Resources Policy 33 (2008) 129–141

Contents lists available at ScienceDirect

Resources Policy

journal homepage: www.elsevier.com/locate/resourpol

Horizontal mergers in the iron ore industry—An application of PCAIDS

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ARTICLE INFO

Article history:
Received 1 December 2006
Received in revised form
15 January 2008
Accepted 18 March 2008

JEL classifications:
D40
C63
L61
L40

Keywords:
Anti-trust
Simulation
Acquisition
M&A
Rio Tinto
CVRD

ABSTRACT

The purpose of this paper is to estimate and analyse the price effects of the iron ore mergers between Rio Tinto and North Ltd in 2000, and CVRD and Caemi in 2001. The analyses are conducted using a merger simulation model that, based on the pre-merger situation, estimates the post-merger outcome. This paper applies the so-called proportionality-calibrated almost ideal demand system (PCAIDS) model, which assumes that the product is differentiated and that the strategic variable is price. The results from the merger simulations show that in the case of the merger between Rio Tinto and North Ltd, the merged firm has a combined market share of almost 20%. However, the estimated market weighted average price effect is only 2.6%. Regarding the merger between CVRD and Caemi, the merged firm's market share is about 29%, and the estimated market weighted average price effect is 4.6%. When removing Caemi's Canadian asset, which was the Commission decision in order to allow the merger, the market price effect decreases to 3.1%. Overall the results in this study support the Commission's decisions regarding both merger cases, and shows that merger simulations of price effects can be valuable tools in merger assessments.

Introduction

The amount spent on mergers and acquisitions in the mining industry between 1995 and 2005 averaged at about 20 billion US dollars per year, with a peak in 2001 when 40 billion US dollars were spent on mining mergers and acquisitions. During 2006 a remarkable 140 billion US dollars were spent on mergers, even though probably a one off event, illustrating that consolidation is an important strategy for mining companies (Ericsson, 2007). The iron ore industry is a good example of a mining industry that has experienced many mergers and acquisitions during this time period, exemplified by Anglo American–Kumba Resources (2002), CVRD–Ferteco (2001), BHP–Billiton (2001), CVRD–Caemi (2001), Rio Tinto–North Ltd (2000) and North Ltd–Iron Ore Co of Canada (1997). All of these mergers have increased the concentration in the iron ore market. What is the effect of the increased consolidation? The steel industry voiced a concern of iron ore producers becoming too powerful in the yearly price negotiations already in 2000, when the proposed merger between Rio Tinto and North Ltd was discussed (Ericsson, 2002). Evidence also shows that the price negotiations that followed the period of large-scale mergers in the iron ore industry did become lengthier (Ericsson, 2003).[1] However, the question remains, has the consolidation trend had a significant effect on the prices of iron ore?

The purpose of this paper is to estimate and analyse the price effects of the mergers between Rio Tinto and North Ltd in 2000, and CVRD and Caemi in 2001. These are interesting case studies given that the mergers united two of the top five producers of iron ore in both cases, and thus increased the market concentration significantly. The analyses will be conducted using a merger simulation model that, based on the pre-merger situation, estimates the post-merger outcome. Generally, merger simulation models estimate the price effect mergers have by combining estimates of elasticities of demand with an economic model of firm behaviour.

[1] In 2002 the first iron ore price was settled on May 29, and in 2003 the first price was settled on May 15. This should be compared to a long tradition of settling prices between February and March. However, the long-lasting price negotiations during the early 2000, also reflect the conflict between strong demand (especially stemming from the exceptional growth in China) and weak economic performance in the steel-making industry, an industry that lags behind the consolidation trend in the iron ore industry (Ericsson, 2003).

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doi:10.1016/j.resourpol.2008.03.003

The use of empirical economic methods to analyse the price effects from mergers has increased during the last decade. The literature in this area has been extensive, for a comprehensive review see Baker and Rubinfeld (1999). The development of empirical methods used in merger analysis has been paralleled with an increased reliance on unilateral effects analyses by most competition authorities. Unilateral effects analysis aims at determining if firms in an industry have market power and how a merger will affect that situation, assuming that the firms act in an uncoordinated way. In a differentiated product market it is difficult for firms to collude tacitly, which is why uncoordinated decision-making seems more likely.[2] Unilateral effects refer to the possibility of the new merged firm to raise prices unilaterally, i.e., raise the price of its products above the pre-merger level. This is especially important when the merging firms' products are relatively close substitutes for each other (Merger Guidelines, 1997).[3]

The iron ore industry might, at a first glance, be best described as a Cournot market, i.e., the firm's production level is set by the mine capacities and the product (iron ore) is relatively homogenous. This situation is also what previous research on the iron ore market has focused on; Hellmer (1997) analysed the competitive strength on the iron ore market by studying the European market for iron ore. He tests the hypothesis that all participants in the market are engaged in a Cournot game (determining output), against an alternative hypothesis that at least one of them, Brazil, is acting as a Stackelberg leader. The results verify that Brazil acts as a leader in the European market. Chang (1994) performed a similar analysis for the Japanese market, and Privovolos (1987) developed an iron ore model using theories of bilateral oligopoly. He applied a two-stage game in order to determine the price formation of iron ore at the contractual negotiations between Brazil and Europe. His main finding was that an increase in Brazilian iron ore capacity would reduce iron ore prices, and also that an increase in European Economic Community crude steel production would increase iron ore prices. These studies are however based on country-level data and not on mine-level data, which increases the market resolution and makes it possible to obtain and analyse the results in greater detail.

However, arguments supporting the notion that the world iron ore market can be described using Bertrand instead of Cournot assumptions have been raised lately. The main argument is that the product is differentiated, and at the time of the mergers (1999–2001) the iron ore industry was characterised by excess capacity. Thus, we have to lift focus from bilateral monopoly and Cournot models and apply a merger model that best can describe the changed situation on the iron ore market assuming Bertrand pricing behaviour, both pre- and post-merger. This implies that firms on the iron ore market set the price of its varieties (in our case iron ore from a specific mine) in order to maximise its profit. Equilibrium is reached when no firm in the market can increase its profit by unilaterally changing the prices of its different varieties (Tirole, 1988). Other core assumptions of the merger simulation applied include: (1) the firms set prices non-cooperatively in a static game; (2) marginal costs are often assumed constant with respect to the production level; (3) the merger does not lead to any other structural changes, such as entry and new product introductions. In merger simulations, it is also important to choose an appropriate demand structure. Different merger simulation models differ regarding which demand model they apply.[4] This study applies a version of the almost ideal demand system (AIDS), which is modified to reflect a proportional distribution of mine-specific demand elasticities to their respective market share. The proportionality-calibrated almost ideal demand system (PCAIDS) was first introduced by Epstein and Rubinfeld (2001, 2004a) and later applied in a number of studies (e.g., Coloma, 2004; Dalkir and Kalkan, 2003).[5]

The paper proceeds with a description of the iron ore industry and a presentation of the mergers between Rio Tinto and North Ltd, and CVRD and Caemi. The section "The iron ore market and market shares" focuses on the market shares and development of the iron ore market. The section "A nested almost ideal demand system with proportionality calibration" outlines the merger simulation model, and finally the results and conclusions are presented.

Background to the industry and the case studies

This section briefly presents the iron ore industry at the time for the mergers, proceeding with the details for each case. The product, iron ore, is mined in two forms, lump ore and fine ore (the rate of lump and fine is set by the composition of the iron ore deposit) but is sold in three forms: lump, fine, and pellets. Pellets are fine ore that have been processed by pelletising or sintering. The reason for this is that in the steel-making process only lump ore can be used as a direct input; fine ore needs to be converted to pellets (European Commission, 2001). Demand for iron ore comes almost exclusively from the steel industry. The prices are negotiated yearly between major iron ore and steel producers in the dominating regions, Europe/Brazil and Japan/Australia. The negotiation process involves a number of meetings and it often takes several months to finish. The role of this process is to set reference/benchmark prices for the different ore types in each consumer region, which then smaller producers use as a guide in their pricing behaviour.[6] The contracts between the iron ore and the steel producer are often between 3 and 5 years, subject to the yearly revised prices (European Commission, 2001). The main reason behind the price negotiation is the noticeable short run instability of iron ore production and prices, mainly caused by a relatively high income elasticity of demand. The use of long-term contracts is a way of stabilising the market and thus decreasing the uncertainties involved for both producers and consumers (Rogers and Robertson, 1987).

The reference price can be seen as a market price since the price negotiators consider the whole iron ore market, i.e., perceived state of demand and supply for iron ore, the financial situation of ore producers and steel mills, as well as the long-term needs of both industries. Moreover, the negotiations can be considered transparent since the expectations of the perceived state of the industry and possible price movements are widely

[2] Note that the predicted price increases only reflect unilateral effects of the merger, and thus do not include possible coordinated effects. The price increases could therefore be treated as lower bounds.

[3] The rationale is that the price increase resulting from the merger can be profitable for the new firm if a large enough group of buyers are directed to the firms for other products. Previously such a price increase might not have been profitable given that the lost sales would have been directed to competitors (Merger Guidelines, 1997).

[4] The static assumption is, according to previous studies, reasonable (see Nevo, 2000; Pinske and Slade, 2004). Regarding the marginal cost assumption, this fits relatively well for the iron ore industry (see Torries, 1988). The third assumption, merger simulations can be seen as static since they do not include structural changes after the merger. However, regarding iron ore, such structural changes are few and far between (see next section).

[5] Appendix B provides a simplified introduction to an AIDS model, which the further simplified PCAIDS model is built upon.

[6] The benchmark price is normally settled for fines first, mainly because of the lower prices and higher quantities concerned. After this price is settled, the prices for lumps and pellets are negotiated (European Commission, 2001).