EABER
EAST ASIAN BUREAU OF ECONOMIC RESEARCH

EABER WORKING PAPER SERIES

Paper No. 94

A LESSON IN MARKET CONTESTABILITY: CALCULATING THE COST OF CHINESE STATE INTERVENTION IN IRON ORE PRICE NEGOTIATIONS

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JEL Codes: F13, L16, L11

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ABSTRACT

This article analyses the motivation and impact of the 2009 intervention of the China Iron and Steel Association (CISA) in benchmark price negotiations. The impact of the transition from benchmark pricing to a spot market mechanism, which was a consequence of the CISA's intervention, is examined using a constrained bilateral monopoly model to calculate the financial impact of switching pricing mechanisms on Australian exporters and Chinese importers.

Introduction[1,2]

Following a visit to China in 2003, the Japan Iron and Steel Federation (JISF) reported that, "China will inevitably have a great impact on not only iron ore supply but also price negotiations" (Tex Report, 2012). Six years after JISF's prediction about China's inevitable impact on the structure of the iron ore market, the benchmark pricing system was abandoned following the increasing dysfunction of the bilateral price negotiations in the Asian market.

The iron ore benchmark pricing system provided an institution to update the contract iron ore price annually to account for imperfect market foresight in the terms of long-term contracts (LTCs). The annual price updates associated with the benchmark mechanism reduced price uncertainty for buyers and sellers, as compared to the volatile spot market, while allowing the price to be updated to reflect any change to the marginal operators' costs. The negotiations took place separately between major LTC holders in the European and Asian markets. Once a benchmark was settled in a market, it would be adopted in all contracts for the coming year.

The large scale of the iron ore price boom led Chinese industry stakeholders to question the fairness of the benchmark price outcomes, believing the settled benchmark price did not reflect the marginal cost of iron ore. For example, in 2006 then Chinese Premier, Wen Jiabao, appealed to the Australian government that the two governments should "put in place a fair, open and reasonable market order as well as to come up with a pricing mechanism that is in accordance with international practices" (Uren, 2012).

The perception among Chinese steel industry stakeholders that the price outcomes following the iron ore demand shock were 'unfair' (above the marginal cost) led the Chinese state to intervene in the price negotiations. How Chinese state intervention in price negotiations influenced market outcomes is an important question that this article sets out to answer. To understand the impact of the Chinese state intervention in iron ore benchmark price negotiations, this article analyses the impact of the iron ore price rise on China's steel industry; next, it looks at the benchmark price outcomes in the lead-up to China's state intervention and uses a constrained bilateral monopoly framework to estimate the long-run bilateral advantages accruing to Australian and Chinese iron ore traders under the benchmark system; after that, the article examines Chinese state intervention in the 2009 benchmark pricing negotiations and the impact it had on short- and long-run market outcomes.

1. The impact of the iron ore price boom on China's steel industry

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[2] I am indebted to Shiro Armstrong, Peter Drysdale, Ligang Song, Philippa Dee, and Ryan Manuel for comments on drafts of this paper.

Over the period 2003 to 2012, the average domestic price index for Chinese steel rose around 38.2 per cent (Williams, 2013). In comparison, the price of iron ore increased by around 588.4 per cent over period 2003 to 2012 (from US$17.36/t to US$119.51/t). The rising iron ore price had a significant negative impact on the Chinese steel industry.

One of the main reasons for the negative impact of the iron ore price boom on steel is the different elasticity of supply in each market. In a competitive market the elasticity of supply reflects the substitutability of the product and the extent to which fixed factors of production constrain production expansion over the short run.

Fixed factors impact on iron ore market adjustment more than they do on adjustment in the steel industry due to the massive economies of scale required to profit from low margin iron ore production and shipment, and the long lead times necessary to locate and develop new market-quality mineral endowments and associated infrastructure. The relatively high fixed factors of iron ore production, as compared to steel, are reflected in the different price elasticities of supply of each market. Matthews (1993) and Cima (1996) estimated the steel price elasticity of supply at between 2 and 5.9—that is, a 10 per cent increase in the price of steel is associated with a 20 to 59 per cent increase in production, which compares to Zhu's (2012) estimate of iron ore price elasticity of supply being 0.45 (in Maasouumi et al., 2002)[3], implying that a 10 per cent increase in the price of iron ore leads to less than a 4.5 per cent increase in iron ore production.

The disparity in the price elasticities of iron ore and steel supply meant the escalation of iron ore prices put strong negative pressure on Chinese steel industry profits. The impact of the rising iron ore price on China's steel industry is estimated here using the ratio of the traded price of iron ore to the weighted Chinese steel export price[4]. The weighted average price for Chinese steel exports (wp^x) was calculated by dividing the proportion of each steel product (q_i^x) by total steel exports (q_W^x) and then multiplying by the price of the steel product (p_i^x). To calculate the total weighted price each weighted steel product prices ($p_i^x \frac{q_i^x}{q_W^x}$) were summed (Equation 1).

$$wp^x = \sum_{i=1}^{N} p_i^x \frac{q_i^x}{q_W^x} \tag{1}$$

The price of 1.4t of iron ore—it takes around 1.4t of iron ore to produce 1t of steel in a modern BOF—was then divided by the weighted price of Chinese steel exports per ton (wp_t^x from Equation 1), to provide a proxy for the impact of the rising iron ore price on the Chinese steel industry ($pp_t^{FeO/x}$) (Equation 2).

[3] The price elasticity of demand of steel is in the range of –0.2 to –0.3, that is, a 10 per cent increase in the price of steel leads to a 2 to 3 per cent decrease in demand (Gonzalez and Kaminski, 2011; Malanichev and Vorobyev, 2011). The price elasticity of demand for iron ore was estimated by Zhu (2012) at –0.24, meaning a 10 per cent rise in the iron ore price would cause a 2.4 per cent reduction in demand.

[4] The weighted export price was used as a proxy for the price of Chinese steel as there was no data on the domestic price of Chinese steel in the public domain.

$$pp_t^{FeO/x} = \frac{1.4(p_t^{FeO})}{wp_t^x} \quad (2)$$

By applying the above equations to Chinese steel export price and quantity data it was estimated that in 2003, the price of 1.4/t of iron ore accounted for around 6.4 per cent of the weighted average price of a ton of exported steel from China. Figure 1 shows that by 2012 this figure had increased to 20.3 per cent, after peaking at 25.7 per cent in 2010.

<FIGURE 1 ABOUT HERE>

During the iron ore price boom, China's steel industry profits rose and fell remarkably. Demand for steel increased on average 34.1 per cent per annum from 1999 to 2012; data reported by the China Iron and Steel Association (CISA) and presented in Figure 2 shows that in 1999, China's steel industry posted a profit of around US$329.5 million (US$316,000 per steel producer, on average). By 2007 annual industry profits had risen to US$20.4 billion (US$2.9 million per steel producer, on average) before dropping to US$267.9 million in 2012 (US$18,600 per steel producer, on average)[5].

<FIGURE 2 ABOUT HERE>

The iron ore price boom is not solely responsible for the decline of the Chinese steel industry's profits but it did contribute significantly. The increased price of iron ore added around US$36.4 billion per year to the cost of iron ore imports over 2003 to 2012, as compared to a situation in which the 1999 price had been maintained. The added cost of iron ore for Chinese buyers from 2003 to 2012 is more than three times the annual average profits of China's steel industry over the same period (US$11.1 billion per annum).

The increased cost of iron ore could not be passed onto the end user due to the high level of competition (discussed below) and overcapacity in the Chinese steel market. China's steel industry overcapacity became acute in 2006 and by 2008 steel production capacity was 660 mt/a, around 160 mt/a higher than consumption; overcapacity became a significant issue for the industry's profitability as it meant that when profitability rose, idle capacity would increase and place downward pressure on the price (Tang, 2010).

2. Estimating the distribution of bilateral quasi-rents under the benchmark price mechanism

The increasing iron ore price placed negative pressure on the profits of China's steel industry. While there was no indication of a coordinated strategic intervention by the 'Big 3' iron ore exporters (Rio Tinto, BHP Billiton, and Vale) the annual negotiations became increasingly acrimonious.

[5] The number of Chinese steel producers ballooned in number from 1,042 in 1999 to 14,377 in 2012.

In 2004, Baosteel led the Asian market negotiations. This was the first time a non-Japanese firm had done so since the establishment of the benchmark system in 1974 (Uren, 2012). The impact of the transition to China's leadership was described by one iron ore executive who was involved in the benchmark negotiations as:

Once the Chinese got involved and you had the transition of the leadership of the negotiation; coming to China there was a similar dynamics but actually the stature of those at the table diminished. … after a while it became apparent that it was just presentations of pre-prepared speeches. It was very, very obvious—it was kind of obvious that [exporters] want the price up and kind of obvious that they want the price down.

The Chinese, in what little exposure they had, had been habituated around low prices and excess [iron ore] supply. So the assumptions that they had all had broke down, which creates tension in negotiation situations.

The impact of China's iron ore demand shock was expressed in the benchmark price outcomes in the years following Baosteel's inclusion in the price negotiation—from 2004 to 2006 the price of iron ore had doubled from US$16.39/t to US$33.45/t. The cost pressure the iron ore price rise placed on China's steel industry and the suspicion that the benchmark price outcomes reflected strategic interventions by the Big 3, led the state to signal it would intervene if the price rises continued. In 2006, the Ministry of Commerce (MOFCOM) and the National Development and Reform Commission (NDRC) released a statement signalling that state intervention was imminent. It stated:

Chinese steel and iron enterprises are facing many problems so China cannot accept another price rise. The companies' costs keep increasing while their profits drop … The government's role is necessary for big deals; foreign parties are monopolies while Chinese parties are diversified and do not have significant bargaining power (Wei, 2006).

On the demand-side, the iron ore demand shock flowed through to the bulk freight market[6], which increased the transport cost differential between Australian exporters as compared to Brazilian exporters to the Asian market [7]. The transport cost differential between Australia and China (TCD_t^{AC}) equals the difference in freight between Brazil to China (F_t^{BC}) and Australia to China (F_t^{AC}) at time *t* (Equation 3).

$$TCD_t^{AC} = F_t^{BC} - F_t^{AC} \tag{3}$$

The Asian market benchmark pricing mechanism rewarded Australian exporters to the Asian market for their relative geographic closeness, as compared to Brazil (the other major exporter to the Asian market). The freight sharing component paid to Australian exporters to the Asian market (FS_t^A) is equal to the free on board[8] (FOB) freight sharing price paid to Australian exporters to the Asian market (p_t^{FS}) minus the

[6] Chinese ports were not designed to unload huge quantities of iron ore, and at the initial stage of the growth in demand for ore China's ports were filled with iron ore waiting to be hauled to the final destination. Many ports were stuck with ore carrier vessels waiting for unloading (Sukagawa, 2010).
[7] For example, the distance from Port Hedland/Dampier (Australia) to Qingdao is 3,458 nautical miles, whereas from Tubarão (Brazil) to Qingdao it is 11,023 nautical miles for Brazilian exporters.
[8] Under an FOB pricing mechanism the imported pays the cost of iron ore and is then responsible for organizing freight.

FOB price paid to Brazilian exporters to the Asian market (p_t^{FOB}) at time *t* (Equation 4).

$$FS_t^A = p_t^{FS} - p_t^{FOB} \tag{4}$$

The freight sharing component within the Asian benchmark price did not distribute the transport cost differential equally between Australian and Asian traders. The asymmetry between the distribution of the transport cost differential is to be expected due to the increased risk and cost accruing to the importers, which are obliged to organise and manage the seaborne freight of the iron ore shipments. The proportion of bilateral quasi-rents accruing to Australian iron ore exporters to the Asian market (BQR_t^A) (Equation 5) equals the freight sharing component (Equation 4) divided by the transport cost differential (Equation 3).

$$BQR_t^A = \frac{FS_t^A}{TCD_t^{AC}} \tag{5}$$

Applying the above equations to the freight and price data, in 2005, the Australia transport cost differential to the Asian market was around US$17.42/t, of which the existing Asian market freight sharing component provided around US$3.96/t to Australian exporters (23 per cent of the transport cost differential). The remaining 77 per cent (US$13.46/t) of the bilateral quasi-rents accrued to the Asian importers from Australia.

The increasing value of Australia’s transport cost differential to Asia led BHP Billiton negotiators to put forward a proposal to reformulate the freight sharing component of the Asian price during the 2005 benchmark negotiations. BHP Billiton’s proposed freight sharing agreement meant that Australian exporters to the Asian market would receive the same FOB price as Brazilian exporters and would be compensated half (as opposed the 23 per cent in 2005) of the transport cost differential.

The bilateral quasi-rents sharing proposed by BHP Billiton in 2005 was designed to share the transport cost differential equally between Asian importers and Australian exporters. Under the 2005 proposal, the freight sharing component (FS_t) accruing to Australian and Asian contract holders would equal half the transport cost differential at time *t* (Equation 6).

$$FS_t = \frac{TCD_t^{AC}}{2} \tag{6}$$

The total value of the bilateral quasi-rents (VFS_t^{AC}) equals the freight sharing component (FS_t) multiplied by the quantity of iron ore traded between Australia and Asian market buyers (Q_t^{AC}) at time *t* (Equation 7).

$$VFS_t^{AC} = (FS_t)Q_t^{AC} \tag{7}$$

The change in the value of the freight sharing agreement (ΔVFS_t^{AC}) equals the value of the freight sharing agreement in the current period minus the value of the freight sharing agreement in the previous period (Equation 8).

$$\Delta VFS_t^{AC} = VFS_t^{AC} - VFS_{t-1}^{AC} \tag{8}$$

BHP Billiton's proposed freight sharing recalculation in 2005 was rejected. Applying the above equations to the freight and price data it is estimated that if it had been adopted, Australian exporters would have received an extra US$337.2 million per year[9] in bilateral quasi-rents in iron ore export revenue to Asia (Japan, China, and South Korea) (averaged over the three years from the 2005 settlement to when a freight sharing component was updated in 2008), *ceteris paribus*. For context, the total revenues accruing to Australian iron ore exporters to Asia in 2005 under the existing freight sharing component were around US$948.3 million.

In 2008, Rio Tinto took advantage of the informal nature of the benchmark price negotiations[10] and refused to adopt the 65 per cent benchmark price rise achieved by Vale's negotiators with NSC/POSCO, which was around US$84.59/t lower than the spot market price (US$76.33/t and US160.92/t, respectively). On the rejection of Vale's benchmark, Chief Executive Officer Rio Tinto Iron Ore, Sam Walsh, said,

> We were concerned about the huge differential between the new prices that Vale had set and the spot price … We are sitting tight at the moment waiting for the market to recognize the fundamentals. The indication would be greater than 71 per cent (The New York Times, 2008).

In response to Rio Tinto's demand for an increase in the freight sharing component, Baosteel's negotiators threatened that China would slash steel production by 10 per cent (50 mt/a) to enforce a boycott of Rio Tinto and BHP Billiton imports (Uren, 2012). The Chinese boycott never eventuated and Hamersley and Baosteel agreed to a 79.9 per cent price rise for Australian exporters (to US$89.69/t). The Australian iron ore price rise was 14.9 per cent greater than the 65 per cent price rise for Brazilian exporters (to US$82.27/t) representing the upward adjustment of the freight sharing component of US$7.42/t.

In 2007, Australian exporters received just US$5.15/t of the US$36.87/t transport cost differential (around 14 per cent), a decrease of around 16 percentage points from the previous year when they received US$4.71/t of the US$15.69/t transport cost differential. The 2008 freight sharing component recalculation shifted a large amount of bilateral quasi-rents from Asian importers to Australian exporters. To estimate the rents shifted the proportion of bilateral quasi-rents accruing to Australian exporters in the previous period will be compared to the proportion of bilateral quasi-rents received by Australian iron ore exporters in the current period. The proportion of bilateral quasi-rents accruing to Australian iron ore exporters in the previous period (BQR_{t-1}^{A}) is equal to the freight sharing component in the previous period (FS_{t-1}^{AC})

[9] Calculated using Equation 1 above.

[10] "The benchmark system was never a codified system of rules, it was just a convention. For something to be a benchmark you needed a supplier to settle a big enough contract with a big enough buyer for that to set the market price" (*iron ore executive 1*).

divided by the transport cost differential in the previous period (TCD_{t-1}^{AC}) (Equation 9).

$$BQR_{t-1}^{A} = \left(\frac{FS_{t-1}^{AC}}{TCD_{t-1}^{AC}}\right) \tag{9}$$

The zero-sum nature of bilateral quasi-rents means that the proportion of bilateral quasi-rents received by Asian iron ore exporters in the previous period (BQR_{t-1}^{C}) is equal to one minus the share of Australian exporters' share of bilateral quasi-rents in the previous period (Equation 10).

$$BQR_{t-1}^{C} = (1 - BQR_{t-1}^{A}) \tag{10}$$

The change in the share of bilateral quasi-rents for country *x* (ΔBQR^{x}) equals the current share of bilateral quasi-rents accruing to *x* (BQR_{t}^{x}) minus the share of bilateral quasi-rents accruing to actors in the previous period (Equation 11).

$$\Delta BQR^{x} = BQR_{t}^{x} - BQR_{t-1}^{x} \tag{11}$$

The change in the value of country *x*'s bilateral quasi-rents ($V\Delta BQR_{t}^{x}$) is equal to *x*'s share of bilateral quasi-rents in the current period minus *x*'s share of bilateral quasi-rents in the previous period, multiplied by the quantity of iron ore traded between the countries *x* and *y* (Q_{t}^{xy}) (Equation 12).

$$V\Delta BQR_{t}^{x} = (BQR_{t}^{x} - BQR_{t-1}^{x})Q_{t}^{xy} \tag{12}$$

Applying the above equations to the data shows that the increase in the freight sharing component meant that Australian iron ore exporters to Asia received around 20 per cent of the transport cost differential in 2008, an increase of around 6 percentage points on the freight sharing component applied to Australian iron ore exports to Asia in 2007 (Tex Report 2012). Applying the constrained bilateral monopoly model, the 6 percentage point increase in the freight sharing component for Australian iron ore exporters to the Asian market in 2008 translated to a shift of around US$980.6 million in bilateral quasi-profits from Chinese importers to Australian exporters and US$418.2 million from Japanese importers to Australian exporters in 2008, as compared to if the 2007 freight sharing component had remained in place.

3. China's state intervention in the 2009 benchmark negotiations

The 2008 price negotiations were a turning point for the benchmark mechanism. On top of Rio Tinto's demand for a greater share of the transport cost differential, it also exploited loopholes in LTCs to take advantage of the price discrepancy between the spot and benchmark prices. In the lead-up to the 2008 benchmark settlement (May 2006 to February 2008), the spot market price rose from US$57.71/t to US$157.32/t

(62 per cent fines FOB, Asian market). Despite the significant spot market price rise, the 2008 benchmark price for Australian exporters to China was just US$89.69/t.

The disparity between the benchmark and spot market prices created large incentives for exporters to exploit contract loopholes and divert supply from LTC obligations to gain short-run rents. The switching costs—such as market search costs and potential reputational damage—associated with diverting contracted supply to the spot market was considered acceptable by Rio Tinto and it announced it would sell 15 mt on the spot market. CISA accused Rio Tinto of enacting the *force majeure* clause on 46 per cent of its contracted supply, so that Rio Tinto could take advantage of the high spot market price (Uren, 2012). CISA released a statement condemning Rio Tinto's diversion of supply to the spot market stating,

> Market participants suspect that Rio Tinto has reduced the long-term contract supply volume and shifted supply to spot sales for gaining greasy profits … Rio Tinto is supposed to abide by the supply contracts for the sake of responsibility and integrity … [CISA] urges Chinese mills and trading houses to boycott or not get involved in the spot iron ore sales from Rio Tinto in China (Uren, 2012).

The increased benchmark price; freight sharing component recalculation; and the proposed spot market supply diversion by Rio Tinto during the 2008 negotiations led the Chinese state to intervene by appointing CISA as chief negotiator for the Chinese steel mills in 2009. CISA was appointed chief negotiator on the basis that the Chinese steel industry was identified by the State Council as a 'pillar industry' (*zhizhu chanye*)[11] in which the state is required to retain a "somewhat strong influence" and CISA's stated role of,

> Maintaining the overall interests and legal rights of the member companies, functioning its role as a bridge between the government and enterprises and continuously improving the competitiveness of the Chinese steel industry in the domestic and overseas market.

Shortly after its appointment as chief negotiator, CISA launched the *Convention for Enhancing Self-discipline in the Iron and Steel Industry to Ensure an Orderly Iron Ore Import Trade*. The Convention stipulated that the Chinese industry would be represented by a designated group of negotiators, led by CISA, and the negotiated iron ore price would be binding for all Chinese importers. It also forbade iron ore imports by individual importers in excess of a steel mill's own consumption needs (der Heiden, 2011).

The aim of CISA's bargaining strategy was to enforce a cartel strategy in order to create dependence asymmetry. By creating a dependency asymmetry iron ore suppliers involved in the Asian benchmark negotiation would be forced to agree to CISA's price demands or face crippling China-wide import boycotts[12].

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[11] Chinese State Council (2006), 国务院办公厅转发国资委关于推进国有资本调整和国有企业重组指导意见的通知, <www.gov.cn/gongbao/content/2007/content_503385.htm>.

[12] CISA's Secretary-General, Shan Shangua, said "miner's profits should be pegged to the steel makers" (Uren, 2012).

In May 2009, Hamersley agreed to a 33 per cent reduction in the benchmark price with Nippon Steel, due to decreased global steel demand following the global financial crisis (GFC). The price reduction agreed between Hamersley and Nippon was less than the 45 per cent reduction CISA was demanding (CISA had initially wanted an 82 per cent price reduction), which led CISA to publicly announce,

> These prices do not reflect a mutually beneficial, win-win relationship for steel makers and iron ore suppliers. CISA therefore cannot accept these prices and will not follow them … In the case of short supply of iron ore, Chinese steel producers would rather cut output (Uren, 2012).

The benchmark negotiations were unresolved when price agreements expired on 30 June 2009. On the expiry of the benchmark price, CISA instructed its members to offer provisional prices of 60 per cent of the 2008 benchmark price for iron ore (Uren, 2012).

Five days after the price agreements expired, four employees of Rio Tinto's iron ore sales team, including Stern Hu, who was the assistant and translator to Rio Tinto's chief iron ore price negotiator, were arrested on suspicion of bribery and espionage. The arrest of Rio Tinto's negotiators increased the anxiety for iron ore exporters to China and exemplified some of the issues inherent with the benchmark negotiations. In its sentencing, the Chinese court noted,

> The four [Rio Tinto employees] have seriously damaged the interests of the Chinese steel enterprises and put those enterprise in an unfavourable place in the iron ore negotiations which led to the suspension of the negotiations in 2009 (Sainsbury, 2010).

The expiry of the price agreements and the arrest of Rio Tinto's negotiators provided the opportunity for BHP Billiton to push formally for a change to the pricing mechanism on the basis that the hostile short-run negotiations were damaging long-run trade relationships and could not be sustained. The alternative to the benchmark system was to move contract pricing to a spot market index, which would not require negotiations[13]. BHP Billiton CEO, Marius Kloppers, hinted at his desire to change the pricing mechanism following the 2008 settlement when he said,

> We've just been through a process where we've negotiated for almost six or seven months to arrive at a 12 month settlement of our contract price. That isn't the kind of relationship we want to have with our clients… Our long-term objective is to move to a price that is fair, and that is based on willing buyers and willing sellers (Uren, 2012).

On 30 March 2010, a day after Stern Hu and his colleagues were each given between 7 and 14 years in prison for bribery and stealing business secrets, the benchmark system was abandoned (Bath, 2011). BHP and Vale agreed to deals to settle prices quarterly based on the spot market price. The initial quarterly price was around US$114.51/t, almost double the 2008 benchmark price of US$60.80/t, due to China's surging steel demand following the government's US$586 billion stimulus to avoid stagnation in the wake of the GFC (McKissack and Xu, 2011).

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[13] Under the spot market system there are no pricing negotiations and a Cost and Freight[13] (CFR) to Qingdao is reported daily from actual trades by independent indices, such as *Platts* and the *Metal Bulletin*, for 62 per cent and 58 per cent ferric content fines and 65 per cent pellets (The Steel Index, 2010).

CISA attempted to enforce a further boycott of Australian and Brazilian iron ore to protest the move to the spot market pricing system. The head of CISA stated, “CISA calls on the steel enterprises and iron ore traders not to buy iron ore from … BHP, Rio Tinto and Vale, for the coming two months.” But within four weeks Baosteel—a centrally-owned SOE—had signed up to the spot pricing system (Uren, 2012).

4. The impact of switching price mechanisms on the distribution of bilateral quasi-rents

The increasing hostility between major trading partners during the 2008 and 2009 price negotiations precipitated the collapse of the benchmark system. The collapse of the benchmark pricing system and adoption of a spot market pricing mechanism was the biggest change to the iron ore pricing institution since the benchmark system replaced fixed pricing in 1974.

The switch to the spot market system was particularly important for two reasons: first, it showed that the market could respond effectively to strategic interventions to protect the long-run relationships, which underpinned it; and second, the new spot system was settled on a CFR basis, which changed the distribution of bilateral quasi-rents between Australian iron ore exporters and Asian market importers.

Independently formulated price indices provide a price based on actual transaction data—usually averaged over the previous quarter—to update contract prices; the independence of the index mechanism and the absence of annual price negotiations reduce the opportunities for short run price interventions.

Unlike the Asian benchmark mechanism, which included a freight sharing mechanism between Australian and Asian traders, the spot market price is settled on a ‘cost and freight’ (CFR) basis where the exporter is wholly responsible for the freight obligation. The CFR basis of the spot price means that all the bilateral quasi-rents from Australia’s relatively low freight costs to the Asia market, which were previously shared, then accrued exclusively to Australian exporters. The spot market pricing mechanism was opposed by CISA Secretary-General Shan on the basis that, “this kind of pricing model will transfer all the risk to the demand-side, the profit to the supply-side” (Zhang, 2008).

The extent of bilateral quasi-rents and their distribution between Australian and Chinese iron ore traders can be estimated using the constrained bilateral monopoly model. The transport cost differential accruing to Australian exporters (TCD_t^A) under the CFR spot price is equal to the world CFR price (p_t^{CFR}) minus the world CFR price less the cost of freight from Australia to Asia (F_t^{AC}) (Equation 13).

$$TCD_t^A = p_t^{CFR} - (p_t^{CFR} - F_t^{AC}) \tag{13}$$

The total value of the transport cost differential for Australian contract exporters ($VTCD_t^A$) is equal to the transport cost differential multiplied by the quantity traded between Australia and countries in Asia (Q_t^{AC}) (Equation 14).

$$VTCD_t^A = (TCD_t^A)Q_t^{AC} \tag{14}$$

Equation 15 shows how to calculate the change in the share of bilateral quasi-rents (ΔBQR_t^A) accruing to Australian exporters under the CFR mechanism, as compared to the freight sharing component in the benchmark FOB system. The quasi-rents accruing to Australian exporters under the CFR mechanism equals one because all bilateral quasi-profits accrue to Australian exporters. To calculate the change from the FOB system, we deduct the share of bilateral quasi-rents accruing to Australian exporters under the benchmark FOB system (BQR_{t-1}^A) (Equation 15).

$$\Delta BQR_t^A = 1 - BQR_{t-1}^A \tag{15}$$

The total value of the change in Australian exporters' share of bilateral quasi-rents ($V\Delta BQR_t^A$) equals the change in Australian exporters' share of bilateral quasi-rents multiplied by the quantity of iron ore traded between Australia and countries in Asia (Q_t^{AC}), the value of the change for the Asian country importers' is equal to the negative value of Australia's gain ($-V\Delta BQR_t^C$) (Equation 16).

$$V\Delta BQR_t^A = (\Delta BQR_t^A)Q_t^{AC} = -V\Delta BQR_t^C \tag{16}$$

Figure 3 below shows how the bilateral quasi-rents accrued to Australian iron ore exporters to China over 2010 and 2011 under the spot pricing mechanism (shaded in light grey) as compared to the 2008 freight sharing mechanism (shaded in black). The results show that since the switch from the freight sharing benchmark mechanism to the spot market mechanism Australian exporters have received around US$6.1 billion in additional bilateral quasi-rents over the estimation period compared to what they would have received under the 2008 freight sharing agreement—on average around US$290.7 million per month over the first 21 months of the new pricing system. The division of bilateral quasi-rents is a zero-sum scenario, meaning Australia's US$290.7 million average gain per month meant that China's iron ore importers from Australia lost US$290.7 million per month. For context, during the 2010 to 2011 period China's steel industry made an average profit of US$1.1 billion per month.

<FIGURE 3 ABOUT HERE>

5. Conclusion

The faster adjustment in the steel market and the low substitutability of iron ore in the steel making process placed downward pressure on the profitability of China's steel industry. China's steel industry is considered a strategic 'pillar industry' by the state and the negative impact of the iron ore price rises, and the perception by the Chinese state that benchmark price outcomes were not 'fair', signalled to Chinese authorities that state intervention was required.

But China's state intervention did not occur until after the 2008 benchmark negotiations. During the 2008 negotiations Rio Tinto exploited loopholes in the informal benchmark system to demand a larger increase than Vale had achieved, and stated that it would redirect contracted supply to the higher priced spot market. The 2008 benchmark price outcomes led the Chinese state to appoint CISA chief negotiator in an attempt to exploit the dependence of the supply side on Chinese market access.

The benchmark system was abandoned as the negotiations posed an increasing threat to the long-run relationships, which underpinned the Asian market. This is an important outcome and showed that the iron ore market was capable of adjusting to short-run interventions to maintain competitive market outcomes and long-run market access relationships. On the impact of China on the global iron ore market, Economy and Levi (2014) note,

> The broader story of iron ore carries an important lesson; the emergence of China has changed the system radically—but not the way Chinese policy makers or industry wanted … Large Chinese steel makers aided by the government in attempting to negotiate collectively, hoped to use the old structure of price negotiations to exercise market power and get lower prices. But a combination of two other Chinese-driven factors—the emergence of large numbers of smaller producers, and a volatile price environment that complicated negotiations—ultimately helped push the system in precisely the opposite direction.

The transition to a spot price mechanism was also important as it changed the way freight was dealt with and how bilateral quasi-rents were distributed between Australian exporters and Asian importers. The Asian freight sharing component present in the benchmark system provided Chinese importers with 80 per cent of the transport cost differential from trading with relatively proximate Australian exporters' in 2008; under the CFR-based spot market pricing system the transport cost differential accrued exclusively to Australian exporters. The move to the new price mechanism shifted around US$290.7 million per month in transport cost differential rents from Chinese importers to Australia over 2010 to 2011, which equates to around 26.4 per cent of China's steel industry profits per month during the same period.

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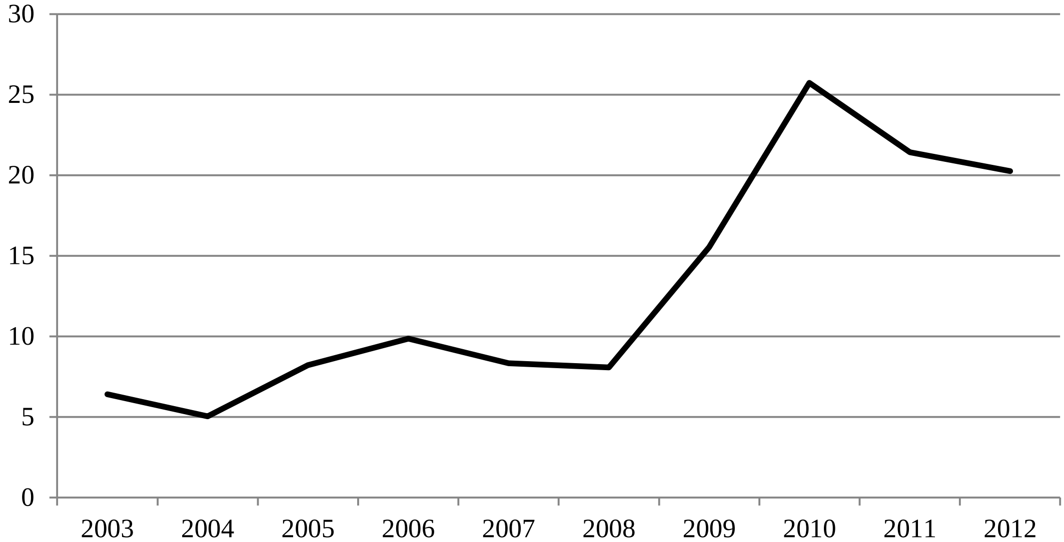
FIGURE 1

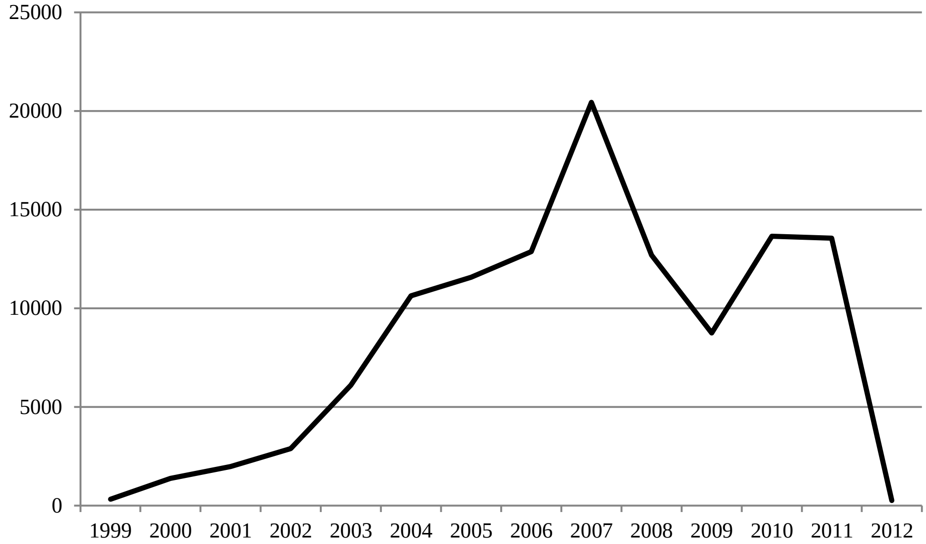
THE IRON ORE PRICE AS A PERCENTAGE OF CHINA'S WEIGHTED AVERAGE STEEL EXPORT PRICE, 2003–2012 (%)



Note: 1.4t of iron ore per 1t of steel product.
Source: Tex Report (2012); ComTrade.

FIGURE 2

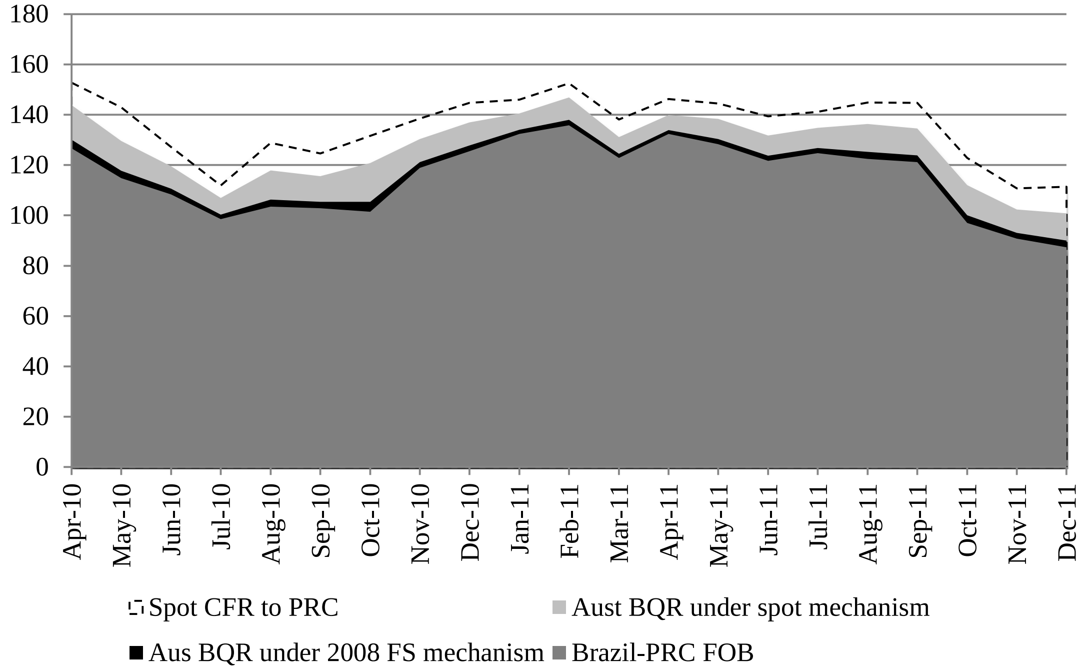
TOTAL CHINESE STEEL INDUSTRY PROFITS, 1999–2012 (US$M)



Source: China Iron & Steel Association, accessed via CEIC data.

FIGURE 3

DISTRIBUTION OF BILATERAL QUASI-RENTS UNDER SPOT VERSUS 2008 PRICING MECHANISMS, 2010–2011 (US$/T 62% FINES)



Sources: Tex Report (2012), World Bank Pink Sheet & author's calculations.