Ancient Computer Expos

- What China is supposed to export

What China is increasingly exporting

What Accounts for the Rising Sophistication of China's Exports?

Zhi Wang, U.S. International Trade Commission
Shang-Jin Wei, Columbia Business School and NBER

**Personal views, not those of the ITC, the IMF or the NBER*

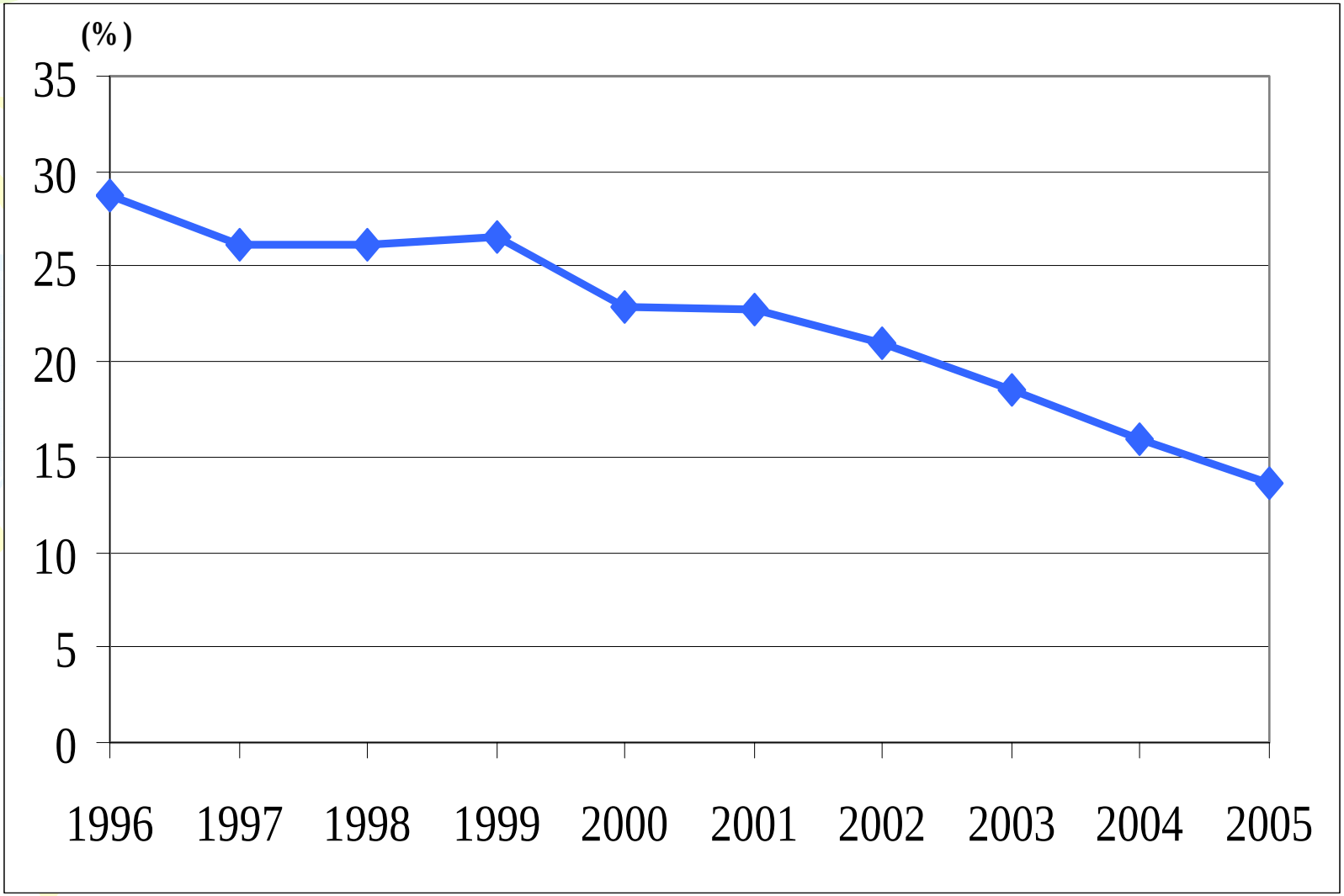
Presentation Outline

- Motivation
  - Why the question
- What Could be the Explanation?
- What Is Actually Going on in the Data?
  - Export Structure
  - Unit Value
- Conclusions

Are China's Exports Becoming More Sophisticated?

- Typical GDP per capita associated with the Chinese export basket is much higher than China's actual income level (Rodrik, 2006)
- The export structure between China and high-income countries is becoming increasingly similar (Schott, 2006)
  - China's export structure is more similar to Japan, the United States, and the European Union than to Brazil and Russia (Fontagne, Gaulier, and Zignago, 2007)

Fraction of the Product Lines that G3 Exports but China Does Not



Export structure dissimilarity index:

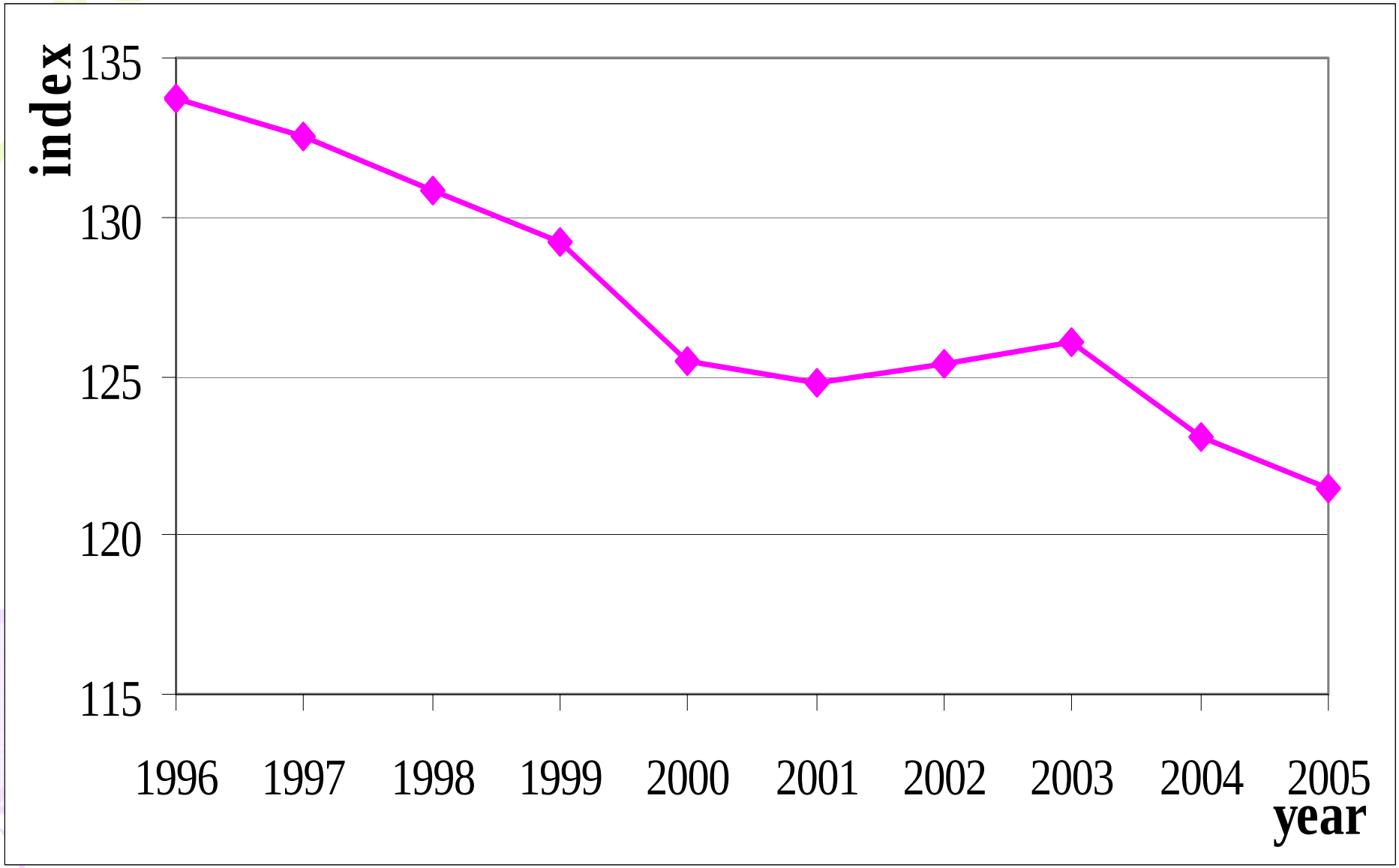
Computed by us

$$EDI_{rft} = 100 * \sum_{i} | s_{i,t} - s_{i,t}^{ref} |$$

Where S(i,t) is the share of product i (at the HS-6-digit level) in China's exports in year t. S^{ref} is the share of product i in the exports of the reference (G-3) economy.

If EDI=0, perfect overlap; If EDI = 200, no overlap

Export Dissimilarity Index 1996-2005



- This has generated a lot of anxiety in the United States and other rich countries

- "Everyone knew that we would lose jobs in labor-intensive industries like textiles and apparel, but we thought we could hold our own in the capital-intensive, high-tech arena. The numbers we're seeing now put the lie to that hope – as China expands its share even in core industries such as autos and aerospace."

Robert Scott, US Economic Policy Institute, 2005

Author of a report presented to the US-China Economic and Security Review Commission

- The anxiety comes not only because China’s exports are becoming more sophisticated in a way that is commensurate to its level of development, but also because the rising sophistication is apparently getting ahead of its stage of development

Is the anxiety justified?

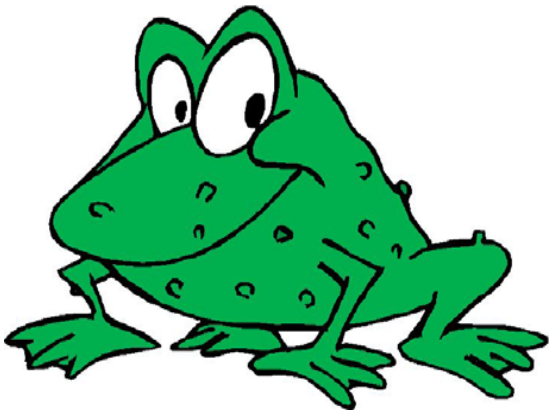
- It depends on the source of the rising sophistication:

- 1. Statistical mirage
  - "it's processing trade"
  - Mis-labeled level of sophistication

- 2. Growth of human capital
  - natural stage of development

- 3. Government policies
  - High-tech zones
  - Economic and technological zones
  - Export processing zones

  - leapfrogging



- 4. Foreign invested firms
  - Hale and Long (2006)

The Objective of This Paper

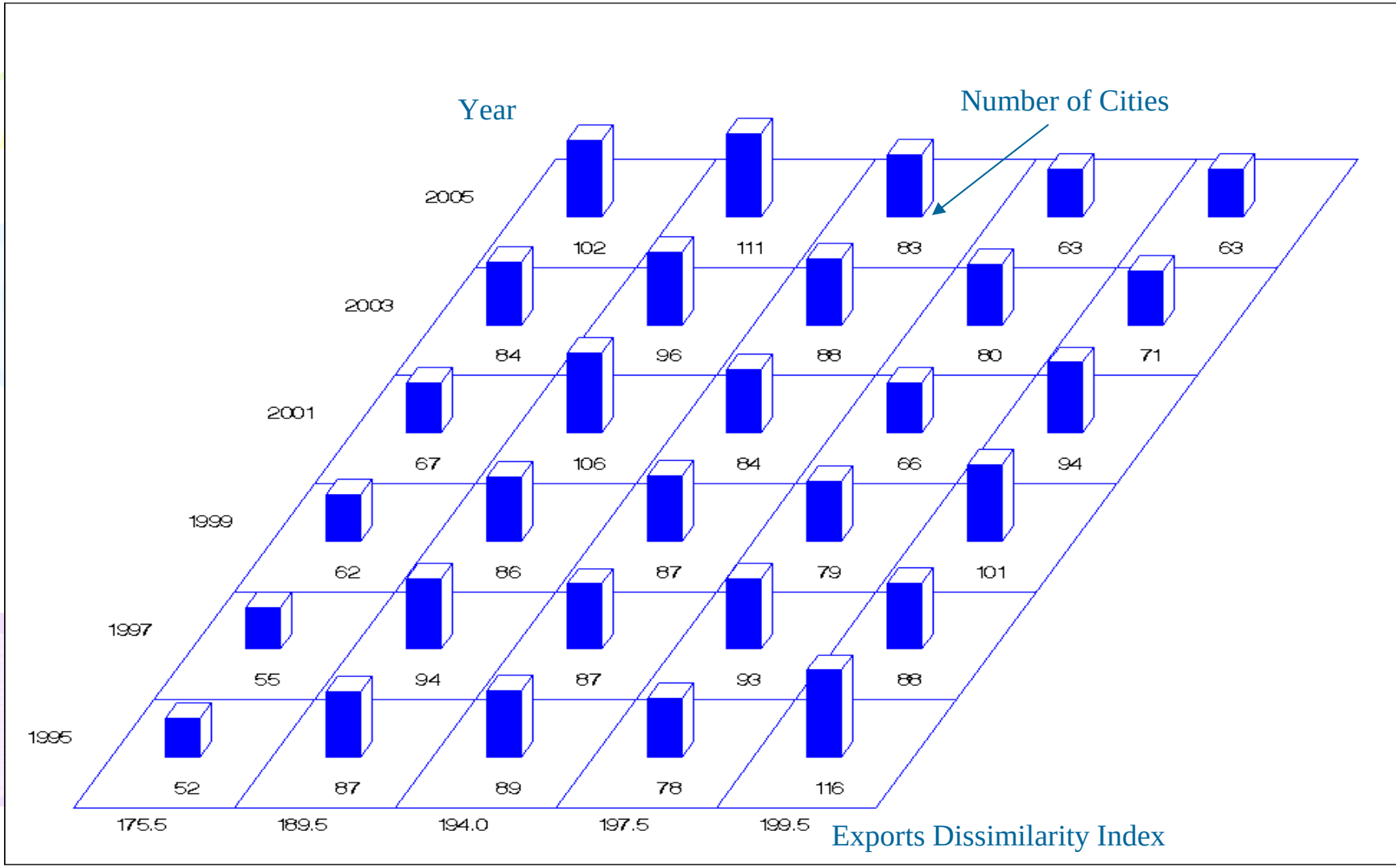
- Uses disaggregated data at the level of region (>200 cities), product (HS-6 digit or 8-digit), firm type (by ownership), and export type (processing trade or not)
- Provides an assessment of these factors in explaining the rising sophistication of China's exports
- Examines
  - Export structure
  - Unit Value

Data

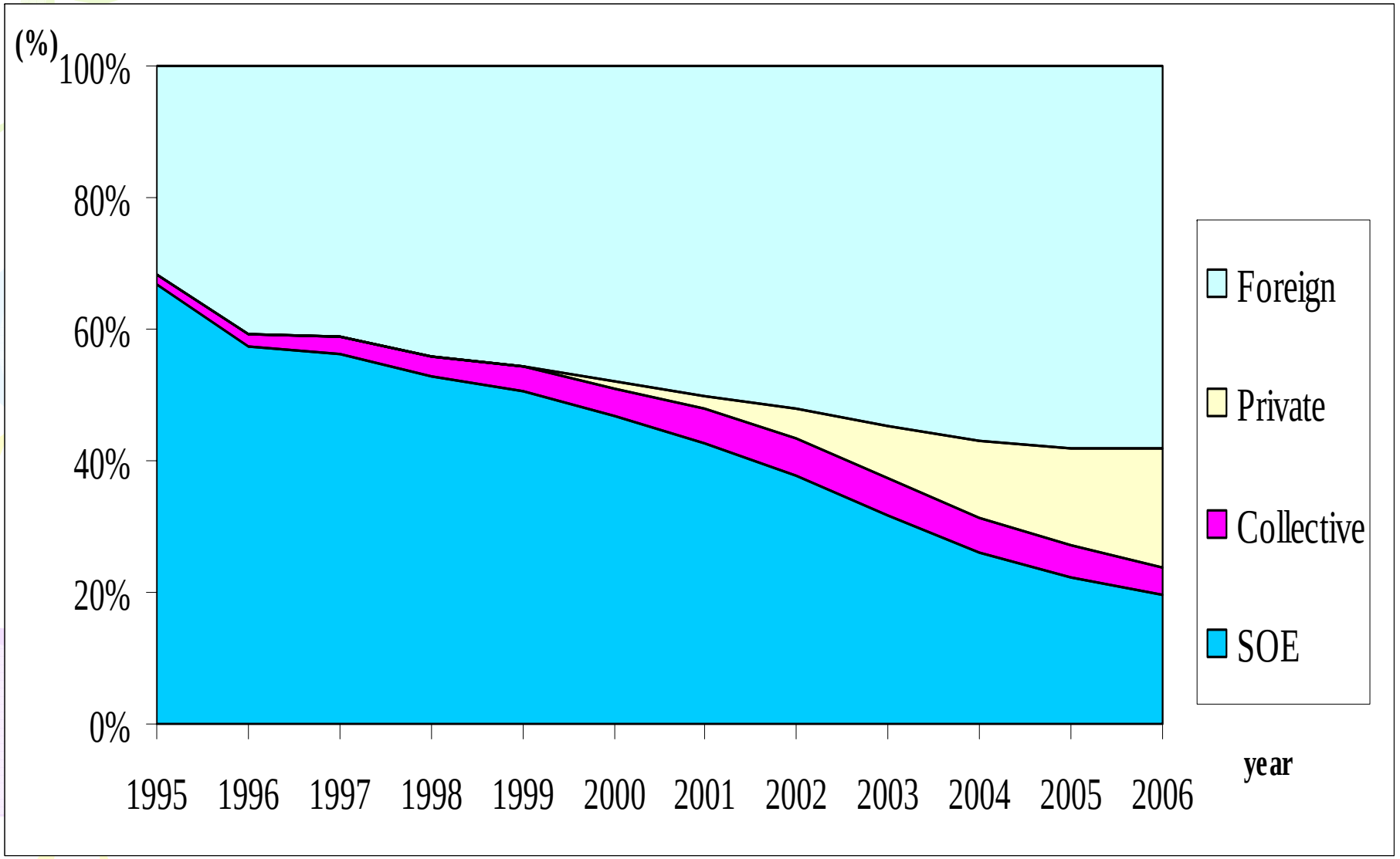
- Export data for China at 8 digit HS level from China Customs
- Chinese City data from China data online
- Reference data of G-3 exports at 6 digit HS from WITS, Physical unit measurement from UN COMTRADE
- Manufacturing product only

The Diminishing Gap and Changing Distribution between Exports of Chinese Cities and Industrial Countries

1995-2005

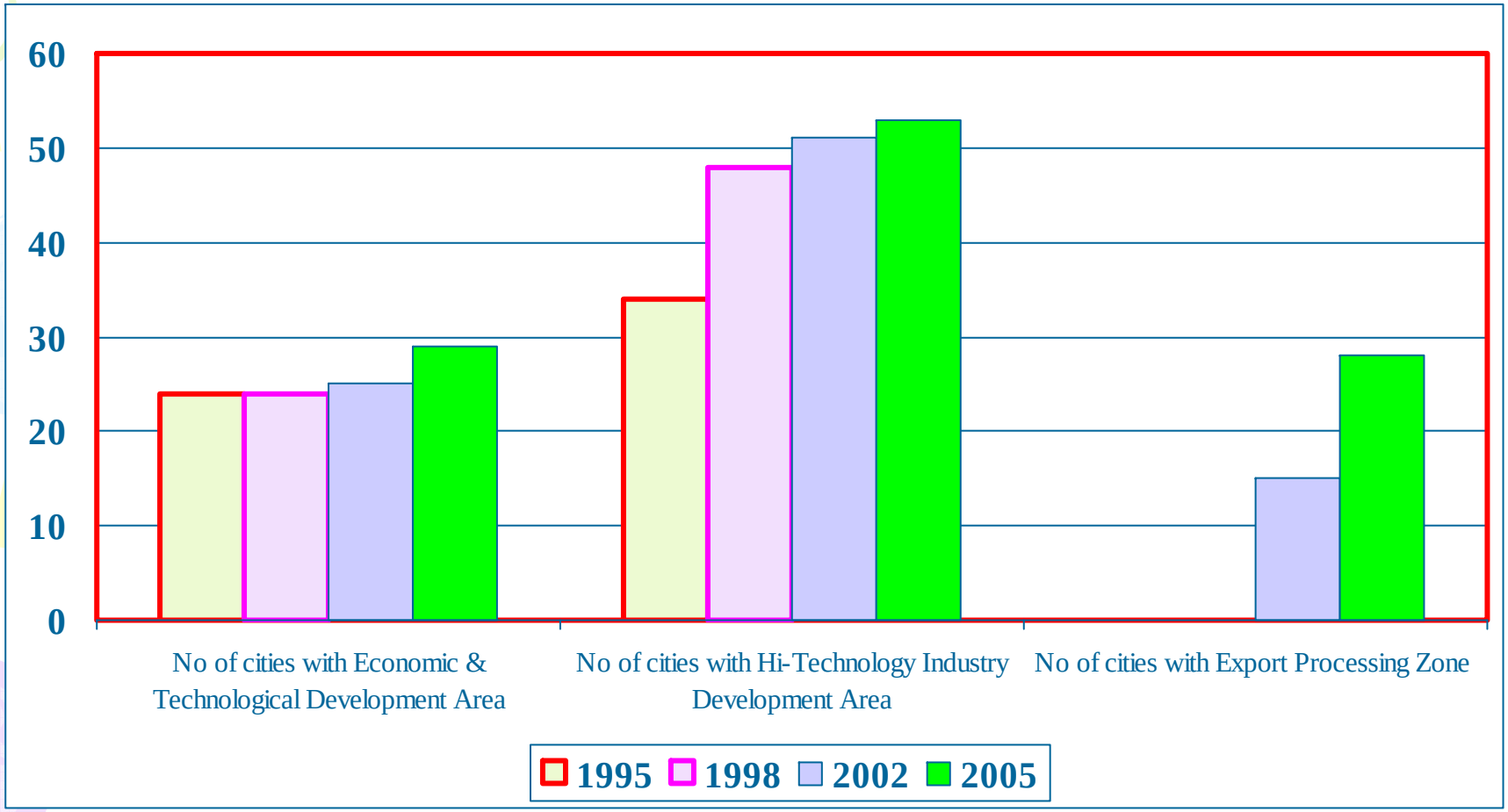


Changing Firm Ownership Responsible for China's Exports, 1995-2006

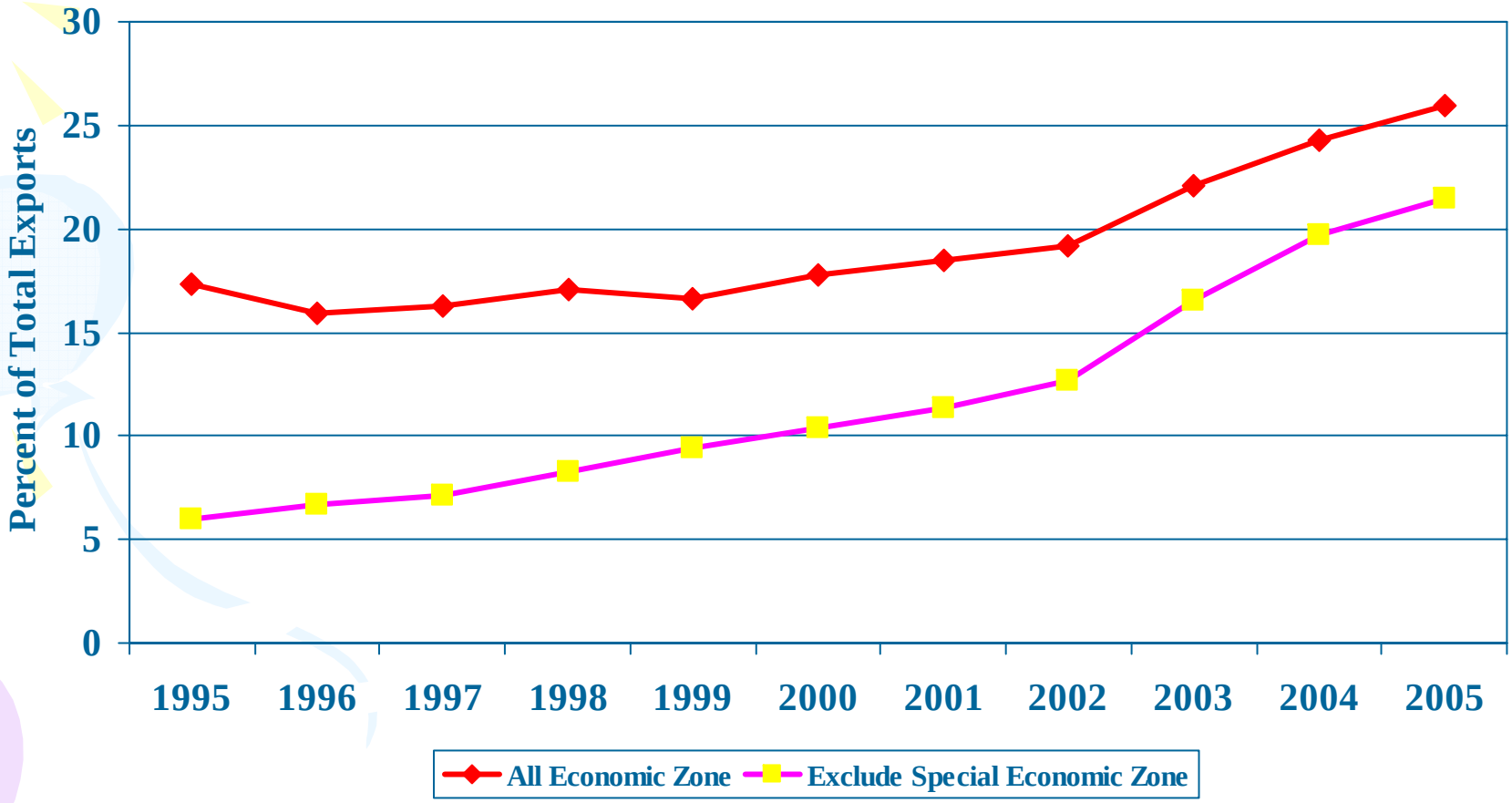


Tax-favored Policy Zones to Encourage Exports

1995-2005

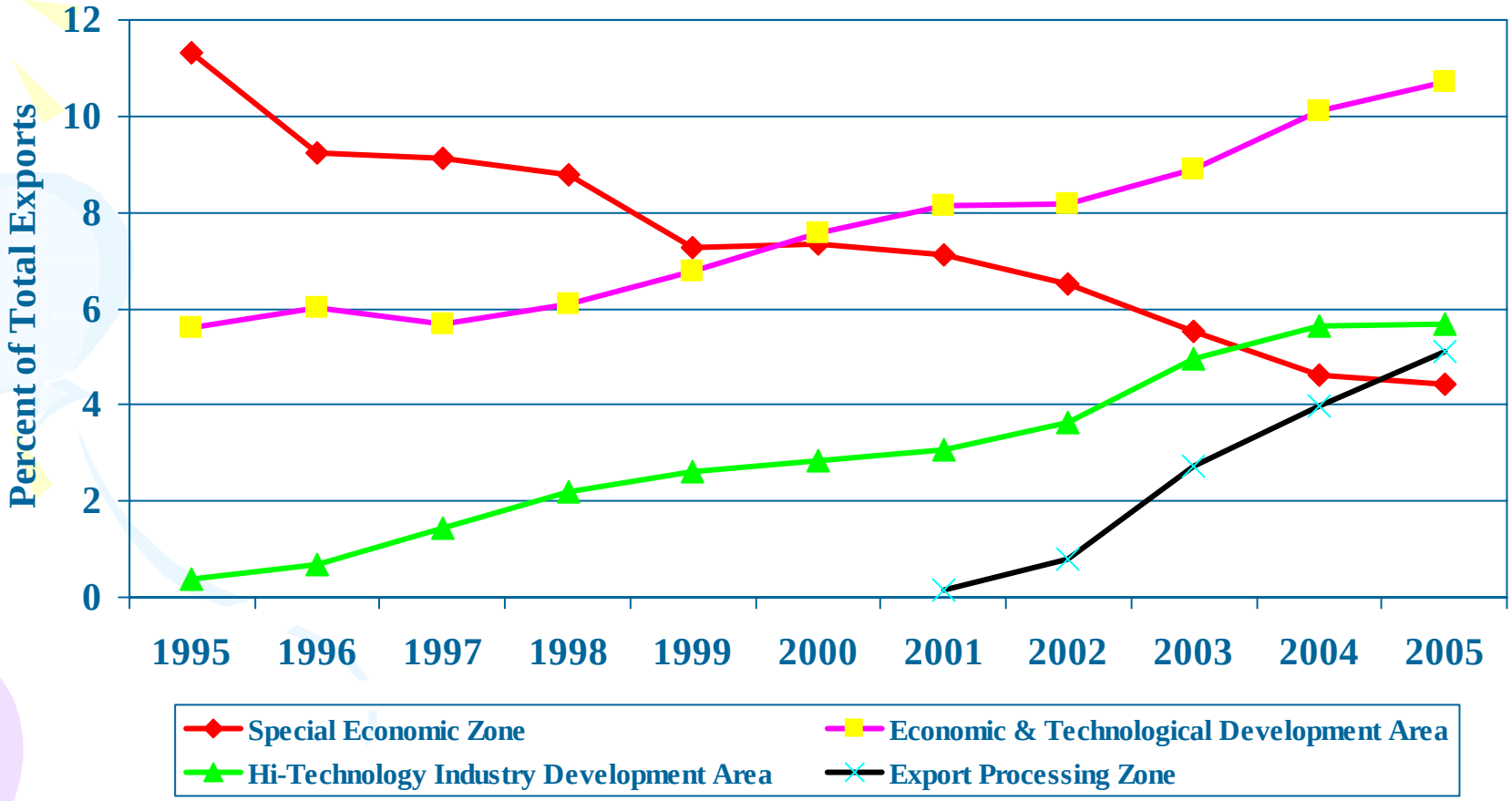


The Growing Importance of Policy Zones in China's Exports, *1995-2005*

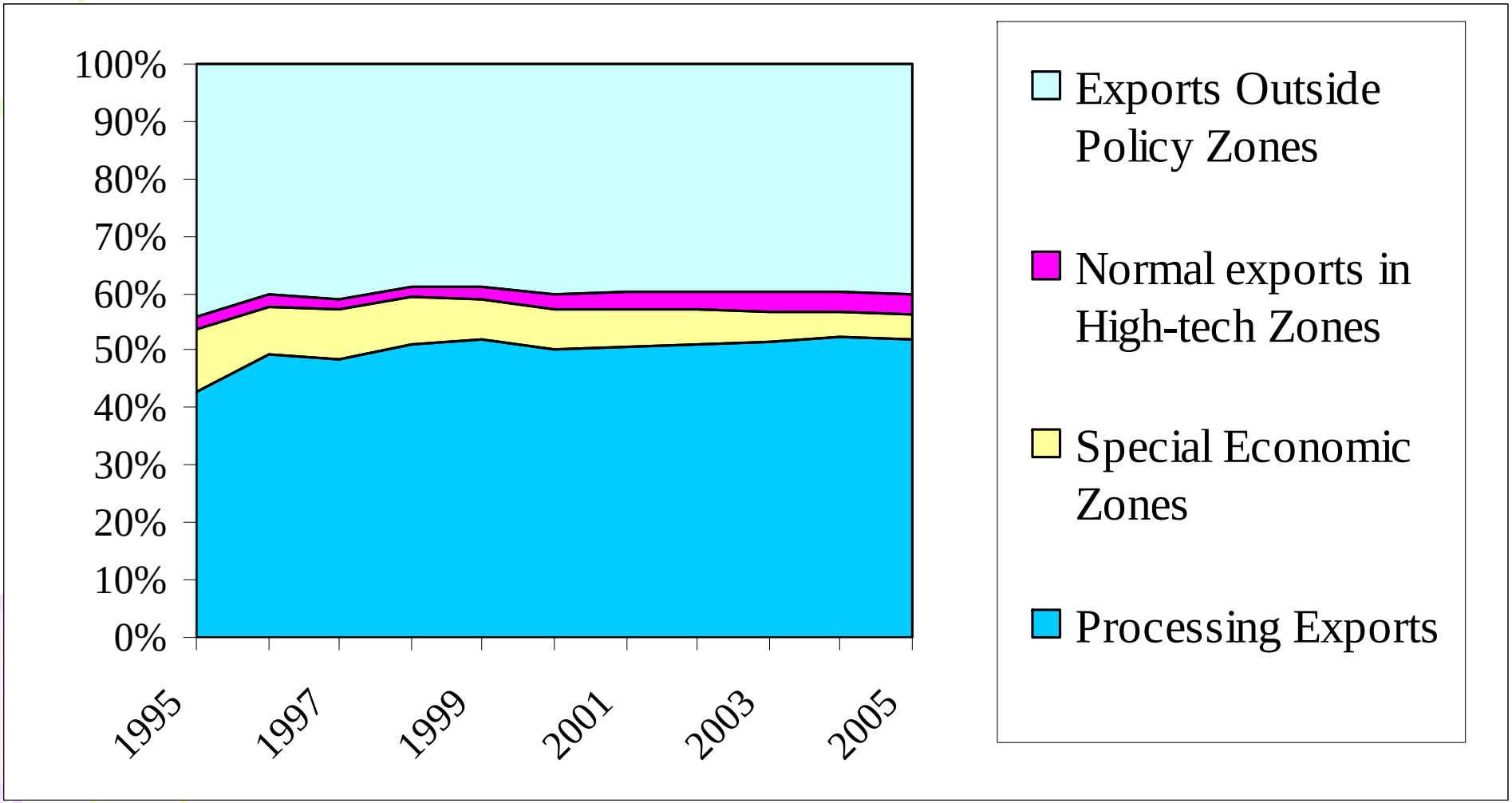


The Role of the Policy Zones in China's Exports

1995-2005



Share of Processing Trade and Policy Zones in China Exports, 1996-2005



Share of processing trade and policy zones in China's total exports, 1996-2005 (%)

Year	Special Economic Zones	Exports Processing Zones	Processing exports in High-tech Zones	Normal exports in High-tech Zones	Processing Exports Outside Policy Zones	Normal Exports Outside Policy Zones	All Other Exports
1995	10.6	0	3.2	2.1	39.8	42.1	2.2
1996	8.7	0	3.9	1.8	45.2	38.3	2
1997	8.8	0	4.6	1.7	43.9	39	1.9
1998	8.2	0	5.5	1.9	45.5	36.9	1.9
1999	7	0	6.4	2.2	45.5	37	1.9
2000	7.1	0	7	2.6	43.3	38.2	1.8
2001	6.8	0.1	7.4	2.8	43	38	1.9
2002	6.2	0.7	8	3	42.2	37.6	2.3
2003	5.3	2.4	9.5	3.4	39.6	37.1	2.7
2004	4.4	3.6	11	3.6	37.7	36.4	3.2
2005	4.3	4.6	11.8	3.6	35.6	36.8	3.5
1996-2004 average	6.3	1.3	8	2.8	41.7	37.4	2.4

Firm Ownership In Different Zones
1996-2004 average

	Special Economic Zones	Exports Processing Zones	Processing exports in High-tech Zones	Normal exports in High-tech Zones	Processing Exports Outside Policy Zones	Normal Exports Outside Policy Zones
State Owned	23.7	0.0	4.8	58.3	28.3	62.5
Joint Venture	34.3	3.4	33.4	16.9	29.2	13.1
Wholly Foreign	36.3	96.0	61.5	16.3	38.0	6.6
Collective	1.7	0.6	0.3	1.4	3.1	8.2
Private	3.8	0.0	0.1	7.1	1.5	9.5
Total	99.9	100.0	100.0	100.0	100.0	100.0

Specification

$$Ln(EDI_{rft}) = city\_fixed + year\_fixed + \beta_1 EPZ\_share_{rft}$$
$$+ \beta_2 High\_tech\_zone\_processing\_share_{rft}$$
$$+ \beta_3 Processing\_outside\_anyzone\_share_{rft}$$
$$+ \beta_4 High\_tech\_zone\_nonprocessing\_share_{rft}$$
$$+ \beta_5 Ln(GDP_{rt}) + \beta_6 SKILL_{rt} + other\_controls + \mu_{rft}$$

- Export Similarity Index (ESI)
- ESI = (200-EDI) / 2
- But log ESI = log (200-EDI) – log2
- Economic theory does not give good guidance as to which one to use
- We adopt log EDI as dependent variable

Table 5a:Export Structure Dissimilarity between Chinese Cities and the G-3, EDI and ESI

	EDI		ESI	
Explanatory Variables	(1)	(3)	(5)	(7)
Export Processing Zone Exports as a Share of Total City Exports	-45.89***	-46.02***	22.94***	23.01***
	(9.01)	(8.58)	(4.50)	(4.29)
Processing exports in High-tech Zones as a Share of Total City Exports	-10.73***	-11.22***	5.36***	5.61***
	(2.88)	(2.82)	(1.44)	(1.41)
Non-processing exports in High-tech Zones as a Share of Total City Exports	-14.70**	-15.88**	7.35**	7.94**
	(7.37)	(7.35)	(3.68)	(3.68)
Processing exports outside economic zones as a Share of Total City Exports	0.956*	0.722	-0.478*	-0.361
	(0.533)	(0.523)	(0.266)	(0.261)
Student Enrollment in Institutions of Higher Education as a Share of the City Non-Agricultural Population	-36.93***	-37.60***	18.46***	18.80***
	(11.40)	(11.35)	(5.70)	(5.67)
City Gross Domestic Product (GDP)	-0.443*	-0.495**	0.222*	0.248**
	(0.233)	(0.242)	(0.117)	(0.121)
Foreign-invested firms' share in city exports		0.465		-0.233
		(0.989)		(0.494)
Joint venture firms' share in city exports		1.91***		-0.953***
		(0.68)		(0.34)
City Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Robust, Cluster(city)	Y	Y	Y	Y
Observations	1981	1981	1981	1981
R-squared	0.98	0.98	0.98	0.98

Table 5b:Export Structure Dissimilarity between Chinese Cities and the G-3, Log(EDI)

Explanatory Variables	Year-by-year benchmark (1)	(2)	(3)	(4)
Export Processing Zone Exports/ Total City Exports	-0.351**	-0.382**	-0.350**	-0.384**
Processing exports in High-tech Zones/Total City Exports	-0.065**	-0.070**	-0.067**	-0.073**
Non-processing exports in High-tech Zones / Total Exports	-0.087*	-0.108**	-0.093**	-0.115**
Processing exports outside economic zones / Total Exports	0.005*	0.004	0.004	0.002
Student Enrollment in Higher Education / Non-Ag Population	-0.225**		-0.229**	
City per capita GDP		-0.006*		-0.007**
City GDP	-0.003*	-0.003*	-0.003*	-0.003**
Foreign-invested firms' share in city exports			0.001	0.004
Joint venture firms' share in city exports			0.010**	0.010**
City Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Robust, Cluster(city)	Y	Y	Y	Y
Observations	1981	1981	1981	1981
R-squared	0.98	0.98	0.98	0.98

Table 5c:Alternative benchmark

Explanatory Variables	2004 benchmark (1)	(2)	(3)	(4)
Export Processing Zone Exports / Total City Exports	-0.552**	-0.594**	-0.544**	-0.591**
Processing exports in High-tech Zones / Total City Exports	-0.083**	-0.089**	-0.082**	-0.090**
Non-processing exports in High-tech Zones / Total City Exports	-0.087*	-0.116*	-0.092*	-0.122**
Processing exports outside economic zones / Total Exports	0.006*	0.004	0.005*	0.003
Student Enrollment in Higher Education / Non-Ag Population	-0.309**		-0.315**	
City per capita GDP		-0.010**		-0.010**
City Gross Domestic Product	-0.003*	-0.003*	-0.003**	-0.003**
Foreign-invested firms' share in city exports			-0.004	-0.000
Joint venture firms' share in city exports			0.009**	0.009**
City Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Robust, Cluster(city)	Y	Y	Y	Y
Observations	1981	1981	1981	1981
R-squared	0.98	0.97	0.98	0.97

State-owned Firms' Export Structure Dissimilarity Relative to the G-3

Explanatory Variables	**Year-by-year benchmark** (1)	(2)	(3)	(4)
Export Processing Zone Exports / Total City Exports	-11.88**	-13.21**	-12.16**	-13.49**
Processing exports in High-tech Zones / Total City Exports	-0.010	-0.023	-0.013	-0.027
Non-processing exports in High-tech Zones / Total City Exports	-0.123**	-0.136**	-0.124**	-0.138**
Processing exports outside economic zones / Total City Exports	0.007**	0.006**	0.007***	0.007**
Student Enrollment in Higher Education / City Non-Ag Population	-0.166**		-0.170**	
City per capita GDP		-0.005**		-0.005**
City Gross Domestic Product	-0.002*	-0.003*	-0.003*	-0.003*
Foreign-invested firms share in city exports			0.001	0.002
Joint venture firms share in city exports			0.006	0.005
City Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Robust, Cluster(city)	Y	Y	Y	Y
Observations	1976	1976	1976	1976
R-squared	0.97	0.97	0.97	0.97

Wholly Foreign-owned Firms' Export Structure Dissimilarity Relative to the G-3

Explanatory Variables	Moving benchmarks (1)	(2)	2004 Benchmark (3)	(4)
Export Processing Zone Exports / Total City Exports	-0.095	-0.097*	-0.112	-0.115
	(0.059)	(0.057)	(0.073)	(0.071)
Processing exports in High-tech Zones / Total City Exports	-0.017	-0.016	-0.024*	-0.022
	(0.012)	(0.012)	(0.014)	(0.014)
Non-processing exports in High-tech Zones / Total City Exports	-0.013	-0.013	-0.019	-0.019
	(0.011)	(0.011)	(0.014)	(0.014)
Processing exports outside economic zones / Total City Exports	-0.001	-0.001	-0.007	-0.007
	(0.001)	(0.001)	(0.008)	(0.008)
Student Enrollment in Higher Education / City Non-Ag Population	-0.078		-0.080	
	(0.063)		(0.074)	
City per capita GDP		-0.012**		-0.012**
		(0.005)		(0.006)
City Gross Domestic Product (GDP)	-0.005*	-0.003	-0.005	-0.003
	(0.003)	(0.003)	(0.004)	(0.003)
City Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Robust, Cluster(city)	Y	Y	Y	Y
Observations	1548	1548	1548	1548
R-squared	0.95	0.95	0.81	0.81

Joint Ventures' Exports Structure Dissimilarity Relative to the G-3

Explanatory Variables	Year-by-year benchmark (1)	(2)	2004 benchmark (3)	(4)
Export Processing Zone Exports / Total City Exports	0.013	-0.002	0.000	-0.016
Processing exports in High-tech Zones / Total City Exports	-0.005	-0.006	-0.014	-0.015*
Non-processing exports in High-tech Zones / City Exports	0.001	-0.000	0.001	0.001
Processing exports outside economic zones / City Exports	0.001	0.000	0.003*	0.002
Higher Education Student Enrollment / Non-Ag Population	-0.094**		-0.104**	
City per capita GDP		-0.004*		-0.005**
City GDP	-0.001	-0.001	-0.001	-0.001
City Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Robust, Cluster(city)	Y	Y	Y	Y
Observations	1831	1831	1831	1831
R-squared	0.97	0.97	0.96	0.96

Private Firms' Export Structure Dissimilarity Relative to the G-3

	Year-by-year benchmark			
Explanatory Variables	(1)	(2)	(3)	(4)
Export Processing Zone Exports /Total City Exports	-14.28**	-15.86**	-14.02**	-15.51**
Processing exports in High-tech Zones / Total City Exports	-0.006	-0.012	-0.003	-0.009
Non-processing exports in High-tech Zones / Total City Exports	-0.100	-0.109	-0.094	-0.103
Processing exports outside economic zones / City Exports	0.007	0.008	0.008	0.008
Student Enrollment in Higher Education / Non-Ag Population	-0.655**		-0.645**	
City per capita GDP		-0.048**		-0.050**
City GDP	-0.019	-0.024**	-0.021	-0.025**
FIE firm export share			-0.086**	-0.091**
Joint venture firm exports share			-0.003	-0.009
City Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Robust, Cluster(city)	Y	Y	Y	Y
Observations	1262	1262	1262	1262
R-squared	0.75	0.74	0.76	0.76

- Unit values
  - Quality?
  - Variety?
  - Cost?

Unit Value: Example

- Video camera (HS 852540) in 2005
  - Unit value of G-3 exports = $331.50
  - Unit values in China's exports
    - Foreign-invested firms = $ 51.5
      - Export processing zones = $ 60.2
      - Processing/High-tech zones = $154.6
      - Processing/outside any zones = $ 66.3
      - Normal trade/high-tech zones = $ 21.6
      - Normal trade/outside any zones = $ 13.2
    - State-owned firms = $ 30.2

Unit Value: Example 2

- Color video monitor (HS 852821) in 2005
  - Unit value of G-3 exports = $467.4
  - Unit values in China's exports
    - Foreign-invested firms = $241.5
      - Export Processing Zones = $347.8
      - Processing/High-tech zones = **$456.7**
      - Processing/outside any zones = $ 56.8
      - Normal trade/high-tech zones = **$364.8**
      - Normal trade/outside any zones = $ 73.6
    - State-owned firms = $ 207.0
    - Joint ventures = $ 126.3
    - Private firms = $ 77.2

- Specification

$$Ln(Unit\_Value_{rkt}) = city\_year\_fixed + product\_fixed$$
$$+ \beta_1 EPZ\_share_{rkt}$$
$$+ \beta_2 High\_tech\_zone\_process\sin g\_share_{rkt}$$
$$+ \beta_3 \Pr oces\sin g\_trade\_outside\_anyzone_{rkt}$$
$$+ \beta_4 High\_tech\_zone\_nonproces\sin g\_share_{rkt}$$
$$+ other\_controls + \mu_{rkt}$$

Table 11: What Explains the Cross City Difference in the Unit Values of the Exports?

Explanatory Variables	(1)	(2)	(3)	(4)
Export Processing Zone Exports / Total City Exports	0.209**	0.068	0.050	0.064
Processing exports in High-tech Zones / Total City Exports	0.589**	0.429**	0.428**	0.434**
Non-processing exports in High-tech Zones / Total City Exports	0.206**	0.171**	0.172**	0.173**
Processing exports outside economic zones / Total City Exports	0.119**	0.117**	0.117**	0.119**
FIE firm export share		0.198**		0.179**
Joint venture firm exports share		0.222**		0.207**
Collective and Private firm export share			-0.290**	-0.094**
SOE firm export share			-0.196**	
Product Fixed Effects	Yes	Yes	Yes	Yes
City_Year Fixed Effects	Yes	Yes	Yes	Yes
Number of Unique Cities	238	238	238	238
Number of Unique products	6,473	6,473	6,473	6,473
Observations	1,256,999	1,256,999	1,256,999	1,256,999
Adjusted R square	0.794	0.794	0.794	0.794

Conclusions

- Important to look at both export structure and unit value
- Important to understand the factors behind the rising sophistication
  - Processing trade -> statistical mirage
  - Human capital -> natural development
  - Government policies -> leapfrog
  - Foreign-invested firms -> profits go to high-income countries

- Neither processing trade nor foreign invested firms play an important role in generating increasing overlap in the export structure between China and high-income countries.

- Improvement in human capital and government policies in the form of tax-favored high-tech zones appear to raise exp structure sophistication.

- Processing trade is positively associated with higher unit values.
  - In the absence of data on value added from imported inputs, difficult to say its role in skill upgrading for China.

- Exports by foreign invested firms (beyond processing) also contribute to higher unit values.

- Policy zones are also associated with higher unit values (beyond promoting processing trade).

- Future work:
  - Why does China appear to engage in substantially more processing trade than other countries?
  - Is there substantial learning/spillover in processing trade?
  - Causality?


Nicholson
2 SEPT
2004
BHP
CHINA
BOOM

Table 3b: Firm Structure of Table 3a (%)

	Special Economic Zones	Exports Processing Zones	Processing exports in High-tech Zones	Normal exports in High-tech Zones	Processing Exports Outside Policy Zones	Normal Exports Outside Policy Zones	All Other Exports
1996-2004 average							
State Owned	23.7	0	4.8	58.3	28.3	62.5	44.3
Joint Venture	34.3	3.4	33.4	16.9	29.2	13.1	13
Wholly Foreign	36.3	96	61.5	16.3	38	6.6	24
Collective	1.7	0.6	0.3	1.4	3.1	8.2	4.6
Private	3.8	0	0.1	7.1	1.5	9.5	10.4
Total	99.9	100	100	100	100	100	96.3
1996							
State Owned	29.4		15.6	79.7	40.5	85.7	63
Joint Venture	39.5		37.8	13.3	35.2	9.4	10.3
Wholly Foreign	30		46.2	6.2	22.4	2.2	11.3
Collective	0.9		0.4	0.9	1.9	2.6	3.4
Private	0		0	0	0	0	0.2
Total	99.8		100	100	100	100	88.2
2004							
State Owned	20.5	0	2.5	44	18.3	41.8	30.3
Joint Venture	30.5	3	27.2	16.4	26.3	15	15.5
Wholly Foreign	37.9	96.5	69.8	23.2	47.9	9.4	29.8
Collective	2.2	0.4	0.2	1.4	3.4	10.3	4
Private	9	0	0.3	15.1	4	23.5	19.7
Total	100	100	100	100	100	100	99.4