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Final Report

Analysis of Market-Distortions in the Chinese Non-Ferrous Metals Industry



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Yearly average exchange rate of the RMB to the Euro (interbank)
(1 Yuan RMB equals x Euro)

2010	0.111
2011	0.111
2012	0.123
2013	0.121
2014	0.122
2015	0.144
2016	0.136

All prices and values in this report are originally quoted in Yuan RMB. All Euro notations are provided for reference only. Euro notations are based on yearly average exchange rates and are subjected to intertemporal fluctuations as well as inexactitudes caused by rounding.

Non-standard Abbreviations Used in the Text:

AD	Anti-Dumping
APT	Ammonium Paratungstate
CAGR	Compound Annual Growth Rate
CDB	China Development Bank
CVD	Countervailing Duty
DES	Debt-equity Swap
EIT	Enterprise Income Tax
EITL	Enterprise Income Tax Law
FIE	Foreign-invested Enterprise
FYP	Five Year Plan/Program
GPA	WTO Agreement on Government Procurement
HNTE	High and New Technology Enterprise
LUR	Land Use Rights
MLP	Medium- and Long-Term Science and Technology Development Plan
NFM	Non-ferrous Metals
SEI	Strategic Emerging Industries
SOE	State-Owned Enterprise
SSSR	Supply Side Structural Reforms
TO	Tungsten oxide
VAT	Value Added Tax

Abbreviations of Administrative Bodies and Communist Party

Institutions Mentioned in the Text:

AMC	Asset Management Corporation
CBRC	China Banking Regulatory Commission
CCB	China Construction Bank
CCCMC	China Chamber of Commerce of Metals, Minerals and Chemicals Importers and Exporters
CNIA	China Nonferrous Metals Industry Association
CNMC	China Nonferrous Metals Corporation
CPPCC	China People's Consultative Conference
CSRC	China Securities Regulatory Commission
CTIA	China Tungsten Industry Association
GACC	General Administration of Customs
GOC	Government of China
ICSG	International Copper Study Group
ILZSG	International lead zinc study group
INSG	International Nickel Study Group
ISSF	International Stainless Steel Forum
ITRI	International Tin Research Institute
MEP	Ministry of Environmental Protection
MIIT	Ministry of Industry and Information Technology
MLR	Ministry of Land and Resources
MMI	Ministry of Metallurgical Industry
MOF	Ministry of Finance
MOFCOM	Ministry of Commerce
MOST	Ministry of Science and Technology
NDRC	National Development and Reform Commission
PBOC	People's Bank of China
PC	People's Congress
SASAC	State Owned Asset Supervision and Administration Commission
SAT	State Administration of Taxation
STE	State Trading Enterprises

EXECUTIVE SUMMARY - DEUTSCH

Die vorliegende Studie untersucht die institutionellen Rahmenbedingungen innerhalb derer die chinesische Nichteisen (NE)-Metallindustrie operiert und geht dabei insbesondere der Bedeutung von Marktprozessen bzw. staatlicher Steuerung für deren Geschäftstätigkeit nach. Auf der Grundlage einer umfassenden Auswertung chinesischer Partei- und Regierungsdokumente, Planungsunterlagen und Unternehmensberichten etc. kommt die Studie zu dem Ergebnis, dass die chinesische NE-Metallindustrie von **massiven Marktverzerrungen** geprägt wird. Diese Verzerrungen wirken in die globalen Märkte hinein und beeinträchtigen die Geschäftstätigkeit europäischer Unternehmen bis hin zur Existenzgefährdung. Die Studie kommt zu dem Schluss, dass die leistungs- und wettbewerbsbasierte Marktordnung Europas durch besondere Sicherungsmechanismen vor Marktverzerrungen, die von dem chinesischen System eng verzahnter Regierungs- und Geschäftsinteressen ausgehen, geschützt werden muss. **Handelspolitische Schutzmechanismen, wie sie im Rahmen der „Nicht-Marktwirtschafts“-Klassifikation** Chinas umgesetzt wurden, müssen aufrechterhalten oder durch andere Schutzmechanismen ersetzt werden.

Die wichtigsten Erkenntnisse der Studie zu den Funktionsprinzipien der chinesischen NE-Metallindustrie und ihrer Einbindung in die polit-ökonomischen Strukturen Chinas stellen sich wie folgt dar.

Die chinesische Regierung definiert die NE-Metallindustrie als von **strategischer Bedeutung** für die chinesische Volkswirtschaft und deren weitere Entwicklung. Aus diesem Verständnis heraus erfährt die NE-Metallindustrie intensive Beachtung von Regierungsorganen aller Ebenen und ist ein unabdingbarer Bestandteil aller industriepolitischen Initiativen der Regierung. Die NE-Metallindustrie ist dementsprechend ein zentrales Element der chinesischen Planungsinitiativen wie der *Strategic Emerging Industry Initiative* (seit 2009), dem *Made in China 2025 Plan* (seit 2015) sowie anderen wichtigen Programmen. Der **Made in China 2025 Plan** führt so zum Beispiel detailliert aus, die Entwicklung welcher Metallspezifikationen in den Feldern der High-end-Werkzeugmaschinen und Robotik, Luft- und Raumfahrttechnik, High-end-Schienenverkehrsausrüstungen, energieeinsparenden und alternativen Antriebstechnologien sowie der neuen Werkstoffe in den kommenden Jahren durch ein breites Spektrum an staatlichen Fördermaßnahmen forciert werden soll.

Die chinesische Regierung **greift direkt in die Preissetzung** für die Produktionsfaktoren Arbeit, Boden und Kapital sowie grundlegende Rohstoffe und Inputs ein. Die hierdurch hervorgerufenen Preisverzerrungen pflanzen sich durch die gesamte Wertschöpfungskette fort und führen somit auch auf den Endproduktmärkten zu „falschen“ Preisen. Die tatsächlich existie-

renden Knappheiten werden nicht korrekt wiedergegeben und die Gewinn- und Verlustrechnung aller involvierten Akteure verfälscht.

Im Widerspruch zu den ursprünglichen Verlautbarungen der chinesischen Regierung ist die gegenwärtige **debt-equity swap** Initiative, mit der Unternehmensschulden in Eigenkapital umgewandelt werden, nicht marktgetrieben. Stattdessen wird sie eingesetzt, um notleidende, aber als strategisch wichtig eingestufte Unternehmen zu unterstützen und zu rekapitalisieren. In der ersten Runde dieses Programms kamen zwei Unternehmen der NE-Metallindustrie so in den Genuss von milliardenschweren Kapitalspritzen. Für die nächsten Rekapitalisierungsrunden stehen nun sieben weitere Unternehmen der NE-Metallindustrie auf der Liste derer, die von entsprechenden Kapitalmaßnahmen profitieren sollen.

Die chinesische NE-Metallindustrie kommt traditionell in den Genuss **umfassender finanzieller und nicht-finanzieller Förderungen** durch den chinesischen Staat. Dies ist auch gegenwärtig der Fall; eine Änderung dieser Situation in der Zukunft ist nicht absehbar.

Die Auswertung von Unternehmensdaten von 65 Unternehmen der NE-Metallindustrie, die zwischen 2010 und dem ersten Halbjahr 2016 auf dem Kapitalmarkt durch die Emission von Aktien oder Unternehmensanleihen aktiv geworden sind, bietet einen Einblick in die Dimensionen, in denen der chinesische Staat Subventionen an den Unternehmenssektor austeielt. Allein die genannten Unternehmen haben in besagtem Zeitraum Subventionen (verbucht als betriebsfremdes Einkommen) im Wert von über **41,6 Mrd. Yuan RMB (5,2 Mrd. Euro)** erhalten. In Summe machen diese Fördermittel mehr als **44 % der ausgewiesenen Nach-Steuergewinne** dieser Unternehmen aus. Zusätzlich hierzu kamen sie in den Genuss von Subventionen (verbucht als passive Rechnungsabgrenzungsposten) im Wert von über **16,5 Mrd. Yuan RMB (2,1 Mrd. Euro)**. Im Rahmen der Studie konnten somit nicht-marktkonforme Zuwendungen an Unternehmen der chinesischen NE-Metallindustrie in Höhe von **7,3 Mrd. Euro** identifiziert und dokumentiert werden.

Hauptnutznießer der Subventionszahlungen chinesischer Regierungsorgane im NE-Metallsektor sind Staatsunternehmen und unter diesen eine kleine Gruppe von sehr großen Akteuren. Diese Unternehmen werden bewusst zu „**National Champions**“ gemacht, die dann auch auf globaler Ebene aus einer Position der Stärke heraus agieren sollen.

Unter den mehr als 4.000 individuellen Subventionszahlungen (verbucht als betriebsfremdes Einkommen) der betrachteten Unternehmen stechen **Subventionen für Energie (d.h. Stromverbrauch)** durch ihre besondere Höhe hervor. Profiteure waren in erster Linie chinesische Staatsunternehmen aus der Aluminiumindustrie. In der Regel befinden sich Kraftwerke und

NE-Metallhütten gemeinsam im staatlichen Eigentum. Preisnachlässe, die insgesamt bis zu einem Drittel betragen können, sind auf staatlicher und regionaler Ebene weit verbreitet.

Andere Subventionsleistungen werden im Rahmen von Programmen ausgegeben, die explizit der **Förderung von Produktionsverlagerungen, Maßnahmen zur besseren ökologischen Verträglichkeit, technischen Innovationen, Initiativen zur lokalen industriellen (Wieder-)Belebung, der Entwicklung von Handelsmarken und Patenten, Forschung & Entwicklung**, u.a. dienen. Unabhängig vom Programmtitel führen diese Subventionszahlungen aber zu einer nicht-marktgerechten (finanziellen) Stärkung der geförderten Unternehmen und verleihen diesen eine Durchsetzungskraft im Wettbewerb, die sie sich nicht auf dem Markt erarbeitet haben.

Die verzerrten Marktstrukturen in China haben u.a. zur Ausbildung **massiver Überkapazitäten** geführt. So weisen zum Beispiel die Aluminium-, Blei- und Wolframindustrien Produktionskapazitäten auf, die weit über den Marktbedarfen liegen. Die chinesischen Überkapazitäten werfen einen langen Schatten auf die globalen Märkte. Sie beeinträchtigen die Rentabilität der europäischen Akteure, indem sie grundsätzlich das Preisniveau auf den Absatzmärkten drücken und zusätzlich Verdrängungseffekte auf Heimat- und Drittmärkten auslösen.

Die chinesische NE-Metallindustrie steht nicht in einem direkten, unmittelbaren Marktzusammenhang mit ihren weltweiten Konkurrenten und Partnern. Die chinesische Regierung übt eine **strenge Kontrolle über die Preise und Volumina** aller NE-Metallprodukte aus, die grenzübergreifend gehandelt werden. Zu diesem Zweck unterhält die chinesische Regierung ein breites Arsenal an Instrumenten mittels derer sie die Handelsströme im Sinne ihrer industriepolitischen Ziele lenkt. Die chinesische Handelspolitik ist von daher als die Ausübung von **Industriepolitik an der Schnittstelle zum Weltmarkt** zu charakterisieren. Die wichtigsten dieser Instrumente, mit denen die chinesische Regierung eine **detailgenaue und flexible Mikrosteuerung** aller grenzübergreifenden Warenströme umsetzt, umfassen sowohl auf der Export- wie auch der Importseite Steuern und Steuererlasse, Zölle, Quoten, Lizenzen, explizite Verbote und Förderungen, etc.

Als grundlegendes Prinzip dieser Maßnahmen kann identifiziert werden: **Gefördert** wird die Einfuhr von Rohstoffen (Erze, Konzentrate, Schrotte, etc.) und von modernsten Anlagen und Werkzeugmaschinen. Gefördert wird zudem die Ausfuhr von Metallprodukten höherer Wertschöpfungsstufen. Dem gegenüber steht die **Einschränkung** bzw. das **Verbot** der Ausfuhr von Rohstoffen (Erze, etc.) und Produkten am Beginn der Wertschöpfungskette, sowie von weiterverarbeiteten Produkten, für die in China eine erhöhte Nachfrage besteht.

Im Mittelpunkt all dieser Maßnahmen (in der Binnenwirtschaft wie auch an der Schnittstelle zum Weltmarkt) steht die Vision einer **starken chinesischen Industrie**, die auf modernsten technologischen Standards basiert. Die chinesische Volkswirtschaft soll von ihrem aktuellen Status eines Lieferanten grundlegender Produkte geringen technologischen Gehalts am Beginn der Wertschöpfungskette zu einem Akteur aufsteigen, der in der internationalen Arbeitsteilung **hochwertige Endprodukte** anbieten kann.

Die **Geschäftstätigkeit europäischer Unternehmen** wird durch die verzerrten Marktstrukturen in China und die massiven Interventionen der chinesischen Regierung in die Industriestrukturen, die technologische Ausrichtung wie auch die Geschäftstätigkeit einzelner Unternehmen in **erheblichem Maße beeinträchtigt**. Die Entstehung und das langfristige Fortbestehen massiver Überkapazitäten setzen das globale Preisniveau unter Druck und beeinträchtigen die Rentabilität europäischer Anbieter. Selektive Regierungseingriffe in den grenzübergreifenden Güterverkehr verhindern zudem einen marktgerechten Ausgleich der globalen Ungleichgewichte, die durch Marktverzerrungen in China ausgelöst werden. Von entscheidender Bedeutung ist dabei, dass chinesische Firmen aufgrund ihrer engen Verzahnung mit der Regierung, ihrer Erfüllungsfunktion für strategische Regierungsziele und nicht zuletzt ihrer substanziellen staatlichen Subventionierung offensichtlich „zu politisch geworden sind, als dass sie scheitern dürften“. Auch mit langfristigen operativen Verlusten werden diese Unternehmen am Leben und ihre Kapazitäten im Markt gehalten. In der Folge werden europäische Unternehmen mit der Gefahr konfrontiert, von chinesischen Wettbewerbern aus dem Markt gedrängt zu werden. Chinesischen Wettbewerbern, die ihre offenbarte Wettbewerbskraft nicht aus überlegenen Managementfähigkeiten, Produktivitätsleistungen oder natürlichen Kostenvorteilen ziehen, sondern aus verzerrten Marktstrukturen, die von chinesischen Regierungsorganen zu ihrem Vorteil manipuliert worden sind. Vor diesem Hintergrund ist es zwingend notwendig, dass in Europa **handelspolitische Schutzmechanismen** in Kraft bleiben und in Kraft gesetzt werden, die einen fairen Marktwettbewerb unter allen Akteuren garantieren.

EXECUTIVE SUMMARY - ENGLISH

This study looks into the institutional framework governing the Chinese economy and its non-ferrous metals sector. It focusses especially on the role markets as well as government interventions play for their operations. Based on an extensive analysis of Chinese Communist Party and government documents, plans and programmes, company reports, etc., this study documents **massive distortions** in the Chinese economy and its non-ferrous metals sector in particular. These distortions are spreading over the global markets and seriously affect European firms endangering their business models and mere existence. The study comes to the conclusion that an **institutional airlock must be upheld** to protect the European merit-based competitive market order from distortions emanating from the Chinese system of inter-locking state-business interests. Trade defence mechanisms in line with the former **“non-market” economy practices are indispensable**.

Major insights into the operating principles of the Chinese non-ferrous metals industry and its embeddedness in the Chinese politico-economic set-up include the following:

The government of China (GOC) defines the non-ferrous metals industry (NFM) to be of **strategic importance** for the Chinese economy and its further development. As such the NFM sector receives substantial attention by GOC agencies of all levels and is an inalienable part of all Chinese **industrial policy** initiatives. In consequence, the NFM sector constitutes a core element of government planning in the context of the *Strategic Emerging Industry Initiative* (launched in 2009), the *Made in China 2025 Plan* (launched in 2015) as well as other high level programmes. The ***Made in China 2025 Plan***, e.g. provides very detailed directions for non-ferrous metal specifications to be developed and promoted in the fields of high-end machine tools and robots, aerospace equipment, advanced rail transport equipment energy saving and new energy vehicles as well as new materials. A broad range of governmental promotional programmes and policy tools has been put in place for this purpose.

GOC directly **intervenes in the pricing** of capital, labour, land, raw-materials and basic inputs to the production process. Although the prices for final products are mostly determined by market mechanisms, the price distortions created at the beginning of the value chain cast long shadows at these very prices and create “wrong” price signals that do not reflect the true scarcities in the industry and distort the profit/loss balances of all players involved.

In contrast to former declarations by GOC the contemporary **debt-equity swaps** initiative is not market-driven. It is rather utilized to support ailing firms deemed to be of strategic im-

portance for (local) governments. Two firms of the non-ferrous metals industry profited from such deals in the first round, and received billions (RMB and Euro) in terms of equity injections. Seven more are standing in line to take advantage from the next rounds of this recapitalization programme.

The Chinese NFM sector has consistently benefited from **generous financial and non-monetary support** and continues to do so to the present day.

The analysis of 65 firms of China's NFM sector that have accessed the capital markets with the emission of stocks and corporate bonds provides an insight into the volumes of subsidies handed out by Chinese government agencies. These firms have received subsidies accounted as non-operating income amounting to more than **41.6 billion Yuan RMB (5.2 billion Euro)** from 2011 to the first half of 2016. Between 2011 and 2015, these grants make up 44% of these companies' aggregate after tax profits. In addition they received/realized another **16.5 billion Yuan RMB (2.1 billion Euro)** in the form of deferred income subsidies. As such, this study identifies and documents non-market based governmental allowances to companies of the Chinese NFM industry valued at 7.3 billion Euro.

Main beneficiaries of GOC subsidy disbursements in the Chinese NFM sector are state-owned enterprises (SOE) and amongst these a small group of very large players. These firms are obviously groomed to become **national champions with a global impact**.

Among the over 4,000 individual subsidy transactions (non-operating income, only) received by the 65 enterprises since 2011, **energy subsidies** stand out due to their sheer magnitude. These have been profiting most Chinese state-owned enterprises operating in the aluminium sector. Aluminium Corp of China for example has received more than RMB 500 million (more than 60 million Euro) every single year between 2012 and 2014 allowing for a reduction of its total energy costs by nearly 3%.

Other non-operating income subsidies are being disbursed in the context of programmes for **plant relocations, green development, technology innovation, industry revitalization, trademark and patent development, research & development**, etc. Irrespective of the programme title under which these subsidies are being disbursed, they unduly strengthen the financial constitution of the receiving firms and grant them competitive strengths not earned in the market arena.

China's distorted market structures have been instrumental for the evolution of **massive overcapacities**. E.g. China's aluminium, lead and tungsten industry are featuring production

facilities of a size way beyond market requirements. These Chinese overcapacities are throwing long shadows in the global markets and threaten the viability of European players as they lead to generally depressed price levels coupled with lost sales to former customers on home and third markets.

China's domestic non-ferrous metals industry is not standing in a direct, un-mediated relationship with its global counterparts. The GOC is upholding **strict control over the volumes and prices** at which products of the non-ferrous metals industry are allowed to enter or leave the Chinese economy. In order to do so the GOC maintains a large variety of instruments to direct trade flows in line with the national industrial policy agenda. China's trade policy should thus be understood as **industrial policy at the global markets interface**. The most important of these instruments include import and export duties, quotas, licenses, explicit restrictions and promotional subsidies, taxes and tax rebates that allow for a **flexible micro-management of all cross-border flows**.

As a general principle the import of raw materials (ores, scrap, etc.) and advanced machinery required for industry operations is **promoted** by government as well as the export of processed metal products. Tight **restrictions** and outright bans apply to the export of raw materials (ores, etc.) located at the very beginning of the value chain and processed goods in scarce supply in the domestic economy.

At the core of all these initiatives (domestic and at the global markets interface) is the vision of China as a **strong manufacturing country** with state-of-the-art technological capability and to transform the country from a supplier of basic commodities into a **provider of high end finished products** in the global division of labour.

The operations of **European firms are seriously affected** by the distorted market structures in China and the massive interventions of the GOC into the industry structure, its technological set-up and development as well as the business operations of individual firms. Massive overcapacities allowed to evolve and persist in the Chinese market are depressing global prices and undermine business models. Selective interventions in cross-border transactions prevent a balancing out of global market imbalances caused by distortions originating in China. And most importantly, as Chinese firms are implementing governmental goals and strategies, are artificially propped up by grants, subsidies and targeted institutional arrangements, they have become "too politicized to fail", even if their operations generate a permanent stream of losses. As a result, European firms are facing the threat of being crowded out by Chinese competitors who are drawing their revealed strength not from superior management skills, productivity achievements, or natural cost advantages, but rather from dis-

torted markets manipulated in their favour by Chinese state agencies. As such, **trade defence** mechanisms must be kept in place in order to guarantee fair market competition in Europe and the global markets.

1 INTRODUCTION

When China joined the WTO in December 2001, it agreed that other countries, notably the European Union (EU) could continue to treat it as a “non-market economy” for the purposes of trade defence measures. The background to this special arrangement lay in the fact that at the turn of the century the Chinese economy was still in transition from a centrally planned economy to a market economy based on scarcity prices and free competition. There neither existed a comprehensive set of institutions that could support comprehensive market exchanges in the economy, nor was the government willing to give up its claim to directly steer economic development of the economy, its sectors as well as its major firms.

In expectation of substantial progress of China’s transition towards a full-fledged market economy in the coming years, the Protocol of Accession of China to the WTO outlined that 15 years after its accession China’s status might be upgraded to a “market economy”. While China interpreted the wording of these paragraphs as guaranteeing it an automatic transition to “market economy” status, the EU upheld the position that China would have to demonstrate that it complies with the five criteria defining the “market economy” status. With all economic observers agreeing, that China did not fulfil these criteria (by a wide margin) at the end of 2016, the dispute focused on juridical exchanges on the existence of a guarantee or not. Eventually, the dispute was solved with some diplomatic genius that neither awarded China the status of a “market economy”, nor inflicted a massive loss of face to one of Europe’s most import trade partners and thereby might have provoked an open trade war. The solution found is to completely give up the differentiation between “market” and “non-market” economies – not only with regard to China, but all economies. Instead, for all trade defence measures the normal reference value will be the domestic prices. However, if significant distortions (e.g. caused by state interferences) affecting domestic prices can be shown to prevail, international benchmark prices can be used instead. In order to make this new mechanism operational, the European Commission is going to publish specific reports identifying such distortions in on an economy-wide or specific sector level. EU manufacturers can then refer to these reports in order to determine the basis for complaints and to calculate what the normal reference prices should be.

Against this background it becomes of paramount importance for all industries interacting with China to generate an appraisal in how far the firms and sectors they are operating within China are functioning according to competition-based market standards or are impaired by governmental distortions.

This study is addressing the question, if and in to what extend the Chinese non-ferrous metals industry is subjected to market-distorting governmental interventions. As such it intends to provide detailed information for an assessment of the market compatibility of Chinese prices and output patterns as well as the competitive foundations of any strategic actions by Chinese firms in the global markets. Based on the various structural features, operational mechanisms and specific phenomena documented in the following sections, the study will conclude with a clear recommendation, how the Chinese non-ferrous metals industry should be evaluated in any European Commission assessment and covered in its trade defence reporting.

In the following the report will first of all introduce the politico-economic framework in which the Chinese non-ferrous metals industry is embedded (chapter 2). The issue of state-ownership as well as the integration of the industry in top-down planning initiatives will be discussed here. Chapter 3 will then take a closer look at horizontal, cross-sectional, government policies and initiatives that distort the free play of market forces. The contemporary supply side structural reforms, the latest debt-equity swaps as well as new competition-undermining institutions will be introduced. Chapter 4 will then provide detailed insights in the specific tools of industrial policy in China, focusing especially on various forms of subsidy disbursements. The governance and discretionary management of the interface to the global markets will be looked at in chapter 5. Chapter 6 will then proceed with a discussion of the specific constellations pertaining to the operations of firms focusing on seven non-ferrous metals: aluminium, copper, lead, nickel, magnesium, tin, and tungsten. Chapter 7 concludes the report and presents an assessment of the Chinese non-ferrous metals industry's exposure to governmental interventions and distortions in the market process.

2 CHINA'S POLITICO-ECONOMIC SET-UP AND THE ROLE OF THE NON-FERROUS METALS INDUSTRY THEREIN

Chapter summary:

The Chinese non-ferrous metals industry is understood to be of great importance for the Chinese economy and its future strategic development. As a consequence Chinese government is controlling the industry tightly by means of direct state-ownership titles, a mixture of corporate leadership with government and party functions as well as a broad array of industrial policy initiatives. The borderline between business, state and party is fuzzy at best. As a matter of fact in many aspects it appears correct to define the non-ferrous metals industry of China as one collusive entity where business, government and party leaders collaboratively determine operational and strategic issues. One emanation of this structure is the vision and role attributed to the nonferrous metals industry in the Chinese planning universe of five-year plans, industry plans, and most importantly the Made in China 2025 Plan: the non-ferrous metals industry is tasked to play a crucial role in China's quest to transform itself into a "strong manufacturing country" – one that not only features a large industry in terms of volumes, but also an industry that is technologically advanced, highly productive and innovative as well as pro-actively engaged in the global markets.

The GOC attributes great importance to the NFM industry. State-ownership in the sector is still strong and dominant, while administrative regulation is tight. Development plans and policy documents have consistently emphasized its strategic importance. Consequently, the 13th Five-year Programme for the NFM industry opens

"The non-ferrous metals industry is an important basic industry and an important pillar for realizing the goal of becoming a strong manufacturing country. [...] The time covered by the 13th five-year programme is a crucial moment for our country to march into the front ranks of strong non-ferrous metals industry nations" (MIIT 2016).

This appreciation for the NFM sector is also reflected in its integration in overall, i.e. cross-sectoral, industrial policy. The industry is part of the Strategic Emerging Industry Initiative (launched in 2009), the Made in China 2025 Plan (launched in 2015) as well as other high level programmes. A comprehensive review of GOC development plans, guidance catalogues, implementation policies and other documents covering the past ten years reveals an

ambitious – if not aggressive – growth vision for the sector that is backed up by numerous administrative instruments for industry direction.

2.1 State-ownership and regulatory administration

In China, the state has traditionally reserved itself the right to mine and smelt non-ferrous metals. Chinese law stipulates that all mineral resources are owned by the state. At the onset of economic reforms, all assets were owned and controlled by the government. Until the mid-1980s, NFM “enterprises” served as productive state units controlled by the NFM Bureau of the Ministry of Metallurgical Industry. In 1983, the office was spun off and converted into the China Nonferrous Metals Corporation (CNMC). It retained much of its former staff, operations and responsibilities.

In 1998, the CNMC’s industrial operations were spun off into the Aluminium Corporation of China, the Copper Lead and Zinc Corporation of China and the Rare Earth Metals Corporation of China. Administrative functions and personnel of the former CNMC were transferred into the State Nonferrous Metals Bureau, a newly founded supervisory unit. After less than three years in existence, the Bureau was converted into the China Nonferrous Metals Industry Association. The central industry association still retains some of its previous supervisory functions, e.g. the task to organize and ensure industry discipline.

The Aluminium Corporation of China still is owned and controlled by the State-owned Assets Supervision and Administration Commission (SASAC) of the State Council and has listed a subsidiary at the Shanghai stock exchange in 2007. The Copper Lead and Zinc Corporation only existed for about one year before being broken up into separate companies, including Jiangxi Copper, Yunnan Copper, Jilin Nickel, Jinchuan Nonferrous Metals or Tongling Nonferrous Metals. Ownership was transferred to the provinces hosting business operations.

In the 1990s, the GOC held a positive stance on private ownership in NFM mining, smelting and processing. Anticipating future demand increases, the GOC opened the NFM sector to private capital and allowed the privatization of some SOEs. The surge of private investment that followed led to a rapid increase in capacity and output. As a side effect of this trend, the NFM industry became heavily fragmented as the number of players multiplied and their average size shrank. Industrial policymakers increasingly struggled to regulate and police the thousands of enterprises. The stronger role and larger number of non-state companies greatly diminished state control over the mining and processing of important resources.

In the early 2000s, the GOC reversed its previous policy and worked towards the reduction of independent players and the strengthening of SOEs. Formally led by the objectives to promote technology enhancement, raise quality standards, curb environmental pollution, prevent resource waste, improve worker safety and generally optimize the industrial structure, the GOC introduced a variety of streamlining instruments. Comprehensive catalogues of minimum operating requirements were compiled for most areas of the NFM sector. Companies that failed to meet any of a large number of benchmarks were given limited time to bring themselves into conformity or had to exit the market. The various catalogues were adjusted every few years to tighten the standards and ensure they did not lose their bite. At the same time, catalogues also served to put up market entry barriers and discourage potential investors.

The operating benchmark catalogues have gradually been established as cornerstones of industrial policy for the NFM sector. In order to maximize their effectiveness, the catalogues were also tied into other policy strands, such as the lending regulation for financial institutions, to ensure the providers of inputs and services could be co-opted as enforcement agents for industrial policy. The catalogues dealt a heavy blow to many smaller and older outfits that lacked the resources to make necessary adjustments. Private enterprises were particularly affected as they often lacked the administrative and financial backing of supervising government departments. SOEs, on the other hand, benefited from easy access to subsidy funds and policy loans. But it is impossible to pass a final judgement concerning the differential treatment of state and non-state enterprises.

The effectiveness of policy implementation and particularly the enforcement of plant closures are characterized by large regional differences. Furthermore, SOEs faced very different incentives and financial opportunities depending on the hierarchy level of controlling government organizations. The Aluminium Corporation of China (owned by the central government) certainly faced tighter scrutiny but received more adjustment assistance than most small SOEs run by municipal governments. Similarly, it is difficult to make generalizations about the treatment of private companies as “private” should be regarded as a relative term. Many so called private companies maintain close connections to government organizations through political, business or personal ties. These ties can take a multitude of forms that are typically very hard to evaluate without insider information. The quality of state-business links, an enterprise’s importance for the local economy and the gap between catalogue requirements and enterprise realities constitute the variables that determine the treatment of private companies by supervising local governments in executing central government policy.

While the catalogues serve to raise market entry barriers for new players and squeeze out existing, the GOC also encourages the combination of players by means of M&A. Government administrations on various levels have been found to propose and/or support such deals to form larger, more powerful players. Tax breaks, loan interest subsidies, direct financial grants and non-monetary incentives are provided in order to facilitate such transactions. While GOC documents emphasize that all M&A deals are completely voluntary and based on the enterprises' own initiative, THINK!DESK has found that sub-national governments often act as rather uncompromising matchmakers. This implies that enterprises with superior financial and technological capabilities are urged to rescue and restructure weaker competitors. In tungsten and other areas of the NFM industry, state businesses have actively snapped up private peers, thanks to financial and administrative backing from supervising government agencies and convenient access to bank loans. The surge in M&A activity has already brought down the number of independent (and private) operators, and progressed toward the restoration of SOE dominance in the NFM industry.

2.2 Functional Overlaps between business, government and Communist Party

THINK!DESK investigations into the individual backgrounds of the members of the boards of directors and the supervisory councils of 65 major NFM enterprises have revealed that a large majority of them are not only party members, but also hold senior positions in the government and CPC hierarchy – or have done so previous to serving in the corporate sector. The borderline between business career, governmental responsibilities and party activities appears to be blurred at best. In certain aspects there appears to exist a direct interdependence, where some positions cannot be attained without a corresponding rank in one of the other spheres. As a result it must be postulated that one of the key-requisites of competition-based market economies, the clear separation and demarcation of governmental regulators from regulated businesses, does not exist in China.

Information obtained by THINK!DESK is highly detailed as some enterprises even provide information on executives' age, ethnicity, nationality, educational attainment, party membership and on them having residence permits for other countries. This report restricts itself to outline several key features.

In many cases, the chairman of the board of directors doubles as secretary of an enterprise's party committee. In listed subsidiaries of SOEs, the board chairman is also a member of the board of the (often wholly) state-owned parent company. Most board members and all board chairmen are party members. The barriers between public administration, SOEs and party organizations are highly permeable. Personnel transfers are common between and

among government and business organizations. Functions in the party are often tied to or reserved for certain positions in the government or business hierarchy.

Many (supervisory) board members can look back on a government career. Mostly employed on the sub-national level, NFM company executives exhibit a striking tendency to circulate through postings in the public administration and SOEs. For the most part, the individuals have vacated their government positions, e.g. through retirement, before becoming board or supervisory board members. Examples include

- Mr. YUAN Zheng. Before serving as independent director for Shenzhen Zhongjin Lingnan Nonfermet Co., Ltd. he headed the environmental protection department of Guangdong Province as well as its party committee. While serving the company, he concurrently works as director of the province's nuclear administration department, deputy director of the environmental resources commission of the Guangdong People's Congress and head of an inspection team of the provincial party committee.
- Mr. LI Yihuang served as general manager and chairman of the board at Jiangxi Copper Co., Ltd. He vacated his company posts in January 2013 when he was appointed deputy governor of Jiangxi Province.
- Mr. WU Shenghui, party secretary of the board of directors at Shenzhen Zhongjin Lingnan Nonfermet Co., Ltd., previously worked at the discipline inspection commission of Guangdong Province as a deputy department director and CPC committee director.
- Mr. CHEN Mingyong worked at the state-owned Nonferrous Metals Group in Tongling as vice-general manager, board member and CPC committee member since 2008. Until January of 2011, he also held the rank of deputy mayor of Tongling City. Later he became deputy party secretary at Nonferrous Metals Group and chairman of the supervisory board of Tongling Nonferrous Metals Group Co., Ltd.
- Mr. WANG Mingxing, chairman of the supervisory board of Yunnan Copper Co., Ltd., started his government career at the Personnel Bureau of Qujing City and eventually became bureau chief and party secretary. In addition he came to serve as deputy head of the organization department of the Qujing CPC organization.
- Ms. ZHU Qingfen, independent director of Yunnan Copper Co., Ltd. until 2012, worked as deputy head of the budgeting bureau of the finance department of Yunnan Province. She then transferred to the state-owned Yunnan Tourism Development Co., Ltd. and served as deputy general manager. Later she returned to the provincial finance department where she successively served as deputy head of the industry bureau and head of the accounting bureau.

- Mr. PENG Haidong, secretary of the board of directors at Yunnan Copper Co., Ltd., began his career at the concrete factory of state-owned Yunnan Railway Industry Co. After three years, he transferred to the Yunnan provincial SASAC where he came to be deputy director of the enterprise section. Four years later he moved to the Yunnan provincial finance department and took over the enterprise section there. After another four years, he resumed his previous post as deputy head of the enterprise section of the provincial SASAC. Five years later he transferred to Yunnan Copper Group where he took office as deputy finance director. In 2008, he briefly acted as deputy general manager at Yunnan Chihong Zinc & Cobalt Group before being named finance director and secretary of the board at Yunnan Copper.
- Mr. JIANG Lü'an, independent director of Jiangsu Alcha Aluminium Co., Ltd, is a former deputy director of the science and technology department of the State Planning Commission, director of the science and technology bureau of the State Council production office, director of the technical equipment department of the State Economic and Trade Commission and also served as inspector for the latter.
- Mr. HU Chunming, chairman of the supervisory board of Hunan Gold Co., Ltd., is a former secretary in the mayor's office of Changsha City, deputy director of the Economic and Trade Commission of Hunan Province, deputy director of the office of the CPC Hunan provincial committee, director of the office of the state-owned enterprise board of supervisors, and director of the work office for state-owned enterprise supervisory boards at the SASAC of Hunan Province.
- Mr. WEI Shanfeng, board member at Zhongjin Gold Co., Ltd., was head of environmental monitoring at the Ministry of Environmental Protection.
- Mr. LIU Caiming, board member of the Aluminium Corporation of China, worked as general manager and board member at China Nonferrous Metals Construction Group Co. before being appointed as deputy director of the finance department of Yunnan Province and then as director of the provincial SASAC. He also served as assistant to the governor of Yunnan Province. Mr. Liu has served as deputy general manager of China Aluminum Corporation from January 2007 to February 2011. He has also served as Chairman of Yunnan Copper (Group) Co., Ltd. and president of China Copper Industry Co., Ltd.
- Ms. CHEN Lijie, independent director at the Aluminium Corporation of China, previously headed the trade and industry section of the legislative affairs bureau of the State Council, served as deputy director of the policy and regulation department of the State Economic and Trade Commission and as inspector of the SASAC of the State Council.

- Ms. JIANG Yuzhi served as director of the Fujian provincial department of geology and mineral resources, director of the policy and law research office, deputy director of the Fujian provincial geological and mineral exploration and development bureau, and deputy director of Fujian provincial land and resources department.

Several individuals have been receiving a permanent financial allowance from the State Council, China's cabinet. Examples include

- Mr. LUO Tao, chairman of the board of directors at China Nonferrous Metal Industry's Foreign Engineering and Construction Co., Ltd.
- Mr. FENG Genfu, independent director at China Nonferrous Metal Industry's Foreign Engineering and Construction Co., Ltd. until 2014
- Mr. YANG Xianming, independent director at Yunnan Copper Co., Ltd.
- Mr. ZHANG Ping, chairman of the board at Jiangsu Alcha Aluminium Co., Ltd.
- Mr. XIONG Weiping, board member and deputy general manager of the Aluminium Corporation of China until 2014.
- Mr. CHEN Jinghe, chairman of the board at Zijin Mining Group Co., Ltd.

Some individuals have (supervisory) board appointments in companies that may be in competition. However, the rotation of senior managers at SOEs is common. As the GOC reserves itself the right to appoint business executives a regular reshuffling of leadership personnel and positions is the consequence. Mr. GAO Dezhu, for example simultaneously served as independent director for Jiangxi Copper Co., Ltd., Rising Nonferrous Metals Co., Ltd. and Jinchuan Group International Resources Co., Ltd.

Other (supervisory) board members have a background in finance, typically in institutions owned and controlled by the state, e.g.

- Mr ZHU Wei, a former deputy department director at the China Banking Regulatory Commission (board chairman of Shenzhen Zhongjin Lingnan Nonfemet Co., Ltd.)
- Mr LIU Ren was assistant general manager at Xiangcai Securities before serving Shenzhen Zhongjin Lingnan Nonfemet Co., Ltd. as member of the supervisory board.
- Mr. GAO Qiping worked at the China Development Bank, a policy bank controlled by the central government, until his retirement in 2004. He successively served as deputy head of the department in charge of loans for the transportation sector, loan director for southwest China, director of the comprehensive planning department, assistant to the president and member of the bank's party committee. Following his retirement in 2004, Mr. Gao continued to work for the bank as advisor and member of its standing committee for loan approval. He retired from both functions in 2009.

From 2006 to 2012, he served as independent director of Jiaozuo Wanfang Aluminum Manufacturing Co., Ltd.

- Mr. YANG Guoliang, successively served as head of accounting at the People's Bank of China in Chuxiong City (Yunnan Province), director of the audit department at the Industrial and Commercial Bank of China (Yunnan Branch) and later as vice president of that Branch. He then transferred to the Shanghai Pudong Bank (Kunming Branch) where he became president. Mr. Yang served as independent director for Yunnan Aluminium Co., Ltd. until 2014.
- Mr. FAN Junling, member of the supervisory board at Henan Mingtai Aluminium Industrial Co., Ltd., previously served as business manager in the Shanxi Province branch and the Pingdingshan City branch of the China Construction Bank.

Some individuals simultaneously to their (supervisory) board appoint serve in research organizations that provide consulting services to government decision makers, for example

- Mr. XU Donghua looks back at successful career at the influential Development and Reform Research Centre of the State Council. In 2002, then director of the research department, he transferred to the China Pacific Insurance as deputy chief economist. In 2005 and 2006, Xu worked as researcher for the SASAC of the State Council. While acting as independent director of Huludao Zinc Industry Co., Ltd., he also served as chief economist and deputy head of the Economic and Management Research Institute for the Mechanical Industry.
- Mr. Wu Shenghui, party secretary of the board of directors at Shenzhen Zhongjin Lingnan Nonfermet Co., Ltd., previously worked at the Research Centre for Global Environment and Global Resources at Sun Yatsen University while serving as independent director of 000060. At the same time, he was director of the Key Laboratory of Guangdong Province for Geological Processing and Mineral Resource Prospecting as well as member of the decision advisory committee of the provincial government.
- Mr. ZHU Guangshen, previously an independent director at Inner Mongolia Xingye Mining Co., Ltd., had been a team leader at the department of land and resources of Henan Province and later headed the department's Geological Survey Institute.
- Mr. YANG Xianming was head of the Economic Research Institute of Yunnan Province.

A number of (supervisory) board members serve or have served as delegates to the National People's Congress (PC), the China People's Political Consultative Conferences (CPPCC) or their equivalents on lower administrative levels. Examples include

- Mr. WU Shenghui: delegate of the Standing Committee of the CPPCC of Guangdong Province (party secretary of the board of directors at Shenzhen Zhongjin Lingnan Nonfemet Co., Ltd.)
- Mr. YANG Xianming: delegate of the national CPPCC (independent director at Yunnan Copper Co., Ltd.)
- Mr. LI Chong: delegate of the National PC (vice chairman of the board of directors at Henan Shenhua Coal & Power Co., Ltd.)
- Mr. JIANG Chun: delegate to the PC of Anhui Province (chairman of the board of directors at Anhui Jingcheng Copper Share Co., Ltd.)
- Mr. WANG Xin'en: delegate to the PCs of Shandong Province and Yantai City (chairman of the board of Shandong Humon Smelting Co., Ltd.)
- Mr. YU Rongqiang: delegate to the CPPCC of Qinghai Province and served as member of its standing committee (chairman of the board of directors at Lofton Environmental Technology Co., Ltd.)
- Mr. WANG Min: delegate to the PC of Jilin Province, member of the standing committee of the PC of Liaoyuan City, and member of the standing committee of the PC of Longshan District of Liaoyuan City (chairman of the board of directors and general manager of Jilin Liyuan Precision Manufacturing Co., Ltd.)
- Ms. WANG Sufen: delegate to the PC of Longshan District of Liaoyuan City (chairwoman of the supervisory board at Jilin Liyuan Precision Manufacturing Co., Ltd.)
- Mr. LI Yihuang: delegate to the National PC and the PC of Jiangxi Province (chairman of the board of directors at Jiangxi Copper Co., Ltd. until 2012)
- Mr. LI Baomin: delegate to the National PC (chairman of the board at Jiangxi Copper Co., Ltd.)
- Mr. ZHENG Hui: delegate to the National PC, a member of the standing committee of the PC of Jiangxi Province as well as a member of the latter's legal affairs commission (independent director at Jiangxi Copper Co., Ltd.)
- Mr. TU Shutian: delegate of PC of Jiangxi Province, a member of its standing committee and its legal affairs commission (independent director at Jiangxi Copper Co., Ltd.)
- Mr. CHEN Jinghe: delegate to the PC of Fujian Province (chairman of the board at Zijin Mining Group Co., Ltd.)

Some of the older (supervisory) members, have worked in the Ministry of Metallurgical Industry and its successor organizations and were transferred to its various successor organizations, e.g.

- Mr. YANG Bin, independent director of Inner Mongolia Xingye Mining Co., Ltd., has successively headed the planning and geology departments at the China Nonferrous Metals Industry Corporation
- Mr. LUO Tao, chairman of the board of directors at China Nonferrous Metal Industry's Foreign Engineering and Construction Co., Ltd., was director of the human resources department at the China Nonferrous Metals Industry Corporation. After the company was split up, he transferred to the Aluminium Corporation of China where he continued his career as member of the comprehensive planning group, vice general manager and head of the CPC discipline inspection commission. In 2011, he concurrently acted as general manager and deputy party secretary at China Non-ferrous Metals Mining Group Co. and CEO of China Non-ferrous Metals Construction Co.
- Mr. XIAO Jinsheng, board member of Jiangsu Alcha Aluminium Co., Ltd., is a former secretary to the Minister of Metallurgical Industry, deputy director of the China Non-ferrous Metals Industry Corporation. Former executive director of the China Nonferrous Metals Industry Association and secretary general China Nonferrous Metals Processing Industry Association

Some individuals have close and potentially valuable connections to up- or downstream industries within the state economy. Mr. FENG Genfu, for example was independent director of Shaanxi Aerospace Motion High Technology Co. and Xi'an Aircraft International Aviation Manufacturing while serving as independent director for China Nonferrous Metal Industry's Foreign Engineering and Construction Co., Ltd. He is also a member of the decision advisory commission of the Shaanxi provincial government and head of the Economics and Finance Institute at the renowned Xi'an Jiaotong University.

2.3 Overview of Chinese industrial policy for the non-ferrous metals industry

The evolution of industrial policy priorities for the NFM industry can be gauged from a comparison of the five year plans (FYP) for the sector. The 12th FYP (2011-2015) covered a time of rapid growth in capacities and output fuelled by massive infrastructure investment projects and policy induced expansions in most downstream industries. Solid demand growth from government-sponsored industrial and infrastructure projects coupled with the generous provision of financial subsidies and cheap credit squared off with slower demand growth from other customer groups, declining commodity prices and worsening financial performance.

The outline of the new 13th FYP for the NFM sector was released by the Ministry of Industry and Information Technology in October 2016. Compared to the preceding five years, it forecasts a significantly slower growth in output and demand for the years 2016-2020.

Many of the key themes of the 12th FYP have been carried over into the new plan. Technology upgrading, indigenous innovation, industry structure adjustment, environmental protection, resource conservation are recurring themes and firmly anchored in national FYPs as well.

Technology innovation. The 13th FYP shows strong ambitions to propel Chinese industry towards the very edge of the international technology frontier. The 12th FYP already highlights the importance of technology upgrades for enterprise development and competitiveness. While it discusses the need for stronger innovative capacity on the part of companies, the 13th FYP is more aggressive in this regard, positioning own innovation as the driving force of success. This can also be seen from the importance attributed to the development and commercialization of high tech materials supplied to seven strategic emerging industries which the GOC seeks to develop into future pillars of the national economy, e.g. new energy vehicles. Whereas previous FYPs for the NFM industry called for increasing the share of deep processed products in total output, the 13th FYP places the spotlight on cutting edge products.

Where previous development plans and programmes called for the Chinese NFM industry to improve the standards of products and processes in its own right, the 13th FYP addresses this topic as a crucial means to consolidate a leading position in international markets. Deliberations of independent innovation at the highest technology levels are, more than in the past, placed in an international context.

Another notable development in the new plan is the tighter integration of individual goals and policies both inside and outside the scope of the plan. Besides the focus strategic emerging industries mentioned earlier, this refers primarily to the comprehensive Made in China 2025 strategy and notions of industry 4.0 and the internet of things contained therein. This contrasts sharply to the rather simplistic calls of the 12th FYP document to develop production capabilities for certain products, pursue the implementation of certain technologies or introduce software tools, like ERP, for efficiency enhancement. This is not to say that the level of detail has dropped between the two documents. On the contrary, the recent plan is remarkably specific when it comes to individual items. It does, however, connect the various strands of the GOC current economic policy in a way that carefully shapes the NFM sector as a modular component of the national industrial economy.

Institutional innovation. While technology related content clearly dominates the 13th FYP outline document, planners have added passages that elaborate on the need for institutional innovation, i.e. new business models that, for example, better support industrial services. The 12th FYP document has introduced the notion of “common service platforms” that offer enterprises located in industry clusters the shared use of specialized infrastructure, goods and services. The 13th FYP, drawing on experiences with such institutional set ups, drives this point even more forcefully. The same can be said for calls for enhanced communication and collaboration between education and research institutions as well as government agencies and companies. Similarly, the plan calls for a tighter integration and interconnection of actors and activities along the entire value chain. Special emphasis is put on joint R&D and close collaboration with major downstream customers.

The 13th FYP for the first time urges companies to create and cultivate well known brands to promote domestic and international sales.

International development. This point has only been scantily addressed in previous FYPs but is a cornerstone of the development strategy proposed in the 13th FYP. Overseas operations that used to be limited to obtaining raw material and selling finished goods are to assume a high profile across the entire value chain. International cooperation in R&D, standardization, production and other fields have been placed high in the priority ranking. Instead of promoting exports, the 13th FYP encourages companies to set up overseas production operations either by way of M&A or by greenfield investment.

Industry streamlining. During the 12th FYP period overcapacities have formed across many parts of the NFM sector. This problem has spread beyond electrolytic aluminium and copper that both have been beset by excess capacities for years. Consequently, the 13th FYP is more adamant and specific in addressing the elimination of obsolete production capacities. Enforcing new regulation on selecting viable producers and forcing inefficient plants out of the market has become a hot topic. In areas like industrial streamlining, i.e. the consolidation of producers through M&A, bankruptcy or other means, the 13th FYP echoes the positions already put forth by the 12th FYP.

Environmental protection. While one of the cornerstone topics of the 13th FYP, the positions and issues addressed are hardly new. Like the previous FYP, the current blueprint reflects a strong determination on the part of the GOC to clean-up environmental damage, prevent pollution, limit greenhouse gas emissions and improve energy conservation. The FYP warns companies to strictly adhere to a volume of environmental protection regulation that

has grown tremendously since the release of the previous FYP. Considering that policy has been evolving rapidly in this field over the past five years, the FYP does not introduce any significant new aspects.

While the 12th FYP is about getting important aspects right (based on standard economic rationality), its successor takes a more ambitious view, i.e. getting China ready to operate as leading player in the international market. It also maintains a more holistic view in that it refers more to integrated systems rather than calling for individual or isolated improvements in select areas.

The 12th plan concerns heavily with the formation of industry champions through improvements in technology and standards. The 13th on the other hand puts a stronger emphasis on consolidating the leading edge of the Chinese NFM industry through cleaning out inefficiencies from overcapacities, resource waste as well as the lack of integrated planning along the supply chain and lack of international focus. In a nutshell, the new plan seeks to fine tune industry development and iron out the kinks resulting from excessive investment and other deficits.

2.4 *Made in China 2025-Programme*

First announced in December 2014, the Made in China 2025 initiative was formally launched in May 2015. It represents the national programme for industrial development from 2015 to 2025 and has been characterized as China's path into the Industry 4.0 age.

The GOC again expressed its concern that as a manufacturing nation China is big but not strong. The main constraints are identified as weak independent innovation ability, production technology and product quality lagging international levels, low efficiency in resource utilization, irrational industrial structure and a concentration on the least profitable parts of the value chain.

The outline document specifies eight strategic countermeasures to overcome these problems: implement a digital network of intelligent manufacturing; enhance product design capabilities; improve manufacturing technology innovation systems; strengthen the manufacturing base; improve product quality; implement green manufacturing; cultivate a global competitive enterprise groups and competitive industries; develop modern manufacturing services.

The outline that was presented in 2015 provided the basic reasoning behind the initiative which is, of course to accomplish the transition from a low cost mass production hub for low to mid tech commodities (i.e. the work bench of the world) to an advanced manufacturing nation that derives strong international competitiveness from an innovation driven, technology and knowledge intensive production base. Like the Strategic Emerging Industry initiative kicked off five years earlier, the Made in China 2025 Programme is highly ambitious, seeking to set off a massive technology push throughout the economy that is complemented by major breakthroughs in priority fields.

As the transformation is envisaged as a long term endeavour, the GOC regards the current 10-year framework as only the first of three development stages. In other words, 2015 to 2025 represents the first decade of action, dealing with a new round of technological revolution and industrial change.

Despite the grandiose rhetoric of GOC plans and statements, the Made in China 2025 initiative holds few genuinely new topics. The whole range of key technologies as well as the objectives, tasks and instruments have already been introduced in previous sectoral guidance policy, five-year plans and individual pieces of regulation. As such, the Made in China 2025 initiative forms a bracket that collects a large spectrum of pre-existing technology development policies under a new boilerplate. These remarks are not meant to trivialize the actual contents of the Made in China 2025 initiative but register doubts that the format itself represents a revolutionary new approach at unleashing China's innovative forces. Key issues, like the increased application of internet functionality throughout the manufacturing sectors and the internet of things (more commonly referred to as internet+ by the GOC), represent paramount development topics that are set to transpire the Chinese economy in the future.

Not surprisingly, the initiative adopts the same set of overarching topics as other national development programmes targeting the role of technology for economic development. Deepening the integration of information technology and manufacturing, environmental protection, resource conservation and greenhouse gas reductions constitute important meta-objectives. Still, the Made in China 2025 strikes a more economic nationalist note in calling for the consolidation of national economic power through establishing the country at the global technology frontier. The cultivation of a group of national champion enterprises also raises concerns regarding the competitive fairness and market conformity of such an effort.

Still, the plan does not amount to or translate into an export promotion programme. The priority areas are chosen based on national development needs and estimated domestic demand dynamics. More than previous plans of this type, the Made in China 2025 initiative

emphasizes the need for international cooperation in research, manufacturing, trade and investment.

The Made in China 2025 initiative, like the Strategic Emerging Industry Programme before it, emphasizes the promotion function of model cities and pilot projects. This serves to mobilizing local resources, initiative and creativity and test new systems through real world demonstration prior to their mass popularization or nationwide adoption. Ningbo City, the capital of Zhejiang Province, was selected to become the first model city with over RMB 200 million (28.8 million Euro) in financial support from the Agricultural Bank of China until 2020.

The Made in China 2025 initiative also comes with a fresh set of technologies defined as priority areas for R&D and manufacturing. The composition shows significant overlap with the previous Strategic Emerging Industry programme since it draws on similar perceptions of economic and social development priorities and national security needs. Through strong guidance and support, the key areas are to make major advances in technology until 2025 and become major pillars for future economic strength and competitiveness. The ten priority areas are

(1) new generation information technology, (2) high-end machine tools and robots, (3) aerospace equipment, (4) marine engineering equipment and high-tech ships, (5) advanced rail transit equipment, (6) energy saving and new energy vehicles, (7) power equipment, (8) agricultural equipment, (9) new materials as well as (10) biomedical and high-performance medical equipment.

The GOC specified priority areas in detail in the Made in China 2025 Priority Area Technology Innovation Green Paper. Serving as a roadmap for the initiative, the paper took several months to prepare and involved more than 400 experts from government administration, industrial enterprises and associations, think tanks, universities and technology research institutions. The road map directs enterprises and scientific research, education and other professional institutions to focus their efforts on the priority areas.

The roadmap instructs government departments on all levels to deploy the resources at their disposal to support the development in priority areas. Importantly, the roadmap also guides financial institutions and other supporting service sectors to focus support on corporate activities in the priority areas.

The seven non-ferrous metals specifically reviewed for the purpose of this study are primarily applied in five priority areas: high-end machine tools and robots, aerospace equipment,

advanced rail transit equipment, energy saving and new energy vehicles, power equipment, and new materials. Details are presented below.

1. High-end machine tools and robots

1.1. High-end machine tools and basic manufacturing equipment

- 1.1.1 Aerospace equipment, large-scale structural parts manufacturing and assembly equipment: Focus on the development of aluminium/magnesium/titanium/super alloys and other difficult to use materials with multi-axis linkage gantry
- 1.1.2 Automotive key parts processing equipment and production lines: Focus on the development of low cost ultra high strength steel/aluminium alloy/carbon fibre auto parts.
- 1.1.3 Car assembly production lines: For high-end car models, high-strength steel/aluminium/carbon fibre light high-strength materials. Application for the direction, focusing on the development of lightweight heterogeneous material mixed body, based on domestic machinery.
- 1.1.4 Engineering and agricultural machinery production lines: Focus on a series of original technology with titanium alloy, high strength alloy steel, high strength aluminium alloy, super alloy

2. Aerospace equipment

- 2.1 large-scale lightweight overall and high-strength metal structure manufacturing technology to the body panels, wing panels and landing gear, frame beam ribs and other components as the main pair like, focus on the development of titanium alloy, aluminium alloy, aluminium lithium alloy, high strength steel and other metal structure
- 2.2 High-performance carbon fibre materials, (super) large-size aluminium alloy materials, high-performance polymer fibre, deformation of high-temperature alloys and other key raw materials such as bottlenecks, Enhance the capacity of self-support of space products.

3. Advanced rail transit equipment

- 3.1 New vehicle body technology. Application of magnesium alloy and other new materials for lightweight body.

4. Energy saving and new energy vehicles

- 4.1 Lightweight parts of steel/aluminium combination, aluminium/fibre combination, carbon fibre body and other representative of the lightweight components accounted for 20% of the market. Body, body closure, wheel, sub-frame, transmission shell, brakes, wire harness, wire and other components to achieve a wide range of lightweight technology applications.
- 4.2 High voltage assembly: DC-DC converter, charger system efficiency > 95%, high-voltage relays, fuses to achieve miniaturization, low cost; high-voltage aluminium wire to achieve mass application.

5. New materials

5.1 Advanced non-ferrous metal materials

- 5.1.1 High-performance light alloy materials: research and develop new 650MPa grade high strength and toughness, low quenching sensitivity, pre-stretching plate of thicknesses in excess of 200 mm.
- 5.1.2 Functional components with non-ferrous metals as key supporting materials: develop high purity oxygen-free copper foil of more than 600mm

5.2 Special alloys for application in high end manufacturing equipment

- 5.2.1 Development of super nickel based alloys for use in power plants
- 5.2.2 Special aluminium magnesium titanium alloys: research and develop special aluminium magnesium and titanium alloy materials preparation and precision forming processes and control systems, service performance evaluation and other technologies; 650MPa grade new high strength and toughness, low quenching sensitivity aluminium alloy pre-stretching plate of thicknesses in excess of 200 mm; and 500MPa grade high strength and toughness magnesium alloy with heat resistance above 250 degrees Celsius and a series of anti-fatigue, creep resistant, impact resistant, high plasticity magnesium alloys

As becomes obvious from this list, the NFM-sector is fully integrated in the conceptual logic of the Made in China 2025 initiative and constitutes a major element of the GOC plans for designing a “new” China featuring (one of) the most powerful economies in the world.

2.5 Regional development policy

Differences in regional (economic) development has been a defining feature of the People’s Republic of China as well as all other entities previously occupying its territory in history. Despite several narrow corridors of growth and prosperity along the route of the ancient (and modern) silk road, inland regions have traditionally suffered from a stark lag in development. Poor infrastructure, little investible resources and weak purchasing power have traditionally limited economic activity to low yield agriculture. The relative backwardness compared to the (economically) more advanced coastal areas has translated in social discontent and mass migration. At least since the 1990s, the GOC has made significant attempts to reduce these disparities. A series of comprehensive regional development schemes, backed

by substantial financial resources, sought to spark growth in the lagging hinterland and accomplish a tighter integration into the modern Chinese economy. These initiatives represented state-led approaches. Massive investments in transportation networks and other infrastructure reduced transportation times and costs, making local resources accessible to the industrial economy further east. Local administrations and individual cadres faced strong incentives to spur economic growth and create employment opportunities by attracting investments. Mining and heavy industry represented attractive targets and were welcomed with substantial subsidies and tax breaks. Heavy industry projects, by default, require substantial investments in fixed assets and thus provide a strong boost to local GDP figures – a crucial benchmark for cadres' career prospects.

On the one hand, the mineral resource endowment, convenient availability of energy, land and labour combined with powerful financial investment incentives created a strong pull. On the other, the operating environment in traditional industrial locations provided a push. Markets had grown crowded and complex, characterised by rising costs (chiefly for labour and environmental protection) and increasingly hostile city administrations that detested urban pollution and the massive resource consumption of, for example, smelting plants.

New host communities in places like Xinjiang, Inner Mongolia, Gansu, Ningxia, Sichuan and Yunnan eagerly courted investors with a multitude of sweetheart deals. This was particularly important for the attraction of private investment, as SOEs had often enough been directed to relocate west by their supervising government agencies. In line with national development policies, the new industrial towns tailored their economic development plans around NFM plants. Where possible, new coal mines were opened to feed new power plants that supplied NFM smelters and rollers. Thanks to their huge energy consumption, smelters in many cases create enough base load power demand to warrant the construction of new power plants which in turn generate demand for local coal. Specialized logistics infrastructure and services were introduced as were schools and colleges to train the local workforce. Tax revenues and fees from NFM enterprises allowed for the upgrading of hospitals and other social infrastructure. Town and municipal governments executed ambitious (and costly) plans at cluster development to localize the whole value chain and perfect operating conditions. As NFM enterprises, like petroleum refiners or steel mills elsewhere, represented the economic nucleus in numerous cities, their direct and indirect influence on local employment and growth shaped local policymaking way beyond the economic sphere.

While the development pattern described above is hardly unique to China or the Chinese NFM industry, it does explain the urgency and devotion with which local governments are fighting for the survival of NFM enterprises. As markets for aluminium, tungsten and other

NFM are heavily oversupplied both in China and worldwide, the fight for survival has culminated in a fight for market shares. Capacity additions and upgrades built under these conditions serve on the one hand to shore up competitive positions thanks to lower production costs. On the other, and viewed through a game theoretical approach, they serve as credible commitments to one's market position, thereby discouraging rival players from expanding their capacities and fuelling a too-big-to-fail situation, i.e. discouraging government authorities from allowing plants go under.

Unfortunately, this strategy has proven successful in many cases, as the central government's measures to counter overcapacities have often been ignored on the local level. The Ministry of Industry and Information Technology and the National Development and Reform Commission which have been spearheading the effort have insufficient personnel and resources to supervise the effective implementation throughout the country. Thus far, the enforcement of industry standards and mandatory closure has been patchy. While successful cases have been widely reported by Chinese news media, THINK!DESK research was able to confirm anecdotal evidence that many companies continue to "fly under the radar" and operate in violation of national laws.

Furthermore, it should be doubted that existing initiatives for limiting or reducing production capacity, even if thoroughly implemented, have the potential to remedy the overcapacity crisis. This is because national policy is focused on the elimination of "obsolete" capacities. Only plants that cannot meet national operating standards pertaining to output volume, production technology and a variety of other benchmarks are threatened by administrative closure. In fact, progress in shutting down old, small, inefficient and polluting – in sum "undesirable" – plant has been good. A fact that is often heralded by national authorities and state media.

However, the fact remains that the past five years have witnessed the formation of large production plants that feature modern production technology and are capable of meeting all required performance benchmarks. These new and advanced plants account for an increasing share of output and capacity. This development is taking place in spite of regulation from central ministries that explicitly prohibit net capacity additions and make both plant construction and upgrades contingent on the elimination of other capacities of equal or larger size. This regulation should have prevented any increases in output potential since 2013 at least. The continuing capacity build up thus illustrates the limited reach of central government policy in the face of strong dynamics at work on the local level. According to AME Group, the autonomous regions of Xinjiang and Inner Mongolia will add 4.3 million tons and

2.5 million tons of aluminium smelting capacity until 2020. While Shandong Province plans another 2 million tons by the end of this year 2017.

Not only have such plants been immune to the crack down on obsolete plant, it also stands to reason that their owners have little intention to write off investments long before the useful lifetime of the assets has been reached. This implies that overcapacity will remain a chronic problem with systemic roots that are becoming increasingly difficult (and costly) to confront.

3 HORIZONTAL ECONOMIC POLICIES OF THE CHINESE GOVERNMENT IMPACTING ON THE NON-FERROUS METALS INDUSTRY

Chapter summary:

China's non-ferrous metals industry is a beneficiary of substantial government interventions in the Chinese market process which result in distorted price structures and discriminatory access to scarce production factors and resources. Instrumental to this governmental design of "market" structures and outcomes are a broad range of institutional arrangements as well as discretionary policies that allow Chinese firms of the non-ferrous metals industry to profit from reduced financing costs, repressed wages, preferential access to land as well as lax environmental standards (respectively lax law enforcement). Also, in the context of the present nation-wide Supply-side Structural Reforms initiative, the non-ferrous metals industry is handled in an especially preferential manner: no additional closure targets for the industry's massive overcapacities have been brought forward. Instead the industry profits from debt-equity swaps that facilitate a re-capitalization of ailing companies. Furthermore it fully participates in local government initiatives to reduce corporate operating costs by cutting systemic transaction costs, tax burdens, social security premiums, financing costs as well as electricity and logistic costs administered by these governments.

Is the market mechanism playing a "basic" (i.e. secondary) or a "decisive" (i.e. primary) role for the allocation of resources in the Chinese economy? The third plenary session of the current 18th Central Committee of the Communist Party of China, held in November 2013, opted for the latter. The excitement this terminology change inspired among international observers lasted for months. A fresh round of western style economic liberalization seemed just around the bend. Little more than three years later, the excitement is gone, the question is trivial and the market mechanism is playing a role that is limited by an interventionist industrial policy.

3.1 Chinese government interventions in the price mechanism

While the markets for finished goods and services have been widely liberalized and scarcity-based pricing – not government policy – is guiding the allocation of available resources, the markets for production factors remain subject to substantial state intervention. The Chinese brand of market opening reforms can be characterized as a dual track approach.

On the level of private household consumption, the liberalization of markets and prices are nearly complete. However, the further up the value chain the analysis advances, the more

restricted the role of markets and prices becomes. The prices of raw-materials and basic inputs to the production process continue to be strictly controlled and guided by the Chinese state and do not fully reflect the true degree of scarcity in the economy. And with regard to the allocation of the factors of production, i.e. capital, labour, and land, scarcity-based market prices eventually play only a subordinated role, being more or less entirely overshadowed by discretionary interventions of government bodies in the allocation process. The fact that government influence targets the most elementary stages of value creation processes provides for a powerful leverage and strong influence on all subsequent stages of the value chain.

Capital markets are subject to systemic as well as discretionary government intervention. Price signals – ideally generated endogenously by the free interplay of market forces – are instead set by government induced distortions. The combination of artificially low interest rates and a managed exchange rate results in the underpricing, and consequently, the excessive utilization of capital. The policy induced repression of capital cost contributed to massive over-investment in capital intensive industries, which in turn caused the formation of overcapacities. In the Chinese “Socialist Market Economy”, which treats state business as the main pillar of the national economy, the benefits from irrationally low priced capital are not equally available to all market participants. Instead, they are stacked in favour of enterprises with ready access to the formal financial system. In other words, it is SOEs and non-state businesses with close government ties that can take advantage. According to calculations by IMF staff this has resulted in an investment ratio ten percentage points above its equilibrium value and costs to the economy in a range of about four percent of GDP per year.

In recent years, the breadth and depth of financial markets increased substantially. China’s stock and bond markets grew to become second and third largest in the world. Regulation of both markets does not reflect the spirit of free markets but is influenced by sectoral industrial policy considerations. The China Securities Law (National PC 2014) still maintains that “The state encourages the listing of corporate stocks that comply with the relevant industrial policies and meet the relevant requirements of listing”. The law also stipulates that “the investment of raised funds must comply with the industrial policies of the state” (National PC 2014 at 16.4).

Successive reforms have not yet produced a free capital market nor have they removed state intervention. Regulatory and legal frameworks are still patchy and the role of large state-owned commercial banks in financial intermediation has remained prominent. In fact, the Commercial Banking Law prescribes that

“financial institutions carry out their business in order to meet the requirements of national economic and social development. They should develop their lending business under the guidance of sectoral industrial policies of the state” (National PC 2003).

In a 2010 OECD discussion paper, Herd, Pigott and Hill suggest that

“Active efforts by the authorities to promote greater private control of financial institutions would help to improve the financial system’s capabilities to serve the private sector and to eliminate interference by government entities, particularly local governments, in lending decisions. Consideration should be given to requiring local authorities to reduce their ownership stakes in commercial banks over a reasonable period” (Herd, Pigott and Hill 2010, p. 36).

THINK!DESK has been able to confirm anecdotal evidence that local governments still routinely lobby local bank branches to expand lending and provide favourable conditions to selected companies. Several examples for this practice have been identified in a recent study on state intervention in the Chinese seamless tube and pipe industry.

Distortions in the financial market are threefold. Firstly, capital was made artificially cheap to stimulate investment growth. Low interest rates and complementary measures have kept borrowing costs at disproportionately low levels. Secondly, a strong bias for lending to SOEs and local governments implied that the availability and cost of capital was far from equal. Finally, access to capital and the terms at which it is provided serve as important tools for industrial policy making. By offering loan interest subsidies, loan guarantees and other means of reducing capital costs, government organisations seek to direct investment into key projects and industries. Similarly, in sectors where industrial policies seek the removal of obsolete production capacities, the closure of polluting plant facilities or the reduction of independent players through M&A, capital availability is tightened. Lending costs are increased indirectly through directives asking banks to re-evaluate their exposure to particular industry risks.

Labour markets are rigged in favour of employers thanks to severe limitation on worker organization and labour mobility. Wages continue to hover below fair value due to an expressed low wage policy by Chinese government in spite of recent GOC initiatives for boosting household income and consumption. Collective bargaining is uncommon and processes are underdeveloped as the GOC continues to ban independent trade unions. Furthermore,

the household registration system (hukou) limits labour mobility by severely curtailing the social benefits of workers outside their place of registration. This lack of recognition of and effective discrimination against migrant labour prevents the formation of a unified national labour market and also contributes to wage repression. Finally, the patchy enforcement of social security systems has led many companies to shirk their duty to transfer premiums for their employees.

Land markets are characterized by particularly high degrees of distortion as prices for industrial land use rights are kept artificially low by local governments to succeed in the inter-jurisdictional competition for industrial investments and attract projects. Over the past ten years, the price of industrial land use rights rose only moderately while prices for commercial and residential land skyrocketed. As a result the allocation of land becomes removed from the true (national) economic necessities and rather favours industrial business models requiring large stretches of land.

Environmental resource markets The greatest distortions – but also greatest improvements in recent years – have been achieved with respect to the pricing of nature. Decades of reckless growth and over-utilisation of environmental resources have limited the supply of clean soil, air and water. Lax enforcement of environmental protection laws by local governments have long translated into substantial cost advantages for industrial companies. However, the past five years have witnessed a significant reduction to that type of environmental dumping as penalties have increased and supervisory agencies strengthened.

Precise estimates of the total costs these allocation distortions inflict on the Chinese economy as a whole are unavailable. The aggregate costs of government intervention in factor markets have been calculated to have amounted to about 10 percent of GDP per year between 2000 and 2010. The benefits enjoyed first and foremost by state businesses in capital intensive and heavy industries are paid for by private households through reduced capital and labour incomes, high real estate prices and serious pollution.

Interventions in the price mechanism, however, are not the only means by which the GOC is actively steering micro- and macro-developments in the Chinese economy.

3.2 Supply-side structural reforms

In December 2015, the economic work conference of the central committee decided on a new strategy to stimulate the slowing economy and create a lasting economic boost from tackling structural problems of the Chinese economy. Labelled Supply-side Structural Re-

forms (SSSR), the approach has been heavily promoted throughout 2016 and come to represent the country's principal economic policy concept by the time of writing (next to the long-term Made in China 2025 strategy). Conceived off by general secretary Xi or close affiliates and further developed in the Leading Small Group for Deepening Reform (which Xi chairs) the initiative is the archetype of a top level design approach with targets and resources passed down the administrative hierarchy.

SSSR are composed of five elements: (1) reducing excess production capacities, (2) reducing an overhang in unsold urban housing, (3) reducing corporate leverage, (4) reducing corporate operating costs, and (5) strengthening weak links. The GOC hopes to avert future economic crises by effectively addressing these structural weaknesses at the present. With the exception of issue 2 and issue 5 (which serves as a placeholder for miscellaneous issues and to allow lower level authorities to complement the list), all others are highly relevant for the NFM industry.

SSSR reflect the realization that distortions of market rules and individuals' incentives have caused excessive investments and the formation of overcapacities which depressed markets for years. (Compensating) Corporate losses caused the waste of state resources while mounting corporate debts siphoned capital into interest payments that could otherwise have been invested in competitiveness enhancing measures. Substantial amounts of land, labour and capital are tied up in idle or useless production capacities while local level authorities are unwilling to support painful restructurings but rather choose to kick the can down the road.

With regard to the **reduction of overcapacities**, the NFM sectors in question have not been subjected to additional closure targets, like the coal and steel industry. For the **reduction of corporate leverage**, the GOC has initiated a fresh round of debt-equity-swap which will be discussed in the next section. Of particular importance is the **reduction of corporate operating costs**. This includes cutting systemic transaction costs, tax burdens, social security premiums, financing costs as well as electricity and logistic costs. In February 2016, Guangdong Province was the first region to release its "action plan for cost reductions in supply side structural reform". By the time of writing, almost all provincial-level governments had released plans outlining such benefits. All plans announce the removal or reduction of administrative fees and taxes, while some also address raw material prices or the cost of labour, logistics and finance.

Among the Chinese regions, Guangdong Province has arguably published the most comprehensive and ambitious action plan. Authorities there aimed to cut corporate costs by RMB

400 billion (54.4 bn Euro) in 2016 (5.3% of local GDP) through lowering taxes and social security contributions and abolishing 86 separate types of fees. Shandong, Jiangsu and Zhejiang provinces have also made impressive pledges for bringing down the costs of local enterprises, covering RMB 200 billion (27.2 bn Euro), RMB 100 billion (13.6 bn Euro) and RMB 100 billion (13.6 bn Euro) respectively.

In order to help industrial enterprises reduce their electricity costs, the GOC has encouraged direct supply agreements between power generators and large energy consumers. Power generators and users that meet industry operating standards have been allowed to choose their business partners and engage in direct negotiations. Electricity sold through these direct transactions is subject to government set charges for electricity transmission and distribution. In 2016, e.g., direct transactions of heavy power consumers in Henan Province covered 24 TWh and saved 78 industrial users from various industries a total of RMB 1.5 billion (204 mln Euro) in electricity charges.

3.3 Debt Equity Swaps

In the context of supply side structural reforms, the GOC has launched a series of measures to reduce the leverage of companies in a variety of industries, including the NFM sector. Debt-equity-swaps (DES) constitute a prominent component of this strategy. The idea behind the move is to lower corporate leverage and cut financing costs by replacing high-interest bank loans with relatively low-cost (dividend) equity capital. Furthermore, DES stands to relieve banks of troubled loan positions.

Following an announcement by Premier Li Keqiang in March 2016, the Ministry of Industry and Information Technology and other departments under the State Council have jointly worked out regulation to guide a new wave of DES released in mid-October of that year. Just a few days later, Yunnan Tin Group became the first company to enjoy debt relief in this fashion (followed almost immediately by Wuhan Steel). Soon thereafter, a second leading company from the NFM industry, Rising Nonferrous Metals, struck an agreement with the CCB. This company obtained a deal for RMB 15 billion (2,160 billion Euro).

The agreement reached between Yunnan Tin and the China Construction Bank (CCB) announced that an investor consortium led by the bank would acquire loans worth RMB 10 billion (1.4 bn Euro) (in two stages of RMB 5 billion each) of five subsidiaries of the industrial conglomerate, reducing the group's leverage ratio from 83% to 68% (China Daily 18.10.2016). This is not the first DES providing debt relieve for Yunnan Tin. In 1998, the GOC

already wiped out large volumes of sour loans held by various state-owned commercial banks.

While the current DES scheme is reminiscent of a previous round, conducted in the late 1990s and early 2000s, GOC representatives remain adamant that this time DES will follow market rules and not serve a “free lunch” for ailing state-owned behemoths. Before China’s accession to the WTO, the GOC orchestrated the transfer of distressed loans worth RMB 1.4 trillion (190 bn Euro) from state-owned commercial banks to four specially formed asset management corporations (AMC) – at face value. Despite the terminology, the AMCs converted only some of the sour loans into equity and never exercised their role as shareholder to influence corporate strategy.

This time, the projected debt relief is slated to be much larger – the initial phase of the DES stands to resolve RMB 3 trillion (408 bn Euro) of troubled loans. In order to contain risks, regulation released by the State Council, China’s cabinet, introduced new rules to prevent the conversion of bad loans into bad equity along with the shifting of financial risks from the industrial to the banking sector. Firstly, enterprises without competitiveness and hope for a turnaround in their business, so called “zombie” companies, are explicitly excluded. The same goes for enterprises from industries plagued by overcapacities. Lian Weiliang, deputy director of the National Development and Reform Commission has told China Daily that “The program is open only to promising companies with short-term difficulties.” (China Daily 11.10.2016) ““Zombie enterprises, including loss-ridden firms that are conceivably beyond recovery, or with opaque debt, or with potential to increase output or inventory for sectors with overcapacity ... they are forbidden”(China Daily 17.10.2016).

The official China Daily newspaper cites State Council regulation stipulating that “‘high-quality’ firms that play a leading role in their respective sectors, particularly high-growth, high-tech or strategic industries, are allowed to use the option, to overcome ‘temporary setbacks’. Such enterprises, however, must have plausible plans for reform and recovery, and should not have any record of defaults.” (China Daily 17.10.2016).

Secondly, only loans classified as normal may be converted into equity as opposed to special mention and non-performing loans. Furthermore, the valuation of loans taken off the debtors’ books is supposed to follow market principles. A transfer at face value – default practice in the past – now has to be warranted by enterprises’ individual conditions and business prospects.

Thirdly, the new rounds of DES are to be devised as purely voluntary transactions between independent, profit seeking business partners – without GOC interference or pressure. Importantly, the GOC has stated that it will not cover investors' losses should the turnaround of the industrial enterprise in question fails and it defaults on its obligations.

Finally, the institutional structure of such deals has been designed to widen funding sources and prevent the accumulation of risk in the banking sector. Banks are prohibited from directly holding the newly formed equity. Instead, they must sell the debt in question to other business entities who will then become holders of the newly minted equity. Such entities may be funded by individual investors, mutual funds, insurance companies, the national social security system or others. China's five largest banks have all created special purpose subsidiaries serving as initial investors to such equity funds.

On the face of it, the new regulatory system seems sound and well equipped to reduce systemic risks from the reallocation of ailing loans. However, a number of caveats can be identified to refute the GOC's claim that DES is based entirely on investment efficiency and market principles.

The leading Chinese economic and business news organ Caixin cited Shang Fulin, the chairman of the China Banking Regulatory Commission, as saying that "banks must ensure that the sales of debt in the swap programme are real, in the sense that the bank is no longer exposed to the risk".

The new equity fund concept has opened the door for private households to invest in distressed debt through wealth management products sold by banks. On the one hand, the sale of packaged debt products to retail investors unable to fully appreciate the financial risks involved is questionable from an ethical point of view. On the other, past practice indicates that banks have mostly compensated for the losses from their WMPs that went bad – even though they were not legally bound to do so. While these implicit guarantees are good news for private households, they mean that default risks remain lodged with banks. Fitch Ratings has warned that complicated and intransparent ownership and transaction structures imply that financial risks from the sour loans may very well end up in the hands of the original debtor banks again. Such practices would contradict the GOC's official stance that more "social capital" should be brought in to help the clean-up of such debt (South China Morning Post 17.10.2016). Consequently, the rating firm has cautioned that "China's debt-for-equity swaps aim to reduce headline corporate leverage ratios, but are unlikely to change the underlying structural risks in the economy to any great extent" (cited in Financial Times

20.10.2016). In any event, banks will be able to scrap distressed debt from their balance sheets.

Some enterprises, such as Rising Nonferrous Metals, have taken a different path towards DES. In this case, the conversion of debt into shares has been handled by the SASAC of Guangdong Province, the company's owner. The Commission took over the role of attracting investors (Wallstreet.cn 04.01.2017).

Unfortunately, little information has been disclosed by industrial enterprises, banks or fund investors on the terms of DES transactions. Based on public statements, in the three months since the DES programme was initiated, deals have been concluded with 27 financially distressed borrowers to dispose of RMB 330 billion (45 bn Euro). The China Construction Bank, which also handled the DES for Yunnan Tin and Rising Nonferrous, alone was in charge of 11 industrial enterprises with debts "worth" RMB 235 billion (32 bn Euro). It is not clear in what way and to what extent equity funds and their investors have assumed the roles and responsibilities as shareholders.

In fact it is not even sure that the funds have actually become shareholders at all. Instead, the fund may have acquired existing loans owed to banks and replaced them with new ones, a concept known as "Ming Gu Shi Zhi" (translated: stock in name, debt in reality). This is accomplished through a deal in which a creditor loans out some of its equity with a pledge to buy it back in the future at a higher price. Short term loans (financial institutions do not provide long term loans to distressed borrowers) can thus be replaced with longer maturities.

For an industrial enterprise seeking to reduce financial leverage, such arrangements work even better when it itself becomes an investor to the fund that converts its debt. Naturally, it will have more say over the terms of the deal but – more importantly – it may consolidate its share of the fund into its own assets. In the case of Yunnan Tin Group, the CCB and the industrial enterprise have jointly formed a fund that is inviting capital contributions from other investors, seeking to collect RMB 10 billion (1,440 million Euro) in two phases (China Daily 18.10.2016).

Caixin cites an official with the People's Bank of China, as saying that "For a debt-to-equity swap to be 'market driven', it needs to be spontaneously formed," highlighting that to be genuinely market driven, such deals should take place without government pressure. However, the article also cites Chen Caihong, the secretary of the CCB's board of directors with a statement suggesting that in DES, banks' own business interests are secondary to national economic strategy "banks serving the national strategy and reducing corporate leverage ra-

tios. Under this precondition, the commercial banks' own demand for sustainable development should fully be met." (Caixin 24.01.2016).

Considering that the new DES scheme is heralded as entirely market driven, a few things stand out. Yunnan Tin Group is a case in point. Considering the company's bad financial performance in recent years, its high leverage ratio and dim business prospects, the company is clearly a distressed borrower in need of debt relief. Over the past three years, the company has registered total losses of RMB 6 billion (864 million Euro) which decimated its net assets to less than RMB 10 billion (1,440 million Euro). As such it is hard to understand why the CCB-led fund did not insist on a discount but acquired the debt at face value. This is especially true as the fund seeks to attract third party investors which should be expected to demand discounts for taking over debt from a distressed borrower. This point is highlighted by a vague assurance on the part of the CCB that "most" of the debt was not subject to impairments. Asked on the matter, the South China Morning Post quoted Liao Qiang, a senior director for financial institution ratings at Standard & Poor's as saying "The pricing of the debt raises doubts over whether the swap is really carried out in line with market disciplines" and "There is a contradiction here. If the debts are absolutely 'normal', why does the company need a debt for equity swap?" (South China Morning Post, 17.10.2016).

If DES will actually spark a turnaround for Yunnan Tin Group is uncertain. Perhaps even more uncertain are the prospects of fund investors to reap the promised returns. Following three consecutive years of losses (RMB 6 billion or 864 million Euro in total), the restructuring plan underlying the DES expects Yunnan Tin to generate revenues and profits averaging RMB 81 billion (11 bn Euro) and RMB 2.3 billion (331 million Euro) per year until 2020. According to CCB forecasts, this would lead to investment returns to the tune of 5-15%. (CreditSight 2016 cited in FT 20.10.2016). In the event that Yunnan Tin Group finds itself unable to meet these targets, it has obliged itself to buy back the shares. Should Yunnan Tin Group, in fact, miss the agreed performance goals, it is highly doubtful that the company can come up with sufficient capital to compensate the investors participating in its equity fund. While the GOC has so far ruled out any compensation for equity investors hit by a default, it remains to be seen if the company which is owned by Yunnan Province will be saved with public funds.

Looking under the surface of DES 2.0 and considering its first few months in operation, the framework does not appear as the "market driven" solution the GOC said it was. As the previous paragraphs have outlined, the independence from GOC meddling as well as the orientation towards efficiency and free market operation should be doubted. Two final aspects that divorce the State Council's concept from economic reality must be mentioned.

Firstly, all of the companies which have reached DES agreements with banking partners are state-owned. This is certainly surprising considering the State Council's assurance to stay out of the selection of industrial enterprises.

Secondly, the industry affiliation of the enterprises chosen for DES is telling, there are 3 steel enterprises, 5 coal and coking enterprises and 2 non-ferrous metals enterprises. At least 10 of the first 16 companies are operating in industries suffering from overcapacities. This is in contrast to initial assurances on the part of the GOC that players from such sectors would be treated with utmost caution, if not excluded. Guangfa Securities expects that the next candidates for DES will come from one of two groups: (1) very large, heavily indebted, state-owned enterprises from industries with overcapacities; or (2) high technology players operating in fields designated by the GOC as Strategic Emerging Industries (Wallstreet.cn 01.11.2016). A list of prospective candidates is provided in table 1:

Table 1 Likely candidates for future DES

Company	Debt-asset ratio	Total debt (bn RMB)	Total debt (bn Euro)	Ownership
Aluminium Corporation of China	72.62%	185.5	25,2	Central SOE
Henan Shenhua Coal & Power	81.79%	50.9	6,9	Local SOE
Yunnan Aluminium Group	76.52%	28.8	3,9	Local SOE
Yunnan Copper Group	72.39%	24.1	3,3	Local SOE
Jilin Ji'en Nickel Group	72.37%	16.0	2,2	Local SOE
Henan Yuguang Group	80.17%	7.4	1,0	Local SOE
Zhuzhou Smelter Group	97.63%	5.8	0,8	Local SOE

Source: Wallstreet.cn 01.11.2016 and THINK!DESK.

The high debt-asset ratio of the companies listed in table 1 warrants special notice. For comparison: The companies constituting the Thomson Reuters EU Large Value Index have over the last 5 years consistently been featuring a high debt-asset ratio of 18% to 19%. Most European companies belonging to the non-ferrous metals sector feature debt-asset ratios amounting to only one third or one quarter of that of their Chinese counterparts listed above.

In spite of the reforms made to the original DES approach of the 1990s, the overall picture we got resembles a game of three card monte intended to shift and hide bad debt so as to keep industrial enterprises alive. Furthermore, the DES will go hand in glove with complementary fiscal and financial support. Recent statements from senior NDRC leaders on the matter have echoed the original State Council circular from October 2016.

3.4 Tolerance of competition-undermining institutional arrangements

Besides the GOC's efforts to streamline the NFM sector, purely enterprise-based initiatives for collusive behaviour are at work.

In late 2015, on the background of widespread financial distress in the NFM industry, a group of six SOEs, which together accounted for about 42% of Chinese aluminium output, prepared to establish a joint aluminium stockpile. The idea was to remove a certain amount of output from the market in order to cut market supply and support price levels. The stockpile was planned as a temporary solution – it was supposed to be dissolved once prices had recovered.

The stockpile was to be put under joint management and at least partly funded by government subsidies. The GOC itself does not maintain aluminium reserves and was not willing to buy the material; however, the national competition watchdog did not oppose the group's plans either. No information was leaked concerning the total size of the stockpile or the individual contributions by the six industry heavyweights before the initiative was abandoned in light of rising prices in April 2016.

It should be noted that the stockpiling initiative developed in parallel with talks on joint output reductions. At the time, leading aluminium smelters held a series of negotiations on how to share the pain of these cuts. Agreements were reached not only on binding commitments (essentially production quotas) for the participating players, but also mutual supervision mechanisms. No concrete information was leaked before the plan fell through due to the market recovery.

While these industry initiatives never came to operate in practise, they have provided leading enterprises in the aluminium sector with a tool to jointly manage market supply in China for their own benefit. Plans for such mechanisms are shelved for now but may well be revived should the situation call for it again. Even more disturbing is the GOC's tolerance in the face of clearly anti-competitive behaviour.

As a matter of fact a very similar scheme was developed a few months later in the Chinese tin sector. In early 2016, the leading nine firms in this sector formed a cartel and agreed to cut their joint output of refined tin by 17,000 tons as well as to take further concerted action to support prices and restore profitability. Again the GOC did not intervene and allowed (at least passively by refraining from regulatory intervention) this market-undermining initiative to unfold.

4 SPECIFIC TOOLS OF GOVERNMENTAL INTERVENTIONS IN THE NON-FERROUS METALS INDUSTRY

Chapter summary:

The Chinese non-ferrous metals industry profits very substantially from direct government grants and subsidy payments disbursed through a broad range of targeted programmes that facilitate the governmental micro-management of industry sectors as well as individual firms by Chinese government. This study identifies non-operating income subsidies received by 65 major Chinese non-ferrous metals industry firms during the period 2011 to the first half of 2016 amounting to more than 41 billion Yuan RMB or more than 5 billion Euro (annual average exchange rates, nominal addition). In addition these companies also profited from deferred income subsidies amounting to more than 16 billion Yuan RMB or more than 2 billion Euro (annual average exchange rates, nominal addition). The programmes through which these subsidies are disbursed target a broad variety of policy goals ranging from electricity subsidies to green development, and from plant relocation to R&D subsidies. The highest subsidy volumes are to be observed with regard to electricity subsidies.

In addition to the various horizontal interventions of the GOV, a large number of targeted, specific programmes have been put in place that allow Chinese government organization a micro-management of industry sectors as well as individual firms. In the following some of the most important programmes targeting the NFM industry are being presented. Chapters 4.1 and 4.2 are presenting aggregate data on subsidies and financial grants provided by the GOC to individual firms the Chinese non-ferrous metals industry. Chapters 4.3 and following are then presenting further details on the specific subsidy disbursements constituting the non-operating income grants summarized in chapter 4.1.

4.1 Subsidies – General Overview

The Chinese NFM sector has consistently benefited from generous financial and non-monetary support. Financial transfers take various forms, e.g. direct cash grants, equity infusions and loan interest subsidies. The aggregate results, displayed in table 2, illustrate the extent of subsidy receipts. All grants presented here belong into the category of non-operating income, i.e. income that affects enterprises' financial performance of the year in which the transfer was received.

Table 2 Subsidies received by leading NFM producers (in RMB, total in Euro)

Chinese name	English name	2011	2012	2013	2014	2015	2016H1
深圳市中金岭南有色金属股份有限公司	Shenzhen Zhongjin Lingnan Nonfemet Co., Ltd.	36,026,309	37,800,595	35,857,363	45,689,677	80,867,773	8,938,859
内蒙古兴业矿业股份有限公司	Inner Mongolia Xingye Mining Co., Ltd.	21,496,999	1,875,000	300,000	318,200	500,000	310,000
焦作万方铝业股份有限公司	Jiaozuo Wanfang Aluminum Manufacturing Co., Ltd.	6,279,926	61,220,835	55,944,594	10,546,702	5,665,762	3,515,862
铜陵有色金属集团股份有限公司	Tongling Nonferrous Metals Group Co., Ltd.	272,009,255	250,995,010	216,543,870	195,998,110	138,085,876	54,258,130
中钨高新材料股份有限公司	China Tungsten and Hightech Materials Co., Ltd.	-	86,302,597	99,874,395	132,490,287	46,341,929	15,393,682
建新矿业股份有限公司	Jianxin Mining Co., Ltd.	10,000,000	1,640,000	190,000	54,969	19,539	50,000
葫芦岛锌业股份有限公司	Huludao Zinc Industry Co., Ltd.	23,095,441	29,292,511	12,160,958	19,755,826	12,162,940	2,571,965
中国有色金属建设股份有限公司	China Nonferrous Metal Industry's Foreign Engineering and Construction Co.,Ltd.	11,676,369	26,870,010	118,421,372	71,189,107	56,578,387	156,320,893
云南铝业股份有限公司	Yunnan Aluminium Co., Ltd.	48,333,080	252,743,177	395,789,205	66,445,107	552,792,577	13,905,111

Chinese name	English name	2011	2012	2013	2014	2015	2016H1
新疆天山毛纺织股份有限公司	Xinjiang Tianshan Wool Tex Stock Co., Ltd.	19,383,217	17,019,246	14,250,499	17,346,104	10,882,308	1,444,092
云南铜业股份有限公司	Yunnan Copper Co., Ltd.	83,824,737	130,226,543	134,465,355	52,037,712	228,845,826	16,440,263
河南神火煤电股份有限公司	Henan Shenhua Coal & Power Co., Ltd.	30,413,900	49,951,901	142,849,399	50,711,959	118,964,196	11,819,015
云南锡业股份有限公司	Yunnan Tin Co., Ltd.	26,128,034	43,635,826	80,087,272	103,766,414	42,973,247	24,011,322
浙江栋梁新材股份有限公司	Zhejiang Dongliang New Material Co., Ltd.	3,032,203	3,253,552	4,000,866	4,743,617	4,946,994	3,361,894
湖南黄金股份有限公司	Hunan Gold Corporation Limited	12,107,170	15,981,167	33,298,940	14,511,509	29,819,071	1,948,528
江苏常铝铝业股份有限公司	Jiangsu Alcha Aluminium Co., Ltd.	6,581,567	3,030,067	1,490,567	5,469,562	7,350,097	2,767,753
安徽精诚铜业股份有限公司	Anhui Jingcheng Copper Share Co., Ltd.	66,269,983	33,388,979	72,910,757	16,049,001	39,555,165	8,539,479
南京云海特种金属股份有限公司	Nanjing Yunhai Special Metals Co., Ltd.	24,264,007	7,648,850	9,873,389	11,381,814	16,295,929	9,372,639
浙江海亮股份有限公司	Zhejiang Hailiang Co., Ltd.	30,020,932	12,227,814	6,599,105	20,125,803	46,111,970	10,967,214
山东恒邦冶炼股份有限公司	Shandong Humon Smelting Co., Ltd.	4,155,350	12,918,800	9,117,060	7,117,421	11,712,245	8,273,402
广东精艺金属股份有限公司	Guangdong Jingyi Metal Co., Ltd.	18,259,242	23,904,382	29,666,577	1,577,673	1,731,853	293,700

Chinese name	English name	2011	2012	2013	2014	2015	2016H1
苏州罗普斯金铝业股份有限公司	Suzhou Lopsking Aluminum Co., Ltd.	96,000	192,500	1,737,401	n/a	34,107,258	49,387,225
崇义章源钨业股份有限公司	Chongyi Zhangyuan Tungsten Co., Ltd.	4,053,162	9,317,578	8,456,775	14,297,223	35,261,476	35,647,271
鲁丰环保科技股份有限公司	Loften Environmental Technology Co., Ltd	4,732,218	7,269,480	1,151,784	84,600	370,100	n/a -
吉林利源精制股份有限公司	Jilin Liyuan Precision Manufacturing Co., Ltd.	3,429,906	11,338,930	8,036,309	13,522,847	11,761,169	7,163,395
江苏亚太轻合金科技股份有限公司	Jiangsu Asia-Pacific Light Alloy Technology Co., Ltd.	18,393,357	13,994,224	9,534,509	8,923,541	10,061,197	9,304,459
福建省闽发铝业股份有限公司	Fujian Minfa Aluminium Co., Ltd	3,892,210	2,950,023	7,550,164	3,772,802	4,019,935	1,397,165
中矿资源勘探股份有限公司	Sinomine Resource Exploration Co., Ltd.	21,680,410	24,778,116	7,029,347	1,120,193	3,073,400	170,000
银邦金属复合材料股份有限公司	Yinbang Clad Material Co., Ltd.	11,640,404	6,096,171	2,725,986	6,233,267	13,257,483	3,932,684
四川西部资源控股股份有限公司	Sichuan Western Resources Holding Co., Ltd	2,431,600	2,876,950	1,014,330	3,619,100	9,329,820	9,277,877
山东南山铝业股份有限公司	Shandong Nanshan Aluminium Co., Ltd.	975,000	11,457,000	14,076,280	12,087,370	13,085,632	6,675,200
安徽鑫科新材料股份有限公司	Anhui Xinke New Materials Co., Ltd.	1,618,300	9,891,140	14,112,215	17,249,563	11,050,325	5,067,011

Chinese name	English name	2011	2012	2013	2014	2015	2016H1
广晟有色金属股份有限公司	Rising Nonferrous Metals Share Co., Ltd.	28,891,132	21,778,597	34,918,872	60,712,863	31,249,106	21,076,419
江西铜业股份有限公司	Jiangxi Copper Co., Ltd.	102,999,090	114,917,569	125,810,017	109,049,458	130,017,135	n/a -
中金黄金股份有限公司	Zhongjin Gold Co., Ltd.	72,619,142	117,479,967	90,631,327	66,552,151	41,835,725	12,066,114
河南豫光金铅股份有限公司	Henan Yuguang Gold & Lead Co., Ltd.	67,607,680	25,733,702	91,569,118	215,374,026	151,991,119	40,536,609
河南中孚实业股份有限公司	Henan Zhongfu Industrial Co., Ltd.	175,420,016	86,376,200	45,979,552	33,484,300	5,387,130	2,065,600
宁波富邦精业集团股份有限公司	Ningbo Fubang Jingye Group Co., Ltd.	100,000	861,049	1,723,357	744,830	389,687	1,155,637
宁波博威合金材料股份有限公司	Ningbo Boway Alloy Material Co., Ltd.	21,277,662	6,299,224	15,375,305	16,160,132	13,755,363	13,291,976
西部矿业股份有限公司	Western Mining Co., Ltd.	96,786,208	26,370,902	18,373,599	34,518,277	37,605,909	433,575
怡球金属资源再生(中国)股份有限公司	Ye Chiu Metal Recycling (China) Ltd.	4,652,034	8,303,637	1,266,458	2,895,651	1,657,511	341,051
中国铝业股份有限公司	Aluminum Corporation of China Ltd.	185,501,000	744,490,000	823,880,000	823,986,000	1,768,926,000	433,165,000
河南明泰铝业股份有限公司	Henan Mingtai Aluminium Industrial Co., Ltd.	8,889,300	29,629,986	7,756,137	5,112,100	3,183,833	867,500
紫金矿业集团股份有限公司	Zijin Mining Group Co., Ltd.	90,944,316	91,978,060	159,679,631	72,870,565	123,080,640	76,529,802

Chinese name	English name	2011	2012	2013	2014	2015	2016H1
国家电力投资集团公司	State Energy Investment Group Co.	n/a	n/a	n/a	1,588,059,840	2,259,227,704	483,540,000
株洲冶炼集团股份有限公司	Zhuzhou Smelter Group Co., Ltd.	13,777,616	32,112,060	171,955,482	45,255,698	28,590,698	28,294,236
中国冶金科工股份有限公司	Metallurgical Corporation of China Ltd.	741,247,000	560,551,000	613,922,000	1,066,485,000	676,858,000	260,264,000
阳谷祥光铜业有限公司	Xiangguang Copper Co., Ltd.	42,162,877	56,537,500	71,135,150	43,947,410	10,998,200	n/a
云南驰宏锌锗股份有限公司	Yunnan Chihong Zinc & Germanium Co., Ltd.	72,962,271	56,043,900	64,663,043	54,662,171	66,543,340	12,211,649
安阳市豫北金铅集团	Anyang Yubei Gold & Lead Group	n/a	n/a	20,480,000	n/a	n/a	n/a
四川其亚铝业集团有限公司	Sichuan Qiya Aluminium Group Co., Ltd.	n/a	n/a	2,739,305	n/a	n/a	n/a
山东魏桥铝电有限公司	Shandong Weiqiao Aluminium & Power Co., Ltd.	30,000	300,000	1,000,000	n/a	n/a	n/a
中国电力投资集团	China Energy Investment Group Co.	2,410,819,610	3,185,689,404	1,932,768,432	1,449,587,886	n/a	n/a
国电投宁夏青铜峡能源铝业集团有限公司	State Energy Investment Ningxia Qingtongxia Aluminium Group Co., Ltd.	n/a	7,092,100	44,154,773	n/a	n/a	n/a
成都华泽钴镍材料股份有限公司	Chengdu Huaze Cobalt & Nickel Material Co., Ltd.	n/a	13,230,000	5,256,700	635,866	1,900,000	n/a

Chinese name	English name	2011	2012	2013	2014	2015	2016H1
厦门钨业股份有限公司	Xiamen Tungsten Co., Ltd.	33,021,762	27,660,122	72,427,972	141,037,115	56,085,028	29,565,687
广东和胜工业铝材股份有限公司	Guangdong Hoshion Aluminium Co., Ltd.	n/a	n/a	2,064,470	3,814,803	3,230,401	276,328
广东翔鹭钨业股份有限公司	Guangdong Xianglu Tungsten Co., Ltd.	n/a	n/a	2,324,900	3,597,140	3,400,499	2,964,000
吉林吉恩镍业股份有限公司	Jilin Ji'en Nickel Industry Co., Ltd.	16,630,743	15,656,595	17,975,624	13,658,956	38,538,564	10,162,468
广铝集团有限公司	Galuminium Group Co., Ltd.	n/a	n/a	1,169,200	937,400	3,819,170	n/a
江西稀有稀土金属钨业集团有限公司	Jiangxi Rare Earth Metals and Tungsten Group Co., Ltd.	n/a	n/a	126,707,242	263,660,456	239,821,577	n/a
中铝宁夏能源集团有限公司	China Aluminium Ningxia Energy Group Co., Ltd.	n/a	n/a	n/a	91,273,721	79,610,552	n/a
中铝国际工程股份有限公司	China Aluminium International Engineering Co., Ltd.	n/a	n/a	n/a	44,334,494	55,339,049	n/a
金川集团公司	Jinchuan Group Co., Ltd.	n/a	n/a	n/a	848,817,291	868,814,513	n/a
中国五矿集团公司	China Minmetals Group Co.	1,104,118,011	1,394,780,769	1,824,269,801	986,087,994	533,093,490	n/a
Total in RMB	65 enterprises	6,116,757,757	7,825,961,318	7,941,094,110	9,015,550,672	8,832,531,424	1,911,333,742

Chinese name	English name	2011	2012	2013	2014	2015	2016H1
Total in Euro	65 enterprises	678,960,111	962,593,242	960,872,387	1,099,897,182	1,271,884,525	259,941,389

Source: company filings, own research

As illustrated above, aggregate subsidy income for the 65 enterprises under review has surged in recent years. Between 2011 and June 2016, the 65 enterprises under review have received a total of 41.6 billion RMB. Contrary to GOC statements, the flood of subsidies has not ebbed in recent years. Disbursements have grown since 2011 and reached a peak in 2014. In 2015, the last full year for which data was available, subsidies have decreased slightly. This indicates that the GOC regards direct financial support as a normal instrument in its industrial policy toolbox.

It is notable that the lion's share of subsidies is given to state-owned enterprises (SOE). The ten largest recipients are all owned and controlled by either the central government or local authorities. Grants to privately owned enterprises and those with foreign capital participation have generally on a much smaller scale, as table 3 clearly shows.

While some part of this assistance is intended to keep enterprises out of insolvency, however, an arguably larger share is provided contingent on compliance with GOC directives. In order to obtain reliable and verifiable data on subsidies provided, THINK!DESK has conducted an extensive analysis of financial statements of 65 NFM enterprises.

Table 3 Top 10 subsidy recipients (in RMB)

Rank	Enterprise	Total (2011-2016 H1)	Ownership type
1	China Energy Investment Group Co.	8,978,865,332	Central SOE
2	China Minmetals Group Co.	5,842,350,065	Central SOE
3	Aluminum Corporation of China Ltd.	4,779,948,000	Central SOE
4	State Energy Investment Group Co.	4,330,827,544	Central SOE
5	Metallurgical Corporation of China Ltd.	3,919,327,000	Central SOE
6	Jinchuan Group Co., Ltd.	1,717,631,804	Local SOE
7	Yunnan Aluminium Co., Ltd.	1,330,008,257	Local SOE
8	Tongling Nonferrous Metals Group Co., Ltd.	1,127,890,251	Local SOE
9	Yunnan Copper Co., Ltd.	645,840,436	Local SOE
10	Jiangxi Rare Earth Metals and Tungsten Group Co., Ltd.	630,189,275	Local SOE
Total		33,302,877,964	

Source: company filings, own research

A review of individual subsidy transactions obtained by the same set of 65 companies confirms that state-owned enterprises (SOE) have benefitted from the largest items. Remarkably, SOEs controlled by the SASAC of the State Council (central SOEs for short) show a marked advantage over those under the purview of provincial or lower level governments (local SOEs).

A further review of the data reveals that subsidies are not distributed evenly but are concentrated on a small group of very large, mostly state-owned, enterprises. This is in line with the national champion strategy. It could be argued that large companies simply require larger amounts of financial aid to weather the crisis of high debts and low profits which has engulfed the NFM industry over the past years. The scale of layoffs and bad debt resulting from the failure of a very large enterprise may also explain higher levels of life support. However,

this narrative is not borne out by the information collected on the types and goals of subsidy transfers.

Available data clearly suggests that the main players are supported in their adjustment towards more technology driven, environmentally friendly and internationally oriented development pattern. Subsidies thus compensate for some of the necessary adjustment cost tied to regulatory tightening in energy efficiency, pollution prevention, emission reduction, worker safety and many other fields.

Subsidies disbursed to the 65 enterprises under review have had a substantial influence on their financial performance. In order to better illustrate the game-changing character of financial aid, the subsidies received by individual companies in various years are related to their respective net incomes. It can be found that grants have in many cases reversed losses or multiplied profits. In 2015, subsidies account for 27% of accumulated net incomes before tax and even 53% of combined after tax profits.

In order to relate subsidies to net incomes, this report employs the subsidy ratio concept. Where net incomes are positive, subsidy ratios reflect the share of grants contained in the net profit (a positive percentage value). Where net incomes are negative, subsidy ratios indicate the reduction of net losses accomplished by these grants (a negative percentage value). In order make this differentiation more visible in the following table 4, THINK!DESK has printed loss reduction ratios in bold and added an asterisk.

Table 4 Subsidy receipts of major NFM enterprises relative to their net income

Chinese name	English name	Subsidies in net income before taxes					Subsidies in net income after taxes				
		2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
深圳市中金岭南有色金属股份有限公司	Shenzhen Zhongjin Lingnan Nonfemet Co., Ltd.	11%	6%	8%	7%	6%	14%	7%	9%	9%	7%
内蒙古兴业矿业股份有限公司	Inner Mongolia Xingye Mining Co., Ltd.	13%	2%	0%	0%	-1%*	14%	4%	0%	0%	-1%*
焦作万方铝业股份有限公司	Jiaozuo Wanfang Aluminum Manufacturing Co., Ltd.	-6%*	15%	20%	-10%**	1%	-9%*	17%	21%	-41%*	1%
铜陵有色金属集团股份有限公司	Tongling Nonferrous Metals Group Co., Ltd.	61%	36%	20%	11%	11%	81%	46%	28%	13%	14%
中钨高新材料股份有限公司	China Tungsten and Hightech Materials Co., Ltd.		39%	-66%*	2585%	578%		42%	-66%*	2866%	605%
建新矿业股份有限公司	Jianxin Mining Co., Ltd.	3%	0%	0%	0%*	1%	3%	1%	0%	0%	1%
葫芦岛锌业股份有限公司	Huludao Zinc Industry Co., Ltd.	26%	1%	0%*	-2%*	-5%*	26%	1%	0%*	-2%*	-2%*
中国有色金属建设股份有限公司	China Nonferrous Metal Industry's Foreign Engineering and Construction Co., Ltd.	3%	11%	40%	10%	14%	4%	16%	53%	14%	18%
云南铝业股份有限公司	Yunnan Aluminium Co., Ltd.	-12%*	-22%*	-75%*	138%	375%	-10%*	-25%*	-78%*	230%	446%
新疆天山毛纺织股份有限公司	Xinjiang Tianshan Wool Tex Stock Co., Ltd.	20%	14%	-52%*	354%	182%	38%	21%	-71%*	445%	198%
云南铜业股份有限公司	Yunnan Copper Co., Ltd.	47%	61%	-9%*	19%	20%	130%	101%	-9%*	40%	27%

Chinese name	English name	Subsidies in net income before taxes					Subsidies in net income after taxes				
		2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
河南神火煤电股份有限公司	Henan Shenhua Coal & Power Co., Ltd.	-11%*	43%	39%	4%	8%	-7%*	-94%*	120%	5%	12%
云南锡业股份有限公司	Yunnan Tin Co., Ltd.	-2%*	87%	-5%*	246%	5%	-1%*	23%	-6%*	163%	6%
浙江栋梁新材股份有限公司	Zhejiang Dongliang New Material Co., Ltd.	4%	2%	3%	4%	2%	4%	3%	3%	5%	3%
湖南黄金股份有限公司	Hunan Gold Corporation Limited	60%	11%	14%	2%	4%	83%	10%	18%	3%	6%
江苏常铝铝业股份有限公司	Jiangsu Alcha Aluminium Co., Ltd.	26%	-5%*	-2%*	80%	15%	31%	-5%*	-2%*	92%	16%
安徽精诚铜业股份有限公司	Anhui Jingcheng Copper Share Co., Ltd.	80%	283%	-51%*	47%	39%	118%	235%	-56%*	60%	45%
南京云海特种金属股份有限公司	Nanjing Yunhai Special Metals Co., Ltd.	79%	50%	54%	43%	65%	104%	42%	326%	66%	150%
浙江海亮股份有限公司	Zhejiang Hailiang Co., Ltd.	6%	4%	3%	8%	18%	6%	4%	3%	9%	19%
山东恒邦冶炼股份有限公司	Shandong Humon Smelting Co., Ltd.	2%	4%	3%	2%	4%	3%	5%	4%	2%	5%
广东精艺金属股份有限公司	Guangdong Jingyi Metal Co., Ltd.	182%	-24%*	836%	21%	10%	287%	-30%*	829%	28%	8%
苏州罗普斯金铝业股份有限公司	Suzhou Lopsking Aluminum Co., Ltd.	0%	0%	2%		43%	0%	0%	2%		52%
崇义章源钨业股份有限公司	Chongyi Zhangyuan Tungsten Co., Ltd.	4%	6%	5%	4%	20%	6%	9%	6%	5%	23%

Chinese name	English name	Subsidies in net income before taxes					Subsidies in net income after taxes				
		2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
鲁丰环保科技股份有限公司	Loften Environmental Technology Co., Ltd	-1%*	57%	4%	0%	1%	-1%*	100%	6%	1%	1%
吉林利源精制股份有限公司	Jilin Liyuan Precision Manufacturing Co., Ltd.	1%	3%	3%	8%	10%	1%	4%	4%	10%	13%
江苏亚太轻合金科技股份有限公司	Jiangsu Asia-Pacific Light Alloy Technology Co., Ltd.	7%	8%	8%	6%	7%	8%	10%	10%	7%	8%
福建省闽发铝业股份有限公司	Fujian Minfa Aluminium Co., Ltd	18%	7%	14%	8%	6%	21%	8%	16%	9%	7%
中矿资源勘探股份有限公司	Sinomine Resource Exploration Co., Ltd.	44%	37%	10%	1%		54%	49%	10%	1%	
银邦金属复合材料股份有限公司	Yinbang Clad Material Co., Ltd.	17%	7%	2%	4%	12%	21%	8%	3%	5%	14%
四川西部资源控股股份有限公司	Sichuan Western Resources Holding Co., Ltd	8%	-8%*	0%	1%	7%	19%	-5%*	0%	1%	7%
山东南山铝业股份有限公司	Shandong Nanshan Aluminium Co., Ltd.	0%	1%	1%	1%	1%	0%	1%	2%	1%	1%
安徽鑫科新材料股份有限公司	Anhui Xinke New Materials Co., Ltd.	4%	-17%*	86%	33%	18%	5%	-17%*	92%	40%	20%
广晟有色金属股份有限公司	Rising Nonferrous Metals Share Co., Ltd.	-8%*	47%	-34%*	44%	10%	-8%*	118%	-34%*	70%	14%
江西铜业股份有限公司	Jiangxi Copper Co., Ltd.	9%	3%	3%	2%	2%	15%	4%	3%	2%	2%
中金黄金股份有限公司	Zhongjin Gold Co., Ltd.	15%	12%	3%	2%	2%	27%	17%	4%	3%	2%

Chinese name	English name	Subsidies in net income before taxes					Subsidies in net income after taxes				
		2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
河南豫光金铅股份有限公司	Henan Yuguang Gold & Lead Co., Ltd.	341%	-5%	104%	160%	70%	250%	-5%*	158%	236%	99%
河南中孚实业股份有限公司	Henan Zhongfu Industrial Co., Ltd.	-12%*	-31%*	-4%*	-35%*	2%	-14%*	-33%*	-5%*	30%	3%
宁波富邦精业集团股份有限公司	Ningbo Fubang Jingye Group Co., Ltd.	0%*	27%	-4%*	13%	-8%*	0%*	33%	-4%*	15%	-7%*
宁波博威合金材料股份有限公司	Ningbo Boway Alloy Material Co., Ltd.	27%	8%	16%	14%	9%	25%	9%	18%	15%	10%
西部矿业股份有限公司	Western Mining Co., Ltd.	41%	6%	3%	-21%*	3%	90%	8%	5%	-21%*	4%
怡球金属资源再生(中国)股份有限公司	Ye Chiu Metal Recycling (China) Ltd.	11%	7%	1%	1%	1%	15%	9%	1%	1%	1%
中国铝业股份有限公司	Aluminum Corporation of China Ltd.	96%	-4%*	78%	-8%*	216%	51%	-4%*	114%	-9%*	256%
河南明泰铝业股份有限公司	Henan Mingtai Aluminium Industrial Co., Ltd.	4%	12%	8%	6%	1%	5%	16%	11%	8%	1%
紫金矿业集团股份有限公司	Zijin Mining Group Co., Ltd.	4%	3%	4%	1%	1%	7%	3%	6%	1%	2%
国家电力投资集团公司	State Energy Investment Group Co.				15%	16%				25%	27%
株洲冶炼集团股份有限公司	Zhuzhou Smelter Group Co., Ltd.	-2%*	55%	626%	-7%*	-5%*	-2%*	81%	741%	-7%*	-5%*
中国冶金科工股份有限公司	Metallurgical Corporation of China Ltd.	10%	8%	12%	-12%*	11%	15%	13%	20%	-9%*	18%

Chinese name	English name	Subsidies in net income before taxes					Subsidies in net income after taxes				
		2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
阳谷祥光铜业有限公司	Xiangguang Copper Co., Ltd.	11%	11%	13%	6%	2%	12%	12%	15%	7%	2%
云南驰宏锌锗股份有限公司	Yunnan Chihong Zinc & Germanium Co., Ltd.	63%	25%	9%	8%	15%	106%	42%	11%	10%	19%
安阳市豫北金铅集团	Anyang Yubei Gold & Lead Group										
四川其亚铝业集团有限公司	Sichuan Qiya Aluminium Group Co., Ltd.			1%					1%		
山东魏桥铝电有限公司	Shandong Weiqiao Aluminium & Power Co., Ltd.	0%	0%	0%			0%	0%	0%		
中国电力投资集团	China Energy Investment Group Co.	93%	59%	17%	25%		485%	106%	26%	14%	
国电投宁夏青铜峡能源铝业集团有限公司	State Energy Investment Ningxia Qingtongxia Aluminium Group Co., Ltd.		-1%*	-5%				-1%*	-5%*		
成都华泽钴镍材料股份有限公司	Chengdu Huaze Cobalt & Nickel Material Co., Ltd.		5%	4%	0%	-3%*		6%	5%	0%	-3%*
厦门钨业股份有限公司	Xiamen Tungsten Co., Ltd.	-6%*	2%	5%	14%	3%	-5%*	3%	8%	16%	4%
广东和胜工业铝材股份有限公司	Guangdong Hoshion Aluminium Co., Ltd.			5%					6%		
广东翔鹭钨业股份有限公司	Guangdong Xianglu Tungsten Co., Ltd.			4%					4%		
吉林吉恩镍业股份有限公司	Jilin Ji'en Nickel Industry Co., Ltd.	0%*	-2%*	190%	-20%*	-69%*	-1%*	-3%*	315%	-9%*	-43%*

Chinese name	English name	Subsidies in net income before taxes					Subsidies in net income after taxes				
		2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
广铝集团有限公司	Galuminium Group Co., Ltd.			0%	0%	1%			0%	0%	1%
江西稀有稀土金属钨业集团有限公司	Jiangxi Rare Earth Metals and Tungsten Group Co., Ltd.			-21%*	-21%*	-56%*			-19%*	-21%*	-50%*
中铝宁夏能源集团有限公司	China Aluminium Ningxia Energy Group Co., Ltd.				-8%*	40%				-7%*	42%
中铝国际工程股份有限公司	China Aluminium International Engineering Co., Ltd.				7%	6%				5%	5%
金川集团公司	Jinchuan Group Co., Ltd.				425%	-11%*				599%	-12%*
中国五矿集团公司	China Minmetals Group Co.	10%	19%	28%	403%	-3%*	16%	29%	41%	-33%*	-3%*
Average contribution to net income across 65 enterprises		20%	27%	18%	32%	27%	36%	52%	28%	51%	53%

Source: company filings, own research

4.2 Other types of financial grants

The subsidies discussed so far only include grants that fall into non-operating income, i.e. that affect enterprises' financial performance of the year in which the transfer was received. In addition, almost all listed enterprises have obtained so called **deferred income subsidies**. The latter may not immediately impact corporate profits in the same year but bestow upon the enterprise a longer lasting benefit. In fact, Chinese accounting rules hide the full extent of government transfers, as deferred income subsidies only gradually come to influence profits while grants made as investments by the state are not treated as subsidies at all:

Where companies receive subsidies for use over multiple years, funds are credited to a deferred income account and gradually released as non-operating income in subsequent accounting periods:

- Subsidies relating to assets are registered at fair value and kept as deferred income. The grant is then converted into non-operating income in equal annual instalments over the assets' expected useful lifetime.
- Subsidies intended to compensate future expenses are booked as deferred income first and recognized as non-operating income in the periods in which the costs to be compensated are expensed. Subsidies intended to cover expenses in the current or past periods are registered as non-operating income in the period they were received.

Deferred income subsidies are substantial, both in their amount and their relevance. They tend to benefit recipients in the long term by helping companies obtain major assets and/or by reducing their cost burden. The following table 5 provides an overview of deferred income subsidies received.

Chinese accounting standards mandate that **government grants made as investments**, e.g. in R&D centres or production plants, are to be credited to the capital reserve once construction of the underlying assets is complete. Such grants have no direct manifestation in the profits and losses.

While information is less explicit, these forms of financial support are highly relevant as they cover state assistance for assets that hold strategic value to corporate strategy and (international) expansion, such as technology development centres and other critical pieces of corporate infrastructure. Especially the leading state-owned players have managed to significantly grow their capacities and enhance their capabilities thanks to the injection of state investment.

Table 5 Deferred income subsidies received by leading NFM producers (in RMB, total in Euro)

Chinese name	English name	2011	2012	2013	2014	2015	2016H1
深圳市中金岭南有色金属股份有限公司	Shenzhen Zhongjin Lingnan Nonfemet Co., Ltd.	n/a	n/a	34,503,878	54,543,310	112,426,991	15,156,934
内蒙古兴业矿业股份有限公司	Inner Mongolia Xingye Mining Co., Ltd.	n/a	6,000,000	n/a	n/a	n/a	n/a
焦作万方铝业股份有限公司	Jiaozuo Wanfang Aluminum Manufacturing Co., Ltd.	6,105,000	4,000,000	1,900,000	5,000,000	n/a	n/a
铜陵有色金属集团股份有限公司	Tongling Nonferrous Metals Group Co., Ltd.	n/a	n/a	83,752,183	140,490,000	215,650,200	13,715,000
中钨高新材料股份有限公司	China Tungsten and Hightech Materials Co., Ltd.	n/a	n/a	31,955,292	50,848,718	64,966,900	5,152,395
建新矿业股份有限公司	Jianxin Mining Co., Ltd.	n/a	n/a	n/a	n/a	n/a	n/a
葫芦岛锌业股份有限公司	Huludao Zinc Industry Co., Ltd.	4,124,728	3,000,000	n/a	n/a	150,000	n/a
中国有色金属建设股份有限公司	China Nonferrous Metal Industry's Foreign Engineering and Construction Co., Ltd.	n/a	n/a	46,040,000	9,826,000	72,634,188	172,070,000
云南铝业股份有限公司	Yunnan Aluminium Co., Ltd.	n/a	n/a	n/a	8,377,250	20,254,652	2,186,300

Chinese name	English name	2011	2012	2013	2014	2015	2016H1
新疆天山毛纺织股份有限公司	Xinjiang Tianshan Wool Tex Stock Co., Ltd.	n/a	4,393,700	2,000,000	n/a	5,300,000	1,845,000
云南铜业股份有限公司	Yunnan Copper Co., Ltd.	122,813,641	189,487,831	37,250,000	19,156,128	8,101,128	5,762,000
河南神火煤电股份有限公司	Henan Shenhua Coal & Power Co., Ltd.	n/a	36,990,758	n/a	19,430,000	72,800,000	31,783,638
云南锡业股份有限公司	Yunnan Tin Co., Ltd.	59,712,798	142,063,010	325,966,367	225,695,644	157,160,422	2,700,000
浙江栋梁新材股份有限公司	Zhejiang Dongliang New Material Co., Ltd.	n/a	3,965,000	n/a	700,000	3,140,000	n/a
湖南黄金股份有限公司	Hunan Gold Corporation Limited	n/a	n/a	24,570,000	37,127,000	13,571,822	11,381,600
江苏常铝铝业股份有限公司	Jiangsu Alcha Aluminium Co., Ltd.	n/a	n/a	8,042,624	n/a	33,374,999	4,000,000
安徽精诚铜业股份有限公司	Anhui Jingcheng Copper Share Co., Ltd.	10,000,000	n/a	n/a	2,900,000	7,361,435	2,951,000
南京云海特种金属股份有限公司	Nanjing Yunhai Special Metals Co., Ltd.	480,000	34,730,000	19,868,800	26,820,000	n/a	n/a
浙江海亮股份有限公司	Zhejiang Hailiang Co., Ltd.	n/a	n/a	n/a	n/a	n/a	n/a
山东恒邦冶炼股份有限公司	Shandong Humon Smelting Co., Ltd.	n/a	n/a	n/a	3,500,000	52,550,000	n/a
广东精艺金属股份有限公司	Guangdong Jingyi Metal Co., Ltd.	4,237,500	500,000	847,600	1,026,400	700,000	

Chinese name	English name	2011	2012	2013	2014	2015	2016H1
苏州罗普斯金铝业股份有限公司	Suzhou Lopsking Alumi-num Co., Ltd.	n/a	n/a	n/a	n/a	n/a	n/a
崇义章源钨业股份有限公司	Chongyi Zhangyuan Tungsten Co., Ltd.	3,000,000	30,000,000	800,000	32,500,000	8,510,000	19,060,000
鲁丰环保科技股份有限公司	Loften Environmental Technology Co., Ltd	3,000,000	15,500,000	12,000,000	2,000,000	n/a	n/a
吉林利源精制股份有限公司	Jilin Liyuan Precision Manufacturing Co., Ltd.	n/a	55,638,551	16,950,000	52,000,000	15,308,386	257,050,000
江苏亚太轻合金科技股份有限公司	Jiangsu Asia-Pacific Light Alloy Technology Co., Ltd.	n/a	5,500,000	n/a	26,950,000	15,220,000	n/a
福建省闽发铝业股份有限公司	Fujian Minfa Aluminium Co., Ltd	n/a	n/a	184,400	33,748,000	10,708,900	n/a
中矿资源勘探股份有限公司	Sinomine Resource Ex-ploration Co., Ltd.	11,500,000	35,690,000	17,750,000	3,700,000	n/a	744,523
银邦金属复合材料股份有限公司	Yinbang Clad Material Co., Ltd.	25,473,139	44,037,167	9,267,833	17,340,000	10,720,000	n/a
四川西部资源控股股份有限公司	Sichuan Western Re-sources Holding Co., Ltd	n/a	n/a	26,750,000	30,266,583	10,335,000	873,000
山东南山铝业股份有限公司	Shandong Nanshan Al-uminium Co., Ltd.	17,219,913	69,128,815	13,397,192	60,867,060	86,676,000	2,800,000
安徽鑫科新材料股份有限公司	Anhui Xinke New Mate-rials Co., Ltd.	n/a	n/a	9,036,724	n/a	n/a	2,825,600
广晟有色金属股份有限公司	Rising Nonferrous Met-als Share Co., Ltd.	37,954,324	n/a	14,890,550	64,394,590	46,970,548	7,851,600

Chinese name	English name	2011	2012	2013	2014	2015	2016H1
江西铜业股份有限公司	Jiangxi Copper Co., Ltd.	100,925,005	82,295,885	87,060,448	136,851,401	226,161,819	2,168,263
中金黄金股份有限公司	Zhongjin Gold Co., Ltd.	89,752,128	n/a	n/a	20,301,525	128,068,227	800,000
河南豫光金铅股份有限公司	Henan Yuguang Gold & Lead Co., Ltd.	n/a	n/a	15,410,000	28,655,750	n/a	n/a
河南中孚实业股份有限公司	Henan Zhongfu Industrial Co., Ltd.	n/a	10,000,000	28,231,000	13,536,600	6,490,000	n/a
宁波富邦精业集团股份有限公司	Ningbo Fubang Jingye Group Co., Ltd.	n/a	n/a	n/a	n/a	n/a	n/a
宁波博威合金材料股份有限公司	Ningbo Boway Alloy Material Co., Ltd.	1,080,000	n/a	20,186,366	n/a	n/a	n/a
西部矿业股份有限公司	Western Mining Co., Ltd.	3,578,944	72,952,783	2,000,000	14,780,552	23,482,298	3,870,000
怡球金属资源再生(中国)股份有限公司	Ye Chiu Metal Recycling (China) Ltd.	n/a	n/a	n/a	n/a	n/a	n/a
中国铝业股份有限公司	Aluminum Corporation of China Ltd.	219,979,000	199,809,000	147,935,000	392,499,000	840,769,000	17,060,000
河南明泰铝业股份有限公司	Henan Mingtai Aluminium Industrial Co., Ltd.	n/a	n/a	8,040,000	n/a	2,210,000	n/a
紫金矿业集团股份有限公司	Zijin Mining Group Co., Ltd.	39,947,581	297,785,805	244,396,390	80,257,881	n/a	11,323,607
国家电力投资集团公司	State Energy Investment Group Co.	n/a	n/a	n/a	n/a	1,761,490,922	n/a

Chinese name	English name	2011	2012	2013	2014	2015	2016H1
株洲冶炼集团股份有限公司	Zhuzhou Smelter Group Co., Ltd.	23,430,000	39,564,000	46,250,000	137,715,488	37,404,692	14,286,387
中国冶金科工股份有限公司	Metallurgical Corporation of China Ltd.	328,521,000	59,826,000	168,491,000	340,282,000	180,466,000	67,706,000
阳谷祥光铜业有限公司	Xiangguang Copper Co., Ltd.	n/a	n/a	n/a	n/a	n/a	n/a
云南驰宏锌锗股份有限公司	Yunnan Chihong Zinc & Germanium Co., Ltd.	28,787,400	58,968,562	145,380,000	33,620,000	14,412,000	8,450,000
安阳市豫北金铅集团	Anyang Yubei Gold & Lead Group	n/a	n/a	n/a	n/a	n/a	n/a
四川其亚铝业集团有限公司	Sichuan Qiya Aluminium Group Co., Ltd.	n/a	n/a	n/a	n/a	52,490,000	n/a
山东魏桥铝电有限公司	Shandong Weiqiao Aluminium & Power Co., Ltd.	1,497,059,217	534,433,611	1,038,847,327	1,407,232,881	n/a	n/a
中国电力投资集团	China Energy Investment Group Co.	10,800,000	n/a	n/a	n/a	n/a	n/a
国电投宁夏青铜峡能源铝业集团有限公司	State Energy Investment Ningxia Qingtongxia Aluminium Group Co., Ltd.	n/a	n/a	n/a	n/a	n/a	n/a
成都华泽钴镍材料股份有限公司	Chengdu Huaze Cobalt & Nickel Material Co., Ltd.	50,722,849	37,925,681	37,409,980	86,004,600	26,273,910	26,273,910
厦门钨业股份有限公司	Xiamen Tungsten Co., Ltd.	n/a	n/a	n/a	n/a	n/a	n/a

Chinese name	English name	2011	2012	2013	2014	2015	2016H1
广东和胜工业铝材股份有限公司	Guangdong Hoshion Aluminium Co., Ltd.	n/a	n/a	n/a	n/a	n/a	920,000
广东翔鹭钨业股份有限公司	Guangdong Xianglu Tungsten Co., Ltd.	n/a	3,627,897	2,350,000	23,250,000	4,500,000	270,000
吉林吉恩镍业股份有限公司	Jilin Ji'en Nickel Industry Co., Ltd.	n/a	2,448,440	24,210,000	39,845,750	21,290,000	n/a
广铝集团有限公司	Galuminium Group Co., Ltd.	n/a	n/a	n/a	n/a	n/a	n/a
江西稀有稀土金属钨业集团有限公司	Jiangxi Rare Earth Metals and Tungsten Group Co., Ltd.	n/a	n/a	n/a	4,253,012	11,739,000	n/a
中铝宁夏能源集团有限公司	China Aluminium Ningxia Energy Group Co., Ltd.	n/a	n/a	n/a	n/a	n/a	n/a
中铝国际工程股份有限公司	China Aluminium International Engineering Co., Ltd.	n/a	n/a	n/a	n/a	12,726,538	n/a
金川集团公司	Jinchuan Group Co., Ltd.	n/a	n/a	n/a	n/a	192,520,000	n/a
中国五矿集团公司	China Minmetals Group Co.	n/a	n/a	n/a	n/a	n/a	n/a
Total in RMB	65 enterprises	2,700,204,167	2,080,262,496	2,753,920,954	3,688,293,124	4,587,085,976	713,036,758
Total in Euro	65 enterprises	299,722,663	255,872,287	333,224,435	449,971,761	660,540,381	96,972,999

Source: company filings, own research

Note: The 65 enterprise for which subsidies are reviewed in detail represent only subsection of the general enterprise population in the NFM industry. They are special in that they hold special significance to their respective home localities. Both economic rationality and prestige considerations have put these companies in a favourable situation to benefit from preferential treatment in many regards. Chinese government documents emphasise the special importance and leadership function of key enterprises. This is also reflected in the designation of individual subsidy payments.

4.3 Energy subsidies

Among the over 4,000 individual subsidy transactions received by the 65 NFM enterprises since 2011, energy subsidies stand out due to their sheer magnitude. The Aluminium Corporation of China, Yunnan Aluminium and a few other companies, all of them state-owned, have obtained staggering amounts. From 2012 to 2014, the Aluminium Corporation of China, for example, was able to cut its cost for energy purchased externally by 2.3 - 2.9%. Details are shown in table 6.

Table 6 Selected energy subsidies

Enterprise	Year	Amount in RMB	Amount in Euro (yearly average exchange rate)
Aluminum Corporation of China Ltd.	2012	560,376,000	68,926,248
Aluminum Corporation of China Ltd.	2013	545,164,000	65,964,844
Aluminum Corporation of China Ltd.	2014	518,494,000	63,256,268
China Energy Investment Group Co.	2011	402,147,168	44,638,336
Yunnan Aluminium Co., Ltd.	2013	256,000,000	30,976,000
China Energy Investment Group Co.	2011	114,674,444	12,728,863
Yunnan Aluminium Co., Ltd.	2012	62,401,118	7,675,338
Jiaozuo Wanfang Aluminum Manufacturing Co., Ltd.	2013	51,360,000	6,214,560
China Nonferrous Metal Industry's Foreign Engineering and Construction Co., Ltd.	2013	19,152,745	2,317,482
China Energy Investment Group Co.	2014	16,900,005	2,061,801
China Nonferrous Metal Industry's Foreign Engineering and Construction Co., Ltd.	2014	13,623,441	1,662,060
Zijin Mining Group Co., Ltd.	2012	13,142,906	1,616,577
Western Mining Co., Ltd	2012	13,055,102	1,605,778
China Nonferrous Metal Industry's Foreign Engineering and Construction Co., Ltd.	2015	11,715,710	1,687,062
Zijin Mining Group Co., Ltd.	2014	10,980,000	1,339,560

Source: company filings, own research

As can be seen from the table, electricity subsidies have been exceptionally large in some instances. Between 2011 and 2015, the 65 enterprises have received a grand total of RMB 2,083 million (300 million Euro) in electricity subsidies. However, only RMB 40 million (5.8 million Euro) of that have been disbursed in 2015.

4.4 Subsidies for plant relocation

For at least the past ten years, the GOC has sought to influence the industry layout in geographic terms. This implies that heavy industry should leave urban areas and resettle into dedicated industrial parks. While this serves cities' environmental protection objectives and brings down pollution in densely populated areas, the move also helps companies in a variety of ways.

Firstly, enterprises benefit from very favourable production environments in the “parks” that often cater to the special needs of selected industries and actively cultivate cluster formation. Local administrations attract or foster enterprises on different stages of industry-specific value chains in order to facilitate densely interconnected networks of people, information and technology as well as robust forward and backward supply linkages. Transaction costs and business risk are reduced thanks to convenient access to local markets for inputs and outputs. But agglomeration economies are not the only advantages.

Many industry parks have been planned with the particular requirements of particular industries in mind to offer state-of-the-art infrastructure and specialized equipment. This includes advanced logistics and transportation facilities as well as ready and cheap access to energy, water, raw materials and other vital inputs.

Park administrations, which are sub-units of local government authorities, typically offer a large bandwidth of supporting services. Through so called common public service platforms, they help companies find suitable professionals and workers, secure financing from local banks, improve R&D capabilities etc.

In order to fill their parks, local governments have been found to provide generous investment incentives and tax breaks. Additional government subsidies are provided to compensate at least partly for the costs incurred in relocating production plant. As this is not always technically feasible or economically advisable, industrial enterprises often use such a move as an opportunity to upgrade and or expand their equipment. THINK!DESK staff has found in several cases that relocations have translated into major plant enhancements. Thanks to the provision of cash grants and subsidized loans, the new plants have often expanded production capacities and introduced new technology.

In a nutshell, government endorsed plant relocations allow enterprises to overcome previously limiting factors and realize nothing short of “a fresh start”.

The RMB 220 million (37.7 million Euro) relocation subsidies contained in the financial statements of the 65 NFM enterprises between 2011 and 2015 represent only a small fraction of the actual benefits incurred, table 5 illustrates the relocation subsidies indicated in corporate filings.

Table 7 Selected plant relocation subsidies

Enterprise	Year	Amount in RMB	Amount in Euro (yearly average exchange rate)
China Energy Investment Group Co.	2011	88,293,098	9,800,534
Suzhou Lopsking Aluminum Co., Ltd.	2015	32,635,158	4,699,463
Xiamen Tungsten Co., Ltd.	2014	25,250,825	3,080,601
Tongling Nonferrous Metals Group Co., Ltd.	2013	24,334,277	2,944,448
Xiamen Tungsten Co., Ltd.	2014	10,443,110	1,274,059
China Nonferrous Metal Industry's Foreign Engineering and Construction Co., Ltd.	2015	10,000,000	1,440,000
China Tungsten and Hightech Materials Co., Ltd.	2013	8,065,231	975,893
Anhui Xinke New Materials Co., Ltd.	2014	4,752,722	579,832
Tongling Nonferrous Metals Group Co., Ltd.	2011	3,730,459	414,081
Xiamen Tungsten Co., Ltd.	2015	2,298,450	330,977
Yunnan Aluminium Co., Ltd.	2014	2,199,279	268,312
Tongling Nonferrous Metals Group Co., Ltd.	2011	1,600,000	177,600
Tongling Nonferrous Metals Group Co., Ltd.	2012	1,561,305	192,041
Xiamen Tungsten Co., Ltd.	2011	1,001,753	111,195

Source: company filings, own research

4.5 Fiscal support for green development

Green development policies have become increasingly prominent as concerns for the environmental protection have grown. The central government is the main driver pushing for higher emission standards, lower tolerance for violations and increased supervision. Local governments are more immediately confronted with the economic fallout from continuously rising green performance benchmarks.

During the annual session of the National People's Congress in March of 2014, Premier Li Keqiang announced that the government will "declare war on pollution". At the same venue one year earlier he stated that he was "quite upset" about the poor air quality in Beijing and other cities. Following the Premier's statements, in spring of 2014, the Environmental Protection Law (National PC 2014b) was revised to provide greater powers to environmental protection agencies on all levels of government.

As a raw material based and energy intensive industry, the NFM sector is strongly affected by the GOC's green development initiatives. Consequently, the industry's considerable consumption of natural and environmental resources is thus targeted by a dense framework of clean production and resource conservation policies. In total, subsidies for environmental protection, pollution prevention and clean up have amounted to at least RMB 2,534 million (365 million Euro) for the 65 NFM enterprises during the period under review.

About half of these "green" subsidies are provided to support the synergistic utilization of resources, i.e. the thorough exploitation of available raw materials as well as the efficient use of side products, wastes and excess heat. During the period under review, RMB 887 million (128 million Euro) were disbursed. Particularly large positions are shown in table 8.

Table 8 Selected synergistic resource utilization subsidies

Enterprise	Year	Amount in RMB	Amount in Euro (yearly average exchange rate)
Henan Yuguang Gold & Lead Co Ltd	2014	101,240,157	12,351,299
Henan Yuguang Gold & Lead Co., Ltd.	2015	96,293,453	13,866,257
Henan Yuguang Gold & Lead Co Ltd	2013	69,198,385	8,373,005
Tongling Nonferrous Metals Group Co Ltd	2011	61,318,680	6,806,373
Jinchuan Group	2014	59,344,740	7,240,058
Zijin Mining Group Co Ltd	2015	49,604,776	7,143,088
Zijin Mining Group Co Ltd	2014	41,160,260	5,021,552
Zijin Mining Group Co Ltd	2013	33,502,393	4,053,790
Yunnan Tin Co Ltd	2013	31,396,968	3,799,033
Jinchuan Group	2015	30,500,000	4,392,000
Yunnan Chihong Zinc & Germanium Co., Ltd.	2011	16,000,000	1,776,000
Henan Yuguang Gold & Lead Co Ltd	2015	12,310,000	1,772,640
Shenzhen Zhongjin Lingnan Nonfemet Co Ltd	2012	12,052,848	1,482,500
Zijin Mining Group Co Ltd	2011	12,000,000	1,332,000
Huludao Zinc Industry Co Ltd	2012	11,541,069	1,419,551
Anhui Jingcheng Copper Share Co Ltd	2013	11,491,581	1,390,481

Source: company filings, own research

Subsidies for energy conservation account for another large portion: RMB 447 million (64.4 million Euro). The ten largest individual subsidy transactions displayed in table 9.

Table 9 Selected energy conservation subsidies

Enterprise	Year	Amount in RMB	Amount in Euro (yearly average exchange rate)
State Energy Investment Group Co.	2015	58,358,622	8,403,642
Aluminum Corporation of China Ltd.	2010	41,557,000	4,612,827
Zhuzhou Smelter Group Co., Ltd.	2014	29,980,000	3,657,560
Aluminum Corporation of China Ltd.	2011	28,840,000	3,201,240
Aluminum Corporation of China Ltd.	2013	28,264,000	3,419,944
Aluminum Corporation of China Ltd.	2015	23,331,000	3,359,664
Aluminum Corporation of China Ltd	2014	20,162,000	2,459,764
Aluminum Corporation of China Ltd	2012	16,099,000	1,980,177
China Energy Investment Group Co.	2014	15,475,215	1,887,976
Yunnan Copper Co., Ltd.	2010	11,810,800	1,310,999

Source: company filings, own research

In addition to subsidies, enterprises have also benefitted from tax breaks encouraging clean production and the synergistic utilization of resources. The Chinese Enterprise Income Tax Law specifies that

“revenues from the manufacture of products that are consistent with national industrial policy and involve the synergistic utilization of resources maybe reduced when calculating taxable income” (National PC 2007 at 33).

Enterprises can take into account 90 percent of the revenues from the resources identified in the Catalogue of Preferential Enterprise Income Tax Treatments for the Synergistic Utilization of Resources (MIIT 2008), e.g. metallurgical slag).

4.6 Fiscal support for technology innovation and upgrading

The GOC is pursuing an economic policy that emphasizes innovation and technology upgrading. Determined to help domestic companies catch up with the international competition, governments on all administrative levels have created strong incentives for boosting innovative capacities. This section outlines the generous financial support measures for sparking technological innovations in a wide variety of areas related to scientific research, technology development, equipment upgrading, product portfolio, and quality improvement.

Research for this study confirmed that the 65 NFM enterprises have received at least RMB 1,766 million (354 million Euro) in subsidies during the period under review. Such grants are provided by GOC administrations of all levels. Most of these transactions appear to have been provided based on close state business interaction on an ad-hoc basis. Some, however, have been awarded through technology support schemes instituted for specific purposes. In the following, light is shed on several major programmes that allowed enterprises to tap public funds for the advancement of their technological capabilities. Technology oriented subsidies address a broad spectrum of objectives from basic research to the commercialization of concrete R&D outcomes.

The National Medium- and Long-Term Science and Technology Development Plan (MLP) (2006-2020) serves as a major guideline directing enterprise based technology work in general and R&D activities in particular. This program underlines the need for promoting science and technology and warns that technology imports without sufficient assimilation, absorption, and re-innovation are bound to weaken China's domestic R&D capability - in turn widening the gap between China and advanced international levels.

By 2020, Chinese companies should have mastered critical technologies for raising international competitiveness. Gross expenditures on R&D should reach or exceed 2.5 percent of GDP, the contribution of science and technology to the general economy should rise to 60 percent, import dependence in the technology sphere should drop to 30 percent or below, and China should be among the top five countries in invention patents (State Council 2005b at 2.2).

In order to operationalise this comprehensive, abstract plan, the GOC released a complementary National Science and Technology Support Plan which categorises numerous tasks in eleven key areas: energy, resources, environment, agriculture, materials, industry, transportation, IT and modern services, population and health, urbanization and city development as well as public security and other social services (MOST 2005 at 4.1).

Technology research and its commercial application as well as the renovation of traditional industries were especially encouraged. Special emphasis is placed on breakthroughs in the fields of energy, natural resources, and environmental protection. The Support Plan treats proprietary intellectual property as a key factor and urges that the independent innovation capabilities of the corporate sector should improve substantially over the five year plan term. Enterprises should be guided to increase their R&D investment and become main drivers of national technology development efforts. The underlying goal is to cultivate a group of internationally competitive companies that draw strength from independent innovation, proprietary intellectual property, and strong trademarks.

The operational framework created by these plans and related implementation documents specifies project application, verification, and supervision procedures. Funds are allocated through annual budget plans drawn up by the Ministry of Finance and other central government departments.

Henan Zhongfu Industrial Co Ltd has received RMB 26 million (4 million Euro) and Zhuzhou Smelter Group Co., Ltd. RMB 4.8 million (691,200 Euro) in subsidies for carrying out research tasks contained in the National Science and Technology Support Plan.

4.7 Subsidies for the revitalization and technology renovation in key industries

In the wake of the global financial crisis, the NDRC introduced industrial policy guidance documents for 10 “key” industries, including non-ferrous metals. The documents, which took the form of development plans, largely overshadowed the actual industry-specific five-year programmes for the time. Complementing subsidy schemes were created with additional funds from the Ministry of Finance to support the objectives laid out for key industries.

Several NFM producers have been able to take advantage of subsidies administered under this programme. This includes Chengdu Huaze Cobalt & Nickel Material Co., Ltd., which has received RMB 10.8 million (1.3 million Euro) in 2012, Chongyi Zhangyuan Tungsten which obtained RMB 2.3 million (278,300 Euro) in 2013 and Xiamen Tungsten Co., Ltd. which got a combined total of RMB 3.9 million (561,600 Euro) over various years.

4.8 Subsidies for supporting trademarks and patents

While national economic policy has strongly encourage the creation of strong brands and patents based on proprietary intellectual property, financial incentives have been instituted by sub-national governments. Provincial and municipal administrations administer incentive programmes that come in the form of cost compensation or lump sum rewards.

Anhui Province is particularly active in assisting local companies in establishing strong brands, especially for product exports. The province has launched a wide array of related support policies – many of which confer monetary benefits. NFM enterprises that have benefitted particularly from such schemes include: Anhui Jingcheng Copper (RMB 1.3 million / 187,200 Euro) and Anhui Xinke New Materials (RMB 1.7 million / 244,800 Euro).

Most NFM producers have made ample use of grant programmes connected to patent registrations, together claiming at least RMB 10.5 million (1.5 million Euro) during the period under review.

4.9 Subsidies compensating for R&D expenses

Direct financial support of the costs involved in research and development can be partially financed by the central government's Ministry of Finance. Before and after China's ascension to the WTO, Chinese businesses have benefited from two specific programmes funded by the ministry. For Chinese companies, this ministry provides such benefits as funding research expenses and even travel expenses for employees. These benefits clearly provide unfair advantages to Chinese businesses for developing technologically.

Since 1996, the Ministry of Finance offers enterprises partial refunds for expenditures linked to the trial manufacture of new products, related experimentation, and to key scientific research projects. The scheme is co-financed by central and local government budgets and aims to allocate public funds to entities carrying out science and technology work, the so called "three categories". Overhauled in 2004, the programme supports technology development and strengthens the connection with the economic sphere.

Companies irrespective of ownership type may seek refunds on their expenditures related to eligible projects or they may apply for subsidization of their activities as long as they possess a strong capability for independent R&D and favourable conditions for carrying out cutting edge research. Supported companies can seek refunds for a wide range of project-related expenses, including those for human resources, equipment, energy and general administration.

The 65 NFM enterprises have obtained at least RMB 60 million (8.4 million Euro) during the period under review. Henan Zhongfu Industrial alone has received RMB 14.4 million (1.6 million Euro) in 2010.

4.10 Support for High and New Technology Enterprise Programme

Since the early 1990s, the GOC has maintained special income tax breaks for High and New Technology Enterprises (HNTE) that initially had to be located in special economic zones. In 2008 a list of 213 favoured technologies, subsumed under eight National Supported Key High and New Technology Fields was introduced. The Enterprise Income Tax Law (EITL) promulgated in the same year grants HNTEs a reduced corporate income tax of 15 percent (instead of the regular 25 percent). Accreditation and supervisory work is handled by the State Administration of Taxation on the local government level.

During the research for this study, it was confirmed that nearly every of the 65 NFM enterprises reviewed was recognized as HNTE and thus eligible for the reduced enterprise income tax rate of 15 percent.

Fiscal benefits bestowed upon companies by this scheme are not limited to these tax privileges. Instead, HNTE status also serves a signalling function for other GOC support programmes: HNTEs are earmarked for further support and may use their status as entrance ticket to a wide range of subsidy schemes and non-financial preferences. Thanks to their special status, HNTEs have obtained significant subsidies from (mostly local) government authorities.

4.11 Support for enterprises active in Strategic Emerging Industries

While support has been strong for industry-wide upgrading, a special focus has been put on a carefully selected group of advanced and (potentially) disruptive, path-breaking technologies. These are considered crucial enablers for profound improvements to future ways of living and doing business in China and worldwide. In late 2010, the top leadership of both the CPC and the state decided to prioritise seven strategic emerging industries (SEI):

- (1) energy conservation and environmental protection,
- (2) information technology,
- (3) biotechnology,
- (4) high-end equipment manufacturing,
- (5) renewable energy sources,
- (6) new materials and
- (7) new energy vehicles.

Non-ferrous metals industries are part of nearly all of these SEI and enjoy the preferential treatment and access to promotional resources outline in the following paragraphs. The concrete products, with which non-ferrous industries are explicitly integrated in the SEI-framework are outlined below (table 10):

Table 10 NFM products explicitly included in the SEI framework

Category	Product
New Components	Aluminum alloy cable
High-end Energy Storage	Energy storage device materials and devices. (Such as nickel cobalt aluminium and nickel cobalt manganese, etc.) and its mixed materials; copper foil, aluminium foil and aluminium plastic film and other auxiliary materials Energy storage device and its management system. Modular Ni-MH battery energy storage system
Key Electronic Materials	New electronic component materials. electronic lead-free solder
Aeronautical materials	Civil aviation materials. Including new aviation aluminium, magnesium, titanium alloy and composite materials
New Metallic Functional Materials	Nickel-based amorphous soft magnetic alloy strip, tungsten and molybdenum materials such as molybdenum alloy, molybdenum copper alloy, Al-Ca alloy, Al-In alloy, Al-V alloy, Al-Ca-In alloy, aluminium alloy die casting material etc .; foam copper, foam aluminium, foam nickel and other foam metal materials.
High purity Elements and Compounds	High purity aluminium, lithium nickel cobalt oxide, nickel manganese oxide binary system, nickel cobalt manganate and Nickel cobalt aluminate ternary system
High-quality New Organic Active Materials	PCB free copper phthalocyanine
Advanced Structural Materials Industry	Magnesium and magnesium alloy thin sheet
High-performance Nonferrous Metals and Alloy Materials	High-precision copper tube, rod and wire products; pipe, rod and wire from alloys of copper and nickel, copper and titanium, copper and beryllium as well as other copper alloys; high strength and high conductivity copper, electrolytic copper foil, rolled copper foil, electronic copper, copper alloy lead frame, high-performance plug-in components and other electronic products with rolled copper materials, other high-performance rolled products from copper and copper alloys. High-performance aluminium and aluminium alloy wire, bar, strip, tube, plate, profile and other products, capacitor aluminium foil, hydrophilic, super thin aluminium and aluminium alloy foil products, semi-solid state casting aluminium and aluminium alloy, high strength aluminium alloy forgings. Pure nickel, nickel alloy wire, bar, tube, strip, plate and other shapes; printing nickel mesh; nickel-based alloy castings; high-

	performance magnesium alloy and deformation of magnesium alloy; magnesium alloy corrosion control and protection; magnesium alloy forgings
New Structural Ceramic Materials	Transparent alumina material
Metal Matrix Composites and Ceramic Matrix Composites	Aluminium-based composites reinforced with silicon carbide, boron carbide, titanium boride, silicon nitride fibre, whiskers, granules; copper-based composites magnesium based ceramic composites and aluminium-based ceramic composites; magnesium-based composites and nickel-based composites
Solar Energy Industry	Solar power products photovoltaic cells and components. Including copper indium gallium selenium and other new photovoltaic cells and components
Solar Energy Production Equipment	Photovoltaic equipment. Including thin film copper indium gallium selenium absorption layer co-evaporation coating equipment
Comprehensive Utilization of Mineral Resources	Nonferrous metals (including rare metals) minerals. The separation of the battery shell, the purification of cobalt and nickel elements and the regeneration of primary and secondary powders, the efficient development of complex copper, lead and zinc mineral resources, low-grade copper ore leaching - extraction - stripping - electrodeposition, low - grade nickel oxide coal - based direct reduction of nickel - iron and other efficient extraction, and other efficient beneficiation technology and equipment. Comprehensive utilization and deep processing of bauxite and other non-associated non-metallic mineral resources.
Recycling of Resources	Metal recycling. Including waste lead-acid battery lead paste desulfurization resource utilization, spent cobalt-nickel material recycling and other technical equipment; paper-plastic-aluminium separation and recycling; Waste mechanical and electrical products harmless recycling. Including waste mechanical and electrical products sorting, dismantling, high value-added use of harmless processing equipment, copper.

Source: SEI documents, own research

SEIs are expected to form a nucleus of future development, create employment opportunities and support environmental preservation as well as resource conservation. Vigorous promotion of SEI is to generate spill-over effects for upgrading technology and improving international competitiveness of the Chinese manufacturing sector.

The strategy has been conceived as a top level design with central government departments defining objectives, tasks and instruments as well as putting up most of the funding. Detailed catalogues specify SEI products and technologies earmarked for promotion. Special funds are managed by various ministries and allocated to support technology innovation, the operation of demonstration projects, the development of regional clusters and related tasks.

Most of the implementation work is delegated to sub-national authorities as they have more administrative resources available to oversee projects and adjust measures to local circumstances. The latter have drafted their own SEI development programmes, guidance catalogues and implementation measures inspired by the national strategy. Every province has to put up SEI development funds with local officials in charge of making allocations to localities in line with SEI policies.

The GOC has devoted significant financial support to corporate R&D as well as to technology commercialization and demonstration projects in the six years since the strategy was launched. A “stable financial input growth mechanism” was created with resources from the central government’s budget - manifested in special tax breaks and subsidy funds.

The GOC also directed banks to expand and improve lending to enterprises in SEI, to develop customized and innovative financing solutions and comprehensively contribute to SEI development. Financial institutions are also instrumental in the internationalisation of SEIs. International trade and investment are boosted, inter alia, by establishing overseas high-tech industrial parks, demonstration bases and innovation bases. Targeted trade policy measures were introduced to improve the structure of imports and exports. A catalogue identifies SEI products for which the GOC promotes international trade. Special support measures for encouraged products are in place to guide trade flows.

Numerous industry-specific instructions were released and instruments launched to ensure policy support is tailored to the individual needs of the different SEI sectors. Support for the new material industry, for example, targeted overseas M&A transactions as a means to strengthen competitiveness and innovativeness. The policy demanded that the state should increase support for the import of new material products and technologies, and strengthen the presence of Chinese high value-added new material products on the world market.

Enterprises are encouraged to set up R&D centres in foreign countries – by M&A, equity or contractual joint ventures, purchasing shares or other means – and pursue strategic cooperative partnerships with foreign research institutions and industrial clusters. The Chinese government also supports companies in establishing overseas marketing centres, maintenance service outlets and other projects. Special support is available for the registration of

overseas patents. SEI firms planning international expansion can rely on state support in public offerings of stocks or bonds. They may also take advantage of more convenient ways for cross border fund transfers. Furthermore, they are eligible for export insurance and export credit at preferential conditions. The GOC even promised to use foreign development aid as a tool to create favourable investment environments in foreign countries.

A small group of leading enterprises with independent intellectual property rights, well-known brands and strong international competitiveness are to serve as vanguard. These national champions are to lead the way in exploring international markets.

A significant overlap exists between the group of recognised HNTes and companies taking advantage of SEI promotion policies. Other strategic technology initiatives, such as the 863 Programme, the 973 Programme, the Torch Programme, and the Spark Programme which provide similar benefits for related projects together lead to a substantial reduction of tax payments and install technology subsidies as a significant source of revenue. In fact, the multitude of support schemes oriented towards strengthening capabilities in science and technology has led companies to devote resources to navigating between numerous available support measures. Various objectives, performance requirements and eligibility criteria create incentives for adjusting operations in order to maximise subsidy income rather than realise the development of marketable products. Rent seeking behaviour may thus undermine the freedom to undertake genuine innovation.

Foreign enterprises are in principle allowed to participate in SEIs. Several high-ranking Chinese officials such as former Premier Wen Jiabao stipulated that foreign and Chinese companies will receive equal treatment. (U.S. Chamber of Business in China 2013 at 7). De jure, foreign firms enjoy equal access to SEI development benefits as Chinese firms. De facto, international enterprises have encountered severe difficulty to even obtain necessary information. Companies even had trouble to determine if they are eligible for SEI promotion measures. Additionally, foreign firms have complained that it is almost impossible for them to tap into the government's special funds and access other benefits that are naturally available for domestic companies. Furthermore, international players are burdened by localisation requirements. As companies have to be registered in the province in which they file funding applications, branch offices are often excluded from this opportunity. As a matter of fact, foreign enterprises do not receive national treatment as stipulated by the WTO accession protocols and are actually discriminated against in various ways.

Enterprises in the NFM industry have benefitted from special support measures. Unfortunately, not all subsidy receipts connected to SEI can be identified as designations do not al-

ways specify an SEI background. However, grants worth RMB 37.8 million (5.4 million Euro) could be identified in the documents of the 65 companies reviewed.

5 DISCRETIONARY MANAGEMENT OF CROSS-BORDER TRANSACTIONS BY CHINESE GOVERNMENT IMPACTING ON THE NON-FERROUS METALS INDUSTRY

Chapter summary:

The Chinese non-ferrous metals industry is subjected to tight governmental regulation and active “management” of all import and export transactions. A wide array of policy tools flexibly adjusted in order to accommodate for changing market constellations allows Chinese government to steer all cross-border interaction. As a general principle the importation of raw materials (ores, scrap, etc.) and advanced machinery required for industry operations is promoted by government as well as the export of processed metal products. Tight restrictions and outright bans apply to the export of raw materials (ores, etc.) located at the very beginning of the value chain and processed goods in scarce supply in the domestic economy. These interventions in the international division of labour and exchange of goods contradict global scarcities and prevent a balancing of global supply and demand. They are designed to put Chinese firms in an advantaged position with regard to the access to raw materials and to promote the export of higher valued-added processed products from China.

Ever since 1949, the GOC has consistently maintained tight supervision and regulation international trade flows. After the onset of reforms in the early 1980s, controls have been relaxed and reduced in number. China’s accession to the WTO has rendered some policy instruments unusable and led to a further cutting of red tape in the tight administration. However, close to 40 years into the reform era and 15 years after joining the WTO, the GOC maintains a variety of instruments to direct trade flows in line with the national industrial policy agenda. China’s trade policy should thus be understood as industrial policy at the global markets interface. In the following the most important contemporary programmes and policy tools are being discussed.

5.1 Import administration

5.1.1 Import substitution

In the hierarchy of policy objectives, supply safety ranks supreme. The GOC is primarily concerned with guaranteeing a stable supply of important commodities in sufficient quality and quantity to support national economic development in general and prioritized downstream sectors in particular. This strategy dictates a differential and flexible treatment of goods. The

result is a highly activist trade management system that reacts dynamically to shifts in market conditions and policy agendas.

The GOC actively promotes the localization of technology development and product manufacturing in order to substitute imports with domestic supply. Over time, this policy has grown increasingly subtle and overt calls for displacing imports have been stricken from national five year plans. However, measures targeting the localization of intellectual property and location specific subsidies still create an uneven playing field for imported goods.

The same is true for manufacturing equipment used in the NFM sector. Between 2012 and 2015, Shandong Nanshan Aluminium Co., Ltd. has been rewarded RMB 18 million (2.3 million Euro) in subsidies for purchasing domestic plant equipment.

5.1.2 Government procurement

Purchases by GOC agencies, affiliated organizations and SOEs are used as a means to promote domestic products over foreign ones. Since China has not joined the WTO Agreement on Government Procurement (GPA) to which all European Union members are parties, public procurement policies continue to discriminate against imports and support domestic suppliers.

“The nationwide ‘Buy Chinese’ measures have been echoed by numerous ‘Buy Chinese’ or even ‘Buy Local’ initiatives taken by provincial or municipal authorities”
(European Commission 2014 at 132).

Without first-hand information, the market share of foreign suppliers and contractors is very hard to gauge. Anecdotal evidence suggests, however, that import penetration in the government procurement market has remained minute.

5.1.3 Import promotion

The GOC supports companies importing advanced manufacturing equipment, production technology and other goods by way of loan interest subsidies. The Administrative Measures for Import Loan Interest Funds specify that fiscal resources are to be set aside in order to promote the importation of items included in the Catalogue of Technologies and Products Encouraged for Import. Published annually, the catalogue divides in four separate categories: advanced technologies to be attracted, major equipment encouraged for import, encouraged development of key industries and resource-type products and raw materials. In 2005 the State Council stipulates that:

“All financial institutions shall provide credit support in compliance with credit principles. The equipment shall be imported within the total amount of investments for the importer's own use. Except for the commodities listed in the Catalogue of Non-tax Free Imported Commodities for Domestic Investment Projects (amended in 2000) promulgated by the Ministry of Finance, the abovementioned equipment shall still be exempted from customs duties and import value-added tax ... As for other preferential policies on encouraged industry projects, the relevant provisions of the state shall apply” (State Council 2005a at 17).

The directive is still valid. Financial support is limited to a maximum of 30 million RMB (4.3 million Euro) per company and items for which tax exempt importation is possible as well. Promotion under this programme aims to depress interest rates to match the one-year benchmark lending rate as set by the People's Bank of China. During the period under review, the 65 NFM enterprises received a total of RMB 916.2 million (132 million Euro).

Table 11 Selected loan interest subsidies for equipment imports

Enterprise	Year	Amount in RMB	Amount in Euro (yearly average exchange rate)
Metallurgical Corporation of China Ltd.	2014	74,490,000	9,087,780
Metallurgical Corporation of China Ltd.	2011	61,408,000	6,816,288
Tongling Nonferrous Metals Group Co., Ltd.	2015	52,410,000	7,547,040
Metallurgical Corporation of China Ltd.	2012	45,367,000	5,580,141
Xiangguang Copper Co., Ltd.	2012	30,000,000	3,690,000
Yunnan Copper Co Ltd	2012	21,073,600	2,592,053
Metallurgical Corporation of China Ltd.	2013	20,144,000	2,437,424
State Energy Investment Group Co.	2015	19,620,030	2,825,284
State Energy Investment Group Co.	2015	16,671,247	2,400,660
Huludao Zinc Industry Co Ltd	2011	16,204,400	1,798,688
Yunnan Copper Co Ltd	2011	14,375,300	1,595,658
Zijin Mining Group Co Ltd	2014	14,228,300	1,735,853
Huludao Zinc Industry Co Ltd	2010	13,141,887	1,458,749
Anyang Yubei Gold & Lead Group	2015	12,220,000	1,759,680
Henan Yuguang Gold & Lead Co Ltd	2010	10,924,500	1,212,620

Source: company filings, own research.

5.1.4 Support for raw material imports

The GOC provides financial assistance to help companies offset cost for imported raw materials. In 2013, Jiangxi Copper and Xiangguang Copper have each received subsidies of RMB 30 million (3.6 million Euro) for the importation of copper ores. Yunnan Copper obtained a combined RMB 5.4 million (664,200 Euro) in 2012 and 2013 for import logistics. Copper producers, as the two mentioned above, also benefit substantially from the partial refund of

VAT paid on imported copper ore. The GOC maintains a programme that refunds 30% of the 17% VAT charged on the material.

Loan interest subsidies have also been provided to support the importation of coal. The China Energy Investment Group Co. is the most prominent example. In 2012 and 2013, the enterprise has obtained loan interest subsidies worth RMB 348.8 million (42.9 million Euro) and RMB 389 million (47.8 million Euro), respectively.

5.2 Export administration

The GOC maintains differential treatment to promote export activity as well as to steer the composition of China's total export volumes, Chinese government agencies continue to employ a broad range of instruments and dedicated policy programmes. In the following some of the most important of these will be introduced in some detail.

5.2.1 Export restrictions

The GOC limits the exportation of numerous commodities, many of them of critical importance to manufacturing businesses in the EU. These include export duties, (non-automatic) export licenses, export quotas, the use of state trading companies and other administrative instruments. From the GOC's standpoint the desirability (and subsequent treatment) of goods exports are measured against their contribution to national welfare. Exports of energy intensive, resource intensive and polluting products (so called 'two high, one resource' commodities) that have a low value added relative to inputs are commonly discouraged using one or multiple restriction instruments. Chinese policy documents state that it is in the national interest to prevent the exportation of goods that put a large burden on the environment and resource use while yielding little in the way of profits or learning advantages for companies. This should also prevent China to play host to the dirtiest, least profitable low tech elements of globalized value chains. In the case of NFM, limitations to exports (and production) the GOC commonly cites a need to prevent illegal mining and smelting operations and thus damage to the health and safety of workers and natural ecosystems.

Using the WTO dispute settlement mechanism, the EU and other countries, successfully challenged the use of export quotas, export duties and certain elements of export licensing affecting bauxite, magnesium, manganese, zinc, silicon carbide, silicon metal, fluorspar, yellow phosphorus and coke. The complainants argued that the restraints caused artificial scarcities and drove up input costs outside China while improving availability and driving down costs on inside the country. The resulting competitive advantages for Chinese players caused

substantial distortions on world markets that adversely affected companies elsewhere – a fact that was amplified by China’s role as leading producer. The panel rejected China’s claim that the export restrictions in question were warranted for the preservation of exhaustible natural resources and necessary to protect human, animal or plant life or health and found them to be designed to achieve industrial policy goals instead. The panel found that restrictions on exports did not make sense without corresponding restraints on the domestic production and consumption of the materials in question. Similarly, the panel was not convinced that the export restraints could contribute to protecting human health through for a meaningful pollution reduction in the short- or long term. An appellate panel formed at China’s request largely upheld the previous ruling, forcing the GOC to abolish the measures in question.

In March 2014, the EU along with the U.S. and other countries, won a second and similar case at the WTO, successfully arguing that Chinese export restrictions on rare earths, tungsten and molybdenum violated its accession protocol and WTO regulation. Once again, China, as the world’s largest producer of these commodities had upset the international market order through the selective use of export duty, quota and licensing systems. A review of the panel decision initiated upon China’s request concluded in August 2014 with the appellate body largely upholding the previous ruling that relevant measures had to be terminated.

Following the rulings, the GOC has abolished the export restraints but left the very same measure in place for commodities not covered by either case.

On July 19, 2016, the EU sought consultations with the GOC under the framework of the WTO’s dispute settlement mechanism on export restrictions imposed on 11 metals. In its third complaint on Chinese trade barriers, the European Union takes aim at export duties (copper lead, magnesia, tin and six other metals), export quotas (magnesia, tin and three other metals) as well as the administration and allocation of export quantitative restrictions (magnesia, tin and three other metals). With regard to the last point, the EU complains that the GOC infringes on the trading rights of potential exporters of the metals by basing approval on prior export experience, minimum capital requirements and other conditions that appear to discriminate against enterprises with foreign investment. The EU also maintains that licensing requirements are not in line with WTO regulation and alleges that the GOC administers these export restrictions in a manner that is not uniform, impartial, reasonable, or transparent.

5.2.2 State trading companies

State trading enterprises (STE) “have been granted exclusive or special rights or privileges, including statutory or constitutional powers, in the exercise of which they influence through their purchases or sales the level or direction of imports or exports” (WTO 1994a+b at 2). The WTO permits STEs if they have to operate in a non-discriminatory manner and solely according to commercial considerations.

However, in line WTO regulation, the 2004 Foreign Trade Law allows the government to subject certain goods to state trading. This is still the case for exports of tungsten or and tungsten products. Since 2014, only 13 companies are licensed to engage in export trade.

5.2.3 Value added tax rebates for exports

All enterprises and individuals engaged in the sale of goods, the provision of processing, repair and replacement services, as well as the import of goods are subject to the payment of value added tax (VAT). Rates vary between 5% and 17% for different product categories but are set at the upper end for the materials discussed here. Enterprises may receive a partial refund of the VAT for exported products. These rebates do not apply uniformly to all goods but are administered on a product-specific basis to support Chinese industry policies. In order to adjust the VAT rebate scheme to changing macroeconomic environments and development priorities, tax and customs authorities revise the catalogue of products eligible for rebates and/or change product specific rebate rates several times per year.

Operating such a flexible rebate system allows economic policymakers to align the volume and composition of exports with industrial policy strategies. Because of their immediate effect on companies’ export incentives, VAT rebates for exports have proven to be a highly effective trade policy instrument.

Due to its dynamic character, the system of VAT rebates may be flexibly increased, e.g. to alleviate oversupply crises on the home market, or lowered, e.g. as precaution against trade defence action in major target markets or to boost the supply on the domestic market and drive down input cost for enterprises further down the value chain. Depending on market development, the GOC can quickly change or even reverse its treatment of certain commodities, as has happened in the context of the world financial crisis. It has become clear, that the Chinese government considers VAT rebates a legitimate and effective tool to steer exports in ways conducive to its overall industrial policy framework.

5.2.4 Export duties

The GOC maintains export duties on a large number of commodities. They take the form of ad valorem taxes levied on the price of certain goods upon exportation. At least once a year, the Ministry of Commerce releases an updated list, specifying the commodities affected and tax rates applied. In addition to regular export duties, the ministry also assigns provisional export duties that are added on top of the regular ones. In many cases, such duties have been imposed in lieu with VAT rebate cancellation in order to amplify the effect. A review based on the harmonized system commodity classification shows the highest export duties for ores and waste materials followed by semi-fabricated products. Unfortunately, space restrictions forbid a comprehensive analysis at this point. As a rule of thumb, there is an adverse correlation between the real net output ratio of a commodity and the export restraints it is subjected to.

In its accession protocol, China reserved itself the right to maintain export duties on a limited number of narrowly specified commodities, including, for example tungsten ores and concentrates. These provisions were challenged in the WTO case mentioned earlier.

5.2.5 Export quotas

The GOC has maintained export quotas for much the same reasons as export duties and many commodities are subjected to both. The explicit reduction of export quantities has had detrimental effects in industries that depend on China as a leading or even sole supplier. The situation is made worse by the proven readiness of the GOC to employ quotas as a means of foreign policy. In 2013, China drastically lowered export quotas for rare earth elements to punish Japanese downstream consumers for their government's policy towards the disputed Senkaku island chain. The Chinese NFM industry has traditionally been particularly affected by export quotas. Thanks to successful WTO action, quotas were lifted from several commodities. The GOC has stopped issuing quotas for tungsten ores and products as well as tin. The first years without quotas were 2015 and 2017, respectively.

5.2.6 Export licensing

The GOC traditionally reserves itself the right to decide who can trade with certain commodities. Traditionally, the China Chamber of Commerce of Metals, Minerals and Chemicals Importers and Exporters (CCCME), founded in 1988, served to coordinate exports in the metallurgical industry and promote their international competitiveness. Today the chamber defines itself as a comprehensive service provider to its member. However, the CCCME does not conform to the Western understanding of industry associations as being platforms.

Instead, the Ministry of Commerce has endowed it with some regulatory power to support the industrial policy implementation and engage in active supervision. Acting under the authority of the ministry, its sub-organisations coordinate activities regarding various commodities. These units are authorised to audit member companies to assess their compliance with coordination programs and set penalties for violators. According to the self-introduction found on the CCCMC website, services include:

“coordination service in metals, minerals, chemicals exports, coordination service in bidding commodities, organisation service at the Chinese Export Commodities Fair, organizing response to anti-dumping lawsuits, verifying export prices for customs clearance , Internet information service, overseas exhibition & training service” (CCCMC 2010)

Through export price coordination, i.e. the enforcement of minimum price for exports, the CCCMC served to restrict outflows and, at the same time, maximise returns for Chinese businesses. In July 2011, a WTO panel on Chinese export restraints for bauxite, coke, fluor-spar, magnesium, manganese, silicon carbide, silicon metal, yellow phosphorus and zinc ruled that

“...the authority to coordinate export prices and enforce these prices through the imposition of penalties on exporting enterprises, or on export licensing entities that issue licences to exporters that do not follow the coordinated export prices, amounts to a requirement to coordinate export prices for the raw materials at issue. The requirement derives from the fact that failure to comply with the coordinated price will result in punishment that rises to a level to prevent an enterprise from exporting altogether. In addition, under the measures at issue, export licensing entities may be punished for failing to enforce a given coordinated price. The measures do not permit exporting enterprises to deviate from coordinated export prices, or otherwise grant discretion to export licensing agencies to make exceptions. Thus, coordinated export prices must be adhered to whenever set by the CCCMC.” (WTO 2011 at 7.1064).

The Chinese challenged the panel ruling, setting in motion an appellate body review. In January 2012, the latter issued a final ruling that confirms China’s practices to be inconsistent with the terms of its accession agreement and general WTO regulation. Chinese authorities acknowledged they had delegated the authority for export price coordination to the Chamber. The officially sanctioned mechanisms for setting binding export prices and sanctioning non-compliant traders implied that CCCMC acted as part of the government.

5.2.7 Export promotion

The GOC selectively encourages the exportation of certain high technology, high added value goods and services. In recent years, the export of industrial services and technology has received substantial support as well.

5.2.8 Export subsidies

Financial grants that are expressly contingent on exports have become rare in recent years. The 65 NFM enterprises have only received RMB 117.2 million (16.9 million Euro) of subsidies supporting exportation. Table 12 shows the largest individual subsidy receipts of the 65 enterprises under review.

Table 12 Selected export promotion subsidies

Enterprise	Year	Amount in RMB	Amount in Euro (yearly average exchange rate)
Jinchuan Group	2014	32,093,573	3,915,416
Shandong Nanshan Aluminium Co., Ltd.	2015	8,220,000	1,183,680
Jilin Ji'en Nickel Industry Co., Ltd.	2013	7,134,000	863,214
Henan Mingtai Aluminium Industrial Co., Ltd.	2012	6,207,000	763,461
Henan Shenhua Coal & Power Co., Ltd.	2015	6,000,000	864,000
Shandong Humon Smelting Co., Ltd.	2015	5,600,000	806,400
Jilin Ji'en Nickel Industry Co., Ltd.	2015	2,800,000	403,200
Henan Mingtai Aluminium Industrial Co., Ltd.	2013	2,353,700	284,798
Jilin Ji'en Nickel Industry Co., Ltd.	2014	2,247,900	274,244
Henan Mingtai Aluminium Industrial Co., Ltd.	2011	2,149,300	238,572
Xinjiang Tianshan Wool Tex Stock Co., Ltd.	2012	2,013,000	247,599
Yunnan Aluminium Co., Ltd.	2010	2,000,000	222,000

Source: company filings, own research.

The small number and minor amounts of export subsidies should not suggest the abolition of such incentives – especially since the overall export promotion strategy of sub-national government remains unchanged. An alternative explanation for the dearth of export subsidies found in annual reports and other documents filed by listed companies is that authorities have chosen other designations.

THINK!DESK has found various forms of export subsidies. Prizes for export performance are handed out by local governments to companies that registered exceptionally strong export growth in the preceding year. Henan Mingtai and Xinjiang Tianshan have each received RMB 1.9 million (274,000 Euro) from such schemes. Subsidies supporting the upgrading of export product portfolios help companies to successfully position themselves in high tech market segments. Yunnan Aluminium, for example, has received RMB 2 million (222,000 Euro) in 2010. Some cities and provinces maintain special export promotion funds. China Tungsten, for example, has received RMB 1.2 million (173,000 Euro) from such a fund administered by Zigong City (Sichuan Province). Some localities have been found to match export revenues with subsidies. This implies awarding fixed subsidy amounts per USD export revenue. China Tungsten has received grants from such a scheme in 2011. Subsidies offsetting domestic transportation cost for export shipments are disbursed through dedicated funds managed by city and town governments. With essentially a “free shipping to the border” benefit for these companies, the cost of doing business is significantly lower. Subsidies for the steady increase of export trade serve stimulate exports of local businesses.

5.2.9 Provision of export credit insurance

Industrial and trade policy from the central government level down consistently encourage and support exporters to use the services of the state-owned China Export & Credit Insurance Corporation (Sinosure). The 65 NFM enterprises covered for this study have obtained a total of RMB 14.1 million RMB (2 million Euro). Almost half of this amount was received by Xiamen Tungsten (RMB 6.8 million or 1 million Euro).

Sinosure, established in late 2001, is the official export and credit insurance company in China and has a service network covering the whole country. Research indicates that enterprises routinely seek out Sinosure services for ensuring overseas investment projects as well as for export trade. Services are often heavily subsidized and available for undertakings compatible with industrial policy. Sinosure’s mission is to promote the export of Chinese goods, first and foremost in the high-value-added and high-tech segment, in accordance with government policies including industrial policy.

5.3 Product-specific differential treatment – Case Study on Trans-shipment

The highly selective and flexible foreign trade management practiced by the GOC has been effective for the pursuit of industrial policy. Export restrictions on raw materials have served to depress the price of bottled up resources inside the domestic market, thereby depressing input cost for China-based processing companies. The more favourable treatment (and promotion) of higher added value and more technology intensive exports has encouraged investment and upgrading in these areas. However, as the preceding sections have shown, limitations imposed on shipments of raw materials and semi-fabricated products have not prevented continuing overinvestment and overcapacities in the initial stages of the value chain, i.e. smelting.

Furthermore, the highly selective character of the GOC's trade administration combined with the equally narrowly targeted protective measures imposed by governments in target markets have led to significant resource waste and market distortions. Chinese exporters have proven very creative in adapting to the focus and rigidity of the trade policy frameworks implemented on both ends. They have adjusted export structures to circumvent limitations and take advantage of promotion policies in multiple ways. The trans-shipment of goods through third countries is used to disguise their origin to the customs authorities in target markets that impose anti-dumping and/or countervailing duties. Similarly, Chinese enterprises circumvent export restrictions put in place by the GOC on basic smelting products by subjecting such goods to very basic and low cost processing in order to label them as semi-fabricated instead of primary products. Often enough, very minor product adjustments can enable exporters to navigate around the obstacles put in place by Chinese and foreign authorities.

6 REVIEW OF INDIVIDUAL METAL-SECTORS IN THE CHINESE NON-FERROUS METALS INDUSTRY

6.1 Aluminium

The Chinese aluminium industry has been growing at breakneck pace for almost two decades. In 2003, China overtook North America and became the world's largest producing region. Since then, Chinese output more than tripled. Since the global financial crisis hit producers worldwide, primary aluminium output stagnated in most producing countries and dropped in some. In China, it doubled.

The amount of primary aluminium smelted in China surged from just 10% of the world total at the time of China's WTO accession to 54% in 2016. By that time, Chinese producers reached a combined output of 31.6 million tons of primary aluminium and China set a new output record in the history of the aluminium industry – as it had in every of the 12 previous years.

As the Chinese aluminium sector expanded, so did leading companies, such as the **Aluminium Corporation of China** which traces its root to the pre-reform era. Since the turn of the millennium, the company tripled its aluminium output. Outside the state-owned sector, new companies have emerged, such as the **Hongqiao Group**. Founded in the mid-1990s as producer and distributor of jeans and denim textiles in Shandong Province, the company entered the aluminium business in 2002. In the 15 years that followed, the Hongqiao Group evolved into the world's largest producer of primary aluminium with close to 4 million tons in annual output in 2016.

As China's aluminium industry expanded, it has displaced production in traditional production centres. A wave of low priced aluminium product exports has uprooted the production in North America and Europe. China's price advantage is borne by four interconnected factors: (1) subsidies and policy loans have enabled substantial capital investments in large scale and technologically advanced production plants. (2) Operating costs remained depressed as land, electricity, water, raw materials and other production factors were provided at less than adequate remuneration. (3) Modern equipment and high technology standards have enabled very efficient forms of low cost, high volume production that generate advan-

tageous cost structures.¹ (4) The formation of excess capacities has caused a supply glut in China which has depressed prices and pushed surplus materials into export markets.

These four interconnected and mutually reinforcing trends have boosted the competitiveness of Chinese aluminium product worldwide. This has led inter alia to the demise of large parts of the U.S. aluminium industry. Of the 20 U.S.-plants in operation in 2010, only three were still in business by the time of writing. While the U.S. imposed protective tariffs for aluminium extrusions, markets for aluminium road wheels, foils and other products remained open to imports and local producers quickly succumbed to Chinese competition. The European Commission maintains anti-dumping measures protecting the markets for road wheels and various types of foil. In spite of the substantial subsidization occurring in China, however, no countervailing duties have been imposed so far. European industry has been adversely impacted by market-distorted imports and Chinese companies have acquired several aluminium industry assets inside the EU.

Overcapacities and industrial policy

Overcapacities are no new phenomenon in China. An industry expert interviewed for this study joked that the only thing that could grow even faster than Chinese output is the country's production capacity. Back in 2000, China's aluminium industry was too small and outdated to accommodate domestic consumption needs and the country had to rely on imports for a quarter of its demand. At the time, both the GOC and global aluminium enterprises anticipated strong market growth. Industrialization and urbanization would continue to drive up metal demand in the medium to long term future. It was surmised that China's import demand would skyrocket for years to come as installed smelting capacity was woefully insufficient and the country lacked adequate supplies of cheap bauxite and electricity. While this conclusion encouraged Russian and Canadian aluminium enterprises to expand their capacities in anticipation of strong Chinese import demand, it also led the GOC to heavily promote the domestic aluminium smelting and processing industry.

In the end, China did not develop into the largest aluminium importer of all time – quite the opposite. After the GOC had made the domestic production of all materials critical to developing the national economy a political priority, investment poured into aluminium projects. By 2016, import penetration on the Chinese aluminium market had dropped to 0.4%. Ex-

¹ New smelting facilities in the Xinjiang Autonomous Region benefit from exceptionally low production cost and easily outcompete the plants run by traditional players, like the Aluminium Corporation of China.

ports, on the other hand, witnessed explosive growth over the years and led China to dominate the market for globally traded aluminium.

Starting from 2005, the GOC and associated think tanks warned of excessive investment flows and irrational capacity formation in the Chinese aluminium sector. Growing concerns were reflected in FYPs and regulatory documents but failed to produce any meaningful effect. Bans of net additions to installed capacity were often circumvented or simply ignored by companies eager to boost their market shares and sub-national governments willing to accommodate their local champions' rapid growth. Over the years, the MIIT and the NDRC, as the central government departments in charge of industrial development planning, have tightened industrial operating standards, intensified supervision (including through on-site inspections) and increased sanctions for rule violations. A variety of instruments were introduced to prevent further capacity growth and flush out obsolete plants. In 2013, the GOC has introduced provisions that allow new plant or expansion projects under the precondition that capacities of larger or equal size are simultaneously retired. At the same time, the GOC has encouraged "international capacity cooperation", i.e. the transfer of production capacity to new locations overseas. Detailed regulations have been released to outline financial and non-monetary support measures for companies that move parts of their production in close proximity to raw material supply or target country markets.

The results have largely disappointed. Even in 2016, production potential continued to expand as newly released plants have overcompensated capacity reductions accomplished through the elimination of small, old or inefficient smelters.

In early 2012 the effect of economic stimulus measures implemented to confront the global financial crisis waned and the Chinese aluminium industry slipped into a deep crisis. Prices tumbled and enterprises' financial performance deteriorated for several years in a row as net capacities increases were faced by slowing downstream demand. While subsidies and other support measures ensured the survival, exports offered some relief and served as pressure valve to vent domestic oversupply. Financial assistance from local governments increased in step with financial distress of enterprises. Companies either begged for state aid or were "force fed" by authorities refusing to accept the bankruptcy of local plants. By November 2015, the situation had deteriorated to the point that leading companies planned to establish a jointly managed stockpile, cut output, freeze all expansion projects and retire a substantial part of their production plant. A special fund was to be created with financial contributions of all major players to help hedge against price volatility and support capacity elimination (see chapter 3.4 in this report for details).

But it did not come to that. In early 2016, prices started to rise from their lows and maintained an upward trend. As revenues recovered and profitability returned, all initiatives to effectively confront overcapacities were shelved. Production plants that had previously been retired were reactivated. At the same time, the GOC initiated its supply side structural reforms that moved the problem of industrial overcapacity to the top of the economic policy agenda (for a detailed discussion see chapter 3.2). Unlike the steel industry, the aluminium sector had not yet been hit with new forceful measures for squeezing capacities. Some market observers interviewed for this study expected the GOC to turn its attention to the aluminium sector after policy measures to fight overcapacities in the coal and steel industries have yielded initial (positive) results.

In the 13th FYP for the NFM sector, the GOC projects continued growth of primary aluminium output. Between 2016 and 2020, production is forecast to increase at an average annual rate of 5.2% and eventually reach 40 million tons. The necessary capacities to realize this output are already in place as the following table 12 shows.

Table 13 Aluminium capacities and output (2011 – 2016)

		2011	2012	2013	2014	2015	2016e
Capacities	mln. tons	23.43	27.31	31.2	35.8	38.9	41.7
Additions	mln. tons		3.9	3.9	4.6	3.1	2.8
Production	mln. tons	19.5	21.3	24.9	28.1	31.6	32.2
Increase	%	12.4	9.2	16.9	12.9	10.3	3.9
Utilization	%	83.2	78.0	79.8	78.5	79.7	77.2

Source: CNIA, CITIC, Antaike.

In 2017, proposed plant construction for the year covered 4.6 million in capacities. While the realization of these projects was uncertain by the time of writing, the fact remains that domestic demand has to make a sustainable recovery in order to allow for the healthy development of the Chinese aluminium sector.

Fresh impulses for a significant reduction of aluminium output come from new and tightened environmental protection regulation. In late 2016, a draft version of the Work Plan for Preventing Atmospheric Pollution in the Beijing-Tianjin-Hebei Region for 2017 sparked concerns of possible cutbacks in future output. The document stipulates seasonal production cuts for electrolytic aluminium and alumina to protect air quality in the metropolitan areas

of Beijing and Tianjin as well as another 26 cities in neighbouring provinces. The proposed provisions demand a 30% reduction in electrolytic aluminium output and a 50% cut in alumina output for the duration of notoriously smog stricken heating season. If passed, the rule would affect 12 electrolytic aluminium producers located in the region which together represent 11.1 million tons or 30.5% of national output in 2016. Calculations based on 2016 production figures suggest that the seasonal 30% reduction would reduce national output by 3.3 million tons or 9.2%. The proposed regulation would mandate even deeper cuts with regards to alumina. The 9 enterprises which would be affected cover 28.1 million tons or 40% of China's alumina production. Estimates based on 2016 data, indicate that a 50% seasonal output cut would lower national alumina production by 28.1 million tons or 20%.

Power supply part 1 – The integration of coal mining and power generation

Electrolytic aluminium smelting requires substantial amounts of electricity. Depending on the size and vintage of a smelting plant, electricity charges typically constitute 30-50% of production costs. Due to the special significance of electricity and its important contribution to competitive advantages for Chinese players, the following section will shed light on the Chinese power sector and related subsidies.

As pointed out in previous sections of this study, the GOC is taking an active interest in the regional layout of industrial activities and strongly supports the formation of functional clusters. In this sense, the planned closer integration of coal mining and power generation sectors is only consequential. The GOC is aiming to promote strategic cooperation between and coordinated development of the two important pillar industries. Coal is China's primary energy resource and coal fired power plants form the backbone of the national power supply.

The International Energy Agency in its World Energy Outlook 2016, calculated that 84% of China's electricity generation comes from thermal power plants. The organization also estimates that Chinese coal consumption has peaked in 2013 and is set to decline further in the coming years.

Although both sectors have a heavy presence of state businesses, the strategic coordination between the two has made modest progress in recent years. In 2014, coal enterprises controlled coal-fired power plants of 1.44 gigawatts (0.1% of total power generation capacity) while power generation enterprises controlled coal mining operations with an annual production capacity exceeded 300 million tons (8% of coal output).

In 2016, the National Development and Reform Commission released the "Guiding Opinions on the Developing Joint Operations of Coal and Power Industries" proposing to fill this blank

and reap efficiency gains. The document urges a variety of financial, technical and business measures to accomplish this: communication platforms, long-term cooperation agreements, asset pooling, cross-shareholdings, M&A transactions and other instruments are to be used for connecting the two industries.

Power supply part 2 – The energy glut in Western China

Triangles of government subsidies, regional policy and market distortions also affect major upstream and downstream industries. Power generation represents an important example. Since the 1990s, the GOC has encouraged the construction of hydropower projects in the country's south-western provinces as part of its regional development programme. Meant to improve the electrification and aid the development of relatively backward areas on the one hand and to realize the power generation potential of local rivers the GOC invested heavily in the construction of numerous hydropower projects of different scales. Non-ferrous metals smelters have been guided to locate in the vicinity of new power plants in order to provide the necessary base load power demand. Local governments scrambled to attract power projects, mostly because construction work would provide employment opportunities and the massive investments required would boost local GDP.

As a result of state business dynamics similar to the ones described in the previous section, power generation capacity has grown rapidly and soon exceeded actual demand. Industry specific policy guidance coupled with financial incentives has set the stage for an investment frenzy that was made possible by factor market distortions. Even though overcapacities had become obvious, government authorities from the city level downwards still seek to attract ever more subsidy financed wind and solar power projects.

In June 2016, the official Xinhua News agency reported that the enormous expansion in power generation had led to the formation of excess capacity. The provincial electricity consumption had failed to grow as anticipated and neither electricity sales to Vietnam nor the transmission volumes to other Chinese regions had met expectations. While Yunnan's power demand had started to decline since 2014, the rapid succession of new generation capacity starts in hydropower but also in thermal, solar and wind power heated up the competition between electricity suppliers. Industrial electricity consumption had been weak as the nine industries that serve as pillars to Yunnan's provincial economy slipped into crisis with their combined operating rate dropping from 61.4% in 2013 to 53.1% in 2015%.

According to projections from the power grid operator of Yunnan Province, installed power generation capacities are set to grow by an annual average of 8% over the duration of the 13th FYP. Over the same timeframe, demand growth is forecast to expand by an annual average of 2.5% - an optimistic scenario considering the consecutive demand declines in 2014 and 2015. By the end of 2016, the overall power generation potential and actual consumption were expected to reach 300 Twh and 210 Twh respectively. During 2016, hydropower plants took a pass on the production an estimated 40 Twh of electricity for which there was no demand. Naturally, enterprises affected by low utilization rates and deteriorating financial performance lobbied their local governments for electricity price cuts to jump start sales. So did heavy electricity users, like Yunnan Aluminium. Ding Jilin, vice-chairman of the board of directors, last year publicly complained of too high power prices. He pointed out that while his company paid RMB 0.37 (0.05 Euro) per kwh in its home province, the national average for the electrolytic aluminium industry was a mere RMB 0.251 (0.034 Euro).

In June 2016, the government of Yunnan Province announced to cut electricity prices for local electrolytic aluminium smelters and further cut the energy cost of that industry. Taking aim at the principal smelter in the territory, the Yunnan Aluminium Co Ltd, the province ruled that the electricity price per kilowatt hour should not exceed RMB 0.2785 (0.0375 Euro) between June 1st, 2016 and May 31st, 2017. Yunnan Aluminium, which is owned and controlled by the provincial government, had already benefitted from falling electricity prices during previous years: from RMB 0.514 (0.074 Euro) in 2013 to RMB 0.35 (0.05 Euro) in 2015. The move by the Yunnan authorities thus indicated another 20% reduction. Of the RMB 0.2785 (0.034 Euro) per kwh, RMB 0.185 (0.023 Euro) are to be paid to two local hydropower producers, RMB 0.045 (0.005 Euro) go to the power grid operator as transmission fees and RMB 0.0485 (0.005 Euro) are collected by the provincial government as fees. The latter contain RMB 0.019 (0.002 Euro) per KWh in mandatory contributions to the renewable energy development fund. In order to further reduce the cost burden of heavy power consumers, the provincial Finance Department has appealed to the central government in Beijing for permission to waive the surcharge. Whether or not this attempt was successful could not be confirmed in time for this study.

Sub-national government authorities have long provided financial support to keep electrolytic aluminium enterprises out of the red. In 2012, at a time when most smelters reportedly lost RMB 1,000 (123 Euro) on each ton of aluminium, local authorities heavily subsidized the price of electricity to compensate.

Power supply part 3 – Provincial electricity subsidies

Considering the supply glut existing in the power generation sector of various hinterland regions, it is not surprising that local governments have sought to lower the electricity cost burden of aluminium smelters.

In mid-2012, sub-national governments across China launched electricity subsidies to aid aluminium smelters suffering from plummeting prices. These moves happened in quick succession but without the involvement of the central government. Only in April of the previous year the Ministry of Industry and Information Technology, the National Development and Reform Commission and seven other central government departments had jointly released the Emergency Notice concerning Containing Excess Capacities and Redundant Construction to Guide the Healthy Development of the Electrolytic Aluminium Industry. The documents had declared in no uncertain terms all subsidies, especially those offsetting electricity costs, as null and void.

In fact, the authority to adjust electricity prices rests with the National Development and Reform Commission. Local governments can thus only provide subsidies to offset electricity costs. Some regions have resorted to creative approaches to help companies wither tough times. In 2012, Henan Province, China's largest aluminium smelting region by output, lowered the effective cost per kWh by RMB 0.08 (0.01 Euro). Provincial authorities allowed companies to defer the payment of this amount until market prices for the metal recovered to at least RMB 17,500 (2,150 Euro) per ton. Unfortunately, THINK!DESK was unable to ascertain if companies have actually paid outstanding electricity charges later.

Other regions, like Guizhou, and Guangxi and Shaanxi, quickly followed suit and introduced electricity subsidies for "their" aluminium smelters. Guizhou effectively cut electricity cost by RMB 0.03 (Euro 0.004) per kWh while Guangxi went even further, reducing cost by RMB 0.1 (Euro 0.013) per kWh. The latter applied the offsetting subsidy to a total of 2,400 GWh, disbursing RMB 240 million worth of subsidies to resident companies. The amounts of the grants are substantial. Considering that smelting one ton of electrolytic primary aluminium on average consumes about 14,000 kWh, the subsidy depressed the cost per ton by RMB 1,120 (136 Euro) or 7.5% (based on a primary aluminium price of RMB 15,000 (1,815 Euro) at the time).

The relief measures have had several adverse side effects. Smelters that had already shut down in the face of unprofitable market conditions resumed production again. The reactivation of mothballed capacities had not been anticipated and severely undermined the central government's efforts to flush out obsolete plants.

Furthermore, local government electricity subsidies provided momentary relief as they eased the financial pressure on ailing companies. However, over a period of several weeks, the supporting effect of subsidies got largely neutralized. In the absence of additional market demand, the electricity subsidies led companies to expand production and worsen the existing over supply crisis. The resulting pressure on prices cancelled out a significant proportion of the profit margin that was created by government largesse.

Finally, as a representative of the China Non-ferrous Industry Association stated at the time, the subsidies heavily distorted the competitiveness of enterprises and upset market structure. Differences in cost structures and profit margins between competitors that resulted from superior production technology and successful management practice were glossed over by subsidies.

In fact, not all smelters have been eager to resume production as the additional output was almost impossible to sell at a profit and pile up as inventory. Instead, many have been pressured by local authorities to restart and maintain normal production operations - even in light of certain losses. Governments from the city level down have commonly prevented enterprises from going bankrupt, even if the companies in question had been inclined to do so. The detrimental effect on local economic growth, employment and ultimately political careers had been considered unacceptable.

Power supply part 4 - Differential electricity pricing

In reaction to the massive subsidization of electricity by regional authorities, the central government has sought to reassert its position as principal regulator of electricity prices.

In late 2013, the NDRC and the MIIT introduced a differentiated electricity price system to reward energy efficient electrolytic aluminium smelters. Plants with an average AC power consumption per ton of liquid metal of 13,700 KWh are not subject to surcharges on the government-set electricity price. Those using 13,700 to 13,800 KWh have to pay an extra RMB 0.02 (0.0024 Euro) per KWh. Plants that need more than 13,800 KWh face surcharges of RMB 0.08 (0,097 Euro) per KWh. Only companies that can meet the 13,700 KWh per ton threshold qualify for the direct electricity transactions with power generators. Provincial authorities are urged to offer special support and preferential treatment in this regard for enterprises with averages of 13,350 KWh and below.

Companies have to install professional and reliable measuring equipment, grid operators have to register usage for individual consumers and local authorities have to carry out effective supervision in order to ensure efficiency and prevent fraud. The average power use for

smelting a ton of electrolytic aluminium is assessed once a year and determines the cost for that year. Grid companies are informed by provincial pricing departments about the status of their clients and are tasked to collect the surcharges where applicable. 10% of the additional electricity revenues collected remain with grid companies to compensate them for the additional technical and administrative effort involved. The remainder is transferred to provincial governments to be disbursed as subsidies for energy conservation plant renovation, capacity elimination and related projects.

Local government authorities are warned to carry out the differential electricity price system in strict accordance to the central government's regulation. Any subsidies that reduce the effective energy cost are expressly prohibited and where preferential policies already exist, they have to be adjusted or abolished.

Foreign trade

China's imports of aluminium products have declined substantially in recent years. Domestic supply increases and quality improvements have helped to accomplish self-sufficiency with very few exceptions in high end segments.

China is the world's largest exporter of aluminium products. The country exports almost no aluminium in raw form but supplies the world with semi-finished and finished products. Trade policy strongly discourages the exportation of raw materials and primary aluminium but encourages sales of higher value added products. In recent years, Chinese companies have increased exports of semi-processed goods. Arguably, this has been done to circumvent Chinese export restrictions and re-melt the materials into raw aluminium inside target markets. Exporting semis instead of raw aluminium mean exporters can avoid paying a 30% export tax and claim a 15% VAT refund. The phenomenon of "fake semis" has received particular attention through the case of China Zhongwang's substantial stockpiling activities in Mexico and Vietnam (see section 5.3 for details).

As is the case with other metals reviewed for this study, the GOC has geared its trade policy instruments to shift the composition of exports towards higher value added and more technology intensive products. The financial incentives of this guidance imply that Chinese exporters have rapidly evolved into formidable competitors in even the most demanding product segments, like aviation and aerospace. Owing to low production cost and GOC support, Chinese products have quickly penetrated traditional export markets of the European aluminium industry. At the same time, Chinese companies have expanded their presence in the EU market through acquisitions of production assets or the creation of sales networks.

6.2 Copper

Copper is of key importance to the Chinese economy and “vice versa”. The country is dominating the copper market – both by means of consumption and international trade. In 2016, as in previous years, about 36% of copper refining took place in China and 50% (ICSG, Copper Bulletin, March 2017) of global refined copper use was based there. Over the past 50 years, China’s copper consumption has increased at an average annual rate of 8%. The past ten years, however, have witnessed even stronger demand growth of close to 12% annually. In the 13th FYP for the NFM sector, the GOC targets another 25% increase in refined copper output, from 8.4 million tons in 2016 to 9.8 million tons in 2020. Remarkably, Chinese output and consumption of copper have continued to grow during the global financial crisis, even as both indicators sharply contracted across OECD countries.

China only possesses about 5% of global minable copper reserves and currently accounts for 7.4% of worldwide mine output. With a total production of about 1.9 million tons in copper ores in 2016, the Chinese copper mining sector ranked second after Chile. But still, in 2015, China had to import about three quarters of its ore. Based on figures of the International Copper Study Group (ICSG), none of the world’s 20 largest mines (by capacity) were located in China in that year. Following a decade of substantial investments in overseas mining assets, however, Chinese companies (almost exclusively SOEs) have acquired significant mining interests, predominantly located in South America. Among them the Toromocho mine in Peru, which is operated by the Aluminium Corporation of China, is in the group of the 20 largest in the world.

The picture is a different one with regard to smelting operations. In the reform era, the rapidly increasing imports of copper ores China attracted in the reform era were to feed its rapidly expanding smelting operations. In 2015, China already accounted for 6.9 million tons or about a third of global blister and anode output. According to statistics compiled by the ICSG, seven of the 20 largest copper smelters in the world were located in China.

Copper refining displays a similar pattern: 36% of refined copper output, or about 8 million tons, come from plants based in China. Based on ICSG figures, the country is home to nine of the world’s 20 largest refineries. These supply the production of semi-fabricated copper products, an area where China covers the world’s largest output capacity (about 22 million tons or 40% global share) and the largest number of plants (582).

As economic growth in the Chinese economy cooled in recent years, the expansion of copper production and consumption has begun to level off. Considering the already exceptionally high copper use, when measured on a per capita or per unit of GDP basis, the potential for

future growth is indeed limited. However, continued urbanization and infrastructure construction suggest that the country is going to maintain its leading role.

Copper in the form of rod in power cables, has been a key ingredient for the dramatic expansion of China's power grid. The demand has been exceptionally high since the onset of economic reforms as urbanization and industrialization boosted consumption. The electrification of remote areas has contributed to alleviating regional development disparities and stimulated economic activity. Similarly, the electrification of China's railway system has helped the transportation sector. Across all applications in infrastructure, industry and households, the consumption of copper materials has skyrocketed since the early 1980s. In recent years, however, growth has begun to level off as economic growth has slowed and market saturation has come closer in many market segments. The price increases following from China's demand spike have led the copper processing industry to develop alloy materials that have a reduced copper content. Aluminium copper alloys have been widely used as substitute in power line applications. Similarly, copper has been widely replaced by other materials when it comes to water piping in the residential housing sector.

Eventually, three decades of copper refining and imports have led to the formation of a large social stock of the material. Consequently, the recycling sector has become an important supply source and reduced the need for further imports.

Industry structure and industry policy

Since the turn of the millennium, the surging growth of copper production and consumption has led to a number of structural problems in the sector. Similar to other raw material based industries where SOEs have traditionally played a dominant role, like steel or aluminium, the copper sector was the target of excessive investment and plant construction. Fuelled by easy access to capital markets and loan interest subsidies, many SOEs boosted their output capacities in a fight for market shares. The capacity build up often occurred without rational market analysis, sound demand projections or coordinated planning between players. Local governments were eager to attract copper smelters or refiners and lured potential investors with sweetheart deals. Where enterprises, state-owned or private, expanded their plants, local authorities provided administrative backing and financial support. As copper demand continued to grow, new players entered the market and industry concentration dropped. A combination of these and other factors led to the emergence of redundant production plants, tight price competition and low financial performance. Another consequence was high energy consumption and heavy environmental pollution, as many of the new players were relatively small in size and did not employ state-of-the-art equipment.

At least since 2005, the GOC has made attempts to remedy the situation with increased industrial policy regulation. Aiming for a more sustainable development pattern, i.e. higher efficiency, improved technology and less negative externalities, the GOC organized a concerted effort of various central government departments. Led by the NDRC (the chief economic planner) and the MIIT (the chief industrial regulator), the group included the People's Bank of China (the central bank), the China Banking Regulatory Commission, the Ministries in charge of environmental protection, land and resources and several others.

The GOC ordered a full review of all projects in various stages of planning and construction to discourage undertakings that lacked competitive advantages and market potential. But in spite of momentous announcements by the ministries and even the State Council, this undertaking proved ineffective as many projects sidestepped the official investment approval process and/or were protected by supervising local authorities.

In 2006, the GOC released the Copper Industry Access Conditions, a comprehensive catalogue of mandatory performance requirements that new and existing smelters had to meet. The document prohibited projects in or near densely populated areas, natural preserves and other sensitive areas. It mandated a minimum plant capacity of 100,000 tons per year and demanded that operators be able to provide a substantial part of the refined ores from own mining operations. Companies had to employ modern production technology, like flash smelting, to ensure adequate levels of resource efficiency, energy consumption and environmental standards. Certain backward technologies, such as the hot acid pickling process or the smelting waste copper with a direct burner, were prohibited and enterprises had to phase out small-scale smelting equipment. The GOC imposed separate energy efficiency and environmental protection standards for new and existing plants.

Importantly, it emphasized that project construction must not take place without the approval of supervising authorities, environmental impact assessments are mandatory and the legal procedures for the allocation of land use rights have to be observed. Regular inspections by various functional government departments were announced to ensure continued regulatory compliance. Furthermore, the China Nonferrous Metals Industry Association was tasked to assist in monitoring and supervision. Where enterprises failed to meet operating standards, government departments were ordered to stop handling administrative procedures for the company and revoke its business license. Moreover, financial institutions were banned from granting bank loans and power grid operators had to terminate electricity supply. The GOC also pledged more effective supervision and warned that enterprises and individuals violating the rules were subject to punishment and prosecution.

While these measures appear forceful and rather drastic, the results were mixed and generally did not bring about the intended clean-up of the copper smelting sector. Limited resources and personnel limited the number and scope of on-site inspections and many companies succeeded to operate “under the radar” for years. In 2007, the GOC released the names of (only) seven enterprises that had been confirmed to comply with industry requirements: Yunnan Copper and six other state-owned heavy weights.

In 2015, the GOC amended the minimum operating requirements for copper smelters. The adjustment expanded the coverage to producers of secondary metal and renamed the document Copper Smelting Industry Standards. It introduced new performance criteria, such as quality management, and tightened energy conservation and environmental protection standards. Subsequently, in 2015 and 2016 another 18 and seven enterprises were approved respectively, among them several private companies.

In addition to these three “white lists”, the MIIT has so far also released ten “black lists”, specifying plants subject to mandatory closure due to rule violations. Since their introduction in 2010, several hundred companies from across the country have been affected and 2.8 million tons of smelting capacity has actually been removed.

A comprehensive review of the industrial policy framework targeting the Chinese copper industry over the past ten years reveals a high degree of consistency. The objectives stated in GOC guidance documents in 2005 and 2015 show great similarity as do the derived administrative tasks and implementation measures. Although the administrative closure of inefficient or backward plants has contributed to a streamlining of the sector, its effect was arguably overshadowed by the crisis that moderating demand and low price levels inflicted on many weaker players.

However, the policies outlined above have never been sacrosanct. Exogenous shocks like the Subprime/Lehman crisis can be shown to have overriding powers resulting in existing policies being substituted by new programmes. In order to stimulate the domestic economy amidst a faltering global economy by means of a Keynesian investment initiative, the GOC has very substantially supported the expansion of cathode production capacity. Xiangguang Copper, based in Liaocheng City (Shandong Province), may serve as a case in point. In the years prior to the global financial crisis, Xiangguang Copper had developed plans to double its cathode output potential to 400 thousand tons per year. After the onset of the crisis, the provincial government adopted the expansion project into its "Adjustment and Revitalization Programme for the NFM Industry". The Programme was drafted in late 2009 as a cornerstone of economic stimulus policy and implemented until the end of 2011. Xiangguang Copper's cathode capacity expansion was recognized as a "provincial key industry project to be

constructed" and included in the sixth batch of the "2009 China Development Bank Policy Loan Project Investment Programme". The provincial government used the "Development and Investment Corporation of Shandong Province", a wholly government owned finance and investment company, to make available RMB 1 billion (111 million Euro) of policy loans to Xiangguang Copper.

Partly owing to government set incentives, but mostly stimulated by changing market demand, Chinese companies have succeeded to update production technology, improve quality levels and enhance their competitiveness on the home market and overseas. In this transition, the larger companies, especially the state-owned ones, have benefited from state aid in the form of financial grants and non-monetary measures. Large funding support available to enterprises carrying out technology development and commercialization in areas highlighted as strategically important in the Made in China 2025 programme and other similar initiatives have guided investments into technology intensive and higher value added product segments, like high performance copper foil. In fact, the 13th FYP for the NFM industry complains about the high market share of imports in certain product segments. Consequentially, in the section overwritten insufficient technology innovation capabilities, the GOC calls on enterprises to end this very import dependence in high end copper foil, sheet and strip categories.

During the 12th FYP (2011-2015), the environmental performance of the Chinese copper smelting industry has improved. The average energy consumption per ton of refined copper has dropped by 28% to 426 kg of standard coal units. Over the same timeframe the supply of secondary copper increased at an average rate of 5% per year to reach 3 million tons.

Following decades of surging copper consumption and the resulting formation of a very large stock of the metal tied up in buildings, equipment and infrastructure, the GOC has sought to better regulate the production of secondary copper. It has encouraged the collection, sorting and processing of scrap resources and seeks to raise the market share of secondary copper. The 12th and 13th FYPs for the NFM industry emphasize the need to strengthen the recycling sector and conserve resources.

The industry has undergone consolidation and streamlining through market exits as well as M&A. The outcome is a more coordinated industry structure characterized by increasing concentration levels and the formation of national champions. For the most part, these are the large state-owned players that can trace their roots to the pre-reform era and have emerged after the nonferrous metals sector was corporatized in the 1980s and 1990s. Newer players have developed in niche segments but mass markets and high end applications are firmly controlled by state-owned companies like Yunnan Copper, Jiangxi Copper and

Tongling Nonferrous Metals. The current industry layout is the result of developments in the market, industrial restructuring policies or subsidization – specifying the precise contributions of these drivers, however, is beyond the scope of this study.

One recurrent element, however, that must be highlighted and distinguishes the Chinese copper industry from the rest of the world is its specific investment logic. As documented above governmental plans for strategic industry design (technological upgrading, import substitution, comprehensive value chain coverage, etc.) play a dominating role for investment decisions – not short- or medium-term profitability considerations. As a consequence, capacities are being created that most likely do not (and cannot) contribute to corporate profitability, but stand in line with governmental visions for national industry development. While the predominantly state-owned or semi-private and subsidy receiving Chinese enterprise sector may be in a position to disregard such operating losses, foreign firms are directly affected. Operating without soft-budget constraints and exposed to fierce market competition, they see their business models disintegrating as global prices fall due to increasing Chinese overcapacities. As a consequence healthy European firms face the danger of being crowded out by Chinese players propped up by governmental subsidies and protected domestic markets.

A case in point is the projected drastic expansion of smelting capacities in China by 2-3 million tons during the coming 4 years. Against the background of stable mining output, which is characterized by high intertemporal inertia, this may lead to a global oversupply in smelting capacities and in direct consequence thereof to shrinking smelting fees world-wide during a certain period of a cycle. European firms that have no access to governmental subsidies and uphold high ecological standards are clearly put in a disadvantaged position. What China – as an economy – wins is a reduction of its import demand for copper cathodes and a higher self-reliance in copper cathode production. But this import substitution may come at the price of reduced smelting fees for all players – in China and world-wide. Business rationality, i.e. market driven business decisions free of governmental interventions and without access to governmental subsidies, would rather opt for a supply demand balance with higher smelting capacity utilization at continued cathode imports and higher smelting fees.

Foreign trade and investment

In the copper industry, as in most other parts of the national economy, the GOC has come to regard foreign trade and investment policy as integral elements of its comprehensive and activist industrial development policy. Until the present, the GOC employs a wide bandwidth of instruments to shape the incentives of enterprises at the global market interface. At the beginning of the value chain it has encouraged imports of copper scrap through the provi-

sion of tax breaks and – until very recently – discouraged its exportation through export taxes. VAT refunds have been granted on the import side but denied on the export side where raw materials were to be attracted for domestic processing. The recent easing of trade policy measures pertaining to copper scrap reflect the fact that the social stock of copper has reached a high level and the accumulation of scrap resources is no longer necessary. Further down the value chain, exports of higher value added and more technology intensive products are encouraged through VAT rebates, the provision of export credit insurance and relaxed administrative procedures.

With regard to overseas investments, the GOC has offered substantial financial, political and administrative support for enterprises acquiring mining interests abroad. Loans from the China Development Bank and the Import Export Bank of China, two policy banks, have been instrumental in project financing and securing large scale deals.

6.3 Lead

China is the world's largest producer and consumer of refined lead. In both regards, the country accounts for about 40% of the international total. Thanks to large reserves in lead, the second biggest in the world, China is significantly less dependent on raw material (lead carrying ore concentrate) than the EU and most other leading producers of the metal. In fact, China produces 57% of lead concentrates and generates about a quarter of all secondary lead worldwide.

Lead production has expanded at a brisk pace of 12.2% per year during the 11th FYP period (2005-2010). Since 2011, the growth of Chinese lead output has slowed and even contracted in 2014 and 2015. In 2016, nationwide production of primary lead reached 3.15 million tons, about 3.3% more than in the previous year. Additionally, the country's smelters produced 1.7 million tons of secondary lead, up 3% compared to 2015. Output growth is constrained by the limited availability of concentrates and environmental protection regulation. In 2016, production of concentrates stood at only 2.85 million tons. GOC projections indicate a slow expansion of concentrate production (2% CAGR) to 3.5 million tons until 2030.

As bottlenecks prevailing in mining coexist with overcapacities in smelting, plant utilization is low. The GOC's 13th FYP for the NFM targets a production volume of 4.65 million tons of primary and secondary lead for 2020. At the same time, the share of secondary lead in domestic market supply stands to increase from just 33% in 2015 to 45% in 2020.

The GOC has actively intervened in the mining and processing of lead. On the one hand, SOEs have been instrumental to expanding production and improving technology. On the other, industrial policy has sought to streamline the sector through M&A consolidation and forced market exits of inefficient, polluting and small plants. The targeted market structure is characterized by a small number of players with strong capabilities in technology development and environmental protection.

In order to regulate the market, the GOC has released the Lead Zinc Industry Access Conditions in March 2007. Akin to similar documents published for aluminium, copper, tin and other metals, the Access Conditions comprise a comprehensive set of minimum operating standards pertaining to plant size, production technology, environmental protection measures and a wide array of other aspects. Serving as a central reference point for all sector regulation, the Access Conditions guide the actions of all GOC agencies as well as financial institutions. Compliance is to be enforced through a concerted effort of all government and state-affiliated organizations. An amended and expanded edition of industry performance benchmarks has been released in 2015 with the Lead Zinc Industry Standards.

In the same vein, the GOC published the Recycled Lead Industry Access Conditions in September 2012 and followed up with the Recycled Lead Industry Standards, an updated edition, in December 2016. In the field of secondary lead, companies were encouraged to make use of their existing advanced smelter techniques and equipment to recover lead paste from batteries. In order to facilitate recycling of lead acid batteries, the GOC encourages cooperation between battery manufacturers and lead smelters.

By means of these documents, the GOC has consistently urged plant improvements. During the 13th FYP period, the GOC continues to promote technology upgrading in the lead industry. In 2015, the initial year, only 80% of capacities conformed to advanced production standards. This proportion is very low when compared to other metals like aluminium (100%) or copper (99%).

The GOC has ordered strict controls of new production capacity releases in the lead industry. Enterprises operating outmoded lead-zinc smelters are urged to enhance their production technology. In 2009, 2013 and 2016, the GOC has released lists of enterprises that have been found to conform to industry standards. This official approval gives companies the green light for operation and expansion. At the same time, the GOC has released black lists. Plants that fail to meet requirements are forced to cease production until problems have been remedied or leave the industry permanently. Such lists have been published once or twice annually since 2010. As a consequence, 3.8 million tons of obsolete lead smelting plant has been phased out between 2011 and 2015.

This practice, however, has not prevented a net increase in smelting plants and the formation of overcapacities that depressed financial performance. THINK!DESK estimates average utilization ratios to be at about 60%. Overcapacities have existed for at least the past decade but become more prominent in recent years with the release of new large scale smelting facilities. For the most part, these plants employ state of the art technology and are located near major ports in order to process imported ores and concentrates. A lot of this new capacity has been established by SOEs and partly financed by subsidies and low interest loans.

Smelting fees

The ore concentrates produced by mining enterprises contain lead in conjunction with other base or precious metals. The concentrate price consequently reflects the metal value which is composed of the market prices for contained base metals, as determined at the London Metal Exchange, and those for precious metals, as set by the London Bullion Market Associa-

tion. While the metal value determines the concentrate price, treatment and refinery charges as well as impurity penalties are deducted. Annual contract negotiations between miners and smelters serve to define the terms of trade. Smelters' gross profits are derived from treatment and refinery charges and, where appropriate, impurity penalties. These proceeds include a portion of unpaid metal which represents the difference between the analytically proven metal content and the affordable metal content supplied by the mines.

While some smelters operate captive mines, most have to procure concentrate on the market. As domestic supply has expanded only at a slow pace, hampered by mine exhaustion and output reductions due to environmental protection considerations, Chinese lead smelters have increasingly turned to imported concentrates. According to incomplete statistics and expert estimates, one quarter of the concentrate consumed in 2016 had to be imported. Shipments have expanded by about 4% on the year to 2.45 million tons. As importers, Chinese buyers compete directly with EU companies for limited world market supplies. It is in this sphere that Chinese smelters and traders have caused serious prejudice to the interests of EU based lead smelters which rely on the world market for an even larger proportion of their concentrate inputs.

Chinese smelters have come to purchase concentrates with minimal or no deductions for treatment and refinery charges in order to obtain sufficient raw materials. They commonly agree pay the full metal value and largely forgo the opportunity of reasonable discounts. This is a striking departure from established industry practice which helps Chinese smelters attract concentrates ahead of the international competition. However, it also drives up their production cost and effectively eliminates their profit margins in the smelting business. Due to this situation, a large proportion of Chinese smelters have incurred heavy losses. Some enterprises that have diversified into downstream processing have been able to use profits from the manufacturing of final products to (partly) compensate for their loss making smelting operations.

At the same time, companies have also come to use subsidies and low interest loans to stay in business. The latter have been particularly important as revenues generated from refined lead have stagnated or dropped. In fact lead prices have been hovering on low levels during much of the 12th FYP period (2011-2015), the time when significant new smelting plants had come on stream. To varying degrees, the same holds true for the markets for major by-products, such as silver, copper matte and sulphuric acid.

As the increase in capacity coincides with depressed prices for refined lead, most smelters have, for the most part, been unable to offset smelting losses with downstream profits. The

renewed expansion in lead smelting has thus been based on a combination of utterly flawed market predictions and, more importantly, GOC financial support.

In recent years, the operating environment for Chinese lead smelters has become more challenging as costs have increased in many areas, especially environmental protection. Lead producers and other companies in the heavy metals industry have caused extensive pollution with grave consequences for nature, agriculture and human health. After years of lax oversight by local authorities and inaction by the central government, the situation has begun to change significantly during the 12th FYP period (2011-2015). New laws have put forth tighter environmental protection standards and introduced more effective enforcement instruments. Inspections have grown in number, scope and frequency and penalties for rule violations have increased in step with detection risk. The costs of necessary technology upgrades and equipment installation have impacted on the financial performance of the Chinese lead smelting sector. In addition, the cost of adapting to tighter work safety regulations as well as rising prices for energy and labour have exacerbated financial problems.

In 2016, the Chinese practice of overpaying lead concentrates has been a major factor behind escalating competition in the world market. The low metal prices of previous years have led several large mines in South America and other world regions to cut or halt production. At the same time, a few smelters based outside the EU have increased their production. As a result, EU smelters have struggled to find sufficient and adequately priced supplies to keep operating and remain profitable.

The market outcomes in the Chinese lead smelting sectors cannot be explained by the free interaction of market forces. Instead, they manifest GOC intervention that has facilitated and/or supported the formation of new capacities. The resulting supply bottlenecks in lead concentrates and low plant utilization have been a direct result. The smelters' willingness to abandon conventional pricing practices and accept heavy losses follow from this. Considering that the inflated raw material costs compound with increasing outlays in other areas make this decision appear highly irrational. In a genuine market economy, the intense price competition for major inputs coupled with the loss of profitability would have translated into market exits. The inability to keep up production or repay debt would have led to bankruptcies while the existence of higher profit margins elsewhere in the economy would have encouraged players to transition into other business areas.

In this scenario, the most competitive players would have survived this streamlining process, increased plant utilization and restored profitability. Their improved bargaining power would have put them in a position to return to the established pricing mechanisms for lead concentrate. As a consequence the business models and cost structures of Chinese smelters would

have come to mirror that of their international peers (apart from normal local differences). In a nutshell, the removal of state direction and subsidies would bring about a global market that is efficient, transparent and most of all fair.

Consumption

The Chinese consumption of lead has grown at an average rate of 16.5% between 2005 and 2010 but the expansion almost ground to a halt (0.8% CAGR) during the following five years. For the current 13th FYP period, national lead use is projected to increase from 4.37 million tons in 2015 to 4.5 million tons in 2020.

China's lead consumption structure is dominated by battery manufacturing, accounting for about three quarters of metal use. The remainder is made up of lead as well as its alloys and salts. In the field of lead acid batteries, demand has been propelled by surging automobile output. Except for starter batteries used in gasoline or diesel powered vehicles; traction batteries for electric bicycles, scooters, tricycles, cars and other vehicles have become important sub-segments. Compared to lithium ion solutions, lead acid battery technology is more mature, secure and cheap. The cost advantage and established recycling routes have made lead acid batteries the preferred choice for the low-speed electric vehicle sector, which now accounts for over 40% of lead acid battery consumption.

In recent years, the market for electric two wheelers has approached saturation and sales growth has dropped to the low single digits. In early 2016, the GOC has increased consumption taxes on the purchase of electric two-wheelers which has further depressed sales. In the medium term, replacement demand is going to support consumption on current levels. Electric car production and sales have increased in China, mainly boosted by the GOC's provision of financial incentives for their development, production, commercialization and popularization. Buyers can take advantage of purchasing premiums, tax breaks as well as an exemption from road charges and driving restrictions. However, this wide array of preferences is not available to makers and buyers of electric vehicles powered by lead acid batteries. The generous funding support for expanding the footprint of "new energy vehicles" is contingent on those cars conforming to wide spectrum of narrowly defined characteristics which specifically exclude lead acid technology.

At present, the application of lead acid technology in traction batteries for four wheelers is limited to low-speed electric cars (max. speed of 70 km/h). Manufactured mainly in Shandong and Jiangsu Provinces, these vehicles are positioned at the lower end of the automobile market – sometimes they are not even granted a road license. Due to the lack of embedded high end technology, such mini-cars are not contained in the MIIT's directory of

promoted EVs. Moreover, industrial policy restricts the production and sales. In spite of this discrimination, demand has remained robust for several years, principally driven by poor buyers in the country side, the GOC has announced a review of its policy stance which may lead to further demand increases for low-speed EVs and, by extension, lead.

Foreign trade

The GOC has made active use of trade policy instruments to prevent the outflow of concentrates and encourage imports. In finished products, the situation is reversed. This now familiar pattern has been established across all individual metals reviewed in this study.

Recent GOC action has also supported lead smelters in their export of silver, a by-product. The Chinese market for the processing of silver-containing lead concentrates has significantly expanded. In order to allow companies to tap new sources of revenue, the GOC has granted tolling licenses for silver to at least eight lead smelters. The licenses exempt companies from paying the regular 17% VAT on imports of silver-containing concentrates. In the past, there was little incentive for Chinese smelters to import such concentrates as the VAT discouraged processing trade and Chinese silver prices were lower than LBMA (London Bullion Market Association) quotations. Thanks to the tolling licenses, a selected few enterprises have been able to process concentrates at a cost advantage and export the extracted silver based on the same LBMA prices.

Shortly before the release of this study, the GOC has terminated export duties on concentrates. Said duties have been challenged by the EU in its July 2016 complaint to the WTO Dispute Settlement Body. Their removal at this point suggests an admission on the part of the GOC acceptance that they violate WTO regulation. However, the termination of export duties on lead concentrates has not sparked an increase in outward shipments as materials fetch higher prices on the Chinese market.

Owing to export promotion for more technology intensive and higher value added products, shipments of such goods have increased significantly in recent years. Exports of lead coated steel sheet, for example, have surged as exporters can claim a partial VAT refund (13%). In recent years, imports of Chinese-made lead acid batteries into the EU have skyrocketed. Between 2011 and 2016, shipments from China into the EU have doubled to almost 44 million tons.

6.4 Magnesium

The Chinese magnesium industry is the largest in the world. The country accounts for about 80% of global mining and processing. Worldwide, capacities for the production of primary magnesium stand at 1.65 million tons of which about 1.4 million are located in China. In 2016, about 1 million tons of raw magnesium was produced worldwide, 880 thousand tons of that in China. This marks a strong increase from only 560 thousand tons of output in 2004. The production of raw magnesium is concentrated in three provinces. In 2016, roughly half of the national output came from Shaanxi Province (+26% year on year) while the regions of Shanxi (-27%) and Ningxia (+13%) together contributed a third. Different from the industry structure in other metals, magnesium producers are predominantly private companies and the role of SOEs is limited.

Furthermore, the magnesium industry is also less fragmented. The ten largest smelters account for about a third of output. Only 32 enterprises produced more than 10,000 tons in 2015 and 2016 – together covering three quarters of national output. The leading players in magnesium alloys are mostly also among the largest smelters.

As the use of magnesium and its role in the national economy increased, the GOC started to tighten regulation of the sector. In order to prevent a surge in low level production capacity, the authorities released a catalogue of market entry requirements in 2011. The catalogue is both comprehensive and detailed in specifying minimum standards for plant size, production technology, product quality, energy efficiency, environmental protection and other parameters. The GOC also began to consolidate the sector and flush out inefficient plants. In 2012 and 2013, the MIIT gradually released the names of enterprises which had been approved for operation in the magnesium industry.

The GOC has warned against net capacity additions in the 13th FYP for the NFM industry. However, new projects have come on stream in 2016 or will be put in production in 2017. A new plant in Qinghai Province will add 100,000 tons of capacity while plant expansions at Baishan (Jilin Province) seek to triple production potential to 75,000 tons.

As in other raw material sectors, the GOC encourages the formation of large scale modern production facilities before 2020. Policies speak of the objective to cultivate a group of “backbone” enterprises to efficiently organize supply for the domestic market and develop international competitiveness in high value added products. Different from other raw material industries, the emphasis on international expansion is less pronounced as there is still potential for future domestic demand growth.

While much of the Chinese magnesium producers have traditionally obtained the metal from ferrosilicon through the reduction of the oxide at high temperatures (Pidgeon process), the newer plants refine magnesium through the electrolysis of fused magnesium chloride from brines (Dow process).

Owing to tighter environmental protection regulation and rising energy costs, some plants based on the silicothermic Pidgeon process have cut output or closed down. A new plant scheduled to launch production in Qinghai Province later this year, is designed to make 100,000 tons of magnesium per year from brines of Lake Qinghai. In order to promote energy conservation, the GOC actively supports technology upgrades targeting efficiency improvements and aims to flush out wasteful plant equipment. Plans for 2020 call for cutting the energy use per ton of magnesium by 1,000 kg of standard coal in the silicothermic process and by 2,000 KWh in the electrolytic process.

Consumption and customer structure

China is the world's leading magnesium consumer by a large margin. Domestic demand has surged since the early 2000s, buoyed by the growth in automotive, high speed railway and aviation sectors. Especially the surge in China's automobile production and an accompanying increase in per unit magnesium use have boosted consumption. Overall, the growth in die casting and aluminium alloys is perhaps the most important factor driving magnesium processing.

The GOC promotes the application of magnesium in transportation, packaging and other sectors. It has earmarked the industry for special support in the 13th FYPs for NFM and the Programme for Developing Industrial Technology Innovation Capacities (2016-2020). Magnesium applications feature prominently in the catalogues of promoted products and technologies associated with the Strategic Emerging Industry initiative as well as the Made in China 2025 strategy. Following the development roadmap laid out in the 13th FYP for the NFM industry, magnesium production is to increase at an average annual rate of 8.4%, from 853,000 tons in 2015 to 1.3 million tons in 2020. For the same timeframe, the GOC forecasts substantial growth in the metals consumption. Downstream industries are expected to expand demand by an average 7.1% per year to reach 750,000 tons in 2020.

Similar to other metals, the industry experienced a profound crisis in 2015 that brought down growth in mining and processing as well as domestic consumption and foreign trade. Prices plunged to 16 year lows and profitability was bad. As losses mounted and access to external funding dried up, some of the weaker players idled plants or exited the market. In

2016, the industry recovered, buoyed by price rises from little over RMB 11,000 (1,580 Euro) per ton of magnesium in early January to RMB 17,000 (2,450 Euro) in October. However, they dropped again from their peak and ended the year at about RMB 14,000 (2,016 Euro). Overall, production and consumption increased in 2016 and financial performance in the industry improved.

Importantly, the rapid development of Chinese magnesium has been strongly affected by the development in other industries. The steel industry, which uses magnesium in the desulphurization process, the titanium industry, which uses it for making sponge products, and the aluminium industry, which uses it as alloy component, have experienced a recovery during 2016. This trend has supported both demand and prices, helping magnesium producers offset higher prices for energy and ferrosilicon.

The GOC strongly promotes the development and production of light weight materials for application in large aircraft, passenger vehicles, high speed trains, ships, ocean engineering and other high end equipment manufacturing.

More specifically, the GOC called for large size, complex casting parts from high-strength magnesium alloy for use in aviation and aerospace applications; large-size extrusion profiles and forgings of high-strength heat-resistant magnesium alloy; 3C products with magnesium alloy precision die casting; large volume, low cost high ductility magnesium alloy strip; and precision die casting of magnesium alloys for lightweight components used in automobiles. The latter is particularly emphasized as the GOC plans to support aluminium-magnesium alloy die casting. It aims to expand the application of magnesium alloy in transportation equipment to 150,000 tons until 2020.

Since 2014, China's exports of magnesium and products have declined by 20% to about 350,000 tons in 2016. Over the same timeframe, export revenues have even dropped by a third. Estimates based on incomplete data for the year 2016 indicate particularly strong reductions in export volumes compared to 2015 of magnesium powder and raw magnesium by 23% and 15%, respectively. Shipments of magnesium alloys have likely declined by 5.5% to 105,000 tons. The relatively strong drop is mainly caused by market conditions, particularly strong domestic demand in high tech industries. Chinese exports of magnesium and products thereof almost exclusively consist of raw or semi-processed metal. Only a tiny fraction of 2-3% is accounted for by finished products.

For the same reason, imports have expanded in recent years, albeit on a much lower level than exports. In 2016, China imported roughly 1,500 tons of magnesium, made up mostly by

wastes and scraps (>50%) as well as raw magnesium and its magnesium alloys, which together make up another third.

6.5 Nickel

Mine output of nickel inside China is very limited. Based on data of the U.S. Geological Survey, the country's deposits are ranked ninth in the world – far behind the principal mining countries of Indonesia and the Philippines. Proven Chinese nickel deposits account for barely 4% of the world's total.

China's domestic nickel ore production is very small and has declined in 2015. Traditionally, China is highly dependent on imports which have accounted for more than 80% of 2016 demand. Based largely on raw material imports, the Chinese nickel production has expanded rapidly over the past two decades.

In order to raise national supply security, the GOC supports extensive exploration efforts for new nickel reserves. The 13th FYP for the NFM industry calls for intensifying prospecting activities in the provinces of Gansu, Xinjiang, Yunnan, Qinghai and Inner Mongolia. The plan strongly encourages the exploration and development of additional nickel deposits. Until 2020, more than 800 thousand tons of new reserves of nickel ore are to be developed.

The nickel industry stands out from the other six metals reviewed in this study as the GOC did not formulate any specific development framework. That being said, the nickel sector is still subject to heavy state intervention through its exposure to the steel policy in China and mining policies in Indonesia and the Philippines, the two main supply sources of nickel.

Electrolytic nickel

Between 2010 and 2015, production of electrolytic increased from 159 thousand tons to 232 thousand tons – an average annual increase of 7.8%. During the first 11 months of 2016, electrolytic nickel production reached 158 thousand tons, a decline of 17% compared to the same period one year earlier. In 2017, output is expected to drop further, albeit at a slower pace of 3% to 160 thousand tons.

Due to limited supplies of raw materials, the output of electrolytic nickel is declining. By the time of writing, only five companies are engaged in the production of electrolytic nickel, the largest of which is the Jinchuan Group, located in Gansu Province. The company obtains half of its raw materials from own mining operations and purchases the remaining half from the market. The Jinchuan Group's self introduction indicates close government ties:

"Jinchuan Group was founded in 1958 and is a state-owned enterprise with its majority interest held by the People's Government of Gansu Province. Jinchuan Group is a large-scale non-ferrous mining conglomerate, specialising in mining, concentrating, metallurgy, chemical engineering and further downstream pro-

cessing. With the world's third largest mine of nickel sulphides associated with cobalt sulphides, Jinchuan Group is the fourth largest nickel producer and second largest cobalt producer in the world, the largest producer of nickel, cobalt and platinum group metals in the PRC and the third largest copper producer in the PRC" (Jinchuan Group 2014 Annual Report at 4).

"The Group itself is part of a larger group of companies under JCG, a state-owned enterprise with its majority interest held by the People's Government of Gansu Province, which is controlled by the government of the PRC and the Group operates in an economic environment currently predominated by entities controlled, jointly controlled or significantly influenced by the PRC government" (Jinchuan Group 2014 Annual Report at 167).

Two other players, Jilin Ji'En Nickel and Xinxin Mining also operate captive mines while Yantai Kaishi and Guangxi Silver completely depend on market purchases.

Affected by tight raw material supplies and depressed price levels, Jinchuan Group targeted a production volume of 140-145 thousand tons in 2016, down 12 thousand tons from 2015, while the other four enterprises announced stable output targets. Due to the market situation, several companies that have halted their plants, including Sichuan Nike, Huaze Cobalt & Nickel, Yuanjiang Nickel, Zhejiang Jialike and Zhejiang Gaibo, show no signs of resuming operation.

Nickel pig iron

Nickel pig iron (NPI) is a low grade ferronickel invented in China as a cheaper alternative to pure nickel and commonly used for the production of stainless steel. The production process of NPI utilizes laterite nickel ores instead of pure nickel sold on the world market. Most of China's NPI production is based in the provinces of Jiangsu, Fujian, Shandong, Guangdong, Inner Mongolia and Liaoning. Supplies of imported laterite ores have been tight since Indonesia imposed an export ban on the material in 2014 and the Philippines cut output due to environmental concerns in 2016. NPI production has come under pressure from strict environmental protection regulation in China. Rising costs for coke, transportation and labour have further complicated the operating environment. As a consequence of production halts and market exits, industry concentration in the NPI sector has increased. The number of active producers has dropped to about 40, down from over 200 a few years ago. In spite of the challenging operating environment, several large-scale plants have succeeded to turn a profit in 2016; examples include Inner Mongolia Shangtai and Jiangsu Delong. These companies have also begun to expand capacities and plan further growth in coming years. The concentration in the NPI sector thus stands to rise further.

Three quarters of China's NPI output consists of high nickel pig iron. Due to increasingly stringent environmental protection regulation, the production of low nickel pig iron is expected to decline. From January to November 2016, China's domestic NPI production reached 338 thousand tons. Output has exceeded forecasts due to better profitability during the year. During 2017, production is likely to remain stable at about 350 thousand tons.

Following the imposition of Indonesia's export ban on unprocessed nickel ores, Chinese enterprises have invested heavily to establish NPI production plants in the Southeast Asian country. Since mid 2016, these projects are gradually put into operation. In 2016, China imported more than 70 thousand tons of NPI from Indonesia and quantities are expected to increase as more plants come on stream. The strong growth in 2016 shipments is due mainly due to exports from plants operated by the Qingshan Group and Dongfang Zhenshi. The Qingshan plant is operating 12 furnaces and plans the launch of another eight later in 2017. Dongfang Zhenshi has installed a set of furnaces as well. Jiangsu Delong constructed 15 furnaces that are scheduled to enter production in 2017. In addition, new projects initiated by Xinhualian and Xinxing Ductile Pipes are expected to launch production in the same year. By the 2017, Chinese invested NPI plants could have installed 250 thousand tons of NPI output capacity.

Other nickel products

In 2016 tonimet nickel production stood at about 20 thousand tons, roughly flat with the previous year, and is expected to remain stable in 2017. Production of nickel salt has been buoyed by demand from new energy vehicles manufacturing. Production of nickel sulfate reached 28 thousand tons in 2016 and will continue to rise in 2017.

Consumption

China is the world's leading consumer of nickel. In 2016, the country used 1.04 million tons, accounting for 52% of the global total. In 2017, Chinese consumption is set to increase by 2.9% to 1.07 million tons.

The production of stainless steel represents the dominant use for nickel in China (84%). This proportion is significantly higher than the international average (64%). Another 6% of Chinese nickel demand are used for plating, 5% for alloys and casting, and just 4% for battery manufacturing. While demand from the latter is still very small, nickel consumption is set to rise strongly due to expected upgrades in battery technology. The GOC targets the development of specific nickel materials to support the renewable energy industry, such as layered high nickel cathode material for high capacity and long cycle life lithium ion batteries as well as nickel-based high temperature and corrosion resistant alloys and carbonyl nickel.

The consumption of nickel has increased strongly in 2016, as Chinese stainless steel production expanded by 15.7% to 24.9 million tons. Because output in the rest of the world grew by only 4.3%, China's share of world production has reached 54.5%. The surge in output comes on the back of strong infrastructure spending by the GOC and robust real estate construction. Statistics indicate that much of China's fixed asset investment has been organized by the GOC and its SOEs, both of which have displayed higher investment growth than the private sector.

Nickel demand from the steel industry has also been boosted as a large proportion of 200 series stainless steel being replaced by the more durable 300 series products. Production of the latter registered 12.7 million tons, up 13.2%, and accounted for 51% of the total. Output of 400 series grade steel reached 4.8 million tons, an increase of 22.1%, and represented 19% of production.

Stainless steel output was driven by new production plants that have come on stream at Jiangsu Delong and Inner Mongolia Shangtai which added capacities worth 2 million tons and 1 million tons, respectively. In 2017, another wave of new production facilities may be put into operation by Shandong Xinhai Stainless (2 million tons) and Shandong Shengyang (1.6 million tons).

In order to obtain the required quantities of nickel, steel smelters have been blending higher-content concentrates and even refined metal into their ore mix. The use of primary metal for the production of stainless steel is relatively new but supported by the better availability of supplies.

In addition to establishing new stainless steel smelting projects inside China, enterprises are increasingly developing plants in proximity to nickel suppliers: in Indonesia and the Philippines. In 2016, Qingshan Indonesia, a stainless steel plant with an annual capacity of 1 million tons, has already entered trial production. In a second project phase, the Chinese company is building a new plant to double existing capacity.

These overseas investment projects are in line with the GOC's Maritime Silk Road Strategy which aims to expand resource and infrastructure development along ancient trading routes. At the same time, the Qingshan plant and similar projects conform to the GOC's objective to boost international capacity cooperation, i.e. the transfer of production activities overseas for industries beset by overcapacities inside China. Both initiatives are integral parts of Chinese economic policy during the 13th FYP period (2016-2020). As a result, enterprises establishing NPI processing or nickel smelting plants in Indonesia or Myanmar can

enjoy a wide spectrum of support measures. This includes bank loans on preferential terms, tax breaks, services from the China Export Credit Insurance at no or reduced cost as well as outright financial support.

The Chinese steel industry, as the principle downstream consumer of nickel, has grown at an exponential rate since the 1990s. Thanks to state direction and subsidization, its capacity build up is unparalleled. As steel, including stainless steel, is regarded as a key ingredient of economic development, the industry has been treated as a pillar of the national economy. Like in other resource sectors, the GOC has emphasized large scale technology upgrading and an ambitious shift towards higher value added products. In line with this strategic industry policy, the stainless steel segment has been prioritized. Several anti-dumping and countervailing duty investigations, for example against stainless cold rolled sheet in the EU, have illustrated that subsidization is widely employed as a tool to implement industrial policy objectives and cultivate national champions.

State influence is manifested in the 5.3% average annual rate of output growth, which the stainless steel industry has displayed between 1980 and 2015 or the doubling of production volumes between 2010 and 2016. State intervention is also a key factor behind the quadrupling of China's output share in stainless steel: from 13% in 2005 to 52% in 2015.

Over the same timeframe, the corresponding proportion EU production has halved: from 34% in 2005 to just 17% in 2015.

The state-induced rapid growth of the Chinese steel industry has been instrumental to the corresponding development of the Chinese nickel industry.

Foreign trade

China imports large quantities of nickel ores and concentrates: 31.9 million tons in 2016. Import volumes have declined for three consecutive years as the two main exporting countries have curbed outflows.

China relies on the world market for over 80% of its nickel ores and also accounts for almost 90% of global imports. Inflows began to skyrocket in 2007 and rose from 4 million tons to a peak of 71 million tons in 2013. Chinese importers purchased low quality nickel ores from Indonesia and the Philippines that was then processed into NPI. At its peak in 2013, Chinese NPI production stood at 500 thousand tons, up from 2.5 thousand tons in 2006. In 2013, China's entire supply of nickel ores depended on these two Southeast Asian supplier countries.

In early 2014, the Indonesian government imposed a general export ban on unprocessed nickel ores, effectively terminating China's supply from that country. The Indonesian gov-

ernment had intended to support local business to move down the value chain from mining to processing and refining. The plan was to encourage the formation of several home-grown nickels smelters with preferential access to local ores.

Because the measure had been announced ahead of time, Chinese smelters and traders had been able to react and create huge stockpiles of Indonesian ores. By year end 2013, stocks in Chinese port warehouses had reached the staggering amount of 24 million tons.

As a result of the export ban, Chinese nickel ore imports dropped at an annual average rate of 23% between 2014 and 2016. Shipments from the Philippines rose to 36 million tons in 2014, but not enough to fill the gap left by Indonesia. Moreover, the Philippines proved to be a poor supply alternative, as supply lines were frequently disrupted by weather conditions and, more recently, government actions against environmental destruction. About half of local nickel mining capacities were forced to shut down at least temporarily while the situation was assessed by government investigators. Environmental protection authorities were still confronting miners by the time of writing and the number of smelters shut by government order varied.

Chinese imports of nickel ore from the Philippines had decreased in 2015 and 2016 by 6% and 11%, respectively. Although China still buys 95% of its nickel ore from the Southeast Asian nation, the disruptions in Philippine nickel ore have not reduced the Chinese nickel supply as much as initially expected. This is because China has scaled back imports of nickel ores and increased the amount it buys in more refined form. Neighbouring Myanmar has emerged as a new supplier of nickel resources with rising shipments to China. A new plant constructed with investment from Shanxi Taigang, China's leading manufacturer of stainless steel, has facilitated this increase. Furthermore, imports of ferronickel increased by 60% in 2016, with most materials originating in Indonesia.

There appears to be no deficit of refined nickel as high inventories at the Shanghai Futures Exchange illustrate. In mid-March 2017, nickel stocks at the SHFE stood at about 81 thousand tons, less than the 111 thousand tons recorded in August 2016 but up from 44 thousand tons in early January.

In early 2017, the Indonesian government has relaxed the three year old export ban. New rules allow exports under certain conditions. Nickel miners have to dedicate a minimum of 30% of their smelter capacity to the processing of low grade ores (nickel content of less than 1.7%) but can export remaining materials. In other words, all low grade nickel ore that cannot be absorbed by smelters in the year it is mined, may be sold abroad. For Chinese enterprises which have invested an estimated total of USD 15 billion in the country, this comes as

a disappointment. However, the current solution only allows for the exportation of low grade ores (the type used to make NPI) while materials with higher metal content remain the preserve of local processing business.

The move appears reasonable as Indonesian plans for cultivating a local processing industry have failed to meet expectations. In 2014, the initial year of the export ban, nickel ore output dropped by 77%. The attempt to push local companies down the value and attract overseas capital for developing a modern smelting sector has had mixed results.

In 2017, China has introduced a 15% export duty on nickel ores and concentrates. Considering the current market situation, it is unlikely that this move will bring about any change in export flows. Nickel exports have been extremely low during the five years before the introduction of the duty. The high expected downstream demand in China is certain to provide sufficient incentives to keep materials tied in the domestic market.

6.6 Tin

China is the world leader in tin mining and processing. Taken together, China and Indonesia share more than half of global tin reserves and each account for roughly a third of worldwide mining output. In smelting, refining and processing, however, China is unchallenged. Tin ore is mined in open pit and underground mining operations located in the six regions of Yunnan, Guangxi, Hunan, Inner Mongolia, Guangdong and Jiangxi. These areas also host the country's (and the world's) largest smelting and processing centres.

China is the world's principal user of refined tin and has held this position for at least the past ten years. Consumption of the metal has been propelled by downstream users in the electronics industry (solder products) and the steel industry (sheet coating). Impulses came also from the burgeoning battery manufacturing sector that uses tin in lead acid batteries. Following more than a decade of breakneck growth, the expansion of downstream demand has now slowed.

In the steel industry, the rapid production expansion in sheet coating operations has led to overcapacities and oversupply. Similarly, the market of lead acid batteries has slipped into a supply glut as increasing output capacities are confronted by a trend towards more advanced battery chemistries. However, new tin applications have emerged in lithium ion (tin nano-needles, silicon/tin anodes, and tin electrolyte), magnesium ion (tin alloy anodes), sodium ion (tin sulphide/carbon anodes) batteries.

Furthermore, tin is gradually being replaced by other materials in the food packaging (canning) industry. Even in solder production, the main application of tin, demand growth has slowed as new production techniques have cut unit consumption. Output growth in the photovoltaics segment (copper-zinc-tin sulphide (CZTS), tin perovskite) has also come down. This brief overview of changing demand structures is not to suggest a major drop in future tin demand but rather points to stagnation on the current, high, level.

Industry structure and industrial policy

The tin smelting sector is highly concentrated, with the world's top 10 enterprises accounting for 70% of output. China, the leading producing country, naturally mirrors this pattern. Yunnan Tin, owned and controlled by the SASAC of Yunnan Province, is the dominant player in the Chinese tin sector. Founded in 1883 in Gejiu City (close to the border with Vietnam), the company is recognized as one of ten priority enterprises by the provincial authorities. According to its own account, Yunnan Tin is

“the largest production and manufacturing base in the world for metal Tin and the largest production center for tin profiles, tin chemicals and arsenic chemicals in China” (Yunnan Tin official website).

Since the foundation of the People’s Republic, substantial state investments have expanded mining, dressing and smelting operations. Today, the company is a large scale, diversified SOE that operates along the whole length of the tin value chain. Yunnan tin covers an area of 200 square kilometres and has 30,000 active staff, including 64 experts receiving financial allowances directly from the State Council.

The company has the capacity to produce an annual 40,000 tons of organic tin, 40,000 tons of tin profiles and tin chemicals, as well as 2,000 tons of arsenic chemicals. Main products include refined tin, tin-lead solder, tin profiles and tin chemicals.

As Yunnan Tin has high relevance for both the local economy and the Chinese tin industry, it has been tightly regulated by the GOC and the CPC. In recent years, the enterprise has been commended for the “Excellent Establishment of National Ideological and Political Work”, awarded the “National May 1st Labour Merit Certificate”, and labelled “National Advanced Grass-roots Party Organization”.

The remote region where Yunnan Tin is based is also home to a range of other leading tin refining and processing enterprises, such as Gejiu City Independent Mining and Metallurgy Co., Ltd., Honghe Kaimeng Industry and Trade Co., Ltd., Gejiu City Yunxin Nonferrous Electrolysis Co., Ltd. and Yunnan Gejiu Metallurgical and Mining Co., Ltd.. Yunnan Chengfeng Nonferrous Metals Co., Ltd. is located in the provincial capital of Kunming. In its 13th FYP for the NFM industry, the GOC targets the accelerated expansion of existing tin mines in Yunnan Province as key development projects. According to the plan, the amount of proven domestic tin deposits is to increase by 700,000 tons until 2020.

Other major Chinese players include Nankang City Nanshan Tin Industry Co., Ltd. (Jiangxi Province), Ma’anshan City Weitai Tin Co., Ltd. (Anhui Province) and Guangxi Huaxi Group Co., Ltd. (Guangxi Province).

These nine enterprises, many of them SOEs, form the backbone of the Chinese tin sector and coordinate their operations. This has become visible in early 2016, when all nine formed a cartel and agreed to cutting output of refined tin by 17,000 tons and to taking other concerted measures to support prices and restore profitability. The GOC did not stop the creation of his cartel or took any regulatory action against its market-competition undermining

behaviour. At the same time, the group has also appealed to the State Resource Bureau to create a tin stockpile and drain materials from the market. Unfortunately, little information is available on the operations of the State Resource Bureau, so THINK!DESK was not able to ascertain if stockpiles had been formed or increased. However, in spring 2016, tin prices started to recover in line with a broad rebound across resource sectors.

The GOC is directing tin enterprises to strengthen their innovation capabilities and R&D activities. The 13th FYP for the NFM emphasized high-quality tin-based alloy solder powder and paste, tin chemical products and large size indium tin oxide target. The catalogues of encouraged technologies in the context of the Made in China 2025 strategy and the Strategic Emerging Industry initiative also urge technology upgrading and R&D on high end products.

As in other resource based industries, the GOC has intervened to achieve or defend industry concentration. While the smelting and refining of tin has been firmly controlled by a small group of companies, the situation was different in the mining sector. According to estimates from the International Tin Research Institute, unreported mine output accounted for half of primary tin production as late as 2006. Since then, the proportion has steadily declined as unlicensed players were squeezed out of the market.

The policy tools employed to regulate development in the tin industry largely match those directing other sectors. In 2006, the GOC released the Tin Industry Access Conditions that largely mirrored similar provisions imposed for the copper industry. The Conditions represent a catalogue of mandatory performance requirements that new and existing companies had to conform to. Following inspections of leading enterprises based on the specified criteria, the GOC released a “white list” of approved tin producers. In 2015, the Tin Industry Standards replaced the previous set of operating requirements. The updated version has substantially expanded the number and scope of performance benchmarks. It has also significantly tightened rules on environmental protection, energy conservation, product quality and approved technologies.

Foreign trade

The GOC has employed trade policy instruments in order to ensure an adequate supply of tin ores and refined metal inside the country. Based on figures from the International Tin Research Institute, Chinese imports of tin concentrate have increased since the global financial crisis to levels of 25,000-30,000 tons per year in 2014-2016. Imports of tin ores from South-east Asia have increased. Particularly shipments from neighbouring Myanmar have risen in recent years. At the same time, Chinese miners have acquired mining interests in that country as well as in Indonesia and Malaysia. This is in line with the 13th FYP for the NFM industry which promotes tin development projects in resource-rich countries.

Until 2007, China had been a net exporter of refined tin but became a net importer in the following year due to the introduction of export duties. As in other metals reviewed for this study, the outward shipment of raw materials was complicated by administrative procedures and fiscal barriers. On the side of finished products, the reverse is true. Yunnan Tin and its peers have benefitted from VAT rebate on product exports and taken advantage of several other export promotion instruments. Yunnan Tin, for example has been exempted from export inspection by customs authorities. As outlined in the section on export constraints, the tin sector has been subject to export licensing and quotas which were administered in a discretionary manner to support industrial policy objectives.

6.7 Tungsten

Tungsten has been designated a critical raw material by the European Union and the German Mineral Resources Agency. It belongs to the large and growing group of materials where production is concentrated inside the People's Republic of China. The country, by a large margin, dominates global mining and processing of the metal and also represents its largest consumer. In 2016, Chinese companies produced an estimated 71,000 tons of tungsten (by metal content) or about 80 percent of global output even though the country is home to only half of global tungsten deposits. China is responsible for an equally large proportion of ammonium paratungstate (APT) output, a key intermediary processing product.

While prospecting has continued to increase the amount of proven Chinese tungsten deposits, this has not compensated a drop in minable reserves. But China's resource advantage from domestic tungsten may only wane in the distant future. Some segments, however, are going to face depletion sooner, such as black tungsten ores.

Like elsewhere in the world, the industrial application of tungsten in China is dominated by the manufacture of carbides, which takes up about half of available material. However, the structure of downstream usage is different from other countries because a substantial part of the metal is consumed in the production of special steels, alloys and super alloys.

Driven by rapid industrialization and urbanization, Chinese tungsten demand has by far eclipsed that of other individual countries and currently covers roughly one half of the world total (the remainder is split in decreasing order of magnitude between the EU, the U.S. and Japan). In recent years, Chinese consumption increases have accelerated due to the substantial upgrading of the Chinese manufacturing sector.

With very limited mining output (less than 5% of world production) and only relatively small APT processing capacities, the EU is highly dependent on Chinese imports. As such, European enterprises have to cover about half their tungsten demand from recycled wastes. Owing to the combination of these factors, the trade relationship with China and market dynamics inside the country are of critical concern for European industry.

Chinese tungsten mining is concentrated in the more or less remote hinterland regions of Gansu, Hunan, Inner Mongolia and Jiangxi. Different from open pit mining that dominates in other parts of the world, Chinese tungsten ore is largely produced from underground mining. Numerous enterprises are active in the sector and mining locations are heavily dominated by the tungsten industry. In 2015, the last year for which statistics are available, the average annual tungsten ore output of the 134 tungsten miners registered in the China Tungsten

Industry Association (CTIA) stood at less than 500 tons while only 19 companies crossed 1000 ton threshold. While practically all larger miners are state-owned, there exists an abundance of small private players.

The latter, due to resource constraints, employ very basic mining technologies that pollute the environment and risk workers' lives. Lacking technology and capital, these players have been unable to diversify downstream into the processing of tungsten ore into APT or tungsten oxide (TO). Primitive mining techniques have also resulted in a relatively wasteful or inefficient way of extracting tungsten from the surrounding material. Much of the mining activity undertaken by small private enterprises is illegal in that it does not meet the GOC's operating standards and takes place without proper certification and licensing.

The larger mines are controlled by SOEs which employ far superior mining technology and have diversified downstream to capture substantial parts of the value chain – in some cases even including the manufacturing of final products, such as tools. Favourable access to capital, technology and skilled workers, combined with (and enhanced by) close ties to local authorities have allowed the formation of advanced mining and processing bases that exist alongside a wealth of illegal operations. Much of the ore output is refined into APT and TO before being transported to coastal regions for further processing. The leading tungsten producer is the China Minmetals Group, a state-owned enterprise controlled by the SASAC of the State Council. The mining and metals conglomerate is highly integrated and commands a substantial resource advantage over its national and international competitors.

For years, the GOC has tried to crack down on small scale backward mining, seeking to shutter illegal operations. But with success mixed at best, the sprawling tungsten mining sector continues to be suffering from high fragmentation and low utilization. Profitability is low and development prospects dim for players limited to mining. As a consequence, inputs for the production of APT and TO are plentiful and cheap.

The GOC imposes strict limitations on the TO production and administers a quota system that serves a gate keeper function and prevents a supply glut on downstream processing stages. On an annual basis, the Ministry of Land and Resources (MLR) issues production quotas to major mining provinces and regions. The latter are then tasked to assign quotas to localities and/or individual companies. These quotas cap the national output and specify the amount of TO to be produced from primary mining and the comprehensive utilization of resources (e.g. the processing of tailings).

With the exception of a handful of leading players, the Chinese tungsten industry suffers from a technology gap vis à vis its international peers. Innovative capabilities are weak, the

technology content and added value of products remain modest and the vast majority of enterprises are limited to the less profitable medium to lower segments of the tungsten value chain. Relatively low corporate R&D investment, older processing techniques and equipment reflect negatively on product quality and grades which in turn affects competitive positioning, profitability and overall development prospects. With only limited basic research and limited grasp of core technologies, Chinese suppliers struggle to meet the demand of advanced downstream industries which in some high tech fields still rely on imports.

Pronounced over-investment and low level redundant construction have caused the formation of overcapacities almost throughout the entire Chinese tungsten value chain. Since the early 2000s, the GOC and the CTIA have tried and failed to reign in blind investment and flush out obsolete equipment. By the end of 2015, the latest time for which statistics are available, the production capacities have been enormous while their utilization was more or less dismal (see table 13):

Table 14 Production capacities and utilization ratios of intermediate tungsten products

	Production capacity	Utilization ratio
APT	208,000 tons	38.9%
Tungsten powder	76,200 tons	49.5%
Hard alloys	43,100 tons	61.5%
Tungsten filament	35 bn meters*	39.1%

* This equals about 372 bn conventional household light bulbs.

Source: China Tungsten Industry Association 2017.

In spite of heavy GOC intervention, the Chinese tungsten industry has expanded into a sprawl of hundreds of enterprises – few of them with genuine competitive advantages, proprietary technology or positive net incomes – that places high pressure on the environment and yields little in the way of sustainable development. A Chinese industry expert consulted for this study characterized the vast majority of players as “many, dispersed, small and weak” and found only minor improvements over the past five years. Fragmentation is pronounced even in the higher added value segments, like hard alloys. In 2015, only 4 of the 50 producers registered at the CTIA manufactured more 1,000 tons (together accounting for 51% of national output).

Planning directives

In light of these structural problems, the 13th FYP (2016-2020) for the tungsten industry emphasizes innovation and technology, green production and strict capacity controls. While addressing these issues may seem more urgent than before, the current FYP for the sector closely tracks previous documents for the 11th and 12th planning periods. The plan announced structural adjustment and upgrading which is envisioned to guide the tungsten industry “from large to strong”. But it introduces few genuinely new instruments to confront the well-entrenched problems. On the background of rising prices and strengthening demand, however, the available resources for technology improvements may increase.

The plan forecasts global tungsten demand to grow by an average of 4% per year to 103,000 tons in 2020. At that time, China is predicted to consume 55,500 tons of total output (a 6% average annual increase from 2015) while the rest of the world is expected to account for 47,500 tons, growing at a slower pace of only 2% per year. The 13th FYP calls for strengthening the international competitiveness and demands a shift in the composition of exports towards higher added value and technology intensive goods.

Until 2020, the Chinese tungsten industry is to improve its sales revenues and profits. Additional funds should be invested in corporate R&D: enterprises are urged to spend at least 1.5% of their revenues for R&D; those engaged in the production of hard alloys even 4%. These resources should contribute to the successful development of high added value end products. Based on proprietary technology and strong brands, these products are to form the new backbone of China’s reinforced international competitiveness in tungsten. For producers of hard alloys, the sale of new products is to account for 35% of total revenues.

At the same time, the plan calls for redoubling efforts at energy and water conservation (until 2020, the overall energy and water consumption per RMB 10,000 (1,440 Euro) in added value should drop by 5% and 10% respectively, compared to 2015 levels) and comprehensive resource utilization (through increased processing efficiency, less waste and more utilization of tailings and low grade ore). A focus is put on the exploitation of white tungsten and low grade ores in order to tap into new resources and delay the depletion of some state-owned mining operations. Pollution prevention and clean up are important topics as well: the discharge of major pollutants is to be cut by 10% per unit of added value. Filtration and treatment equipment as well as monitoring systems are to be installed in order to improve green performance.

The 13th FYP stipulates that by 2020, the annual output of hard alloys should reach at least 33,000 tons and generate more than RMB 36 billion (5.2 bn Euro) in revenues. About one third of the hard alloy production is to be exported. At the same time, the output capacity

for making high end machine tool blades from hard alloys should expand to 400 million units and manufacturers should accomplish sales in excess of 300 million units. Similarly, the output of complete cutting tools made of hard alloys is to reach 130 million units and sales of such products should be no less than 100 million units. By 2020, the production of PCB bits and hard alloy bars is targeted at 800 million units and 8,000 tons, respectively.

Foreign trade

In the first 10 months of 2016, tungsten product exports grew by 13.7% year on year to reach about 18,000 tons of tungsten products (tungsten metal content). Over the same timeframe, the country imported 2,647 tons which represents an 11.1% decline over the same period of 2015.

Export restrictions were implemented in reaction to large outflows of tungsten concentrate and APT in the 1980s and 1990s. Concerned about the drain of resources, which had to be produced at significant environmental cost, and, due to the global supply glut, only fetched relatively low prices on the world market, the GOC put up a variety of trade barriers. The latter succeeded in cutting outflows but adversely affected overseas tungsten consumers due to reduced supply and higher prices. World market supply was particularly tight as the abundance of cheap tungsten from China in previous years had led to the closure of production sites elsewhere.

Since 1995, export barriers have more or less stopped the exportation of Chinese tungsten ore and concentrates. A variety of instruments (see section on export restrictions) have been employed in order to curb outflows of semi-processed products. In order to upgrade the composition of China's tungsten export structure, the GOC adjusted the VAT export rebate system to discourage exports of intermediate materials and promote the exportation of higher value added goods products. In 2012/2013, existing VAT rebates for tungsten chemicals and powders were cancelled and new rebates for semi-finished and final goods were introduced. The stated aim of the GOC and the CTIA is to transform the country from a supplier of basic commodities into a provider of high end finished products.

While the GOC has bowed to the WTO ruling that called for the removal of export quotas, it has so far not relinquished its export licensing system. Companies have to submit applications to obtain export licenses that are granted on an annual basis. The prerequisites of the licensing as well as underlying procedures are vague, leaving significant discretion to political decision makers.

In addition, Chinese companies have become active importers of secondary tungsten from the EU and other countries that heavily rely on recycled materials to cover much of their

industrial needs. This phenomenon drains already tight supplies outside China and further disrupts input markets. The GOC actively encouraged these secondary tungsten imports through preferential tax treatments exacerbating supplies stress outside its borders. All things considered, the GOC undertakes a major effort to control and direct the supply of tungsten both inside and outside China. This systematic intervention is based on industrial policy priorities and leaves little room for market forces.

As a result, China's resource-based dominance in tungsten production gets amplified into a quasi-monopolistic market position. This is manifested in a more or less constant 20% price differential between APT Europe traded inside and outside the country. While both benchmark prices generally move in sync, Chinese players can benefit from a significant cost advantages.

The China Tungsten Industry Association

The Association is registered as a non-government organization and serves as a communication channel between the state and member enterprises. A comprehensive document review has revealed that the CTIA is actively involved in formulating and implementing industrial policy for the tungsten industry. This does not necessarily violate its mission as representative of industry interest since its membership is dominated by SOEs which themselves are subjected to intense GOC direction and support. The majority of companies active along the tungsten value chain in China, and especially the private ones, are not members and thus receive neither services nor representation from the CTIA.

In fact, the Association appears to actively support the GOC objective of streamlining the industry structure around a core of large SOEs. Its statements suggest nothing less.

"Only by uniting the backbone enterprises, we can form a core leadership force for the industry. [...] we have to continue to strengthen self-discipline in the industry, harmonize behaviour and create a fair, orderly, standardized and transparent industry environment in line with national industrial policy and relevant requirements" (speech of CTIA chairman Chen Quanxun, 04.02.2017).

"We have to encourage and support backbone enterprises with competitive advantages to use capital as a driving force [...] to carry out M&A across regions and ownership types, form a reasonable industry layout with specialized development clusters, increase industry and resource concentration, and raise international competitiveness" (id).

In early 2017, the China Tungsten Industry Association released the 13th FYP for the sector. This is remarkable as the publication of such an authoritative document is normally handled by the MIIT or the NDRC. Indeed, it appears that the CTIA is playing a momentous role in regulating the Chinese tungsten industry in support or on behalf of the GOC.

A work report given at the 5th CTIA board of directors meeting in early February 2017 outlines a series of regional industry meetings held in the previous year. The gatherings of executives were organized by the organization and took place in various locations across the country with the expressed purpose to coordinate and harmonize corporate strategies. An industry expert consulted for this report has confirmed that the meetings were intended as platforms to agree on prices and quantities for main products. This is all the more relevant as the board of directors is staffed with the executives of the leading tungsten producers, all SOEs.

The Association has been instrumental in collecting and compiling information for the MLR and various other departments. It has actively participated in the drafting of five-year plans and industrial guidance regulation. By its own account it has consistently collaborated in the implementation of policy directives of the party and the state. In order to maximize industry supervision and policy enforcement, the CTIA has made full use of its networking, coordinating and guidance functions. While not officially ranked a government department, the Association's mission is closely intertwined with the policy process. Its coordinating function serves both GOC departments in charge of sectoral planning as well as large SOEs seeking to grow into national champions. Interests and incentives of the two actor groups (if they can be called separate at all) are in close alignment.

However, the apparent disorder in the current industrial layout speaks of a pronounced implementation deficit with regard to industrial policy guidance. The CTIA has so far not proven very effective in remedying the various structural deficiencies crippling the tungsten industry which were outlined earlier. The reason for that is that the CTIA does not work effectively outside the scope of its membership. Information collection and policy implementation serve members' interests and are limited to that group. The same can be said for enforcement mechanisms targeting overcapacity elimination, low level redundant construction or widespread deficits in environmental protection and worker safety. Control and regulation of China's many (semi)-private players remains highly deficient and ineffective. Macroeconomic balancing initiatives and industrial policy initiatives appear to have little impact on them, resulting in a rather anarchic constellation in certain market segments.

7 CONCLUDING REMARKS

The European non-ferrous metals industry is paying close attention to developments in China. Not only is China the world-wide largest supplier of non-ferrous products located at the early stages of the value chain, but it is quickly moving up the processing ladder and stands close to challenge also the most advanced producers of non-ferrous metals products in Europe. This rising challenge from Chinese players is aggravated by the fact that to outside observers the Chinese market appears to be a black box in which firms and government agencies are colluding to promote the “Chinese cause”. The true strength of Chinese firms, their real capacity to compete in a fair “level playing field” is hard to evaluate. This turns the organization of business transactions as well as long-term strategic planning by European firms into a difficult exercise burdened with substantial uncertainties and risks.

The study presented here has been designed to explore these patterns of state-business interaction in the Chinese non-ferrous metals industry and determine the degree to which market forces are being distorted by government interventions. A comprehensive analysis of Chinese documents as well as a series of in-depth interviews with industry experts have shed light on the highly intransparent structures of this industry and its – de facto – seriously distorted market structures. The resulting picture is one of a strong, interventionist government seeking to cultivate and mold the non-ferrous metals industry as a crucial element of China’s industrial development objectives.

What becomes obvious is that state-ownership of the dominating firms; state-directed industry associations; board members co-opted in company, government and party functions; explicit state planning; massive subsidy disbursements as well as a comprehensive state management of all cross-border transactions are all common features of the Chinese non-ferrous metals industry. As a matter of fact, its organization and operations rely more on an interventionist state planning system than on competitive markets.

Until the present, development plans and statements by political leaders have consistently defined the principal task for the domestic non-ferrous metals sector (and any other) as ensuring supply safety on the home market in order to support national economic development policy and downstream industries (especially high tech manufacturing designated to form the country’s future economic backbone). Furthermore, the GOC is pursuing an industrial policy that aims to cultivate a group of powerful core enterprises, i.e. large enterprises with strong control over the industry-specific value chain and superior capabilities in technology, output and branding. The performance of these players is no longer measured against domestic industry benchmarks but geared towards the global market and the leading

edge of international technology. As this study shows, administrative and financial support is increasingly focused on grooming national champions to become global leaders across all product segments (especially strategic ones) to realize the vision of a strong manufacturing country.

But at the same time, the Chinese economy as a whole and the non-ferrous metals sector in particular are ridden by massive overcapacities. These overcapacities are born out of various reasons. (i) They are the result of lacking macro-economic coordination, where central policies are being blindly (and very egoistically) copied by local governments without regard of the larger context while central government regulators are unable to rein in overshooting national investment. (ii) They are also caused by corporate cost calculations that do not (fully) take into account the greater picture of price developments – and ensuing profitability effects – caused by additional supply in a given (domestic and/or global) market. As this study has been able to document, many Chinese players in the non-ferrous metals industry actually don't have to look at the profit-contribution of additional investment – what counts is the alignment with governmental (“national”) strategic goals. Losses or weak profitability holes can be filled with subsidies or windfall profits generated through market distortions created by government agencies to further their vision of a strong China.

These mechanisms have fuelled a massive build-up of production facilities in China during recent years and decades. China's industry overcapacities come in two types: (a) local production capacities capable of supplying all of the local market plus featuring an additional residual production capacity pushing on the global markets. Global markets, which, however, had already been in a supply/demand balance and have no need for further supply (e.g. existing in the aluminium, lead and tungsten industries); (b) capacity additions to a global supply/demand system that had been balanced out, but where China was not self-sufficient but was importing products to fill local demand (e.g. contemporarily evolving in the copper industry).

Both manifestations of Chinese overcapacities are threatening the viability of European players' business models. Type (a) leads to generally depressed price levels coupled with a massive intensification of competition for customers on home and third markets caused by Chinese production trying to find a sales outlet outside the home market. Type (b) also leads to generally depressed price levels. Here, however, it is not Chinese exports, that pressure sales volumes. It is rather the production volumes that cannot longer be sold on the Chinese market that are being diverted on to the (already satiated) global markets.

Overcapacities are actually a regular phenomenon of functioning market economies that arise in the competitive process. As a matter of fact, nobody would want to forbid an entre-

preneur to install new capacities in the market, who wants to try a new business model, new management concept, new technology, etc. If this newcomer or the incumbents prevail, shall be determined by the competitive forces of the market process. Temporary overcapacities are being eliminated quickly. In the case of China the situation is different. The overcapacities built-up in the Chinese economy are persistent and rather grow than diminish. The reason for this phenomenon is, that China's economy – and its non-ferrous metals industry in particular – is not running according to market principles. Neither does the (central) government implement an effective macro-economic control mechanism (scarcity prices plus hard budget constraints would be a solution, but are not in sight), nor are investors fully accountable for the profits and losses created by their investment decisions. Decision makers in firms and (local) governments rather target national development goals than corporate profitability, always knowing that tax income can be diverted to fill ensuing revenue losses and additional market distortions can pretty up unprofitable business models. Overcapacities of type (b) for example, clearly constitutes a case of import-substitution at the expense of foreign suppliers. It follows a nationalistic ideology contradicting propositions of a free-market design for the global economy.

European firms are directly threatened by this constellation. It is obviously not the weakest, least productive and least profitable firms that will leave the markets in order to regain a global supply/demand balance. Chinese firms are protected by a system of inter-locking state-business interests that keep them afloat for as long as they serve strategic national interests. As such, European firms that do have to observe hard-budget constraints and cannot hope for governmental grants and subsidies are in the danger of being crowded out by Chinese players that are less innovative, less productive and – measured in fair market competition terms – less competitive.

In some industries like aluminium, lead and tungsten this crowding out process has already started. Seen from the perspective of global welfare, ecological compliance as well as market efficiency, superior firms are being substituted by lesser players.

As such the European non-ferrous metals industry is well advised to monitor developments in China carefully. Against the background of huge overcapacities lingering in the Chinese market, very significant governmental promotion programmes already in place as well as very ambitious initiatives for technology upgrading and increasingly complex business models running, the Chinese non-ferrous metals industry is on the verge of directly challenging even the most advanced and complex business models of their European counterparts. Making sure that the contest between European and Chinese players on the European and global (if not also the Chinese) markets follows the rules of fair and equitable competition will be a key task for European firms, associations and policy makers alike.

And what becomes clear as well is that this challenge is no longer restricted to just a specific metal and its basic industry (mining, smelting, first processing stages), but becomes an overarching issue that requires the collaboration of firms along the whole value chain and across various metals. Even players that at the time being are profiting from (unduly) low prices caused by cheap Chinese imports or depressed global prices must keep in mind that once market dominance is established, prices are bound to go up. By crowding out foreign competitors, Chinese players are successively gaining market power – market power that over the medium term translates into price setting power.

The message this study sends out is clear cut: The Chinese economy and its non-ferrous metals industry in particular are not operating according to the working principles of competition-based market economies. Prices determined in this environment do not reflect actually existing scarcities. This results in distorted industry structures, massive overcapacities and perverted outcomes of competitive processes (in the international arena). European firms are negatively affected by these structures as they must cope with international prices that are either artificially low (raw materials, smelting fees, etc.) or artificially high (raw materials). The consequences are depressed operating margins or altogether lost sales, which directly translate into weakened liquidity positions and therefore reduced resources available for R&D, market development, strategic investments, etc. As they must achieve positive business results in the medium term and are not propped up by government subsidies and other promotional measures as their Chinese counterparts, European firms are structurally disadvantaged. Eventually, they are facing the threat of being crowded out by Chinese competitors who are drawing their revealed strength not from superior management skills, productivity achievements, or natural cost advantages, but rather from distorted markets manipulated in their favour by Chinese state agencies. As such, upholding trade defence mechanisms in line with the former “non-market” economy practices are not a reflection of modern European protectionism, but rather an indispensable means to uphold the functionality of the European market system and its performance oriented competitive order.

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