



Chinese statistics and metal forecasting

April 2008

Macquarie Commodities Research
Macquarie Capital Securities



Overview – China continues to drive global growth

- China has fuelled one of the biggest resource booms in history in steel, steelmaking raw materials, coal, coke and a wide range of commodities.
- China is treading a well-worn path to development already trodden by most Western countries – only difference is the size.
- There are no signs that this growth is about to come to an end any time soon.
- China is playing a more important role on the supply-side and this is supporting higher prices for raw materials and finished products



Year-on-year growth in Chinese demand – still strong in 2007

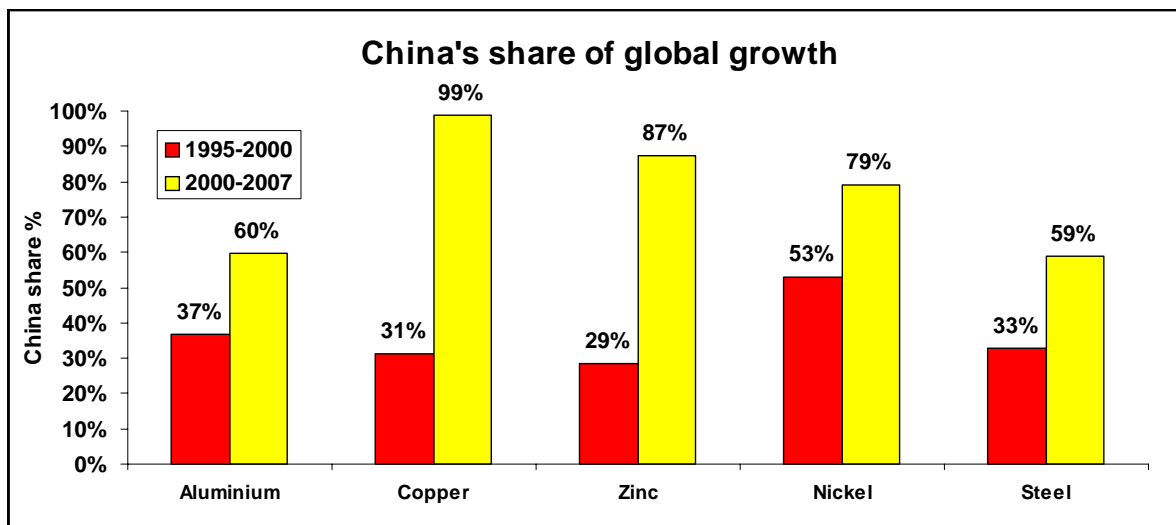
	2000	2001	2002	2003	2004	2005	2006	2007
<u>Refined Consumption</u>								
Aluminium ('000t)	11.5%	9.8%	18.3%	23.8%	19.2%	15.5%	21.6%	40.8%
Copper (;000t)	14.4%	22.2%	16.5%	17.8%	19.2%	4.2%	5.7%	23.5%
Zinc ('000t)	10.8%	17.0%	12.7%	12.9%	31.8%	16.6%	8.7%	11.6%
Lead ('000t)	38.0%	15.4%	19.0%	31.6%	17.0%	38.4%	13.7%	14.8%
Nickel ('000t)	40.2%	28.8%	16.7%	24.5%	24.4%	19.0%	29.0%	36.9%
Tin ('000t)	35.9%	20.3%	-14.2%	34.7%	25.2%	14.9%	32.7%	9.6%
Crude steel (mt)	1.7%	23.0%	21.4%	26.1%	14.6%	19.2%	9.4%	12.2%
Average (above)	21.8%	19.5%	12.9%	24.5%	21.6%	18.3%	17.3%	21.3%
<u>Consumption inc semis net trade</u>								
Aluminium ('000t)	10.2%	7.4%	17.5%	21.8%	17.0%	11.5%	15.3%	36.3%
Copper (;000t)	14.0%	18.1%	17.3%	16.5%	15.0%	0.5%	2.6%	21.4%
Zinc ('000t)	9.6%	17.4%	12.4%	12.6%	32.1%	16.9%	8.8%	13.3%
Nickel ('000t)	16.9%	17.6%	20.4%	26.1%	-1.6%	14.3%	5.3%	13.5%

Source: NBS, China Metals, Macquarie Research, April 2008



China in world context

	<u>2007 Level</u>	<u>China's Share in World</u>				<u>Average Growth Rates (% p.a.)</u>		
		<u>1980</u>	<u>1990</u>	<u>2000</u>	<u>2007</u>	<u>1980-1990</u>	<u>1990-2000</u>	<u>2000-2007</u>
<u>Refined Consumption</u>								
Aluminium ('000t)	12,267	3.4%	4.5%	13.0%	32.5%	5.0%	14.2%	21.0%
Copper (;'000t)	4,800	4.5%	6.5%	11.8%	26.2%	5.4%	9.5%	15.0%
Zinc ('000t)	3,750	4.2%	8.2%	14.9%	32.1%	7.8%	9.4%	15.7%
Lead ('000t)	2,548	3.8%	6.7%	10.1%	30.6%	6.4%	5.8%	21.1%
Nickel ('000t)	345	1.9%	3.9%	6.0%	24.9%	11.2%	6.5%	26.3%
Tin ('000t)	150	6.2%	7.3%	18.6%	39.9%	2.0%	11.7%	16.5%
Crude steel (mt)	437	5.8%	8.7%	16.3%	32.3%	4.8%	7.4%	17.8%
Iron ore seaborne imports (mt))	379	2.3%	4.1%	15.6%	48.2%	7.0%	17.2%	27.3%
<u>Consumption inc semis net trade</u>								
Aluminium ('000t)	11,162	3.5%	4.6%	14.2%	29.6%	5.1%	14.9%	17.8%
Copper (;'000t)	5,363	4.5%	6.6%	15.1%	29.3%	5.6%	12.0%	12.8%
Zinc ('000t)	3,583	4.2%	8.2%	14.0%	30.7%	7.8%	8.7%	16.0%
Nickel ('000t)	343	1.9%	4.7%	12.6%	24.8%	13.1%	12.7%	13.5%



Source: NBS, ICSG, INSG, ILZSG, China Metals, Macquarie Research, April 2008



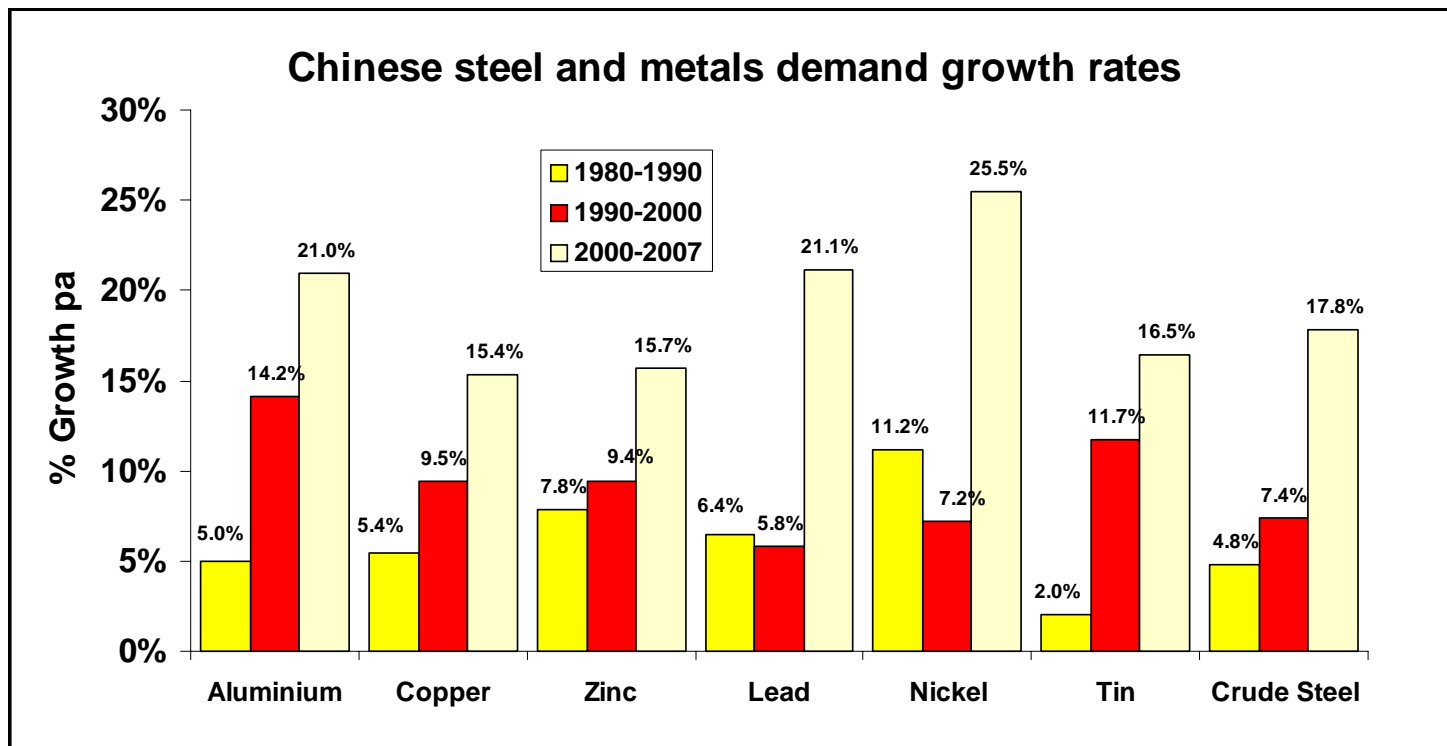
China's influence on supply

	<u>2007 Level</u>	<u>China's share of world</u>				<u>Average Growth Rates (% p.a.)</u>		
		<u>1980</u>	<u>1990</u>	<u>2000</u>	<u>2007</u>	<u>1980-1990</u>	<u>1990-2000</u>	<u>2000-2007</u>
<u>Raw materials output</u>								
Alumina ('000t)	19,457	2.4%	3.4%	8.1%	24.0%	5.5%	11.4%	23.7%
Copper (;000t)	972	2.8%	3.1%	4.3%	5.6%	2.9%	6.8%	6.3%
Zinc ('000t)	3,626	4.4%	11.0%	22.7%	28.5%	10.7%	10.4%	7.3%
Lead ('000t)	1,631	4.9%	12.0%	22.5%	36.2%	7.6%	6.5%	9.8%
Nickel ('000t)	85	1.7%	3.3%	4.3%	6.9%	10.3%	4.6%	11.7%
Tin ('000t)	153	7.9%	18.4%	38.3%	41.6%	8.6%	8.9%	4.8%
Iron ore (63% fe basis mt)	334	5.5%	9.7%	13.3%	20.3%	3.4%	4.7%	14.4%
Average (above)		4.2%	8.7%	16.2%	23.3%	7.0%	7.6%	11.1%
<u>Finished output</u>								
Aluminium ('000t)	12,600	2.5%	4.4%	11.4%	33.1%	7.8%	12.7%	24.0%
Copper (;000t)	3,550	4.1%	5.3%	9.2%	19.4%	4.1%	9.1%	14.6%
Zinc ('000t)	3,800	3.7%	8.0%	21.6%	32.7%	8.9%	13.7%	10.2%
Lead ('000t)	2,800	3.3%	5.4%	16.6%	33.4%	5.3%	14.1%	14.2%
Nickel ('000t)	205	1.5%	2.9%	5.1%	14.1%	9.2%	7.4%	20.3%
Tin ('000t)	151	7.2%	14.6%	41.1%	40.1%	7.7%	12.1%	4.3%
Crude steel (mt)	493	5.8%	8.7%	16.3%	32.3%	5.8%	6.9%	21.3%
Average (above)		4.0%	7.0%	17.3%	29.3%	7.0%	10.8%	15.5%

Source: NBS,CNIEC, China Metals, Macquarie Research, April 2008

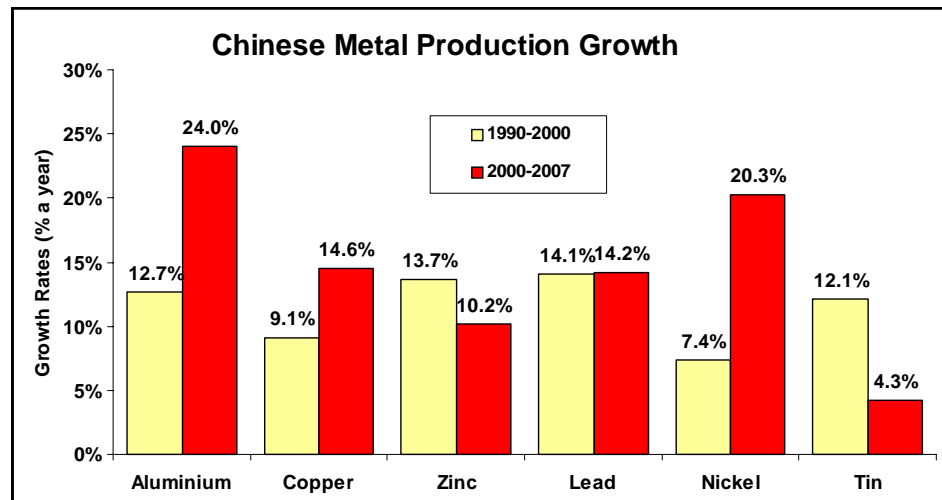
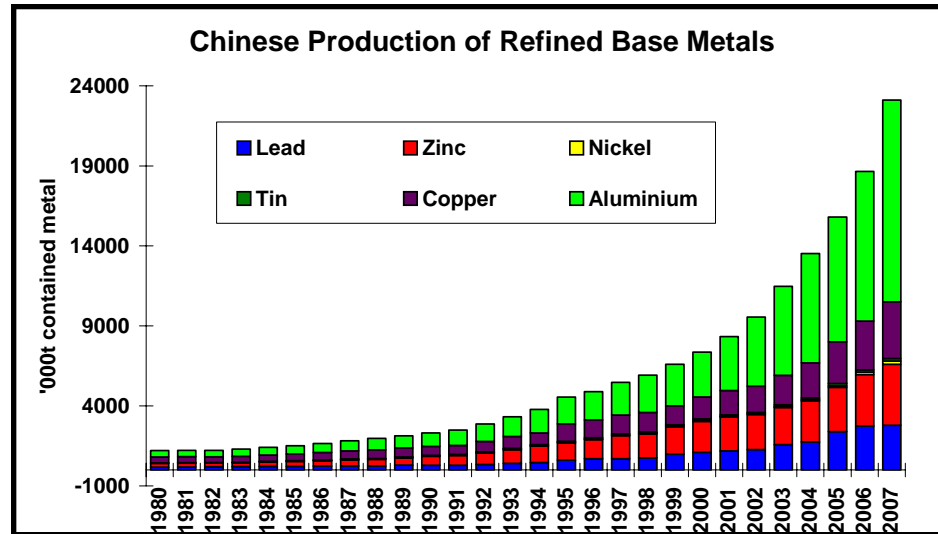


Acceleration in trend growth in base metals this decade



Source: Macquarie Research, April 2008

Supply growth rates mixed



Source: Macquarie Research, April 2008



Chinese statistics – some issues

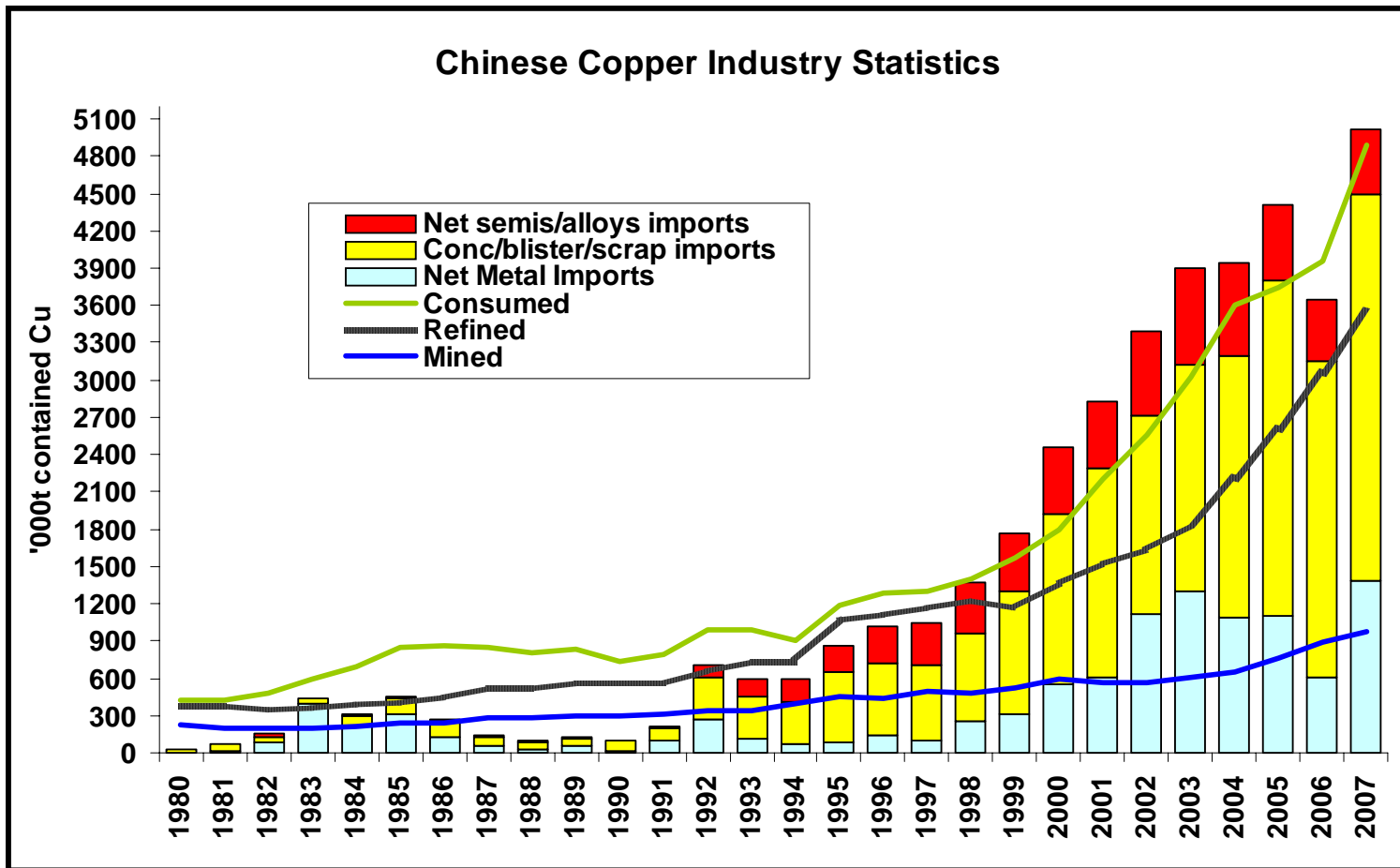
- Common misconception: Chinese statistics are “really bad” making coherent analysis impossible. We disagree...you just have to “work” at the numbers and think about things a little harder!
- Hidden/non-reported stocks are a major issues, but are not uniquely a “China problem” – we have the same issues in rest of world.
- Under reporting of production is still a specifically-China problem.
- Trade data is (now) mostly accurate but smuggling and misclassification still a concern.
- No “real” consumption data is available so apparent consumption calculations must be relied upon
- We have confidence in most Chinese data and spend more time on it than anywhere else in the world.

China is not the “black box” it once was and the statistical challenges are often similar to other countries

Problems of Chinese statistics

- Chinese mine and refined production statistics are by no means comprehensive especially for lead and zinc industry; they are non-existent for nickel pig iron.
- Reported monthly mine output covers as little as 50% of real lead mine output. In all metals, significant revisions between monthly and final annual data.
- Production and capacity changes at the smaller mines and smelters are difficult to track accurately due to the sheer volume of small-scale producers.
- Stocks held in bonded warehouse and government stockpiles including Strategic Reserve Bureau (SRB) are unknown and are impossible to accurately track changes.
- Secondary is a major factor, especially in copper and nickel, but metal content of imports and domestic output is unclear – as it is in rest of world...

Chinese copper: high import reliance



Source: China Metals, Macquarie Research, April 2008



Problem for copper: stock changes at the SRB

- Strategic Reserve Bureau (SRB) is thought to have bought about 250,000t of copper back to the year 2002.
- From 2004-2006, the SRB gradually released about 500,000t of refined copper into the market and was rumoured to have had a large short position on the LME
- Some believed that SRB bought back some copper in 2007 as part of a plan to restock (we don't believe it).



Distortions in copper apparent demand calculation (using monthly data)

000tonnes	Jan-Dec	Jan-Dec	Y-o-Y	Y-o-Y
Apparent demand	2007	2006	Level Chg	% Change
Copper (without SRB)	4892	3605	1287	35.7%
Copper (with SRB)	4892	3818	1074	28.1%

000tonnes	Jan-Dec	Jan-Dec	Y-o-Y	Y-o-Y
Apparent demand	2006	2005	Level Chg	% Change
Copper (without SRB)	3605	3653	-48	-1.3%
Copper (with SRB)	3818	3707	111	3.0%

Source: China customs, Macquarie Research, April 2008

- ➔ Apparent demand growth was higher in 2006 given SRB destocking...
- ➔ Destocking at end users in 2006 was still excluded from the calculations. It is estimated that in 2006 end users stocks/working capital were run down by up to 200,000t



Trade in Chinese bonded warehouses: problem of double-counting?

'000 tonnes	2007	2006	% Change	Tonnes
Refined copper imports	1494	827	80.6	667
of which:				
General trade	442	124	283.9	323
Processing (tolling)	547	443	23.3	103
Through bonded warehouses	309	187	65.6	123
Transferred within bonded warehouses	196	73	168.6	123

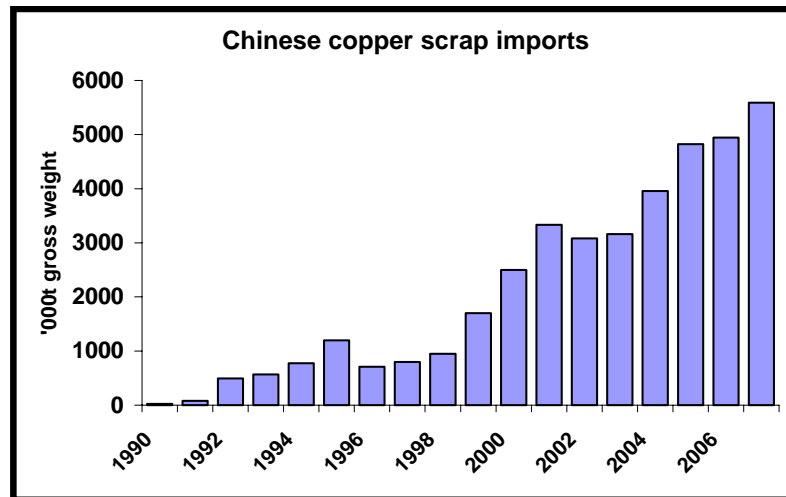
Source: China customs, Macquarie Research, April 2008

- All copper delivered into China counted as imports at the customs despite the transfer into bonded warehouse which has not gone through the customs clearance.
- Transfer within bonded warehouses associated with trading activities between various traders for the same cargo.
- Copper imports then recounted when released from bonded warehouse?



Scrap copper is another big hole...

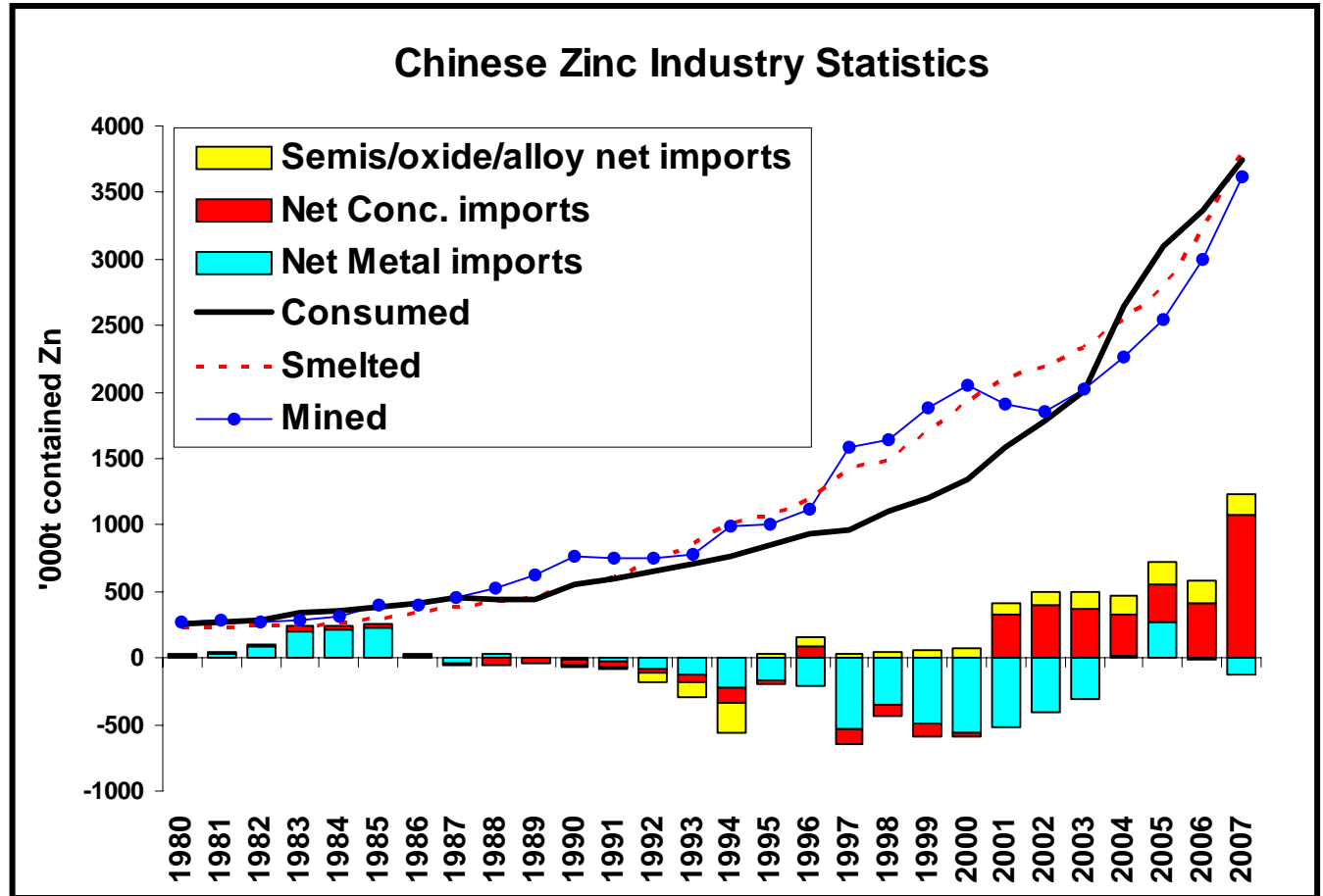
- Copper content of imported scrap is unknown (some say 20% in 2006 and then 25% in 2007...but who knows!)
- Declared lower copper content at Chinese customs to avoid higher tax payments
- Smuggling of recycling materials into China accounts for a large percentage of market supply but no data is available, so the real volume is unknown. Imports registered at the customs only represent 2/3rds of “real” imports?
- No official statistics available for domestic scrap generation.



Source: China Metals, April 2007



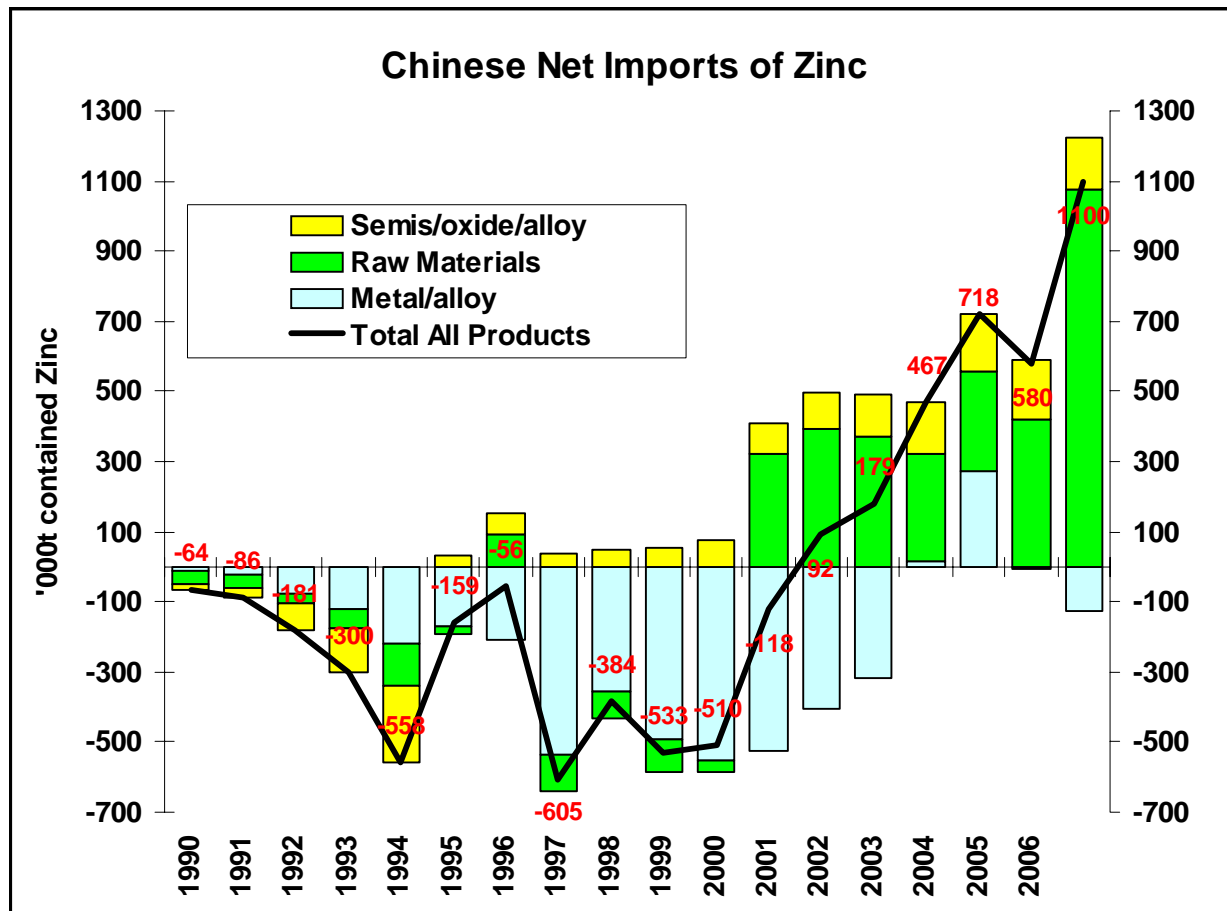
Zinc: China ramps up imports of raw materials



Source: China Metals, Macquarie Research, April 2008



Zinc Net trade swings dramatically



Source: China Metals, Macquarie Research, April 2008



Domestic concentrate production was severely under-reported in 2006

Chinese zinc mine production under-reported			%	Change
000tonnes	2007	2006	Change	'000t
Domestic primary zinc output	3660	3137	523	16.7%
Concentrate recovery rate	95%	95%		
Net Imported ore (gross weight)	2152	837	1315	157.1%
Imported ore (metal content)	861	419	442	105.7%
Domestic mine output reqd	2992	2884	108	3.8%
Reported domestic mine output	2738	2260	478	21.2%
Mine output under-reported	254	624	-370	-59.3%
Reported as % of total mine required	91.5%	78.4%		

Source: CNI-A, China Metal, Antaike, Macquarie Research, April 2008

- ➔ **Domestic zinc mine output was severely under-reported in 2006.**
- ➔ **Statistics are believed to have been improved in 2007.**
- ➔ **Rise in zinc prices encouraged massive rise in zinc mining investment in small scale and lower grade projects**
- ➔ **Chinese zinc mining industry is highly fragmented and average zinc mine production capacity in China is less than 10,000tpa.**
- ➔ **As a result, it is difficult to track the data accurately.**



Lower grades of zinc ore were imported as prices soared

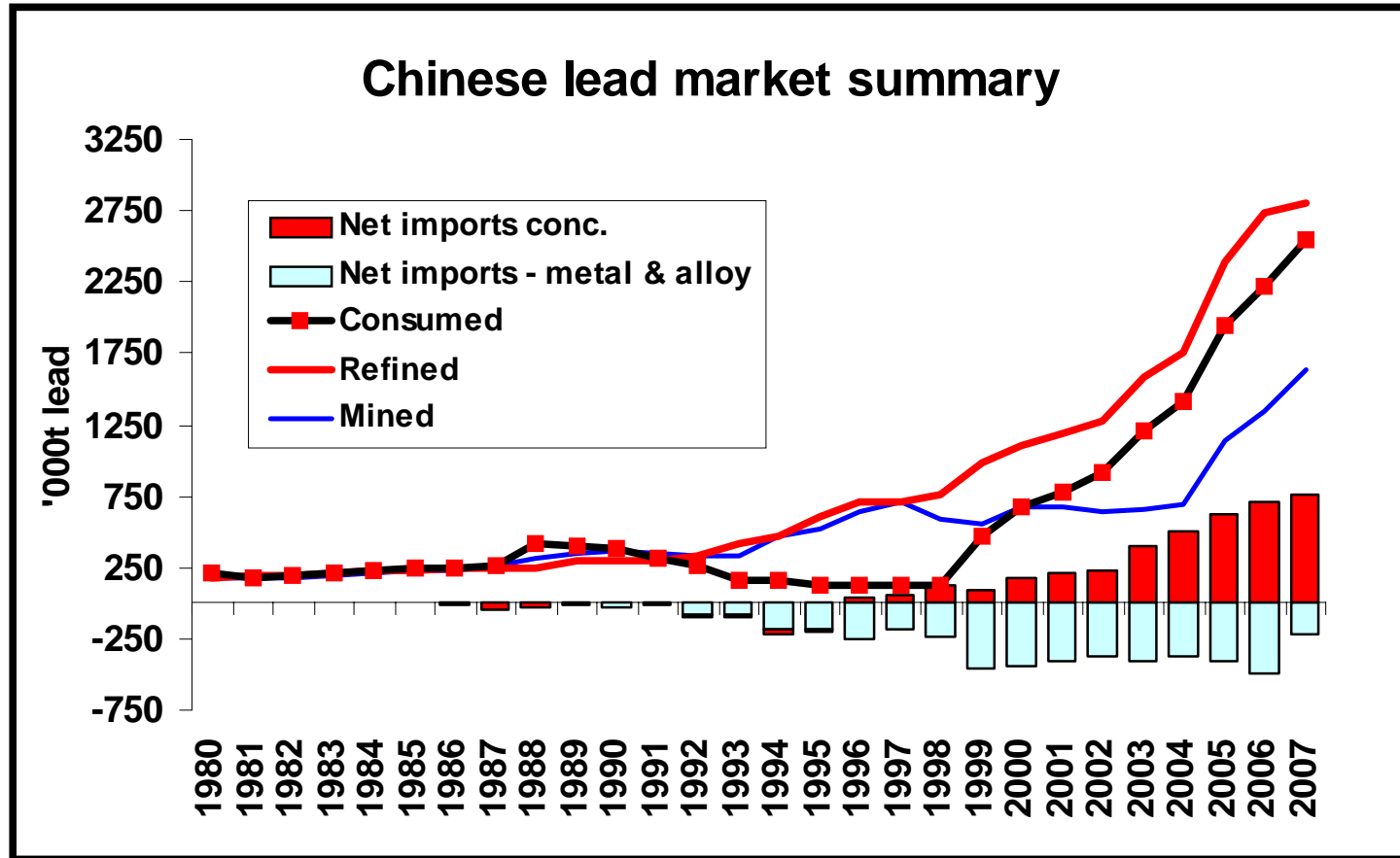
Zinc concentrates imports				
	Jan-Dec	Jan-Dec	YoY	YoY
000tonnes	<u>2007</u>	2006	Change%	Vol.Chg
Australia	667	180	270.4%	487
North Korea	423	89	376.7%	334
Turkey	109	75	45.9%	34
India	192	85	124.5%	106
Iran	85	73	16.0%	12
Mongolia	121	96	26.5%	25
Peru	138	27	404.9%	111
Total	2,151	828	159.7%	1,323

Source: China customs, Macquarie Research, April 2008

- ➔ Imports of concentrates are reported on a gross weight basis. Typically this has been assumed to be around 50% zinc content, but this does not appear to have been the case in 2007.
- ➔ Low grades of zinc ore were imported into China from North Korea with zinc content < 20% compared with 50-60% zinc content raw material imported from South America.
- ➔ Australia is also supplying lower grade ore with zinc content less than 40% with zinc metal payable at 40% of LME zinc prices.



Lead: Refined exports declined due to government tax changes



Source: China Metals, Macquarie Research, April 2008



Low grade lead residual imports counted as lead concentrates

Lead concentrate imports

	Jan-Dec 2007	Jan-Dec 2006	YoY Change%	YoY Vol.Chge
'000 tonnes				
United States	224	207	8.1%	17
Canada	33.9	9	268.8%	25
Peru	189	190	-0.3%	-1
Russian	72	46	56.0%	26
South Korea	116	120	-3.3%	-4
North Korea	42	25	71.1%	17
Mexico	<u>55.7</u>	<u>28</u>	<u>97.4%</u>	<u>27</u>
Total	733	625	6.5%	108

Source: China customs, Macquarie Research, April 2008

- ➔ Reported lead concentrates coming from South Korea are residues from the zinc smelting process with a lead content of less than 20% compared with 60% lead content in concentrate coming from the Australia and Peru.
- ➔ Value of \$100 per tonne for South Korean raw material in trade data compared with \$1,000/t for Australian lead concentrate.



Lead production data

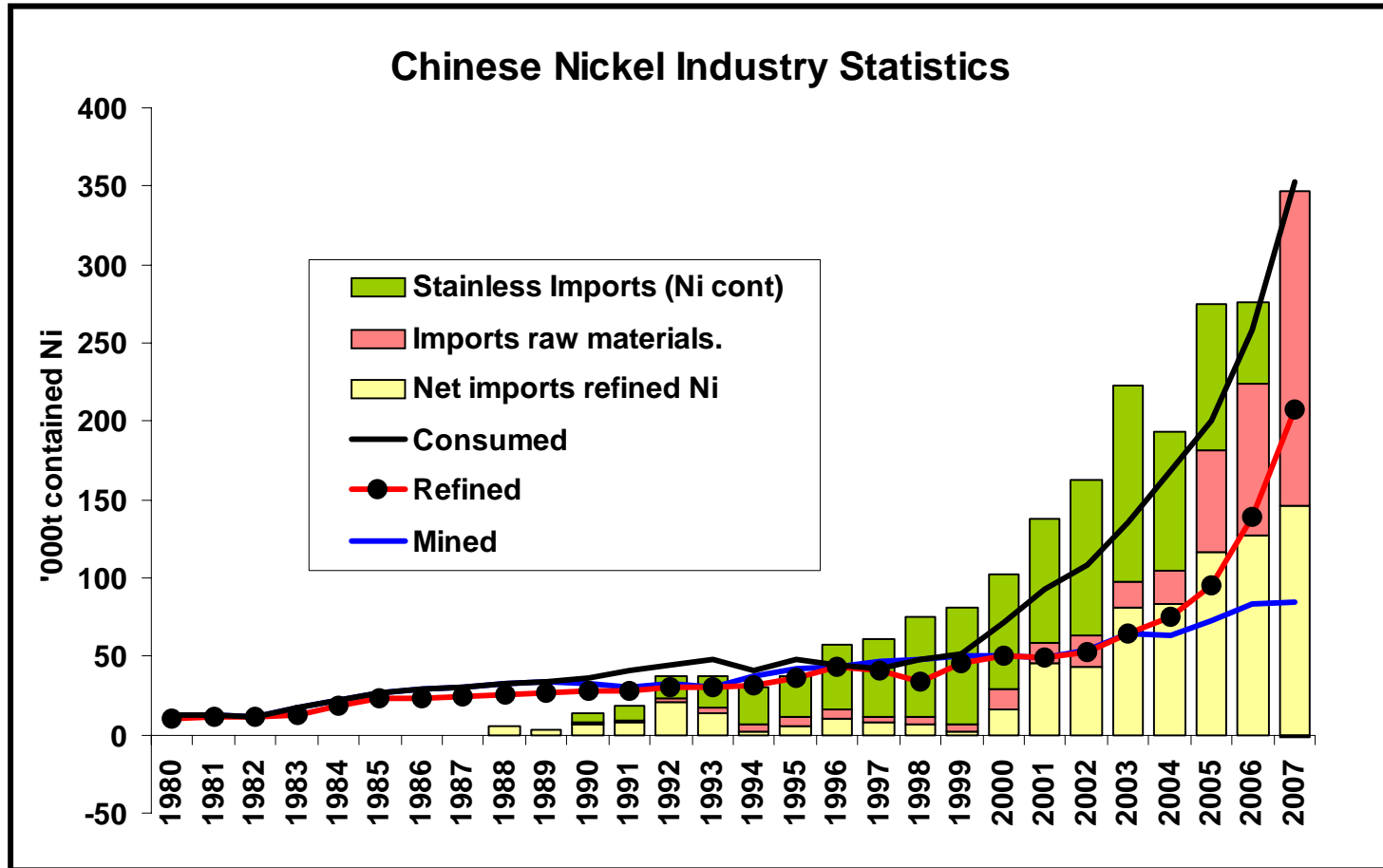
Chinese lead mine production under-reported			%	Change
000tonnes	2007	2006	Change	'000t
Domestic primary lead output	2078	2141	-63	-2.9%
Concentrate recovery rate	95%	95%		
Net Imported ore (gross weight)	1188	1030	158	15.3%
Imported ore (metal content)	653	618	35	5.7%
Domestic mine output rpd	1534	1636	-102	-6.2%
Reported Chinese mine output	953	783	170	21.7%
Mine output under-reported	581	853	-272	-31.9%
Reported as % of total mine required	62.1%	47.9%		

Source: CNI-A, Antaika, Macquarie Research, April 2008

- ➔ **Both Chinese primary lead and mine production are seriously under-reported**
- ➔ **Lead industry is highly fragmented and average lead mine production capacity is less than 5,000tpa**
- ➔ **Top 20 lead mine producers in China only account for 30% of total Chinese reported mine output**



Nickel: Chinese imports of metal and raw materials rising



Source: China Metals, Macquarie Research, April 2008



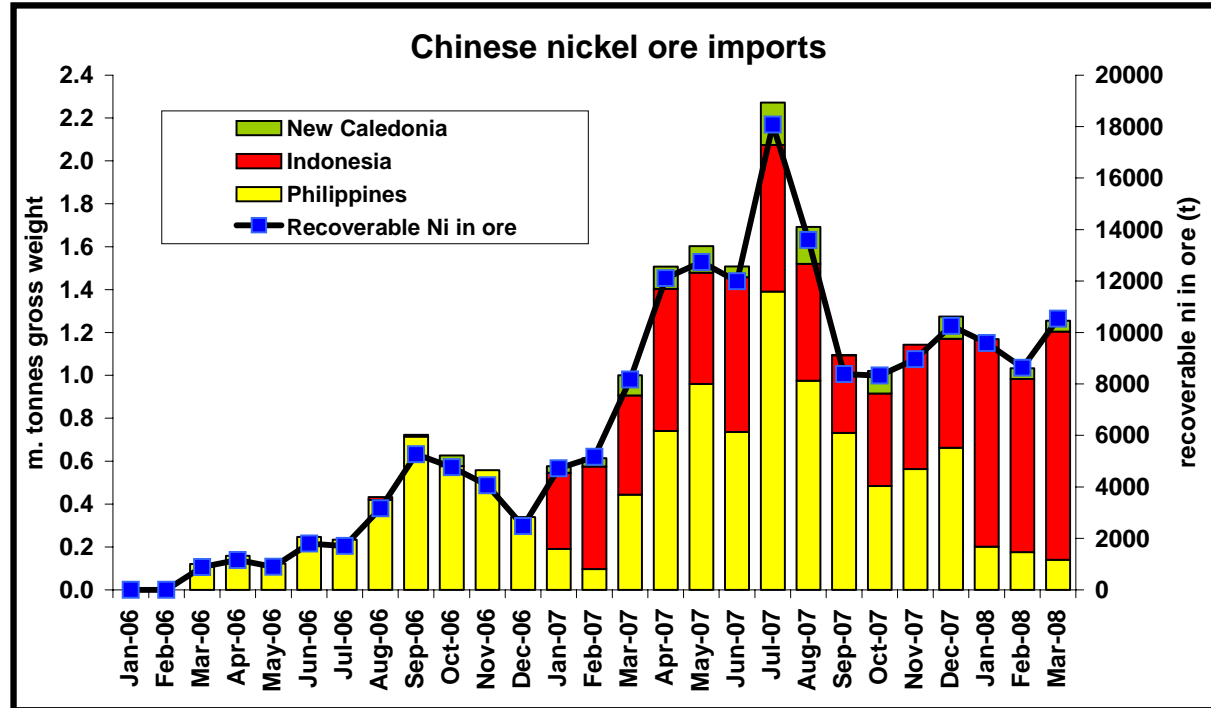
Nickel statistics – problems in supply and demand

- Supply: was easy until the development of Chinese nickel pig iron – totally unreported in official statistics and could have been 85-90,000t nickel production in 2007, over 40% of Chinese nickel production
- Chinese reported stainless steel output only represents 75-80% of real output due to the rapid rise in stainless steel output in recent years from private owned steel mills, which are excluded from the official statistics.
- Major problems in knowing actual grade mix in stainless production (Cr/Mn, Cr/Ni and Cr grades) and the trends in primary nickel demand



MACQUARIE

Recent surge in nickel ore imports



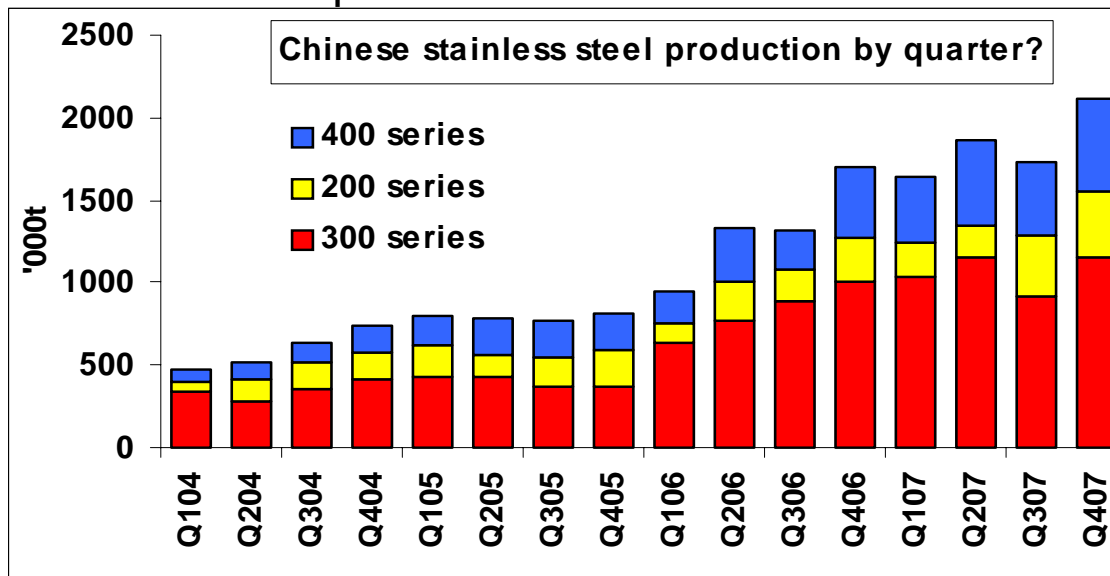
Source: China customs, Macquarie Research, April 2008

- ➔ In 2006, China imported 3.6mt of low-grade oxide nickel ore = 26kt recoverable Ni (estimated); In 2007, Chinese imports of ore were 15.3mt (120Kt Ni); Jan-March 2008 = 3.46mt (29kt recoverable nickel).
- ➔ Due to the overhang of nickel ore stock sitting at the ports, we believe an estimated 4.0mt of stocks would have been carried forward into 2008 (30kt of recoverable nickel).
- ➔ We have estimated actual production of around 85kt for 2007, and think it will exceed 110k in 2008.



Chinese stainless steel output?

- Chinese Stainless Steel Council (CSSC) reports large scale stainless steel mills' production only.
- Massive rise in Chinese production in recent years came from the private owned steel mills which were not included in CSSC statistics - reported statistics only represent 75-80% of Chinese real output of stainless steel?
- Estimates of Chinese melt stainless steel production in 2006 ranged from 4.75mt to 6.1mt; estimates of 2007 range from 7.3mt-7.7mt
- Macquarie believes that Chinese stainless steel output in 2007 was about 7.5mt and output in 2008 will exceed 9.2mt



Source: CSSC, Macquarie Research, April 2008



In summary...

- Ongoing problems with Chinese statistics do present a challenge...but these are not so serious as to make global supply/demand analysis impossible.
- Reported statistics have to be “adjusted” based on assessments of under-reporting/non-reporting of production and non-reported stock changes.
- China is so important in global markets that these China issues are important...but many other countries have similar issues.

Study Groups have a difficult challenge in maintaining a balance between objective reporting of official data, adjusting for generally-accepted “holes” in official data (e.g., unreported production) and making more subjective adjustments (for unreported stock changes).

If the Study Groups want to publish data which reflects the realities of supply and demand rather than simply reporting official data, these challenges must be faced head-on.



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