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# Using trade policy to drive value addition: Lessons from Indonesia's ban on nickel exports

*Background document to the Commodities and Development Report 2017*

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This report was prepared by Kris Terauds, Special Unit on Commodities (SUC) of UNCTAD.

For further information about this document, please contact SUC, UNCTAD, Palais des Nations, CH-1211 Geneva 10, Switzerland, tel. +41 22 917 4546, e-mail: commodities@unctad.org.

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UNCTAD
Special Unit on Commodities
Palais des Nations
CH-1211 Geneva 10
commodities@unctad.org
tel.: +41229171648/6286

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**Abstract**

Importing countries claim commodities as the raw materials that fuel industrial economies. By contrast, commodity-dependent developing countries (CDDCs) claim their natural resources as a rare source of wealth on which to base their development strategies. In contemporary trade debates, considerable friction exists between these two claims on commodities, especially related to the use of export restrictions in support of development strategies. This discussion paper studies Indonesia's 2014-17 mineral export ban, a prominent and contentious example of development-oriented trade policy. The Indonesian export ban is part of a wave of restrictions on exports of industrial raw materials, imposed by producing countries since 2009. It also fits with Indonesia's established history of employing policy to influence its commodity-led development outcomes. Three years after the mineral export ban's implementation, this paper estimates its outcomes, in terms of export earnings, value added, job creation and government revenues. From these estimates, the paper evaluates the likelihood that the nickel ore export ban will achieve its dual long-term objectives of increasing value addition and reducing the extraction rate for the country's nickel resources. The paper closes by identifying policy implications for CDDCs considering using trade policy, and quantitative export bans in particular, as part of their commodity-led development strategies.

## 1. Introduction

On 11 January 2014, Indonesian President Yudhoyono signed a regulation banning the export of unprocessed nickel and bauxite ores. This enforced a requirement, contained in Indonesia's 2009 Mining Law, that miners in Indonesia process their ore domestically. With this export ban, the government sought to compel miners and processors to build smelters in Indonesia, thereby increasing the country's share of the value added to its mineral resources.

This paper focusses on the case of nickel because, of the many minerals that Indonesia exports, the January 2014 export ban initially applied only to nickel and bauxite.[1] While the ban on exports of bauxite ore failed in its objectives,[2] its nickel counterpart compelled the construction of nine new nickel smelters, most of them small in scale,[3] before the Government announced the relaxing of the ban in early 2017.

In resorting to an export ban, the Indonesian government was reacting to a drastic acceleration in its nickel ore extraction rate after 2006. In the prior decade, from 1996 to 2006, Indonesian mines produced a steady range of between five to 10 million metric tonnes (MT) of nickel ore per year, of which the country's two smelters processed more than half into primary or intermediate nickel products. From 2007 to 2013, the nickel ore extraction rate accelerated, reaching 71 million MT in

[1] The January 2014 regulation granted qualified exceptions to producers of other minerals: exports of copper, manganese, iron, lead and zinc were permitted, in concentrate form, until 2017, albeit subject to an export tax.

[2] Instead of prompting the construction of new smelters, the Indonesian export ban had the effect of shifting bauxite extraction activities to neighbouring Malaysia, casting doubt on whether the Indonesian government would persist with the ban. Faced with the consequences of the surge in bauxite mining in its Pahang province, which exploded from 200,000 MT of raw ore in 2013 to 20 million MT in 2015, the Malaysian government imposed a three-month ban on bauxite mining on 19 January 2016, in an attempt to control the boom. See, for example: Head, Jonathan. 2016. "Bauxite in Malaysia: The environmental cost of mining." BBC News, 19 January. www.bbc.com/news; and Home, Andy. 2015. "Bauxite and the Limits of Resource Nationalism." Reuters, 30 March. www.reuters.com.

[3] The Jakarta Post.

2013, on the eve of the ban. This acceleration was driven entirely by raw ore exports, which grew to 65 million MT in 2013, 90 per cent of them going to China.[4]

As of 2014, Indonesia had an estimated 1.3 billion MT of nickel ore reserves,[5] so the worry was not that runaway extraction would deplete these reserves, but rather that the export earnings – estimated at USD 4.5 billion[6] – did not justify the environmentally invasive methods used to extract the ore, or the foregone value addition in exporting it in raw form.

On the eve of the export ban, Indonesia's nickel ore exports were produced by approximately 50 strip mine operations on Sulawesi,[7] whose techniques were among the major causes of deforestation in the country (FWI 2014). As for value added, Indonesia's nickel smelting capacity remained unchanged throughout the 2006-2013 ore export boom, at approximately 100,000 MT of nickel (TNi) per year, meaning that the country added value to only 11 per cent[8] of the 71 million MT of nickel ore it extracted in 2013.[9] The 2014 mineral export ban therefore had the double objective of increasing the country's smelting capacity (i.e. value addition) and reducing its ore extraction rate.

With its focus on the Indonesian mineral export ban, this paper informs the wider debate over the use of trade policy in support of national development objectives. Many commodity-dependent development countries (CDDCs) express frustration that, after decades of following orthodox development strategies, based on free trade, they are no closer to diversifying their economies. Specifically, there is a perception among these countries that asymmetries in the trading system prevent them from accessing the higher value-added activities that they require to reduce their dependence on commodity exports (UNCTAD 2015).

For this and other motivations, the use of restrictions on the export of commodities exploded during the recent 2003-2011 commodity price boom. For example, the OECD (2014) found that over 50 per cent of the 2,000 restrictions in force worldwide in 2012 on industrial raw materials were implemented after 2009. High commodities prices explained some of this rush to restrict exports. But trade policies with long-term development objectives that are unrelated to price, such as Indonesia's 2014 mineral export ban, also represented a more forceful approach by exporting countries, risking more interventionist policies to achieve the commodity-led development outcomes that have largely eluded them. Other countries watched the outcome of the Indonesian ban with interest, to gauge whether a similar interventionist trade policy could succeed for them, where orthodox policies, based on free trade, had disappointed.

Nevertheless, as an attempt to compel the construction of new smelters, Indonesia's mineral export ban represents a considerable gamble. The structure of this paper follows the gambling analogy, with Section 2 reviewing the objectives and context of the export ban "bet" as an ambitious and contentious example of development-oriented trade policy. Section 3 reviews the economic costs of the ban, representing the Indonesian government's "wager," which includes, for example: estimated

[4] International Nickel Study Group (INSG), World Nickel Statistics Yearbook 2014.

[5] Dalvi et al. (2004), a frequently cited source, estimated Indonesia's nickel ore reserves at 1.6 billion MT in 2004. Subtracting the 260 million MT extracted from 2005 to 2013 (source: INSG) leaves approximately 1.3 billion MT in 2014.

[6] Indonesia exported 64.8 million MT of raw nickel ore in 2013 (source: INSG) at an average price, delivered in Shanghai, of USD 70 / MT (source: Metal Bulletin). See Figure 8 for more information.

[7] INSG. See also the Appendix for an illustration, by INSG, of the workflow of nickel strip mines in Indonesia.

[8] Assumes an average grade of Indonesian nickel ore of 1.61 per cent Ni, from Dalvi et al. (2004).

[9] INSG.

losses of USD 4.5 billion in export earnings, 30,000 mining jobs and USD 270 million in government revenues. Section 4 estimates its early outcomes – in terms of export value, value added, job creation and government revenues – as the "payoff." The conclusion in Section 5 includes policy recommendations on the applicability of this type of trade policy for other commodity-dependent developing countries (CDDCs) wanting to increase value addition in their raw material sectors. The paper closes with suggestions of topics for further study in Section 6.

## 2. The Bet – A ban on unprocessed mineral ore exports

With its objective of compelling the construction of smelters, Indonesia's export ban was a forceful attempt to solve the perennial challenge of increasing value addition, as part of a commodity-led development strategy.[10] Developing countries are encouraged to pursue some combination of three strategies to break their dependence on commodities and transform their economies, namely:

- Export diversification, or horizontal shifts into other traded sectors (Newfarmer, Shaw, and Walkenhorst 2009). Indonesia has had some success with this strategy, using oil revenues during the 1970s and 1980s to invest in agriculture and manufacturing (see subsection 2.3).
- Building backward linkages, or producing domestically the inputs consumed by the main commodity sector (Hirschmann 1989). This strategy, in particular, is de rigueur in contemporary development discussions, including on "local content" and similar concepts (Morris, Kaplinsky, and Kaplan 2012). Norway establishing oilfield services to supply its oil sector is an often-cited example. More recently, Chile has had some success in establishing mining services to supply its copper sector (OECD 2014).
- Building forward linkages, or moving into the downstream activities, such as transformation or logistics, that add value to raw commodities on their way to end users as final products. Malaysia's rubber sector, for example, has a fully integrated chain that grows and processes rubber, then fabricates it into final products for automotive, industrial and medical uses (Goldthorpe 2015).

These three commodity-led development strategies, in their different forms, have been prescribed for decades, based, as they are, on the development trajectory of several advanced economies. Australia, Canada and Norway, for example, successfully followed a commodity-led path to transform their economies during the 20th century, employing their versions of the three strategies above.

Nevertheless, for developing countries currently attempting a similar transformation, the landscape has changed. In particular, they have fewer trade policy tools at their disposal, to shape incentives and protect strategic new industries. Since the Washington Consensus era began in the 1980s, and in particular since the formation of the World Trade Organization (WTO) in 1995, trade policy space has shrunk and CDDCs have been encouraged to adopt free trade and liberalised markets (Stiglitz and Charlton 2012).

CDDCs are therefore advised to follow the commodity-led development model without resorting to trade policy. This contributes to a perception among CDDCs that the global trading system serves to cement the competitive position of first movers in sought-after value-added activities, thereby

[10] For this paper, we understand commodity-led development to mean the reinvestment of revenues from strategic commodities sectors to drive growth in other sectors, ideally those richer in technology and value addition; with the overall objective of achieving a diversification and structural transformation of the national economy.

closing off transformative opportunities and depriving CDDCs of an equitable share of the value added on the commodities they produce (UNCTAD 2015). The recent 2003-2011 commodity price boom exacerbated this situation, as the shares of the windfall were that much more valuable. This motivated many commodity-exporting countries, including Indonesia, to eschew free trade and employ targeted export restrictions in pursuit of a greater share of the windfall. The objectives of these export restrictions varied widely, but this paper focusses on the Indonesian mineral export ban as a trade policy in support of increasing value addition.

This section continues by situating Indonesia's mineral export ban within the wider incidence of export restrictions (2.1). The subsequent subsections relate the objectives of the ban to key components of its domestic context, such as: resource nationalism (2.2), Indonesia's commodity-led development history (2.3), its persistent problems with corruption (2.4) and the political economy of the nickel export ban (2.5).

***Increasing incidence of export restrictions during the commodities supercycle***

As a trade policy, Indonesia's mineral export ban and its prospects for success, are subject to the disciplines (rules) agreed in multilateral negotiations at the WTO. These disciplines are extensive and restrictive with respect to import measures, such as tariffs and quotas. By contrast, there are few disciplines, and therefore more flexibility, with respect to several export measures, loosely grouped as "export restrictions."

For the purposes of this paper, export restrictions are divided into the following subgroups:

1. Domestic measures, such as licensing requirements, value-added taxes and other domestic obligations;
2. Export taxes, including duties; and
3. Quantitative export restrictions, either partial (e.g. quotas) or comprehensive bans.

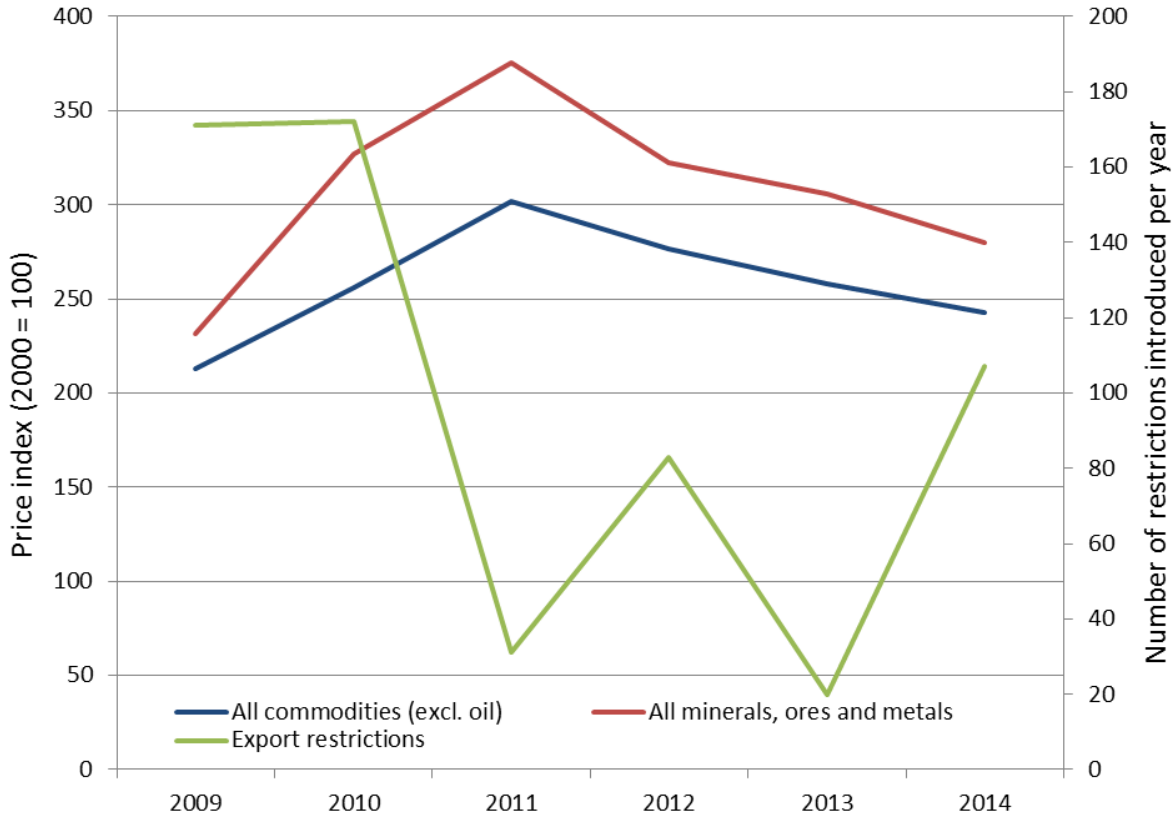
Many, but not all, of these types of measures are allowed within WTO rules, but their use is highly contentious in multilateral negotiations. Importing countries generally call for more disciplines on the use of export restrictions, arguing that their use deprives their companies, and the market more generally, of important commodities, jeopardising established, competitive supply chains and creating a negative net collective effect (Fung and Korinek 2013). On the other side, exporting countries defend the policy space that export restrictions represent, arguing that they are important policy tools to redress the inequitable distributions of rents in global value chains (GVCs) (UNCTAD 2015) and to ensure that the exploitation of agricultural and natural resources in their countries contributes to national objectives (WTO 2010).

Export restrictions are difficult to classify, compare and analyse, as their details vary considerably, measure-by-measure and across countries. Moreover, restrictions generate tensions between exporting and importing countries, so their use and communication are often opaque. Nevertheless, in 2009 the Organisation for Economic Co-operation and Development (OECD) undertook a research programme on export restrictions on industrial raw materials,[11] which has catalogued an inventory of export restrictions in force worldwide from 2002-2014.

[11] OECD, Export restrictions on raw materials, http://qdd.oecd.org/subject.aspx?Subject=ExportRestrictions_IndustrialRawMaterials.

The OECD found that the incidence of export restrictions rose dramatically during the recent commodities supercycle. Figure 1 illustrates this relationship by plotting commodity price indices against the number of export restrictions introduced per year. Indeed, over 50 per cent of the approximately 2,000 restrictions in force in 2012 were implemented after 2009, including 23 per cent in 2012 alone (OECD 2014, 23).

**Figure 1 - Commodities prices and the incidence of export restrictions, 2000-2014**




*Sources: UNCTADStat (price indices), OECD Inventory on Export Restrictions on Industrial Raw Materials*
*Note: Export restrictions on HS4 codes 72xx-81xx (i.e. ferrous and non-ferrous metals, metal ores)*

In 2012, the OECD estimated that seven per cent of the total trade in minerals and metals was subject to export restrictions, although some commodity groups are subjected to a much greater degree. For a handful of metals,[12] for example, over 50 per cent of the world trade was subject to export restrictions, while for base metals, such as nickel and aluminium, three to eight per cent of traded volumes were subjected to export restrictions (OECD 2014, 24–26).

Despite the increasing incidence of export restrictions during and after the 2003-2011 commodities supercycle, Indonesia's 2014 mineral export ban is nonetheless relatively unique. This is because, as shown in Table 1, of the 371 export restrictions in force on minerals and metals in 2012, only 23 were quantitative and only three were outright bans.

[12] Thorium, niobium, tantalum and vanadium.

**Table 1 – Types of export restrictions in force in the trade of minerals and metals, 2012**

| Type of restriction | Count |
|---|---|
| Export taxes | 144 |
| Quantitative export restrictions | |
| Partial (e.g. quota) | 20 |
| Comprehensive (e.g. ban) | 3 |
| Others | 204 |
| Total | 371 |

*Source: Adapted from (OECD, 2014, tab. 1.2, p. 25)*

An examination of the individual features of the different types of export restrictions is beyond the scope of this paper. Instead, three prominent examples are presented below, of export restrictions in force at some point during the recent commodities supercycle. For brevity, from the three broad types of restrictions identified earlier in this section – domestic measures, export taxes and quantitative restrictions – this paper omits domestic measures to focus on pure trade measures.

**Table 2 - Prominent examples of export restrictions, 2000-2015**

| Type of measure | Description |
|---|---|
| Export tax | As of 2002, Argentina applied a 10 per cent export tax on all unprocessed mineral ore exports. The government justified these taxes as an efficient method of revenue collection, the proceeds from which it used to repay its national debt and fund social programmes. With this export tax, it also intended to encourage mining companies to build processing capacity in Argentina, although the government did not introduce any direct measures to this effect. The Argentinian government reported that, during the commodities supercycle, it collected approximately 10 per cent of its revenues from its export tax on raw materials (UNCTAD 2015). |
| Quantitative export restriction, partial (e.g. quota) | Since the early 1990s China produced the near entirety of the world supply of rare earth metals, which are used in the fabrication of a variety of defence, electronics and green energy products (UNCTAD 2014). Beginning in 2006, China began imposing a variety of restrictions on the export of rare earth metals, including quotas on the export of unprocessed ores. This contributed to a doubling of international prices for many rare earth metals from 2010 to 2011. In 2012, the United States initiated a dispute at the WTO against these restrictions by China, to which the European Union (EU), Japan and Canada joined as complainants. China defended its export restrictions as necessary to conserve its reserves of rare earth metals, while the complainants countered that the restrictions were, in fact, "designed to achieve industrial policy goals rather than conservation."[13] In 2014, the WTO Appellate Body decided in favour of the complainants, and China was required to remove its export restrictions on rare earth metals.[14] |

[13] WTO, Dispute settlement DS431, "China — Measures Related to the Exportation of Rare Earths, Tungsten and Molybdenum," www.wto.org.

[14] Ibid.

| Type of measure | Description |
|---|---|
| Quantitative export restriction, comprehensive (e.g. ban) | In response to the 1973-1974 oil embargo, the United States Congress passed the 1975 Energy Policy and Conservation Act (EPCA), which, among other measures, introduced a ban on exports of crude oil. The objectives of the ban were: to support the development of domestic value addition; to reduce the United States' reliance on imported crude; and to insulate the domestic market from oil price shocks. Under the crude oil export ban, the import share of US oil consumption has varied considerably, from 35.4 per cent in 1974, on the eve of the ban, to 27.3 per cent in 1985, climbing to 60.3 per cent in 2005, before falling again to 27 per cent in 2014.[15] The US oil market is complex, so it is difficult to quantify the role the export ban played in these swings. This is particularly true since 2008, when domestic production of oil from unconventional methods[16] began to grow rapidly, creating overall supply imbalances between producing and consuming regions and surpluses at Gulf Coast refineries (Kilian 2014). These imbalances created a discount on domestic crude oil prices, essentially a rent that refiners collected at the expense of producers. These were among the reasons that prompted leaders in the US Congress to lift the crude oil export ban in mid-December 2015.[17] |

These three examples illustrate, as does the OECD's inventory of export restrictions, that countries from across the spectrum have employed restrictions on commodity exports have had mixed success in achieving the restrictions' direct objectives, with some countries suffering net negative effects. Moreover, OECD (2014) analysis emphasises that the net effect of export restrictions on trading partners and international markets is consistently negative.

Despite mixed results among the direct effects of export restrictions, governments in producing countries continue to employ them, suggesting that, for some, their indirect benefits warrant the direct costs. In other words, these countries may look beyond the performance of export restrictions at an individual product-code level and instead evaluate how these policies contribute to, for example, diversification into other, higher value-added activities. It is therefore important to understand a government's objectives for its export restrictions, and how those contribute to its wider commodity-led development strategies. To this end, the remainder of this section relates the objectives of Indonesia's 2014 mineral export ban to its domestic context, before evaluating its costs and benefits in subsequent sections.

### *2.2 Resurgent resource nationalism*

Indonesia's January 2014 mineral export ban aimed to achieve the requirement in Law 4/2009 on Mineral and Coal Mining (the "Mining Law") that miners in Indonesia process their ore domestically. This was just one of several major policies contained in the 2009 Mining Law that could be generally described as resource-nationalist, including: capturing a greater total share of rents for the different levels of government; and requiring foreign companies to divest a majority share of their operations

[15] US Energy Information Administration (EIA), www.eia.gov.

[16] Unconventional methods include hydraulic fracturing or horizontal wells used to extract shale or tight oil. Source: EIA.

[17] Harder, Amy, Cook, Lynn, 2015. "Congressional Leaders Agree to Lift 40-Year Ban on Oil Exports." The Wall Street Journal, 16 December. www.wsj.com/.

to Indonesian interests over time. To justify these policies, the 2009 Mining Law cites several times Article 33.3 of Indonesia's 1945 Constitution, with its strong resource-nationalist tone: "The land, the waters and the natural resources within shall be under the powers of the State and shall be used to the greatest benefit of the people."[18]

From this legal basis, Indonesia's January 2014 mineral export ban is a comprehensive quantitative prohibition on the export of raw mineral ores, beginning with nickel and bauxite, and due to extend to other minerals, before the mineral export ban was relaxed in early 2017. According to the ban, only companies that undertake the construction of a smelter were granted an export licence. The ban carried no objectives for influencing domestic or international prices. And, despite its resource-nationalist tone, the mineral export ban did not restrict which companies, foreign or domestic, may build smelters in Indonesia and qualify for an export licence – a crucial feature that may explain why the ban did not provoke a challenge from WTO member states.[19]

The most transformative objectives of the mineral export ban related to value addition and resource conservation. The government was also concerned with the ban's direct macroeconomic impacts, for example on export earnings, jobs and government revenues. But, as shown later in Section 4, these are threshold, substitutive outcomes, that is: the ban, in effect, attempts to sacrifice one type of export (raw ore) for another (processed nickel), one type of job (mining) for another (smelting) and resulted in a net loss in government revenues. By contrast, the transformative potential of the export ban was to increase domestic value addition in Indonesia's nickel sector, while extracting nickel resources at a slower rate - both additive outcomes. Different also from the here-and-now perspective of revenues and jobs, value addition and resource conservation refer to a longer-term vision for Indonesia's sustainable development.

With these objectives, and as part of the 2009 Mining Law, Indonesia's 2014 mineral export ban seemed in line with political currents in Indonesia's commodity-led development, specifically with respect to resource nationalism. Since independence, the Indonesian government's use of resource nationalist policies has ebbed and flowed, reaching a high point during the country's oil boom in the 1970s (Pangetsu, Rahardja, and Ing 2015). From President Suharto's resignation in 1998 until the present day, resource nationalism has resurged in Indonesian politics with, for example, heightened tensions with neighbouring countries over contested offshore hydrocarbon deposits and more strident political rhetoric with respect to foreign investment in the domestic resource sector (Buehler 2012).

But in post-1998 Indonesia, resource nationalism, i.e. with respect to foreign interests, has had a domestic doppelganger called "localism," by which subnational governments capitalise on the significant political decentralisation in the post-Suharto era to demand a greater stake in resource developments in their jurisdictions (Devi and Prayogo 2013). The 2009 Mining Law can be seen, in part, as an attempt to satisfy these parallel but ultimately conflicting political currents, with nationalism rallying Indonesians and localism dividing them in the use of their natural resources.

### *2.3. Commodity-led development history*

[18] "The 1945 Constitution of the Republic of Indonesia", unofficial translation. Available at: www.ilo.org/ [Accessed: 13 July 2015].

[19] See, for example: Yulisman, Linda, 2014. "Japan unlikely to file complaint on ore-export ban with WTO." The Jakarta Post, 5 December. www.thejakartapost.com.

A second interpretation of Article 33.3 of Indonesia's Constitution is that it alludes to a commodity-led development mission, tasking the government with using natural resources to durably improve Indonesians' lives. Indeed, commodity-led development has been a continuous feature of Indonesia's economic policies since 1967, albeit mainly focussed on hydrocarbons.

From the 1960s to 1980s, the government adopted policies aimed at employing the country's oil resources to diversify the national economy. To develop the oil sector, investment policies attracted foreign companies. To capture its share of rents, the government created or strengthened institutions, such as the state-owned company Pertamina. And, after oil prices quadrupled in 1973, the Indonesian government saved or reinvested its windfall to durable effect. It avoided Dutch disease effects by, first, saving a third of its share oil rents abroad from 1974 to 1978, and then, when oil prices began falling, devaluing the rupiah by 33 per cent in 1978 (Auty 2004). Of the portion of oil rents absorbed domestically, the majority was invested in building rural infrastructure and diversifying into liquefied natural gas (LNG), metals and manufacturing. These industrial and investment policies contributed to an increase in the share of industrial sectors by 350 per cent from the mid-1960s to 1992 (Hill 2000, 19). Concurrent agricultural investments, including in Green Revolution technologies, contributed to more than doubling the rice yield per hectare, from 2.25 MT in 1969 to 4.35 MT in 1992 and helped Indonesia achieve rice self-sufficiency in the mid-1980s (Hill 2000, 138). Altogether, the Indonesian government's strategic use of its hydrocarbon resources during the 1970s and 1980s is among the most important factors in the country's post-independence economic development.

For their part, mineral resources did not play the same strategic role as oil in Indonesia's commodity-led development plans. From 1967 to the late 1990s, the government assumed a relatively passive role in the minerals sector, adopting free-market, pro-investment policies that left the private sector, and particularly foreign mining companies, to drive the development of the sector.

The active and interventionist character of the 2009 Mining Law is nonetheless consistent with Indonesia's long-standing use of commodity-led development policies and seems to signal a more strategic role for mineral resources in Indonesia's economic development plans.

### *2.4 Corruption concurrent with development*

Indonesia's commodity-led development trajectory has also been characterised by persistently high levels of corruption. Even as the Indonesian economy was growing and diversifying throughout the 1970s and 1980s, political elites enriched themselves through a variety of corrupt schemes, many of them derived from oil rents (Transparency International 2004, 13). During this period, commodity-led development and corruption were concurrent and even symbiotic, often sharing roots in the same institutions and economic activities.

Corruption remains a major problem in Indonesia: in its 2014 Corruption Perceptions Index, Transparency International rated Indonesia 107$^{th}$ of 175 countries. This contributes to a decline over the past decade in Indonesia's attractiveness as an investment destination. In the Fraser Institute's 2014 Survey of Mining Companies, respondents cited corruption and nationalist policies as the main factors in ranking Indonesia 76$^{th}$ of 122 countries in terms of investment attractiveness (Jackson and Green 2014, 4). Corruption represents a major challenge to the continued development of Indonesia's resource sectors, which depend on foreign investment.

### *2.5. Status quo for the dominant nickel producers*

In terms of political economy, on the eve of the 2014 export ban, Indonesia had approximately 50 nickel mines and only three smelters.[20] The two largest smelters were built in the 1970s and are attached to the two largest concessions in the nickel mining areas on Sulawesi island, namely: PT Vale's nickel matte smelter at its Soroako mine, with a capacity of approximately 80,000 metric tonnes of nickel (TNi)[21] and PT Antam's 26,000-TNi ferronickel[22] smelter at its mature Pomalaa mine. The country's third nickel smelter PT Indoferro, a small plant with a 3,000 TNi capacity, is owned by the Indonesian Growth Steel Group and began operations in Cilegon (Indonesia's "Steel City") in 2013, before the nickel ore export ban. Prior to the export ban, these three smelters represented the entirety of Indonesia's nickel smelting capacity of approximately 103,000 TNi per year.

Other than PT Vale and PT Antam, the remaining 50 or so smaller nickel mines in late 2013 were scattered across Sulawesi Island and the Moluku archipelago. In general, these were strip mining operations that exported their raw ore directly to buyers in China.[23] Their techniques were relatively crude, involving stripping forest cover to excavate the ore underneath. Prior to the 2014 export ban, these mines typically trucked their ore to the coast, where they loaded it on to flat-bottomed barges and then transferred it to oceangoing vessels for direct export to China (INSG 2013). These mines, their rapid rate of nickel extraction, and their environmental impacts, such as deforestation and water pollution, were the targets of the mineral export ban.

Apart from producers themselves, two other groups - Chinese nickel pig iron (NPI) processors and subnational governments in Indonesia - had growing political influence in the Indonesian nickel sector from the mid-2000s until the present day. Prior to the ban, Chinese nickel pig iron (NPI) plants were the predominant buyers of Indonesian ore, as described in detail in Section 3. NPI processors, as well as the Chinese stainless steel companies whose supply chains depend on them, are therefore key stakeholders in Indonesia's 2014 ban on exports of raw nickel ore. In particular, the success of the ban hinged on these companies' decisions about whether or not to build NPI plants in Indonesia.

In parallel with the growing influence of Chinese NPI processors, and as a result of the post-1998 decentralisation of the Indonesian economy, the influence of provincial and local governments in the nickel sector grew throughout the 2000s.[24] In particular, the licencing powers devolved to local government were a major factor in the subsequent profusion of licences for small-scale, direct-export mines.[25] More recently, several local governments appear as joint venture partners in the smelter projects proposed in response to the 2014 export ban, either in the individual ventures or in the industrial parks being built to host clusters of nickel smelters.[26] Local governments' licencing power over smelting projects was an important factor in the outcome of the export ban.

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[20] INSG.

[21] PT Vale.

[22] Nickel matte is an intermediate product, which refiners transform into final products. Ferronickel (FeNi) is a primary alloy product used as a feedstock in stainless steel production. For more information on primary, intermediate and refined nickel products, see INSG's definitions at: www.insg.org/definitions.aspx.

[23] See the Appendix for an explanation and illustration of these direct-export nickel strip mines.

[24] With mining projects, the decentralization of licensing powers also appears to have increased the incidence of other problems, such as: corruption, artisanal and small-scale mining (ASM), illegal mining, land tenure violations and poor stewardship of natural resources and the environment. Source: (Spiegel 2012).

[25] In fact, there remains significant confusion about the number and legal status of newer nickel mines in Indonesia, due to a lack of coordination among the levels of government involved in licencing new projects. Source: (Devi and Prayogo 2013).

[26] Salim, Tama. 2015. "Industrial Estate Development Requires over Rp 192 Trillion." The Jakarta Post, 17 February. www.thejakartapost.com.

This section described the objectives and domestic context of Indonesia's "bet," in the form of its 2014 mineral export ban. Along with other measures deriving from the 2009 Mining Law, the ban responded to strong resource nationalist political currents in the country. Despite this nationalist trend, the export ban, at least for nickel, avoided antagonising the dominant firms in the sector, or discriminating against foreign firms in such a way as to provoke a dispute within the WTO. Ironically, the Chinese NPI producers were likely to be the main investors compelled by the ban to build smelters in Indonesia. Although these smelters will create value addition and jobs, their finances and supply chains will be oriented back to Chinese steel mills. Consequently, the nationalist aims of 2014 mineral export ban only achieved mixed results.

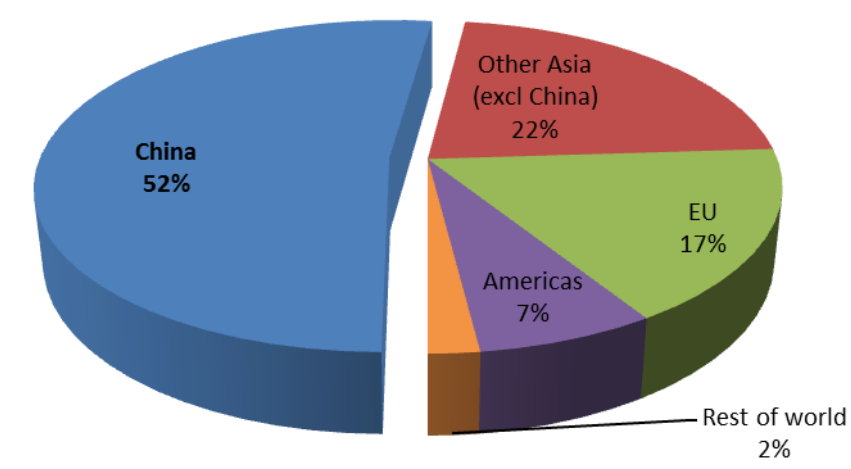
## 3. The Wager – Lost jobs, revenues and export earnings

In banning exports of nickel ore, Indonesia wagered its position as the market's largest ore exporter, along with the associated revenues and jobs. This section examines this wager from two angles: Indonesia's external position as a leading exporter of raw nickel ore, driven from 2010 to 2013 by runaway demand from China (subsection 3.1) and the estimated macroeconomic costs of the ban on these raw ore exports, in terms of jobs, government revenues and export earnings (subsection 3.2).

### *3.1. The leading exporter of nickel ore*

As for most base metals, the boom in Indonesia's nickel ore exports was closely linked to the recent decade of rapid industrial expansion in China. During this period, China's appetite for nickel spanned the industrial value chain, from the metal's principal "first use"[27] - as an ingredient in producing stainless steel - to industrial and construction end uses. For example, Figure 2 shows that China produced more than half of world stainless steel output in 2014.

**Figure 2 - Share of world stainless steel production, by region, 2014**

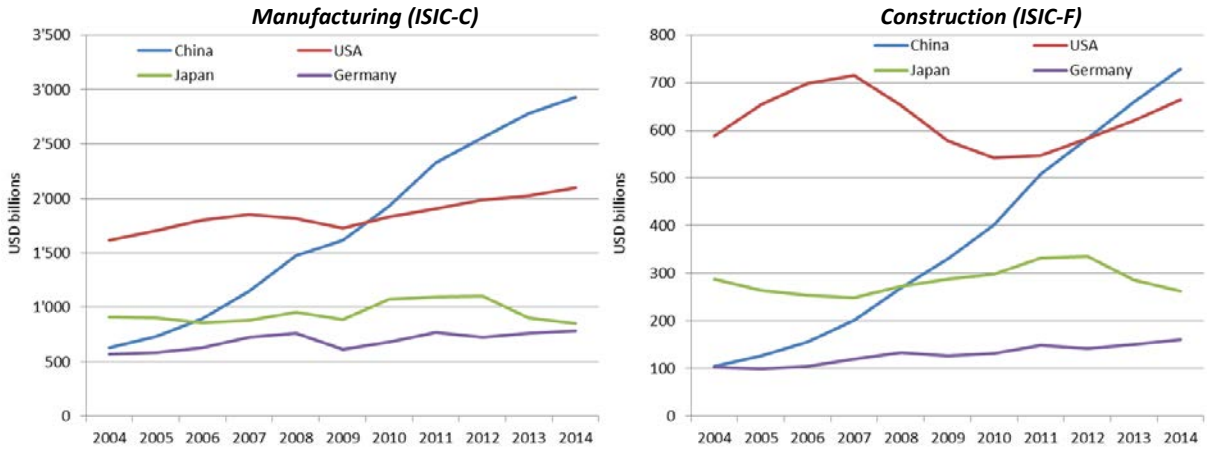



*Source: International Stainless Steel Forum and INSG, Stainless Steel in Figures 2015.*

Similarly, China was the predominant market in recent years for major end uses for nickel, including industry (manufacturing) and construction, as shown in Figure 3.

[27] "First use" denotes newly produced nickel metal, as distinct from recycled scrap. Approximately 65-70 per cent of the nickel consumed annually is from new production, with the balance from recycled scrap. Source: INSG, www.insg.org.

**Figure 3 - Manufacturing and construction value added by country, at current prices, 2004-2014**

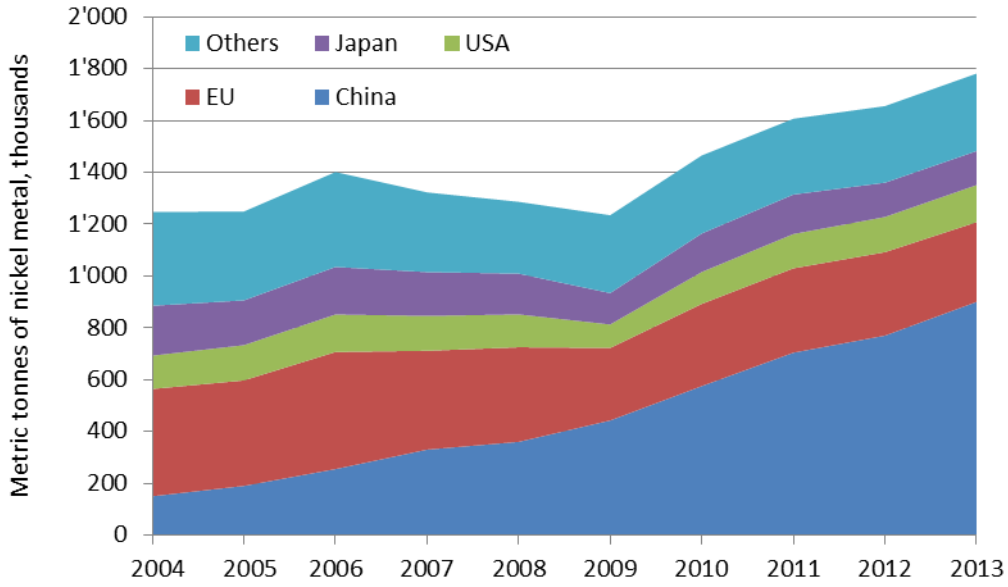



*Source: United Nations*

*Note: ISIC International Standard Industrial Classification of All Economic Activities, Rev.4*

Figure 4 illustrates the irresistible effect of China's nickel consumption: growing steadily throughout the last decade; replacing the EU as the largest single market in 2009; and consuming 900,000 TNi of nickel metal in 2013, or just over half of global consumption.

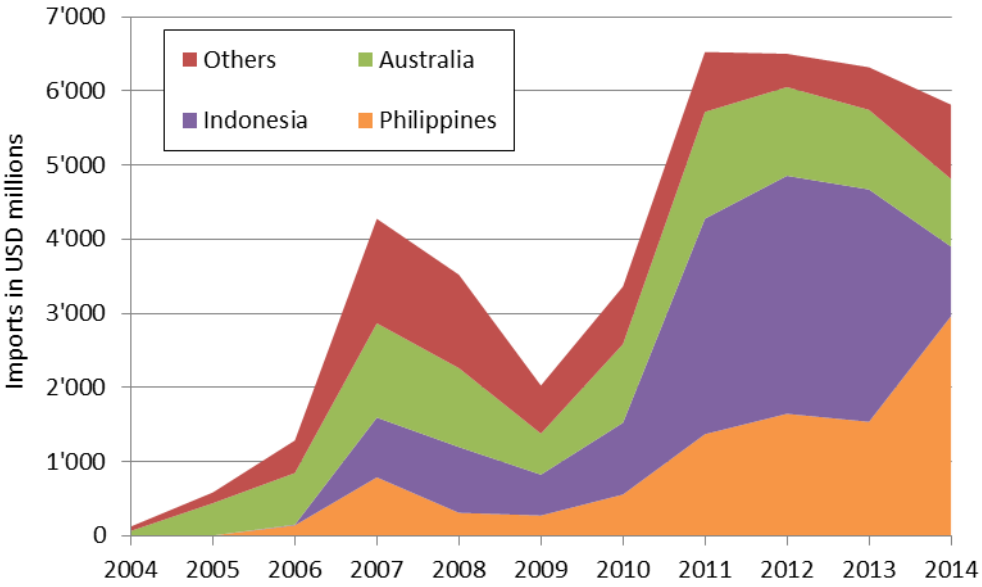
**Figure 4 - Nickel metal consumption by country, 2004-2013**




*Source: INSG, World Nickel Statistics Yearbook 2014.*

Beginning in 2010, Indonesia emerged as China's primary source of raw nickel ore, eventually supplying 50 per cent of China's nickel ore imports in 2013, in value terms. Figure 5 illustrates the importance of Indonesian imports from 2010-2014, as well as the Philippines taking over as China's main supplier after the 2014 Indonesian mineral export ban.

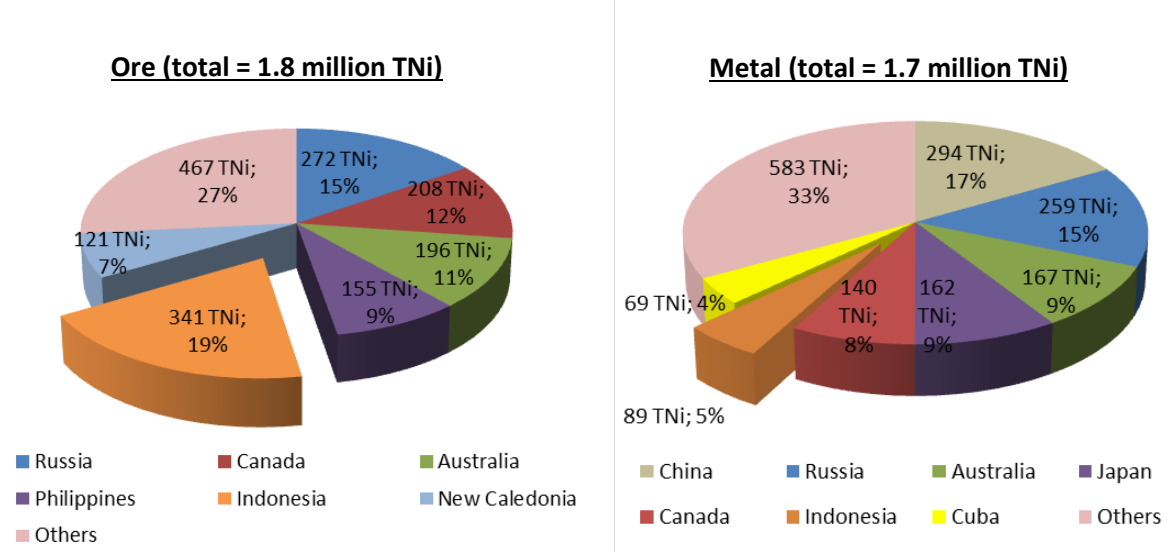
**Figure 5 - Chinese imports of nickel ore, by provenance, 2003-2014**




*Source: UNCTADStat, SITC code 284 (Nickel ores & concentrates; nickel mattes, etc.)*

Among major producing countries, Russia, Canada and Australia have relatively integrated nickel value chains, producing comparable proportions of ore and metal. Meanwhile, China and Japan were major nickel metal producers that import the majority of their ore feedstock. As for Indonesia, it was the single largest producer of ore over the decade 2004-2013, representing 19 per cent of the world total. But it generated a much smaller share of nickel metal, at five per cent. Figure 6 shows the breakdown by country of world nickel ore and metal production. The 10-year average from 2004-2013 is shown, to smooth the temporary market distortions caused by Indonesia's mineral export ban, which was announced in 2009 and implemented in 2014.

**Figure 6 - World nickel ore and metal production, annual average, 2004-2013**




*Source: INSG, World Nickel Statistics Yearbook 2014.*

Indeed, the recent decade of demand growth from China completely transformed the Indonesian nickel sector, which was part of the government's motivation for the mineral export ban. From 1996 to 2006, Indonesian mines extracted a steady average of between five and 10 million MT of nickel ore per year, of which the country's smelters transformed a little more than half into primary and intermediate products. As of 2007, China's industrial expansion, and particularly the rapid growth of China's nickel pig iron (NPI) sector, created a yawning demand for raw nickel ore that was filled mainly by Indonesian supply. See Box 1 for a brief discussion about the competitive advantages of Indonesia's nickel ore that made it the preferred feedstock of Chinese NPI processors.

**Box 1 – The non-substitutability of Indonesia laterite nickel ore in nickel pig iron production**

Nickel smelting is an energy-intensive process whose cost is determined largely by the grade of the feedstock ore. Higher grades can be processed by smaller processing units and therefore reduce capital expenses. Operating expenses are also lower because higher-grade ore requires less energy to smelt and produces less waste in the form of tailings and slag, whose disposal is costly (Dalvi, Bacon, and Osborne 2004; Torries 1995).

Feedstock ore is extracted from two main forms of nickel deposits: sulphide and laterite. Laterite nickel ore occurs in tropical climates, including Australia, New Caledonia, Indonesia and the Philippines. The majority of new nickel developments in the last decade have been of laterite deposits, because they are among the highest-grade and most accessible of the undeveloped nickel deposits in the world (Mudd and Jowitt 2014; Selby 2015). As Table 3 shows, this is particularly true of Indonesia's nickel deposits, which have a higher average grade (1.6 per cent Ni) than laterite nickel deposits in other countries.

**Table 3 - Surveyed laterite nickel resources, by region**

| Country / region | Raw ore, MT millions | Avg grade, %Ni | TNi millions | Share of world Ni resources, % |
|---|---|---|---|---|
| Indonesia | 1'576 | 1.61 | 25 | 15.8 |
| Central and South America | 1'131 | 1.51 | 17 | 10.6 |
| New Caledonia | 2'559 | 1.44 | 37 | 22.9 |
| Africa | 996 | 1.31 | 13 | 8.1 |
| Philippines | 2'189 | 1.28 | 28 | 17.4 |
| Other Australasia | 269 | 1.18 | 3 | 2.0 |
| Caribbean | 944 | 1.17 | 11 | 6.9 |
| Other Asia and Europe | 506 | 1.04 | 5 | 3.3 |
| Australia | 2'452 | 0.86 | 21 | 13.1 |
| Total | 12'622 | 0.01 | 161 | 100.0 |

Source: (Dalvi, Bacon, and Osborne 2004)

Along with average nickel content (Ni) of 1-2 per cent, laterite nickel ores in Southeast Asia, i.e. not only in Indonesia, are also rich in iron. These are two of the key ingredients in stainless steel, which the NPI process transforms into a product with 4-13 per cent Ni and the balance mainly of iron. With

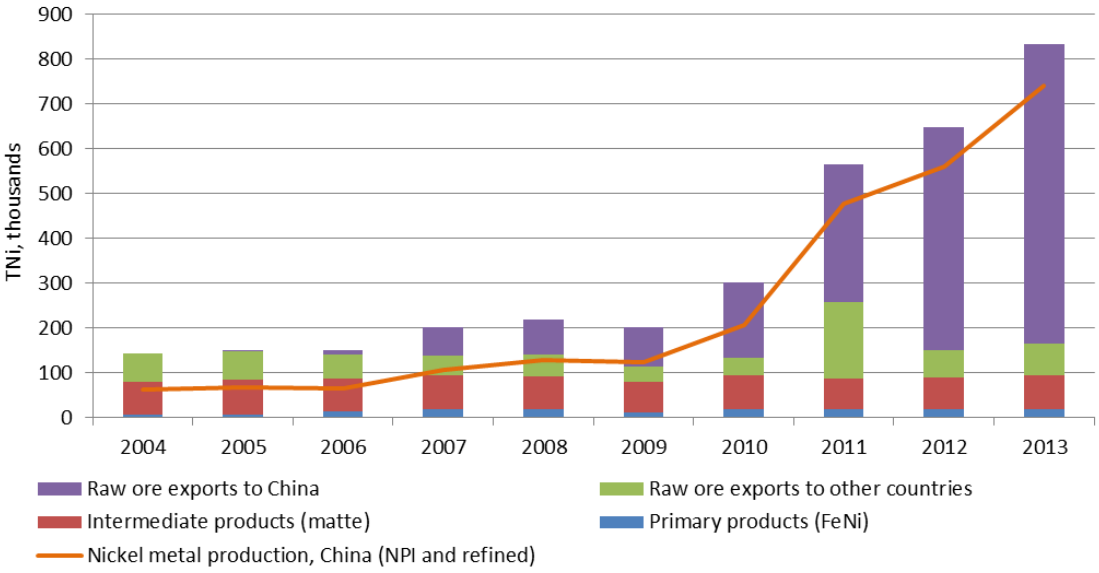
NPI, stainless steel companies therefore pay less for a lower-grade nickel product and receive the iron essentially for free.[28]

As a result, the majority of installed NPI capacity in China was calibrated for the specific characteristics of Indonesian nickel ore, leaving those plants with no viable long-term substitute among the ores produced by other countries.[29] This non-substitutability of Indonesian nickel ore is the core reason that the export ban continues to hold and, indeed, is likely to achieve its objective of forcing NPI processors to build smelters in Indonesia.

As a result of the post-2007 boom in Chinese demand, Indonesia's extraction of nickel ore exploded to 71 million MT by 2013, of which 65 million MT, or 92 per cent, was exported as raw ore. These raw ore exports represented approximately 40 per cent of world nickel consumption in 2013.

Figure 7 illustrates the explosion of Indonesian nickel extraction, skewed in favour of raw ore exports to China. The single trend line shows nickel metal production in China, including both NPI and refined products, representing the key demand factor in the transformation of the Indonesian sector.

**Figure 7 - Distribution of Indonesian nickel ore production, by output, 2004-2013**



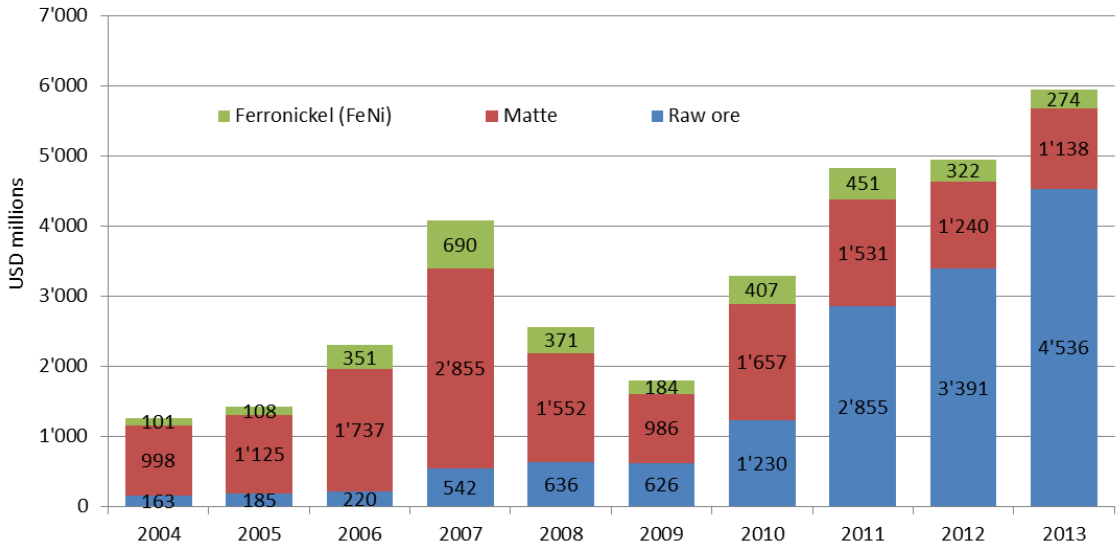

*Sources: INSG, UNCTAD calculations*

The surge in raw nickel ore exports to China, especially after 2009, is also reflected in the value of Indonesia's nickel exports. Figure 8 shows the breakdown by product of nickel export value, with raw ore exports ballooning from USD 220 million in 2006 to USD 4.5 billion in 2013, or 76 per cent of the total value of Indonesia's nickel exports. These increased exports in raw nickel ore were the target of Indonesia's mineral export ban.

[28] Hoffman, Andy. 2011. "A Breakthrough in China, Another Blow for Sudbury." The Globe and Mail, 6 November. www.theglobeandmail.com.

[29] INSG.

**Figure 8 - Indonesia nickel export value, by product, 2004-2013**




*Sources: INSG (volumes), UNCTADStat (nickel prices), Metal Bulletin (ore prices)*

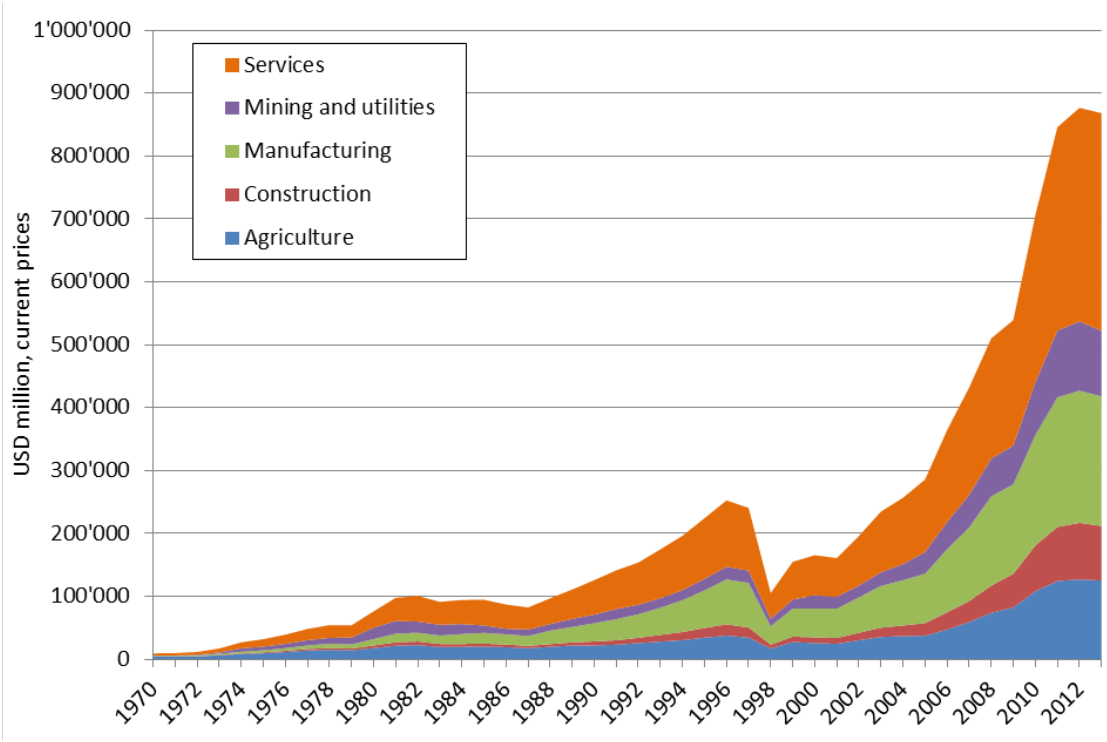
*Notes: - Nickel price Nickel cathodes, min. 99.8% purity, USD cash terms, London Metal Exchange*
*- Ore price Raw tonnage, provenance Indonesia, average grade of 1.8 per cent Ni*
*- Whereas Statistics Indonesia's figures for the volume of nickel ore exports correspond with figures from other sources, its figures for nickel ore export values from 2002-2014 imply a per-tonne ore price that is considerably and consistently lower than prices reported elsewhere. Without the time to investigate this discrepancy, this paper uses the per-tonne nickel ore prices reported by Metal Bulletin, which are comparable to those reported by INSG.*

### *3.2. Nickel's place in the national economy*

Indonesia's national accounts contain data on mining activities only at the level of "mining, quarrying and utilities."[30] For the purposes of this paper, these could more accurately be described as "extractive" activities, since they include the extraction of crude oil and natural gas. Figure 9 illustrates that the share of extractive activities in Indonesia's total value added peaked at approximately 20 per cent during the oil shocks from the mid-1970s to mid-1980s. Thereafter, from 1985 to 2013, extractive activities represented eight to 12 per cent of total value added, behind services, manufacturing and agriculture, highlighting the diversification and structural transformation of Indonesia's economy over recent decades.

[30] ISIC Rev. 3.1, Divisions 10-14 (mining and quarrying) and 38-41 (utilities). The mining and quarrying activities include the extraction of: coal (10); crude oil and natural gas (11); uranium and thorium (12); metal ores, including nickel (13); and others, such as salt or sand (14). In Indonesia's case, the extraction of coal, crude oil and natural gas are the largest components, in value terms. Source: UNCTADStat.

**Figure 9 - Breakdown of total value added by activity**

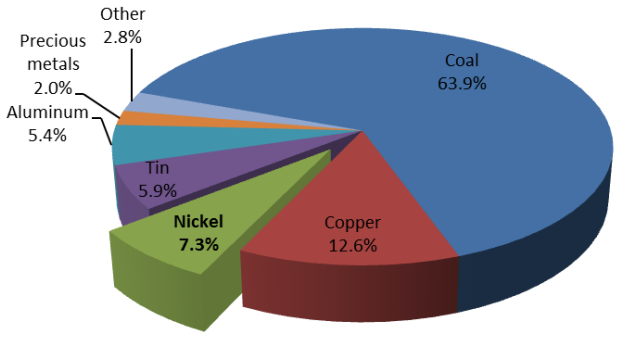



*Source:* *UNCTADStat*

*Note:* *Indonesia's total value added remained almost identical to its gross domestic product (GDP) throughout the period shown, 1970-2013.*

Since Indonesia's mining activities, including for nickel, are export-oriented, this paper uses export value as an index to estimate nickel's share of sector-level statistics, such as employment and government revenues. Figure 10 shows the share of total "ores, metals and coal" export value in 2013, by mineral, of which nickel represented 7.3 per cent – this will serve as a rough index for nickel's share of the macroeconomic indicators to follow.

**Figure 10 - Export value of ores, metals and coal, share by mineral, 2013**

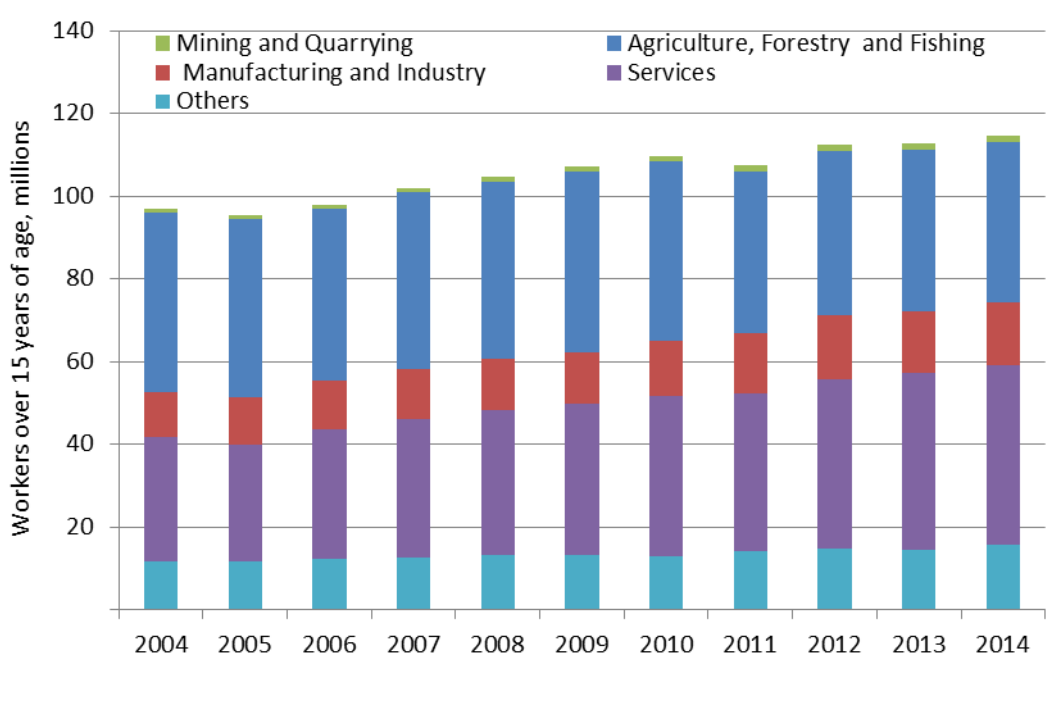



*Source:* *UNCTADStat*

Jobs in the mining sector grew from an average of one million from 2004-2008 to 1.4 million by 2014, as shown in Figure 11. Applying the index of 7.3 per cent, calculated above, Indonesian nickel mines employed an estimated 100,000 workers in 2013. It follows that an estimated 30,000 of these jobs

were created as a result of the 2009-2013 nickel ore export boom. Many of these new jobs, at strip mines that exported their ore directly, were suspended after the implementation of the 2014 mineral export ban[31] and they will disappear permanently should the ban remain in place.

**Figure 11 - Indonesia labour force, by economic sector, 2004-2014**




*Source: Indonesia National Labour Force Survey*

From 2012-2014, the Indonesian government collected average total revenues from mining of approximately 51 trillion rupiah (IDR) per year - USD 4.8 billion at average 2013 exchange rates[32] - or slightly more than three per cent of total government revenues, as shown in Table 4. Applying the index of 7.3 per cent, nickel's rough annual contribution to government revenues is estimated at IDR 3.7 trillion, or USD 350 million from 2012-2014. Furthermore, raw ore exports contributed an estimated USD 270 million to the total (or 76 per cent - see the discussion of Figure 8). This rough estimate represents the export ban's cost in lost government revenues.

[31] The Indonesian Mineral Entrepreneurs Association estimated the same 30,000 jobs lost as a result of the nickel export ban, quoted in: Taylor, Michael, and Kanupriya, Kapoor, 2014. "Indonesia's Export Ban Bullet to Miss Foreign Miners as Local Players Hit." Reuters, 10 January. www.reuters.com.

[32] Annual average rate, 2013, IDR:USD = 10,461, Source: UNCTADStat.

**Table 4 - Indonesia government revenues, by source, billions rupiah, 2012-2014**

| | Source of revenues | 2012 | 2013 | 2014 |
|---|---|---|---|---|
| 1 | Tax revenues | | | |
| 2 | Income tax | | | |
| 3 | Oil and gas | 83'461 | 88'747 | 83'890 |
| *4* | *Mining (est)* | *28'141* | *30'888* | *34'756* |
| 5 | Other | 349'801 | 386'807 | 451'221 |
| 6 | Total income tax | 461'403 | 506'442 | 569'867 |
| 7 | Trade taxes | 49'656 | 47'456 | 56'280 |
| 8 | Other taxes | 8'056 | 16'966 | 50'093 |
| 9 | Total tax revenues | 980'518 | 1'077'306 | 1'246'107 |
| 10 | Non-tax revenues | | | |
| 11 | Oil | 144'717 | 135'329 | 154'750 |
| 12 | Natural gas | 61'106 | 68'300 | 56'918 |
| *13* | *Mining* | *15'877* | *18'621* | *23'600* |
| 14 | Forestry | 3'188 | 3'060 | 5'017 |
| 15 | Other | 126'917 | 129'442 | 146'661 |
| 16 | Total non-tax revenues | 351'805 | 354'752 | 386'946 |
| 17 | Grant | 5'787 | 6'833 | 2'325 |
| 18 | Total revenues | 1'338'110 | 1'438'891 | 1'635'378 |
| *19* | *Total mining revenues (4+13)* | *44'018* | *49'509* | *58'356* |
| *20* | *Mining revenues, share of total (19/18)* | *3.3%* | *3.4%* | *3.6%* |

*Sources: Statistics Indonesia, UNCTAD calculations*

*Notes: - Mining income tax revenues (4) are estimated by applying the proportion of total non-tax revenues derived from mining (13/16) to total income tax (6), that is: (4) = (13/16) * (6)*
*- In this analysis, neither "trade taxes" nor "other taxes" are included in total mining revenues (19)*

This section estimated the costs of the Indonesian government's "wager" in pursuing its ban on exports of nickel ore. They are summarized in Table 5, separating the threshold criteria, such as export value, jobs and government revenues, from the transformative ones, such as value addition and the nickel extraction rate. This "wager" will be compared with the "payoff" – the early outcomes of the ban – at the end of the next section.

**Table 5 - Summary of "The Wager," or the estimated costs of the nickel export ban**

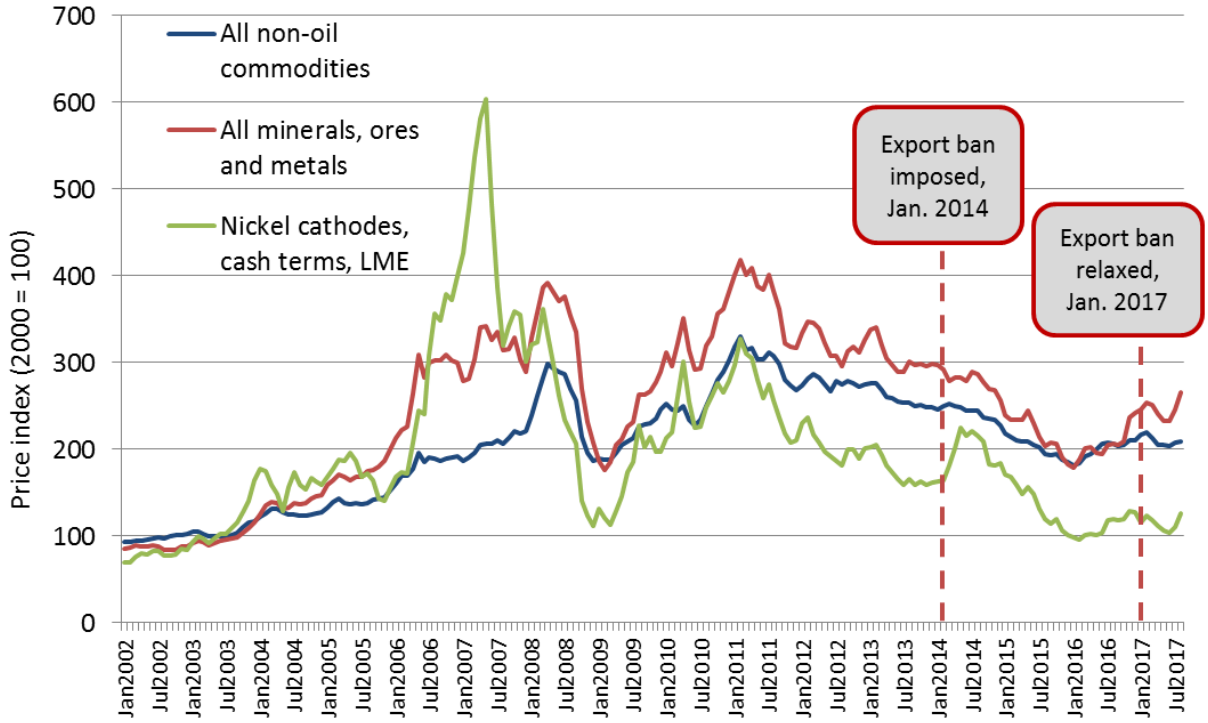
| | | The Wager |
|---|---|---|
| **Criteria** | **Unit** | **(losses as a result of the ban, in 2014)** |
| *Threshold* | | |
| Total nickel export value | USD / year | 4.5 billion |
| Employment | Jobs | 30,000 mining jobs |
| Government revenues | USD / year | 270 million |
| *Transformative* | | |
| Nickel extraction rate | MT / year | 71 million+ |
| Value addition | USD / year | Nil |
| Base year for calculations | | 2013 |

## 4. The Payoff – Increases in nickel smelting capacity

As a result of the ban, Indonesian nickel ore exports fell from 64.8 million MT in 2013 to just 4.1 million MT in 2014,[33] representing exports from those few firms that obtained ore export licences in return for undertaking smelter projects. There are no clear data on the post-ban fate of the many small, direct-export nickel mines that could not afford to build smelters to obtain an export licence. But there is anecdotal evidence that many suspended their operations and laid off their employees.[34]

Although the export ban did not have any price-related objectives, it contributed to a brief, sharp rise in international nickel prices in the first half of 2014. Figure 12 shows that the international nickel price index (2000 = 100) rose from 161 in December 2013, on the eve of the ban, to 220.5 in July 2014, before falling steadily, in line with price trends in the wider metals group and all non-oil commodities.

**Figure 12 - International nickel price, monthly average, January 2002 – July 2017**




*Source: UNCTADStat*

Along with Indonesian mines, Chinese NPI processors have suffered from the ban. With Indonesian ore removed from the international market as of January 2014, Chinese importers turned to Philippine supply. But Philippine nickel ore is of a lower grade than Indonesian ore: too low, in fact, for the minimum levels required by NPI processing units. Chinese processors therefore mixed the lower-grade Philippine ore with stockpiled Indonesian ore to raise its purity to the minimum required levels, until these reserves were exhausted in late 2015.[35]

The outcome of the nickel export ban is still in the balance. Early progress on smelter production was promising for the Indonesian government. The country's third nickel smelter PT Indoferro, owned by

[33] Statistics Indonesia.

[34] See footnote 31.

[35] INSG, Norilsk Nickel.

the Indonesian Growth Steel Group, began operations in Cilegon (Indonesia's "Steel City") in 2013, before the nickel ore export ban. After the ban, a fourth smelter, PT Cahaya Modern Metal Industri, also with Indonesian ownership, began operations in 2014. And a fifth smelter, PT Sulawesi Mining Investment, controlled by the Tsingshan Steel Group from China, began operations in late 2015.

This early progress stalled as of mid-2014, when nickel prices began their steady decline, settling below USD 9,000 by late 2015. Falling prices reduce a smelter's expected profitability in the near term, but their key consequence has been to limit the amount of project financing and working capital credit that lenders are willing to extend to miners' smelter projects. In this difficult investment climate, the Russian nickel producer Norilsk estimates that only one of the approximately 30 nickel smelter projects registered with the government are likely to be completed. Table 6 summarises the three recently completed smelters and the outstanding projects, according to their likelihood of completion.

**Table 6 – Indonesia nickel smelter projects, as of January 2016**

| Project name | Location | Major shareholders | Product | Capacity (TNi) | Jobs created (est) | Status | Probability of completion | Start year of operations |
|---|---|---|---|---|---|---|---|---|
| PT Indoferro | Cilegon, Banten | Growth Steel Group (IDN) | NPI | 12'000 | 2'000 | Operational | | 2013 |
| PT Cahaya Modern Metal Industri | Konawe, Southeast Sulawesi | PT Modern Light Metal Industries (IDN) | NPI | 3'000 | 500 | Operational | | 2014 |
| PT Sulawesi Mining Investment | Morowali, Central Sulawesi | Star Group Eight (CHN), Tsingshan Steel Group (CHN), PT Bintang Delapan (IDN) | NPI | 30'000 | 5'000 | Operational | | 2016 |
| PT Sulawesi Mining Investment (expansion) | Morowali, Central Sulawesi | Star Group Eight (CHN), Tsingshan Steel Group (CHN), PT Bintang Delapan (IDN) | NPI | 60'000 | 10'000 | Under construction | High | 2017 (est) |
| Virtue Dragon Nickel Industry | Konawe, Southeast Sulawesi | Virtue Dragon Nickel Industry (CHN) | Ferronickel | 18'000 | 3'000 | Under construction | Medium | 2016 (est) |
| PT Huadi Nickel-Alloy Indonesia | Bantaeng, South Sulawesi | Shanghai Huadi Industrial Co. (CHN), PT Duta Nikel Sulawesi (IDN) | Ferronickel | 50'000 | 8'000 | Under construction | Medium | 2017 (est) |
| 7 projects | Various | | | | | Under construction | Low | 2016-2018 (est) |

*Sources:* *Norilsk Nickel, Energy and Mineral Resources Ministry (EMRM), Indonesia Investment Coordinating Board (BKPM), press reports, UNCTAD calculations*

*Notes:* *CHN China*
*IDN Indonesia*

As Table 6 shows, Indonesia had three new smelters operating as of the beginning of 2016, adding 45,000 TNi of smelting capacity and an estimated 7,500 jobs. All three smelters produce nickel pig iron (NPI) for export to Chinese stainless steel producers. The three new smelters represent an increase of almost 50 per cent from Indonesia's installed smelting capacity of 100,000 MT on the eve of the January 2014 export ban.

Assuming that only the Tsingshan Steel-owned PT Sulawesi Mining Investment expansion will be completed in the current investment climate, Indonesia's export ban will result in the construction of an estimated total of 100,000 TNi of new nickel smelting capacity by 2020, doubling the country's total capacity to 200,000 TNi.[36] This total smelting capacity would consume approximately 12.4 million MT of ore feedstock. Under the ban, this would eventually constitute Indonesia's total nickel ore extraction rate, or an 84 per cent reduction from the 71 million MT of ore extracted in 2013.

The new smelters would also create an estimated 17,500 manufacturing-type jobs, which can be seen to replace the 30,000 mining jobs lost as a result of the export ban. No recent empirical studies exist on the characteristics of these two types of jobs in Indonesia. But a recent study of Canadian extractive industries by Dubé and Polèse (2015) found that, over time, the number of jobs in extractive sectors, such as mining, fluctuated according to commodity boom-bust cycles. Meanwhile, jobs in transformation sectors, including smelting, declined in a stepwise fashion over time, as new technologies prompted improvements in labour productivity.[37] This suggests that, in Indonesia's case, 17,500 new smelting jobs will be more stable than the 30,000 mining jobs they replaced.

With respect to technology transfer, the construction of new smelters and NPI plants adds little to Indonesian know-how. Pyrometallurgical smelting processes have not changed materially since the construction of Indonesia's two existing smelters in the 1970s. NPI processes are relatively new, but are no more advanced. Moreover, they are compatible only with Chinese stainless steel processes. Consequently, neither smelters nor NPI plants will bring material technological improvements to Indonesia's capital stock. Technology transfer will likely be limited to the improvements in human capital, in the form of training and on-the-job learning for the estimated 17,500 workers at the new smelters.

Most importantly for the Indonesian government, a total capacity of 200,000 TNi would significantly increase the country's share of value added to its nickel resource. In 2013, Indonesia captured only USD 1.1 billion, or eight per cent of the USD 14.1 billion of value added[38] to the 834,000 TNi of nickel ore it produced that year. To illustrate the value added effect of the 2014 export ban, Table 7 compares the 2013 baseline with the implied production volume, export value and value added of the estimated 2020 smelting capacity. The table also calculates the same values at average 2015 prices.

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[36] For comparison, in early 2014, Wood Mackenzie (2014) forecast that the export ban could yield the construction of 200,000 TNi of new nickel smelting capacity in Indonesia by end-2016. Meanwhile, in its "World Directory of Nickel Production Facilities – 2014," INSG estimated that the export ban could yield 91,000 TNi in new capacity.

[37] Dubé and Polèse (2015) also found that wage differentials were fluid between extractive and transformation jobs in Canada, as wages evolved according to wider labour market fundamentals. In addition, they found that growth in transformation jobs in a community had a negative effect on its number of college or university degree-holders – mining jobs had no effect in this respect. Given the considerable differences between Canada's and Indonesia's labour markets and educational attainment levels, it is unlikely that these two findings apply to the comparison between mining and smelting jobs in Indonesia.

[38] Value added = nickel value (TNi * nickel price) less ore value (MT * ore price).

**Table 7 - Estimated domestic value added of new smelting capacity**

| | Unit | 2013 | 2020 (est) at 2013 prices | 2020 (est) at 2015 prices |
|---|---|---|---|---|
| Total ore production | MT | 71'014'040 | 12'422'360 | |
| Average grade | %Ni | 1.61% | | |
| Direct export, raw ore | | | | |
| Volume | MT | 64'802'860 | 0 | |
| Price | USD/MT | 70 | | |
| Export value | USD | 4'536'200'200 | 0 | |
| Nickel metal | | | | |
| Ore feedstock | MT | 6'211'180 | 12'422'360 | |
| Smelting capacity (matte, FeNi) | TNi | 100'000 | 200'000 | |
| Avg annual price | USD/TNi | 15'018 | 15'018 | 11'831 |
| Export value | USD | 1'501'800'000 | 3'003'600'000 | 2'366'248'333 |
| Total export value | USD | 6'038'000'200 | 3'003'600'000 | 2'366'248'333 |
| **Domestic value added** | **USD** | **1'067'017'391** | **2'134'034'783** | **1'496'683'116** |

*Sources: Statistics Indonesia (production, trade), Metal Bulletin (ore price), UNCTADStat (nickel price), Dalvi et al. (2004) (grade), UNCTAD calculations*

*Notes: Value added = nickel value (TNi * nickel price) less ore value (MT * ore price)*
*Price Nickel cathodes, min. 99.8% purity, USD cash terms, London Metal Exchange*

Since the three new smelters only began operations recently, they are still ramping up production, so have yet to produce at full capacity. As a result, no reliable data exists to estimate their contributions to government revenues and to project the potential contribution of the Tsingshan smelter expansion. For our analysis of the "payoff" of the export ban, therefore, the effect on government revenues remains to be determined as the new smelter projects approach full capacity.

Should the 2020 scenario depicted in Table 7 materialise, the Indonesian government would likely count its export ban gamble as a net success, as its wager will have paid off with respect to its two transformative objectives: doubling nickel value addition activities by 2020, while drastically reducing the extraction rate of its nickel resources.

**Table 8 - Comparison of the "wager" and "payoff" of the Indonesian nickel export ban**

| Criteria | Unit | The Wager (losses as a result of the ban, in 2014) | The Payoff (gains as a result of the ban, by 2020) |
|---|---|---|---|
| *Threshold* | | | |
| Total nickel export value | USD / year | 4.5 billion | 2.4 billion |
| Employment | Jobs | 30,000 mining jobs | 17,500 smelting jobs |
| Government revenues | USD / year | 270 million | unknown |
| *Transformative* | | | |
| Nickel extraction rate | MT / year | 71 million+ | 12 million |
| Value addition | USD / year | Nil | 2.4 billion |
| Base year for calculations | | 2013 | 2015 |

For investors, the picture was less appealing. Prior to the ban, processors avoided building smelters in Indonesia because operating costs there were higher there than in China, and nickel smelting itself was not particularly profitable. After the ban, processors and steel companies were compelled to build smelters in Indonesia, but the plants themselves will almost certainly be unprofitable until nickel prices rebound. Table 9 illustrates the difficult economics facing nickel smelters at the time of writing: they are likely to fall well short of covering operating costs, let alone overhead.

**Table 9 - Implied margins of laterite ferronickel smelters**

| Measure | Year | USD/TNi |
|---|---|---|
| Average C1 cost | 2014 | 16'000 |
| Average C3 cost | 2014 | 18'500 |
| Average price | 2015 | 11'831 |
| Implied operating margin (M1) | | (4'169) |
| Implied financial margin (M3) | | (6'669) |

*Sources: Wood Mackenzie (costs), UNCTADStat (price)*

*Notes: Excludes NPI plants*

| | |
|---|---|
| *Price* | *Nickel cathodes, min. 99.8% purity, USD cash terms, London Metal Exchange* |
| *C1* | *Cash cost to mine, process and deliver nickel to market, less byproduct credits* |
| *C3* | *The sum of C1 plus depreciation, depletion and amortisation (C2) and indirect and interest costs (C3)* |
| *M1* | *Price – C1* |
| *M3* | *Price – C3* |

The wide current gap between the international nickel price and the costs of operating a laterite nickel smelter is unsustainable, offering no incentive to producers. Historically, the price has dipped below operating costs for only brief periods, so it is reasonable to expect this incentive re-establish itself over the coming years. For example, since smelters are power-intensive, the steady fall in energy prices since 2015 will ease operating costs.

Nevertheless, the new Indonesian nickel smelters will be on the high end of the global cost curve, so will endure some difficult economics during their first years of operation. That the Indonesian export ban forced stainless steel companies to absorb and justify these losses was a further testament to the non-substitutability of Indonesian laterite nickel ore in their supply chains.

## 5. Conclusion and policy implications

The Indonesian government undertook an ambitious gamble: it banned nickel ore exports to compel mining companies and processors to build smelters in Indonesia. In so doing, it wagered its position as the world's leading exporter of nickel ore and, in particular, as the chief ore supplier to China's nickel pig iron (NPI) industry. The gamble paid off, in that the durable benefits of the ban - in value addition and jobs, for example - outweighed their opportunity costs.

This paper situated Indonesia's mineral export ban within the significant increase in the incidence of export restrictions during the recent commodities supercycle and in particular as of 2009. Although Indonesia's ban fits within this general trend for export restrictions, it is nonetheless a rare example of a quantitative export restriction. According to the OECD, of the 371 restrictions in force in 2012 on the export of minerals and metals, the vast majority were either export taxes or domestic measures. By contrast, there were only 20 partial quantitative measures, such as quotas, and only three comprehensive bans like the one Indonesia has undertaken.

The riskiness of Indonesia's mineral export ban gamble was underlined by the mixed results of the many export restrictions implemented during the recent commodities supercycle. Prominent examples include: the export bans that contributed to the 2007-2008 rice price crisis; China's various restrictions on the export of rare earth metals that were successfully disputed in the WTO; the

impending cancellation of the USA's crude oil export ban; and the Democratic Republic of the Congo's still-stalled ban on export of mineral concentrates.

As for its domestic context, the interventionist posture of the mineral export ban appeared to balance contemporary political currents in Indonesia, including resurgent resource nationalism and a new "localism" current that has driven the significant political decentralisation in the post-Suharto era. In addition to these political currents, corruption remained a major challenge to the continued development of Indonesia's resource sectors, which depend on foreign investment.

From this domestic context, the 2014 mineral export ban implemented one of several resource-nationalist policies contained in Indonesia's 2009 Mining Law, which was the basis for the sector's current legal framework. As with these other policies, the export ban was interventionist in approach and drew clear inspiration from Article 33.3 of Indonesia's 1945 constitution, which states: "The land, the waters and the natural resources within shall be under the powers of the State and shall be used to the greatest benefit of the people."

Crucially for its implementation in the nickel sector, the resource-nationalist tone of the export ban was limited to pursuing greater returns for Indonesians from their mineral resources, and did not discriminate against foreign investors in this pursuit. For example, the ban did not challenge the sector's two established nickel metal producers – PT Vale and PT Antam – and it welcomed Chinese steel producers as the main foreign investors in new smelter projects. At least for nickel, this meant the export ban avoided challenging the domestic status quo and provoking a dispute in the WTO.

As for the likelihood of the export ban's success for nickel, nine smelters were built by mid-2017. Low nickel prices, which fell steadily from mid-2014, caused delays and cancellation among the remaining nickel smelter projects, meaning few, if any of them are likely to be operational before 2018. Assuming that the nine new smelters are the only projects likely to be realised, Indonesia would have added at least 100,000 TNi of nickel smelting capacity by 2020 as a result of the export ban, increasing its total capacity to 200,000 TNi. This doubling of value addition in the nickel sector would create an estimated 17,500 manufacturing-type jobs at the new smelters. Moreover, the ban quelled the runaway rate of nickel extraction, from 71 million MT of ore in 2013 to an estimated 12.4 million MT per year by 2020, once the new smelters reach full capacity.

In terms of environmental impacts, a lower nickel extraction rate reduced – but did not eliminate – the role of nickel mining in deforestation. On the other hand, the new smelters built as a result of the export ban will produce additional waste, in the form of tailings and slag, as well as air and water pollution. The net environmental effect of the nickel export ban is therefore mixed.

If these early outcomes of the nickel export ban prove durable, the Indonesian government will likely consider its gamble a net success, despite the costs.

Investors will likely remain more circumspect about the outcome of the export ban. Many of them are Chinese NPI processors or steel companies whose supply chains were jeopardised by the Indonesian export ban. At current average cost and price levels, new smelters in Indonesia face considerable operating losses until margins improve and an economic incentive for new smelter projects is restored.

For commodity-dependent developing countries (CDDCs) considering more interventionist trade policy to drive their commodity-led development strategies, the Indonesian nickel export ban is unlikely to be a realistic model. Its preliminary success is due, as much as anything, to the non-

substitutability of Indonesian laterite nickel ore in the NPI process. For a counter-example to the nickel export ban's preliminary success, one need only look at its stalemated twin, the ban on bauxite ore exports. With ready substitutes to Indonesian bauxite, aluminium refiners shifted to sourcing it from neighbouring countries, which were the net beneficiaries of Indonesia's bauxite export ban. From this perspective, the lesson from the Indonesian experience is for CDDCs to avoid a comprehensive export ban on commodities with ready substitutes in the marketplace.

Moreover, the Indonesian government likely chose nickel and bauxite for its export ban gamble, in part, because these two minerals represent a relatively small share of its economy. The government may even see this first round of the export ban as a trial, before undertaking a similar exercise in more economically important and politically challenging mineral sectors, such as copper. For CDDCs whose main commodity exports represent a strategic share of their economy, copying Indonesia's export ban gamble would be considerably riskier.

More recently, the Indonesian government decided to relax the ban in early 2017 after its revenues plunged, due partly to the generalized crash in commodities prices from mid-2014 to mid-2016. This is a further warning to CDDCs that interventionist trade policies are only feasible when prices are strong enough to compensate for such policies' significant opportunity costs.

## 6. Topics for further study

This paper focussed on the domestic economic outcomes of Indonesia's 2014 nickel export ban. This policy, as one of the many significant reforms contained in the 2009 Mining Law, had far-reaching potential consequences, outside of what this paper was able to consider. The following topics for further study emerged from this paper's analysis.

- ***Political economy:*** Regionalism and localism are among the most important political currents in the current Indonesian political economy. In this paper, we touched briefly on the increased role of local governments in licencing and taxing new mining developments. But on this important topic, it is worth a more detailed study of the economic consequences of Law 4/2009 on regionalism and localism in Indonesia.
- ***Environmental management:*** Smelting laterite nickel, especially from progressively lower grades of ore, produces important volumes of waste in the form of slag and tailings, as well as water and air pollution. Given the weakness of environmental regulation in Indonesia, the relative lack of infrastructure and the remoteness of nickel mining areas, what is the potential environmental impact of the new laterite nickel smelters commissioned in response to the export ban?
- ***Vertical integration:*** The nickel export ban could represent a long-term, strategic opportunity to integrate and revitalise Indonesia's steel value chain. Although Indonesia's share of the commercial steel market has dwindled in competition with Chinese producers, stainless steel represents a promising opportunity, in particular to integrate with Indonesia's large and growing automotive sector. Nevertheless, NPI plants are most numerous among the new smelters in Indonesia, making them incompatible with the country's existing steel kilns.
- ***The Chinese NPI sector:*** The spectacular growth of China's NPI sector since its commercialisation in 2007 is one of the most important recent developments in the nickel and stainless steel markets. The sector in China is still in its growth phase, having recently converted the majority of capacity to a new, more efficient technology, rotary kiln electric furnaces (RKEFs), which produce

a higher-grade NPI product (10-15% Ni) at a lower cost. Engineered largely on the characteristics of Indonesian laterite nickel ore, a large number of these NPI plants will be forced to close as a result of the Indonesian nickel ore export ban. What impact, then, on the Chinese NPI and steel sectors? And how will that impact world nickel and stainless steel markets?

- ***Clustering:*** Nickel smelting is a high-cost, low-margin activity. Existing processors therefore chose to build their plants in locations that offer cost advantages, such as a captive source of hydroelectric power or brownfield equipment to reuse (Dalvi, Bacon, and Osborne 2004). Particularly in Indonesia, this has meant building smelters that are dependent on large mines, to benefit from a captive supply of ore. In contrast to this model, several local governments in Sulawesi proposed that investors build clusters of commercial smelters, i.e. not owned by or dependent on a single mine and situated in dedicated industrial parks. Will the potential advantages of this model, such as the economies of agglomeration, compensate for the increased operating cost of buying ore on the market? Will the government be able to provide the public services, infrastructure and environmental management necessary to support this cluster model of nickel smelting?

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## Appendix

### Indonesian direct-export nickel strip mining operations

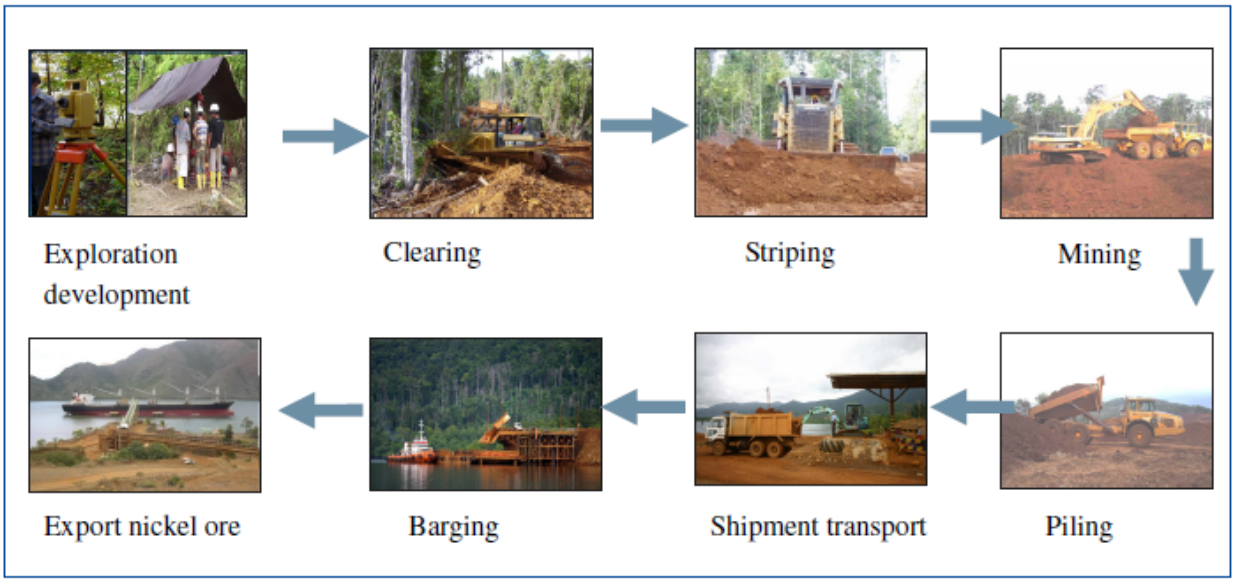
This paper identified the primary target of Indonesia's 2014 nickel ore export ban as the approximately 50 small-scale strip-mining operations that sprang up to satisfy the rapid post-2007 growth in demand from Chinese nickel pig iron (NPI) producers for raw nickel ore. According to the 2014 ban, direct exports of raw nickel ore are prohibited and export licences are only awarded to mine owners that undertake the construction of a smelter. Few, if any, of these direct-export strip mines operations were positioned to invest in a smelter, so they will presumably all disappear if the ban remains in force, if they have not disappeared already.

The following text and graphic were prepared by Shanghai Metals Market and are reprinted from INSG (2013, 10) to illustrate the activities of Indonesia's pre-2014 direct-export nickel strip mines.

"The deposits currently being exploited in the region are often small scale and use simple technology. Prospecting and exploration for laterite nickel ore in Southeast Asia are often conducted through exploratory trench, shallow well, and shallow drilling operations as the ore bodies are close to the surface. The nature of these ore bodies allows for rapid exploration and low prospecting cost. Large-scale strip mining using heavy excavating and transport equipment is suitable for exploitation. Ore is stockpiled, and then moved by barge to ocean going vessels for export.

Here is an of a typical laterite project in the region as things stand now. The diagram below provides an illustration of a typical work flow for laterite deposits in Southeast Asia."

**Nickel Ore Business Work Flow (currently)**




*Sources: Shanghai Metals Market (SMM) and International Nickel Study Group (INSG).*