

# CHINA'S GROWING ROLE IN THE PRODUCTION & SUPPLY OF MINOR METALS



## PART I: MEASURING DEPENDENCE ON CHINESE MINOR METALS [APRIL 2010]

Whether they produce water treatment chemicals with lanthanum chloride, antifriction alloy bearings using antimony metal or any other of the countless minor metal end-products, these manufacturers all have one thing in common, their raw materials more likely come from China than from any other country.

China currently produces about 40 percent of the world's minor metals and this share has been steadily increasing over the past ten years. Manufacturers who require minor metal materials are well aware of the influence Chinese supply has on the price of many metals, but not all are conscious of critical changes that have recently effected both the availability and prices of many minor metals. Two of the most important changes to the minor metal industry since 2000 have been the increase in China's share of global minor metal production and government policies within China aimed at supporting domestic production and ensuring material availability for Chinese end-users. These developments have not only led to international reliance on Chinese supplies of strategic metals, but have also resulted in greater Chinese control over minor metal prices. Over the past two years, the rare earth industry has received much media attention because it epitomizes these issues, igniting western concern about heavy reliance on foreign sources of critical resources. However, as we examine in this report, these issues stretch beyond rare earths, affecting many minor metal supply chains and numerous industries. Only recently have companies and governments recognized this situation and begun discussing methods to avoid supply shortages.

In the first part of this three-part report on the effect of China's role as a key supplier of primary minor metal products, we analyze recent minor metal production trends while focusing on China's growing role as the world's major producer. Part-two of the series will examine the factors behind growing dependence on China for minor metal production with consideration for both Chinese domestic policies and macro-economic influences. Finally, in part-three, we will develop on the impacts of the increasing dependence on Chinese minor metal production and discuss the responses from, and options for, international end-users to reduce the consequent effects of price volatility and risk of supply disruptions.

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### Evaluating Global Dependence on Chinese Minor Metal Production

Based on available statistics from the United States Geographical Survey (USGS), Strategic Metal Investments Ltd. (SMI Ltd.) has created a minor metal production index to analyze the level and growth of China's involvement in global minor metal production. Our index included country-based production statistics for 16 different minor metals between 2000 and 2009.<sup>i</sup> Table 1 lists these minor metals in descending order based on China's share of their global production in 2009 and also indicates the production statistic evaluated for each metal.<sup>ii</sup>

Minor Metals	Percentage of Global Production 2009	Production Measurement
Rare Earths	96.77%	Mine production (REO equivalent)
Antimony	90.91%	Mine Production (Sb content)
Tungsten	81.03%	Total Production (V content)
Silicon	64.81%	Ferrosilicon and Silicon Metal Production (Se content)
Bismuth	61.64%	Mine Production (Bi content)
Indium	50.00%	Refinery Production
Molybdenum	38.50%	Mine Production (Mo content)
Vanadium	37.04%	Mine Production (contained TiO <sub>2</sub> )
Gallium	32.07%	Primary Ga Production Capacity
Manganese	25.00%	Mine Production (Mn content)
Cadmium	22.87%	Refinery Production (Cd content)
Lithium	12.78%	Mine Production (Li content)
Titanium	10.49%	Concentrate Production (W content)
Cobalt	10.00%	Mine Production (Co content)
Chromium	0.87%	Mine Production (Chromite)
Selenium	<1.00%	Mine Production (Si content)

By themselves, these numbers are not extremely revealing, and understood by most in their respective industries, but once put in the context of a ten-year period, a noticeable trend becomes evident. As Chart 1 below indicates, of the 16 metals examined, only two, tungsten and lithium, saw their Chinese share of global production decrease between 2000 and 2009. By contrast, 13 metals<sup>iii</sup> became increasingly

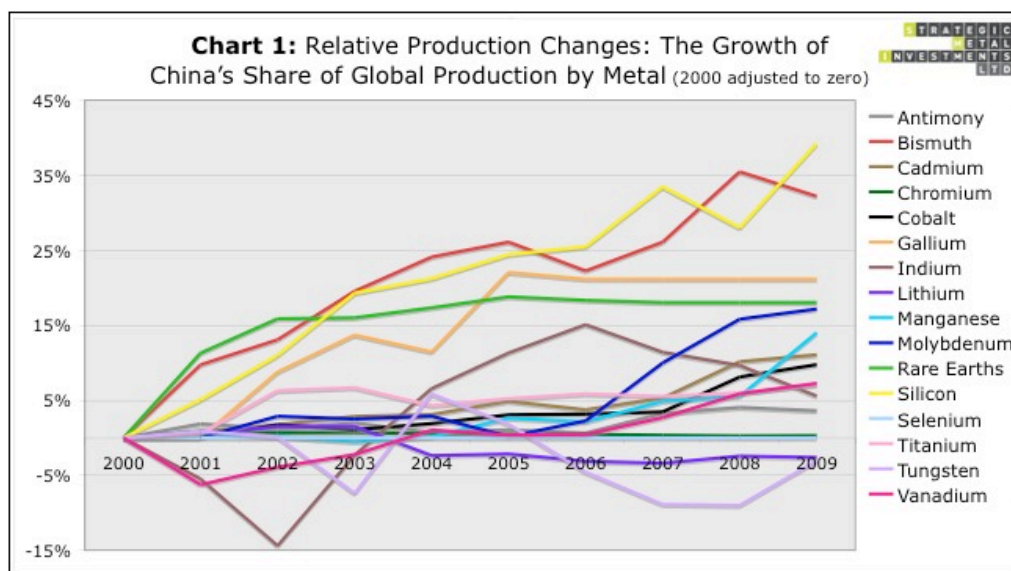
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dependent on Chinese production over the same period, led by silicon whose Chinese share of global production rose 39 percent.<sup>iv</sup> Bismuth and gallium also saw their dependence on Chinese production increase significantly, by 32 and 21 percent, respectively. China's share of global production for the remaining 11 metals in the survey increased by an average of almost eight percent between 2001 and 2009. While, on the reverse-side, China's share of the world's primary tungsten and lithium production decreased by only about three percent each.



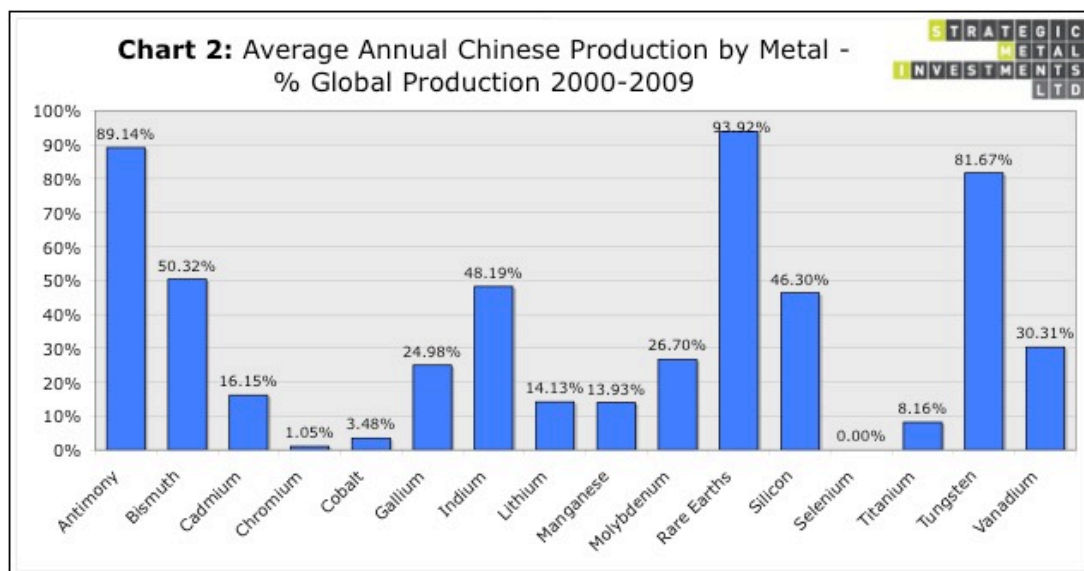
According to the USGS, since 2000 antimony and rare earth production has consistently been extremely dependent on Chinese production, with over 85% of global antimony and rare earth production coming from China each year. In contrast, very little primary production of Selenium, Chromium and Tantalum has come from China over the same period. Chart 2 summarizes China's average annual production per metal, as a percentage of total global production between 2000 and 2009.

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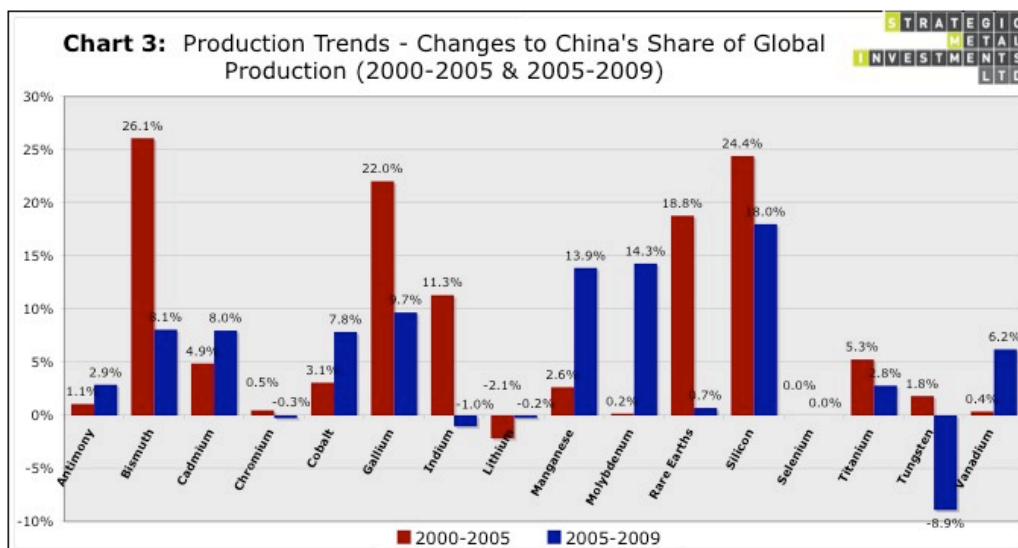
Another change that should be noted is the different growth rates of China's share of production for many metals between the first and second half of the decade. While China's share of global titanium and cadmium production was relatively consistent throughout the decade, bismuth and rare earths saw the majority of their production shift to China in the first half of the decade, thereafter remaining fairly steady. Chinese molybdenum and manganese production grew by less than three percent between 2000 and 2005, but then both increased by 14 percent of global production in the following five years. China's share of indium production, on the other hand, grew 11 percent, from 44 to 55 percent between 2000 and 2005, but then declined by five percent between 2005 and 2009. Finally, Chinese tungsten production grew from just over 84 percent of global production in 2000 to 85.9 percent in 2005, but, consequently, declined to 81 percent in 2009. Chart 3 summarizes these trends:

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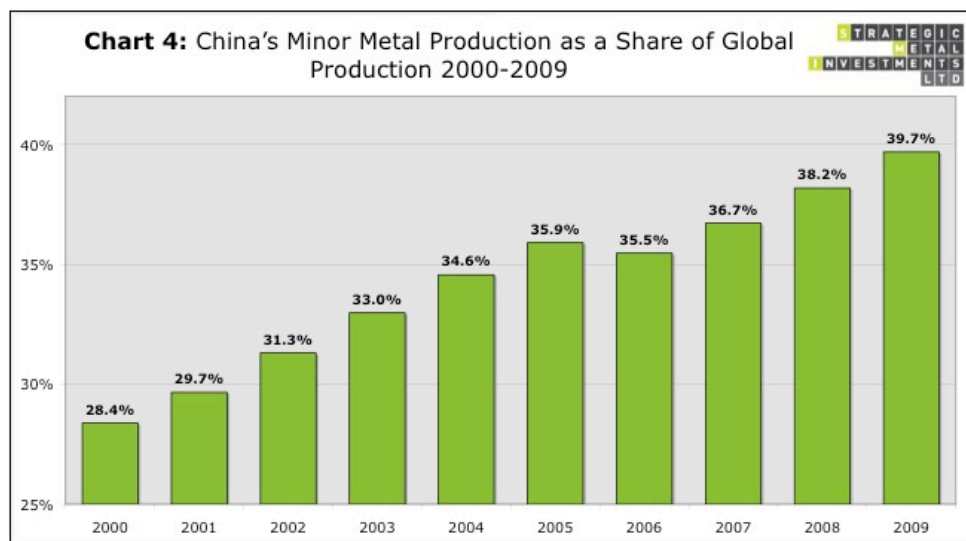
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### The Chinese Minor Metal Production Index

In order to create an index of China's minor metal production, we first calculated the level of annual Chinese production as a percentage of global production for each of the 16 metals. Chinese production levels for all the metals were then averaged on an equal-weight basis, for each of the 10 years between 2000 and 2009. The results are shown in Chart 3:



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The statistics clearly show that the growth of China's share of global minor metal production over the past ten years increased 34 percent, from 29 percent of global production in 2000 to 39 percent in 2009. While silicon and bismuth led the shift to greater dependency on Chinese minor metal production, almost all the metals in our index followed this trend. Moreover, since 2006, this shift towards Chinese production has been sustained by the country's growing share of molybdenum, manganese and other minor metals that China previously produced only in relatively insignificant quantities.

What factors have played into China's growing share of global production and is it a situation that international minor metal end-users should be concerned about? What impacts will these changes have on the supply and prices for strategic and minor metals and can this trend be expected to continue? These are some of the questions that we will address and analyze in part-two of this series.

SMI Ltd.  
April 2010

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<sup>i</sup> Our initial list of minor metals began with 20 metals. However, due to limitations on the availability of global and Chinese production statistics, some metals had to be excluded. We hope to expand this list over time to make the index reflect the production statistics of more minor metals.

<sup>ii</sup> An effort was made to use as much primary production data as possible. That is, extracted quantities from mine production measured in terms of metal content. This was done in all but three cases; Indium and cadmium statistics are based on refinery production, whereas primary production capacity was used as a proxy in the case of gallium. Although we recognize that these proxy statistics could potentially be significantly different than primary production data for the related metals, after reviewing the proxy statistics and comparing these with estimated Chinese and global primary production, we felt that they would not be misleading or construe test results.

<sup>iii</sup> Recognizing that a number of minor metals with incomplete Chinese and global production statistics were also those with little Chinese primary production, in order to avoid data bias, we decided to include selenium in our analysis despite incomplete data available from USGS.

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Although China did have some primary selenium production during the period examined, this was determined as an insignificant quantity and recorded as zero percent of global production for the purpose of the minor metal index. The selenium statistics are used only to help ensure that the Chinese production of minor metals index (Chart 4) is representative and are not further analyzed.<sup>iv</sup> The remaining metal, selenium, showed no change, as China's selenium production was determined to be insignificant and for statistical purposes was measured as zero percent of global production in each of the years between 2000 and 2009.

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