Ask WORLD STEEL DYNAMICS

World Steel Dynamics (WSD) is a leading steel information service in Englewood Cliffs, N.J. WSD's steel experience, steel database and availability of steel statistics are the principles for performing steel forecasts, studies and analysis for international clients. WSD seeks to understand how the "pricing power" of steel companies the world over will be impacted by changes in the steel industry's structure.

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Q. What effect, if any, have high raw material prices for iron ore and coking coal had on the global steel industry?

A. WSD's World Cost Curve for pig iron producers has steepened noticeably in 2011. In November 2010, pig iron production cost ranged from US$225/tonne to $516/tonne. This compares to a much steeper cost curve as of August 2011, when the cost to produce pig iron ranged from $240 to $640/tonne. The limited increase in cost for the lowest-cost pig iron producers illustrates the significant advantage they possess as a result of captive supply of raw materials versus those who are purchasing raw materials on a quarterly contract or on the spot market.

The price of pig iron producers' raw materials — i.e., iron ore and coking coal — have severely impacted their cost structure:

- **Iron Ore:** The spot price of Indian iron ore delivered to China rose 21% between 1 November 2010 and 31 January 2011, later reflected in the 16% increase for the second quarter contract price to $183 per tonne. Subsequent to this initial rise, the spot Indian iron ore price has remained virtually flat through August 2011 at an average price of $184/tonne. The impact of higher iron ore prices on the median pig iron producer's cost is estimated at $48/tonne in 3Q11 versus 4Q10.
- **Coking Coal:** Flooding in Australia's Queensland Province in December 2010 resulted in a coking coal "price shock." The average spot price of coking coal increased 55% from $222/tonne FOB Australia to $343/tonne from 4Q10 to 1Q11. Despite some decline, the price of coking coal remains 51% higher in August 2011, at $302/tonne FOB Australia, compared to one year prior. The impact of higher coking coal prices on the median pig iron producer's cost is estimated at $38/tonne in 3Q11 versus 4Q10.

WSD's World Cost Curve estimates the total increase in cost for the median pig iron producer at about $90/tonne between November 2010 and August 2011 (Table 1).

WSD's Global Metallics Balance (GMB) system indicates that pig production in the developing world ex-China could be flat year-over-year (y-o-y) in 2011, despite 8.4% y-o-y growth in crude steel production (Table 2). It has been observed that, through July 2011, the average ratio of pig iron production to crude steel production has declined to 0.52 from 0.56 in 2010. Assuming that crude steel production amounts to 362 million

Table 1

World Cost Curve Median Pig Iron Producer Cost: 4Q10 versus 3Q11

For mills purchasing all steelmaking raw materials at global spot market prices (Production in tonnes, prices in US$ per tonne)

	4Q 2010			3Q 2011			
	Usage per tonne shipped	Market price of input ($)	Production cost of input ($)	Usage per tonne shipped	Market price of input ($)	Production cost of input ($)	Change over period
Iron ore (fines, lump, concentrate and pellets)							
Purchased	1.6 tonnes	150.00	240.00	1.6 tonnes	180.00	288.00	48.00
Self-supplied	0 tonnes	0.00	0.00	0 tonnes	0.00	0.00	
Subtotal	*1.6 tonnes*	*150.00*	*240.00*	*1.6 tonnes*	*180.00*	*288.00*	*48.00*
Iron ore cost per tonne of pig iron			**240.00**			**288.00**	**48.00**
Coking coal							
Purchased	1.43 tonnes	263.50	376.81	1.43 tonnes	325.00	464.75	87.95
Self-supplied	0 tonnes	0.00	0.00	0 tonnes	0.00	0.00	
Subtotal	*1.43 tonnes*	*263.50*	*376.81*	*1.43 tonnes*	*325.00*	*464.75*	*87.95*
Coke and PCI							
Purchased/JV coke	0 tonnes	0.00	0.00	0 tonnes	0.00	0.00	0.00
Self-supplied coke	0.36 tonnes	376.81	135.65	0.36 tonnes	464.75	167.31	31.66
PCI	0.14 tonnes	210.00	29.40	0.14 tonnes	255.00	35.70	
Subtotal	*0.5 tonnes*	*330.10*	*165.05*	*0.5 tonnes*	*406.02*	*203.01*	*37.96*
Carbon cost per tonne of pig iron			**165.05**			**203.01**	**37.96**
Electricity	38 kWh	0.04	1.33	38 kWh	0.07	2.66	
Other energy	3.3 mmBTU	6.50	21.45	3.3 mmBTU	6.50	21.45	
Net labor	0.69 man-hours	15.25	10.52	0.69 man-hours	19.25	13.28	
Energy credit			–41.89			–41.89	
All other costs			21.04			21.04	
Non-raw material costs			*12.45*			*16.54*	
Total pig iron cost			***417.50***			***507.55***	***90.05***

tonnes in the developing world ex-China, this 0.04 decline in the pig iron ratio amounts to 15 million tonnes.

A deeper dive into the GMB blast furnace raw material analysis indicates that production costs for developing world ex-China pig iron producers could be more susceptible to coking coal price shocks (compared to those producers in other parts of the world):

- The average blast furnace coke rate in the developing world ex-China is about 0.45 tonnes of coke per tonne of pig iron, versus a 0.36 rate in advanced countries.
- Assuming 1.43 tonnes of coking coal are required, on average, per tonne of coke, developing world ex-China producers consume about 0.13 more tonnes of coking coal per tonne of pig iron produced.
- Thus, pig producers in this region consume about 25 million tonnes more coking coal to support a 187 million tonne pig iron output, than would have been the case in advanced countries. ✦

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Table 2

Global Metallics Balance: Pig Iron Coal Requirements

(million tonnes)

	2000	2005	2008	2009	2010	2011e	2012e	2015e	2020e	2025e
Advanced countries										
Pig iron production	286	276	277	200	257	267	276	286	307	330
Total coke required*	121	112	112	83	104	108	111	114	120	126
Blast furnace coke rate	0.38	0.36	0.36	0.37	0.36	0.36	0.36	0.35	0.34	0.34
PCI required	30	35	35	25	32	35	36	39	44	50
Blast furnace PCI rate	0.11	0.13	0.13	0.12	0.13	0.13	0.13	0.14	0.14	0.15
China										
Pig iron production	131	345	471	541	586	652	685	745	846	961
Total coke required*	76	177	242	274	297	330	344	367	404	445
Blast furnace coke rate	0.49	0.43	0.43	0.43	0.43	0.42	0.42	0.41	0.39	0.38
PCI required	14	44	67	81	90	100	107	124	154	189
Blast furnace PCI rate	0.10	0.13	0.14	0.15	0.15	0.15	0.16	0.17	0.18	0.20
Developing world ex-China										
Pig iron production	159	180	181	166	186	188	210	240	325	431
Total coke required*	84	93	92	88	96	96	106	118	152	191
Blast furnace coke rate	0.47	0.46	0.45	0.47	0.46	0.45	0.45	0.43	0.41	0.39
PCI required	8	10	12	11	13	13	16	22	37	60
Blast furnace PCI rate	0.11	0.13	0.14	0.14	0.15	0.15	0.17	0.21	0.28	0.36

*Coke requirement for steelmaking includes coke required by sintering plants.

e = estimate.

Comments are welcome. To submit your questions for WSD, email WSD@aist.org.
Please include your full name, company name, mailing address and email in all correspondence.