

Distinguishing Capital Investment and Consumption of Material Footprint: A Comparative Analysis between Subnational China and Other Nations

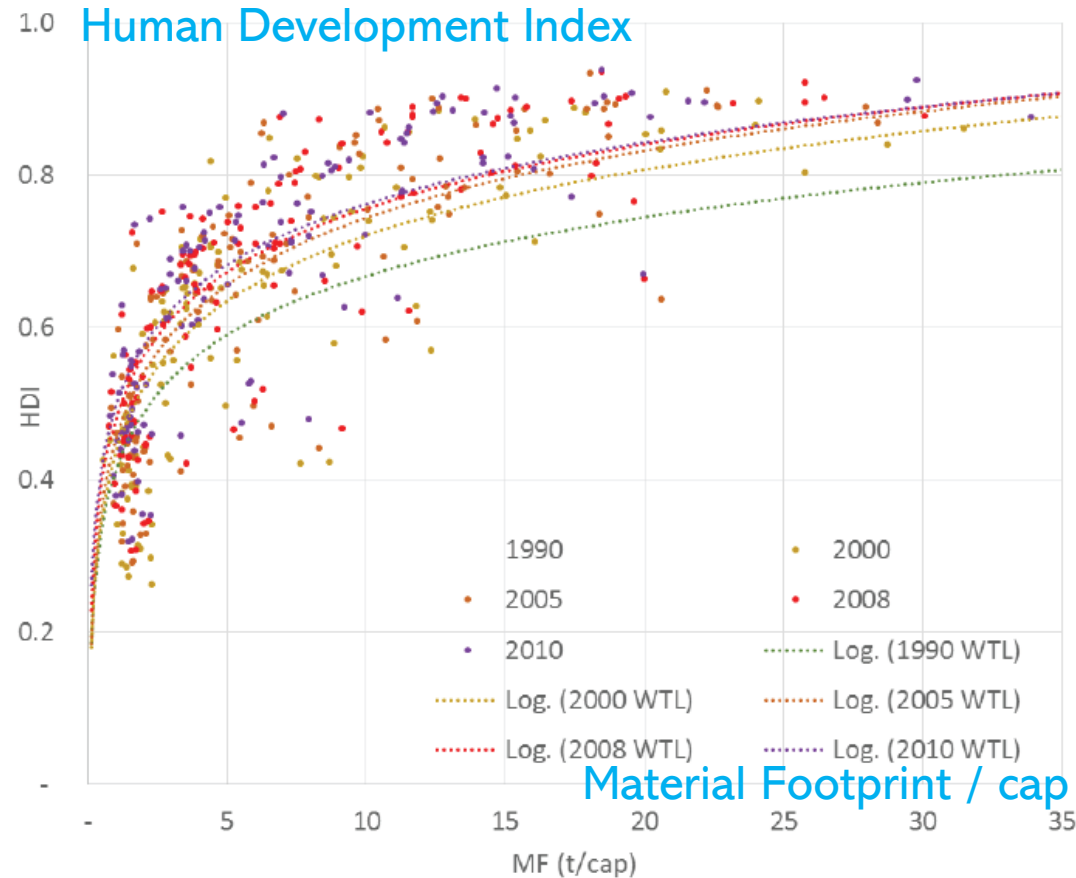


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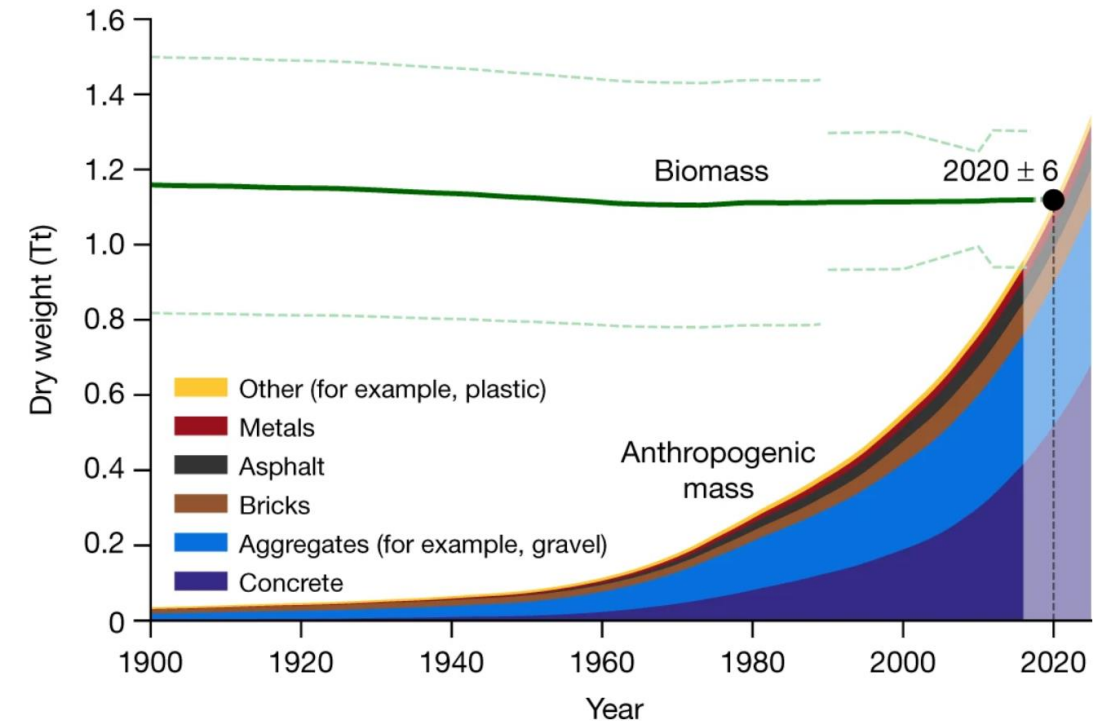


Economic prosperity is vital to human development but relies heavily on material extraction...



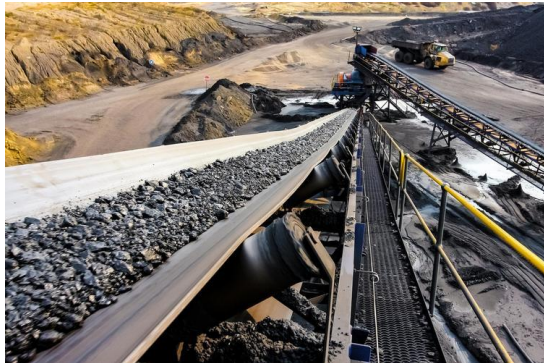
Relationship between per capita material footprint and human development (UNEP 2015)

Global human-made mass exceeds all living biomass



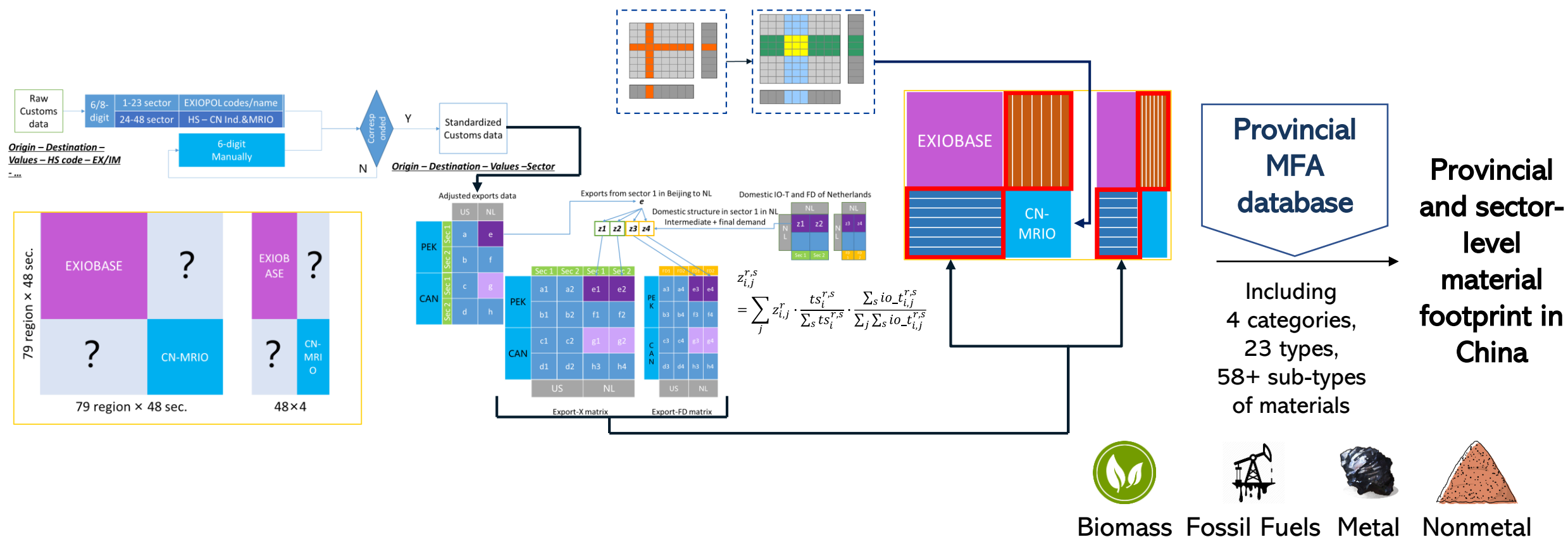
Biomass and anthropogenic mass estimates since the beginning of the twentieth century on a dry-mass basis (Elhacham 2020)

China is large, and sees large regional disparities



Modeling material footprint of provinces in China

1. Nesting Chinese interprovincial **MRIO** into EXIOBASE (nested-GMRIO) by using **regional trade data**
 2. Provincial-level **material flow** database and link it to nested-GRMIO
- ✓ **Consistent** modeling framework for provinces in China & other countries and regions in the world
 - ✓ **Comparable** between provinces in China & other countries and regions

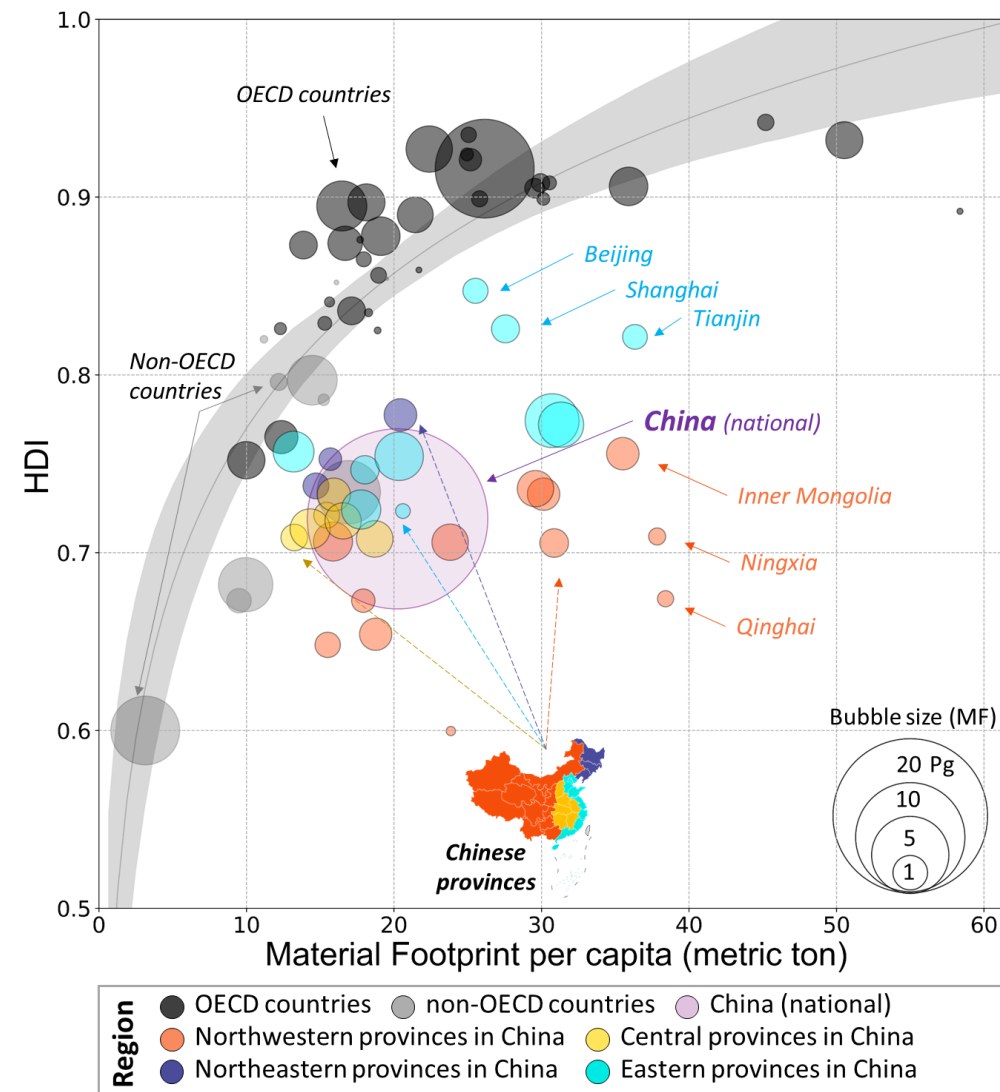
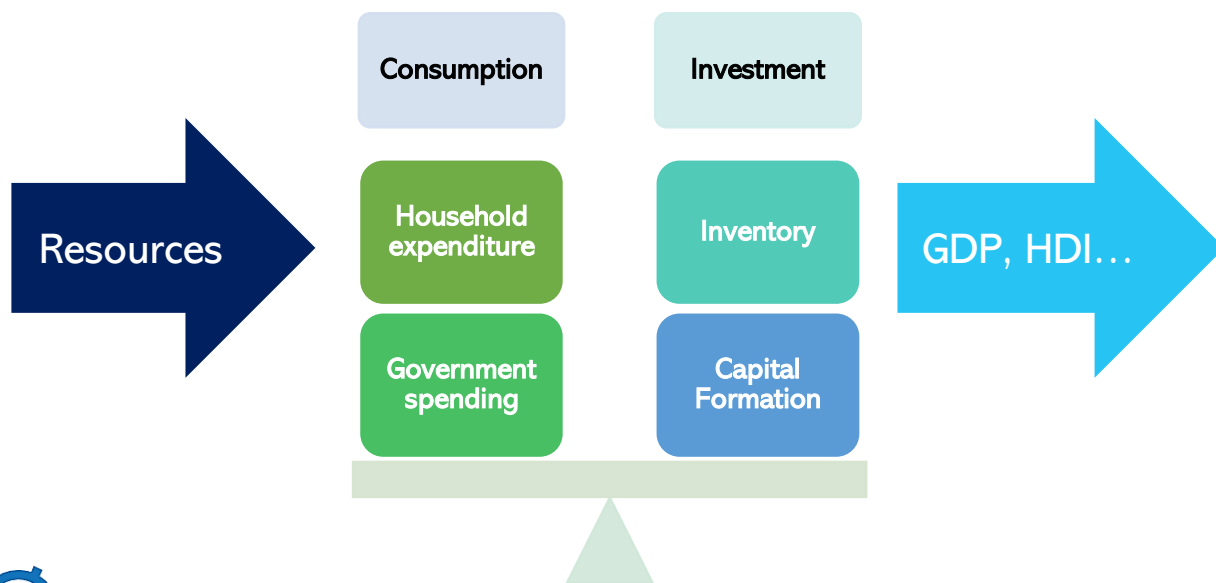


China's complex material footprint (MF)

It seems that provinces in China **do not** follow the 'general global trends'...

Both **rich** and **poor** provinces have **high per capita material footprint**

Why could some of China's poorest provinces have highest material footprint per person?



Relationship between per capita material footprint and human development: provinces in China and other nations (Jiang et al., 2022)

Surprisingly similar trends of consumption-driven material footprint trends between provinces in China and other nations

20% of the global MF driven by consumption

Rich provinces (in the east China / coastal areas) have higher MF/cap

HDI 0.7, MF ~5t/cap

- Indonesia
- Inner Mongolia (CN)

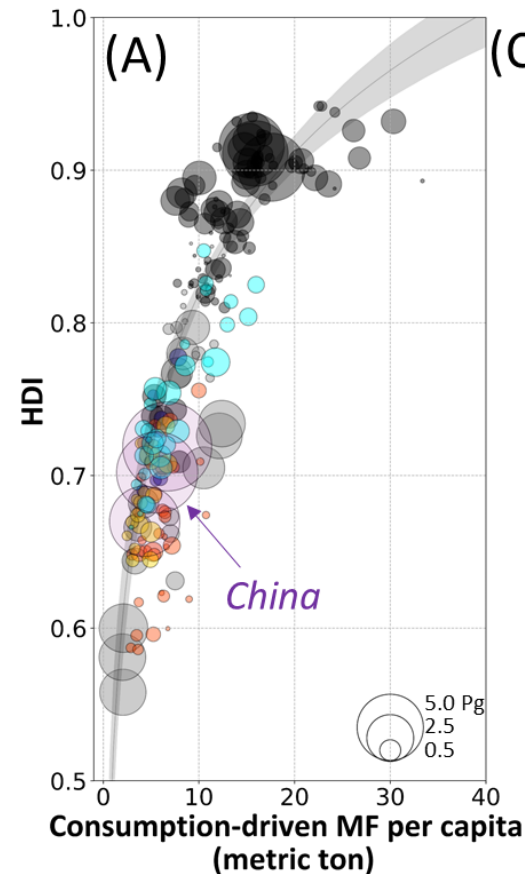
HDI 0.8, MF ~10t/cap

- Hungary
- Zhengjiang (CN)

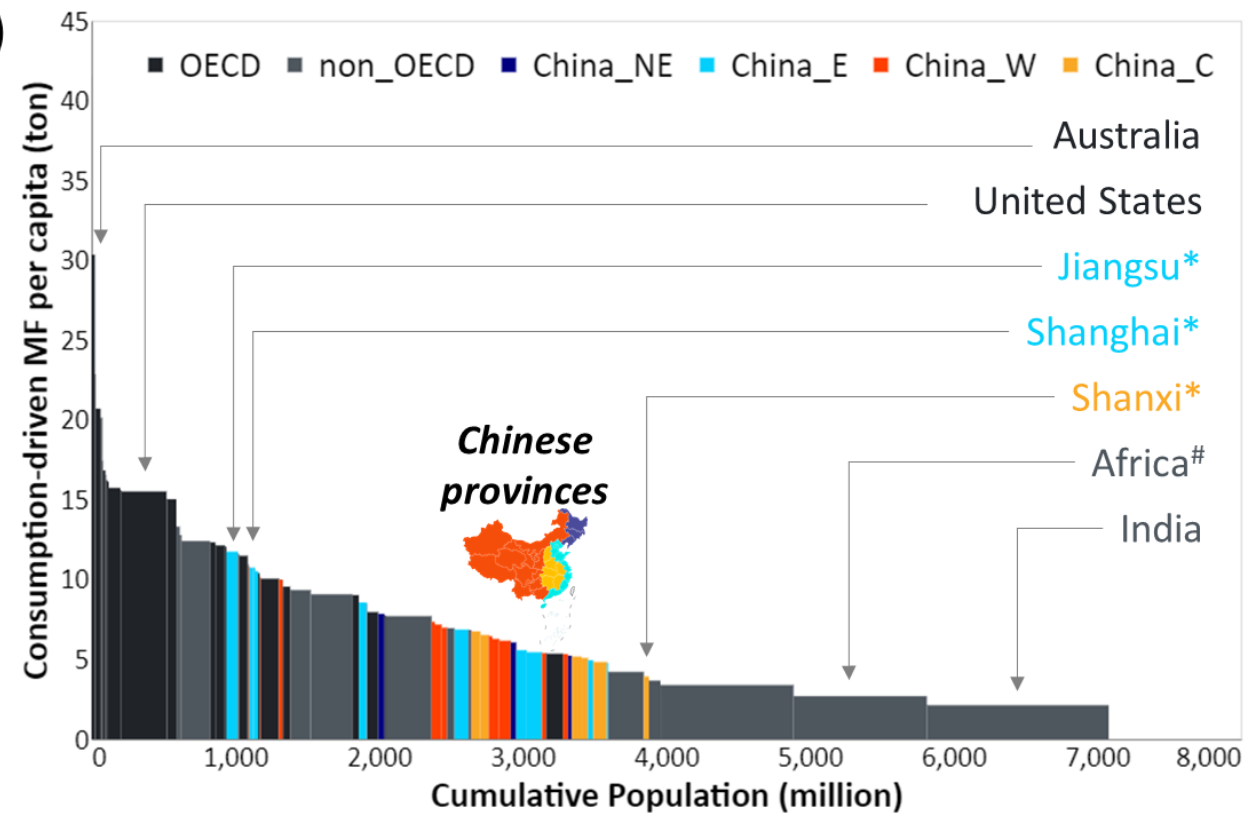
HDI > 0.9, MF > 15t/cap

- USA, Australia, Norway...

Consumption-driven MF



(A) Relationship between per capita consumption-driven material footprint and human development: provinces in China and other nations (Jiang et al 2022)

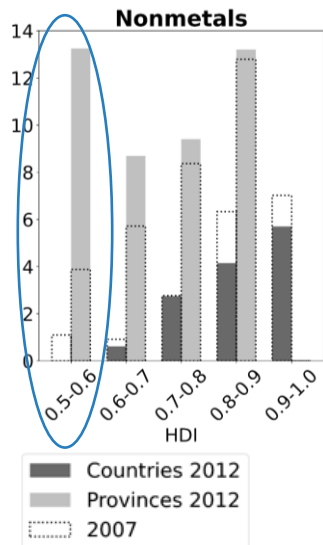


(B) Per capita consumption-driven material footprint by regions (Jiang et al 2022)

China's different MF trajectory can be mainly explained by high capital investments

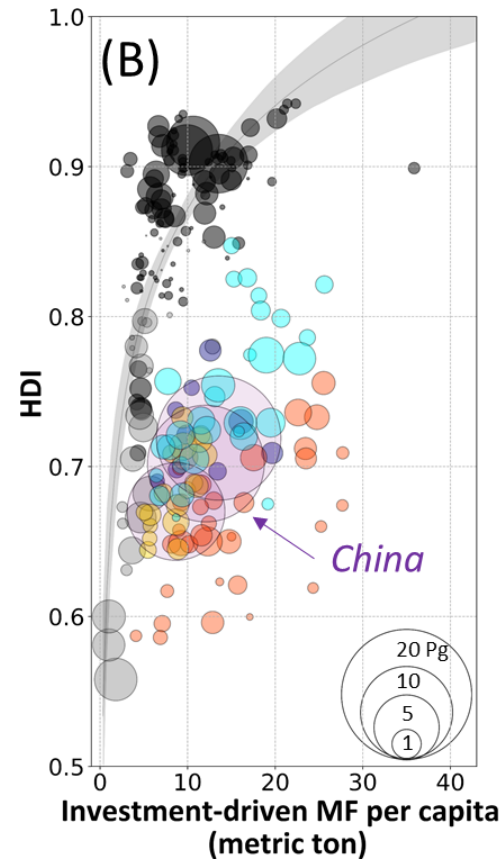
47% of the global MF driven by investments

The investment-driven proportion of MFs for the western provinces all exceeded 60%, with some reaching 82%

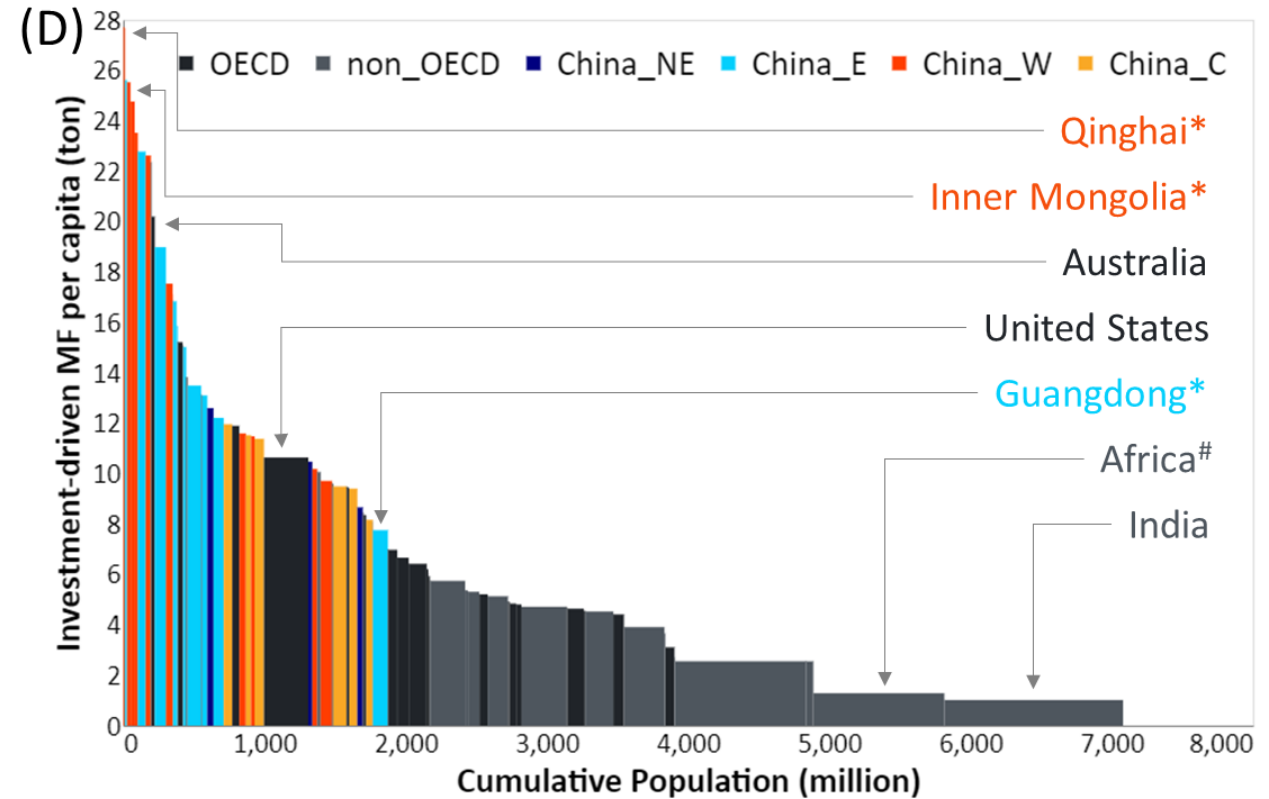


Poorest provinces in China have higher investment-driven MF/cap than any other HDI region clusters

Investment-driven MF



(A) Relationship between per capita investment-driven material footprint and human development: provinces in China and other nations (Jiang et al 2022)

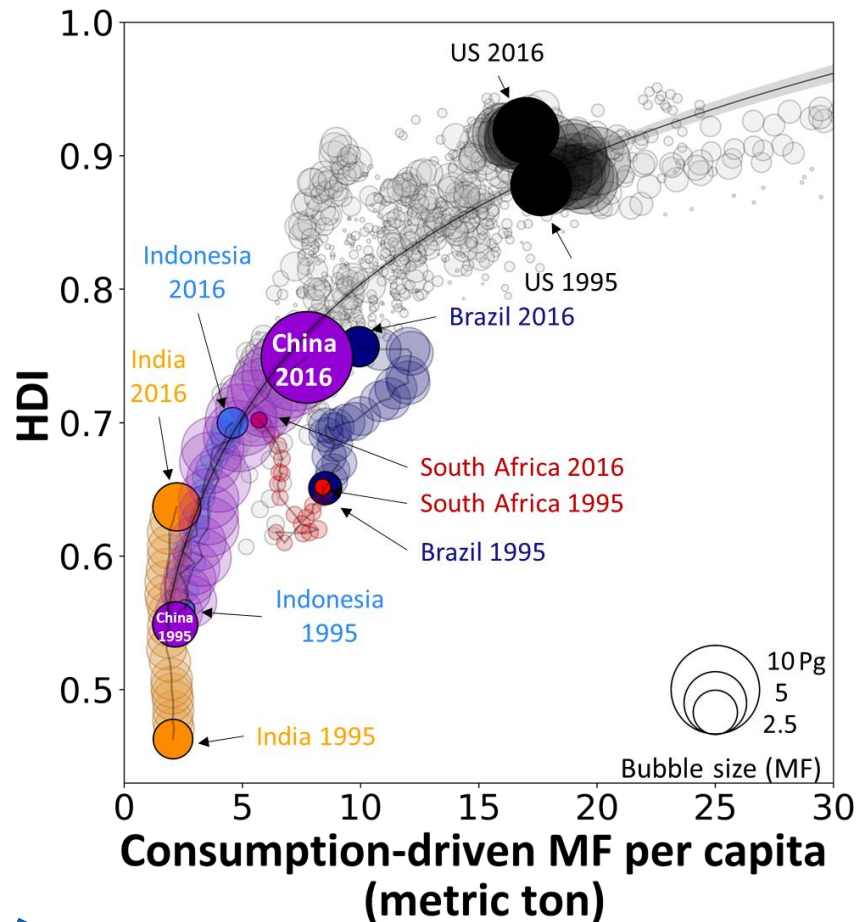


(B) Per capita investment-driven material footprint by regions (Jiang et al 2022)

Comparison of MF trends with other countries

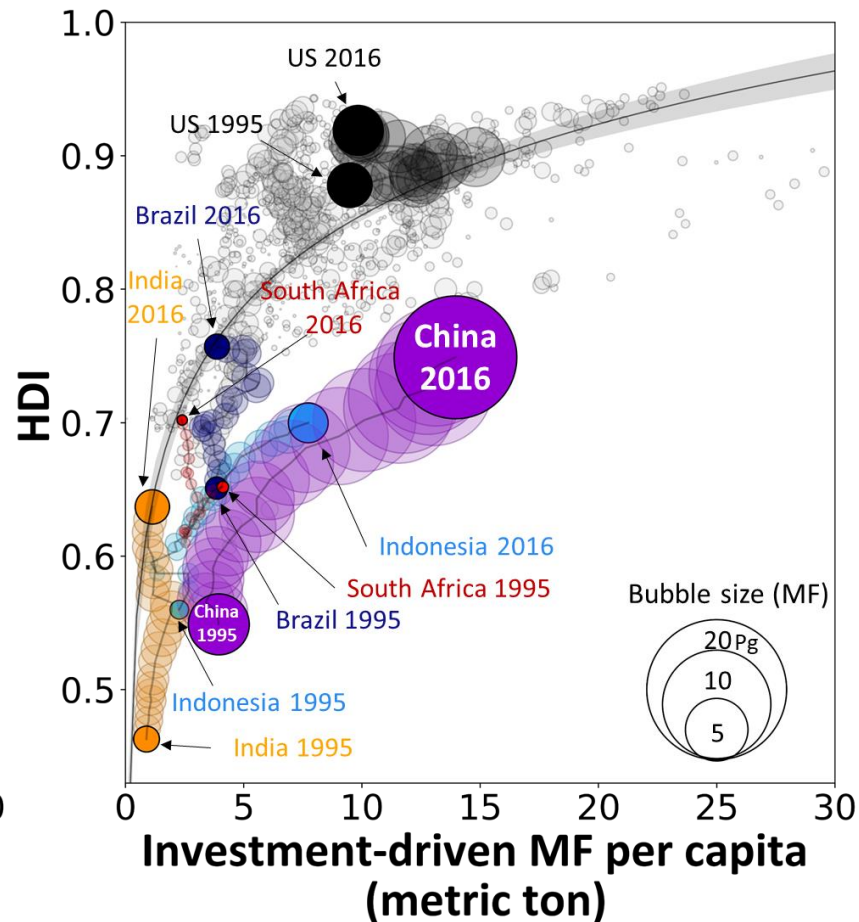
Consumption:

MF of China follows the general international trends



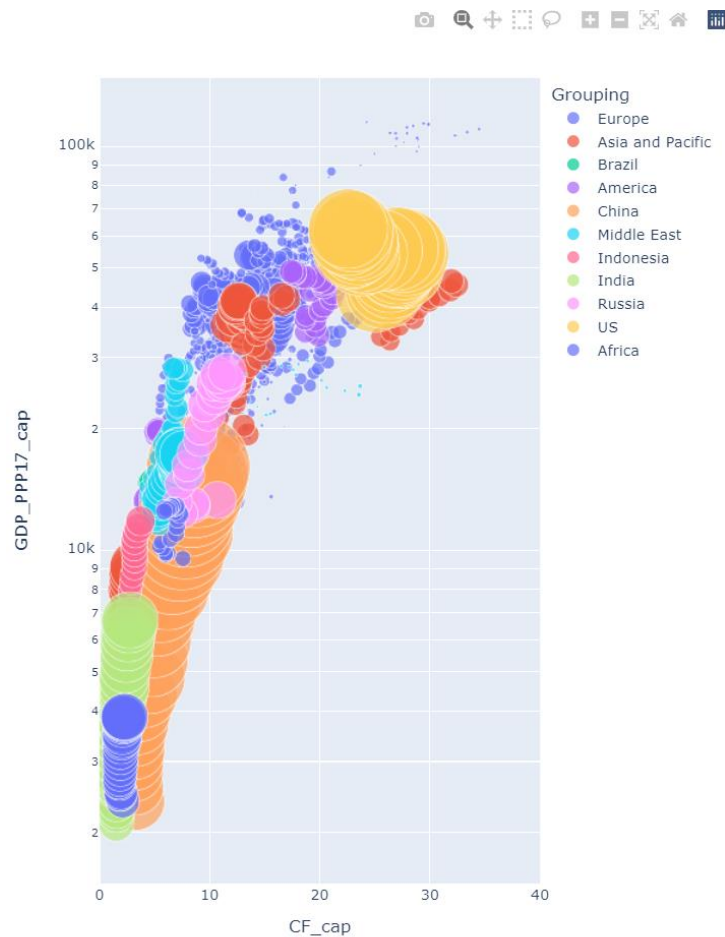
Investment:

MF paths of developing economies apparently deviated from the general “HDI-MF curve”

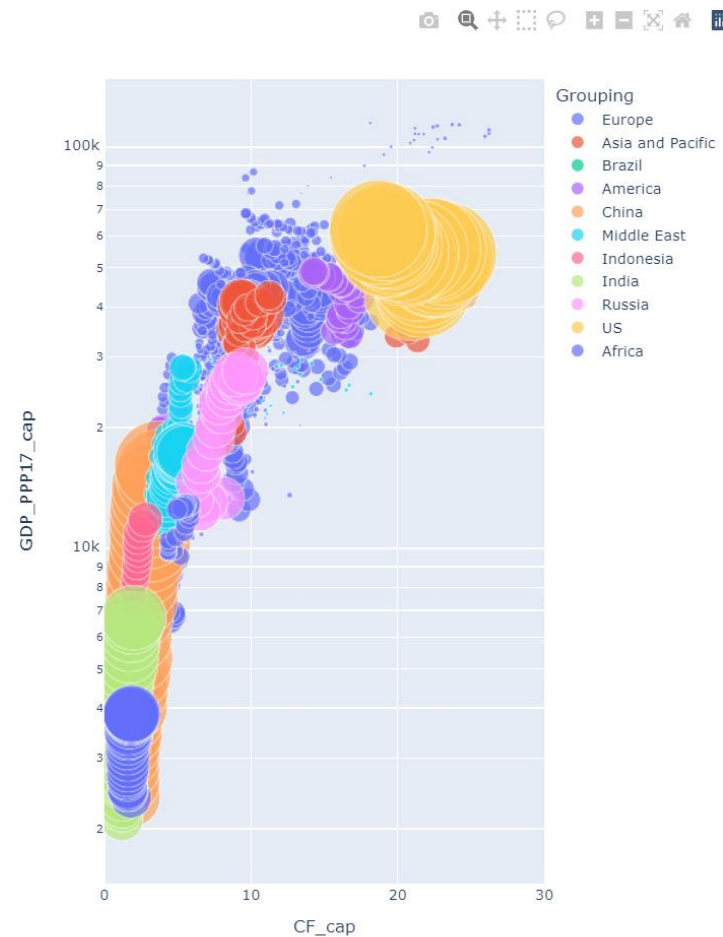


1. Lower **population** intensity
2. Great Western **Development** Programme and investment-driven model
3. A unique **financial transfer** payment system
 - Transfer revenue from East to West
 - Invest% in GDP > 100% in Western provinces
 -
4. Providing wellbeing services in the poorest / extreme places but may be at high (environmental) costs
 - By 2015, all residents (1.4 billion) in China can get access to electricity

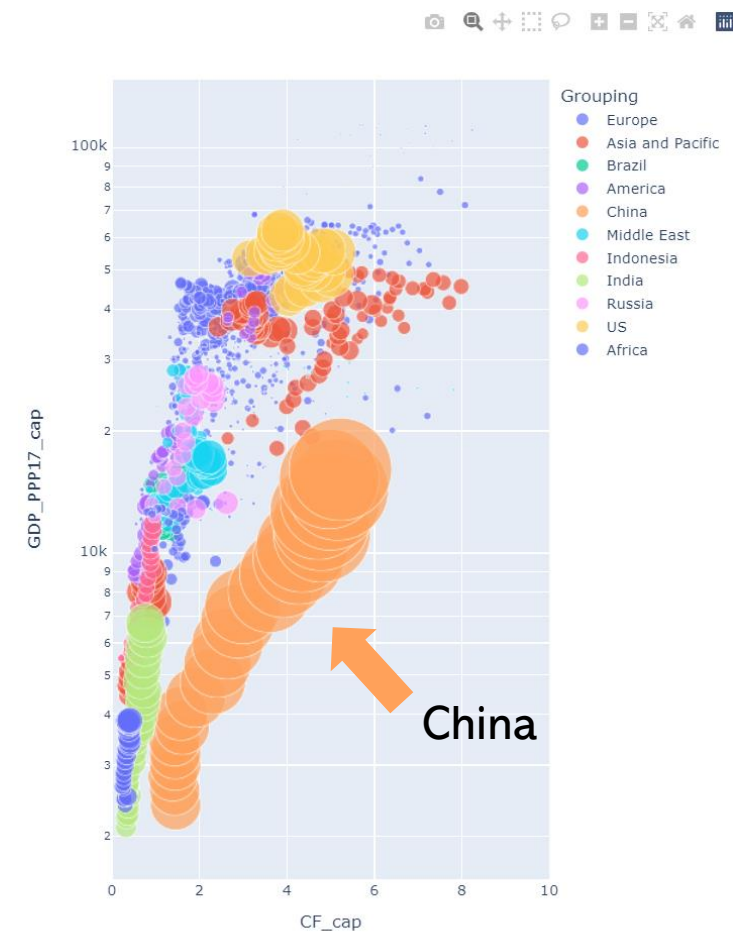
Similar for carbon footprint



(A) Carbon footprint
vs. GDP_PPP



(B) Carbon footprint of
consumption (ton)
vs. GDP_PPP



(C) Carbon footprint of
investment (ton)
vs. GDP_PPP

Placing Chinese provinces in a global context, while splitting consumption-driven MF and investment-driven MF...

Intensive **investments** associated with capital stocks rapidly improved the HDI but at the cost of a very high MF per capita

- post-COVID-19 period: fiscal stimuli / infrastructure gap

The **consumption**-driven MF is highly correlated to human development levels, no matter in Chinese provinces or across the world

- lifestyle / norms of (over)consumption (big house, big car...)

A paradigm?

- The early process of development is in high-investment MFs and, afterward, a shift to a higher-consumption MF once stocks are built up?

Modeling

- Consumption: behavior change
- Capital accumulation, depreciation: maintenance vs expansions
 - Built today but used tomorrow: capital-asset-production-services

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Article

THANK YOU

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