Economic Dependencies between Germany/Europe and China

Current Challenges and Options

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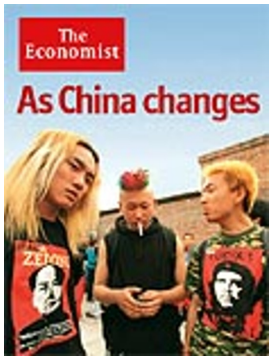
Bielefeld University and Kiel Institute for the World Economy

2 July 2024 — RWTH Aachen


The Economist
China—the fireworks to come


The Economist
China opens up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As China changes


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Dealing with terror
Mixing AIDS and morality
Business's dodgy numbers
Why trees aren't green
GREAT WALL ST
How China runs the world economy


INSIDE THIS WEEK: A 14-PAGE SPECIAL REPORT ON INNOVATION
The Economist
Gordon Brown's disastrous retreat
How the super-jumbo changes air travel
Meet Fred Thompson
Has commercial property peaked?
Che Guevara, the man and the myth
China, beware
The leaders meet, the cities grow, the peasants are left behind


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Shameless greed at AIG
One more try on Iran
What's wrong with General Electric
Farmers rake it in
Let Michelle be Michelle
How China sees the world
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INDIAN OCEAN


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Iran's African charm offensive
Greece and the bond markets
America's terrifying budget
Who rules the nuclear industry?
Facing up to China


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Germany's angst over immigration
Dr Evil, the commodity speculator
Ireland under siege
Keith Richards, management guru
Buying up the world
The coming wave of Chinese takeovers


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California on a roll
Europe's insane climate policies
The inevitability of financial instability
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China loses its allure
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The scam of pay-as-you-go government
Spycraft and corporate security
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Corbyn prepares to govern Britain
How match-fixing poisons sport
Catalonia's destructive referendum
If tech firms were sewage works
Does China play fair?


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Hollywood after Weinstein
Povera Italia: a dismal choice
A special report on autonomous vehicles
How the West got China wrong


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Progress in America's prisons
Will quantum break the internet?
China v America
A dangerous rivalry


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The Middle East after oil
School closures' colossal cost
Union slack: Britons rebalance life
Trade without trust
How the West should do business with China


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Big tech's AI bets
Inside Turkey's economy
The global rice crisis
Russia's abandoned yachts
AMERICA V CHINA
It's worse than you think

TODAY'S ROAD MAP

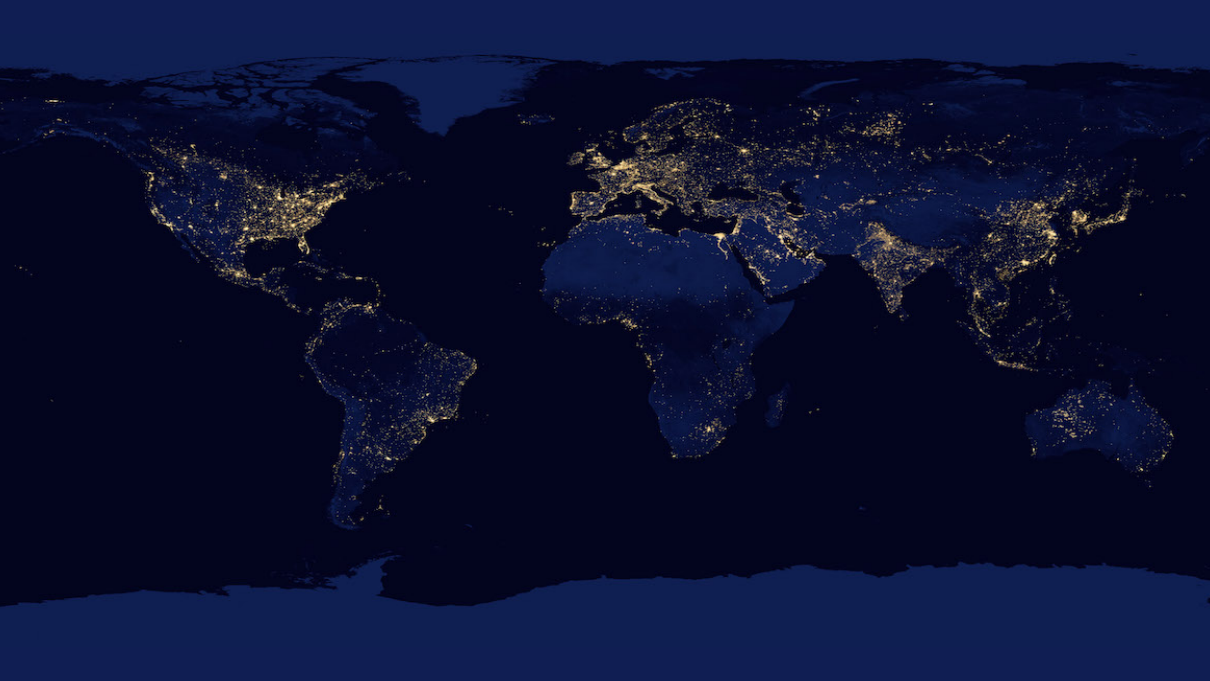
1. The economic rise of China

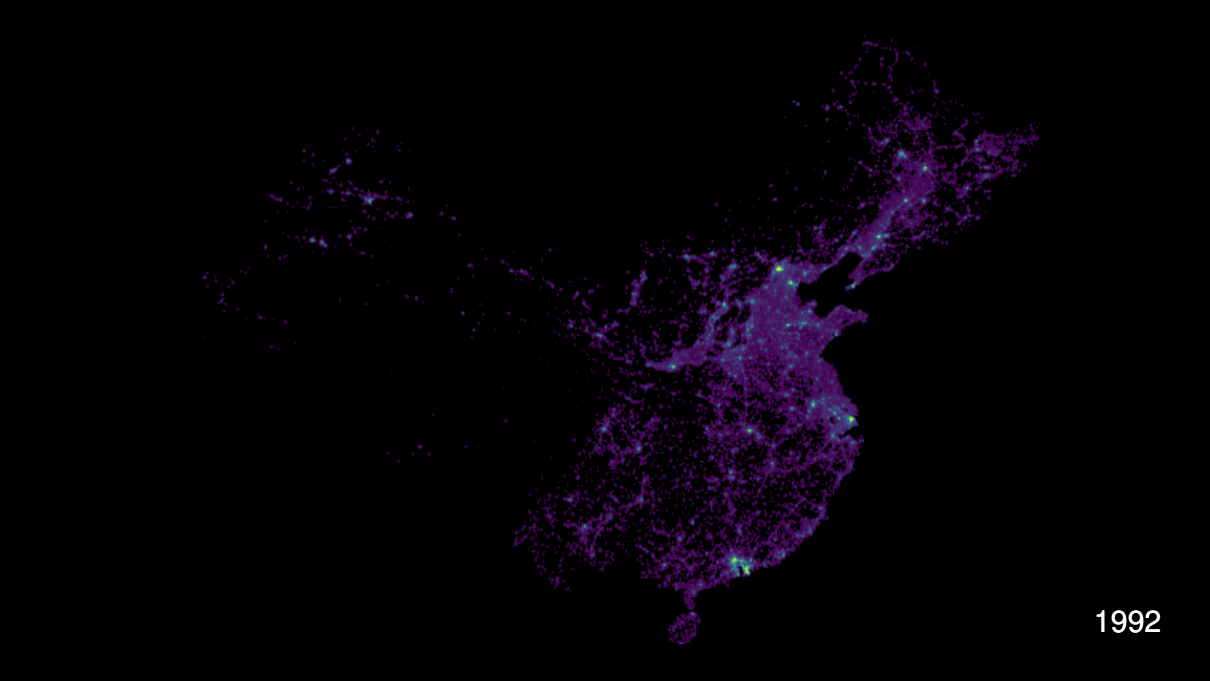
2. Methodological framework: Gravity

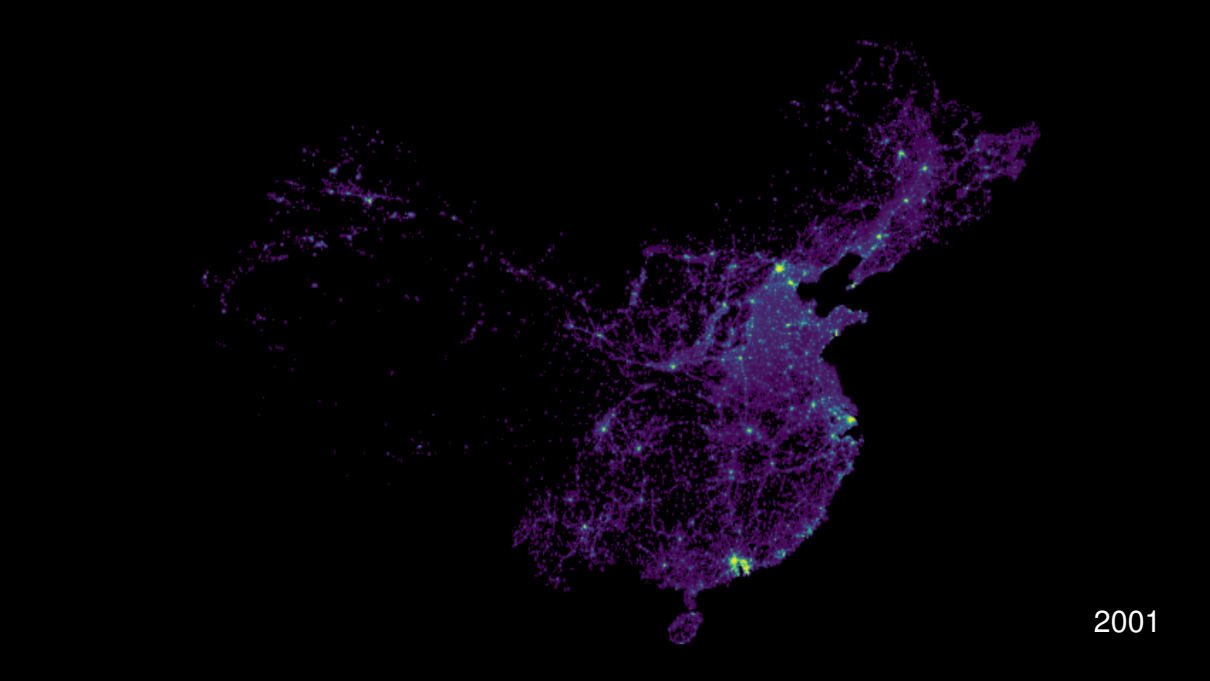
3. Dependence? Interdependence?

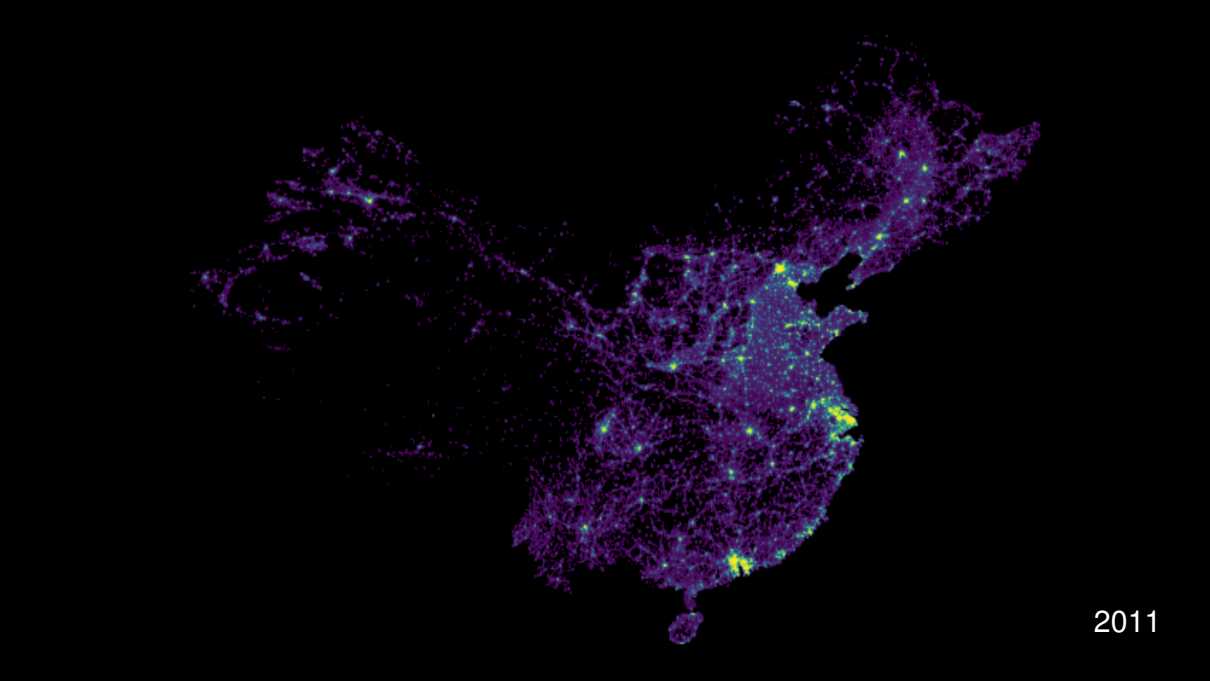
4. Effects of decoupling

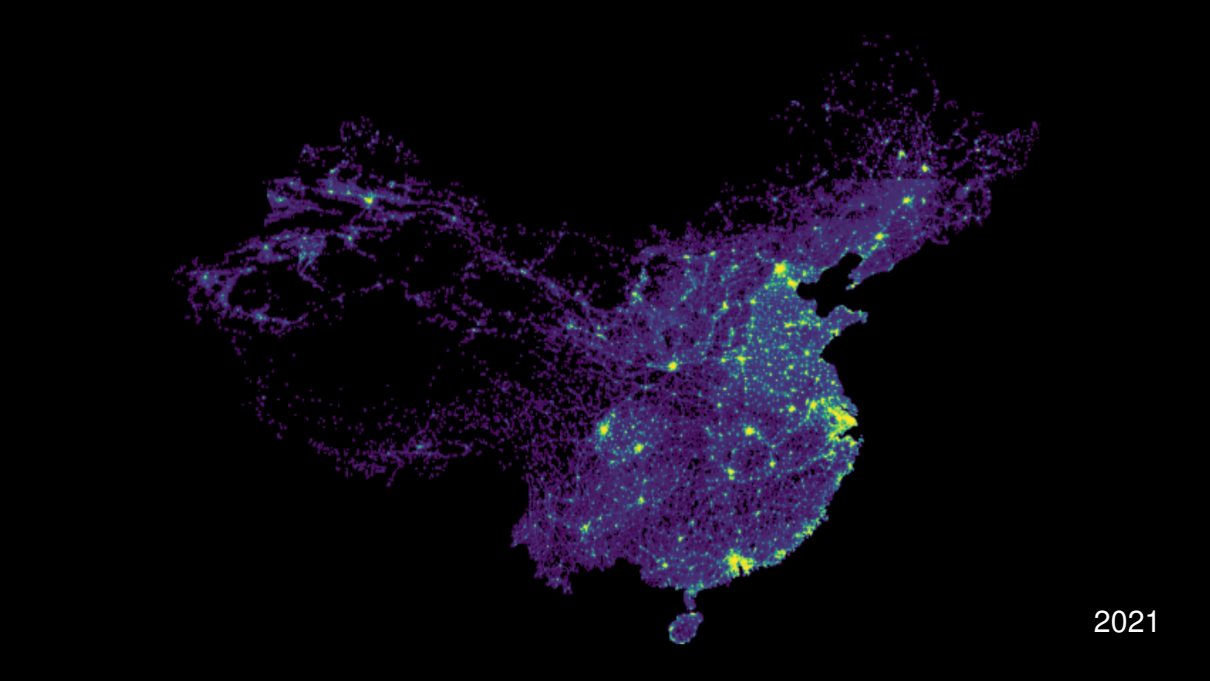
The economic rise of China



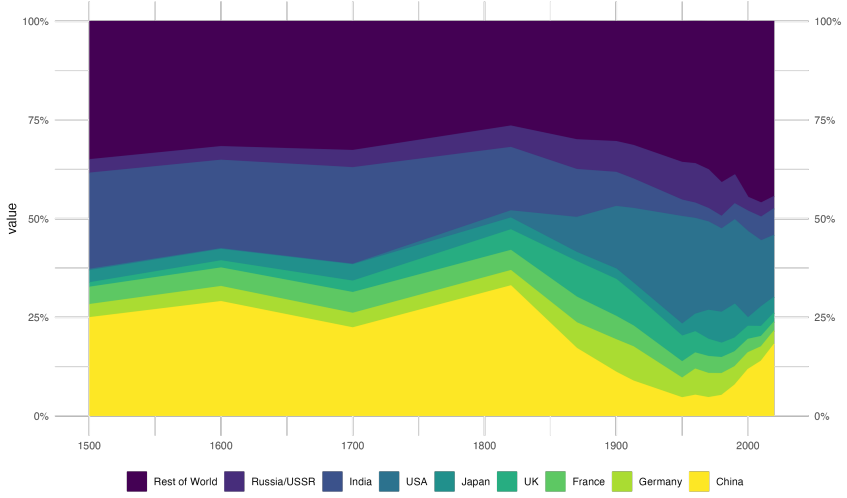

1992

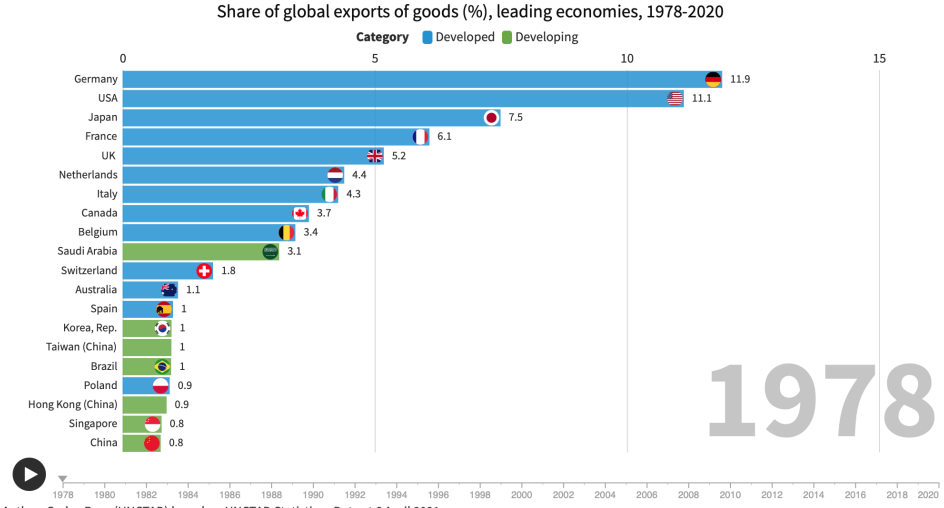

2001


2011

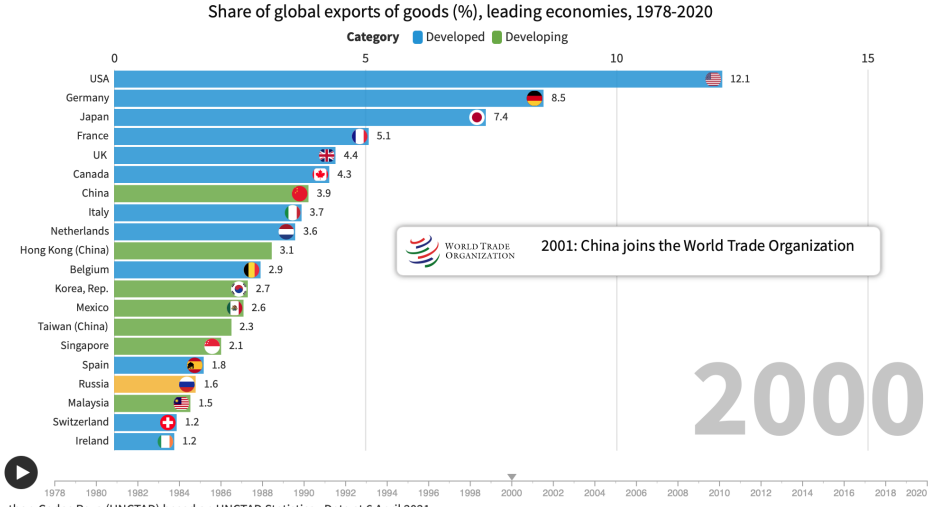

2021

SHARE IN GLOBAL GDP





Author: Carlos Razo (UNCTAD) based on UNCTAD Statistics • Data at 6 April 2021



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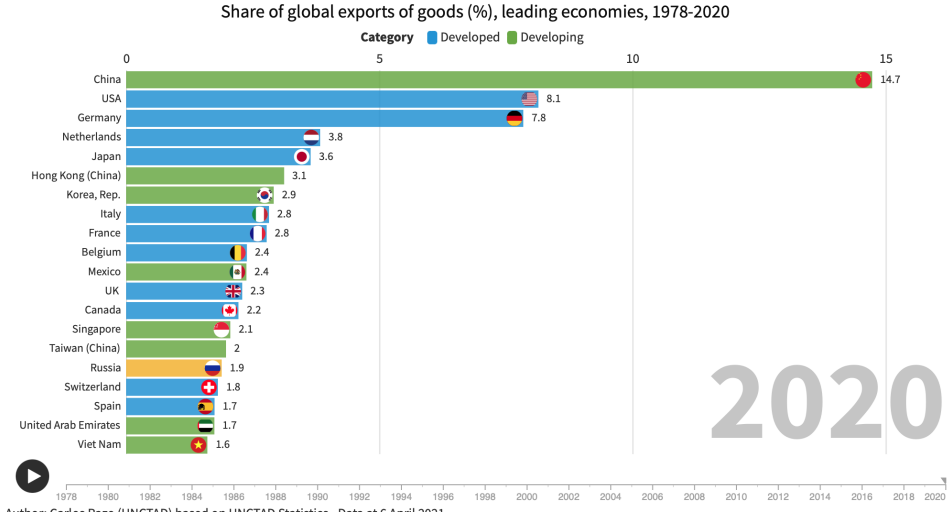

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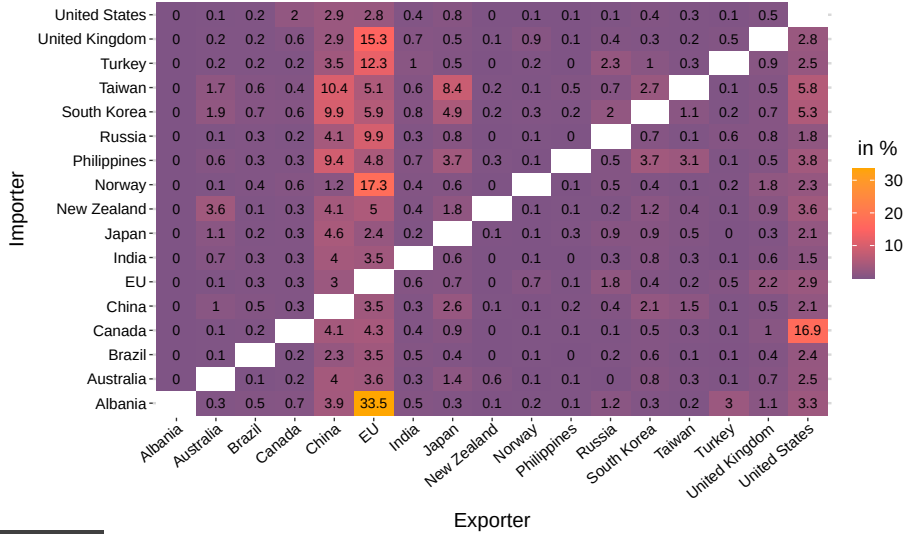
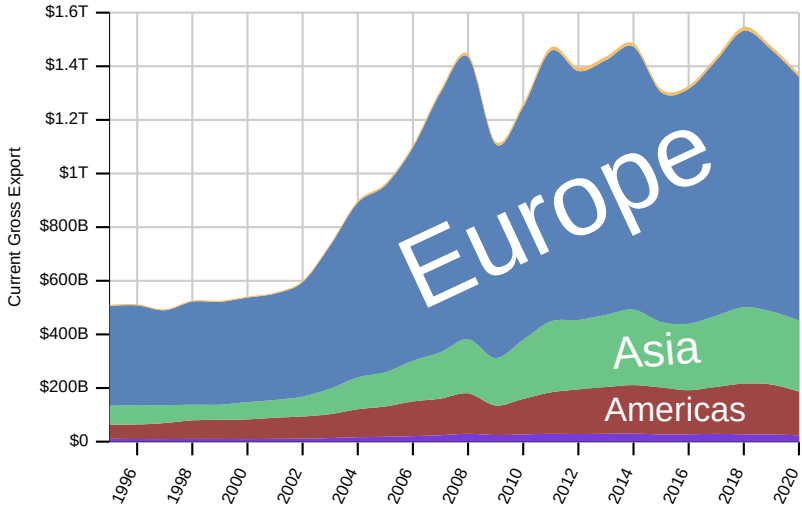
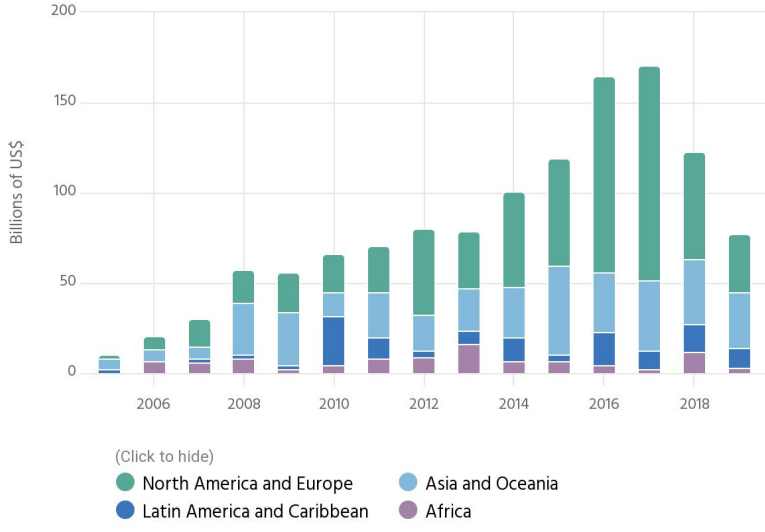
SHARE OF TRADE WITH CHINA GDP



GERMANY'S EXPORT DESTINATIONS

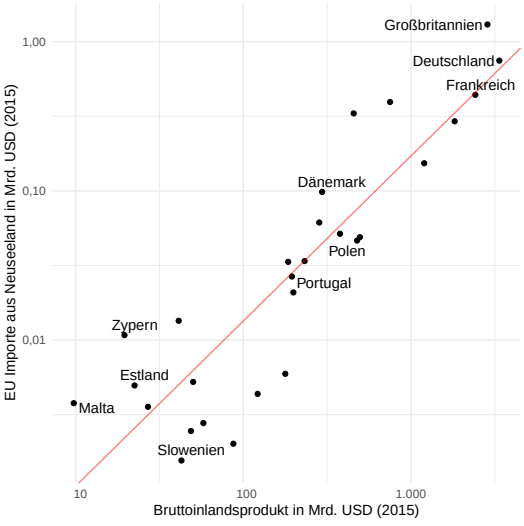


Breakdown of Chinese Outbound FDI by Region

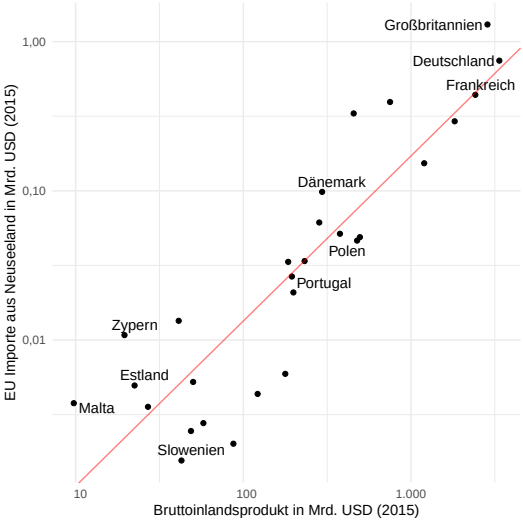


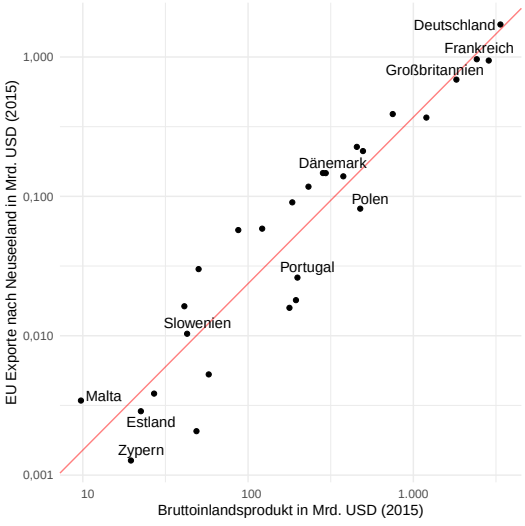
CSIS China Power Project
Source: AEI and Heritage Foundation, China Global Investment Tracker

Methodological framework: Gravity



Source: Own computation and visualization, data from UN Comtrade und CEPII





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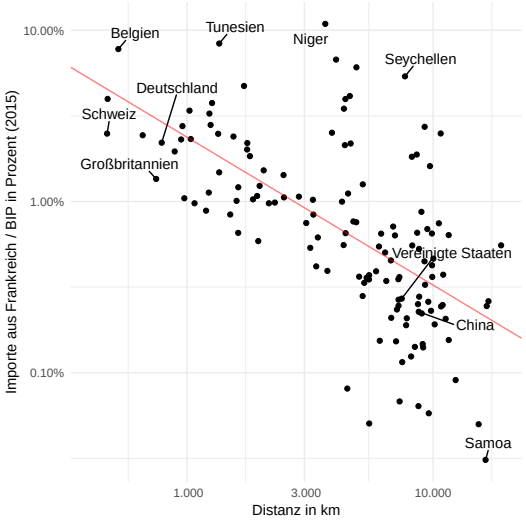
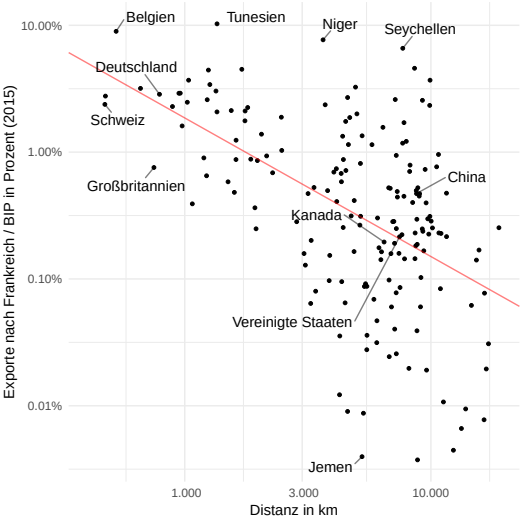
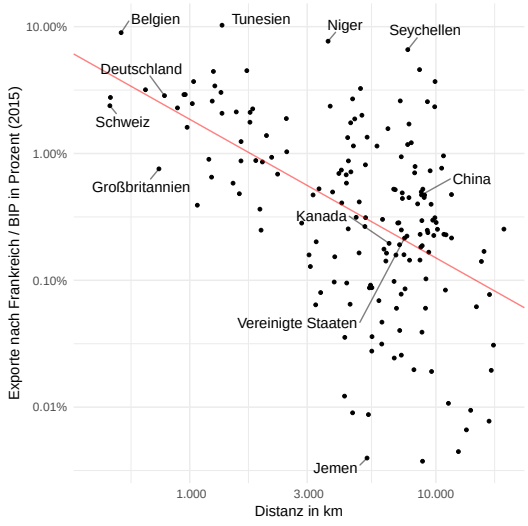

Importe aus Frankreich / BIP in Prozent (2015)
10.00%
1.00%
0.10%
Belgien
Tunesien
Niger
Seychellen
Deutschland
Schweiz
Großbritannien
Vereinigte Staaten
China
Samoa
1.000
3.000
10.000
Distanz in km

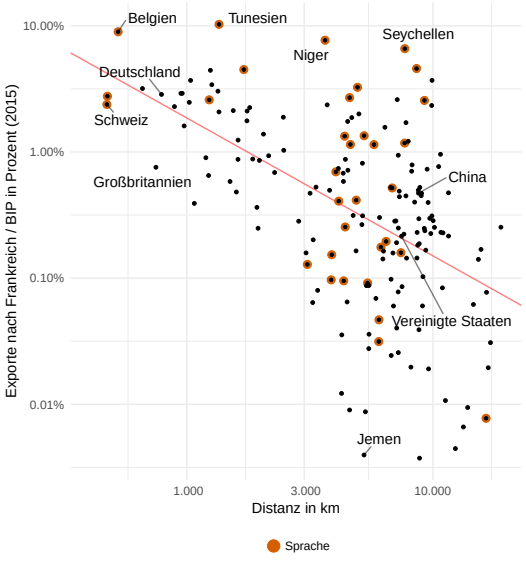

Exporte nach Frankreich / BIP in Prozent (2015)
10.00%
1.00%
0.10%
0.01%
Belgien
Tunesien
Niger
Seychellen
Deutschland
Schweiz
Großbritannien
China
Kanada
Vereinigte Staaten
Jemen
1.000
3.000
10.000
Distanz in km

other “distances”:



other “distances”:

- common language



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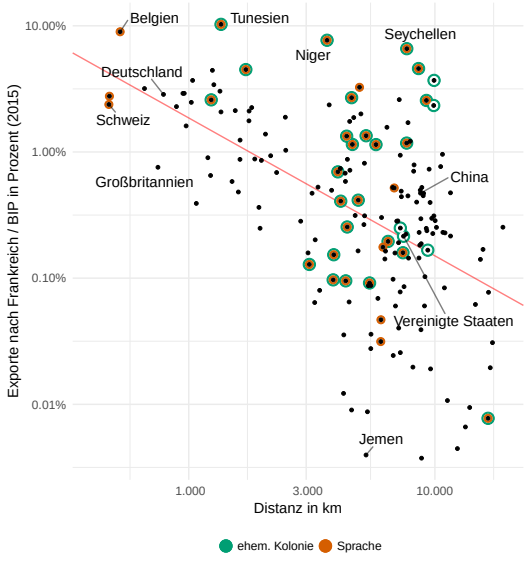

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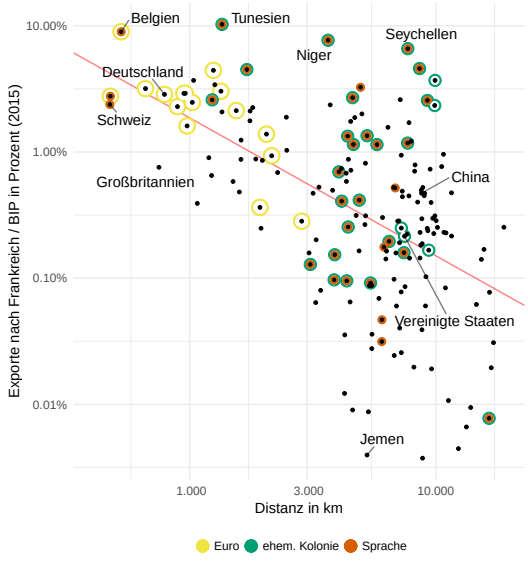

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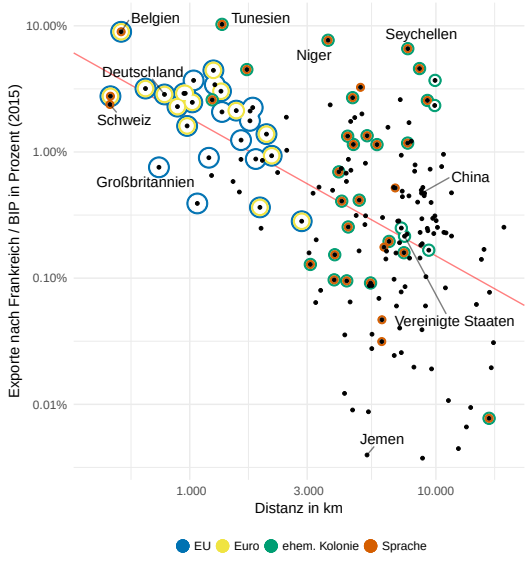

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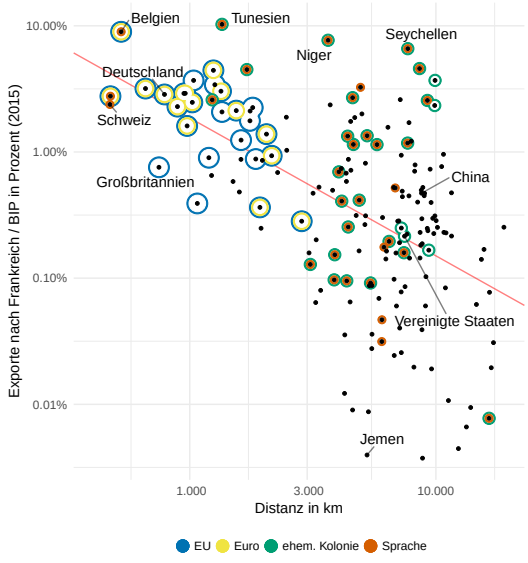
- . . .



“NAIVE” GRAVITY MODEL

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$$X_{ij} = G\ Y_i^{\alpha}\ E_j^{\gamma}\ \phi_{ij} \quad \text{with} \quad \phi_{ij} = \exp\left(\theta_{\text{Distance}} \cdot \log \text{Distance}_{ij} + \theta_{\text{FTA}} \cdot \text{FTA}_{ij} + \ldots\right)$$

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- first application to trade flows: Tinbergen (1962)

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- first application to trade flows: Tinbergen (1962)
- but: very ad-hoc, what's behind Y_i and E_j?

STRUCTURAL GRAVITY

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- $Y_i = \sum_j X_{ij}$ is value of production, $X_j = \sum_i X_{ij}$ is value of expenditure
- Ω_i and Φ_j are "multilateral resistance" terms, defined as

$$\Phi_j = \sum_\ell \frac{\phi_{j\ell} Y_\ell}{\Omega_\ell} \quad \text{and} \quad \Omega_i = \sum_\ell \frac{\phi_{\ell i} X_\ell}{\Phi_\ell}$$

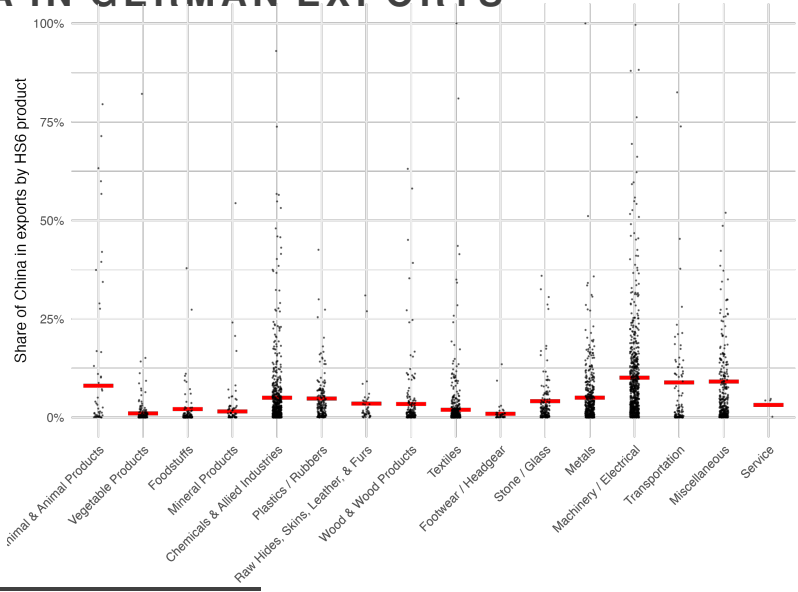
Dependence? Interdependence?

DEPENDENCE

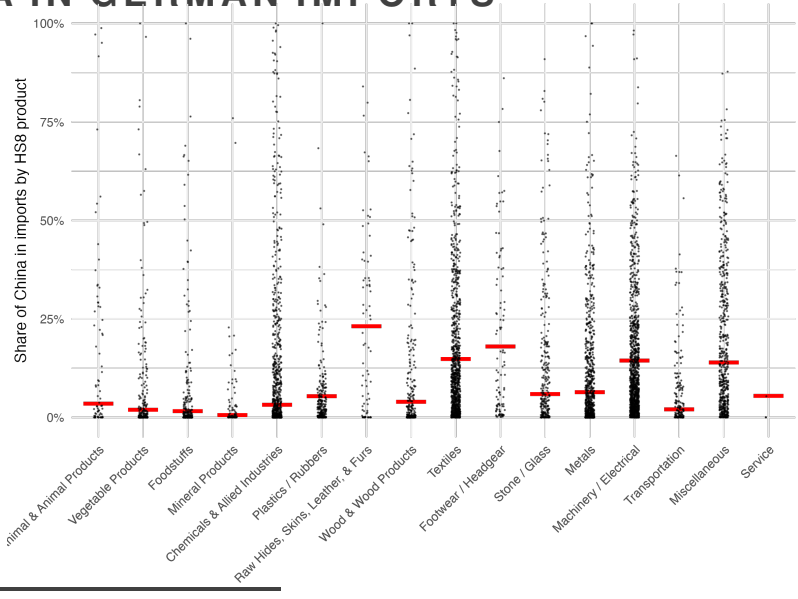
- Exports: Important market where lots of German-produced goods go
- Imports: Critical inputs for German industries
- FDI: Profits from German companies' investments in China

  $\rightarrow$ 0.5 % of German GNI . . .

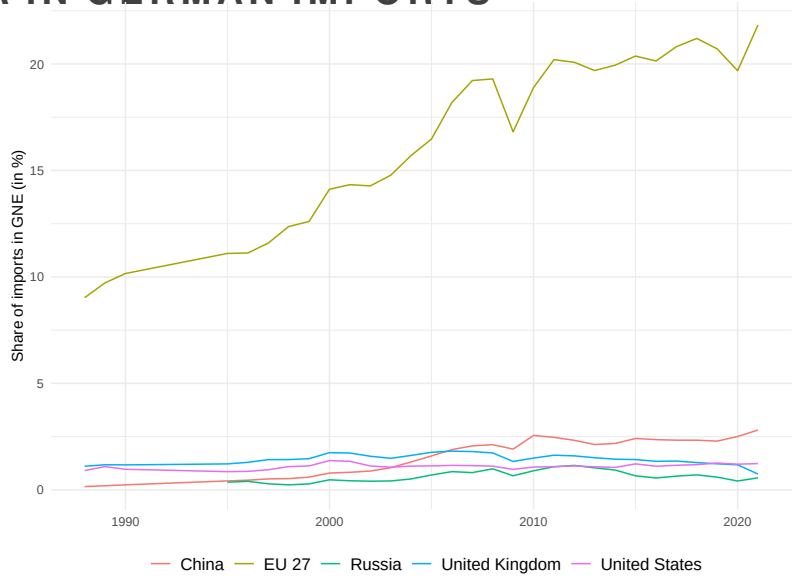
CHINA IN GERMAN EXPORTS



CHINA IN GERMAN IMPORTS



CHINA IN GERMAN IMPORTS

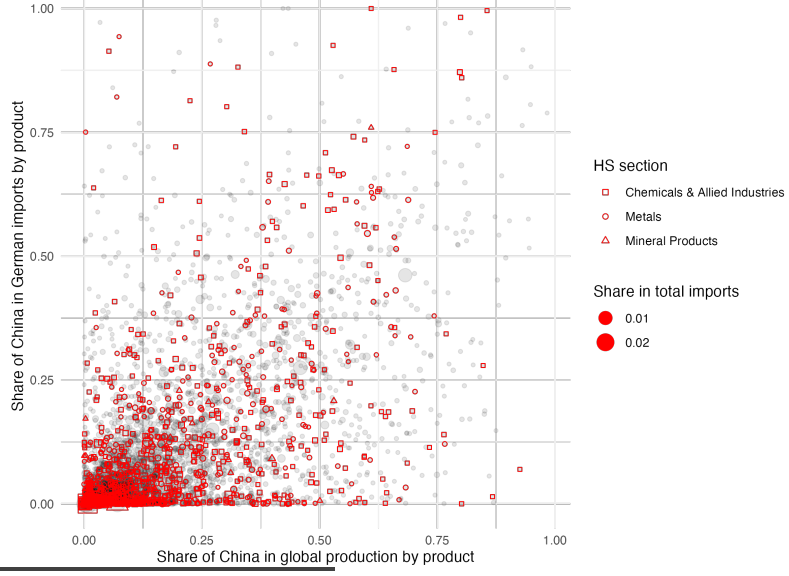


CRITICAL INPUTS

- Energy: Natural gas, electricity
- Raw materials: Quartz sand, soda, lime, dolomite, sodium sulfate, aluminum oxide, tin, titanium oxide, zirconium oxide, borax, boron oxide, cobalt, indium, other metals and rare earths

→ Important for production, imported, concentrated world market

CRITICAL INPUTS FROM CHINA



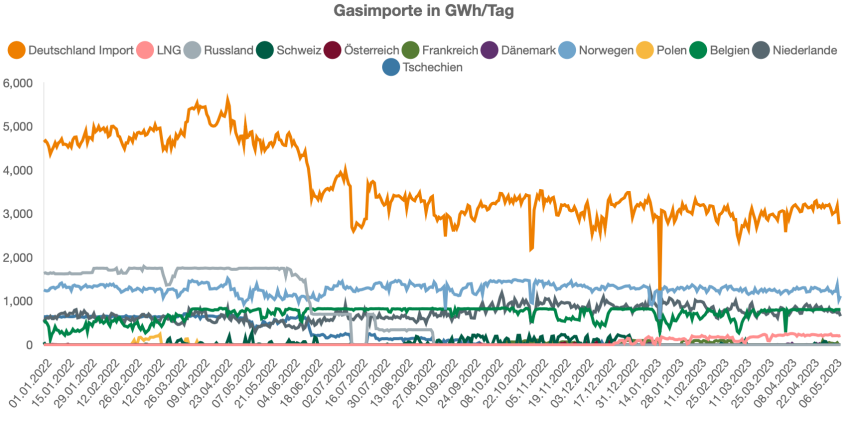
Effects of decoupling

DECOUPLING

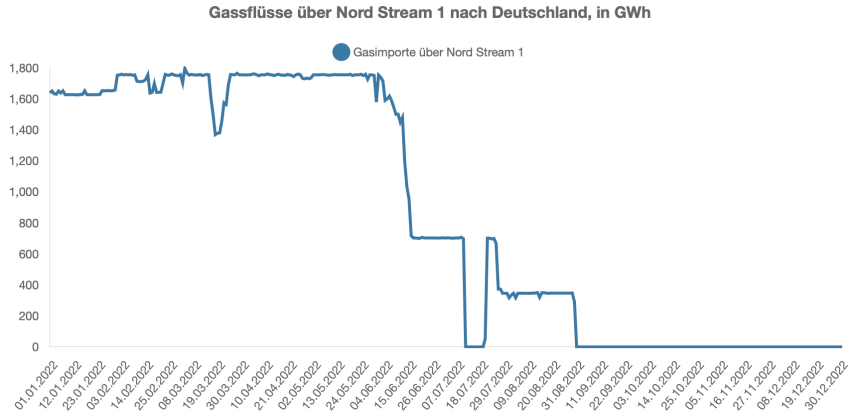
- German industry is dependent on energy and other imported inputs
- But: Import structure actually quite diversified
- Can trade diversions avoid shortages?



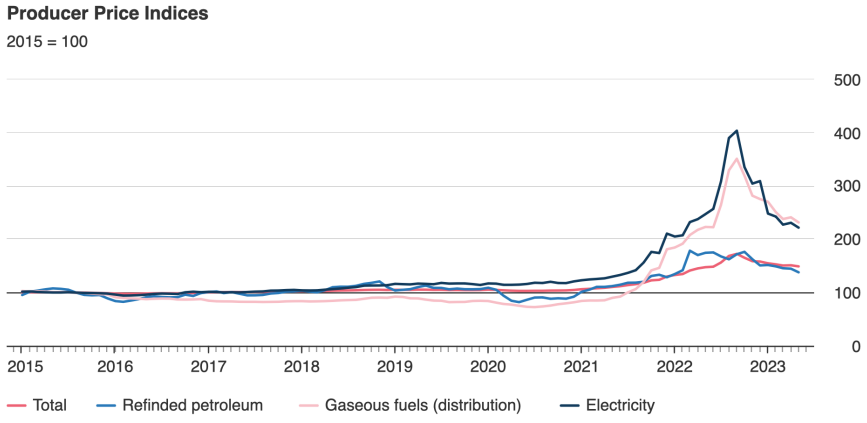
NATURAL GAS


Gasimporte in GWh/Tag
Deutschland Import
LNG
Russland
Schweiz
Österreich
Frankreich
Dänemark
Norwegen
Polen
Belgien
Niederlande
Tschechien
6,000
5,000
4,000
3,000
2,000
1,000
0
01.01.2022
15.01.2022
29.01.2022
12.02.2022
26.02.2022
12.03.2022
26.03.2022
09.04.2022
23.04.2022
07.05.2022
21.05.2022
04.06.2022
18.06.2022
02.07.2022
16.07.2022
30.07.2022
13.08.2022
27.08.2022
10.09.2022
24.09.2022
08.10.2022
22.10.2022
05.11.2022
19.11.2022
03.12.2022
17.12.2022
31.12.2022
14.01.2023
28.01.2023
11.02.2023
25.02.2023
11.03.2023
25.03.2023
08.04.2023
22.04.2023
06.05.2023

NATURAL GAS FROM RUSSIA



PRODUCER PRICES FOR ENERGY



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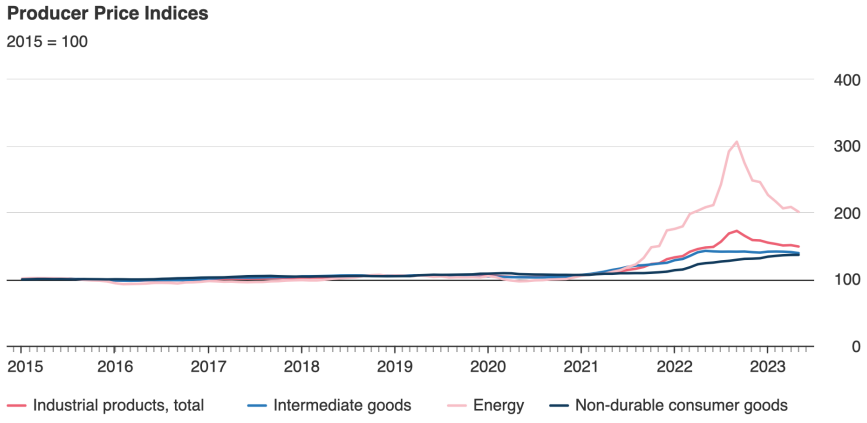
PRODUCER PRICES FOR GOODS



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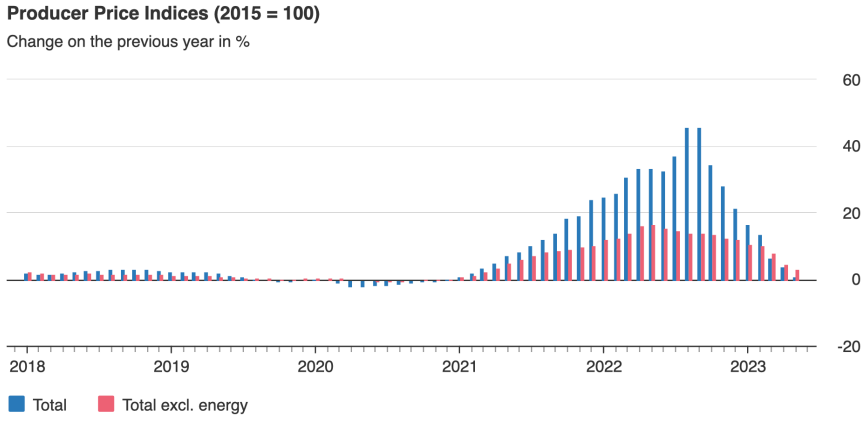
PRODUCER PRICES CHANGES



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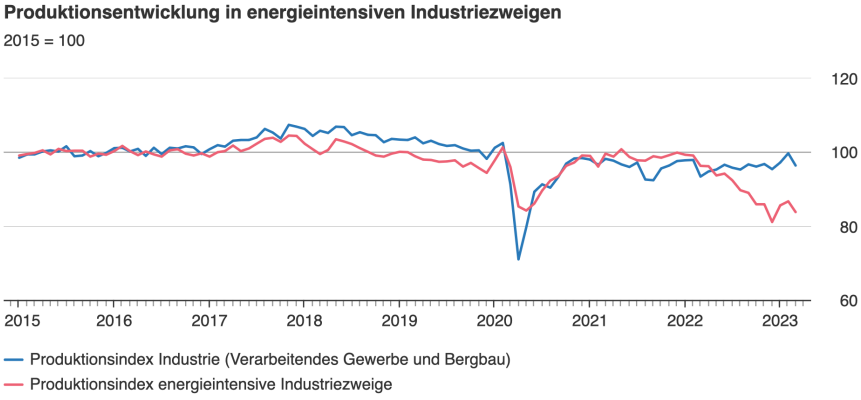
EVOLUTION OF OUTPUT



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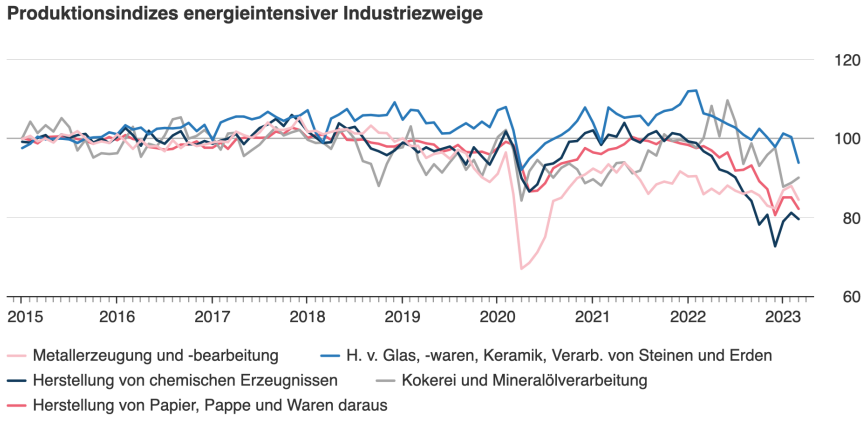

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MORE ACADEMIC RIGOUR

- Simulation study with gravity-based model of the world economy
- Many sectors, countries, and global value chains
- Idea: “What if?” — Counterfactual scenarios
- Calibration of the model with actual production and trade data

ECONOMIC IMPACT OF SANCTIONS

Russia ’14

	Current Coalition	Global Coalition
Current measures	-1.44 %	-2.49 %
	(0.29)	(0.41)
Complete embargo	-8.81 %	-15.24 %

ECONOMIC IMPACT OF SANCTIONS

Russia ’14

	Current Coalition	Global Coalition
Current measures	-1.44 % (0.29)	-2.49 % (0.41)
Complete embargo	-8.81 %	-15.24 %

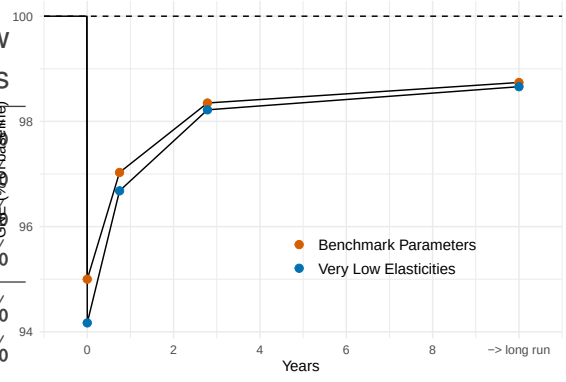
Iran ’12

	Current Coalition	Global Coalition
Current measures	-1.9 % (0.16)	-4.88 % (0.45)
Complete embargo	-4.04 %	-13.2 %



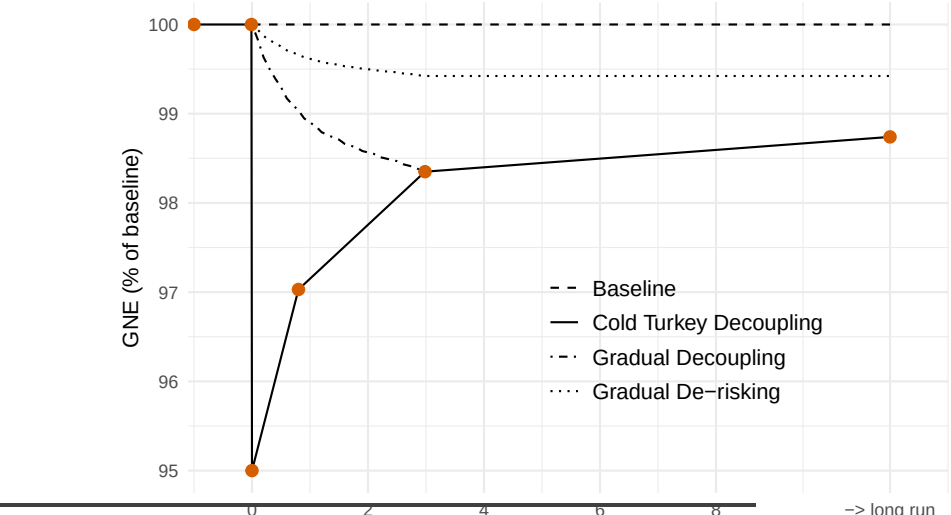
RESULTS: GERMAN WELFARE EFFECTS

Trade Elasticity	Benchmark Parameters	Very Low Elasticities
$\varepsilon = 0.5$	-5.00%	-5.83%
$\varepsilon = 1.5$	-2.97%	-3.32%
$\varepsilon = 3$	-1.65%	-1.78%
$\varepsilon = 4$	-1.26%	-1.34%
$\varepsilon = 0.1$	-5.92%	-6.15%
$\varepsilon = 0.25$	-5.62%	-6.38%



- Short-run: comparable to global financial crisis
- Long-run: comparable to Brexit.

RESULTS: COLD TURKEY VS. GRADUAL DECOUPLING



LESSONS FROM 2022

- Trade redirection: Imports from other countries
- Production adjustment: Substitution of input materials
- Production adjustment: Change/relocation of production
- Market mechanism: Global market price increases, promotion in other countries

TAKE-AWAYS

- German industry: High energy intensity, important imported inputs
- Possible trade conflict with China: Risks?

  → Doom scenarios completely overblown
- 2022 shows resilience of the German industry

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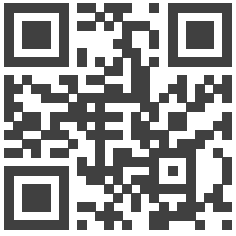
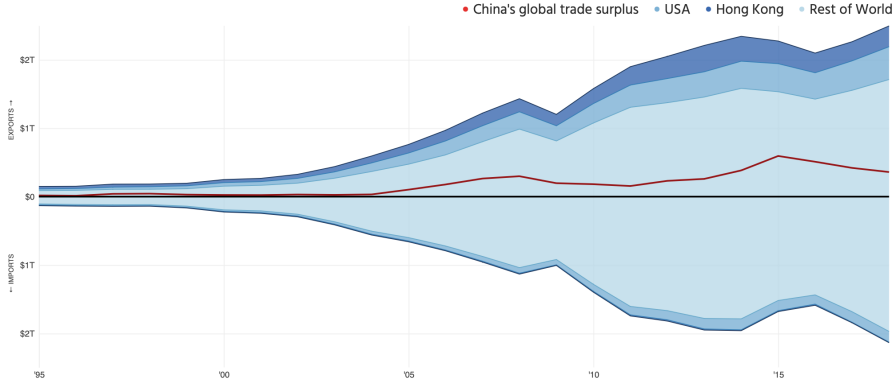


jhi.nz/240702_RWTH

Appendix

Rise of China

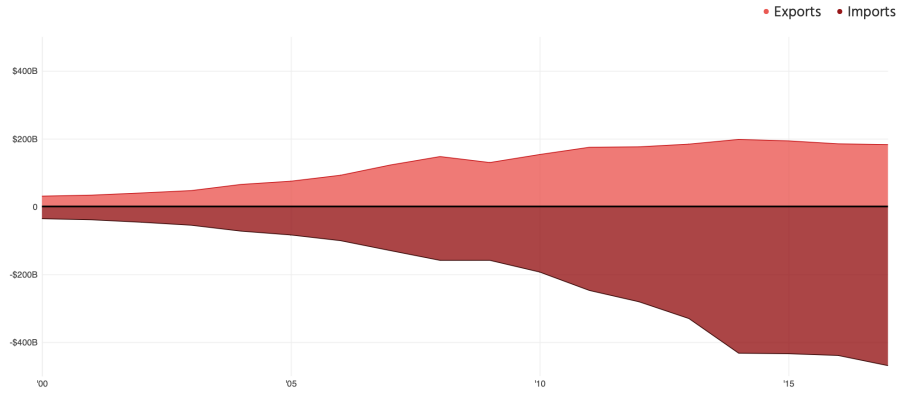
GOODS TRADE BALANCE



CSIS | ChinaPower

Source: UN Comtrade

SERVICES TRADE BALANCE



CSIS | ChinaPower

Source: UN Comtrade

Gravity

GENERAL GRAVITY

$$X_{ij} = G\, S_i\, M_j\, \phi_{ij}$$

- generalization of the “naive” version
- S_i and M_j are exporter and importer characteristics

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  $\rightarrow$ can be formalized in so-called structural gravity model

FROM GENERAL TO STRUCTURAL GRAVITY

- Recall general gravity

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  $\rightarrow$ nests most modern microfoundations

TWO CONDITIONS

1. Spatial allocation of expenditure for the importer
2. Market-clearing for the exporter

ALLOCATION OF EXPENDITURE

From above it follows that

$$X_{ij} = \pi_{ij} X_j \quad \text{with} \quad \pi_{ij} \geq 0, \sum_i \pi_{ij} = 1$$

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- "bilateral resistance"-weighted sum of exporter characteristics
- requires that expenditure shares are independent of income

MARKET-CLEARING

Sum of country *i*'s exports to all destinations equals value of production

$$Y_i = \sum_j X_{ij} = S_i \sum_j \frac{X_j}{\Phi_j} \phi_{ij}$$

Rearranging

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- Ω is similar to "market potential" in economic geography

Decoupling

PRODUCTION OF RARE EARTH ELEMENTS

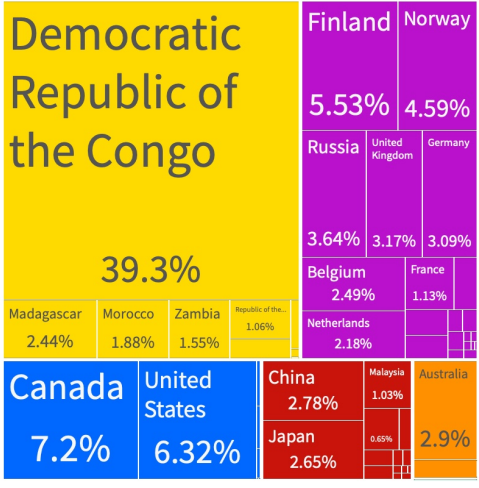
Country	Production share (%)
China	60.6%
US	15.5%
Myanmar	9.4%
Australia	7.9%
Thailand	2.9%
Madagascar	1.2%
India	1.1%
Russia	1%
Brazil	0.2%
Vietnam	0.1%
Burundi	0%
Rest of world	0.1%

Source: Statista

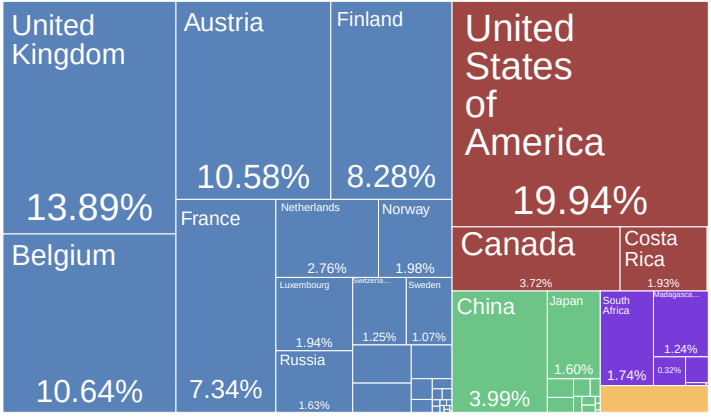
PRODUCTION OF LITHIUM

Rank	Country	2021 Production (tonnes)	% of Total
#1	Australia	55,416	52%
#2	Chile	26,000	25%
#3	China	14,000	13%
#4	Argentina	5,967	6%
#5	Brazil	1,500	1%
#6	Zimbabwe	1,200	1%
#7	Portugal	900	1%
#8	United States	900	1%
	Rest of World	102	0.1%
	Total	**105,984**	**100%**

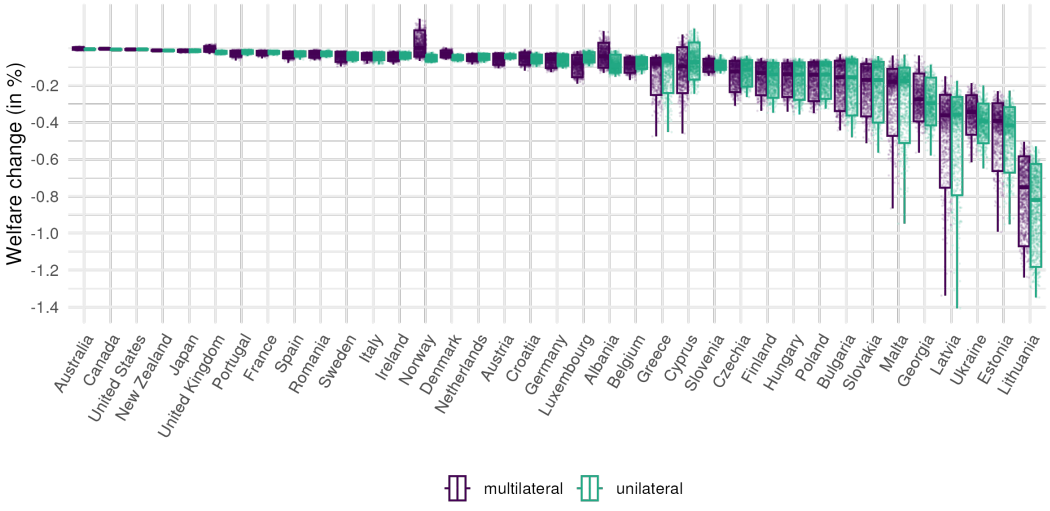
PRODUCTION OF COBALT



GERMAN IMPORTS OF COBALT



INCURRED WELFARE COSTS



IMPOSED WELFARE COSTS

