Industrial Upgrading in China: What Are the Lessons?

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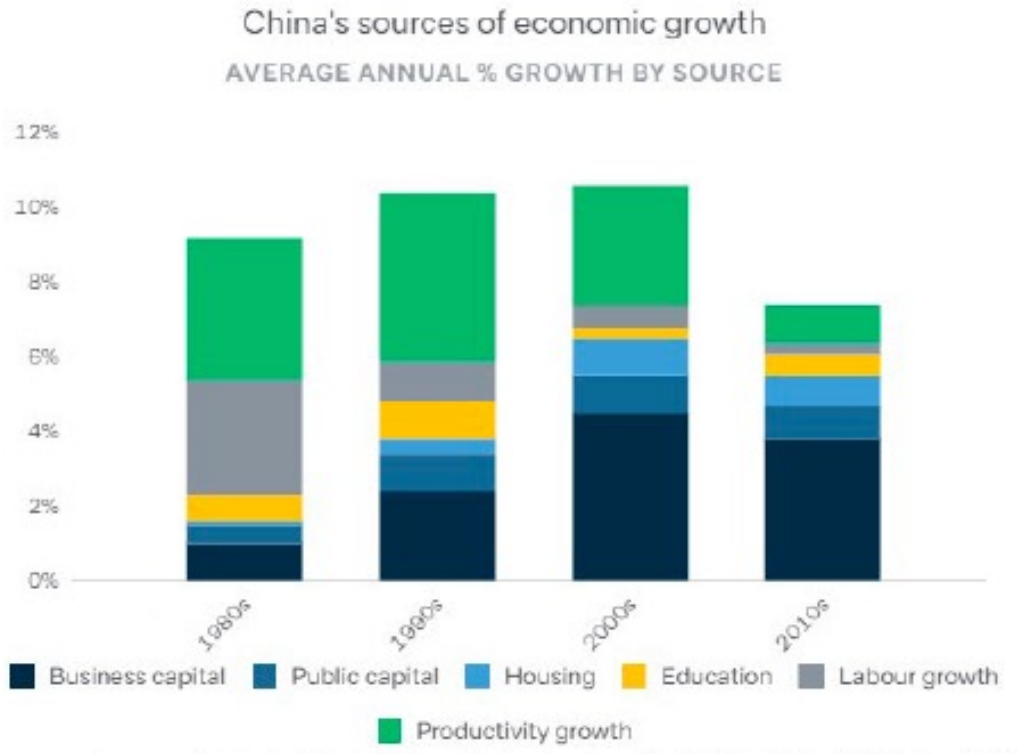
Background and Context

- Even before Covid, marked slowdown in Chinese economic growth
- Most important reason … sharp reduction in productivity growth, the source of 3/4^{ths} of growth between 1978-2007 (Zhu, 2012).
- On paper, hard to explain:
  - Productivity only a quarter to a third the level in advanced countries … significant "latent" potential
  - Rising expenditures on R&D
  - Significant investments in complementary inputs
- However, marked shift in policy and "balance" between state and market beginning in mid-2000s
- Motivation?
  - Perceived failure of "market for technology" policies?
  - Too few national champions?
  - Less disadvantaged in newly-emerging technologies?
  - Strategic considerations?

Sources of Growth in China



Source: Lowy Institute, 2022.

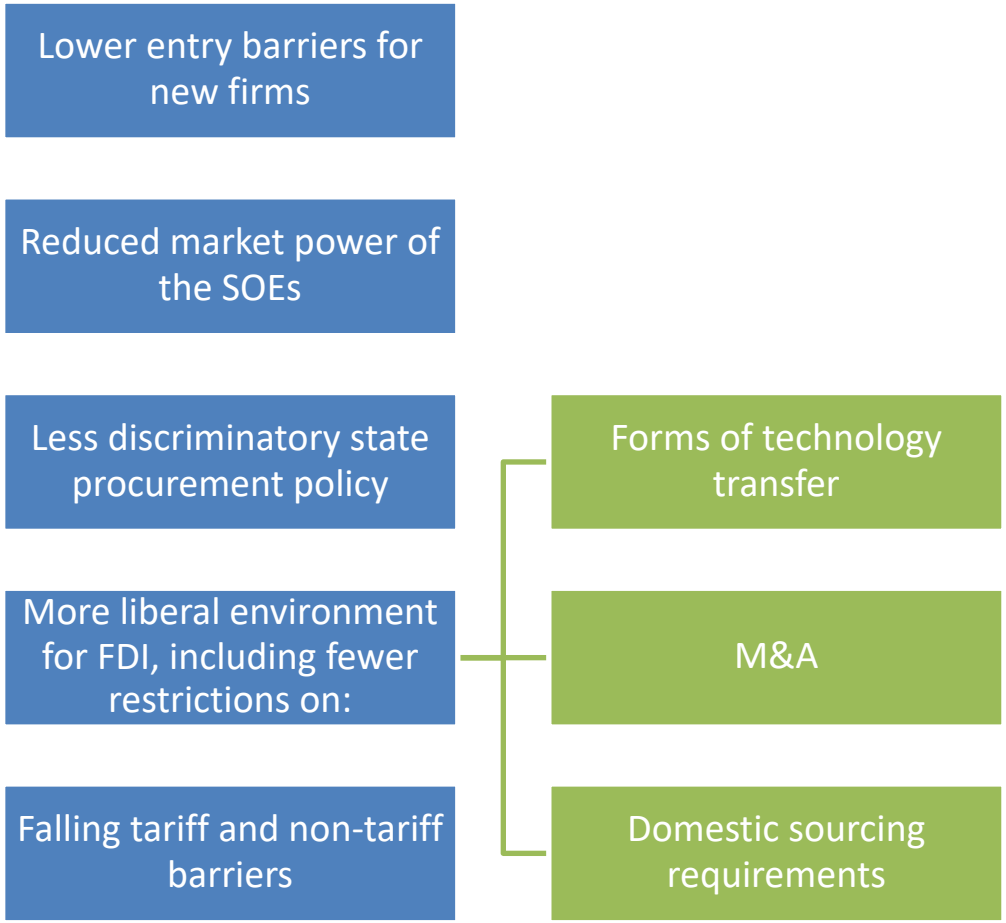
Long-run Perspective

- Salient feature of the economy: Dynamism plus huge inefficiencies, with new firms especially important
- Sources of distortions and inefficiencies
  - Strategic objectives of the state
    - Import substitution
    - Domestic capabilities in *all* key and leading sectors
  - Important role of rents and patronage in the system
  - Incentive system facing local cadres
- Most dynamic sectors: Those that have been most open, and free from the visible and often distorting hand of the state
- Concern: Under current leadership, the economy and key sectors becoming less not more open and competitive, with clear implications for dynamism and growth

Critical Role of Manufacturing Sector

- Prior to Global Finanical Crisis, productivity growth on par with other Asian economies
- Source of much of the dynamism -- a highly competitive domestic market--courtesy of entry into WTO--which absorbs more than 85% of output
- New firms especially important
- But huge heterogeneity between sectors

Common Elements of Most Dynamic Sectors



Tariff Reform in China, 1992-2007

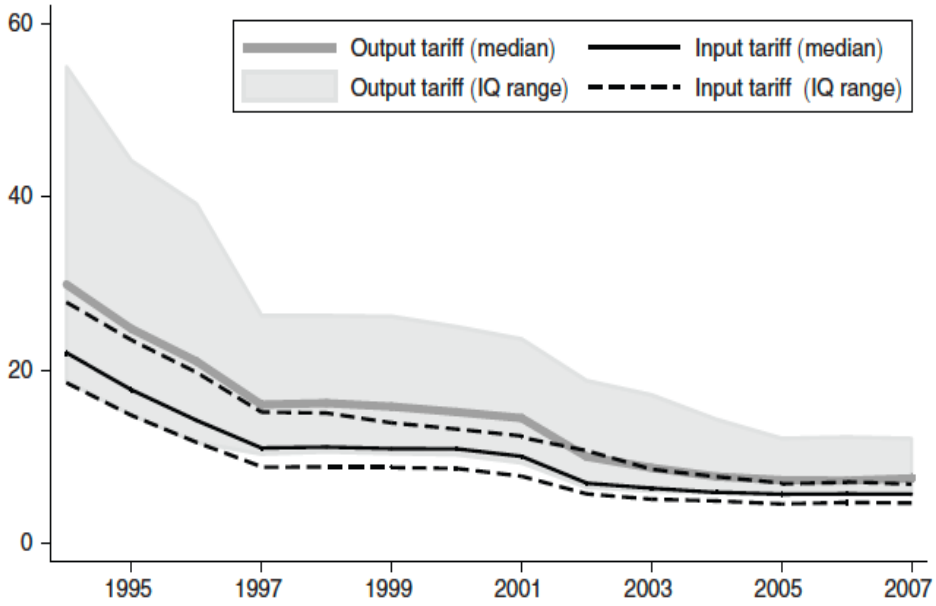
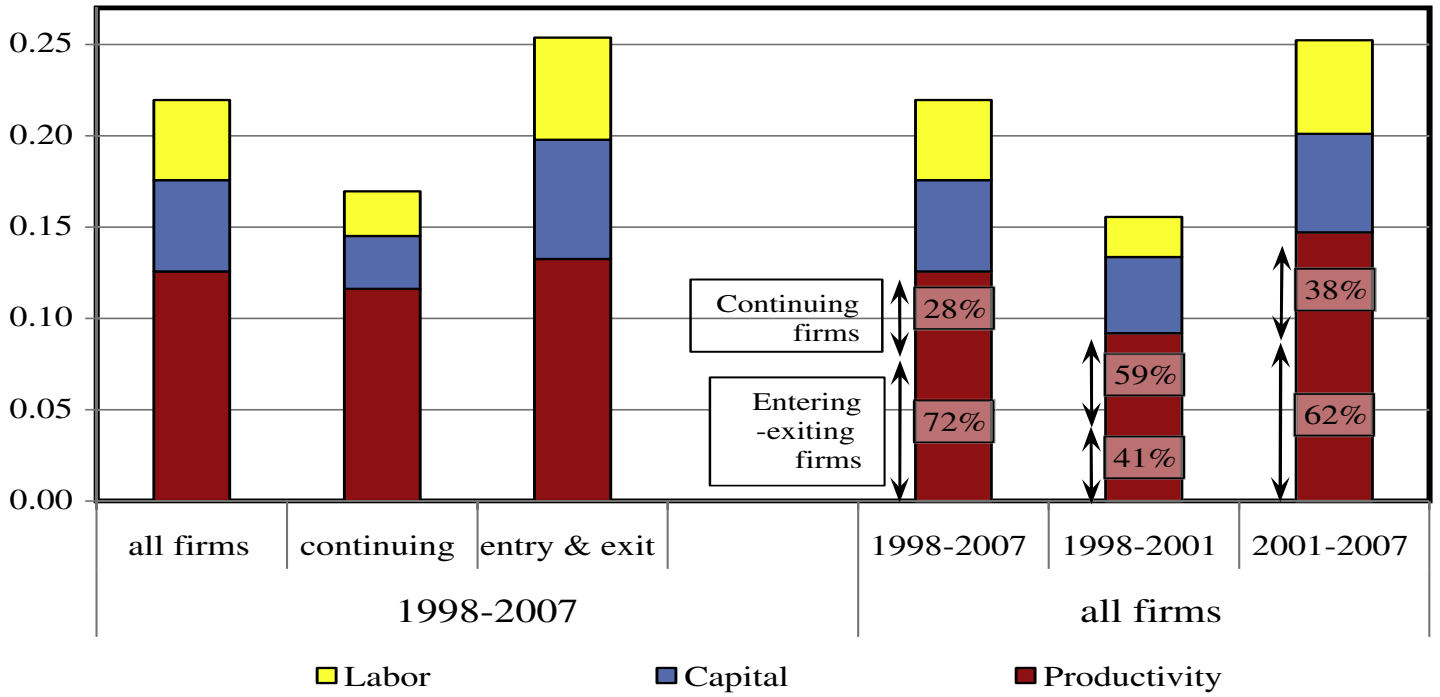


FIGURE 1. EVOLUTION OF IMPORT TARIFFS ON EACH SECTOR'S OUTPUT AND INPUTS

How Do New Firms Matter?

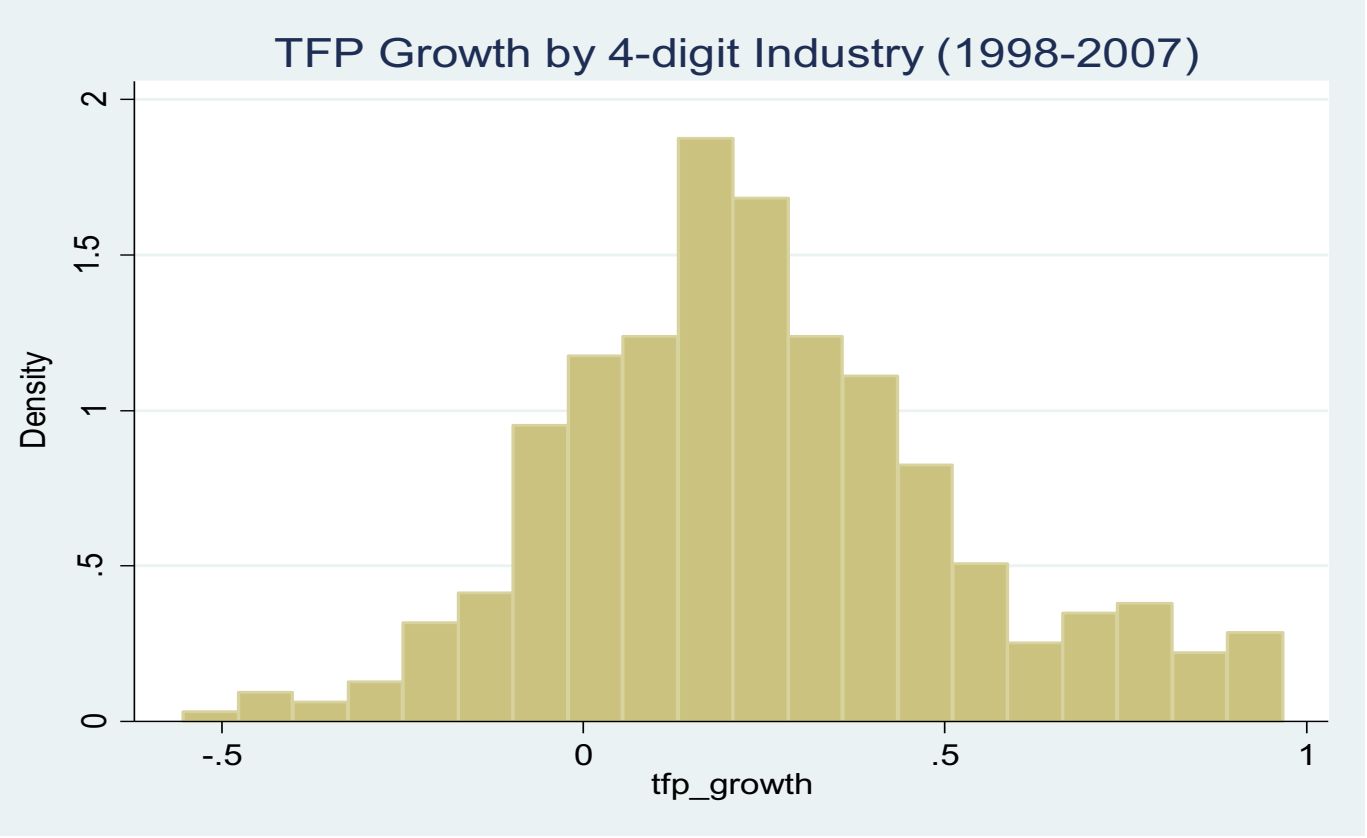
- Source of growth on both the extensive and intensive margin
  - Extensive: Draw more labor and capital into the economy
  - Intensive: Contribute to higher levels of TFP (total factor productivity) in the economy if better than incumbents
- Also put competitive pressure on “incumbent” firms

Decompositions of Output and Productivity



Source: Brandt et. al. (2012).

Huge Heterogeneity Across Sectors



SOEs and TFP Growth

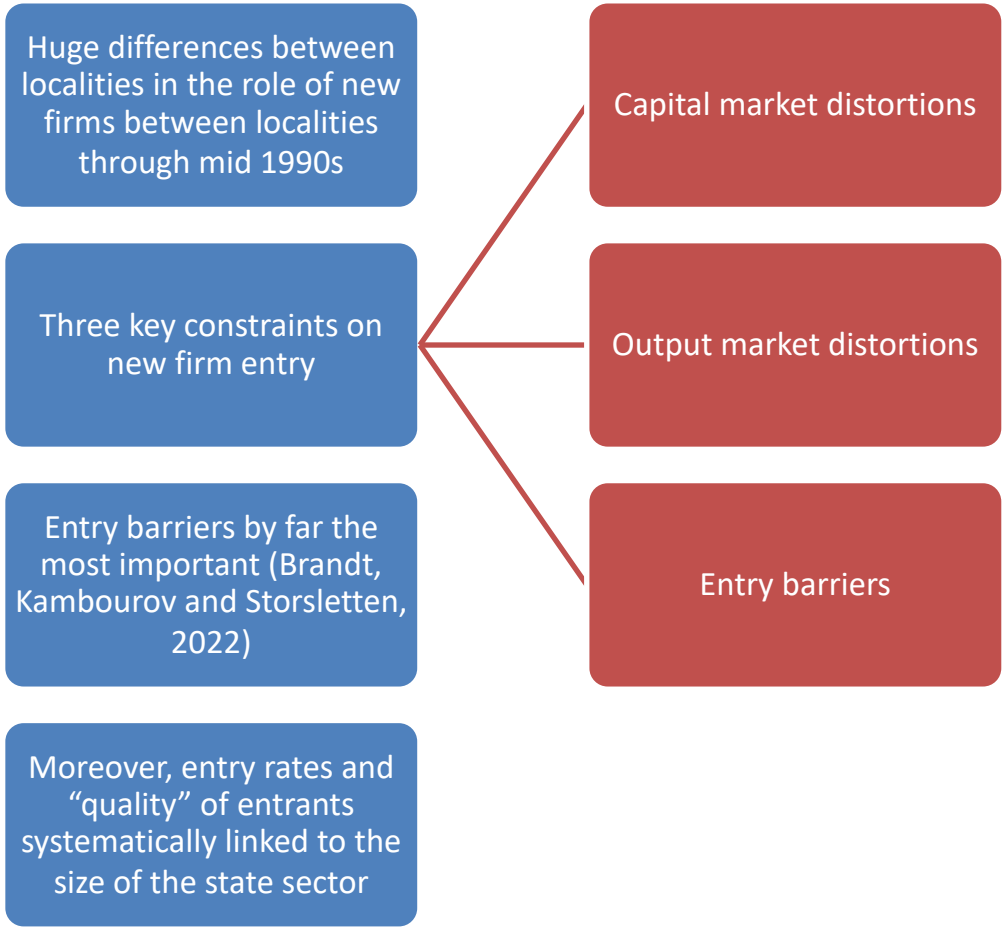
		Sources of Change in TFP			
Sectors	Total Change in ln TFP	Within	Between	Entry	Exit
SOE Share > 0.50	-0.117	-0.048	0.007	-0.080	0.004
Soe Share < 0.50	0.208	0.050	-0.024	0.175	0.007
All Sectors	0.107	0.019	-0.014	0.096	0.006

Based on TFP estimates from Brandt, Van Biesebroeck, Wang and Zhang (2017).

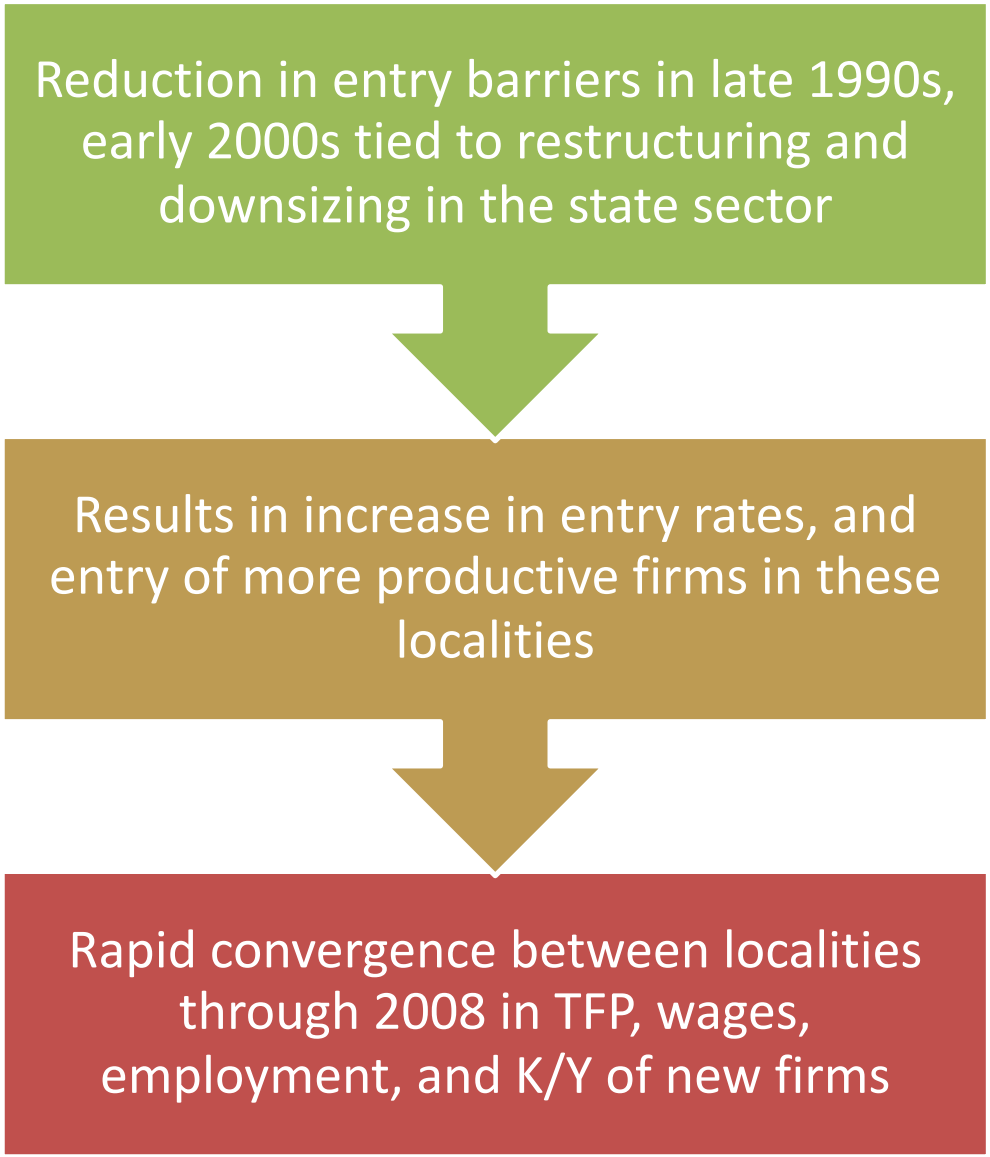
Differences Among SOE-Dominated Sectors

	SOE Share		Change in TFP	Contribution to TFP			
Sector	1998	2007		Within	Between	Entry	Exit
"Better Perfoming" SOE-dominated Sectors							
Special Purpose Machinery	0.58	0.43	0.21	0.07	-0.01	0.15	0.00
Transport Equipment	0.52	0.39	0.16	0.07	-0.02	0.11	0.00
"Average" SOE-dominated Sector							
Smelting of Ferrous Metals	0.76	0.60	-0.06	-0.01	0.00	-0.04	-0.01
Chemical Products	0.55	0.41	-0.12	-0.06	0.00	-0.06	0.00
"Poorly Performing" SOE-dominated Sectors							
Smelting of Non-ferrous Met	0.53	0.52	-0.55	-0.21	0.06	-0.39	-0.01
Processing of Petroleum	0.87	0.75	-0.80	-0.31	0.08	-0.57	0.00

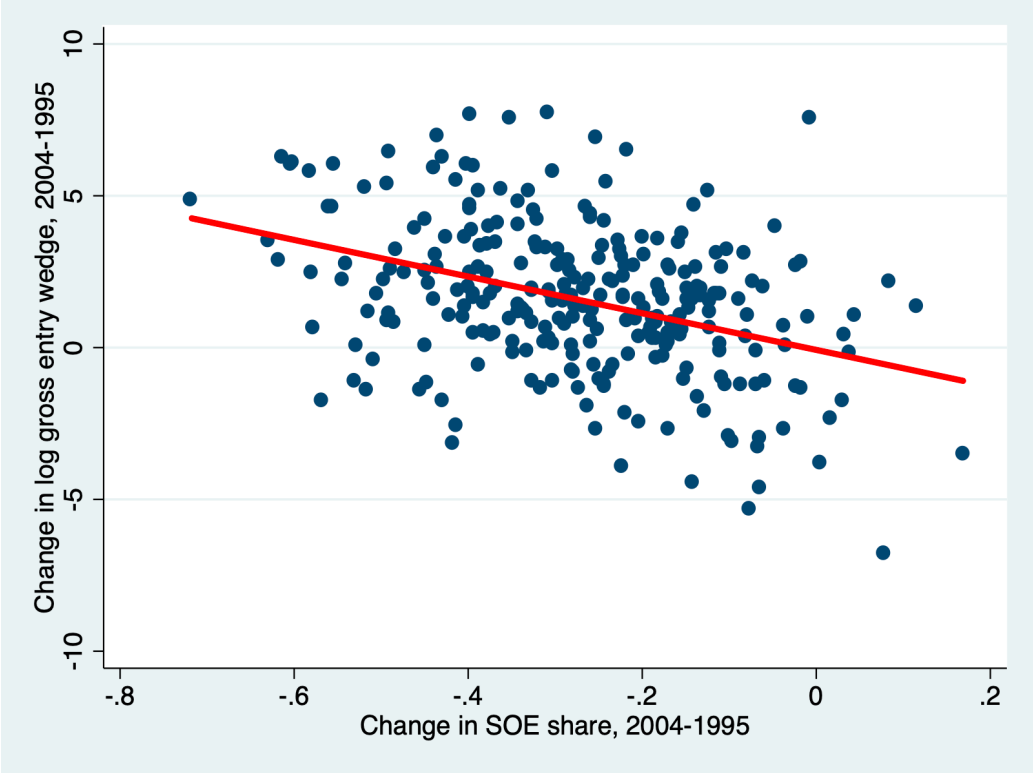
Important Role of Barriers to Entry in the Cross Section



Relaxation of Barriers to Entry

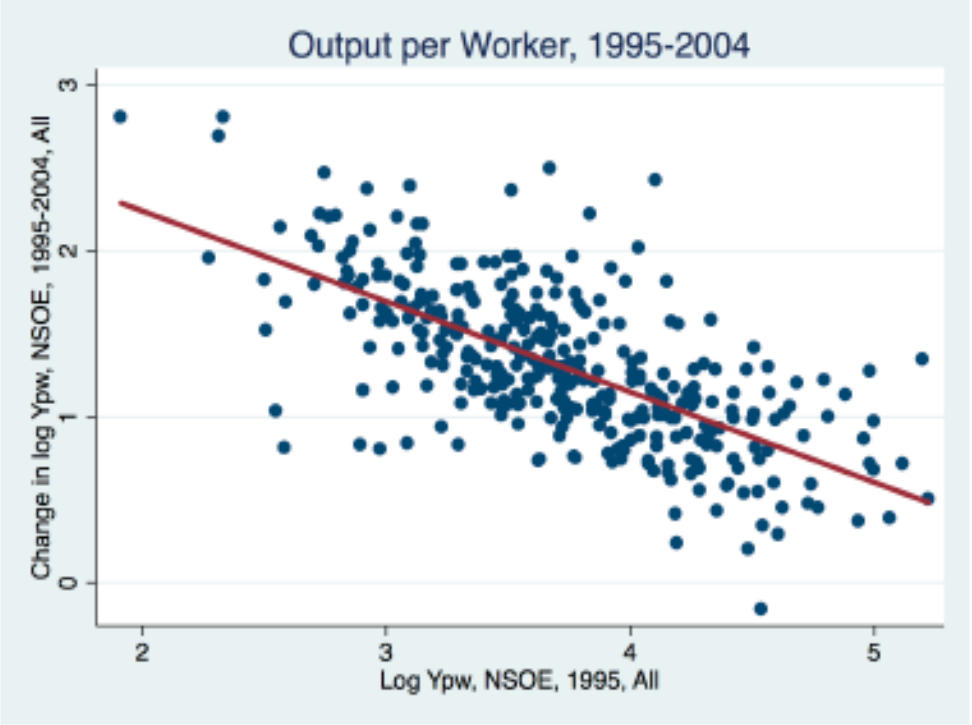


SOE Restructuring and Falling Entry Barriers



Source: Brandt, Kambourov and Storesletten (2022).

Rapid Convergence over Time

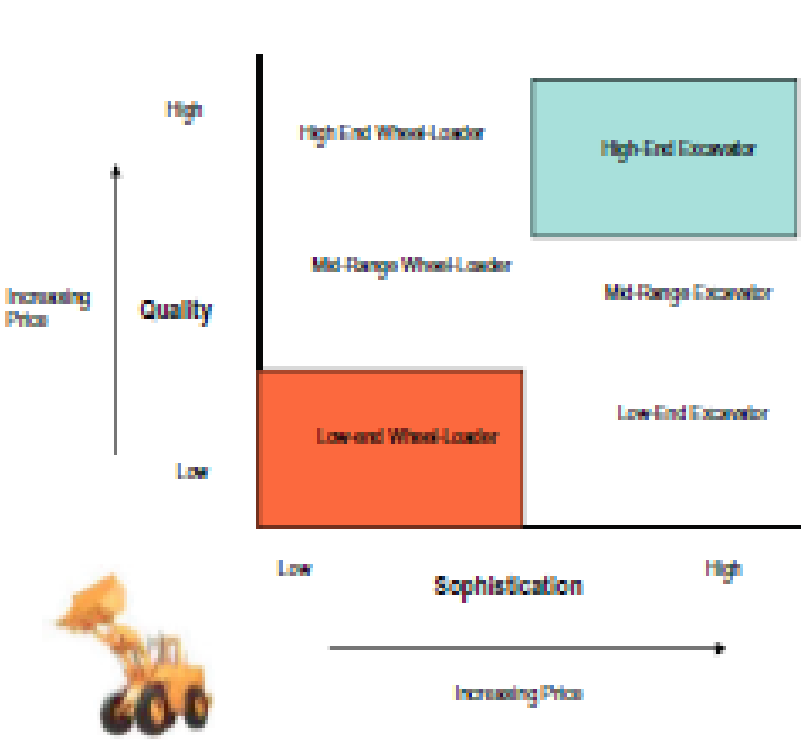


Source: Brandt, Kambourov and Storesletten (2022).

A Tale of Two Sectors
Autos versus Heavy Construction Equipment

- Similar in numerous respects
  - Mature industries, with relatively well-defined technological paradigms
  - Success in both sectors in other leading Asian economies
    - Japan
    - Korea
  - Length of quality ladders similar (Khandewal)
  - Larger domestic market in China, with huge lower end in both sectors that provided “natural protection” to help foster development
- But major differences in outcomes and current strength of local (Chinese) firms
- Reason: Policy dating back to 1980s

The Market for Wheel Loaders and Excavators



Heavy Construction Equipment

- **Wheel-loaders**: Market consolidation, with four-firm concentration ratio rising from 43.5% in 1997 to 62.2% in 2010; by 2014, nearly 70%**. Of the top four, three are Chinese.**
- **Mid-size Excavators**: CLSA test of 13 leading excavator brands in China, performed over 185 working hours during a two week period in 2013.

Test	Champion	No. 2	No. 3	No. 4	No. 5
Work-cycle	Caterpillar	Sany	Komatsu	Doosan	Hitachi
Productivity	Caterpillar	Sany	Komatsu	Doosan	Hitachi
Fuel-saving	Sany	Caterpillar	Hitachi	Komatsu	Doosan
Durability Assessment	Caterpillar	Sany	Doosan	Komatsu	Hitachi
Ease of Operation	Komatsu	Caterpillar	Sany	Hitachi	Doosan
Overall Rating	**Caterpillar**	**Sany**	**Komatsu**	**Doosan**	**Hitachi**

Overall, CLSA found that "**technology gaps are non-existent** between top-tier Chinese and international companies…" (CLSA 2013)

Autos
Top 5 Models by Segment, 2012

Sales Rank	A-segment	B-Segment	C-Segment	D-Segment
1	Chery QQ3	Chevrolet Sail	Ford Focus	VW Passat
2	Changan Benben	VW Polo	Buick Excelle	VW Santana
3	Suzuki Alto	Kia K2	VW Lavida	VW Magotan
4	BYD F0	Honda City	VW Jetta	Toyota Camry
5	Lifan 320	FAW Xiali N5	Chevrolet Cruze	Nissan Teana

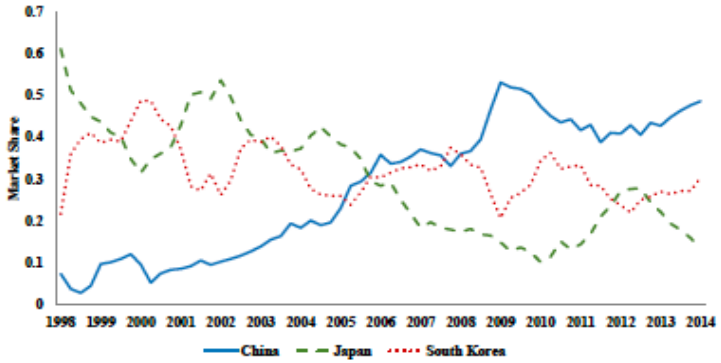
"The leading Chinese products now have bodies, safety and suspension hardware that are largely competitive. But they are behind on engine technology and are also let down by assembly standards, material choices, systems integration, refinement, and a lack of final development and testing. **They are still a long way from being genuinely 'world class.**" Bernstein 2012

Solar vs Wind

Table 1: Comparisons of Solar and Wind		
	Solar	Wind Turbines
Barriers to entry	Low compared to LEDs or SCs, but significant capital investments required for silicon and cell production.	Existing domestic capabilities in key components, e.g. gearboxes, generators, etc. Weak domestic capabilities in design and control systems overcome through technology transfer.
Form of technology transfer	Returning Chinese with experience in sector; much of technology embodied in equipment.	Licensing of designs from leading international firms
Major market	Overseas, but more recently, increase in domestic sales.	Domestic to wind farm developers, most of whom are now state-owned.
Ownership	Largely private, especially further down the value chain. Role of FIEs modest from the beginning. With designation as a strategic sector, SOEs upstream.	Largely SOEs, but several prominent private firms
Industry Concentration	Medium, but higher upstream in silicon	High
Government support	Local government support. Central government support in the form of FIT and subsidies. R&D support for 2nd and 3rd generation technologies. Export financing. ERP negative.	Central government support for firms in the sector. FITs. Government-imposed barriers on FIEs and local content requirements. R&D support for offshore and larger onshore turbines. ERP positive.

China's Shipbuilding Sector

Figure 2: China's Market Share Expansion



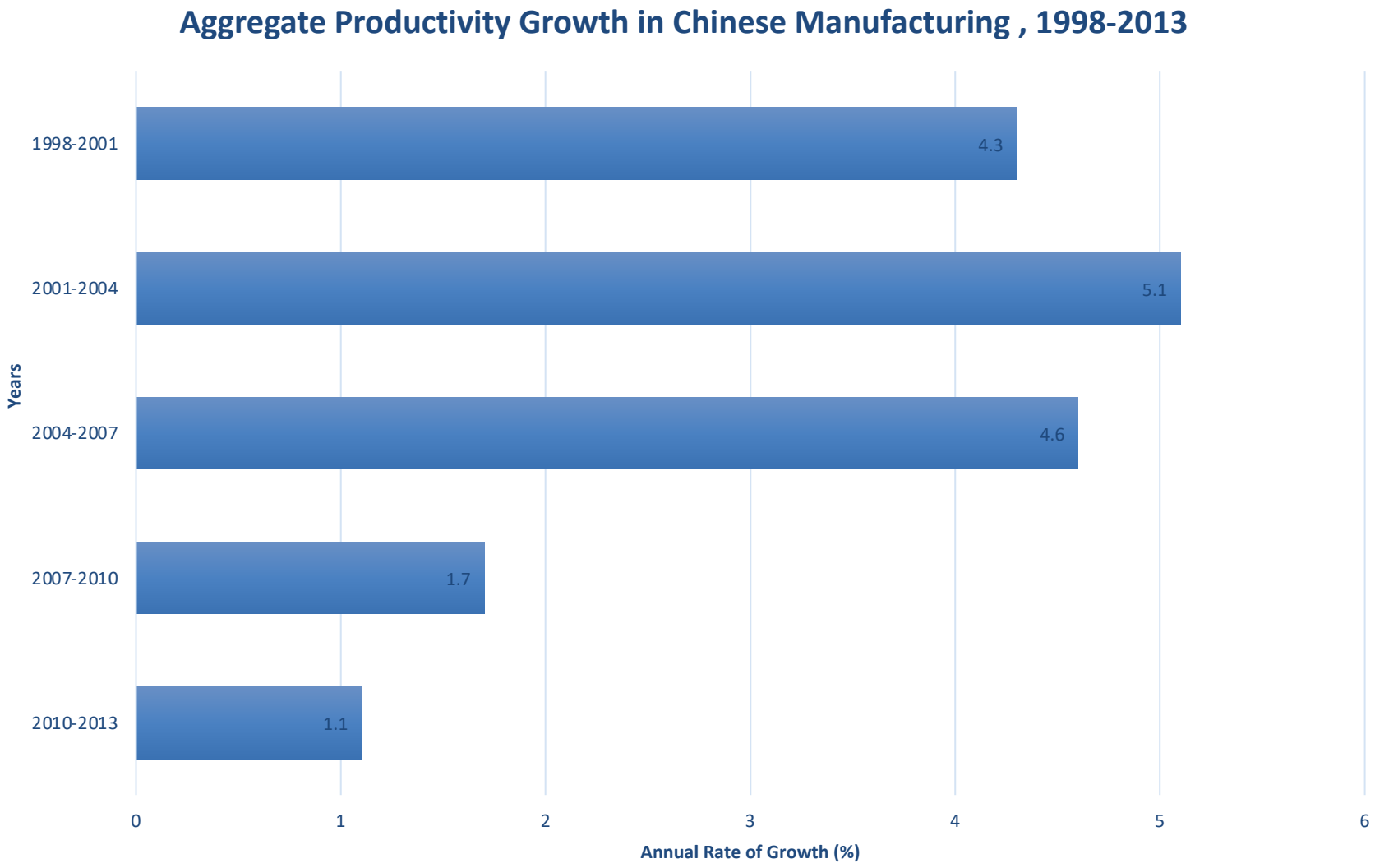
Source: Clarkson Research. Market shares computed from total quarterly ship orders.

"Much of the subsidies was dissipated through the entry and expansion of unproductive and inefficient producers, which exacerbated the extent of excess capacity and did not translate into significantly higher industry profits in the long term."

Subsidies to Shipbuilding Industry, 2006-2013 (Billion RMB)

Entry	330
Production	159
Investment	51
Total	550

Source: Barwick et. al. , 2019.



Source: Brandt, Van Biesebroeck, Wang and Zhang (2022).

Establishment of New Firms

Table 1: New Firms

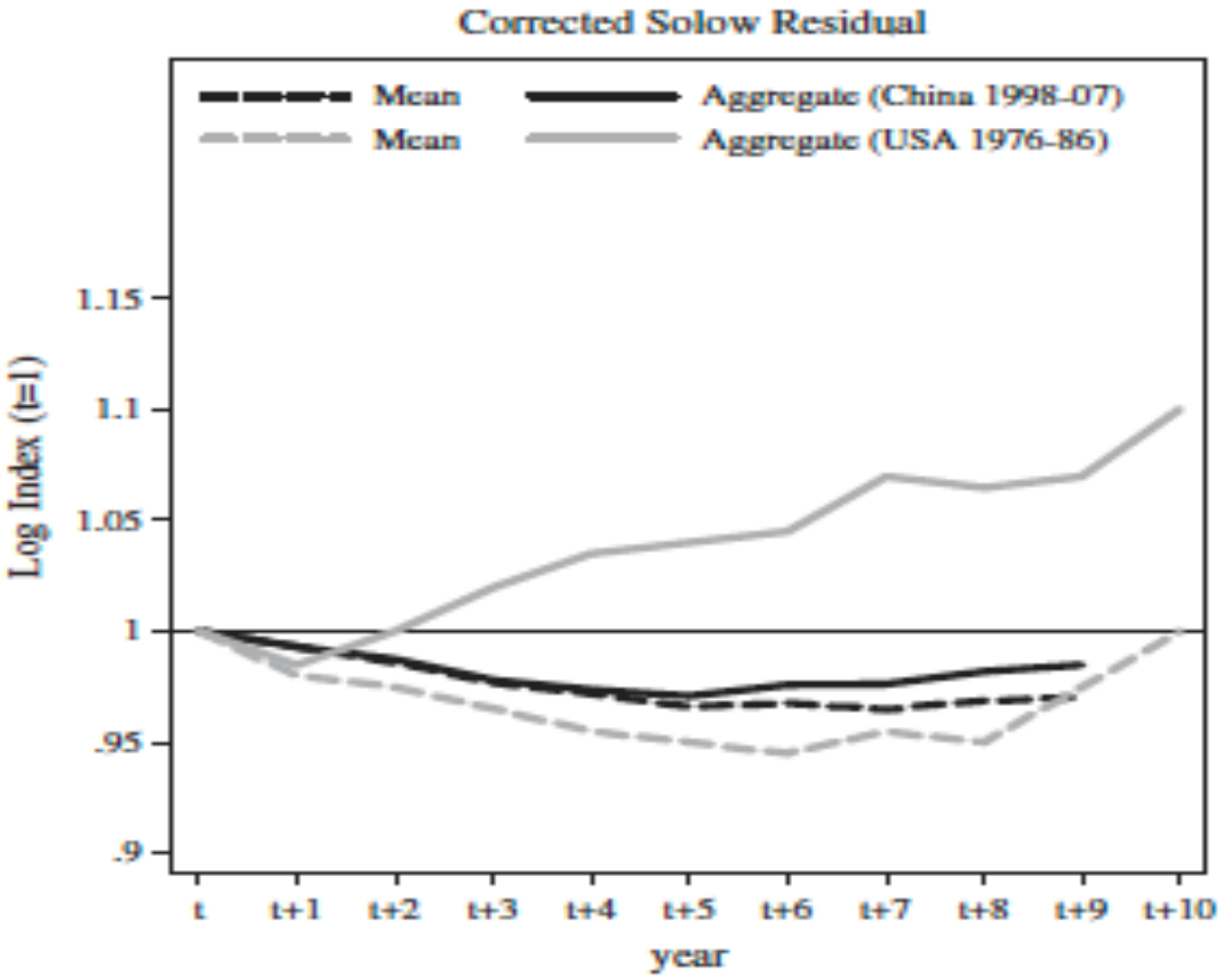
Year	Number of Firms	Sales > 20 million	All New Firms Established current year	All New Firms Established previous year	% New(1)	New Firms > 20 million Established current year	New Firms > 20 million Established previous year	% New (2)
1998	165,039	53,078	5,727	7,602	8.79	1480	2331	7.74
1999	161,972	54,931	3,491	8,205	7.78	865	2726	6.99
2000	162,820	59,290	2,806	7,886	7.03	711	2639	5.99
2001	168,985	63,910	5,161	9,681	9.63	1451	3408	8.23
2002	181,500	72,824	3,538	11,539	9.06	875	4152	7.41
2003	196,168	86,898	6,846	11,966	10.61	1843	4579	7.98
2004	279,068	119,480	14,313	27,485	17.62	3837	9642	12.72
2005	271,788	135,250	10,234	21,044	13.00	2677	9652	10.03
2006	301,906	161,881	10,171	22,947	12.32	2916	10549	9.07
2007	336,698	197,983	13,380	23,387	12.26	4293	11572	8.71
2008	410,905	234,373	16,953	28,204	12.35	5252	13591	8.74
2011	300,685	297,009	4,005	13,525	6.19	3917	13237	6.13
2012	309,460	305,687	5,208	11,073	5.55	5038	10729	5.44
2013	342,954	339,475	4,842	11,662	5.06	4788	11419	5.01

New FIEs

Number of New FIEs (annual)					
	1979-1991	1992-1999	2000-2007	2008-2014	2015-2018
Light Mfg	1,234	11,121	8,631	2,561	1,537
Heavy Mfg	603	7,164	6,914	1,480	765
Adv Mfg	314	3,506	4,307	2,021	1,117
Utlities	9	181	331	274	411
Total	2,160	21,971	20,183	6,336	3,829

Source: Business Registry of China

Limited Contribution of Resource Reallocation to TFP Growth in China



Reasons for Limited Role of Reallocation

- Capital market constraints?
- Product market constraints?
- Political Capital?
- Risk Diversification?

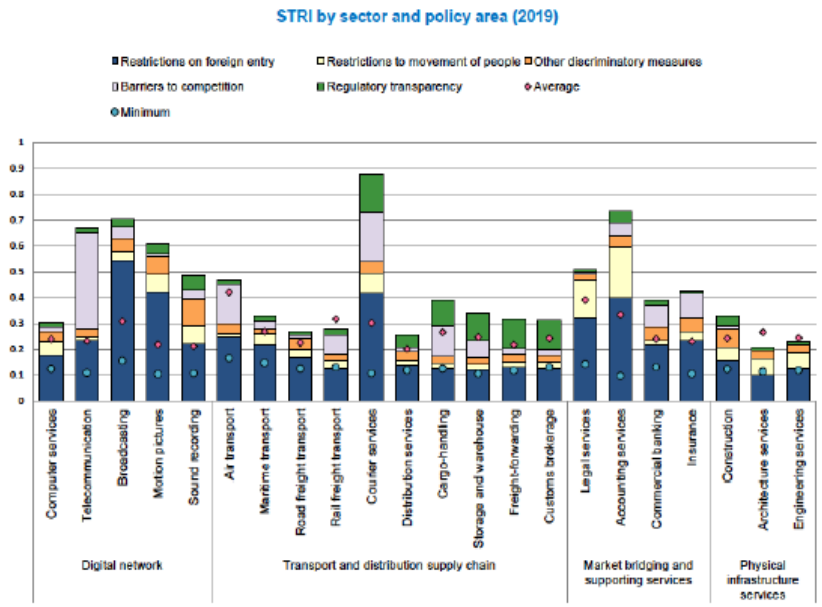
Final Thoughts

- Significant decline in TFP after mid-2000s
  - Spans most sectors at two-digit
  - 2008-2013 TFP growth appears to be negligible
  - Consistent with more aggregate exercises
- Premium of non-state firms over state at the 2-digit level disappears and becomes negative on average ….. Less dynamic private sector?
- Contribution of entry diminished, and not offset by improvement on other margins
- Big Question (1): Was the high productivity growth between 1998-2007 a product of one- time gains?
  - WTO entry
  - Reduction in barriers to entry
  - Retreat of SOEs in non-strategic sectors
  - Increased labor mobility
- Big question (2): What is underlying the sharp reduction in productivity growth after 2007?
- Big question (3): Is this behavior replicated in the Tertiary sector?

Incorporating the Tertiary Sector

- Contribution rising since early 1990s; larger than industry in terms of GDP and employment
- Highly segmented
  - SOEs: Often dominate most capital and skill-labor intensive sectors, e.g., finance, telecommunications
  - NSOEs
    - Prominent role in some newly emerging technologies, and often highly innovative, but …
    - Remaining NSOEs -- left to absorb much of the increase in the labor force that can't find jobs elsewhere
  - Limited role for MNCs

Barriers to Entry in China's Service Sector



Source: OECD Services Trade Restrictiveness Index (STRI): The People's Republic of China 2019.

The Knowledge Ecosystem