Chinese Mining Activity in Latin America: A Review of Recent Findings

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INTER-AMERICAN DIALOGUE

Summary Findings

Over the past decade, China has rapidly emerged as the world's leading consumer and importer of minerals. Minerals are used in a growing number of applications, from simple steel tubes in China's sprawling infrastructure projects, to wires and magnets in high-technology gadgets destined for export. Under the aegis of China's official "Going-Out" strategy, China's global mining activity has also surged. Conservative data from China's Ministry of Commerce (MOFCOM) indicates that mining accounted for a fifth of China's non-financial outbound investment from 2003–2012 (see Figure 1). Estimates based on individual deals are far higher (see Appendix Table 1). Investment is also impressive in terms of the number and scope of projects; already in 2008, Chinese miners were active in over 60 countries across the world, mining both ferrous and non-ferrous metals. Modes of entry have become more complex, spanning geological prospecting in poor countries and takeovers of large foreign mining companies in Australia. Equally impressive is the diversity of actors making these investments, comprising small private and large state-owned enterprises; mining and multi-industry companies; and a host of financial institutions.

A comprehensive review of China's global mining activity is necessarily complex and multi-disciplinary. Mining is after all an *activity*, not an economic sector per se, like oil and gas. Although iron ore accounts for the bulk of China's metals imports in both value and volume terms, a diverse set of non-ferrous metals, each with unique dynamics, also figures into the equation. At the macro-level, mining has to do with why and how China acquires natural resources—an issue that pertains to energy and agriculture as well. Mineral extraction can raise broader questions about China's industrial policy, resource use, engagement in foreign trade, investment, and capital markets, and not least, its relations with resource-rich economies.

This review draws selectively from the literature to explore a sub-set of issues relevant to policymakers. Section 1 organizes the scholarship into general, country-level, and industry-level studies. In addition to English-language scholarship, it also considers publications in Chinese, Spanish, and Portuguese. Section 2 explores central themes in more detail. Section 3, drawing on media reports and statistical databases, provides an overview of current industry trends and suggests opportunities for further research.[1]

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[1] Media articles are referenced in footnotes.

FOREWORD

The Inter-American Dialogue is pleased to publish this report by Iacob Koch-Weser, analyst of economic and trade policy for the US-China Economic and Security Review Commission and former researcher at Wharton and Harvard business schools. A product of the Dialogue's China and Latin America program, this report is a first-ever, comprehensive overview of recent findings on Chinese mining activity in Latin America.

Koch-Weser offers an extensive review of the English, Chinese, Spanish, and Portuguese literature on Chinese overseas mining activity, highlighting a sub-set of issues especially relevant to policymakers. These include China's effect on global commodity markets, the country's outbound investment policies, and the much-debated impact of Chinese demand on resource-rich economies. Drawing on media reports and statistical databases, Koch-Weser also analyzes current industry trends, including developments in China's metals trade, overseas mining activity, and Beijing's take on environmental regulation. The report concludes with timely suggestions for further research on Chinese mining in the Americas.

The Dialogue's aim in publishing this report, in addition to our China and Latin America working papers, is to inform and engage policy makers, civil society representatives, and academics from China, Latin America, and the United States on evolving themes in China-Latin America relations. We seek to determine areas of interest, identify shared priorities, and determine means by which emerging relationships can be made most productive for all countries involved.

Our China and Latin America Working Group, of which Koch-Weser is a member, has been a centerpiece of the Dialogue's China-related programmatic efforts since it was launched in 2011. The group is made up of approximately thirty select policy makers, analysts, and scholars from Latin America, China, the United States, Europe, and Australia. Group meetings generate diverse interpretations of the issues driving China-Latin America relations to highlight opportunities for cooperation and address emerging challenges.

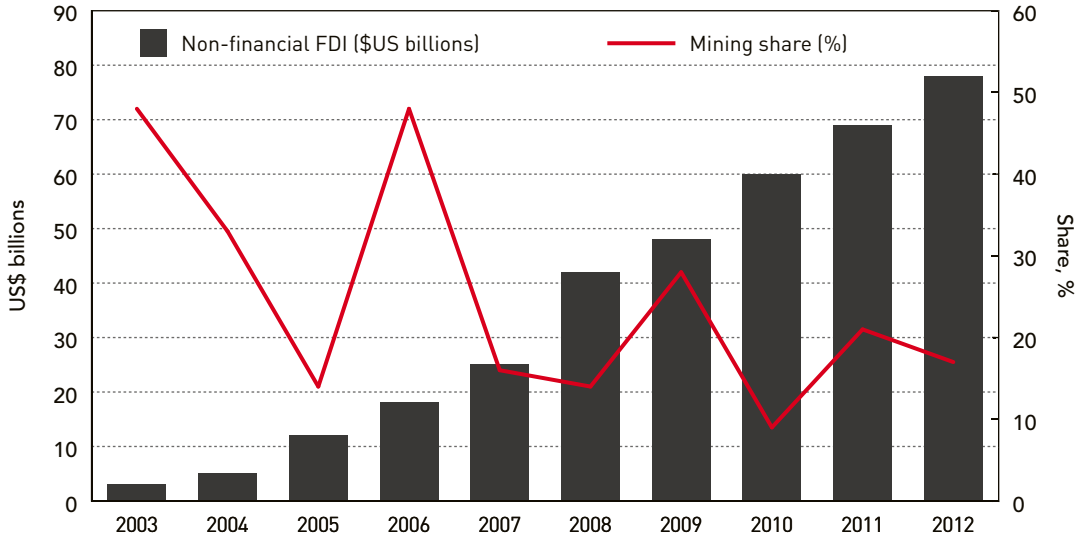
Previous China program papers and reports have dealt with a wide variety of topics including Chinese state-to-state financing in Latin America, China's free trade agreements in the region, energy-based engagement and cooperation, and the US-China-Latin America "triangular" dynamic.

We are pleased to recognize the Open Society Foundations and the Henry Luce Foundation for their ongoing support of the Dialogue's work on China and Latin America.

Margaret Myers
Director, China and Latin America Program

Michael Shifter
President

Figure 1. Mining in China's Non-Financial Outbound Investment, (2003–2012)



Source: China Ministry of Commerce, via CEIC data.

Overview of the Literature

- *English-language.* The English-language scholarship on China's global mining activity can be divided into three types: general reviews of China's industrial policy, global mining acquisitions, and impact on commodity markets; country- and region-specific studies of China's impact on resource-rich economies, ranging from fieldwork at mining sites to discussions of China's macro-economic impact; and industry-level studies of mining and metals. Government and industry reports supplement this research.
- *Scholarship in Latin America.* Scholarship on Chinese mining activity is growing and spans journals across Latin America, foremost Brazil. Of note is theoretical work on "dependency" theory, and related quantitative studies examining the region's commodity boom and its declining manufacturing competitiveness vis-à-vis China. Lacking from the Spanish and Portuguese literature is case study analysis based on fieldwork.
- *Scholarship in China.* China has a legion of mining experts at state-run institutes, often affiliated with the Ministry of Land and Resources. They publish short, normative pieces that focus on a specific sub-sector or issue. Rather than reflect on theoretical scholarship, their work provides insight into China's policy making.

Central Themes and Topics

- *China's impact on global commodity markets.* Underlying China's mining activity are three factors: (1) demand; (2) efficiency; and (3) global supply capabilities. Questions of demand and efficiency revolve around China's ability to tackle excess capacity in the short run, rebalance the economy in the medium term, and deal with structural constraints on metals intensity in the long run. It is also important to acknowledge variation across China and among metals types. On the supply side, there is general agreement that China will diversify the minerals supply (e.g., fringe production, commodity markets). Yet, more so than for oil, there is also the potential for China to "lock up" supply by monopolizing production of certain minerals (e.g., rare earth elements) or by using its position as a dominant buyer, with strong state influence over corporations, to manipulate resource supplies and prices.
- *China's outbound investment strategies.* China's outbound investment in minerals has given rise to debates about the degree of state influence over Chinese miners in terms of driving and patterning investment. Several scholars point to the relative autonomy of individual companies. Moreover, debates over investment patterns—regarding "whether to invest, and if so, who, what, where,

and how"—elicit interesting discussions among Chinese scholars. Frequent themes include how to reduce regulatory hurdles, improve corporate practice, hedge risks, and help China increase its bargaining leverage in the global market.

- *Developmental impacts.* At the macro-level, theoretical arguments about China's impact on resource-rich economies mark a return to older theoretical paradigms of "dependency" and "resource curse," albeit with novel modifications that take into account China's own developing country status and the complexity of the global economy. Quantitative studies—increasingly by Latin American scholars—point to the potential for a "resource curse," but China's impact varies by indicator and method used. Fieldwork done on mines in Peru, Zambia, and elsewhere identifies variation in Chinese mining practices across countries, among companies, and over time. China lags the West in governance practices, yet the extent and causes are debatable.

Suggestions for Future Research

- *Studying trends in China's trade and investment policies.* China's mining activities have accumulated large losses and done little to improve resource security. Chinese policymakers and corporations appear to be reconsidering whether outbound investment is the best strategy going forward. While some firms pull back, others forge ahead. Recent innovations in trade policy suggest that the government is seeking alternatives to managing resource security that do not entail ownership of foreign mines. At the same time, China could alter its outbound investment strategy, starting with a focus on non-ferrous and rare metals that have greater long-run potential than iron ore. New patterns in actors and entry modes also raise compelling questions about how China might reshape global mining activity and commodity markets.
- *Improving empirical research on China's mining activity.* Important fieldwork has been carried out in Peru, Zambia, and Papua New Guinea. But there is room to expand the research to include a representative sample of countries, sub-sectors, and companies.
- *Mining and metals in China's rebalancing.* Mining and metals play a central role in China's rebalancing from a resource-driven, industrial economy to a more sustainable, service-driven economy. Industry restructuring, the financial sector, and environmental regulation are three core elements of rebalancing that also impact the metals industry. At present, the government appears to favor gradual reforms that do not cause too much pain, such as upgrading of steel production, novel financing vehicles, and relocation of polluting industries to inland regions.

Overview of the Literature

English-Language Scholarship

General Studies on China's Resource Acquisitions

A first category of research looks at China's global resource acquisitions. An underlying question in these writings is whether China will "lock up" global resources or diversify supply. Economy & Levi (2014) cover many of the key debates on China's global mining activity, from internal supply-demand dynamics to governance practices at mining sites, effectively aggregating a bevy of academic studies. Their work follows in the footsteps of Moyo (2012), who takes a similar "tour-de-force" approach to describing China's resource acquisitions. Ferchen (2011) and Ferchen & Herrero (2011) consider the relationship between China's heavy industry boom and commodity imports, and what might happen to commodity exporters if China's demand slows. Moran (2010) draws from 16 cases of large Chinese resource acquisitions across the world to inquire whether China is diversifying or "locking up" global resources.

In the category of general studies are also discussions of mining in the context of China's broader economic and trade policy. Shambaugh (2013) refers to mining in the context of China's "Going-Out" outbound investment strategy. Abrami & Zheng (2011) compare and contrast trade policy in China's iron and steel and oil and gas sectors. Haberly (2011) and Koch-Weser & Haacke (2013) analyze resource acquisitions by China's sovereign wealth fund, China Investment Corporation (CIC). With regard to industrial policy, works of particular interest address China's efforts to shed excess industrial capacity and improve energy efficiency. These include the European Union Chamber of Commerce in China (2010), Heilmann & Melton (2013), and Wang (2013). Also worth noting are U.S. government sources. The Congressional Research Service (e.g., Humphries 2012) and the U.S.-China Economic and Security Review Commission (USCC) examine China's mining and metals

industries in research reports. Congressional hearings are also useful. Menzie (2012) and Green (2012) testified before the USCC on China's mining activity and rare earths policy, and McGroarty (2013) discussed U.S. critical materials before the U.S. House of Representatives Committee on Natural Resources Sub-Committee on Energy and Mineral Resources.

Country-Level Qualitative Studies

A common way to study China's global mining activity is to conduct fieldwork in the countries and regions where it takes place. Authors ask whether China's mining investments promote local development, and how Chinese companies interact with local workers, companies, civil society groups, and political elites. Popular sites for fieldwork are Zambia's copper mines (Carmody & Taylor 2010, Haglund 2009, Gadzala 2010, and Sautman & Yan 2013), Peru's copper and iron mines (Moran, Kotschwar & Muir 2012, González-Vicente 2011, 2012, 2013, Sanborn & Torres 2009, Irwin & Gallagher 2012), and Papua New Guinea's Ramu nickel project (Brant 2013 and Smith 2013).

These localized studies are embedded in a broader literature. On one hand, scholars are assessing the impact of globalization on local communities. National governments in resource-rich economies are seeking investment from foreign mining companies. Mining companies integrating their operations into networks of global production are marginalizing local communities.[2] On the other hand, country-level studies of mining contribute to the regional studies literature on China's engagement with Africa and Latin America. Interest in China's activities in Africa peaked in the 2007–2009 period, with books edited or authored by Broadman (2007), Rotberg (2008), Alden et al. (2008), Guerrero & Manji (2008), and Brautigam (2009). Influential work on China in Latin America includes Roett & Paz (2008), Ellis (2009, 2012, 2013), Hearn, Peters & Shaikey (2013), and the March 2012 special edition of the *China Quarterly*. Salient topics in this literature are China's state-centered resource diplomacy (typified by Angola, see Corkin 2008 and Campos & Vines 2008) and the intersection between economic and security interests (e.g., Ellis 2009).

China is also investing in wealthier countries' resource sectors, inspiring a separate strand of literature. Hearn (2013) offers comparative insights on China's mining investments in Latin America and Australia. Wilson (2011) and Nottage (2013) consider Australia's increased restrictions on foreign investment in the mining sector, which were developed partly in response to aggressive bids by Chinese companies. Manicom & O'Neil (2010) assess how Australia's economic interdependence with China weakens its political alliance with the United States.

Salient topics in the qualitative literature include China's state-centered resource diplomacy and the intersection between economic and security interests.

Quantitative Studies

Quantitative studies of China's economic impact on resource-rich countries are also numerous. With some exceptions, such as the work of Dungey, Fry-McKibbin & Linehan (2014) on Australia, this literature focuses on Latin America, where China's resource demand has had a tangible effect on reducing manufacturing activity and increasing resources exports. Formative work includes Blázquez-Lidoy, Rodríguez & Santiso (2006), Jenkins, Peters & Moreira (2008), and Gallagher & Porcezanski (2010). Scholars in Latin America also participate in this debate (see Spanish and Portuguese scholarship in the following paragraphs).

[2] The theoretical work of Bridge (2004, 2008) has been formative, along with a number of country-specific studies, such as Bebbington et al. (2008) on the Andes; Emel, Huber, & Makene (2008) on Tanzania; Hilson & Maconachie (2009) on Sub-Saharan Africa; Spiegel (2012) on Indonesia; and Negi (2013) on Zambia.

Industry-Specific Studies

A final area of English-language scholarship deals with the industries in China that depend on mining. Movshuk (2005) and a multi-author volume edited by Song & Liu (2012) analyze the restructuring of the steel industry as part of China's economic transition from plan to market. He et al. (2013) and Sheng & Song (2013) examine energy efficiency and productivity gains at steel mills. Complementing these writings on steel is analysis of coal, a mineral in its own right that supplies metal processors and dominates the country's energy mix (Ma & He 2008, Wright 2012, and Betz 2013).

A unique group of industry-level studies pertains to rare earth elements. In contrast to most minerals, China virtually monopolizes world output of rare earths, which are used in an increasing number of high-technology products. China in recent years has taken measures to curb rare earths exports and to corner the market overseas. Moran (2010), Brennan et al. (2012), Gillispie & Pfeiffer (2012), Basso (2013), and Humphries (2013) think through the implications of these actions. As noted above, Green (2012) and McGroarty (2013) also provided testimony on rare earths to the U.S. Congress.

Scholarship in Latin America

China's deepening presence in Latin America has led to an increase in China-related scholarship in the region. In terms of mining, the majority of the relevant work focuses on trade statistics, thereby contributing to the debate on the resources-for-manufactures pattern of trade. Mauricio Mesquita Moreira, of the Inter-American Development Bank, was among the first economists to explore China's impact on Latin America's resource sector, combining theoretical discussions with cursory statistical analysis (see Moreira 2005). Since then, scholars have taken a closer look at the numbers, with methods ranging from descriptive statistics on the composition of trade (e.g., Cacciamali, Bobik & Celli Jr. 2012, Bekerman, Dulcich & Moncaut 2014) to econometric studies on indicators such as revealed comparative advantage, co-movements in output and prices, and the effect of China on Latin American exports to third markets (e.g. Jaramillo, Lehmann & Moreno 2009, Montenegro, Pereira & Soloaga 2011, and Cunha et al. 2011). Several of these works also address China's economic development and industrial policy.

A nexus of scholars in Beijing—spanning academia, government, and industry—jointly examines China's overseas mining activity. Experts from state-owned mining companies often weigh in as well.

Scholarship in China

China's top scholars nowadays increasingly work at Western research institutions or contribute to English-language publications. Nonetheless, valuable articles in Chinese journals can go unnoticed. The work on global mining activity is impressive in breadth and scope—a quick glance at China's long list of mining journals is illustrative (see Table 1). The journals are generally affiliated with state-run research institutions that focus specifically on mining and minerals.

A nexus of scholars in Beijing—spanning academia, government, and industry—jointly examines China's overseas mining activity. Many of these scholars are housed in the China University of Geosciences (CUGS) in Beijing (publisher of *China Mining Magazine)* and foster close ties with the Ministry of Land and Resources (MLR). For example, an April 2006 article in *China Mining Magazine*, on China's mining enterprises "going out," was co-authored by CUGS and MLR scholars. Experts from state-owned mining companies often weigh in as well; a July 2010 piece, making the case for outbound investment in the copper industry, was

Table 1: Overview of Chinese Language Journals on Mining Activity

Name		Affiliation
English	Chinese	
China Mining Magazine	中国矿业	China Mining Federation
World Nonferrous Metals	世界有色金属	China Non-Ferrous Metals Association
Mineral Exploration	矿产勘查	China Nonferrous Metals Industry Association
Natural Resource Economics of China	中国国土资源经济	Ministry of Land and Resources (oversight); Chinese Society on the Economics of Geology & Mineral Resources, China Institute for Land and Resource Economics (publisher)
China Metals Report	中国金属通报	China Nonferrous Metals Technology Institute
Journal of Geology and Mineral Resources	地质找矿论丛	Tianjin Geology Institute
China Coal	中国煤炭	Institute for Coal Information
Mining R&D	矿业研究与开发	China Nonferrous Metals Institute, Changsha Mining Institute
Geology Studies	地质学刊	China Geology Institute, Jiangsu Geological Prospecting Institute, Jiangsu Geology Institute
Resources and Industries	资源与产业	Ministry of Education (oversight), China University of Geosciences
Resources Science	资源科学	Chinese Academy of Social Sciences (Department of Geography and Resources)
Land and Resources Information	国土资源情报	Ministry of Land and Resources (Department of Information)
China Nonferrous Metals	中国有色金属	Private magazine based at Tsinghua University

Sources: CNKI, Baidu.

jointly written by researchers at CUGS and Jinchuan Group, one of China's largest copper companies.[3]

Few scholars consistently appear in Chinese mining publications. One exception is Chen Jiabin (陈甲斌), a senior researcher at the China Institute for Land Resource Economics. He has looked at different metals industries, including bauxite, iron ore, lead and zinc, and precious metals, to suggest ways for China to overcome its mineral shortage. Unlike many of his colleagues, who promote overseas mining exploration as an inevitable step toward achieving resource security, Chen has studied alternative strategies, such as creating a strategic mineral reserve and adjusting export and import tariffs.

Chinese articles on global mining activity tend to be short and to the point. The emphasis is on informing government officials and corporate actors rather than responding to an academic discourse. Some articles look at market trends in individual sub-sectors, while others analyze the investment environment in foreign countries.

[3] There is a long list of resource-focused research institutes that inform China's policy discourse. The most influential may be the China Institute for Land Resource Economics [Zhongguo Guotu Ziyuan Jingji Yuanjiu Yuan], which is housed within the Ministry of Land and Resources. The Beijing Institute of Geology for Mineral Resources (BIGM) [Beijing Kuangchan Dizhi Yanjiusuo] specializes in studies of non-ferrous metals, such as aluminum and copper, and publishes its own in-house journal, *World Nonferrous Metals* [Shijie Youse Jinshu]. Originally the in-house research unit of state-owned China Non-Ferrous Metals Group, BIGM now falls under the China Non-Ferrous Metals Association. The China Steel Development Research Institute (CSDRI), attached to the China Iron and Steel Association, collaborated with scholars from Australian National University to author the English-language book *The Chinese Steel Industry's Transformation: Structural Change, Performance, and Demand on Resources* (2011).

Central Themes and Topics

China's Impact on Global Metals Markets

Is China exerting a transformative impact on the world metals market? This question is a useful way to begin analyzing China's global mining activity. It is prompted by the scale and rate of China's urbanization and industrialization, its heavy reliance on minerals imports, and the pervasive role of non-market forces in shaping the country's supply and demand. During the global financial crisis, China sustained its commodity demand with the aid of a massive stimulus program, much of which went toward financing resource-intensive infrastructure projects. Economy & Levi (2014) argue that China's effect on the world metals market will depend on three factors: (1) the composition of China's economic growth, (2) the efficiency of its resource use, and (3) the ability and willingness of global suppliers to raise resource production in response to China's demand. Working within this framework, this section examines supply and demand debates.

If China fails to rebalance, one of two things can happen: either the high price trends of the past decade will recur or the economy will falter, gutting demand across the board.

Economic Growth and Metals Demand

Over the past decade, China's economy has been characterized by high rates of investment and exports, and low rates of consumption. According to Economy & Levi (2014), that pattern has contributed to inordinate increases in mineral consumption and metals output. These authors see two scenarios for China's future metals demand. If rebalancing toward consumption and services sets in, China's minerals intensity will be reduced (the effect on energy consumption is more ambiguous, since it could shift to households). If China fails to rebalance, one of two things can happen: either the high price trends of the past decade will recur—confirming the commodity "super-cycle"—or the economy will falter, gutting demand across the board. So far, no decisive rebalancing has occurred, despite numerous pronouncements to this effect, beginning with the 11th Five-Year Plan (2006-2010). An intermediate outcome is that China will rebalance very gradually, orchestrating a "soft landing" that will cause demand for major mining commodities to wane after 2015.

Focusing on the steel industry, the authors in Song & Liu (2012) look at China's metals demand in more detail. A common metric applied is the intensity of use (IU) of steel and base metal, which is defined either as tons of steel per capita, or volume of metal consumed per unit of output. As McKay (2012) notes, the prevalent theory for IU is the inverted U-shaped "Kuznets curve for steel," by which metal intensity is low when countries are poor; rises as they industrialize; and then falls again as the consumption basket shifts to services, urbanization peaks, and demand for metal-intensive durables is saturated. According to McKay, China does not neatly correspond to this theory. Its metal intensity was unusually high at low levels of income, due to the industry imperative of the Maoist command economy. China's metals demand is comparable to other countries in some cases, but not in others. China, like the United States, is a continental economy with further potential for infrastructure build-out. Yet like Japan, it lacks domestic oil supply and contends with dense urban spaces, which constrain car ownership and magnify environmental externalities. This general argument is substantiated by Ma, Shi & Tong (2013) of Deutsche Bank, who argue that the only way for China to combat pollution is to make car ownership costly and invest heavily in rail and transit systems.

Demand could of course increase in China's export sector. Here, McKay notes, China so far has exhibited similar patterns to Korea, which became a competitive exporter of steel products in the course of industrialization. However, China is unlikely to sustain Korea's high level of metal-intensive exports. For one, China's steel sector is much larger, accounting for half of world output; its exports cannot outpace aggregate world demand indefinitely. China's steel mills compete on scale and cost, and rely on market distortions, such as subsidized inputs and an undervalued currency, that are unsustainable. (History shows that Japan's steel exports dropped after it committed to revaluing the

yen at the 1987 Plaza Accords.) Korean steel, by contrast, is export-competitive due to technology intensity and indigenous R&D content.

In contrast, McKay, Liu & Song (2012) indicate that China's steel export-to-output ratio, now in the upper teens, is still very low compared with its neighbors (compare Taiwan 55.9 percent, South Korea 37.4 percent, Japan 31.2 percent). China, they add, is producing higher value-added content and exporting to advanced economies. The authors attribute this to a combination of efficiency gains and low labor costs. Although currency undervaluation has played a role in the competitiveness of China's steel exports, they argue that this factor should not be exaggerated because China would still enjoy labor cost advantages.

Golley, Yu & Zheng (2012) also find that metals demand can continue to rise in China, owing to different levels of metals intensity across the country. By utilizing time-series, province-level data on steel production and three factors—industrialization, urbanization, and fixed investment—they find that, at the same level of GDP per capita, the eastern regions' per capita steel demand is already much higher than in other countries in the past. As such, metals demand will peak in China's eastern regions at a higher level of per capita income than it has elsewhere, even as metals consumption in the western and central regions continues to rise in tandem with income.

China's steelmakers face limited market discipline due to subsidized inputs, low-cost loans from state-run banks, limited dividend payout requirements, and fiscal subsidies.

Resource Efficiency

Can efficiency gains lower China's metals demand? Some evidence suggests yes. Sheng & Song (2012, 2013) note that gains in labor productivity and a reduction in the iron-to-steel ratio were achieved alongside rising steel output during the market reform period. They attribute these improvements to fixed investment in scale and technology (esp. larger furnaces and the transition from open-hearth to continuous casting), and the restructuring of state-owned enterprises into leaner, more autonomous units. They also argue that the entry of smaller and private enterprises into the sector has helped intensify market-based competition.

With regard to the steel industry's environmental impact, Dai & Song (2012) note a 33 percent fall in energy intensity in 1999-2006, even as crude steel output increased more than threefold. Another landmark in China's industrial efficiency was the 11th Five-Year Plan (2006-2010), when the government took steps to curb exports of more polluting and energy-intensive products (by cancelling VAT rebates and raising tariffs). Heilmann (2013) and Wang (2013) view the 11th Five-Year Plan as a turning point in China's economic planning and its approach to evaluating the performance of local Communist Party officials. For the first time, the environment was placed on par with other performance metrics, like growth and stability. Wang sees this as proof that China's reforms progress via "rule of mandates" rather than "rule of law." The 12th Five-Year Plan, in turn, introduced measures to achieve a low-carbon economy (Fulton 2011).

Still, other literature suggests that China has made limited progress toward improving resource and energy efficiency. Ferchen (2011) points out that, "just after the turn of the millennium, China began a dramatic, unexpected, and unplanned reversion toward heavy industrial production." In the early stages of market reform, China had moved away from the Mao era "big push" model of capital-intensive, heavy industrial development towards a reliance on labor-intensive, light manufacturing. However, in the five years after 2002, heavy industrial production nearly tripled relative to the overall economy, prompting a stark reversal in the decline in energy intensity achieved in the 1980s and 1990s. This trend was clearly manifested in iron and steel production, which, as a percentage of GDP, increased from around 1.5 percent in 2002 to over 3 percent in 2005. In 2002, China's steel imports outpaced its exports by 450 percent, but by 2006, exports exceeded imports by 230 percent, as China became the world's largest producer and exporter.

In contrast to major steel producing countries like Korea and Japan, China's steel industry is bloated and fragmented. According to Movshuk (2005), value-added per worker at

China's steel mills rose rapidly in the late 1990s due to the closure of smaller mills and SOE restructuring; yet owing to their traditional function as socialist "work units," China's largest mills still employ tens of thousands more workers (if one includes corollary services) than modern mills in Japan and Korea. Steelmakers frequently act as the largest employers in their community and de facto welfare providers in place of the state, making massive layoffs exceedingly difficult. Sheng & Song (2012) note that the industry has in fact regressed: after growing more concentrated in the late 1990s, the top-8 firms' share of output declined again in 1998-2007, from 33 percent to 18 percent. He et al. (2013) argue that efficiency gains at steel plants have been achieved largely through scale efficiencies and replacement of outdated equipment, so future gains will come at a higher cost.

As illustrated by the EU Chamber of Commerce (2010), China has built up huge excess capacity. Heavy industry rose threefold as a share of China's GDP in 2003-2008. Thanks to an unprecedented increase in steel production, China became a net steel exporter in 2005, in spite of its large domestic market. Similar patterns have emerged in aluminum processing. Excess capacity has taken root not only in China's metals industries, but also in downstream sectors such as shipbuilding and wind turbines. The USCC (2013) and EU Chamber (2010) outline the web of distorted incentives that give rise to excess capacity. Steelmakers face limited market discipline, due to subsidized inputs, low-cost loans from state-run banks, limited dividend payout requirements, and fiscal subsidies. Steel mills accumulate excess savings, which they tend to invest toward increasing market share instead of raising profit margins. Mergers and acquisitions within the industry are dis-incentivized by the fact that the acquired firm no longer pays local value-added taxes. Meanwhile, as part of Beijing's "Go West" initiative to develop inland regions, the central and western parts of China have attracted an increasing share of the metals industry.

Chinese demand on world metals... does not always lead to massive price increases as typically assumed, because supply-side details matter.

The Supply Side

Are mineral suppliers willing and able to meet China's rising demand? Can China satisfy its needs without destabilizing world resource markets? If China acquires ownership over productive assets, will it "lock up" or diversify supply?

According to Economy & Levi (2014), China's real impact on global markets is more varied and beneficial than many claim. First of all, China is hardly the first power whose quest for resources has far-reaching consequences. Take, for example, Japan, which experienced resource-intensive industrialization in the 1950s and 1960s. Japan eventually held many mines "captive" through off-take agreements and direct ownership. Countries such as Australia became very dependent on Japanese resource demand. The market was self-correcting, however: Japan's industrial growth slowed in the 1980s, while prices of commodities dropped due to oversupply.

Second, the impact of Chinese demand on world metals "is as diverse as the metals themselves." It does not always lead to massive price increases as typically assumed, because supply-side details matter. The authors point to bauxite, China's third-largest metals import, as a poignant example. Bauxite prices have remained steady despite sizable demand increases. This is not because lead times for miners are faster than for copper or iron ore. Rather, before China started to demand bauxite in large quantities, global production capacity was already increasing, as the market predicted that aluminum would replace steel in products like cars. In addition, world bauxite resources are both massive and well-understood, which facilitates long-term investments.

In the case of copper and iron ore, which have witnessed stronger price increases than bauxite, Economy & Levi maintain an optimistic perspective. The copper market has resembled the flexibility and transparency of the oil market since the late 1970s. At that time, long-term supply contracts—based on producer costs—were severed, and pricing was henceforth determined on the London Metals Exchange. Some long-term contracts do persist today but

are based on exchange prices. As such, China will have a hard time disrupting this well-established market structure.

As for the iron ore market, Economy & Levi (2014) contend that China's emergence has actually helped to make global iron ore pricing more market-driven, even if this outcome is not what China's industry or policymakers originally intended. Traditionally, contracts were negotiated annually, with the world's largest iron ore producer and buyer setting a benchmark price. But a lack of consensus among China's steel producers forced the eventual phasing out of annual benchmark pricing in 2009. That has made prices more volatile for steelmakers, but also more market-driven.

Moran (2010), examining China's sixteen largest natural resource procurement arrangements through 2010, finds that China overwhelmingly contributes to diversifying rather than locking up global supply, in a pattern reminiscent of Japan in the 1970s. China does so by choosing to purchase equity in or issue loans to independent, price-taking producers instead of major, price-making ones. An example is Chinalco's winning bid in 2007 for the Aurukun Bauxite Project in Queensland, Australia, which had been abandoned by a Canadian firm. Moran even argues that Chinalco's failed effort to raise its ownership stake in Rio Tinto, the world's second-largest iron miner, was a positive effort to diversify supply, since it succeeded in preventing a merger between Rio Tinto and BHP Billiton, the world's third-largest producer.

Nonetheless, there is cause for concern about China's impact on global mineral markets. Moran (2010), Grasso (2013) and Humphries (2013) view China's approach to rare earth elements as a blatant attempt to "lock up" supply. China today accounts for some 90 percent of rare earths output, and for virtually all output of heavy rare earths. China succeeded in cornering the rare earths market in the 1990s and 2000s by encouraging domestic mining and processing, with little regard for environmental costs. China's exports of these elements flooded the world market and eventually put Western producers out of business. In the intervening years, the number of high-tech applications for rare earths has proliferated. Around 2009, China began to restrict its exports through tariffs, quotas, and bans at the border, as well as efforts to reduce domestic output by closing smaller mines and toughening environmental oversight. In parallel, China has aggressively pursued equity stakes in overseas rare earths producers, beginning with the U.S. magnet producer Magnaquench in 1996 and more recently, Lynas and Arafura in Australia. Chinese firms are also looking to invest in rare earths mining in Brazil.

Given their extensive use by Japanese manufacturers and in the U.S. defense industry, China has leveraged rare earths for geostrategic purposes and to lure foreign high-tech companies to relocate to China. According to Green (2012), the same could happen with many other metals products over which China has extensive control, such as graphite and fluorspar.[4] China is already transitioning toward a more aggressive mineral stockpiling strategy, having singled out cadmium, cobalt, copper, and manganese as priorities. McGroarty (2013) recommends that the United States better define "critical materials" and identify those minerals most in need of stockpiling and non-Chinese procurement.

China diversifies global metals supply by purchasing equity in or issuing loans to independent, price-taking producers instead of major, price-making ones.

Moyo (2012) expresses concern about future supply-demand imbalances for mainstream non-ferrous metals. In a forecast of global commodity imbalances by 2020, she posits that, while steel and aluminum are likely to be oversupplied due to China's waning demand for durables and infrastructure, other metals will be undersupplied. Copper is at the top of the list, followed by lead, zinc, and nickel. These products, she argues, are becoming more difficult to prospect and recover even as they are increasingly used in

[4] At the present time, the main application of graphite is in the steel industry, but lithium-ion batteries in hybrid and electric vehicles promise to be a major driver of future graphite demand. Approximately 73 percent of global graphite production originates in China and about 77.5 percent of global reserves of graphite are located there. Another example is fluorspar, where China accounts for approximately 50 percent of world production. The highest grade, acid-grade, is the primary feedstock for the manufacture of virtually all fluorine-bearing chemicals and is also a key ingredient in the processing of aluminum. China's Ministry of Industry and Information Technology has released an interim planning document labeling fluorite a "non-renewable precious resource" (Green 2012).

high-technology applications, in the form of plates, wires, batteries, and magnets. China is upgrading its capabilities to compete in these industries (see Table 2).

Moyo (2012) also alerts us to two other risks posed by China, at opposite extremes of the market. At one extreme is "monopsony," a future scenario in which China becomes the world's single largest buyer and hence the ultimate price-maker. China's state-owned enterprises would essentially bundle their respective commodity holdings into a single coordinated entity. Uranium is a subsector in which this scenario may already be playing out. Massot & Chen (2013) note that while China has difficulty taking control of its procurement strategy in other commodity markets, it has been able to triple its total uranium imports within just a few years and forge ahead with an ambitious civilian nuclear plan. The underlying reason, they find, is that China's domestic uranium industry is concentrated and centrally managed (under China National Uranium Corporation), whereas the international market is less coordinated.

At the other extreme is the "financialization" of commodity markets, a process that has already begun. Financial investments in commodities increased from $6 billion to $380 billion in 2000–2011. Commodities were initially an attractive buy because they were uncorrelated to other asset classes and offered steady returns to passive investors. However, as the market boomed due to rising Chinese demand, speculators poured in, raising volatility and making commodity prices susceptible to other price trends. Much of the money has gone into commodity indices that pre-buy future consumption instead of funding investments in supply expansion. In theory, when a good becomes too expensive, consumers turn to substitutes, a process known as "demand destruction." But the fact that some Chinese consumers would pay more for the same resources means a rise in commodity prices could lead non-Chinese consumers to swap out of commodities first.

China's Global Mining Strategy

State-Firm Relations

What motivates Chinese miners to venture abroad? How do they choose to invest? To what extent is the Chinese state involved?

China's outbound resource investment is commonly viewed as a state-led effort. The origins are generally traced to the "Going-Out" strategy established during the 10th Five-Year Plan (2001–2005), which encouraged Chinese firms to seek resources, technology, and markets overseas, and in the process, to develop an international profile and experience in the global economy. A corollary strategy, developed in the 1990s, is for Chinese firms to take advantage of both domestic and international resources and markets ("two markets, two resources").

Economy & Levi (2014) define China's "coordinated strategy" as: (1) a combination of policies (especially financial) put in place and sustained for over a decade; (2) a

Table 2: Future Global Mineral Imbalances (for 2020)

Commodity	Some uses	Volume (kt)			Supply-demand ratio	Curve snapshot (5 Jan. '12)
		Demand (2020F)	Supply (2020F)	Deficit/surplus (2020F)		
Copper	Wiring, piping	34,958	18,098	(16,860)	0.52	Backwardation (contango at front end)
Lead	Batteries, weights, solders, bullets	13,712	4,205	(9,507)	0.31	Contango
Zinc	Galvanization, rust prevention	17,627	11,293	(6,334)	0.64	Contango
Nickel	Magnets, rechargeable batteries	2,326	2,155	(171)	0.93	Backwardation (contango at front end)
Aluminum	Packaging, transportation	72,264	134,517	62,253	1.86	Contango

Source: Adapted from Dambisa F. Moyo, *Winner Take All: China's Race for Resources and What It Means for the World*, p.118.

willingness of government entities to help companies seek investment opportunities; and (3) a desire for corporate leaders of state-owned enterprises to pursue profits and gain promotion. A diverse set of institutions combines to guide the process, from the Ministries of Commerce and Foreign Affairs to the policy banks that extend loans and, in the case of central SOEs, a body that supervises state-owned assets. China's "tools of the trade" are well-documented: in exchange for long-term access to mineral assets, China provides foreign aid, infrastructure, and preferential loans to recipient countries.

While it would be naïve to discount the role of the state, several scholars point to the complex dynamics of state-firm interaction. Kaplinsky & Morris (2009) suggest considerable complexity in the ways that ownership and decision-making are negotiated in state-owned and private firms in China, whether between private and state-owned firms or SOEs at the central and local levels. Gonzalez-Vicente (2013) explains the *processual* and *contextual* nature of Chinese investment in natural resource extraction: Chinese investors negotiate their position in relation to government policies, but are equally impacted by the singularities of each of the contexts through which the investment process is channeled.

Scholars also emphasize the ways in which China's home country environment is externalized. China ranks lower in GDP per capita and human development indices than many of the countries it invests in (Gonzalez-Vicente 2013). Jiang (2008) argues that China's domestic developmental dynamics are crucial to understanding how Chinese firms engage abroad. Those dynamics are characterized by brutal profit maximizing, corruption, weak environmental standards, a lack of environmental compliance, and an absence of democracy. Contrary to those who say China adopts a stable and long-term strategy in its outbound investment, Haglund (2009) finds that China's SOEs in Zambia pursue short-term strategies based on cost-cutting and segmented management practices. In the face of underdeveloped property rights and a lack of oversight capacity, the government relies on the threat of sanctions—such as withholding funding or promotions—along with post hoc and discretionary enforcement. Chinese firms respond by pursuing short-term returns and hedging strategies.

A further dimension to this puzzle is the role of private companies. While Gonzalez-Vicente (2012) notes that nearly all of China's largest miners are SOEs, Economy & Levi (2014) point out that non-state companies make up some two-thirds of all overseas mining projects. Thousands of small miners are active, particularly in neighboring Asian countries. The Chinese government is at a loss as to how to best to deal with these scattered actors. In March 2013, for example, the Ghanaian Sector Minister for Land and Resources told the Chinese ambassador that small Chinese miners were damaging China's image in his country. According to Economy & Levi, the Chinese ambassador insisted that it was incumbent on Ghana to deal with the problem.

In the Chinese-language policy literature, there is considerable ambiguity around the role that the country's private firms should play in global mining.

In the Chinese-language policy literature, there is considerable ambiguity around the role that the country's private firms should play in global mining. Wu Jianye and Li Hao (2011) argue that state-owned enterprises should be the focus, given the strategic nature of resource acquisition, but that more private competition could improve overall governance. Chen Jiabin (2013) is similarly ambivalent. On the one hand, he complains that the influx of private firms means that more actors who lack core technical competence and efficient planning are venturing abroad. On the other hand, he urges private companies to make overseas acquisitions in place of SOEs, as this may alleviate host country fears about Chinese state influence. To this end, he also advocates equity acquisitions by private foreign firms in China, because foreign shareholders can provide capital, expertise, and reputational gains to the Chinese partner.

China's policy thinkers complain time and again of gaps in coordination within the Chinese system. Mining companies compete with one another for access to capital at home

and mining projects abroad. Due to vertical fragmentation, those in charge of trading and shipping the minerals are not in sync with the needs of the miners, causing project delays and failures. Numerous proposals are made to improve coordination and information sharing, such as setting up a national database to share geological data and making joint use of professional intermediaries, such as consulting firms, who can serve as a conduit for best practices.

China's policy thinkers also call for a simplification of China's byzantine regulatory process, in which companies seeking to invest abroad must deal with separate agencies for foreign exchange (SAFE), financing (policy banks and China Banking Regulatory Commission), trade duties and import licensing (MOFCOM), mining permits (Ministry of Land and Resources), and tax payments (Ministry of Finance). Scholars argue that regulatory hurdles should either be removed (e.g., by switching from an approval to a registration process) or consolidated.

In China, some policy thinkers view overseas investment as a means to expand China's diplomatic influence, especially in less developed countries.

The Drivers of "Going-Out"

Why do Chinese miners invest abroad to begin with? According to Kaplinsky & Morris (2009), Chinese firms are different from Western firms due to their risk-propensity, lower market discipline, and interest in learning and best practices. Economy & Levi (2014) argue that, while geography goes a long way toward explaining mining investment distribution (e.g. in Southeast Asia, Australia, and Mongolia), China's free trade agreements with Peru and Chile have incentivized mining investment for SOEs and larger private firms. Small miners prefer to invest either in proximate Asian markets, or in peripheral countries like the Democratic Republic of Congo (DRC), where there is less competition. With regard to China's sovereign wealth funds, Haberly (2011) and Koch-Weser & Haake (2013) argue that resource security motives coalesced with an imperative to diversify China's foreign exchange reserves out of low-yielding U.S. treasuries. An example is CIC's 20 percent minority stake in Teck Resources, one of Canada's largest miners.

Several policy thinkers in China view resource security as the raison d'etre for investing in mines abroad. In China, some policy thinkers see "resource insecurity" as a primary motivation for overseas investment (e.g. Lei, Xu & Pan 2004, Li Zhenchao 2013). Others view overseas investment as a means to expand China's diplomatic influence, especially in less developed countries (Li & Liu 2010). There is also an undercurrent of mercantilism that plays on the notion that China must fend for itself in a mining industry undergoing rapid globalization. Wang, Cui & Zeng (2006) argue that Western multinationals are expanding in influence through M&A, restructuring, and strategic alliances, and outcompeting Chinese firms due to their international experience, capital, and market presence. The goal is for Chinese miners to redress these power asymmetries by developing global mining strategies that gradually tilt the playing field in China's favor.

However, some are skeptical that this strategy can work. A State Council (2004) report notes that, in addition to the risk of acquiring poorly performing mineral assets, Chinese companies operating abroad must contend with unexpected changes in a host country's legislation and policy environment, social instability, macroeconomic factors, and other risks. Chen Jiabin (2013) expresses concern about wasteful investments in poor-quality mines that lack local infrastructure and labor resources, causing companies to exceed budgeted expenses. A violent incident involving workers from the Zijin Mining gold mine in Kyrgyzstan in 2012 illustrated the difficulty of importing Chinese workers into a hostile environment, eventually leading to the evacuation of Zijin's personnel. At the same time, finding qualified workers locally is challenging, even in Australia and Canada, where demand for miners is rising just as a generation of mining veterans retires. Chen is also preoccupied with resource nationalism and environmental activism, citing Canada's protracted deliberations over the CNOOC-Nexen deal in the oil sector.

Still others suggest that China try to optimize domestic markets. For example, China has not sufficiently exhausted

trade policy options to improve resource security. Abrami & Zheng (2012) point to the lack of horizontal and vertical integration in China's iron and steel industry as detrimental to negotiating prices with overseas suppliers. Already before the annual iron ore price negotiations were abandoned, Wang, Cui & Zeng (2006) and Wu & Li (2011) complained of China's mismanagement of spot markets and lack of coordination with Japanese steel mills. China could also improve the composition of its metals production and distribution. As Wu & Li (2011) note, China sometimes pays more per unit of imports of minerals than it earns per unit of finished metals exports. Production offshoring could also make sense for environmental reasons. Wang, Cui & Zeng (2006) point to Canada's model of using capital stock to build a competitive edge in high-end metals production while raising domestic technical and environmental standards in ways that encourage offshoring of lower-end production.

Chen Jiabin, perhaps the most progressive Chinese scholar on mineral trade issues, advocates further adjusting China's tariffs to discourage metal-intensive exports, and conducts careful quantitative projections for a strategic mineral reserve. Chen claims as well that China could mitigate its import dependence by raising domestic efficiencies in mining, processing, consumption, and recycling (Chen 2004; Chen, Wang & Gao 2013).

Modifying Outbound Investment Strategies

Policy thinkers in China continue to search for ways to optimize the "Going-Out" process. Unlike major mineral importers Korea and Japan, China has a long history of domestic mining and prospecting. Some argue that Chinese mining companies need to leverage this comparative advantage in overseas operations. Though a risky proposition at first, prospecting may be necessary for China to one day compete with the world's top mining firms (Zhang Xin'an, 2001). However, Meng & Zhou (2010) contend that China's prospecting efforts have for the most part been unsuccessful, because high quality mines are in short supply, and the geological characteristics abroad are very different from those in China. Instead, they argue, China should acquire (publicly listed) foreign miners that already possess prospecting capabilities. This would have other advantages, such as saving time and money on overseas listings; enhancing the reputation of the Chinese company; and using the foreign entity to buy mines overseas without requiring Chinese government approvals. The downside, is the high upfront cost of M&A, the need to hire more legal staff, and the equity ownership caps that host countries frequently apply to foreign investors.

Lei, Xu & Pan (2004) argue that China must become more selective in the projects it chooses to invest in. Criteria could include the degree of foreign multinational control over a given resource; China's dependence on imports of the mineral; and the FDI climate in recipient countries. Song & Hu's (2012) detailed study of Brazil's mining deposits and related legal frameworks (e.g., the uncertainty caused by the recent revision of Brazil's Mining Law) illustrates that detailed market intelligence studies are beginning to emerge in China's policy circles. Chen Jiabin (2013) makes the case for establishing a Center for Inspection of Overseas Markets to run due diligence and cost estimates, monitor the performance of existing projects, and disseminate promising project opportunities through an alert system.

Some policy thinkers in China argue that Chinese mining companies need to leverage their domestic mining and prospecting experience in overseas operations.

With regard to financing, a frequent recommendation is that China should move from a system of preferential financing for SOEs by state-run banks to a more sophisticated policy scheme. An official report by the State Council (2004) states that China should set up an investment risk fund, in line with international practice (US and Japan precedents). Wang, Cui & Zeng (2006) say China should emulate what Japan used in its heyday of overseas mining in the 1960s–1970s, such as a fund to subsidize overseas prospecting (loans covering up to 50 percent of prospecting costs with 15-year repayment); political risk insurance; and debt relief for failed prospecting ventures.

Li Zhenchao (2013) criticizes China's excessive reliance on policy banks to issue loans for mining projects when advanced economies prefer corporate bonds and risk prospecting funds. He recommends a unified national system for prospecting and development, whereby the government finances the most competitive firms and increases coordination between miners and prospectors. Chen Jiabin (2013) comments that private companies lack access to loans and financing and have a very hard time using overseas assets as collateral, and so end up using domestic assets to securitize borrowing for overseas projects. This policy, he argues, has to change in view of the rising share of overseas assets in company portfolios. Prospecting companies, in particular, often take out huge loans to buy mining rights, leaving them exposed when unexpected circumstances arise.

Scholars disagree about whether and how China's resource demand contributes to underdevelopment today. Optimists view China as a unique window of opportunity.

China's Impact on Resource-Rich Economies

Theoretical Approaches

Is a mining boom fueled by China a boon or bane for resource-rich economies? How does China's impact manifest economically and institutionally? What impacts are specific to China, and which are generic to the mining industry? Studies on these issues encompass theoretical, case-based, and quantitative research.

As Gonzalez-Vicente (2009, 2012, 2013) notes, debates on development in resource-rich economies have a long pedigree. Dependency theorists in the 1970s argued that underdevelopment in the "periphery," or South, is impelled by the self-sustained development of countries in the "center," or North, which for centuries have imported low value-added commodities and specialized in technology-intensive production. Theories of underdevelopment can also be traced to the Argentine economist Raul Prebisch, who in the 1950s noted the decline in the terms of trade for resources, and explained the ways in which this "resource curse" weakened the competiveness of resource-exporting countries. Writing in the same period, the U.S. economist Albert Hirschman argued that resource industries have lower upstream and downstream economic linkages than other industries. A later outgrowth of the "resource curse" school is "Dutch disease," the idea that a resource windfall leads to price inflation and currency appreciation in the resource-exporting country, causing a rapid decline in manufacturing competitiveness. In addition to these economic impacts, a long line of scholarship argues that resource extraction comes with a host of social and institutional side-effects, such as conflicts over land and resources in mining communities; environmental degradation; corruption and rent-seeking behavior; and the excessive concentration of wealth.

Scholars disagree about whether and how China's resource demand contributes to underdevelopment today. To be sure, China's resource demand has coincided with a rapid rise in its share of global manufacturing and exports, increasingly in technology-intensive products that are competing with Latin American products in home and third markets. Commodity prices have risen while manufactures prices have declined. This pattern is frequently discussed by Latin American scholars. Vadell (2011), for example, argues that China represents a new version of North-South asymmetry in the post-Washington Consensus era. Rather than a "Beijing Consensus," under which developing countries aspire to follow China's development model, what is really taking shape is a "Pacific Consensus" based on resources-for-manufactures trade complementarity.

Other theorists counter these claims. Optimists view China as a unique window of opportunity: directly in the form of bilateral trade, and indirectly through its effect on commodity prices. Countries throughout Latin America, benefiting from better economic governance, have been able to harness this opportunity to balance their deficits, fund domestic infrastructure, and promote redistribution of income (Cunha et al. 2011). To an extent, cheaper industrial inputs from China have even lowered the cost of production for the region's manufacturers. Others welcome China's emergence as a way to weaken U.S. hegemony and

open new export markets in Asia (Bekerman, Dulcich, & Moncaut 2014).

As Moreira (2005) argues, the jury is out on what role manufacturing should play in Latin America. Elsewhere, countries like Canada have advanced economically in spite of their resource focus. One could also make the case that 20th century industrialization in Latin America was an artificial outgrowth of "import substitution" policies, and that recent decades have seen a reversion to the norm of comparative advantage and geography. China enjoys distinct advantages over Latin American manufacturers not only thanks to state support, but also in terms of labor costs, productivity, and scale. Policy failures also contribute to Latin America's manufacturing decline, notably the region's chronic under-investment in physical capital.

More fundamentally, the complexity of today's global industry raises doubts about the usefulness of "dependency" and "resource course" theories. According to Bridge (2008), the field is stuck at an impasse between the "the pessimism of the dependency tradition that [views resource production as] a pathological disorder that leads inevitably to crisis, and the qualified optimism of the comparative-advantage tradition that [views resource production as] an important asset in the development process." He advocates instead for a "global production network" approach, which understands regional development impacts as a "dynamic outcome of the complex interaction between territorialized relational networks and production networks within the context of changing regional governance structures."

By the same token, China's hybrid political economy does not neatly fit the North-South discourse. As Gonzalez-Vicente (2013) argues, the Chinese state is not a traditional developmental state in the Asian sense, nor does it adhere to "neoliberal" or "post-neoliberal" classifications. The country's industrial policy is inherently pragmatic and entrepreneurial, encouraging state entities to adopt a business mindset even as firms remain closely tied to state objectives. That China is increasingly investing in the resource sectors of advanced economies further complicates the North-South narrative (Economy & Levi 2014).

China's industrial policy is inherently pragmatic and entrepreneurial, encouraging state entities to adopt a business mindset even as firms remain closely tied to state objectives.

Measuring the Macroeconomic Impact

When it comes to a statistical discourse of China's resource demand and the resource-for-manufactures pattern of trade, most scholars prefer to use descriptive statistics, such as the composition of trade. But more granular econometric studies are on the rise. While most of these studies confirm worrying trends about the decline of manufacturing competitiveness in the region, they employ a wide variety of dependent variables that can be used to assess this problem, and in some cases, come to contrary conclusions. The following examples are illustrative:

- *Inter-sectoral vs. intra-sectoral trade.* Cunha et al. (2011) find that Brazil's trade with other APEC countries is predominantly *intra*-sectoral, which is closely associated with dynamic gains in economies of scale and specialization. By contrast, Brazil's trade with China is inter-sectoral (e.g., iron ore for electronics), a pattern that stunts specialization.
- *Synchronicity of output and prices.* Lehman, Jaramillo & Moreno (2009) measure the co-movement of commodity prices and regional GDP growth with China's industrial output and GDP growth. Results show that there is indeed a strong correlation. Business cycle effects in Latin America tend to lag, compared to Southeast Asia, where the effects set in faster. Co-movement is most salient in commodity-focused exporters Chile and Venezuela (see Appendix Table 2).
- *Third-market displacement.* Using a gravity model, Montenegro, Pereira & Soloaga (2011) find that Chinese exports to third markets do not crowd out Latin American exports to those markets at the aggregate level. Indeed, they find a positive relationship between imports from China and exports to third markets in the case of Southern Cone countries. That indicates an increase in trade integration, where, for example, the Southern Cone uses inputs from China for their goods exports.

Governance Issues in Developing Countries

As noted in Section 1, country-level studies have been done on China's mining activities. They focus primarily on China's labor and environmental practices, as well as its relationships with local communities and national elites. The case studies reviewed here focus on Zambia, Peru, and Papua New Guinea.

With regard to labor practices, the studies of Haglund (2009) and Gadzala (2010) on China Nonferrous Metal Corporation's (CNMC) copper mining and smelting activities in Zambia come to critical conclusions. An explosion in 2005 killed scores of local miners. Workers are paid less than at other mining operations in the country. Chinese enclaves also prevent meaningful integration into the local community. Gonzalez-Vicente (2013), Brant (2013), and Smith (2013) in turn identify instances of substandard labor practices in Shougang Hierro's operation in Peru and at the Ramu nickel mines in Papua New Guinea (see Table 3). The general conclusion drawn from these subpar practices is that Chinese companies operate on tight margins and time horizons, and are externalizing poor practices from their home markets.

But there are other points of view. Yan & Sautman (2013), for example, argue that the real problem lies with the decline of unions, casualization of labor, and lax regulation that resulted from the opening up of Zambia's mining sector to foreign investors as of the late 1990s. (Gonzalez-Vicente (2013) comes to similar conclusions about Lima's overly accommodative stance toward foreign mining interests.) They also find that CNMC in fact provided steady jobs and regular working hours during a period when Western mining companies laid off workers due to the financial crisis. The company's low pay is explained to a large extent by its segment of the copper market, where tight operating margins dictate cost-saving strategies.

With respect to local governance practices, arguments likewise run both ways. Fieldwork has uncovered conflicts over land use—ranging from Shougang Hierro's refusal to transfer land use rights for local infrastructure projects, to a failure to consult with local indigenous groups before exploration in Papua New Guinea. Oftentimes, companies are able to trump local interests by relying on high-level political support secured through bilateral diplomatic arrangements. Another factor is corruption—Economy & Levi (2014) cite the example of the Aynak copper mine in Afghanistan, where CNMC won a highly competitive bidding process by allegedly bribing Afghan officials.

And yet, these problems are not categorical. Kotschwar et al. (2012), for instance, find that the aluminum producer Chinalco, which entered Peru at a later date than Shougang Hierro, has done a much better job adapting to local governance standards by establishing a social fund, investing in local infrastructure, and holding public hearings with the local community. Part of the reason, is that China Export-Import Bank, the company's primary lender, set out Guidelines for Environmental and Social Impact Assessments beginning in 2007. According to Economy & Levi (2014) the corporate governance at Chinese companies is often no worse than at Western firms, only that Chinese firms lack the public relations know-how to preserve their image.

Chinese companies have been slow to sign on to international conventions and are cognizant that the Chinese government has limited capacity to monitor their overseas behavior. Kotschwar et al. (2012) find that neither Shougang nor Chinalco signed on to the International Council on Mining and Metals (ICMM) or the Extractive Industries Transparency Initiative (EITI)—multilateral corporate initiatives that set binding requirements for transparency and contributions to sustainable development. Economy & Levi (2014) explain that Chinese miners view EITI as a "Western NGO," because it is partly funded by the billionaire investor George Soros, who also

Table 3: Salaries in Major Mining Companies in Peru (2006)

	Medium salary (Peruvian soles)
Southern	68.27
Minsur	68.18
Minera Milpo	67.28
Huanzala	64.65
Volcan	58.07
DoeRun	56.82
Shougang	
Old salary scale	53.00
New salary scale (min-max)	21.40 – 36.15

Source: Shougang Hierro Peru Workers' Union (2008), from González-Vicente, Rubén, "Development Dynamics of Chinese Resource-Based Investment in Peru and Ecuador." *Latin American Politics and Society* 55, no. 1 (2013): 46–72.

supports democracy initiatives. In addition, EITI requires the participation of larger mining firms, which effectively excludes China's legion of smaller miners.

Governance Issues in Advanced Economies

Advanced economies dealing with China's resource investments face unique governance challenges. That is particularly evident in Australia. According to Economy & Levi (2014), 80 percent of China's direct investment in Australia goes into mining. Deals valued at over $100 million totaled $30 billion in 2005-2013. These have included very large takeover bids, particularly as Australian miners fell into debt during the global financial crisis. The challenge for Australia is how to protect its natural resource assets without interfering excessively in the market.

According to Hearn (2013), Australia's 2013 federal election featured heated debates on how to manage the economic changes caused by China's minerals demand. He notes that "a pressing policy question for Australia and for other resource-exporters is how to act in the broad national interest and preserve the environment while allowing mining companies to run profitable businesses, and at the same time using a portion of those profits to diversify the economy." Several approaches have been tried, without amounting to a coherent policy framework. In 2010, the Australian government proposed a 40 percent tax on mining profits—even higher than Brazil's 25 percent rate—but was criticized by mining companies for being discriminatory, igniting a controversy that contributed to Prime Minister Kevin Rudd's resignation that year. Australia has also failed to develop a fund to manage mineral export earnings; the gold standard for this is Chile's Copper Stabilization Fund, which has facilitated investment in infrastructure, tax cuts for small businesses, and counter-cyclical stimulus measures.

Recent changes to government regulation of foreign investments in Australia met with mixed responses as well. Nottage (2013), for instance, criticizes Australia's decision to revoke investor-state arbitration from its bilateral investment treaties in 2011. Given keen interest from Asia in foreign direct investment (FDI) into Australia's mining sector, Australia may not need to offer such treaty protections to entice foreign investors. This policy shift risks undermining the credibility of the entire investor-state arbitration (ISA) system. Yet, other scholars find Australia's growing vigilance toward resource investment justifiable. Wilson (2008) defends the Foreign Investment Review Board's screening of Chinese takeover deals as "resource liberalism," rather than "resource nationalism," because its declared intention is to more closely screen FDI from state-owned sources and to maintain transparent markets. Moran (2010) concurs with the way Australia handled China's takeover proposals for rare earths producers Lynas and Arafura in 2009. Given that the most advanced sources of rare earths supplies outside of China are located in Australia, the government was right to be suspicious of too much Chinese control.[5]

> Chinese companies have been slow to sign on to international conventions and are cognizant that the Chinese government has limited capacity to monitor their overseas behavior.

In a review of Canada and Australia's screening of Chinese investments, Economy & Levi (2014) emphasize that there are no unitary actors making decisions. Within the recipient countries, parties on the left and right of the political spectrum, and those located in and outside resource-producing provinces, vouch for and against Chinese investment. Decisions are frequently shaped by the administration in power. For China, in turn, failed bids lead individual companies to reevaluate their M&A strategy. In general, China adapt its behavior more readily than the recipient country.

[5] Lynas in 2009 could not find buyers for its bonds and Arafura had a poor public listing, exposing both companies to large debts. CNMC attempted to buy 51.7 percent of Lynas, which have given it four of eight seats on the company's board. The government blocked the move and insisted that CNMC take a minority stake. CNMC eventually backed out. Jiangsu Eastern China Non-Ferrous Metals Investment Holding Company, on the other hand, was permitted to buy 25 percent of Arafura. According to Moran, Australian regulators acted appropriately: Arafura is a small independent producer sthat can use Chinese investment to expand overall supply; whereas control over the larger Lynas would have given China too much leverage in the rare earths market.

Industry Trends and Opportunities for Further Research

Trends in China's Trade and Investment Policies

Ambiguity toward Outbound Investment

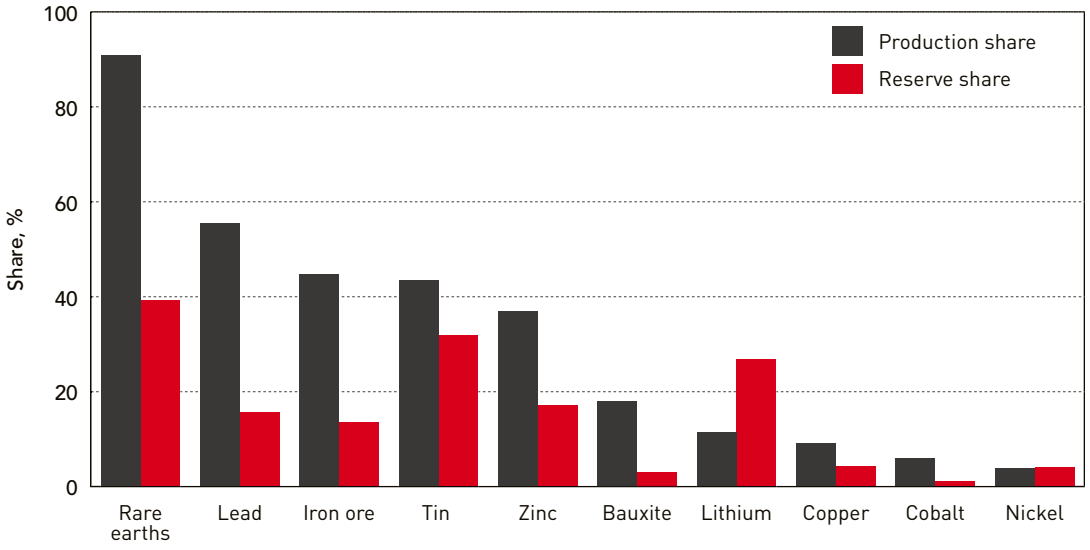
China under market reform has pursued a resource-intensive, export-oriented industrial policy. As a corollary to this policy, China has imported for value-added processing in China, thereby creating an imperative to purchase equity in overseas mining assets. However, a decade-and-a-half into its "Going-Out" policy, China's reliance on commodity imports has become a liability. Its outbound investments have wasted resources while doing little to improve resource security. Some stylized facts:

- *Rapid depletion of the domestic reserve base.* Although China's domestic ores tend to be inferior and costlier than imported ores, they act as a crucial buffer when prices rise. At present, China is depleting its domestic reserves more rapidly than most mining countries, as illustrated by its share of global production and reserves (see Figure 2).
- *Import reliance and bargaining asymmetries.* From June 2012 to June 2013, China imported 743 million metric tons of iron ore, the highest amount on record and an 8 percent annual increase.[6] Meanwhile, the Big 3 iron miners—Vale, BHP Billiton, and Rio Tinto—improved their balance sheets by deleveraging and reducing investment in new mines.[7] They have exercised considerable leverage over the market since the switch to spot-market price-setting in 2009 and benefit from the fragmentation of China's steel industry (see Appendix Table 2).
- *China's lack of direct ownership over the minerals it imports.* In October 2013, Liu Xiaoliang, secretary general of the China Metallurgical Mining Enterprise Association, acknowledged that only 13 iron ore investments by Chinese companies overseas had begun producing and

[6] Sonali Paul and Silvia Antonioli, "Cash Is King as Global Miners Get Set to Boost Payouts," Reuters, February 11, 2014. http://www.reuters.com/article/2014/02/11/us-mining-earnings-preview-idUSBREA1A08M20140211?feedType=RSS&feedName=businessNews.

[7] Sonali Paul and Silvia Antonioli, "Cash Is King as Global Miners Get Set to Boost Payouts," Reuters, February 11, 2014. http://www.reuters.com/article/2014/02/11/us-mining-earnings-preview-idUSBREA1A08M20140211?feedType=RSS&feedName=businessNews; Xinhua, "China Likely to Halve Tax Burdens on IO Companies," December 4, 2012, via Factiva.

Figure 2. China Share of World Production and Reserves of Select Metals (2013)



Source: U.S. Geological Survey.

shipping, and that these accounted for just 8.3 percent of China's total iron ore imports.[8]

At the same time, several high-profile overseas mining projects have failed or are faltering:

- *Sicomines* (Congo). Congo agreed in 2008 to cede mining rights to Sicomines, a $6 billion copper mining joint venture between Sinohydro, the China Railway Group Ltd. and Congolese miner Gecamines. Half of the project's funds were allocated to local infrastructure projects. The volume of copper deposits, initially estimated at 10 million tons, were found in 2013 to amount to just 6.8 million tons.[9]
- *Sinosteel at Weld Range* (Australia). In 2011, Sinosteel, a state-owned Chinese metals producer and trader, suspended its $2 billion Weld Range iron ore mining project, one of China's largest investments in the Australian mining sector. The causes for the suspension included setbacks in developing port and rail infrastructure.[10]
- *Sichuan Hanlong Group* (Australia and West Africa). Sichuan Hanlong is a private conglomerate with interests in numerous industries spanning infrastructure, energy, real estate, and manufacturing. In July 2011, it offered $1.3 billion to take over Australia-listed miner Sundance Resources Ltd., a company in which it already owned an 18.6 percent stake. It aimed to take over a $14 billion iron ore project in Cameroon and Congo owned by Sundance.[11] By December 2012, however, Sundance disclosed that Hanlong had delayed the $1.4 billion acquisition deal. There were rumors that Hanlong lacked funding for the deal and was looking to partner with Chinese SOEs.[12] In April 2013, after months of uncertainty, Sundance terminated the agreement.[13]
- *Sino Iron* (Australia). Located in Australia's Pilbara region, the Sino Iron project was initially estimated to cost less than $2 billion, but by June 2012 the cost had run to $7.1 billion, and could ultimately run closer to $10 billion. The project is owned by the state-owned investment company CITIC. China Development Bank issued a $5 billion loan for the project.[14]
- *Karara* (Australia). This $2.6 billion iron ore joint venture between China's Anshan Iron & Steel (52.6 percent stake) and Australia's Gindalbie Metals has been weighed down by infrastructure design changes, rising material and labor costs, and adverse currency fluctuation.[15]

In light of these failures, will China rethink its overseas mining strategy.

China accounted for nearly 14 percent of all mining merger and acquisition activity by value in 2013, but the number of transactions slid to 21 from 34 and their value declined to US$5 billion from US$6 billion in 2012, according to a research report by Price Waterhouse Coopers. Last year was one of the worst years for global mining mergers and acquisitions in nearly a decade, with the deal value at its lowest since 2004.[16] Still, certain interests within the Chinese government appear to support a continuation of overseas acquisition. The semi-governmental China Iron and Steel Association (CISA) in July 2012 unveiled two targets: (1) to secure half the country's supply outside the major miners (no timeframe specified);[17] and (2) to secure 40 percent of iron ore from domestic sources and overseas mines in which the state has an investment by 2015.[18] The National Development and Reform Commission, China's premier industrial planning body, stated in February 2014 that Chinese steelmakers should keep building up stakes

[8] Xinhua, "China Steel Mills' Overseas Iron Ore Mines Contribute Little to Supply," October 8, 2013, via Factiva.

[9] Reuters, "Copper Reserves at China's Sicomines Less than Hoped," May 24, 2013.

[10] Du Juan, "Crude Awakening," *China Daily*, February 22, 2013, via Factiva.

[11] Zhang Qi, "Sichuan Hanlong Seeks Control of Iron Ore Project," *China Daily*, July 19, 2011, via Factiva.

[12] China Economic Review, "China's Hanlong Mulls Over Partnership with SOEs on African Project," December 28, 2012, via Factiva.

[13] Gillian Tan, "Sundance Resources in Talks to Sell Iron Ore Asset Stake," *The Wall Street Journal*, March 19, 2013, via Factiva.

[14] According to the *Financial Times*: "All the main participants in the Sino Iron saga, Citic Pacific, with 80 percent of the equity, China Development Bank, its principal lender, and China Metallurgical, the main contractor with the remaining 20 percent equity in the project, are squabbling. CDB wants to pull out of the project, while Citic Pacific has considered suing China Metallurgical for the delays and budget overruns, according to people familiar with the matter. Recently, the dispute went to the State Council, or cabinet, where Wang Qishan, the vice premier in charge of financial matters, adjudicated, according to a person with direct knowledge of the matter." Henny Sender, "Dug in Too Deep," Financial Times, June 25, 2012, via Factiva.

[15] Henny Sender, "Dug in Too Deep," *Financial Times*, June 25, 2012, via Factiva.

[16] Toh Han Shih, "Mainland Mining Firms Look for More Overseas Assets," *South China Morning Post*, April 5, 2014.

[17] Angus Grigg Shanghai and Jamie Freed, "China Seeks New Iron Suppliers," *The Australian Financial Review*, July 17, 2012, via Factiva.

[18] Angus Grigg Shanghai and Jamie Freed, "China Seeks New Iron Suppliers," *The Australian Financial Review*, July 17, 2012, via Factiva.

in global iron-ore assets in the interest of China's strategic security and influence in global trade.[19]

Chinese companies now have divergent attitudes toward investing abroad. Wuhan Iron & Steel (WISCO), China's fourth-largest steelmaker, currently relies on the overseas iron ore market to satisfy four-fifths of its imports but expects to attain 95 percent self-sufficiency in iron ore by 2016.[20] The company plans to buy seven overseas mines from its parent company, located in Canada, Australia, Liberia, and Brazil.[21] By contrast, China's largest steelmaker Baosteel said in August of last year that it no longer had overseas acquisition plans—unusual for a company that depends on foreign ore.[22]

There is a salient trend toward diversifying metals acquisition. The value of Chinese overseas mining investments will increase in 2014, but the nature of the mining assets acquired will shift.

Changes in the Metals Portfolio

Given the political and financial capital already sunk into overseas mining ventures, abandoning this strategy completely may not be an option. Instead, we might see intermediate solutions.

First, there is a salient trend toward diversifying metals acquisition. According to the senior vice-president of mergers and acquisitions at CITIC Securities, the value of Chinese overseas mining investments will increase in 2014, but the nature of the mining assets acquired would shift.[23] In theory, China would want to focus on metals that fulfill several of the following criteria: (1) significant market control still possible; (2) high likelihood that the metal will be in high demand (e.g. for high-tech applications); (3) robust price trends; (4) high value-to-weight ratio conducive to long-distance transport; (5) low domestic reserve ratio and high import reliance; (6) potential for economic and geostrategic leverage.

Based on these criteria, iron and bauxite may be less amenable to outbound investment. In the case of iron, foreign miners exert excessive control and prices may decline. In the case of bauxite, there is excess supply in China and demand is not robust. The following minerals, by contrast, remain attractive:

- *Copper, nickel, and cobalt.* As discussed above, copper is likely to be in high demand due to its use in high-technology products. The copper sector is more fragmented than the iron ore sector, which may allow Chinese companies to gain more market share (see Table 4). The biggest challenge is identifying new sources of copper supply. Other examples of nonferrous metals that may be widely used are nickel and cobalt, which are alloys in high-end steel and other metals production. A change in the technology intensity of China's steel production could increase demand for these metals. Cobalt, a super-alloy with high temperature stability and strong wear-resistance, is particularly suited for use in turbine blades and medical devices.[24] China is the world's biggest consumer of stainless steel, of which nickel is an important ingredient. It is notable that the largest Chinese mining deals in 2013 included a US$5.1 billion investment in a ferronickel plant in Sulawesi, Indonesia.[25]

[19] Chuin-Wei Yap, "China Stays in Hunt for Iron Ore Abroad," *The Wall Street Journal*, January 29, 2014, via Factiva.

[20] Steel Business Briefing, "China's Wisco Targets 95% Iron Ore Self-sufficiency by 2016," June 26, 2013, via Factiva.

[21] Ibid.

[22] Chuin-Wei Yap, "China Stays in Hunt for Iron Ore Abroad," *The Wall Street Journal*, January 29, 2014, via Factiva.

[23] Toh Han Shih, "Mainland Mining Firms Look for More Overseas Assets," *South China Morning Post*, April 5, 2014, via Factiva.

[24] The *South China Morning Post* states: "Xiao Zhijian, sales manager at China's biggest cobalt supplier, the Jinchuan Group, said cobalt reserves in China were small, and the country would desperately need them in the future. The metal is widely used in the aerospace industry, he said, where aircraft engines need cobalt to maintain strength amid high temperatures. But the biggest consumption of cobalt is anticipated to be in industrial batteries. When electric vehicles were still at the infant stage, the demand for cobalt was weak. Land reserves in Congo-Kinshasa alone could meet up to 70 percent of the international demand." Stephen Chen, "China Enters Race with Foreign Rivals to Mine the Seabed for Valuable Minerals," *South China Morning Post*, September 4, 2013, via Factiva.

[25] Toh Han Shih, "Mainland Mining Firms Look for More Overseas Assets," *South China Morning Post*, April 5, 2014, via Factiva.

- *Niche metals that support China's industrial upgrading and innovation objectives.* The application of niche metals in high-tech products is proliferating, with a dynamic feedback loop between product innovation and the availability of specific metals. China's control over the output and processing of rare earths is already conferring strategic advantages in the development of high-technology products. Other niche metals could become the target of investment, including: (1) graphite, which could replace copper and steel in some applications; (2) lithium, which may become central to developing electric car batteries; and (3) uranium, which could serve China's future nuclear power plants. Since some of these minerals are heavily concentrated in Bolivia (lithium),[26] Central African Republic (uranium), and the DRC (cobalt), China may try to gain a diplomatic foothold in these peripheral countries.
- *Coal.* Due to strong demand for coal in electricity, heating, and smelting, and significant supply bottlenecks, China in recent years has become a net importer of coal and increased its share of the world's coal imports. Chinese companies are on the hunt for overseas coal mines as Beijing's switch to cleaner fuels stokes demand for higher-quality coal produced in countries such as Australia. Yanzhou Coal Mining Co., for example, is keen to buy out its Australian unit Yancoal Australia, following a one-third slide in Yancoal's share price.[27]
- *Gold and diamonds.* Gold is a non-monetary store of wealth, making it attractive to China's central bank, which currently holds some $4 trillion in foreign exchange reserves, as well as Chinese households, which are looking to diversify their wealth out of volatile real estate and stock markets and are barred by the government from moving large amounts of money overseas.[28] According to an analyst at CITIC securities, Chinese companies currently see gold as a safe investment.[29]

[26] In January 2013, Bolivia opened its first trial plant. It will produce 40 tons of lithium carbonate a year. Over time, the government wants to ramp production up to 30,000 tons—roughly a fifth of current global demand. Simeon Tegel, "The Bolivian Dream: Lithium Batteries Included," *Global Post*, March 28, 2013. http://www.globalpost.com/dispatch/news/regions/americas/bolivia/130321/bolivian-lithium-exports-smartphone-electric-car-battery.

[27] Sonali Paul, "Chinese Firms Want to Buy Coal Assets Overseas, But on the Cheap," Reuters, December 1, 2013, via Factiva.

[28] Bloomberg, "Gold No Slam-dunk Sell in China as Aunties Pounce," November 19, 2013, via Factiva.

[29] Toh Han Shih, "Mainland Mining Firms Look for More Overseas Assets," *South China Morning Post*, April 5, 2014, via Factiva.

Table 4: Top Copper Producers by Volume (2010)

Producer	Metric tons (thousands)
Codelco	1,760
Freeport-McMoRan	1,440
BHP	1,140
Xstrata	907
Rio Tinto	701
Anglo American	645
Grupo Mexico	598
Glencore	542
South Copper	487
KGHM Polska	426

Source: Copper Investing News. http://copperinvestingnews.com/9405-top-10-copper-producing-companies.html

Trends in Deal-making

- *Which types of companies will drive future investment?* According to the China Mining Association, in the first three quarters of 2013, privately-owned companies invested US$1.9 billion in overseas mines, compared to $1.2 billion for SOEs. The consulting firm PricewaterhouseCoopers asserts that the influx of small private investors is reducing average deal size, since these companies lack the financial muscle of SOEs.[30] At the same time, the amount of agreed investment on overseas mines by multi-industry companies stood at $2.4 billion from January to September 2013, compared to just $528 million for mining companies.[31] Given the failures of Sicomines and Hanlong, both of which were led by multi-industry companies, this trend may affect the viability of future mining projects.
- *Overbidding or fair price?* Examples abound of Chinese firms overbidding in order to acquire overseas assets. Jinchuan Group, for example, paid $1.3 billion in July 2011 for South Africa's Metorex, which operates copper and cobalt mines in Zambia and the DRC.[32] China Kingho Energy Group offered a hefty 110 percent premium in a $60 million bid for Australian coal explorer

[30] Toh Han Shih, "Mainland Mining Firms Look for More Overseas Assets," *South China Morning Post*, April 5, 2014, via Factiva.

[31] Xinhua, "China Listed Firms' Enthusiasm for Overseas Mines Still on Rise in Q1-3," November 3, 2013, via Factiva.

[32] Reuters, "China Trumps Brazil in Simmering African Showdown," July 7, 2011, via Factiva.

Carabella Resources Ltd.[33] On the other hand, Minmetals in 2011 paid only a modest premium to copper producer Anvil. Its offer valued Anvil at about 1.7 times the value of its total assets, compared with a median value of 4.08 times for 10 similar deals in the previous five years.[34]

- *Novel approaches to working with foreign miners?* According to Michael Arruda, an energy specialist with legal firm Arruda, China is "taking stakes in consortia instead of looking for 100 percent control over an asset… As time goes on, [the Chinese firms] are more confident in taking positions that are smaller, and they are doing so not just to get access to reserves but also to knowledge and expertise."[35] Teaming arrangements are becoming popular as well. Chinalco, for example, teamed up with Australian mining company Rio Tinto to develop the Simandou iron ore project in Guinea for $1.3 billion.[36] Still, M&A accounted for $1.1 billion last year, making up 36 percent of China's total mining investment.[37] Jilin Jien Nickel Industry, for example, acquired a 59.7 percent majority stake in central Ontario nickel miner Liberty Mines.[38]

Chinese firms are taking stakes in consortia instead of looking for 100 percent control over an asset... As time goes on, they are more confident in taking positions that are smaller, and they are doing so not just to get access to reserves but also to knowledge and expertise.

- *Partnering or competing with fellow Chinese companies?* In Myanmar, CNMC Nickel, a wholly-owned unit of CNMC in charge of developing the Myanmar nickel mine, eventually restructured the project via capital enlargement and equity expansion to bring in Taiyuan Steel, which now owns a 40 percent stake.[39] However, competition among Chinese actors is common. In the case of the Las Bambas copper mine, for instance, Minmetals was the sole Chinese bidder after a consortium led by Chinalco abandoned its offer in November 2013. Chinalco apparently rejected a proposal by the Chinese government that it be a minority partner in a combined bid led by Minmetals.[40]
- *More in-house prospecting?* In January 2014, the *Financial Times* reported that dozens of "geological bureaus," units of the Ministry of Land and Resources, have become entrepreneurs expanding overseas. However, they have had trouble listing on mining-friendly stock exchanges in Canada and elsewhere because they rarely post their reserves according to international standards that are designed to help investors assess a project's value and viability. The lack of formal funding channels means the Chinese bureaus let some overseas blocks sit idle.[41] Another area of long-term potential is sea-bed prospecting.[42]

[33] Sonali Paul, "China's Kingho Offers $60 Million for Australian Coal Explorer," Reuters, December 5, 2013, via Factiva.

[34] Elisabeth Behrmann, "Minmetals Acquires Congolese Copper Producer Anvil Mining for $1.3 Billion," Bloomberg, September 30, 2011, via Factiva.

[35] Reuters, "Chinese Investors Tread More Carefully in Africa," February 23, 2012, via Factiva.

[36] *China Daily China Energy*, "China's Enterprises Invest $6.61Bln to Acquire Overseas Mines," January 13, 2011, via Factiva.

[37] Xinhua, "China Listed Firms' Enthusiasm for Overseas Mines Still on Rise in Q1-3," November 3, 2013, via Factiva.

[38] Eric Ng and Eric Timmins, "Ontario Woos China Mineral Mining Investors Despite Government Action," *South China Morning Post*, October 22, 2012, via Factiva.

[39] Xinhua, "Taiyuan Steel to Invest in CNMC's Myanmar Nickel Project," August 30, 2010, via Factiva.

[40] Zijing Wu, "Minmetals Said to Be Near Deal to Buy Glencore Peru Mine," Bloomberg, February 6, 2014, via Factiva.

[41] Lucy Hornby, "China's Junior Miners Break New Ground," *Financial Times*, January 13, 2014, via Factiva.

[42] In September 2013, the 165-member International Seabed Authority, which regulates deep-sea mining activities, approved exploration plans for cobalt-rich ferromanganese crusts by China over an area of about 3,000 square kilometers in the Western Pacific. China is the only nation authorized to explore sea beds for as many as three major types of minerals through three separate approvals obtained by the China Ocean Mineral Resources Research and Development Association (COMRA) from 2001-2011. China's main challenge, though, is its heavily reliance on overseas suppliers for technology and equipment for geophysical exploration. Amid concerns that China could use and adapt such technology for its own engineering and military use, most countries restricted the export of advanced products. Stephen Chen, "China Enters Race with Foreign Rivals to Mine the Seabed for Valuable Minerals," *South China Morning Post*, September 4, 2013, via Factiva.

Widening the Scope of Fieldwork on China's Mining Activity

Field research on China's global mining activity has been concentrated in select countries, namely Zambia, Peru, and Papua New Guinea. While there is an urgent need to deepen our understanding of China's governance practices in individual countries, we rely on a handful of cases to draw strong conclusions. The field would benefit from more on-the-ground empirical data, which eventually would comprise a diverse sample of low-, middle-, and high-income countries; mining-subsectors; and companies that differ in size, ownership, and orientation. To support future research on how China's mining activity impacts resource-rich economies, it is important to consider trends in the distribution of Chinese investments. Gonzalez-Vicente (2012) has laid the groundwork by mapping Chinese investments, but much work remains to be done.

In choosing sites for investment, Chinese firms frequently face a difficult tradeoff. As latecomers, they may engage in peripheral markets like the DRC to take control of new mining assets and fringe production, albeit at substantial risk. The flipside is that working in established markets like Australia, Peru, and Canada tends be more capital-intensive and subject to regulatory constraints.

CNMC is an example of a company that prefers risky peripheral markets. In Myanmar, it established an $800 nickel mining and processing joint venture in 2009 with Taiyuan Steel, China's leading producer of stainless steel projects that depends on nickel alloys.[43] The same year, it announced it would build a $500 million aluminum smelting plant in Laos and acquired an 80 percent stake in Zambia's Luanshya Copper Mines.[44] The company announced in 2011 that it would commit $2 billion to mining and metals operations in Zambia in 2011–2015, equivalent to the total amount the company invested there since 1999.[45]

Minmetals, which aspires to become one of world's leading diversified metals traders, adopts a mixed approach. In September 2011, its subsidiary, Minmetals Resources Ltd., agreed to buy DRC copper producer Anvil Mining Ltd. for $1.3 billion. The Fraser Institute, a Canada-based research organization, ranked the DRC third to last in its 2010-2011 Survey of Mining Countries, (out of a total of 79 countries), due to political instability and underdevelopment.[46] In parallel, Minmetals has made repeated efforts to work with leading copper companies, having bid for Canada's Noranda in 2004 and partnered with Chile's Codelco in the mid-2000s. In April 2014, the company purchased Las Bambas, a Peruvian copper mine, for $5.85 billion from Glencore Xstrata.[47] By buying the mine from the Anglo-Swiss multinational, Minmetals incurred neither the technical risk of geological prospecting nor the political risk of buying equity in a large mining firm, a strategy that has met with resistance in Canada and Australia. Peru is also a much safer destination than the DRC, given its political stability, open investment regime, and free trade agreement with China.

As latecomers, Chinese firms may engage in peripheral markets like the DRC to take control of new mining assets and fringe production, albeit at substantial risk.

Viewed at the country level, China's investment distribution takes on extremes. At one extreme, China is investing in some of Africa's poorest countries. In Liberia, for example, China-Union Investment signed a $2.6 billion contract to develop Liberia's Bong iron ore deposits.[48] WISCO in

[43] Xinhua, "Taiyuan Steel to Invest in CNMC's Myanmar Nickel Project," August 30, 2010.

[44] Xinhua, "China NFC Joins with SARCO to Build Laos Alumina Factory," November 10, 2009.

[45] Xinhua, "China Nonferrous Metal Mining to Invest USD2 Bln in Zambia in 2011-15," November 21, 2011.

[46] Elisabeth Behrmann, "Minmetals Acquires Congolese Copper Producer Anvil Mining for $1.3 Billion," Bloomberg, September 30, 2011, via Factiva.

[47] Karen Rebelo and Silvia Antonioli, "Metal-hungry China Buys Glencore Copper Mine for $6 Bln," Reuters, April 18, 2014. http://www.reuters.com/article/2014/04/14/glencorexstrata-lasbambas-idUSL6N0N50R120140414.

[48] Reuters, "China's Oil and Mineral Deals in Africa," November 3, 2009, via Factiva; Reuters, "China-Union Makes Its First Shipment of Iron Ore from Liberia," February 13, 2014.

August 2013 purchased a $500 million iron mine in Liberia, a joint investment with the China-Africa Development Fund.[49] In Niger, China granted the government a $95 million preferential loan in 2009 for the SOMINA uranium mining operation, a joint venture between China National Uranium Corporation and the Niger government.[50]

China also continues to ramp up investment in advanced economies. The case of Australia is unique, given the degree of interdependence: Australia last year accounted for some two-thirds of China's iron ore imports[51] and three quarters of Western Australia's iron ore exports went to China.[52] A glance at BHP Billiton's distribution of revenue by region illustrates its rising dependence on China (see Appendix Table 4). A looming question in Australia is whether China will find ways to circumvent BHP and Rio Tinto by working with other miners. That could prompt further scrutiny from Australia's Foreign Investment Review Board (FIRB)—FIRB already sets a lower threshold for reviewing Chinese foreign investments than it does for Western companies.

Less studied is the case of Canada. In 2005, Minmetals' C$6 billion takeover bid for Canadian copper and zinc miner Noranda collapsed owing to opposition from some Canadian politicians. But according to Dealogic data, between 2008 and October 2012, Chinese firms bought into Canada's non-fuel mining firms with upwards of US$6 billion in capital.[53] Canada typically attracts more Chinese investment in copper, gold and nickel projects, although high iron ore prices in recent years have resulted in some investment by mainland steel mills in eastern Canada iron ore projects.[54]

Mining and Metals in China's Rebalancing

China's ability to rebalance its economy—from investment, exports, and manufacturing toward consumption and services—will largely determine its future metals demand. Rebalancing has not progressed much over the past decade, and even suffered a setback after the global financial crisis, when the government loosened up credit to sustain infrastructure development and industrial output. Excess industrial capacity and related problems, such as debt and pollution, are increasingly intractable. The new leadership of President Xi Jinping now faces a tough tradeoff between propping up a slowing economy and instituting painful structural reforms.

China's ability to rebalance its economy—from investment, exports, and manufacturing toward consumption and services—will largely determine its future metals demand.

Future research should take into account that China's economic rebalancing is an ongoing and imperfect process that is already affecting the metals sectors. Scholars could focus on the following areas: (1) industry restructuring; (2) trade policy; (3) financial sector reform; and (4) environmental governance.

Industry Restructuring

After being shut down in the 1990s, small enterprises in the ferrous and non-ferrous metals sectors have surged back over the past decade, coinciding with a decline in profitability and a rise in loss-making enterprises. In 2013, China's crude steel production rose by 8.7 percent year-on-year, up from 2.1 percent in 2012. The rest of the world experienced a decline of 3 percent that same year (see Appendix Table 5). Steel production increased despite a 98 percent year-on-year decline in steelmakers' profits[55] owing to overcapacity, weak demand, and a strong recovery

[49] Xinhua, "WISCO's Iron Ore Project in Liberia Starts Operation," August 1, 2013, via Factiva.

[50] Reuters, "China's Oil and Mineral Deals in Africa," November 3, 2009, via Factiva; Reuters, "China-Union Makes Its First Shipment of Iron Ore from Liberia," February 13, 2014.

[51] Yue Li and Rhiannon Hoyle, "Chinese Yuan Iron-Ore Contract Faces Hurdles," *Wall Street Journal*, January 8, 2014, via Factiva.

[52] Toh Han Shih, "Mainland Mining Firms Look for More Overseas Assets," *South China Morning Post*, April 5, 2014, via Factiva.

[53] Eric Ng and Eric Timmins, "Ontario Woos China Mineral Mining Investors Despite Government Action," *South China Morning Post*, October 22, 2012, via Factiva.

[54] Eric Ng and Eric Timmins, "Ontario Woos China Mineral Mining Investors Despite Government Action," *South China Morning Post*, October 22, 2012, via Factiva.

[55] *China Daily Industry Updates*, "Iron Ore Import Licensing to Be Scrapped," June 17, 2013, via Factiva.

in world iron ore prices.[56] In the nonferrous metals sector, aluminum's share of total non-ferrous metals production in China dipped slightly in 2013 but not enough to offset the huge gains vis-à-vis other metals, like refined copper (see Figure 3). Copper is still being produced at high rates, however. According to Mysteel.com, a leading source on the steel industry, of the more than 300 mills that have blast furnaces that consume iron ore, only 10 plants, with annual capacity totaling 10 million metric tons, may close or scale back operations in 2014.[57]

Excess capacity in the metals industry has been a feature of the Chinese economy for decades. Capacity initially expanded in the 1980s to mid-1990s (see Figures 4 and 5), followed by a period of painful restructuring and the laying off of thousands of workers in China's northeastern rustbelt. These policy reforms were concurrent with the 1997–1998 Asian Financial Crisis that scaled back economy activity throughout the Asia region. Can China's new leadership repeat the politically unpopular austerity measures and capacity shedding implemented by then President Jiang Zemin?

The new leadership of President Xi Jinping has made the right noises since taking office. For example, public ordinances were issued last summer to shut down capacity in the steel and aluminum sector. At the National People's Congress in March, Premier Li Keqiang cited new targets to shed excess capacity.

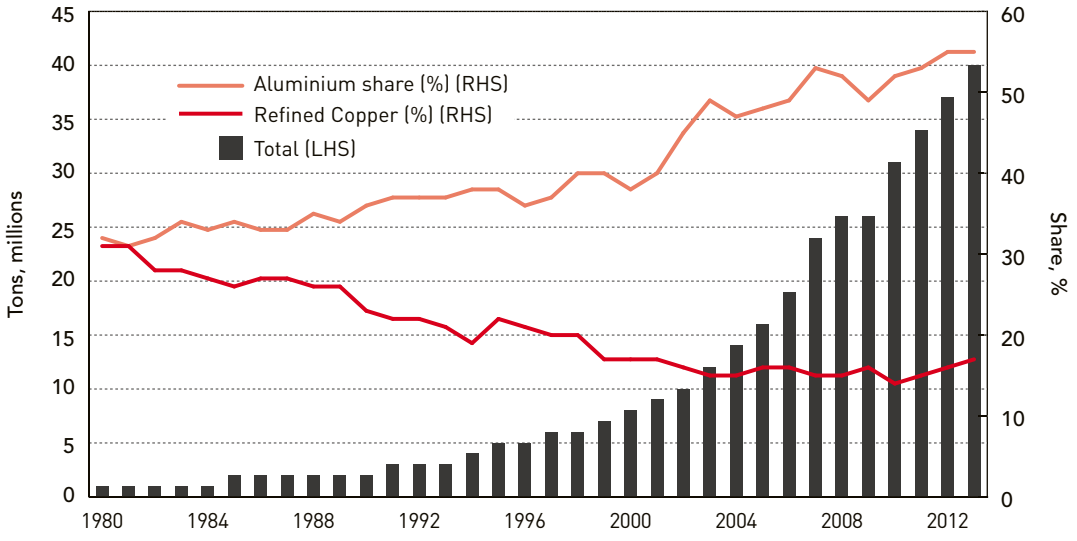
But implementation and outcomes remain uncertain. In terms of permitting corporate defaults, the only noteworthy example thus far in the mining and metals sector is Shanxi-based Haixin Iron & Steel Group, a mid-sized producer with annual capacity of 6 million tons a year. The company defaulted on 3 billion yuan ($483 million) in debt in late March 2014.[58] In early 2014, a new industry consolidation plan published on the website of the Ministry of Industry and Information Technology dropped a longstanding target to bring 60 percent of its steel sector under the control of the 10 largest enterprises by 2015. The plan said it would

[56] Bloomberg, "China's Li Swaps Steel Production for Cleaner Air: Commodities," April 10, 2014, via Factiva.

[57] Bloomberg, "China's Li Swaps Steel Production for Cleaner Air: Commodities," April 10, 2014, via Factiva.

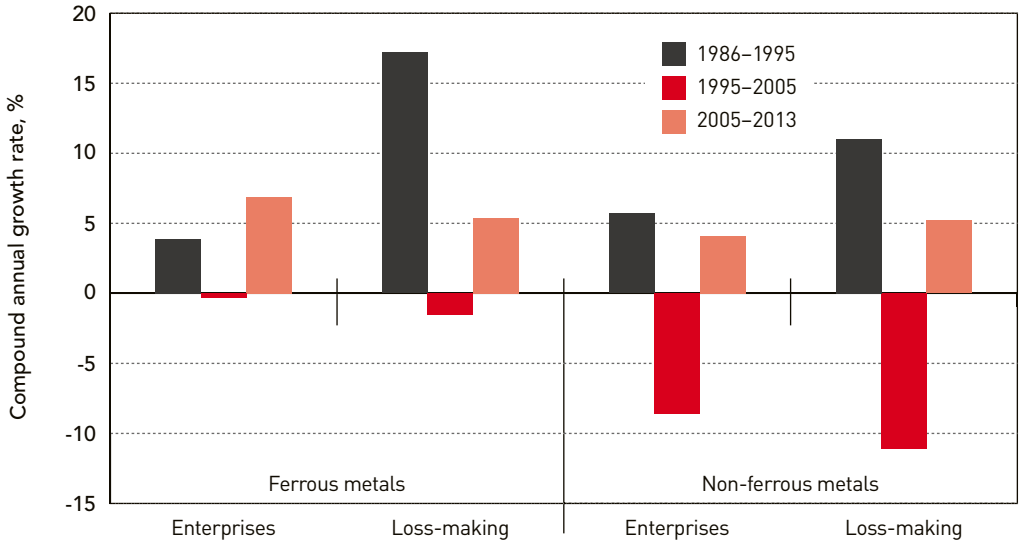
[58] Bloomberg, "China's Li Swaps Steel Production for Cleaner Air: Commodities," April 10, 2014, via Factiva.

Figure 3. China's Non-Ferrous Metal Production Volume: The Rise of Aluminum (1980–2012)



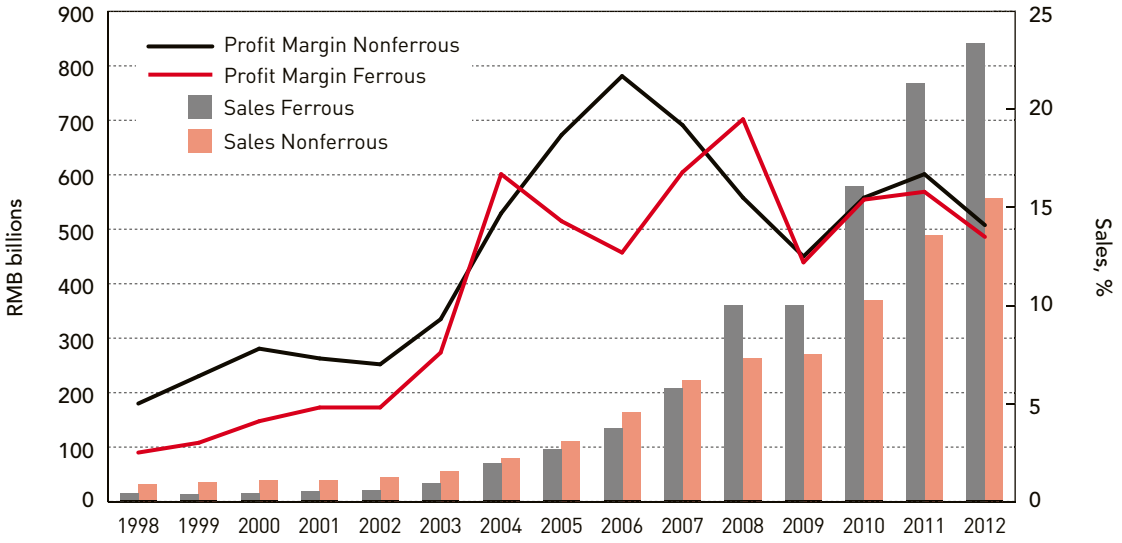
Source: China Nonferrous Metals Industry Association, via CEIC data.

Figure 4. Growth of Metals Enterprises in China: Total and Loss-making (1986–2013)



Source: China National Bureau of Statistics, via CEIC data.

Figure 5. Sales and Profit Margins of China's Metals Producers (1998–2012)



Source: China National Bureau of Statistics, via CEIC data.

continue to simplify approval procedures and make it easier for firms in bloated sectors like steel and aluminum to finance acquisitions, but the absence of a previously-articulated target was notable. Consolidation plans have been unpopular in the industry, since they force the larger firms to take on unhealthy assets. Smaller companies, in turn, are incentivized to grow as fast as possible to avoid being swallowed up, further exacerbating overcapacity.[59]

The following factors may also influence China's policy decisionmaking regarding metals production:

- *Local government incentives.* As discussed in Section 2.1, much of the answer to industry restructuring rests with local governments that depend on the metals industry for tax revenue, employment, and welfare provision. Realigning the country's fiscal structure will be essential to reducing dependency. There are mitigating factors, of course. The central government is wary of vesting too much fiscal power in the hands of local officials. There is also debate about how to develop the country's inland regions. The comparative advantage of inland regions is precisely their ability to offer cheaper coking coal and electricity for smelting processes. The aluminum sector is extremely electricity-intensive.
- *Foreign M&A.* A way around the consolidation issue is to loosen up China's internal M&A market. In February 2014, Switzerland-based global commodity trader Trafigura purchased a 30 percent equity share in Jinchuan Group's copper smelter in southern China, the first time a foreign firm has taken a major stake in such a facility in China. Trafigura would sell copper concentrate to the smelter and resell the refined metal in China and the rest of Asia. Trafigura's capital infusion is timely, as Jinchuan is investing $4.9 billion in the smelting complex.[60] A $1 billion aluminum processing joint venture is also in the works between Hangzhou Jinjiang and Boreno Alumindo Prima.[61]
- *Upgrading and innovation.* Upgrading into new product lines—specifically, high-end corrosion-resistant steel—can alleviate the pain of restructuring by raising and margins and lowering fixed costs. China has made some inroads into the high-end steel market. But it still depends on imports for many high value-added steel products such as coating plates, cold-rolled thin plates, and electrical steel sheets. According Li Xinchuang, deputy secretary of China Iron and Steel Association, "In different high-end and niche steel markets, there are still opportunities and high demand for steel companies."[62]

At the firm level, various avenues to restructuring and upgrading are being taken. Some examples from the steel sector:

- *Hebei Iron & Steel Group.* China's largest steelmaker by output, Hebei Iron & Steel Group, is investing about 8.6 billion yuan in the logistics industry during the government's 12th five-year planning period (2011-15). Wang Yifang, chairman of the Hebei-based company, says the revenue from the non-steel businesses of the group will reach 140 billion yuan by 2015.[63]
- *Baosteel.* China's second-largest steelmaker says it aims to lead in high-end production and sell 80 percent of its production abroad. A new, world-class plant in Zhanjiang, Guangdong province, with nine million tons of annual capacity, will begin production in 2016. Baosteel invests about six billion yuan (just under US$1 billion) a year in research and development. It also wants to create an online trading platform for Chinese steel products, earning commission from each transaction.[64] At the same time, Baosteel plans to keep steel production unchanged at 47 million tons in 2014 and will reduce steel production capacity in Shanghai by six million tons. The company expects mill closures for the next three years. Baosteel says it has no plans for mergers or acquisitions until after 2015.[65]
- *Wuhan Iron & Steel (WISCO).* Last August, WISCO, China's fourth-largest steelmaker, bought ThyssenKrupp Tailored Blanks, a subsidiary of Germany's leading steel producer ThyssenKrupp AG. Headquartered in Duisburg,

[59] David Stanway, "China Drops Steel Industry Consolidation Target in New Plan," Reuters, March 25, 2014, via Factiva.

[60] Reuters, "Trafigura to Buy 30 Pct of Jinchuan Copper Smelter in China," February 21, 2014, via Factiva.

[61] Toh Han Shih, "Mainland Mining Firms Look for More Overseas Assets," *South China Morning Post*, April 5, 2014, via Factiva.

[62] Du Juan, "Crude Awakening," *China Daily*, February 22, 2013, via Factiva.

[63] Du Juan, "Crude Awakening," *China Daily*, February 22, 2013, via Factiva.

[64] Chuin-Wei Yap, "China Stays in Hunt for Iron Ore Abroad," *The Wall Street Journal*, January 29, 2014, via Factiva.

[65] Victoria Ruan, "Recent slump in iron ore prices 'normal', Baosteel executive says," *South China Morning Post*, March 12, 2014, via Factiva.

Germany, the ThyssenKrupp Tailored Blanks group is a leading supplier of tailored blank steel with a global market share of roughly 40 percent.[66]

- *Shoudu Iron & Steel.* Following WISCO's lead, Shougang Jingtang United Iron Ore and Steel Co. Ltd., a subsidiary of the Shougang Group, says it will produce about 500,000 tons of automotive-steel products in 2013, a sizable increase on the 80,000 tons produced in 2011.[67]
- *Jiangsu Shagang.* China's largest private steel maker said it is building a $4.81 billion steel logistics park in Zhanjiagang in eastern China.[68]

Since 2004, the Chinese government's "trade toolkit" for mining and minerals has consisted of strict import licensing, adjustments to value-added taxation (VAT), and trade tariffs.

Trade Policy

Another important component of China's rebalancing is to decrease domestic demand for resource imports. Mining and metals play a central role in this effort. Two sets of factors exacerbate trade imbalances, and with them, excess capacity. Commodity prices, though still very high, have dropped somewhat, thereby inducing import demand. As a result, the volume of key metals imports has outpaced the value (see Appendix Figures 1-4). The other factor is that China continues to use the export sector as a release valve for excess production. Particularly notable are rising net exports of steel products (see Figure 6). Taken together, this fuels a vicious cycle of resource acquisition, commodity price inflation, and wasteful production.

Since 2004, the Chinese government's "trade toolkit" for mining and minerals has consisted of strict import licensing, adjustments to value-added taxation (VAT), and trade tariffs. Specifically, China revoked VAT rebates for metals and minerals products, which at the time were being encouraged for export along with industrial manufactures. It soon went a step further by imposing export tariffs as well. Although this policy initially proved effective in reducing raw material exports, it has not discouraged steel and processed metals exports. Mills suffering from overcapacity are eager to reduce their inventories, even if fiscal policies are not in their favor.

Can China readapt its trade policy? Recent reports show that the government is experimenting with a range of solutions. By and large, though, they comprise intermediate measures designed not to cause producers too much pain:

- *Easing import licensing restrictions.* On July 1, 2013, China abandoned its old import licensing system for metals products. Companies can now apply for iron ore and alumina oxide importing licenses online. As of July 2013, 118 steel companies and traders in China had the right to import iron ore, including the largest steelmakers. The new measures intend to allow more trade by middle- and small-scale steel companies that in the past lacked import licenses and were forced to pay commission fees to middlemen in order to import raw materials. Some analysts argue that this is the first step toward eliminating import licensing altogether.[69] Similar policies are being considered for scrap steel and gold.[70]
- *The Shanghai Free Trade Zone (SFTZ).* Launched on September 29, 2013 with the backing of Chinese Premier Li Keqiang, the SFTZ is the first free-trade zone in mainland China. One of the Zone's objectives is to expand market access for service providers, particularly in the financial industry. Baosteel's chairman has stated: "Shanghai's free trade zone will bring opportunities for Baosteel, especially in raw materials, investment, finance, and steel sales." So far, the SFTZ has not inspired much confidence. Gordon Orr, the Asia chairman of McKinsey

[66] Xinhua, "Wusteel Finishes Buying Thyssen Krupp's Unit," August 15, 2013, via Factiva.

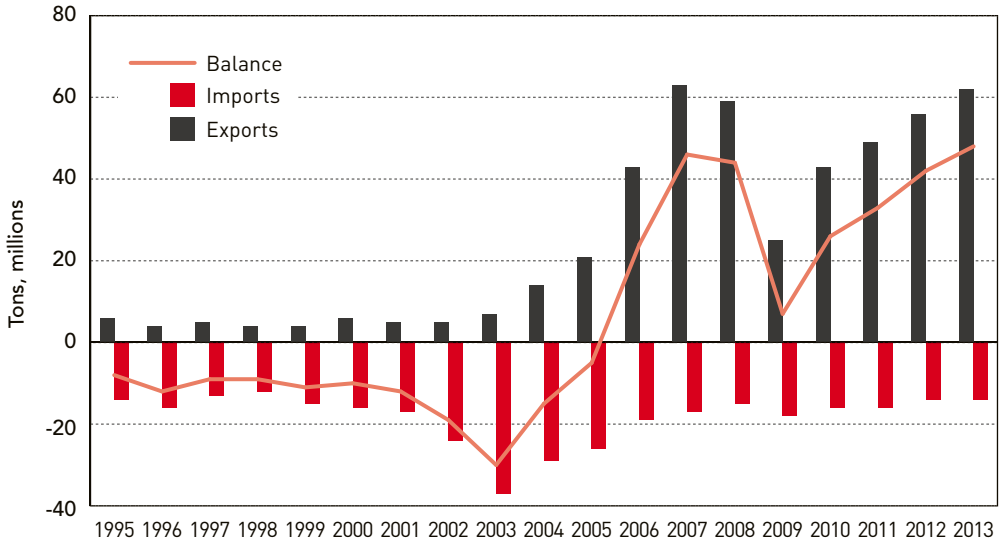
[67] Du Juan, "Crude Awakening," *China Daily*, February 22, 2013, via Factiva.

[68] Ibid.

[69] *China Daily Industry Updates*, "Iron Ore Import Licensing to Be Scrapped," June 17, 2013, via Factiva.

[70] Bloomberg, "Gold No Slam-dunk Sell in China as Aunties Pounce," November 19, 2013, via Factiva; Xinhua, "China Considers Canceling Scrap Steel Import License Administration in 2013, MOC," August 23, 2013, via Factiva.

Figure 6. China's Steel Trade (1995–2013)



Source: China Iron and Steel Association, via CEIC data.

& Company has predicted that the government would do little to develop the SFTZ in 2014.[71]

- *Steel trading platforms and swap markets.* In August 2013, Baosteel and Valin, two of China's top-ten steel firms, won approval to trade iron ore futures overseas in the Singapore-based iron ore swap market. That could boost liquidity in iron ore derivatives to hedge against volatile iron prices. Many view it as the next phase in the evolution of iron ore trading after annual benchmark prices were scrapped in 2009 in favor of quarterly benchmarks. It was also a sign that Beijing is relaxing its tight grip on trading offshore commodities futures contracts. Previously, only 31 state-owned Chinese firms were allowed to trade futures overseas, compelling unlicensed firms to use offshore units to trade derivatives. The decision to allow Baosteel and Valin onto the Singapore exchange was followed in November with the launch of iron futures contract trading on the China Dalian Commodity Exchange, which intends to rival the Singapore Exchange.[72]
- *Offshore renminbi trading.* In the first quarter of 2014, the Bohai Commodity Exchange, the only mainland exchange allowed to conduct cross-border yuan trading, launched a physical iron-ore contract. Investors can open a yuan account at an Australian branch of a Chinese bank overseas, and then register with the exchange. The idea is to facilitate direct trading with buyers at China's steel mills.[73]

The Financial Sector and China's Capital Account

China's state-owned mining and metals firms have long benefited from low-interest loans issued by China's state-owned financial institutions. These loans have been issued domestically—through the "Big-4" banks and municipal banks—as well as internationally via China's policy banks. Easy access to bank liquidity, combined with privileged access to capital markets and low dividend payout requirements, has provided a perverse incentive to invest in greater capacity and engage in risk-prone behavior overseas.

Recently, though, there are signs that loose credit policy is on the wane. The Chinese economy is contending with the "debt hangover" of the 2009 stimulus, as well as tightening liquidity in a slowing economy. At China

[71] See Iacob Koch-Weser, "Should China Join the WTO's Services Agreement?" (Washington, DC: U.S.-China Economic and Security Review Commission, March 11, 2014).

[72] Reuters, "China Relaxes Futures Grip as Steelmakers Test Swaps Market," August 1, 2013, via Factiva.

[73] Yue Li and Rhiannon Hoyle, "Chinese Yuan Iron-Ore Contract Faces Hurdles," *Wall Street Journal*, January 8, 2014, via Factiva.

Development Bank, there was recently a "changing of the guard," as its long-serving chairman Chen Yuan, the son of a former Politburo member, stepped down. According to the *Financial Times,* one external adviser to CDB estimates that "the volume of [CDB's] international lending has dropped as much as 50 percent."[74] Moreover, last July, the central bank lifted the ceiling on bank deposit rates, and in March 2014 widened the yuan's daily trading band—bold and necessary steps toward freeing up the country's capital accounts and exchange. In June and December of 2013, and during the first quarter of 2014, the central bank tightened its credit policy. At the 3rd Plenum in November, the Party announced that state-owned enterprises would be forced to raise their dividend payout ratio from 5 percent to 15 percent. Also in 2014, the government permitted defaults of trust loans and corporate bonds, as well as some high-profile corporate bankruptcies.

How are these broader changes in financial policy impacting China's mining and metals companies? Are there any specific areas in which these companies are being targeted for reform?

At this point, the evidence is mixed. In April 2014, the China Banking Regulatory Commission (CBRC) warned banks to tighten controls over letters of credit for iron ore imports. Steel mills and traders have used iron ore imports to raise money as other sources of credit dry up, as a channel for off-book or "shadow" financing. Part of the attraction of the practice is that mills benefit from lower international interest rates compared to those in China. The CBRC's move indicates a tougher stance by the government.[75]

Nonetheless, among the largest miners, profligate lending continues. China's largest metals trader Minmetals' latest income and cash flow statements suggest that the company is heavily leveraged (see Appendix Table 6). But in April 2014 the company led a Chinese consortium to purchase the Las Bambas copper mine in Peru for billions of dollars. Its partners in the deal are Hong Kong-registered Guoxin International Investment Corporation and state-owned investment giant, CITIC Group.[76] To finance the Thyssen deal, WISCO issued mid-term notes of three years with a total value of RMB 7 billion in August 2013. China Construction Bank was the underwriter. China's leading rating agency CCXI, whose independence is disputed, rated the notes at AAA.[77] WISCO has also partnered with China-Africa Development Fund to invest in more than 20 mining projects in Africa, covering iron ore, copper, gold, and other metals and minerals in Africa.[78]

Interestingly, the Chinese government appears to be looking for ways to reconcile financial sector reform with improving liquidity for mining and metals companies, to create a "win-win" dynamic. In particular, China's metal companies are spearheading innovations in China's underdeveloped corporate bond markets:

- *Dim sum bonds.* In March 2013, Minmetals became just the fourth mainland company to issue dim-sum bonds, raising $402 million. Dim-sum bonds are issued outside of China but denominated in Chinese yuan. The first dim sum bond was issued by the CDB in July 2007, and until July 2010, only Chinese and Hong Kong banks could issue them. China's National Development and Reform Commission (NDRC) then set up a pilot system whereby five mainland companies could issue three-year dim-sum bonds under a total quota of 25 billion yuan. Minmetals' dim sum bond was more than 12 billion yuan from 106 accounts, of which 16 percent were foreign central banks.[79]
- *Exchangeable bonds.* In April 2014, the steelmaker Baosteel unveiled China's first exchangeable bond, effectively monetizing a stake in New China Life Insurance that has little to do with the steel business. Apparently, Chinalco is also turning to overseas hybrid capital to deleverage its balance sheet.[80]

[74] Henny Sender, "China Tightening Rations Credit Abroad," *Financial Times,* April 21, 2014. http://www.ft.com/intl/cms/s/0/26058568-c965-11e3-bba1-00144feabdc0.html.

[75] Lucy Hornby, "China Plans Crackdown on Iron Ore Import Loans," *Financial Times*, April 28, 2014.

[76] Karen Rebelo and Silvia Antonioli, "Metal-hungry China Buys Glencore Copper Mine for $6 Bln," Reuters, April 18, 2014. http://www.reuters.com/article/2014/04/14/glencorexstrata-lasbambas-idUSL6N0N50R120140414.

[77] Xinhua, "Wusteel Finishes Buying Thyssen Krupp's Unit," August 15, 2013, via Factiva.

[78] Toh Han Shih, "Mainland Mining Firms Look for More Overseas Assets," *South China Morning Post*, April 5, 2014, via Factiva.

[79] Michelle Chen, "Central banks Among Eager Buyers of China Minmetals Dim Sum Bond," Reuters, March 21, 2013, via Factiva.

[80] "Capital Revolution," *IFR Asia* 838, April 5, 2014, via Factiva.

Environmental Regulation

China is taking tentative steps to combat pollution and the effects of climate change. The central government in January 2014 ordered 15,000 large and small factories to make real-time data about water pollution available to the public. Chinese officials also announced in February 2014 that that they were offering a total of $1.65 billion to cities and regions that make "significant progress" in air pollution control.[81] In tandem with these anti-pollution directives, Beijing continues to pour vast sums into clean technologies. New data published in February showed that for the first time China spent more on energy efficiency than the United States last year, with the $4.3 billion it invested accounting for almost a third of the world's total.[82]

These environmental regulations are also impacting the metals industry:

- *Prevented from listing.* In December 2013, Jinchuan Group, the country's largest producer of nickel, cobalt and platinum, was not allowed to list in Hong Kong due to its failure to meet environmental protection standards set forth by China's Ministry of Environmental Protection (MEP). More than 200 other companies are awaiting MEP approval in order to go public—metals companies are likely among them.[83] Notably, China National Petroleum Corporation (CNPC), the country's biggest oil producer, was placed on a pollution blacklist for the second time in six months after breaching regulations at one of its refineries.[84]
- *Industry relocation.* Baosteel Group, the second-biggest steel producer, signed a pact with the municipal government of Shanghai in July 2012 to cut its output there by more than 12 million tons—about a third of its total output—over the next five to ten years. The mill provides more than 110,000 jobs. Government researchers admit the reduction in Baosteel's local output will have an adverse effect on Shanghai's economy at a time when the city is already grappling with an economic slowdown.[85]

How committed the Party is to extensive environmental regulation is unclear, however. Have incentives for Party officials in China fundamentally changed to incorporate environmental criteria? At what point might interest groups in China's industrial sector organize to resist change? If China's export-driven economy rebounds, will environmental regulations be relaxed?

China National Petroleum Corporation (CNPC) was placed on a pollution blacklist after breaching regulations at one of its refineries.

[81] *New York Times*, "China to Reward Cities and Regions Making Progress on Air Pollution," February 13, 2014. http://www.nytimes.com/2014/02/14/world/asia/china-to-reward-localities-for-improving-air-quality.html.

[82] Louise Downing, "China Spends More on Energy Efficiency Than U.S. for First Time," Bloomberg, February 18, 2014. http://www.bloomberg.com/news/2014-02-18/china-spends-more-on-energy-efficiency-than-u-s-for-first-time.html.

[83] Xinhua, "Environmental Problems Stops China Jinchuan Group from Going Public," December 9, 2013, via Factiva.

[84] Reuters, "China's Top Oil Firm Blacklisted for Environmental Breaches," February 13, 2014. http://www.scmp.com/news/china/article/1427169/chinas-top-oil-firm-blacklisted-environmental-breaches.

[85] Daniel Ren, "Baosteel Moving Plants out of Shanghai to Cut Pollution," *South China Morning Post*, November 17, 2012, via Factiva.

Appendix

Appendix Table 1: China's Overseas Mining and Metals Investments (2005—June 2014)

Year	Month	Investor	Amount (US$ m)	Share Size	Partner/Target	Country
			Aluminum			
2006	October	CITIC and Chinalco	$940			Egypt
2007	November	Chinalco	$1,200	40%	Binladin, MMC	Saudi Arabia
2008	February	Chinalco	$12,800	11%	Rio Tinto	Australia
2009	July	Chinalco	$1,500	1%	Rio Tinto	Australia
2010	February	Chinalco	$350	35%	GIIG	Malaysia
2010	September	Bosai Minerals	$1,200	80%	Ghana Bauxite	Ghana
2011	February	Nanshan Group	$160			USA
2011	April	Chinalco	$800		Smelter Asia	Malaysia
2012	March	Bosai	$100			Guyana
2012	April	Norinco	$500		Basic Element	Russia
2013	January	China Power Investment	$5,950			Guinea
2013	February	CITIC	$470	13%	Alumina Ltd.	Australia
2013	October	Hongqiao	$600	60%	Winning Investment	Indonesia
			Copper			
2005	February	Minmetals	$550	50%	Codelco	Chile
2006	October	Jiangxi Copper	$110	75%	bcMetals	Canada
2006	November	China Nonferrous	$310		(Chambishi)	Zambia
2007	February	Zijin, Tongling, and Xiamen C&D	$190	45%, 35%, 20%	Monterrico	Peru
2007	June	Chinalco	$790		Peru Copper	Peru
2007	July	Golden Dragon	$100			Mexico
2007	November	MCC and Jiangxi Copper	$2,870			Afghanistan
2007	December	Minmetals and Jiangxi Copper	$450		Northern Peru Copper	Peru
2008	May	Chinalco	$2,160			Peru
2008	July	China Railway Engineering	$1,190	28%	Congo Simco	DRC
2008	July	MCC and Sinohydro	$1,350	40%	Congo Simco	DRC
2008	November	MCC	$1,020			Philippines
2009	May	China Nonferrous	$370		(Luanshya)	Zambia
2009	July	CIC	$1,500	17%	Teck Resources	Canada
2009	December	China Railway Construction and China Nonferrous	$650	100%	Corriente Resources	Ecuador
2010	April	Jinchuan	$120	49%	Kazakhmys	Kazakhstan
2010	September	Jinchuan	$420	100%	Continental Metals	Canada
2010	September	Norinco	$1,480		Myanmar Economic Holdings	Myanmar
2010	October	Minmetals	$2,500			Peru

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Year	Month	Investor	Amount (US$ m)	Share Size	Partner/Target	Country
2011	July	Jinchuan	$1,360	100%	Metorex	South Africa
2011	September	Minmetals	$1,280	100%	Anvil Mining	DRC
2012	February	Golden Dragon	$100			USA
2012	July	China Copper Mines	$100			Zambia
2012	September	China Nonferrous	$830			Zambia
2012	December	Hebei Steel, General Development, Tewoo	$380	35%, 25%, 20%	Palabor Mining	South Africa
2013	April	China Railway Construction and China Nonferrous	$2,040			Ecuador
2013	July	China Molybdenum	$820	80%	Rio Tinto	Australia
2013	July	Yunnan Copper-led consortium	$180	100%	Kilembe Mines	Uganda
		Iron and Steel				
2005	March	MCC	$670	85%	Highlands Pacific	Papua New Guinea
2005	October	Sinosteel	$140	50%	Midwest	Australia
2006	March	CITIC	$2,920		Mineralogy	Australia
2006	November	Sinosteel	$230	50%	Samancor Chrome	South Africa
2007	March	Sinosteel	$500			India
2007	September	Ansteel	$330	50%	Gindalbie Metals	Australia
2007	December	Sinosteel	$100	92%	Zimasco	Zimbabwe
2008	February	MCC	$370		Cape Lambert Iron	Australia
2008	February	Minmetals and Xinxing Iron	$1,200	20%, 35%	Kelachandra and Manasara	India
2008	April	Hopu	$150		Lung Ming	Mongolia
2008	July	Sinosteel	$1,320	51%	Midwest	Australia
2008	September	Jiangsu Shagang and RGL Group	$360	45%	Grange Resources	Australia
2008	December	Wuhan Iron & Steel and China Development Bank	$110			Liberia
2009	February	Hunan Valin	$770	17%	Fortescue Metals	Australia
2009	February	Shougang	$990			Peru
2009	March	Wuhan Iron & Steel	$240	20%	Consolidated Thompson	Canada
2009	April	Tianjin Pipe	$1,010			USA
2009	May	Najinzhao	$100		Cardero	Peru
2009	June	Ansteel	$130	24%	Gindalbie Metals	Australia
2009	July	Xiyang Group	$480			Russia
2009	November	BaoSteel	$240	15%	Aquila Resources	Australia
2009	November	Wuhan Iron & Steel	$250	15%	Centrex Metals	Australia
2009	November	Wuhan Iron & Steel	$400	22%	MMX Mineracao	Brazil

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Year	Month	Investor	Amount (US$ m)	Share Size	Partner/Target	Country
2009	December	CIC	$500		CVRD (Vale)	Brazil
2009	December	Shunde Rixin and Minmetals	$1,910	70%		Chile
2010	March	East China Mineral Exploration and Development Bureau (Jiangsu)	$1,200			Brazil
2010	April	China Railway Materials	$260	13%	African Minerals	Sierra Leone
2010	July	Chinalco	$1,350	45%	Rio Tinto	Guinea
2011	January	Wuhan Iron & Steel	$120	60%	Adriana Resources	Canada
2011	March	Sichuan Hanlong	$180	16%	Sundance Resources	Australia
2011	May	Shandong Iron	$1,490	25%	African Minerals	Sierra Leone
2011	July	Jilin Jien Nickel	$930			Indonesia
2011	September	Jilin Huroc Nonferrous	$2,990		Billy Indonesia	Indonesia
2011	November	Guangxi Nonferrous Metal	$500			Cambodia
2011	December	Shougang Group	$240	40%	Hiap Teck Venture Berhad	Malaysia
2012	April	Hebei Iron & Steel	$200	20%	Alderon Iron Ore	Canada
2012	June	China Nickel Resources	$1,260	61%	PT Jhonlinto	Indonesia
2012	June	China Railway Construction	$410		C.V.G. Ferrominera Orinoco	Venezuela
2012	August	Dafeng Port	$600			Indonesia
2012	August	Shenwu Group	$180			Indonesia
2012	September	Wuhan Iron & Steel	$450		ThyssenKrupp	Germany
2012	September	Sinomach	$100			Uganda
2012	December	Sinosteel	$660			Cameroon
2013	April	Tsingshan Group	$530	50%	Bintang Delapan	Indonesia
2013	July	Kingho Energy	$1,700			Sierra Leone
2013	September	Ansteel	$230	12%	Gindalbie Metals	Australia
2013	September	Tianjin Materials	$990	17%	African Minerals	Sierra Leone
		Other Non-Ferrous Metals				
2005	January	Minmetals	$500		Cubapetroleo	Cuba
2006	November	China Development Bank	$800	1%	Anglo-American	Britain
2006	November	Export-Import Bank	$2,000			DRC
2008	January	Jinchuan	$210		Tyler Resources	Mexico
2008	June	China National Nuclear	$190			Niger
2008	July	China Nonferrous	$810	50%	Tagaung Taung	Myanmar
2009	May	Guangdong Rising Asset Management	$140	20%	PanAust	Australia
2009	June	Minmetals	$1,390	51%	Oz Minerals	Australia
2009	December	Baiyin Non-Ferrous, CITIC, and Chang Xin	$190	60%	Oxus	Uzbekistan

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Year	Month	Investor	Amount (US$ m)	Share Size	Partner/Target	Country
2010	April	Sichuan Hanlong	$140	55%	Moly Mines	Australia
2010	May	Jinchuan Group and China Development Bank	$230	51%	Wesizwe Platinum	South Africa
2010	June	Yunnan Metallurgical	$100	50%	Selwyn Resources	Canada
2010	July	Hangzhou Jinjiang	$510	51%	ANTAM	Indonesia
2010	November	Chongqing Chonggang Minerals	$270	60%	AsiaIron	Australia
2011	May	CITIC, China Development Bank, Long March Capital	$470	75%	Gold One	South Africa
2011	May	Zijin Mining	$100		Glencore	Switzerland
2011	July	Sinosteel	$300			Zimbabwe
2011	August	Taiyuan Iron, CITIC, Baosteel	$1,950	15%	CBMM	Brazil
2011	August	Jilin Jien Nickel	$400			Canada
2011	October	China Nickel Resources	$270	80%	PT Yiwan Mining	Indonesia
2012	January	Jilin Jien Nickel	$100	100%	Goldbrook Ventures	Canada
2012	March	China General Nuclear and China Development Bank	$2,380	100%	Extract Resources	Australia
2012	March	Zijin Mining	$100			Russia
2012	May	Sinomach	$120	60%	Procon	Canada
2012	May	CIC	$420	5%	Polyus	Russia
2012	June	Zijin Mining	$240	100%	Norton Gold	Australia
2012	July	Hubei Changyang Hongxin	$160			Ukraine
2012	August	Zhejiang Huayou Cobalt	$350			DRC
2012	September	Shandong Gold	$240	51%	Focus Minerals	Australia
2012	December	Chengdu Tianqi Industry and CIC	$840	65% and 35%	Talison Lithium	Australia
2013	January	Minmetals	$1,570			Australia
2013	February	Guangxi Beibu	$650			Malaysia
2013	April	China Nonferrous	$750	50%	East Siberian Metals	Russia
2013	May	Qixing Group	$140		Stonewall Resources	Australia
2013	August	Shanxi Coking Coal	$140	100%	Inova	Australia
2013	September	Zhongjin Lingnan	$110	47%	Perilya	Australia

Source: Heritage Foundation, "China Global Investment Tracker." http://www.heritage.org/research/projects/china-global-investment-tracker-interactive-map.

Appendix Table 2: Impact of China's Industrial Production on Commodity Output

	Long Term	Short Term	Error of Correlation Coefficient	Long Term Price
Estimated Coefficient				
Global Index	1.37 (4.75)***	1.04 (3.44)***	-0.1 (1.8)*	
Energy	2.11 (3.84)***	1.66 (3.11)**	-0.05 -1.09	
Metals	2.13 (6.36)***	1.31 (3.87)***	-0.05 (1.68)*	
Precious Metals	0.86 (4.88)***	0.42 (1.77)*	-0.16 (3.36)***	
Soft Commodities	1.71 (4.97)***	0.96 (2.01)**	-0.08 (2.21)**	
Grain	0.16 -0.44	-0.07 -0.16	-0.1 (3.65)***	
Livestock	0.83 (3.6)***	0.2 -0.67	-0.09 (3.01)***	
Agriculture	0.6 (2.13)**	0.18 -0.57	-0.09 (3.55)***	
Estimated Coefficient				
Global Index	2.89 (7.1)***	1.87 (3.89)***	-0.09 (2.39)***	109.7
Aluminum	1.03 (4.48)***	0.39 (1.16)	-0.14 (2.26)***	1,622.80
Nickel	0.75 (1.88)*	0.64 (1.19)	-0.16 (2.46)***	7,007.20
Gold	0.92 (4.92)***	0.52 (2.16)	-0.15 (3.33)***	402.6
Corn	0.35 -1.26	-0.42 (0.73)	-0.09 (1.77)***	232.4
Wheat	0.69 (2.51)**	0.43 (0.43)	-0.14 (3.09)***	330.7
Soy	5.6 (3.99)***	0.7 (0.47)	-0.11 (0.66)***	722.3
Petroleum	1.71 (4.21)***	1.35 (2.38)	-0.03 (1.73)***	38.6

Significance of parameter: ***, **, * significant of 10%, 5%, and 1%, respectively. (Source: Authors' elaboration.)

Source: Jaramillo, Patricio, Sergio Lehmann, and David Moreno. "China, precios de commodities y desempeño de América Latina: Algunos hechos estilizados." *Cuadernos de Economía* 46, no. 133 (2009): 82.

Appendix Table 3: Top 25 Steelmakers

			Production (tons millions)					
	Company	Headquarters	2007	2008	2009	2010	2011	2012
1	ArcelorMittal	Luxembourg	116.4	103.3	77.5	98.2	97.2	93.6
2	Nippon Steel & Sumitomo Metal	Japan	35.7	37.5	26.5	35.0	33.4	47.9
3	Hebei Iron & Steel	China	31.1	33.3	40.2	52.9	44.4	42.8
4	Baosteel Group	China	28.6	35.4	31.3	37.0	43.3	42.7
5	POSCO	South Korea	31.1	34.7	31.1	35.4	39.1	39.9
6	Wuhan Iron & Steel	China	20.2	27.7	30.3	36.6	37.7	36.4
7	Jiangsu Shagang	China	22.9	23.3	26.4	30.1	31.9	32.3
8	Shougang	China	12.9	12.2	17.3	25.8	30.0	31.4
9	JFE	Japan	34.0	33.0	25.8	31.1	29.9	30.4
10	Ansteel	China	16.2	16.0	20.1	22.1	29.8	30.2
11	Shandong Iron & Steel Group	China	23.8	21.8	26.4	23.2	24.0	23.0
12	Tata Steel	India	26.5	24.4	21.9	23.5	23.8	23.0
13	United States Steel Corporation	United States	21.5	23.2	15.2	22.3	22.0	21.4
14	Nucor Corporation	United States	20.0	20.4	14.0	18.3	19.9	20.1
15	Gerdau	Brazil	18.6	20.4	14.2	21.6	20.5	19.8
16	Maanshan Iron & Steel Company	China	14.2	15.0	14.8	15.4	16.7	17.3
17	Bohai Iron & Steel Group	China	0	0	0	17.5	19.2	17.3
18	Hyundai Steel	South Korea	10.0	9.9	8.4	12.9	16.3	17.1
19	Gruppo Riva	Italy	17.9	16.0	11.3	14.0	16.1	16.0
20	Evraz	Russia	16.2	17.7	15.3	16.3	16.8	15.9
21	ThyssenKrupp	Germany	17.0	15.9	11.0	16.7	17.9	15.1
22	Severstal	Russia	17.3	19.2	16.7	14.7	15.3	15.1
23	Benxi Steel	China	7.6	7.4	9.1	22.1	16.5	15.1
24	Novolipetsk Steel	Russia	9.7	11.3	10.9	11.9	12.1	14.9
25	Valin Steel Group	China	11.1	11.3	11.8	15.1	15.9	14.1
	TOP 25		581	590	528	670	690	693
	China		188.6	203.4	227.7	297.8	309.4	302.6
	Other		391.9	386.9	299.8	371.9	380.3	390.2
	REST OF WORLD		770.5	738.7	691.5	743.3	800.3	855.2
	WORLD TOTAL		1,351.0	1,329.0	1,219.0	1,413.0	1,490.0	1,548.0

Source: Wikipedia.

Appendix Table 4: BHP Billiton Revenue by Region (2008–2013)

BHP Revenue by Region (US$M)	2008	2009	2010	2011	2012	2013	Annual Growth
Australia	5,841	4,621	4,515	5,487	5,318	4,583	-4.7%
United Kingdom	3,091	3,042	1,289	1,043	956	1,651	-11.8%
Rest of Europe	11,258	7,764	8,554	8,370	7,419	6,317	-10.9%
China	11,670	9,873	13,236	20,261	21,617	19,365	10.7%
Japan	6,885	7,138	5,336	9,002	8,920	7,783	2.5%
Rest of Asia	10,111	9,280	9,840	15,805	15,035	13,642	6.2%
North America	4,771	4,020	5,547	6,167	8,099	8,417	12.0%
South America	2,640	1,652	2,013	2,592	2,013	1,782	-7.6%
Southern Africa	2,003	1,374	1,227	1,548	1,437	1,316	-8.1%
Rest of World	1,203	1,447	1,241	1,464	1,412	1,112	-1.6%
Total Revenue	59,473	50,211	52,798	71,739	72,226	65,968	2.1%

Composition (%)	2008	2009	2010	2011	2012	2013	Change in Share
Australia	9.8%	9.2%	8.6%	7.6%	7.4%	6.9%	-2.9%
United Kingdom	5.2%	6.1%	2.4%	1.5%	1.3%	2.5%	-2.7%
Rest of Europe	18.9%	15.5%	16.2%	11.7%	10.3%	9.6%	-9.4%
China	19.6%	19.7%	25.1%	28.2%	29.9%	29.4%	9.7%
Japan	11.6%	14.2%	10.1%	12.5%	12.4%	11.8%	0.2%
Rest of Asia	17.0%	18.5%	18.6%	22.0%	20.8%	20.7%	3.7%
North America	8.0%	8.0%	10.5%	8.6%	11.2%	12.8%	4.7%
South America	4.4%	3.3%	3.8%	3.6%	2.8%	2.7%	-1.7%
Southern Africa	3.4%	2.7%	2.3%	2.2%	2.0%	2.0%	-1.4%
Rest of World	2.0%	2.9%	2.4%	2.0%	2.0%	1.7%	-0.3%

Source: BHP annual reports 2010, 2013.

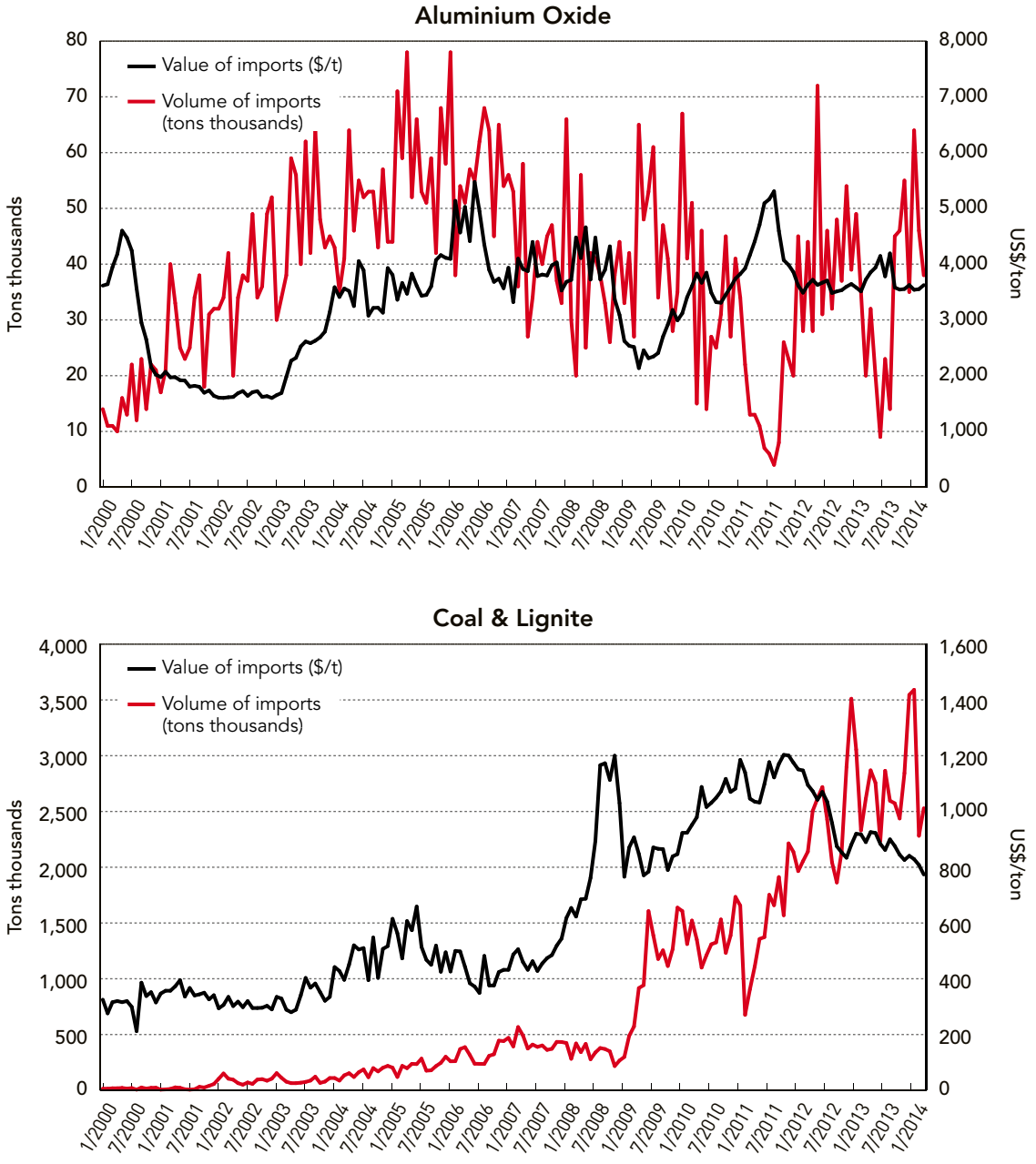
Appendix Table 5: Crude Steel Output, China vs. Rest of World (1980–2013)

	Tons millions									
	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
China	37.1	46.8	66.4	95.4	128.5	355.8	638.7	702.0	716.5	779.0
World w/o China	**679.3**	**672.1**	**704.1**	**657.8**	**721.7**	**792.0**	**794.0**	**835.0**	**828.5**	**803.5**
Japan	111.4	105.3	110.3	101.6	106.4	112.5	109.6	107.6	107.2	110.6
India	9.5	11.9	15.0	22.0	26.9	45.8	69.0	73.5	77.6	81.2
North America	124.8	102.8	111.4	122.7	135.4	127.6	111.6	118.7	121.6	87.0
EU27	208.0	199.0	191.8	190.7	193.4	195.6	172.8	177.7	168.6	165.6
Rest of World	225.5	253.1	275.5	220.8	259.5	310.5	331.1	357.6	353.5	359.1
World (65 countries)	**716.4**	**718.9**	**770.4**	**753.2**	**850.2**	**1,147.8**	**1,432.8**	**1,537.0**	**1,545.0**	**1,582.5**

Composition (%)	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
China	5.2%	6.5%	8.6%	12.7%	15.1%	31.0%	44.6%	45.7%	46.4%	49.2%
World w/o China	**94.8%**	**93.5%**	**91.4%**	**87.3%**	**84.9%**	**69.0%**	**55.4%**	**54.3%**	**53.6%**	**50.8%**
Japan	15.5%	14.6%	14.3%	13.5%	12.5%	9.8%	7.6%	7.0%	6.9%	7.0%
India	1.3%	1.7%	1.9%	2.9%	3.2%	4.0%	4.8%	4.8%	5.0%	5.1%
North America	17.4%	14.3%	14.5%	16.3%	15.9%	11.1%	7.8%	7.7%	7.9%	5.5%
EU27	29.0%	27.7%	24.9%	25.3%	22.7%	17.0%	12.1%	11.6%	10.9%	10.5%
Rest of World	31.5%	35.2%	35.8%	29.3%	30.5%	27.1%	23.1%	23.3%	22.9%	22.7%
World (65 countries)	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

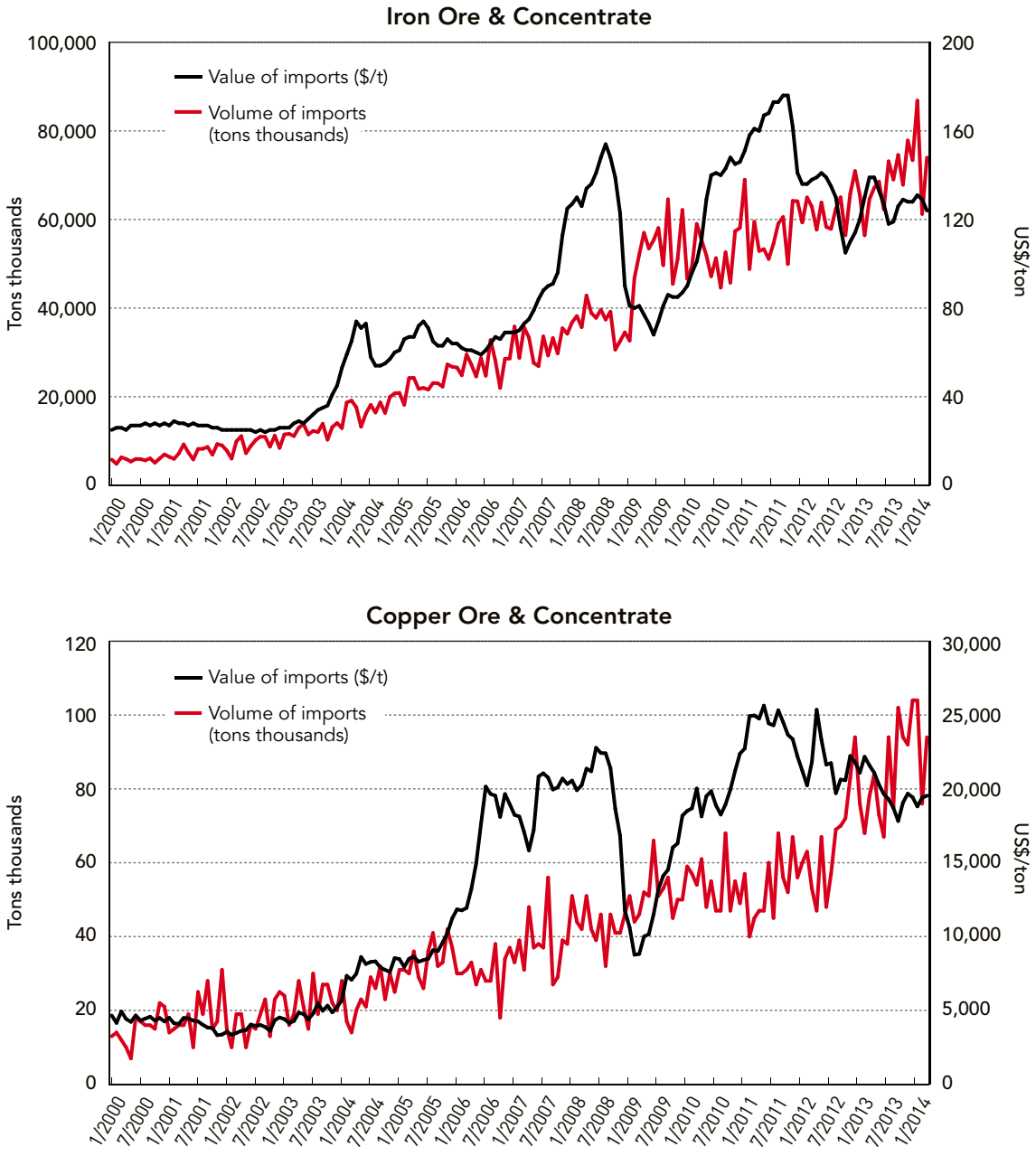
Source: World Steel Association.

Appendix Figure 1: China's Imports of Key Metals: Volume and Unit Value



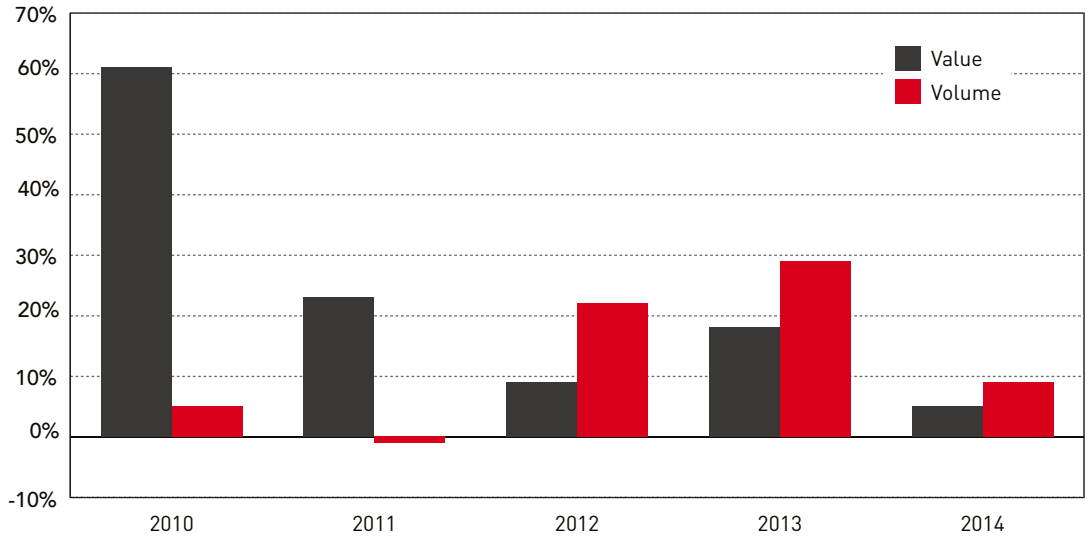
Source: China General Administration of Customs, via CEIC data.

Appendix Figure 1: China's Imports of Key Metals: Volume and Unit Value—continued



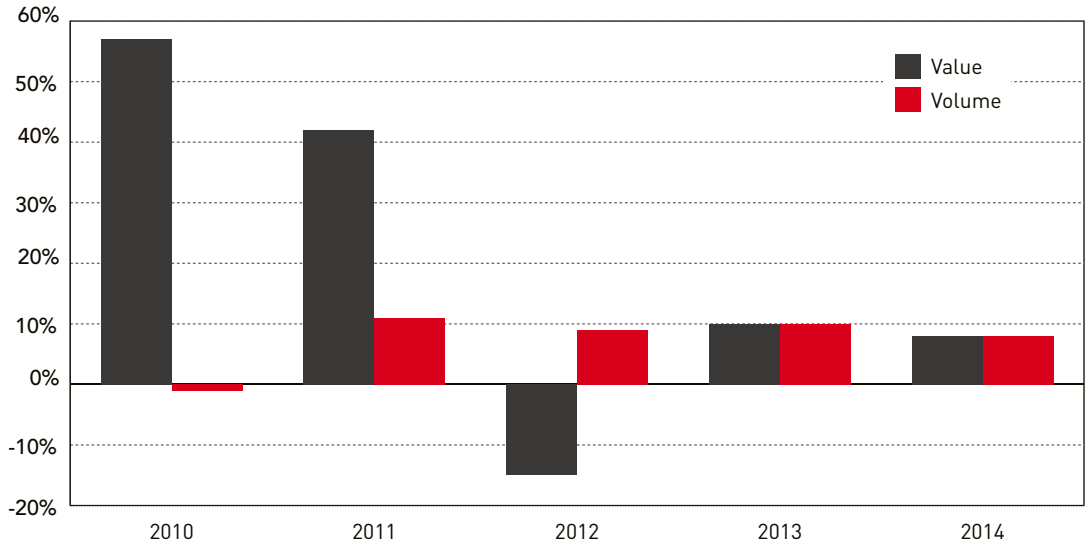
Source: China General Administration of Customs, via CEIC data.

Appendix Figure 2: Annual Growth in China's Copper Imports—Value vs. Volume



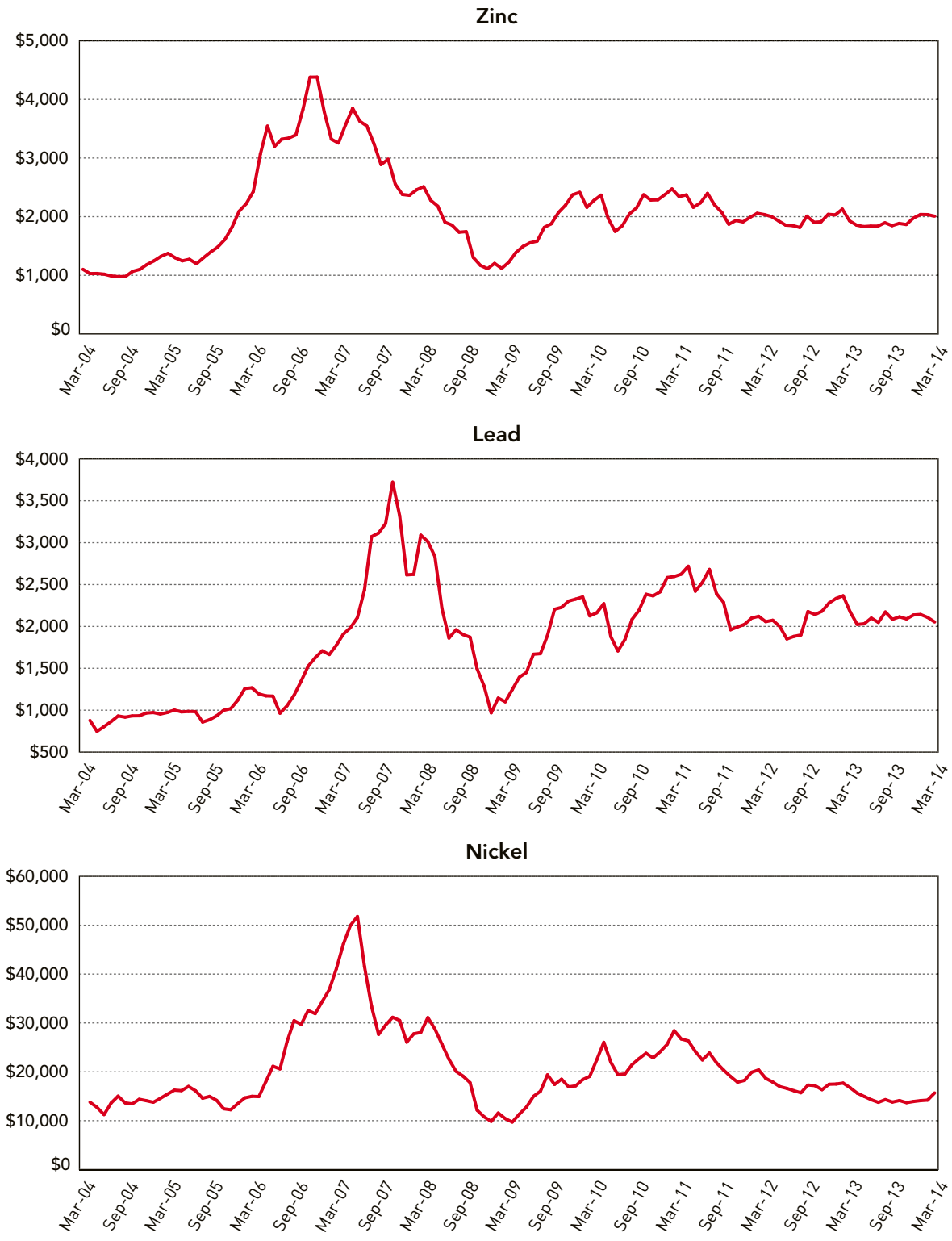
Source: China General Administration of Customs, via CEIC data.

Appendix Figure 3: Annual Growth in China's Iron Ore Imports—Value vs. Volume



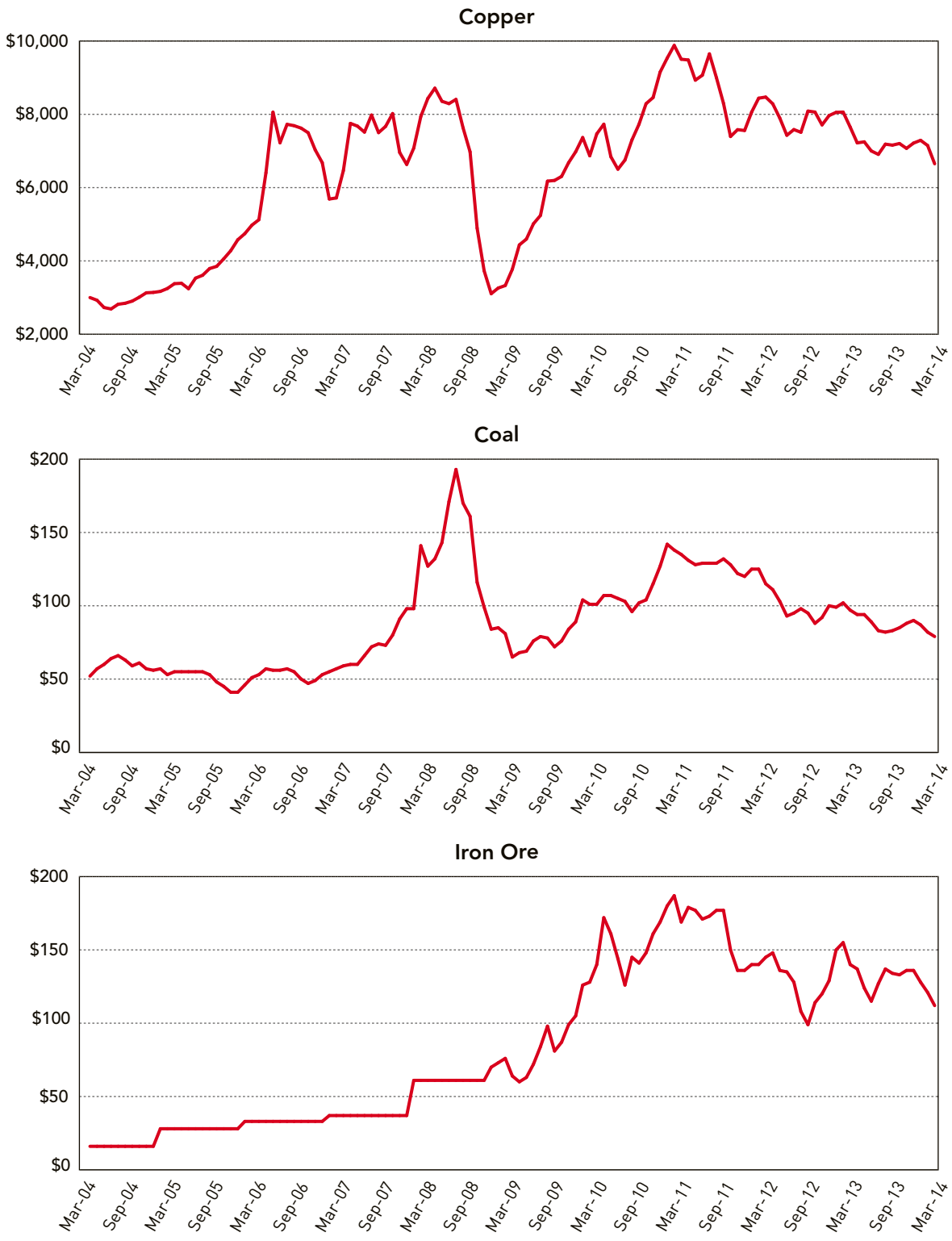
Source: China General Administration of Customs, via CEIC data.

Appendix Figure 4: Select Metals Prices (US$/ton)



Source: World Bank, via IndexMundi.

Appendix Figure 4: Select Metals Prices (US$/ton)—continued



Source: World Bank, via IndexMundi.

Appendix Table 6: Minmetals Financials

Income Statement US$ millions	2010	2011	2012	2013
TOTAL REVENUES	1,919.9	2,229.5	2,509.0	2,470.7
Cost of Goods Sold	1,041.6	1,302.0	1,716.6	1,637.3
GROSS PROFIT	878.3	927.5	792.4	833.4
OTHER OPERATING EXPENSES, TOTAL	278.2	397.3	421.0	559.0
OPERATING INCOME	600.1	530.2	371.4	274.4
Interest Expense	(24.2)	(26.5)	(45.9)	(50.3)
Interest and Investment Income	4.3	2.4	4.5	2.8
NET INTEREST EXPENSE	(19.9)	(24.1)	(41.4)	(47.5)
EBT, EXCLUDING UNUSUAL ITEMS	562.8	504.8	327.5	223.0
EBT, INCLUDING UNUSUAL ITEMS	482.8	709.1	341.5	201.1
Income Tax Expense	126.6	225.5	107.4	78.6
Minority Interest in Earnings	(21.0)	(33.6)	(25.0)	(19.2)
Earnings from Continuing Operations	356.2	483.6	234.1	122.5
EARNINGS FROM DISCONTINUED OPERATIONS	74.2	90.9	—	—
NET INCOME	409.4	540.9	209.1	103.3

Cash Flow US$ millions	2010	2011	2012	2013
NET INCOME	409.4	540.9	209.1	103.3
DEPRECIATION & AMORTIZATION, TOTAL	299.6	312.5	329	456.3
CASH FROM OPERATIONS	816.2	800.5	557.9	554.5
Capital Expenditure	-307.7	-380.3	-641.9	-558.2
Sale of Property, Plant, and Equipment	2.5	4.2	0.6	0.3
Cash Acquisitions	-100	—	-1360.5	—
Divestitures	—	509.1	28.5	—
Sale (Purchase) of Real Estate Properties	—	—	—	1.1
Sale (Purchase) of Intangible Assets	—	—	-19.5	-58.1
Investments in Marketable & Equity Securities	-99.9	245	-74.3	-45.7
CASH FROM INVESTING	-505.6	280.2	-2067.1	-660.6
Long-Term Debt Issued	—	—	1351.0	250.0
TOTAL DEBT ISSUED	—	—	1351.0	250.0
Long Term Debt Repaid	-1.7	-712.4	-828.8	-448.5
TOTAL DEBT REPAID	-1.7	-712.4	-828.8	-448.5
Issuance of Common Stock	—	494.3	—	—
Other Financing Activities	-388.2	-168.5	-87.7	345.5
CASH FROM FINANCING	-389.9	-386.6	434.5	147.0
Foreign Exchange Rate Adjustments	6.4	4.2	0.6	0.8
Miscellaneous Cash Flow Adjustments	—	—	73.3	—
NET CHANGE IN CASH	-72.9	698.3	-1000.8	41.7

Source: Minmetals Annual Report 2013.

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