Aluminum – Commodity Forecast – 2017-2018

9/06/2017

Aluminum ingots waiting to be transported in the port of Rotterdam

Contents

1. Introduction

This document provides recent and up-to-date information on factors affecting the price of aluminum on the global market, examines production, demand, trade and trade policy as well as competitiveness factors and gives an idea on what we can expect for the Q4 of 2017 and beyond.

Aluminum has been lately at the center of the U.S. policy. The U.S. filed a complaint with the WTO (World Trade Organization) accusing Chinese subsidies to domestic aluminum producers of suppressing global prices of the metal. It was followed by an investigation on the impact of imported aluminum (and steel) as a national security threat. The initiative, has the potential to translate into quotas or tariffs, or both, for imported aluminum which will impact negatively many U.S. industries that have nothing to do with national security. The frontrunners being automotive, the industrial machinery manufacturing, construction, and packaging industries.

The aluminum prices decreased significantly in 2016 but started to rise in the recent months. The source of the problem: Chinese overcapacity. The Chinese government has been struggling since last year, somewhat unsuccessfully, to reduce smelter capacity. The central government's decision to crack down on overcapacity and polluting smelters saw opposition at local government level where maintaining employment rates and tax revenue was the priority. And, objectively, aluminum inventories in China rose more than 4 times YTD.

2. Market Overview and Structure

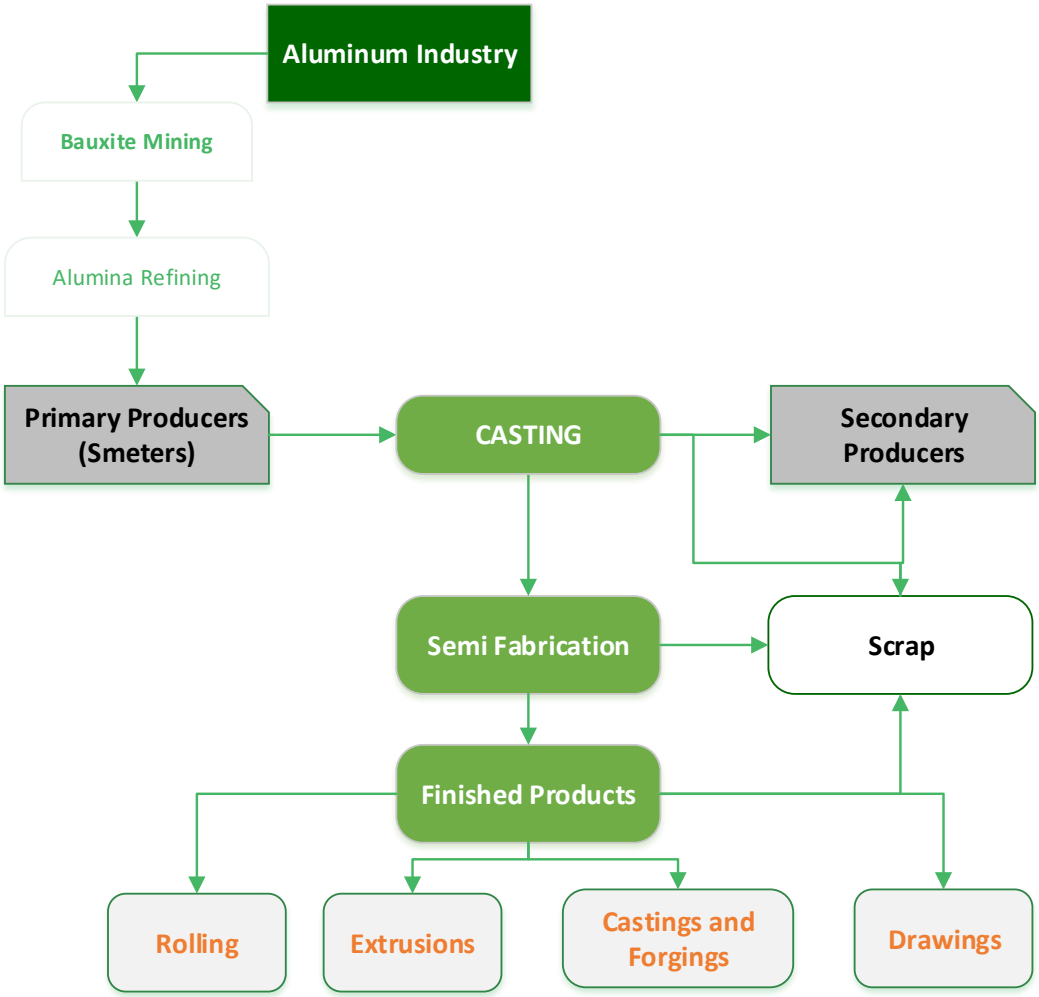
The global aluminum industry is divided into 2 major segments—primary and secondary unwrought aluminum (upstream production), and wrought aluminum (downstream production yielding semi-finished products). Traditional players on the market such as the U.S. and Germany have lost their competitive position to Canada, Norway, Russia and, more importantly, China due to high cost of energy, lack of investment in new technologies, and overall high production costs.

Upstream production process involves bauxite mining, refining into alumina, and smelting. Resulting from this process are: millets, ingots, wire rods, slabs, and cc strips. It is capital intensive, has high fixed costs, and production cycles around the clock. It is the commodity business of aluminum production and consequently has the higher exposure to the price of aluminum. Consuming a lot of energy, the upstream

production is very sensitive to electricity and labor costs. This sensitivity can be noticed in the zoom in section of the Evolution of Aluminum Prices Graph on page 10.

The downstream production yields semi-finished products: rolled, extruded or drawn. Most of these products are still considered commodities, but some value-added goods and highly engineered are not uncommon especially in transport (automotive, aerospace, rail, maritime).

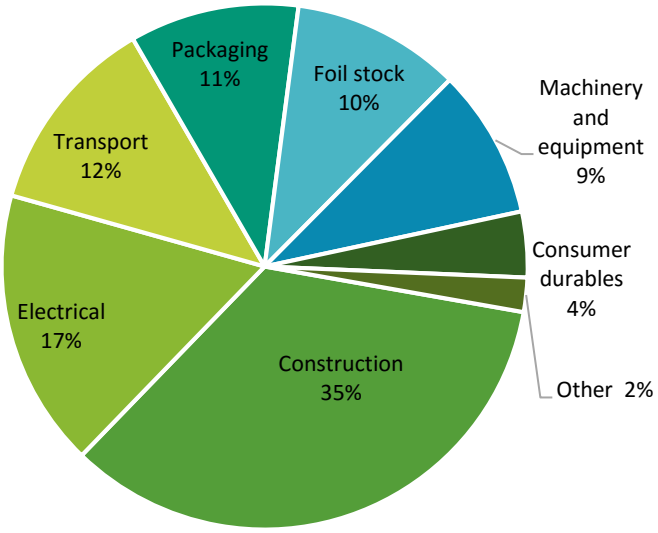
Structure of the Aluminum Industry
Source: Aluminum Association



Demand for aluminum comes largely from:

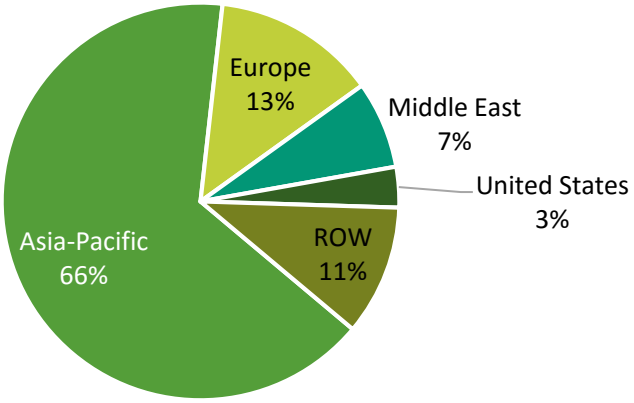
- Construction (window frames, AC, doors, frames, sidings, roofing etc.);
- Electrical industry (wire cables, components of electric equipment and machinery),
- Transportation: motor vehicles and aircrafts (parts and body), railway (freight cars, rails), maritime and shipping (ships and shipping containers;
- Machinery and equipment (appliances, electronics etc.);
- Food packaging containers (aluminum foil).

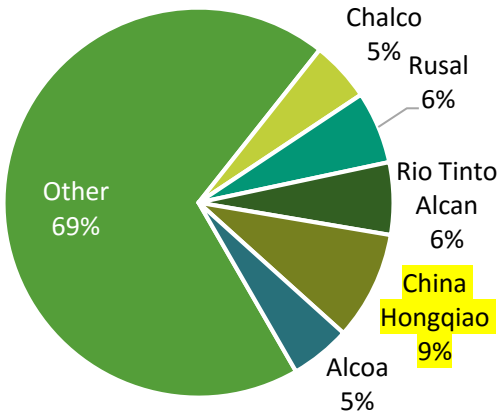
World consumption of aluminum wrought products by major end-use sectors, 2015
Source: USITC



The aluminum industry is dominated by cheap imports from the Asia-Pacific, that drive aluminum prices down and force other producers to reduce their output. And many see it as unfair competition. Asia-Pacific accounts for 65.6% of the global aluminum industry value. Chinese company Hongqiao is the leading player with a whopping 9.1% market share.

Global Aluminum Production in 2015 by Geography and Main Players
Source: Marketline (left); Bloomberg (right)





Downstream production of aluminum remains very competitive on the global market (China still comes in as a close second). The key factor is the proximity to the robust North American transportation and packaging end-use markets. U.S. primary aluminum producers are handicapped by high electricity costs (highest among top players) and lack of investment in new, more efficient technologies.

Worldwide production of primary aluminum totaled about 58 million metric tons in 2015, about 1.6 million metric tons of which was produced in the U.S. The largest aluminum producers are China, Russia, and Canada.

3. Trade Policy and Trade Balance

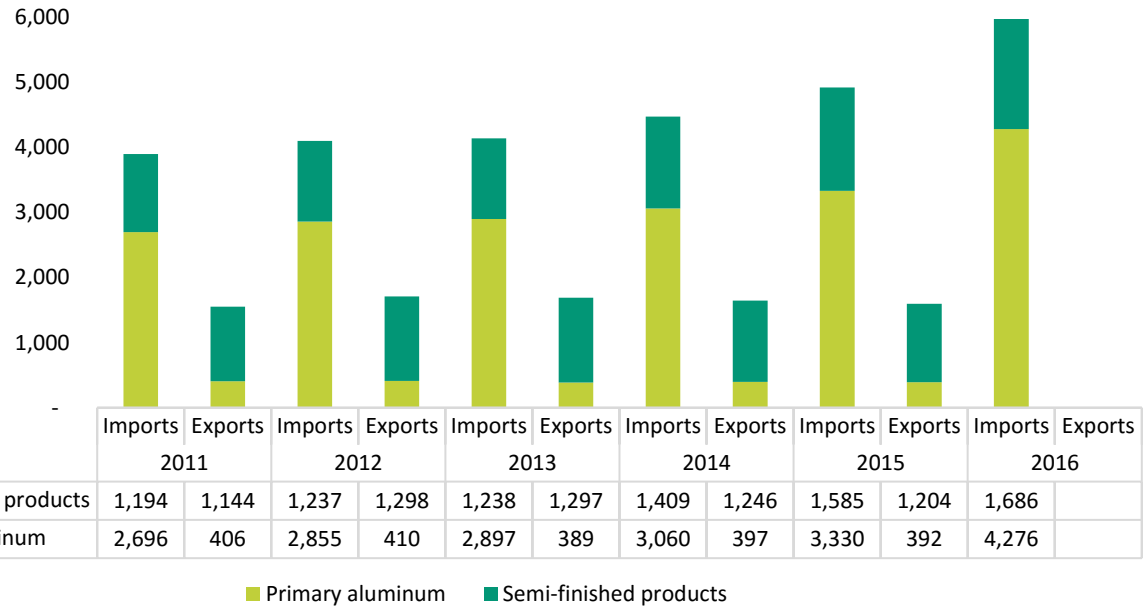
	Import	Exports
Primary Aluminum	Over 50% of the global primary aluminum exports were sent to five importing countries: U.S., Japan, Germany, the Netherlands, and South Korea. U.S., Japan, and Germany, are countries with established wrought aluminum industries and large end-use markets.	Six countries accounted for 50% of the global primary aluminum exports: Russia, Canada, Netherlands, GCC countries1, Australia, and Norway, all countries with limited domestic markets and low internal demand for semi-finished aluminum products. China's exports of primary aluminum are insignificant compared to its domestic production, because of the export tariffs in place.
Semi-finished aluminum products	Despite Germany and U.S. owning a 21% share of global imports, the remaining share of imports is evenly distributed among the top importing countries (UK, France, Canada, Mexico, Netherlands, Saudi Arabia, Italy and China).	China leads however in the exports of semi-finished products followed by Germany and the U.S. and together accounted for over 40% of the global exports in 2015.

[1] Gulf Cooperation Council (**GCC**) member states: The United Arab Emirates, Bahrain, Saudi Arabia, Oman, Qatar and Kuwait, and in 2009, Yemen joined the Organization, which is headquartered at Doha, Qatar.

Imports make up about 30% of the U.S aluminum market. Canada is the largest supplier to the U.S., followed by China, Russia, and the United Arab Emirates. Aluminum exports, mainly to Canada and Mexico, account for about 20% of U.S. production.

Aluminum has been at the center of the U.S. presidential office concerns since In January 2017, when the U.S. filed a complaint with the WTO (World Trade Organization) accusing Chinese subsidies to domestic aluminum producers of suppressing global prices of the metal. Subsequently, in April 2017, the administration opened an investigation under Section 232 of the Trade Expansion Act of 1962 on the impact of imported aluminum (and steel) as a national security threat[2]. The initiative, has the potential to translate in quotas or tariffs, or both, for imported aluminum which will impact negatively many U.S. industries that have nothing to do with national security. Moreover, yet unrelated to the first issue, an investigation into the practices of Chinese aluminum foil producers identified up to 81% state subsidies (Bloomberg). Following the results of this investigation. U.S. Secretary of Commerce Wilbur Ross said it would seek to impose duties on imports of aluminum foil from China.

2011-2015 U.S. primary aluminum vs. semi-finished aluminum products imports and exports.
Source: USITC



	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
	2011		2012		2013		2014		2015		2016	
Semi-finished products	1,194	1,144	1,237	1,298	1,238	1,297	1,409	1,246	1,585	1,204	1,686	
Primary aluminum	2,696	406	2,855	410	2,897	389	3,060	397	3,330	392	4,276	

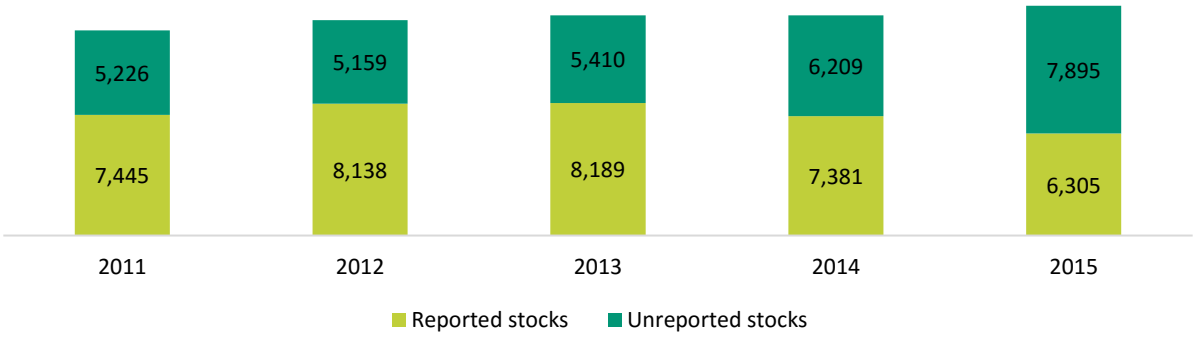
[2] Since the introduction of section 232 of the Trade Expansion Act, there have been 26 investigations with only two leading to import restrictions. Both referred to crude oil imported, the first from Iran, the second from Libya (Bloomberg). More recently, in 2001, the Department of Commerce investigated iron ore and semi-finished steel but ruled that the imports were not posing a threat to national security.

4. Prices

Between 2011-2015, the price of aluminum on the global markets saw a drop of about 30% mainly because of:

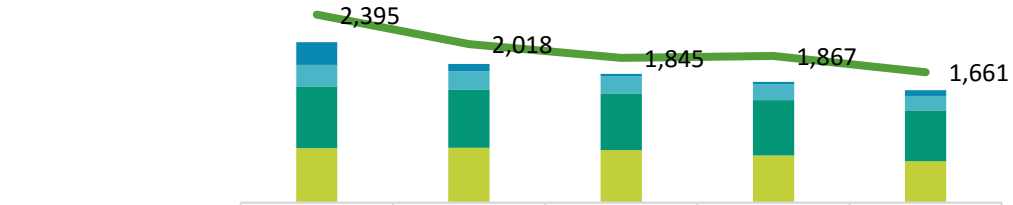
1. **Growth of inventories and stocks** (reported and unreported). Estimates of China's share of global stocks in 2015 were between 18% and 30% between 9% to 15% more respectively compared to 2011. Some analysts, however, suggest that much of the expanded Chinese production was consumed domestically, and that the its share is relatively small to its share of global production (30% stock share compared to almost 60% production share). They consider Russia to be the main driver behind the increased stocks (USITC).

Primary aluminum stocks 2011–2015
Source: USITC



2. **Reduction of production costs** mainly because of access to cheap energy (which represents about 40% of the production costs) and increased investment in new technologies. (USITC) The figure below shows a 30% reduction in the production prices which is correlated with a 30% drop in the price in the same period (2011-2015). Three elements of the production price structure have registered a significant decline in the 5-year time frame: anodes (-32%), energy (-24%), alumina (-18%). All the top aluminum producers (Canada, Russia, the GCC countries) have access to low cost energy either hydro electrical or fossil. Paradoxically, China's electricity is among the highest in the world, but in counter measure, between 2011 and 2015, China has been investing in advanced technology smelters, coal-based that are more energy efficient.

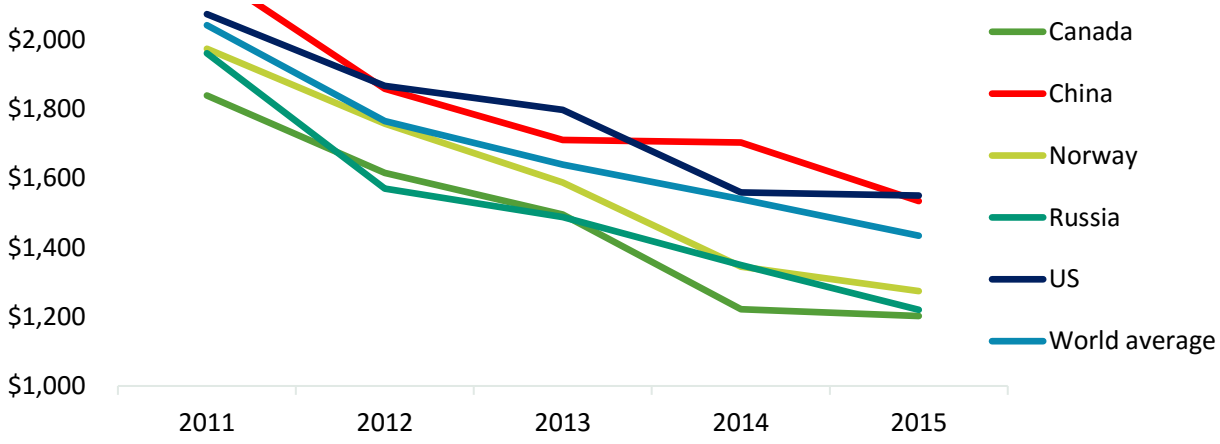
Global evolution of production price structure of primary aluminum 2011-2015 (USD per MT)
Source: USITC



	2011	2012	2013	2014	2015
Other costs	286	92	28	33	75
Anodes cost	274	237	219	200	185
Alumina cost	785	735	722	707	647
Electricity cost	697	701	670	600	527
LME (cash)	2,395	2,018	1,845	1,867	1,661

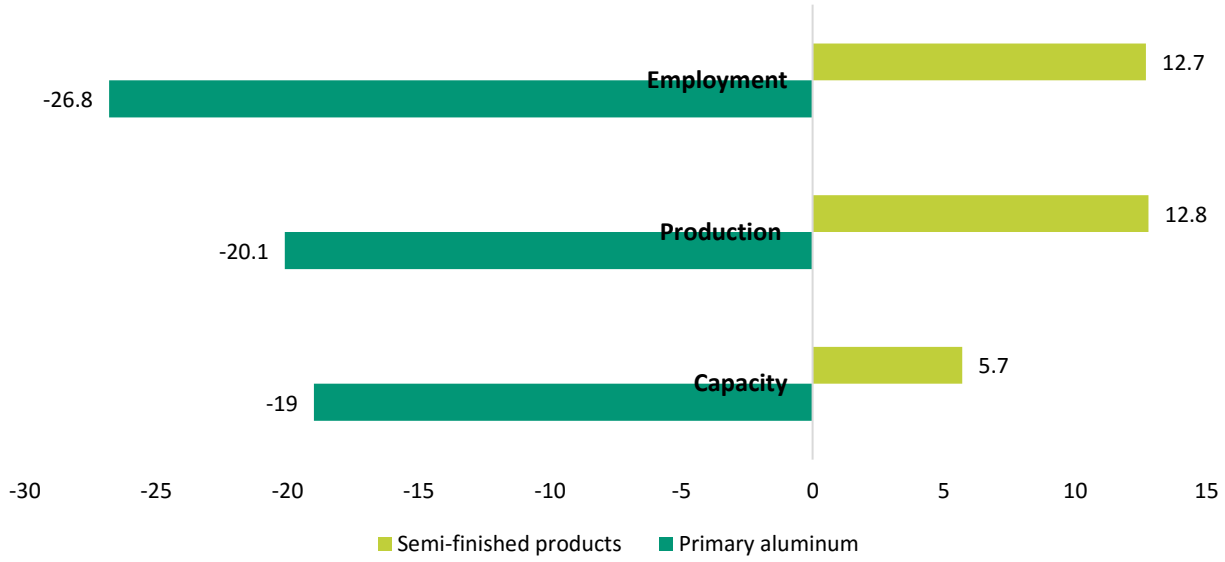
The U.S. reduced primary aluminum capacity by 19% between 2011 and 2015 with an additional 39% in 2016. But despite a 25% reduction in primary aluminum production costs, the U.S. remains one of the world's highest-cost producers. Interesting to note that both the U.S. and China's average business costs of production of primary aluminum are above the World average and they have been in a negative correlation. By comparison, Canada, Norway and Russia (again, countries with access to cheap electricity) have managed to keep the costs low. High electricity costs, lack of investments in new technologies, and constant currency appreciation are all factors at play against the U.S.' competitiveness.

Average business costs of production of primary aluminum, 2011–15 (USD per MT)
Source: USITC



As far as the semi-finished products are concerned, U.S. remains competitive and as a consequence, employment, production and capacity increased.

2011-2015 Change (%) in the U.S. in capacity, production and employment between primary aluminum and semi-finished aluminum products industries
Source: USITC

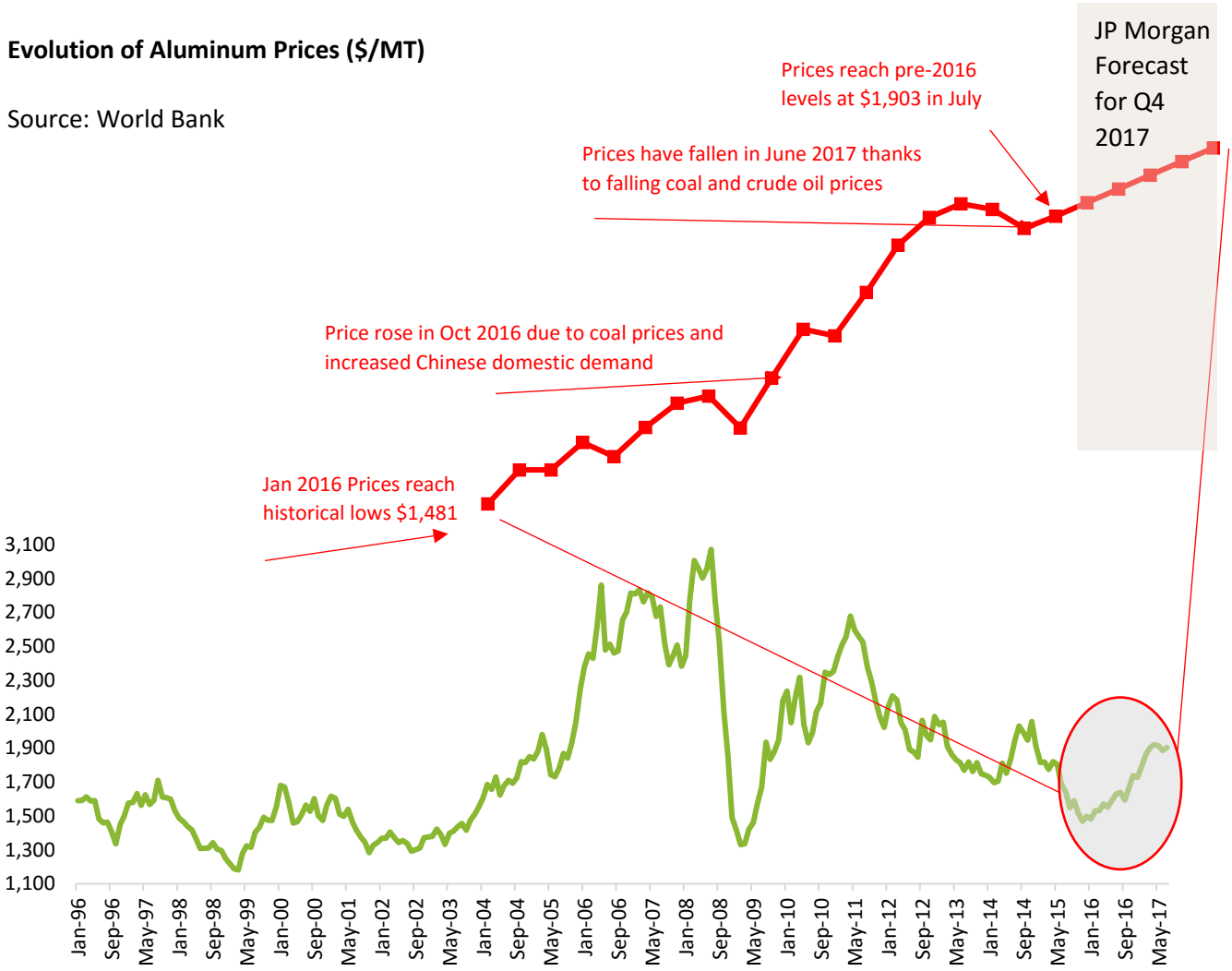


China, on the other hand, expanded its primary aluminum production capacity more than 40% upstream and 90% downstream. The expansion was driven by government intervention (e.g. export tariffs, reduced electricity prices, low-cost financing, rebates on value-added taxes to encourage exports, discounted land use fees) and investments in cost-efficient technologies. All of these concurred to give China an economy of scale and achieve low production costs across the board. The main beneficiaries of these incentives are, however, the state-owned enterprises (SOEs) (USITC).

Aluminum prices have risen significantly in the past months, up 27% on the Shanghai Metal Market and up 23% on the London Metal Exchange, driven by unrealistic concerns over shrinking supply. LME aluminum prices have averaged close to $1,900 per metric ton this year, 17% higher than the 2016 average (Forbes).

Evolution of Aluminum Prices ($/MT)

Source: World Bank



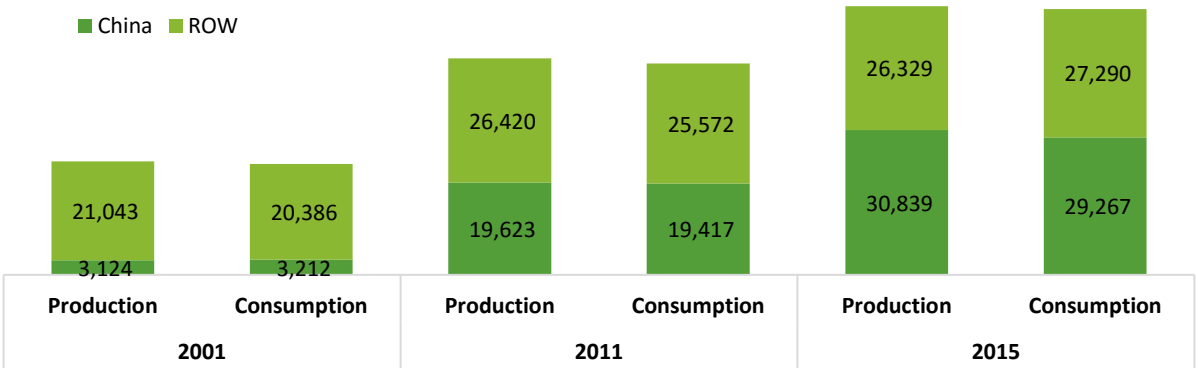
The initiative of the Chinese government to crack down on aluminum smelters that are excessively polluting, if successful, is expected to lead to the closure of around 4 million MT or around 10% of the country's total smelting capacity (Forbes). Considering that China accounts for nearly 60% of global aluminum production, the closure of even 10% of its production capacity stands to significantly affect the demand and supply curves. There remains a lot of skepticism about Beijing's policy of closing "polluting industries" and its ability to do so.

The increase in prices have also been supported by a steady increase in demand of aluminum (and steel) in China where the real estate power network and automotive sectors flourished (Platt's).

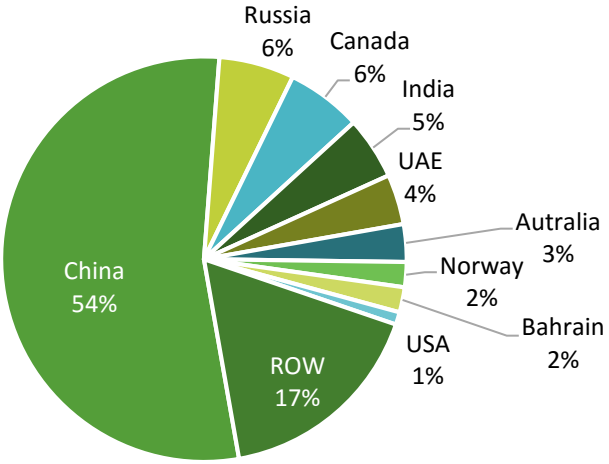
5. Production and Consumption

Consumption trends for primary aluminum follow closely the production trends for semi-finished products, since the latter is the main consumer for the first. Between 2011-2015, consumption of primary aluminum grew globally, including in the more established markets such as the U.S. and Germany (17% and 7% respectively) (USITC). The U.S, Germany, and Japan, the mature markets for semi-finished aluminum products registered a flat line in consumption driven mainly by aerospace and automotive, more engineered products than commodities. The U.S. aluminum production industry includes about 400 companies with combined annual revenue of about $38 billion.

Production and consumption of primary aluminum in China compared to the rest of the world
Source: USITC



World Primary Aluminum Production in 2016
Source: USGS



China's aluminum industry grew at a staggering pace. in the 2001-2015 timeframe both production and consumption of primary and semi-finished aluminum rose almost 10 times in volume. China accounts now for almost 60% of the global aluminum production – mainly serving the domestic market. The primary aluminum industry is dominated by SOEs and has limited foreign participation. Unlike the primary aluminum

industry, the semi-finished aluminum products industry is more fragmented, is where private ownership as well as foreign ownership, is more common.

In a twofold attempt to curve supply and to reduce pollution, the Chinese Government is currently forcing illegally built plants to close and giving an ultimatum to other that don't meet environmental targets. The measures are meant to reduce 3-4 million tons of smelting capacity (Deutsche Bank and Wood Mackenzie) which translates in about 10% of China's overall capacity. The largest aluminum producer, China Hongqiao announced recently that it would cut more than 2 million tons per year of "outdated capacity" but added

Some analysts, suggest that much of the expanded Chinese production was consumed domestically, and that the its share is relatively small to its share of global production. They consider Russia to be the main driver behind the increased stocks (USITC).

that it will be replaced by new capacity (Reuters).

The sudden hike in prices which followed, however, is seen by analysts as purely speculative and does not account for the high inventories and relatively low demand. In fact, stocks of aluminum in Shanghai Futures Exchange warehouses are the highest in four years and some traders expect stockpiles to grow to almost double to 2 million tons by year end.

Details of China smelter closures

Closures, '000tpy	Announced	Implemented	Latest expectation
Jinlian (Jinjiang Group)	50	50	300
Xinjiang Jiarun	200	200	200
Xinjiang East Hope	800	300	800
Hongqiao Group	2,680	900	1,350
Shandong Xinfa Group	531	530	530
Total	**4,261**	**1,980**	**3,180**

Data: CRU

6. Market Opportunities

The properties of aluminum are the indicators of its market success and ability to gain market share fast. The future of aluminum both on the short and long term is inevitably tied to 3 elements of the economy:

1. **Material substitution in the automotive industry** is the strongest driver for aluminum, as the most OEMs are replacing steel and other metals with aluminum not only to reduce weight and save emissions, but also to take advantage of improved design flexibility. After in 2015 Ford went famously from producing the body of its F-150 truck from steel to aluminum, other OEMs have shown themselves eager to and re-design and re-engineering their vehicles and make them lighter and implicitly more fuel efficient. Aluminum reduces noise and vibration, important selling points, and is a better electricity conductor than copper. A win-win solution for OEMs, consumers, and the environment.

Lightweight: 1/3 of the weight of steel or copper;

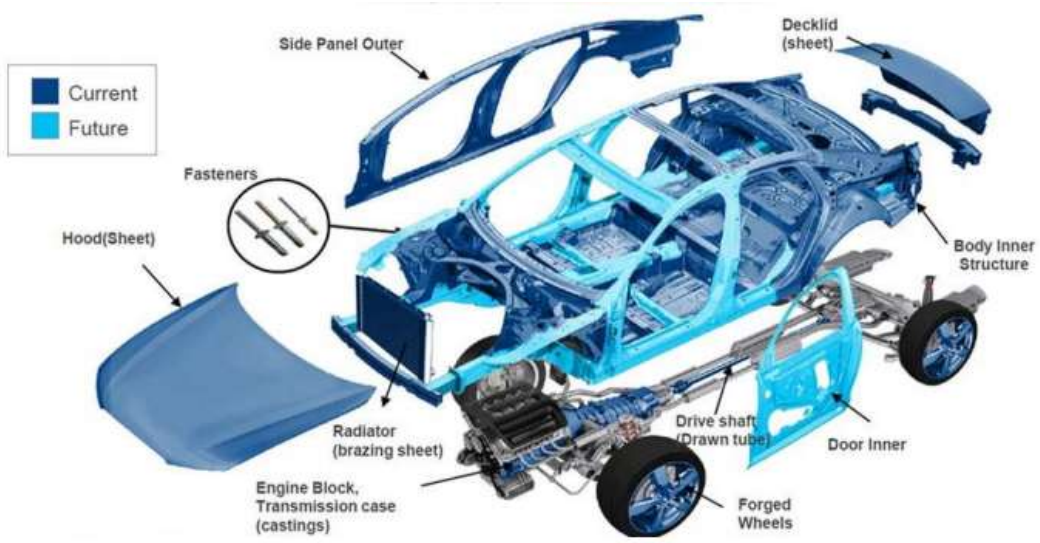
Recyclable: 75% of all aluminum produced still in use

Durability and corrosion resistant due to oxide layer

Malleability, ductility, high formability and low melting point compared to steel - Extrusion, rolling, casting, drawing

Excellent conductivity both thermal and electrical

Jim Lentz, CEO of Toyota Motor North America:
"We have to look at many, different ways to improve fuel economy (…) So, obviously, we will be looking at more and more ways to use lightweight materials like aluminum in future products."



An image from Alcoa gives us an idea of current vs. the future use of aluminum in automotive manufacturing.

Source: Alcoa

2. **The use of aluminum across various industries and products** has increased significantly in the past decades. Demand for aluminum is expected to be driven by its use in emerging applications such as oil and gas drilling and transportation, LED lighting, solar energy, electronics, and telecommunications (Grace Matthews). Aluminum is a material in demand in casing and drill pipes because its light weight and corrosion resistance allow for deeper drilling and don't require as much maintenance (EIA). In the solar energy industry, the solar panel frames are made with aluminum extrusions, while sheets and casted studs are used in the reflective surface (Grace Matthews). Finally, for the LED lighting and electronics industries, aluminum is a very effective material for heat sinks (extrusions) used in CPUs, power transistors, LED lighting systems, and wireless communication towers. As these industries grow, the demand for aluminum heat sinks is likely to increase as well.

> *Christine Keener, VP of commercial sales at Alcoa says:*
> *"It's lightweight, it's durable, it's corrosion resistant, formable. And because of all of those wonderful properties, it's used in planes, cars, trucks, buses, trains, buildings, making all them more energy efficient, as well as reduce greenhouse gases as a result." (WESA)*

3. **Increased environmental awareness** gives priority to aluminum over steel because it is highly and easily recyclable and has a relatively lower carbon footprint. This will affect positively and drive demand for the secondary unwrought industry. Recycling aluminum uses 5% of the energy and emits 5% of the carbon dioxide compared to producing aluminum from scratch. As green building standards become a reality in most developed countries, aluminum will take its rightful place in infrastructure and urban architecture.

7. Looking forward

The global aluminum industry will continue, on the short and medium term to be characterized by oversupply which will weigh on prices. If the output will remain unchanged, especially from Chinese firms, the production cuts in the U.S. and Europe will not be sufficient.

Analysts agree that the price of aluminum is on the rising slope but they are split as to how much they will rise. In January BMI Research forecasted prices to average $1,750/ton in 2017 and $1,900 by 2021. They are already off in their estimates by at least $100. JP Morgan analysts expect a $100 rise in the price by

the end of Q4 2017 which would bring the 2017 average at over $1,900. We believe this forecast to be fairly realistic.

A big unknown remains the consequences of the U.S. trade policy. The investigation opened under Section 232 of the Trade Expansion Act on the impact of imported aluminum (and steel) as a national security threat has the potential to translate into quotas or tariffs or both for imported aluminum which will impact the automotive, industrial machinery manufacturing, construction, packaging etc. in the form of taxes and duties.

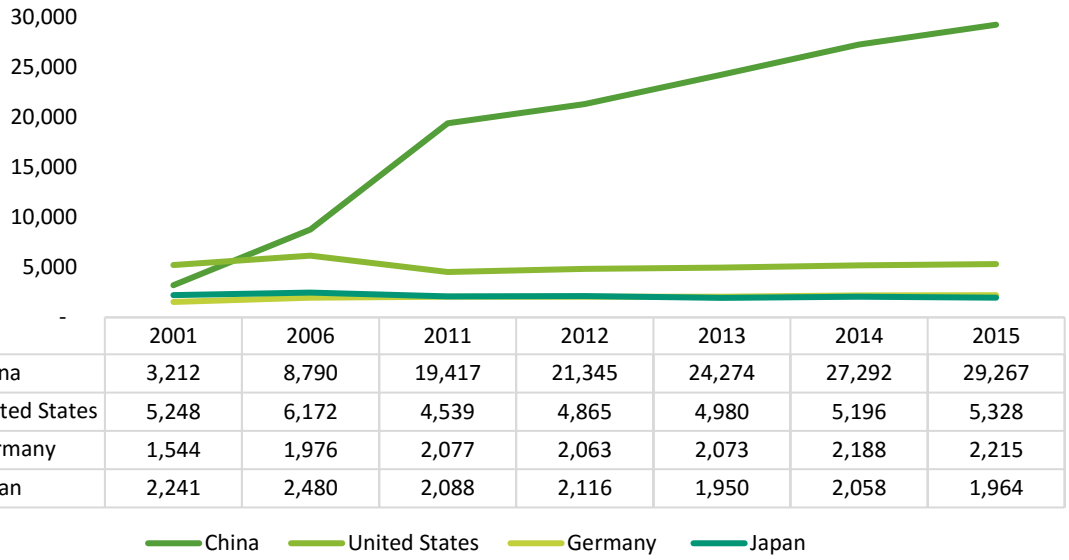
The market is also expected to see further divestment and consolidation as main strategies among global aluminum producers. More closures of smelters are expected in November as China begins its winter heating season, when aluminum producers in 28 cities have been ordered to slash output to reduce pollution. But, the Chinese aluminum SOEs are forecast to increase production from new technologies by 2.4 million tons in 2018. CRU forecasts large production growth from Chalco, China's largest aluminum SOE. Chalco is currently the fifth largest aluminum producer in the world, and Chalco is on track to become the second largest producer in the world by 2019.

China will also continue to import high-value-added products where domestic production is insufficient to meet domestic demand.

ANNEXES

Consumption of primary aluminum, by country, 2001-2015 ('000 MT)

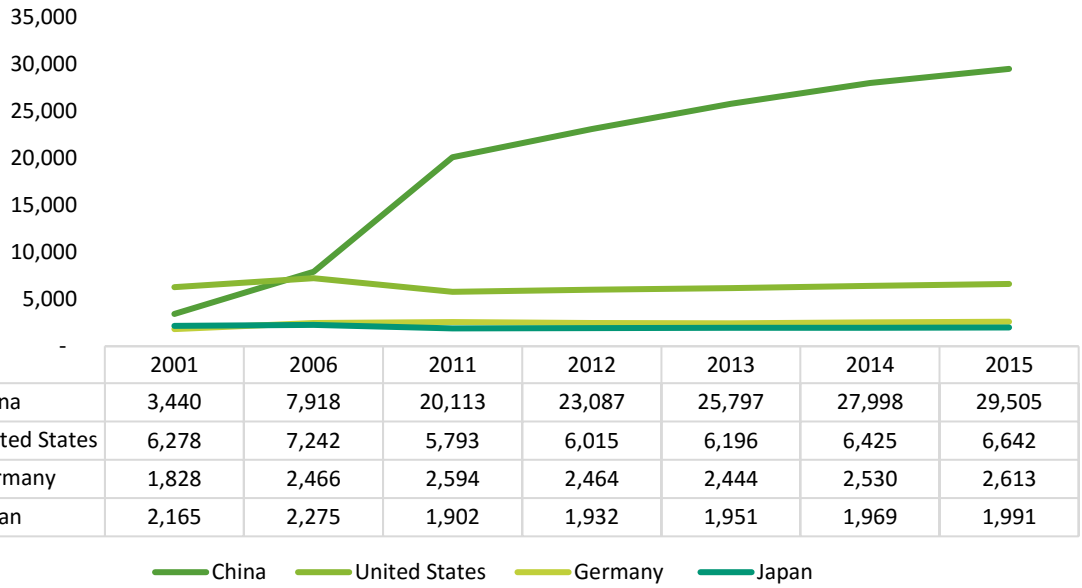
Source: USITC



	2001	2006	2011	2012	2013	2014	2015
China	3,212	8,790	19,417	21,345	24,274	27,292	29,267
United States	5,248	6,172	4,539	4,865	4,980	5,196	5,328
Germany	1,544	1,976	2,077	2,063	2,073	2,188	2,215
Japan	2,241	2,480	2,088	2,116	1,950	2,058	1,964

Consumption of semi-finished aluminum, by country, 2001-2015 ('000 MT)

Source: USITC



	2001	2006	2011	2012	2013	2014	2015
China	3,440	7,918	20,113	23,087	25,797	27,998	29,505
United States	6,278	7,242	5,793	6,015	6,196	6,425	6,642
Germany	1,828	2,466	2,594	2,464	2,444	2,530	2,613
Japan	2,165	2,275	1,902	1,932	1,951	1,969	1,991