

Determinants of China's Energy Imports: Implication for Sino-Australian Bilateral Trade

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Objectives

- Determinants of China's energy imports?
- Implication for Sino-Australia energy trade?

Outline

- Introduction
- Literature review
- Factors affecting China's oil import
- Analytical framework, and empirical results
- Implications for Sino-Australian energy trade
- Concluding remarks

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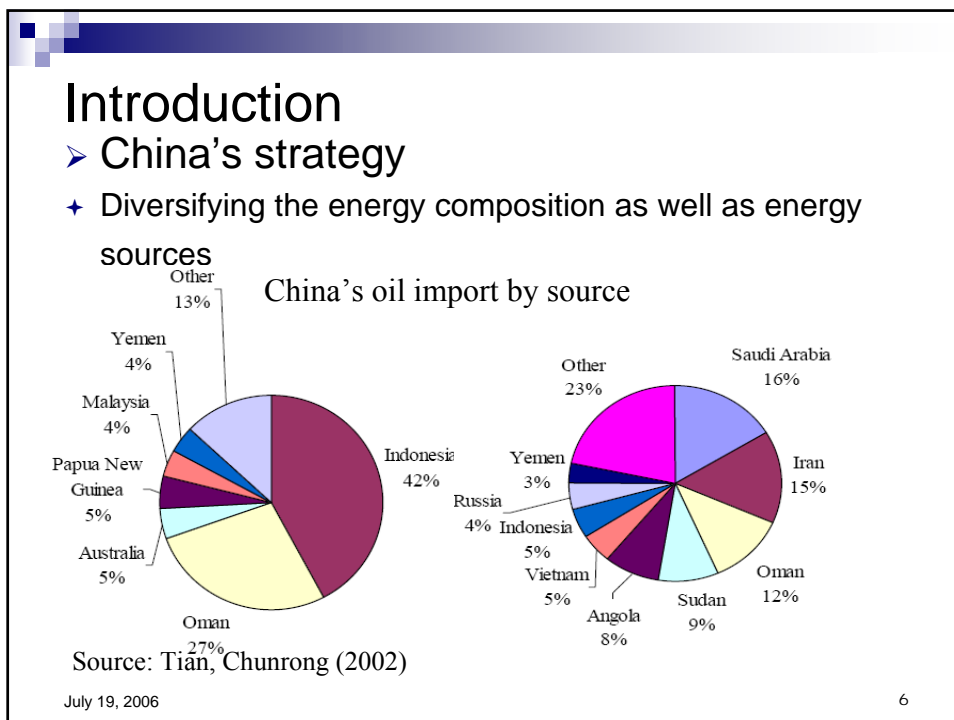
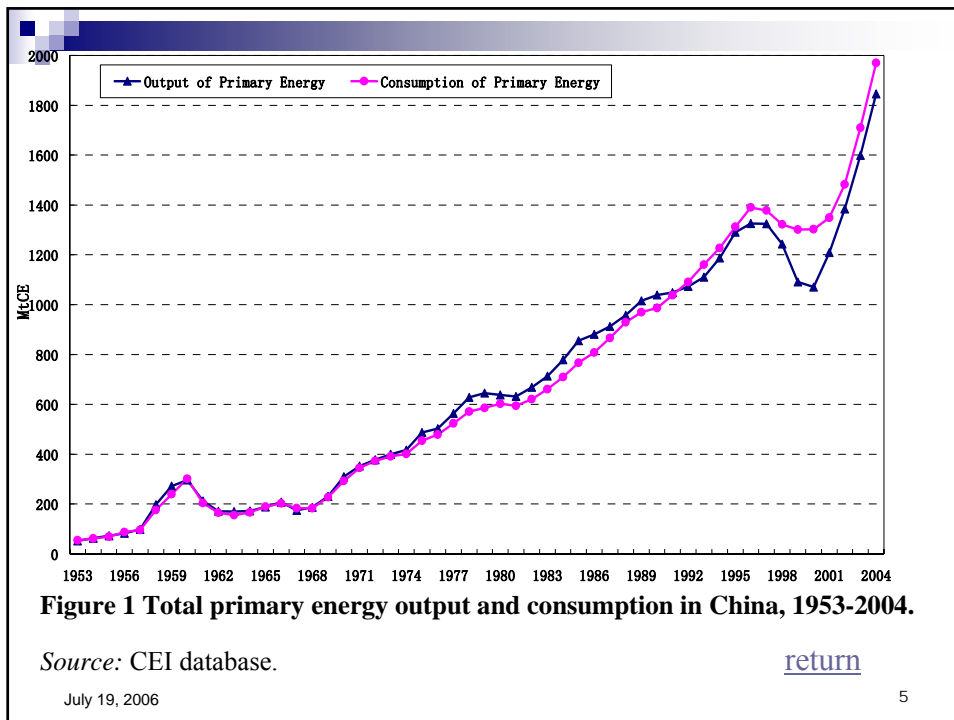
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Introduction

- China's economic growth
 - ✦ Annual growth rate 9.62% between 1978 and 2005 (National Bureau of Statistics)
 - ✦ Four-fold growth between 2000 and 2020 (7% growth rate) (Sixteenth National Congress)
- China's energy market
 - ✦ Development ----three stages ([Figure 1](#))
 - ✦ Unbalanced mix
 - in 2004, Coal 67.7%; Oil:22.7%; NG: 2.6%; Hydroelectricity: 7.0%

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Literature reviews

- Examine the relationship between energy consumption and macro-variables and make forecasting
- Two general conclusions
 - ✦ economic growth is the most important factor in determining China's energy consumption
 - ✦ China's energy consumption structure will change slowly
- Few studies consider China's energy import

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Factors Affecting China's Oil Import

- The price of crude oil
 - ✦ Relative price=oil price/industrial product index
- Domestic energy production ([Table 2](#))
- Industrial output ([Figure 2](#))
- Total traffic volume ([Table 4](#))

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Table 2 China's production, consumption and trade of crude oil (1995-2004) (Million tonnes)

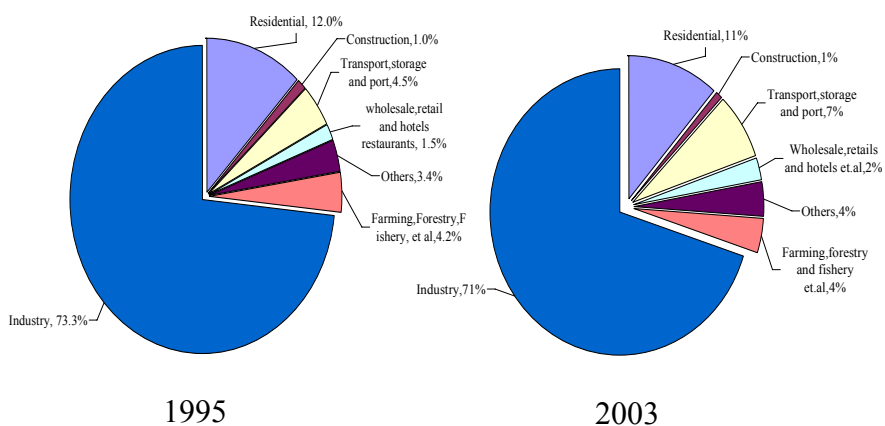
Year	1995	2000	2001	2002	2003	2004	Annul growth rate (%)	
							95-04	00-04
Production	149.0	162.6	164.8	166.9	169.6	174.5	1.77	1.78
Consumption	160.7	230.1	232.2	246.9	266.4	308.6	7.52	7.61
Import	17.1	70.3	60.3	69.4	91.0	122.7	24.49	14.96
Export	48.85	10.31	7.55	7.21	8.13	5.49	-21.56	-14.58

Source: BP Statistical review of world energy, 2005; State Custom Administration, P. R. China.

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Source: National Bureau of Statistics, 2005.

Figure 2 Primary energy consumption by sector.

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Table 4 Number of civil Vehicles (10000 units) and aircrafts (units) (1990-2004)

Year	1990	1995	2000	2004	Absolute growth (units)		
					90-95	95-00	00-04
total vehicles	551.36	1040.00	1608.91	2693.71	488.64	568.91	1084.80
passenger vehicles	162.19	417.90	853.73	1735.91	255.71	435.83	882.18
trunks	368.48	585.43	716.32	893.00	216.95	130.89	176.68
civil aircrafts	499.00	852.00	982.00	1245.00	353.00	130.00	263.00

Source: National Bureau of Statistics, 2003, 2005.

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Analytical Framework: Cointegration and VECM-----Johansen-Juselius (1990)

$$X_t = A_0 + A_1 X_{t-1} + A_1 X_{t-1} + A_1 X_{t-2} + \dots + A_1 X_{t-k} + u_t \quad (1)$$

$$\Delta X_t = A_0 + \pi X_{t-1} + \sum_{i=1}^p \pi_i \Delta X_{t-i} + u_t \quad (2)$$

$$\Delta X_t = A_0 + \alpha \beta X_{t-1} + \sum_{i=1}^p \pi_i \Delta X_{t-i} + u_t \quad (3)$$

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Data and empirical results

- Data ([Table 7](#))
 - ✦ Quarterly series obtained from conversion of monthly series
 - ✦ Source: CEI database; IFS (IMF)
- Stationarity test results: I(0)
- Cointegration test results ([Table 9](#), [Table 10](#))
- Long-run relationship from VECM ([Table 11](#))

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Table 7 List of Variables

Variables	Details	Observations range
Lncoimsa	Crude oil import	1995Q1-2006Q1
Lnrpoilsa	Relative price of crude oil	1995Q1-2006Q1
Lnvaisa	Value added of industry	1995Q1-2006Q1
Lnvahisa	Value added of heavy industry	1998Q1-2006Q1
Lnvalisa	Value added of light industry	1998Q1-2006Q1
Lnteopsa	Total domestic energy output	1995Q1-2006Q1
Lncoilopsa	Domestic crude oil output	1995Q1-2006Q1
Lncoalopsa	Domestic coal output	1995Q1-2006Q1
Lnngopsa	Domestic natural gas output	1995Q1-2006Q1
lnhyeopsa	Domestic hydroelectricity output	1995Q1-2006Q1
Lntvftsa	Total volume of freight traffic	1998Q3-2006Q1
Lntvptsa	Total volume of passenger traffic	1998Q3-2006Q1

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Table 9 Variables grouping

Group number	Variables	Sample Range
1	Oil import, Price, Energy output, VAI	1995Q1-2006Q1
2	Oil import, Price, Energy output, VAHI	1998Q1-2006Q1
3	Oil import, Price, Energy output, VALI	1998Q1-2006Q1
4	Oil import, Price, Oil output, VAI	1995Q1-2006Q1
5	Oil import, Price, Coal output, VAI	1995Q1-2006Q1
6	Oil import, Price, NG output, VAI	1995Q1-2006Q1
7	Oil import, Price, Hydro-E output, VAI	1995Q1-2006Q1
8	Oil import, Price, Energy output, Lntvftsa	1998Q3-2006Q1
9	Oil import, Price, Energy output, Lntvptsa	1998Q3-2006Q1

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Table 10 Results of Johansen & Juliusen Cointegration Test

VAR ^a	Lag ^b	Trace test					Maximum eigenvalues test				
		H ₀	H ₁	Trace Statistic λ_{trace}	5% critical value ^c	Prob.	H ₀	H ₁	Max-Eigen Statistic λ_{max}	5% critical value ^c	Prob.
(1)	4	r=0	r=1	65.175***	47.856	0.001	r=0	r≥1	40.077***	27.584	0.001
		r≤1	r=2	25.098	29.797	0.158	r=1	r≥2	16.260	21.132	0.210
		r≤2	r=3	8.838	15.495	0.381	r=2	r≥3	5.869	14.265	0.630
(2)	2	r=0	r=1	63.980***	47.856	0.001	r=0	r≥1	31.135**	27.584	0.017
		r≤1	r=2	32.845**	29.797	0.022	r=1	r≥2	18.970*	21.132	0.098
		r≤2	r=3	13.875*	15.495	0.086	r=2	r≥3	13.454*	14.265	0.067
(3)	2	r=0	r=1	58.186***	47.856	0.004	r=0	r≥1	30.687***	27.584	0.019
		r≤1	r=2	27.500*	29.797	0.090	r=1	r≥2	15.539	21.132	0.253
		r≤2	r=3	11.961	15.495	0.159	r=2	r≥3	11.819	14.265	0.118
(4)	1	r=0	r=1	64.153***	47.856	0.001	r=0	r≥1	36.719***	27.584	0.003
		r≤1	r=2	27.434*	29.797	0.092	r=1	r≥2	12.882	21.132	0.463
		r≤2	r=3	14.552*	15.495	0.069	r=2	r≥3	10.136	14.265	0.203
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Table 11 Long-run equilibrium relationship from VCEMs

Dependent variables	Lncoimsa						
	(1)	(2)	(3)	(4)	(5)	(8)	(9)
Models	95Q1-06Q1	98Q1-06Q1	98Q1-06Q1	95Q1-06Q1	95Q1-06Q1	98Q3-06Q1	98Q3-06Q1
C	12.43	32.73	65.61	80.43	9.56	-2.19	-15.53
Lnrhoilsa	0.58*** (3.36)	0.17 (1.07)	-0.37 (-1.14)	0.81*** (2.72)	0.51*** (3.13)	0.19 (1.00)	-0.38 (-1.20)
Lnvaisa	1.01*** (4.35)			1.23*** (2.93)	0.89*** (4.26)		
Lnvahisa		2.76*** (7.55)					
Lnvalisa			7.28*** (6.37)				
Lnteopsa	-0.96*** (-4.64)	-3.49*** (-6.49)	-8.08*** (-6.05)			-0.83*** (-3.70)	-0.57 (-1.52)
Lncoilopsa				-9.49*** (-3.01)			
Lncoalopsa					-0.63*** (-5.21)		
Lntvftsa						1.92*** (4.92)	
Lntvptsa							3.60*** (6.64)

Notes: The t-statistics are reported in the parenthesis, and ***, **, * indicate significance at the level of 1%, 5% and 10%, respectively.

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Conclusions

- International relative price of oil seems not to be a major determinant of China's oil imports.
- Industry value added has a positive effect on oil imports.
- Domestic energy production (especially for oil and coal outputs) has a strong substitution effects on oil imports.
- The transport sector also plays an influential role in China's oil imports.

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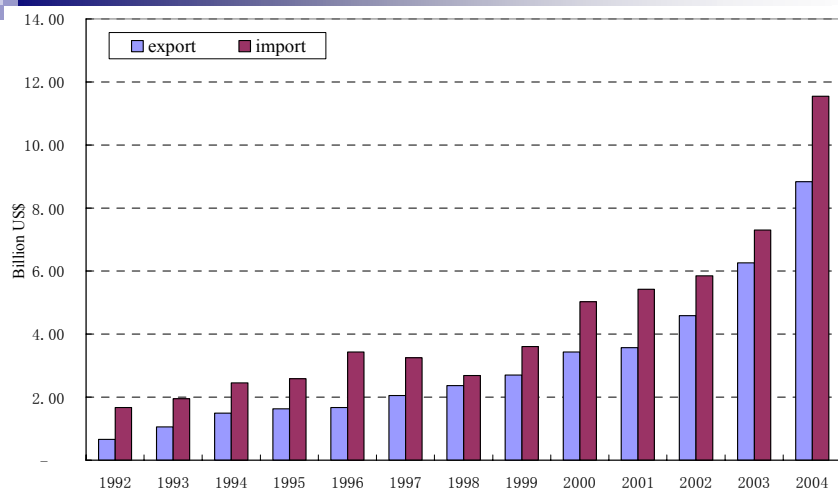
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Implications for Sino-Australian energy trade

- Bilateral trade between two countries
 - ✦ Growth of trade volume ([Figure 3](#))
 - ✦ Complementary trade structure
- Potential energy trade
 - Oil export from Australia to China ([Table 12](#))
 - LNG: Fastest energy export in LR (ABARE, 2005)

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Source: United Nations Comtrade database.

Figure 3 China's commodities export to and import from Australia.

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Table 12 China's crude oil trade with Australia (1996-2003)

(Thousand tones)

Year	1996	1997	1998	1999	2000	2001	2002	2003	annual growth rate
									1996-2003
import	188.16	325.49	353.86	901.04	1108.40	709.12	1156.44	1779.94	37.85%
export	163.54	170.41	306.49	262.63	224.31	145.51	204.28	221.53	4.43%
net import	24.62	155.07	47.37	638.42	884.09	563.61	952.16	1558.41	80.86%

Source: UN Comtrade database.

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Implications for Sino-Australian energy trade

- Other factors affecting bilateral energy trade
 - ✦ A mature China-Australia political relationship
 - ✦ Further trade and investment liberalization ([Table 13](#))

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Table 13 Tariffs applied to China's major mining and energy import from Australia 2004

Product	Value of import 2004 Billion US\$	China's 2005 applied tariffs
Iron ores and concentrates, including roasted iron pyrites	3346	0%
Crude oil	464	0%
Coal	387	3-6%
Petroleum gases and other gaseous hydrocarbons	274	0-11%
Unwrought aluminum	261	5-7%
Manganese ores and concentrates	227	0%
Unwrought nickel	186	3%
Copper ores and concentrates	157	0%
Unwrought zinc	136	3%
Copper waste and scrap	132	1.5%

Source: China's Ministry of Finance 2005: Tariff Schedule.

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Conclusions

- strong growth in industrial production (both heavy and light) is a key contributor to China's oil imports.
- domestic energy output, especially oil and coal outputs, has a strong substitution effect on oil imports.
- expansion of the transport sector will also induce the increase in China's oil imports.

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Conclusions

- Increase in China's energy import demand has important implication for Sino-Australian energy trade
- A mature political relationship between two countries can provide a foundation for further economic and energy cooperation.
- The China-Australia free trade agreement (CAFTA) would deepen the energy relationship and widen the areas of cooperation.

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***Thank you for your
attention!***

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