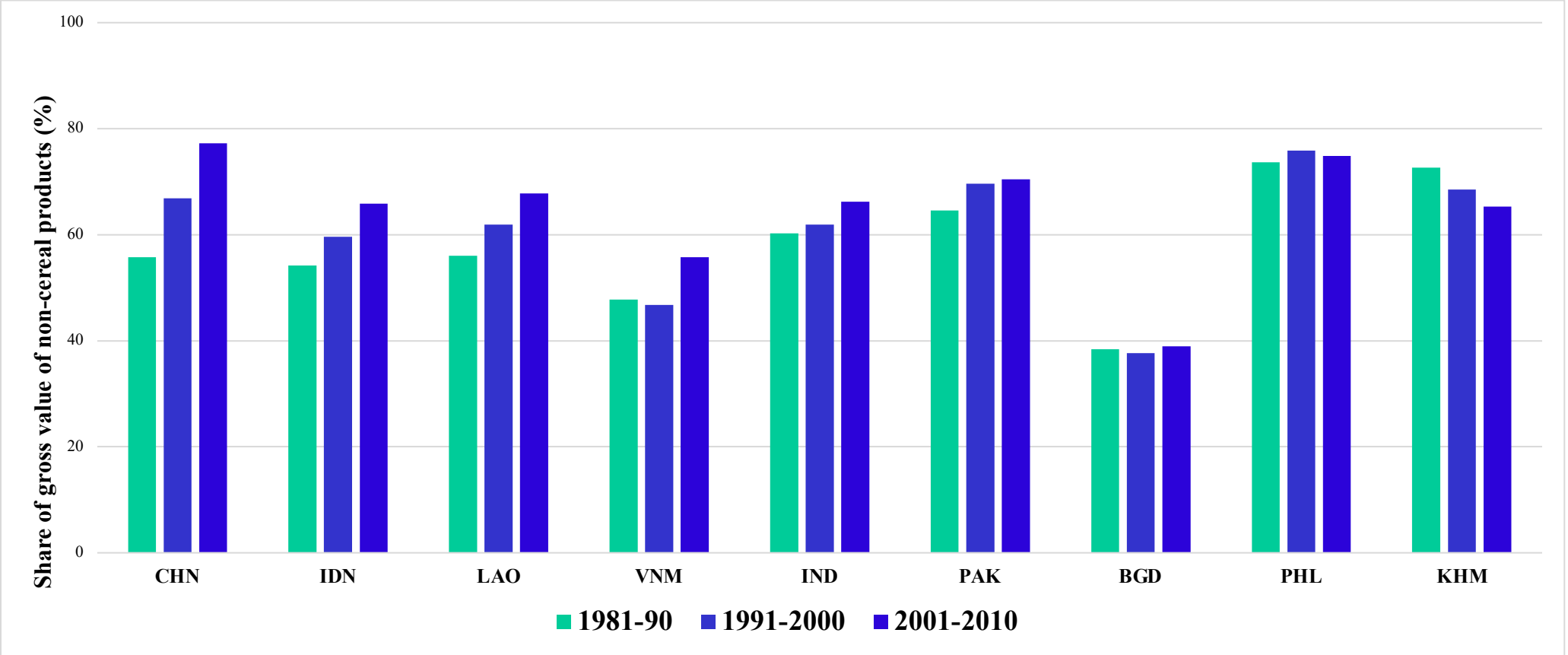
Within crops: area share



Source: FAO (2023), FAOSTAT

The speed of agricultural transformation (RT1) differed largely among countries

Output value share of non-cereal products in agriculture (%), 1980-2010



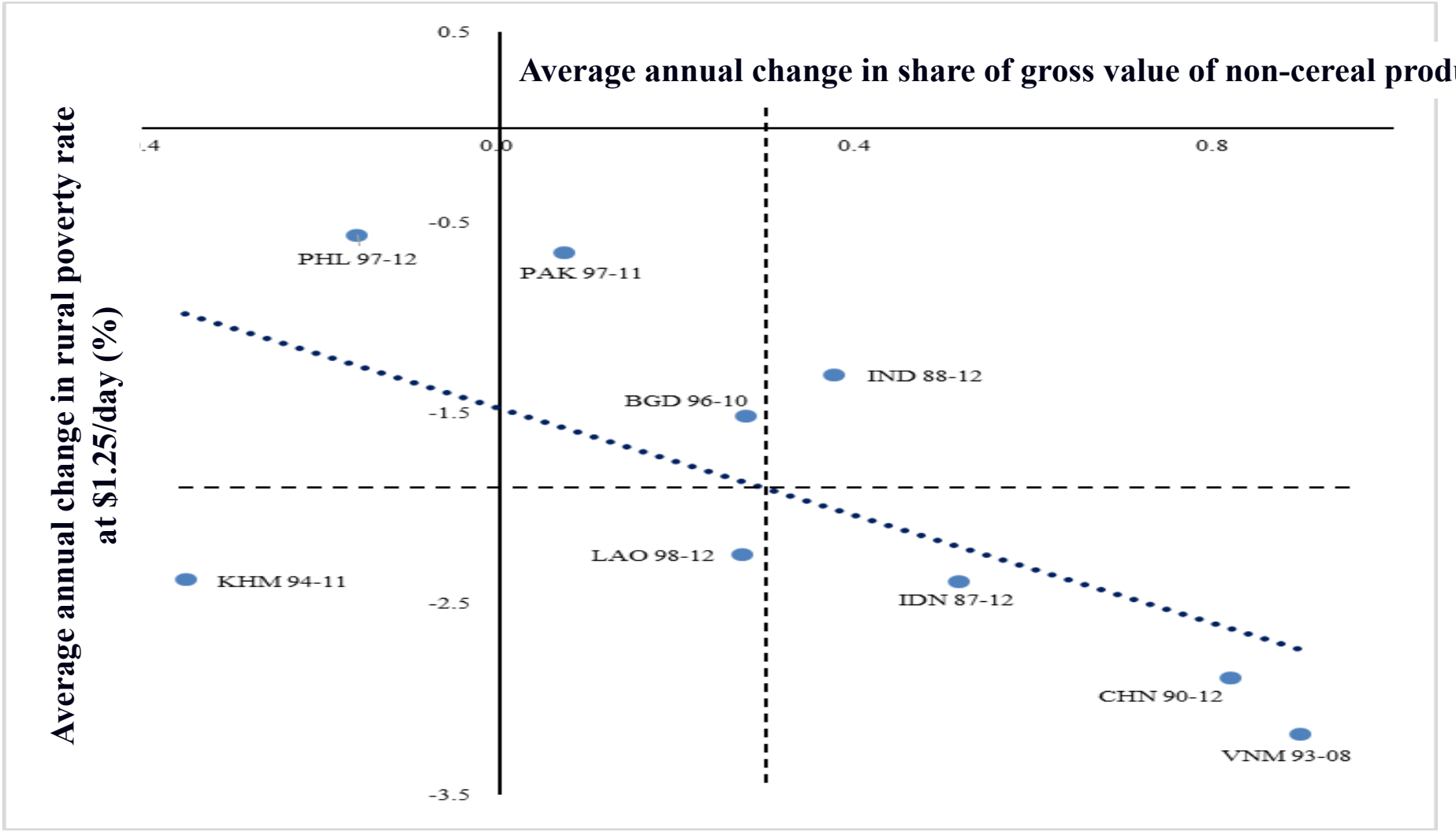
Rapid transformation: China, Indonesia and Laos; Vietnam recently

Moderate transformation: the rest of Asian developing countries

Exceptions: Cambodia and the Philippines

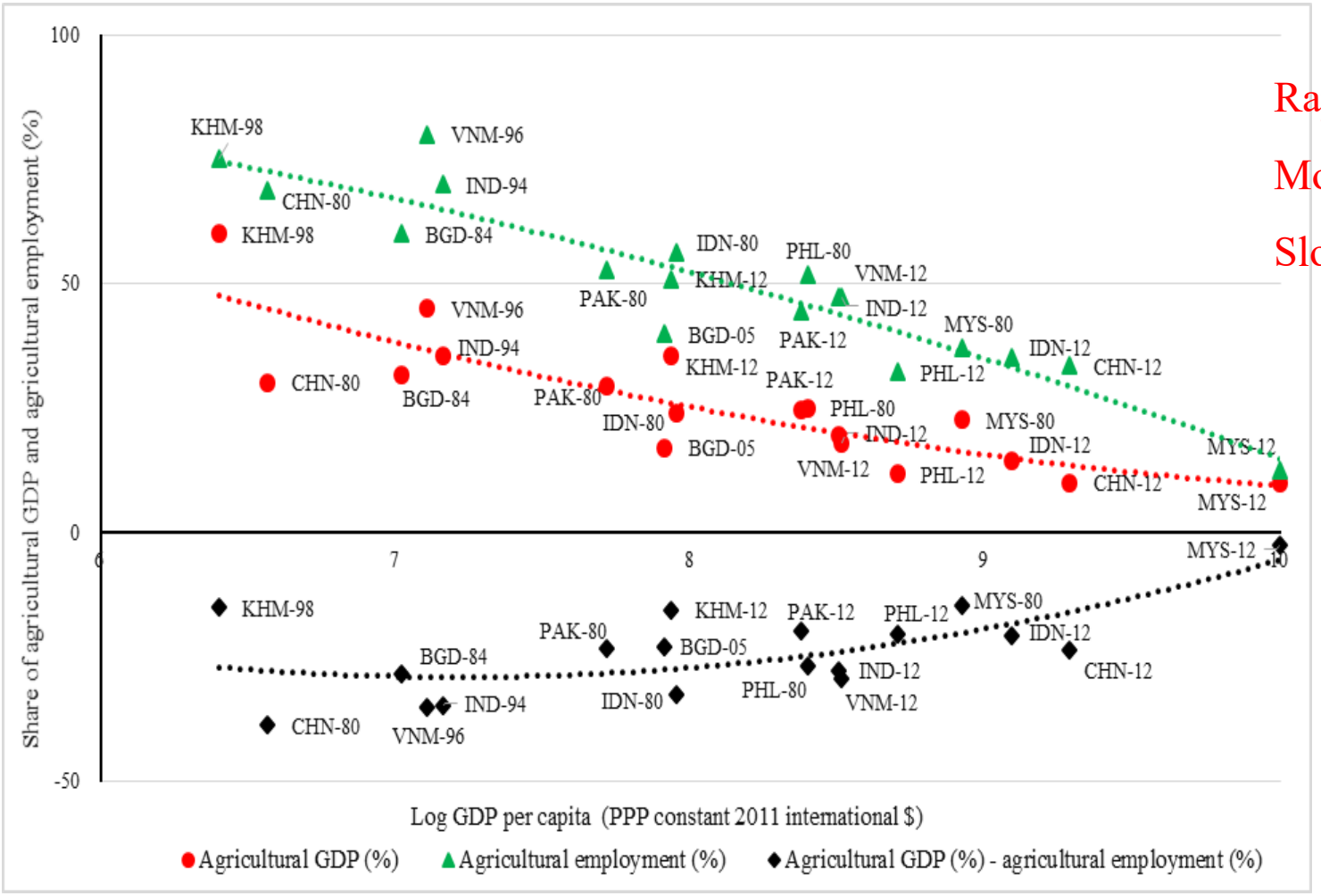
Huang (2018)

Speed of RT1 has important implications for rural poverty reduction



Source: Huang (2016)

Convergence of shares of agricultural GDP and employment in Asia, 1980s - 2010s



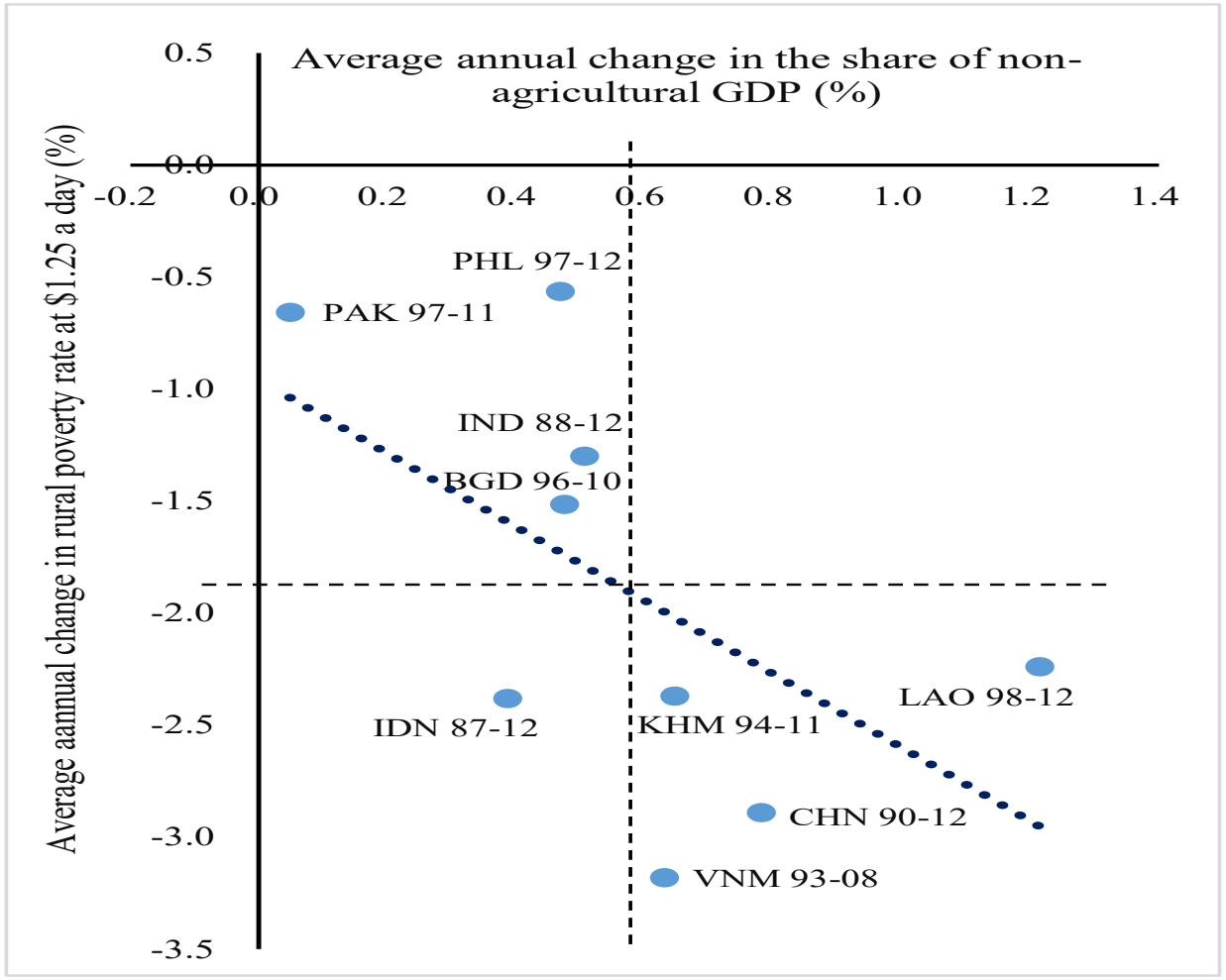
Rapid ST: China, Thailand and Malaysia

Moderate ST: India, Bangladesh and Pakistan

Slow ST: Cambodia, Sri Lanka and Philippines

Huang (2018)

Structural transformation and rural poverty reduction in the period indicated



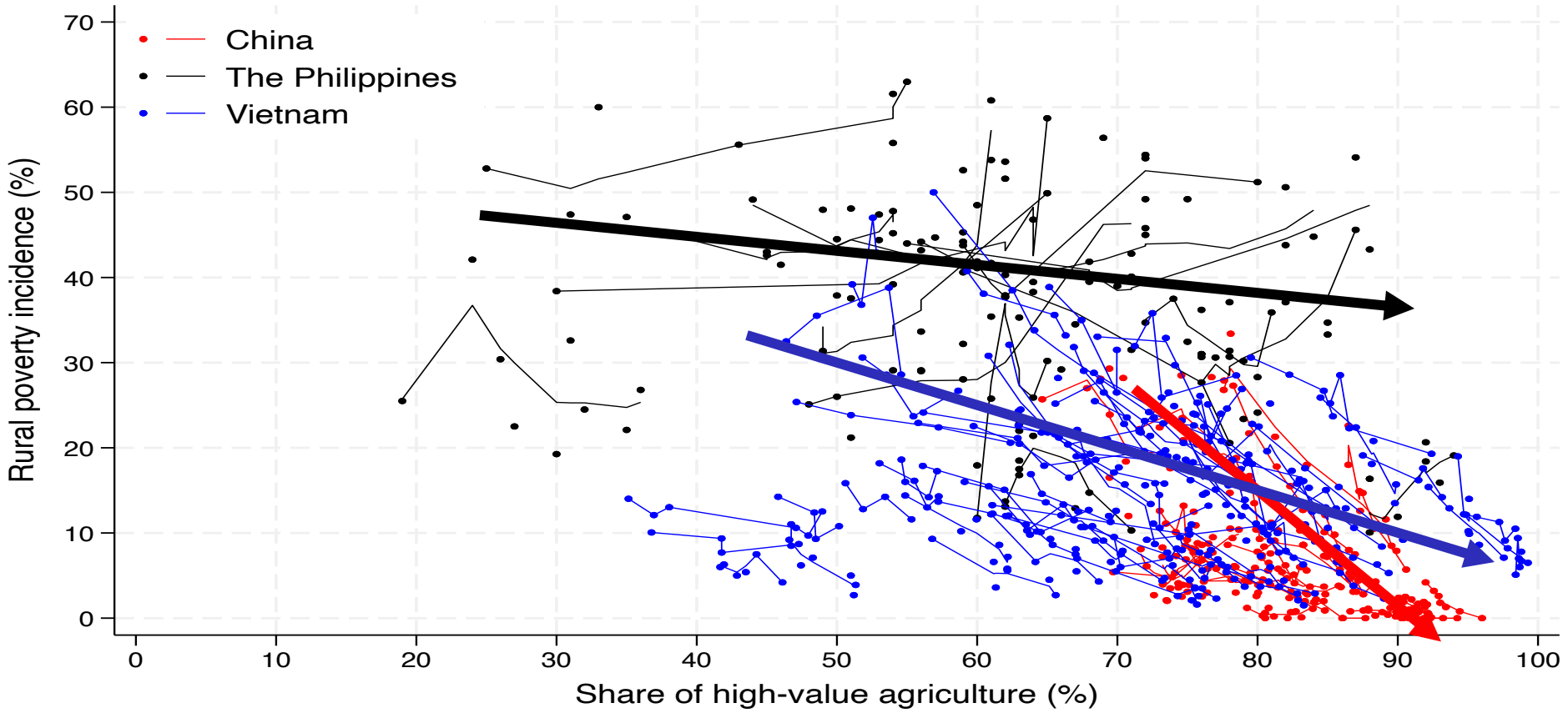
Panel A: Rural poverty and non-agricultural GDP

Typology of rural transformation in Asia

		Rural poverty reduction (or income growth)		
		Fast	Moderate	Slow
Fast ST	Fast RT	China Vietnam		
	Slow RT		Laos Cambodia	
Slow ST	Fast RT		Indonesia India	
	Slow RT			Philippines Pakistan Bangladesh

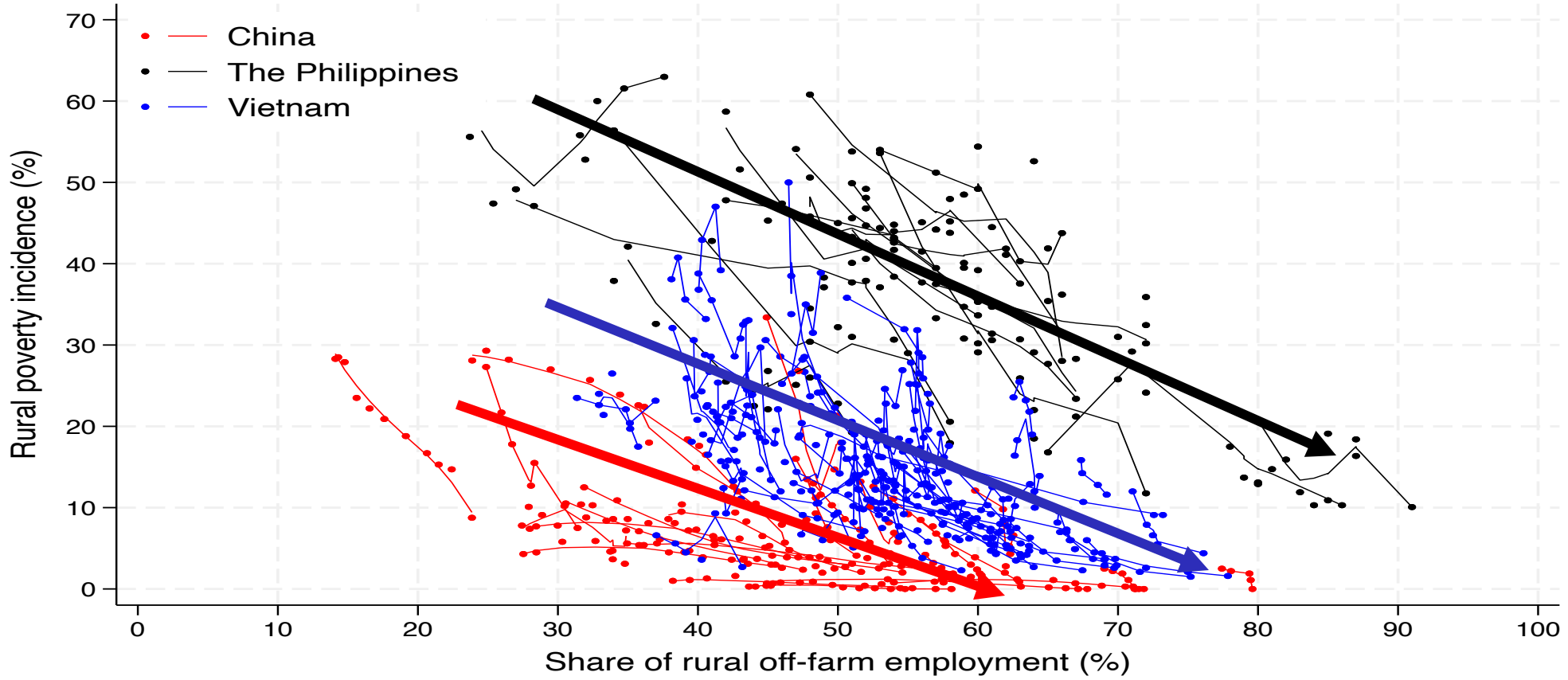
Analyses at regional level in 3 countries

Share of high-value agriculture (RT1) and rural poverty reduction in China, the Philippines, and Vietnam, 1994-2017



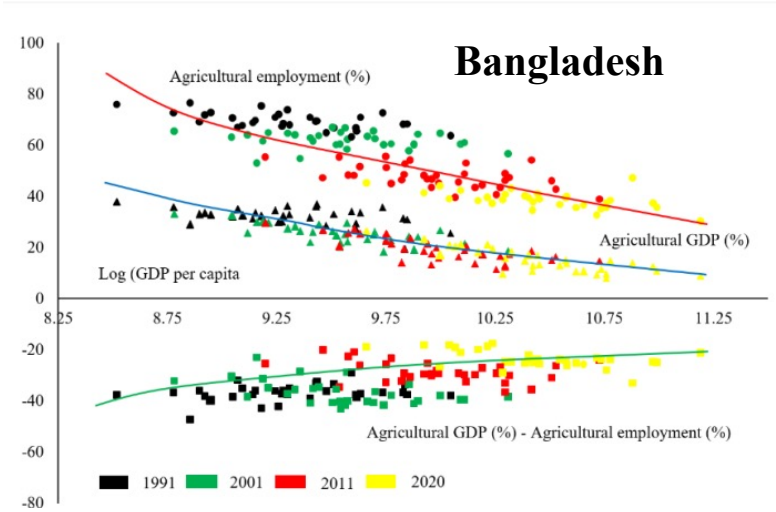
Chen, Huang, Sombilla and Truong (2023)

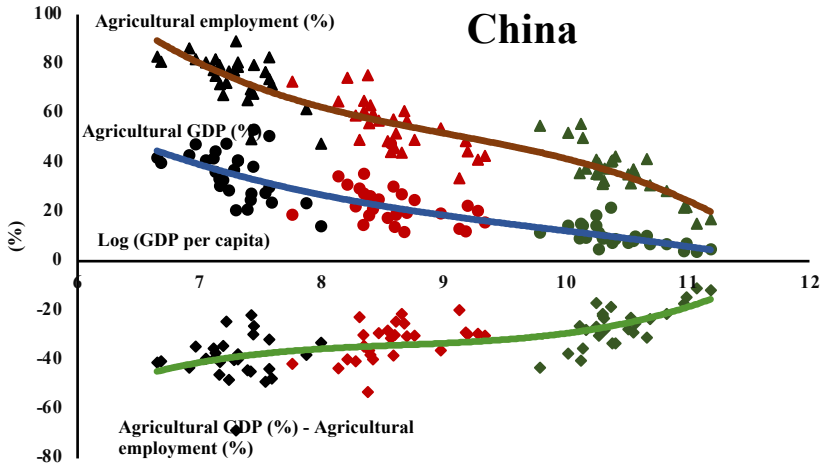
Share of rural labor off-farm employment (RT2) and rural poverty reduction in China, the Philippines, and Vietnam, 1994-2017

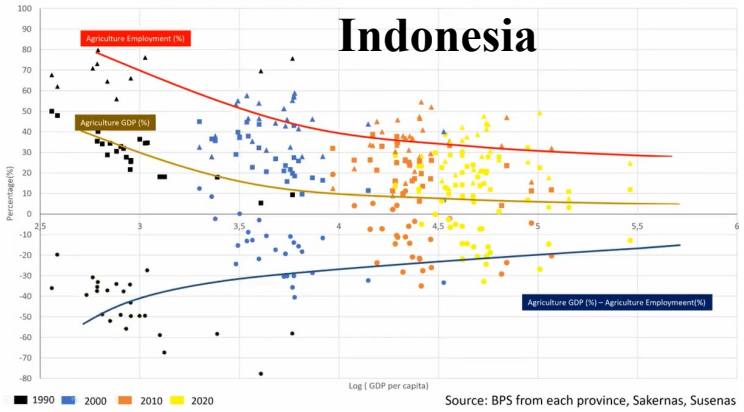


Chen, Huang*, Sombilla and Truong (2023)

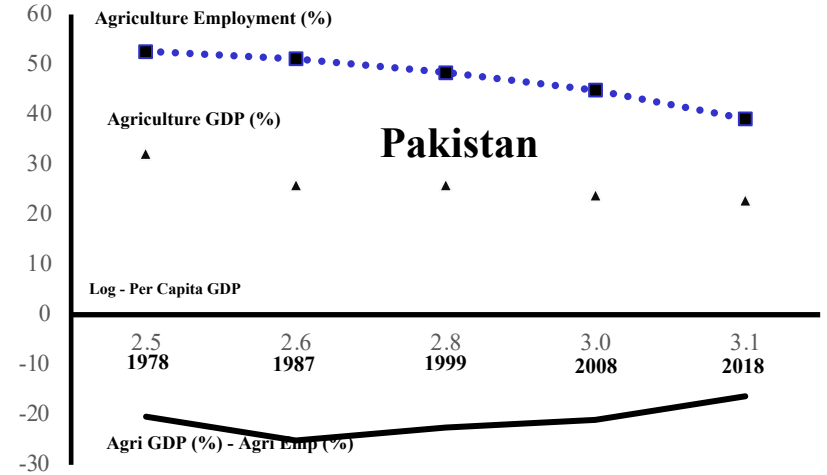
The 4 cases studies: Bangladesh, China, Indonesia and Pakistan at provincial/district level







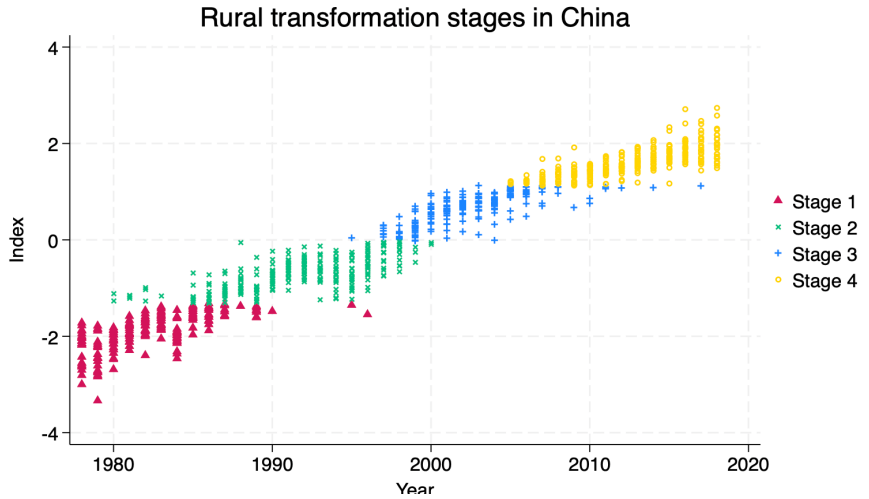
Source: BPS from each province, Sakernas, Susenas

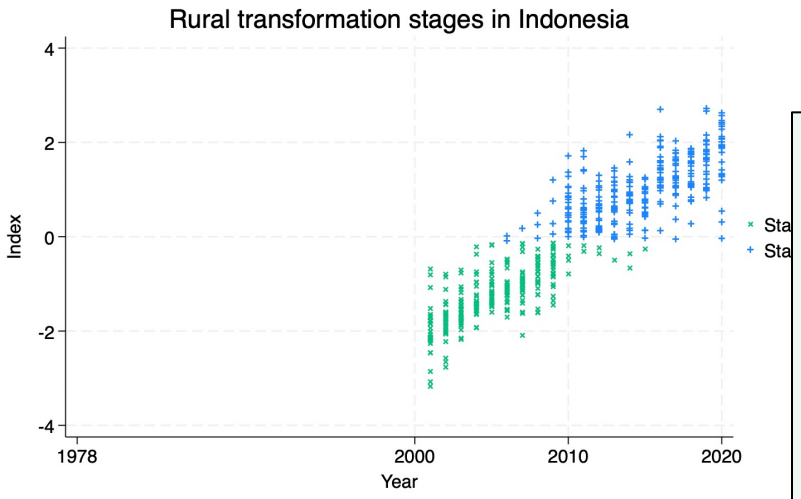


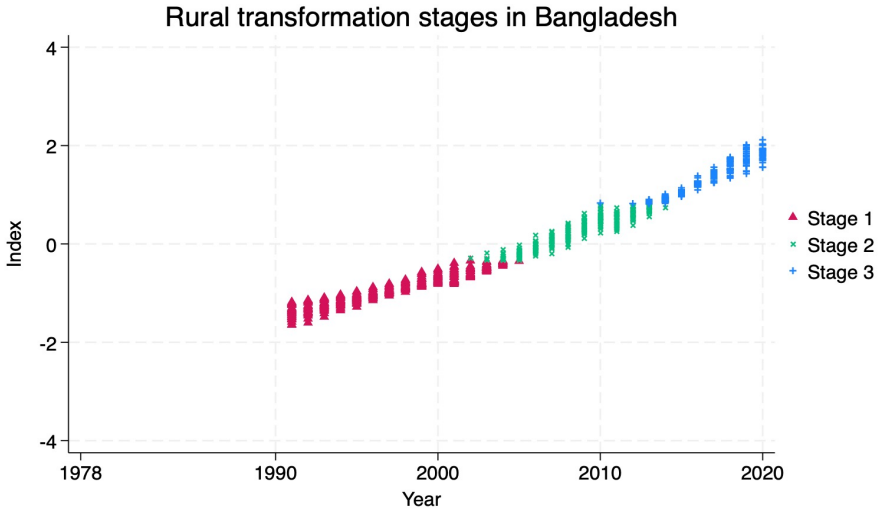
- The shares of agriculture in both GDP and employment have been falling with the growth of per capita GDP.
- The gap between agricultural GDP share and its employment share has been generally narrowed over time – convergency.
- It suggests the labour productivity among sectors is converging.

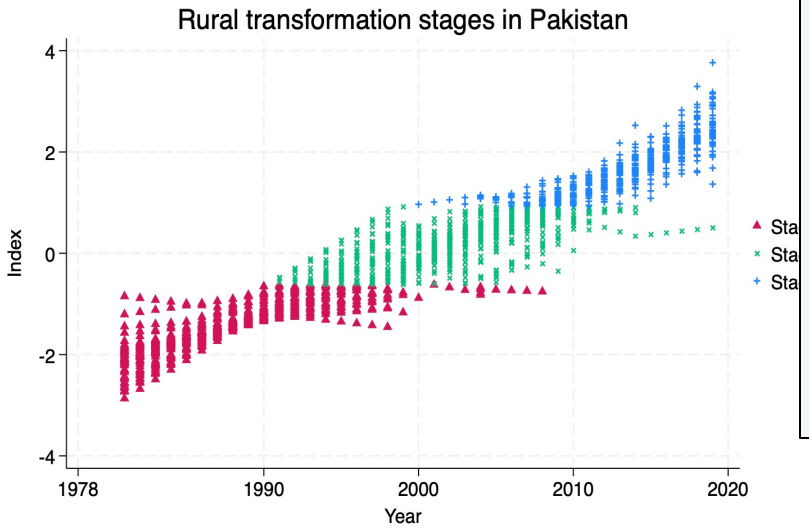
The period in which each stage of RT is located

Within a country, it demonstrates the relative position of each region. The stage is comparable across 4 countries, but the index value is not.









Empirical studies:

- The faster rural transformation, the faster rural income growth and also faster rural poverty reduction
- There is also evidence of importance of IPIs to facilitate inclusive rural transformation

Outline of presentation

- **Agricultural growth, rural transformation and major driving forces in China**
- **Major challenges and recent policy responses in China**
- **International comparison of rural transformation: China and other Asian developing countries**
- **Concluding remarks**

Concluding remarks

Facilitating rural transformation and structural transformation:

- Labor-intensive and high-value agricultural transformation
- Labor-intensive economic/structural transformation before rising wage

Rural transformation and IPIs

	Paths of Transformation	Major Institution, Policy and Investment (IPIs)
1	**Primary on staple food production**	**Institutions** (e.g., land) **+ irrigation + tech-1** (e.g., modern variety)
2	**Diversification/commercialization**	**Plus agri. mkt + mkt/road infrastructure + tech-2** (e.g., high-value agri tech)
3	**Farming + part time off-farm → Mechanization + full time off-farm**	**Plus labor mkt + local land mkt & consolidation + custom services + tech-3** (e.g., labor saving tech)
4	**Grain security +high value and green agriculture; integrated urban-rural**	**Plus new IPIs: New Institutions, New Policies (e.g., tech., market reform, supporting policies, etc.) and New Investment**

1) **Appropriate Institution, Policy and Investment (IPIs) matter**
2) **Sequence of IPIs is critical to speed up agricultural productivity growth, rural transformation, poverty reduction and income growth**

Thanks!