

FABRICATION DEMAND DRIVERS FOR SILVER IN THE INDUSTRIAL, JEWELRY, AND SILVERWARE SECTORS THROUGH 2033

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EXECUTIVE SUMMARY

The industries that use silver as an intermediate input are forecast to experience strong output growth over the next decade (2023 to 2033). Much of that output growth is likely to occur in Asia, and in particular in China. This report investigates the forecasts of the output growth of different end user industries of silver to gain insight about how demand for the metal may change over the next 10 years. It also looks at where in the globe the strength in demand for silver inputs is predicted to arise.

The main points are:

- Between 2023 and 2033, we forecast the global output of end users of industrial silver will increase by 46% in real terms. This reflects predictions of particularly rapid growth in the output of the electrical and electronics applications industry, which is forecast to grow by 55% over the decade.
- Jewelry fabricators' output is forecast to increase by 34% in real terms between 2023 and 2033. At the country level, the output forecasts suggest that India may lose some of its dominance of silver jewelry manufacturing to China over the decade.
- Silverware fabricators' output is forecast to increase by 30% over the next decade. Some 43% of the growth in output between 2023 and 2033 is forecast to occur in India, although this is less than the country's 73% share of the market in 2022.
- Combined, the output of industrial, jewelry and silverware fabricators is forecast to increase by 42% between 2023 and 2033. This is roughly double the rate of growth of their demand for silver over the previous decade.

1. INTRODUCTION

This paper looks at how demand for silver as a manufacturing input is likely to evolve over the next decade (2023 to 2033). It does so by looking at how the output of the industries that use silver as an input into their production process is forecast to grow around the globe. The forecasts are presented for the key consuming sectors of silver (industrial, jewelry, and silverware).

The paper also investigates where demand for silver as an intermediate input is forecast to grow most rapidly around the globe over the next decade. Using predictions of the output growth of key consuming sectors by country, we analyze the extent to which demand for silver as an input into production is shifting east towards China and the rest of the Asia Pacific region.

The paper also details why demand forecasting for silver as an input into industrial processes is important. Additionally, we explain our methodology and its drawbacks. Lastly, we review how silver consuming industries' output is forecast to change over the next decade, both by geography and end using industry. Lastly, the paper concludes with the main points.

2. WHY IS LONG TERM DEMAND FORECASTING IMPORTANT?

Long-term demand forecasting helps any industry make better informed supply decisions and resource allocation decisions. It is particularly important for an extraction industry like silver due to the time lags and expense incurred between prospecting and receiving revenue for any refined silver produced. Undertaking the initial geological surveys to establish the existence of deposits, applying for planning permission and meeting environmental regulations, building the mine and associated infrastructure to transport the ore for crushing and smelting, and refinement all take time and incur major investment costs.

Any investment decision or entry into the market is made more complex as the price of silver is volatile. In the last decade (2013 to 2022) the London Bullion Market Association daily price of silver has ranged from \$12.01 to \$32.23 (troy/oz), around a mean average of \$19.19. The profitability of any long-term investment will vary markedly depending on the price of silver when the facility is operational.

The complexity and uncertainty surrounding investment decisions about silver projects is increased as most silver is produced as a by-product of mines targeting other metals. In 2022, 72% of mined silver production came from mines which produced lead, zinc, copper, and gold.¹

The geographical location of demand is also important as it shapes investment decisions about shipping and logistics. Most of the major producing countries are located in North, Central, and South America, whilst increasingly most of the end user manufacturers are based in Asia. This creates a requirement for the secure transportation and warehousing of the silver for delivery to end use customers. Geographical forecasts of where demand is likely to grow most rapidly also offers insight for decisions about the location of marketing and sales offices, so they are in close proximity to existing and prospective customers.

2.1 OUR FORECASTING METHODOLOGY

To construct the global forecasts of the indicator of demand for silver as an intermediate input in aggregate and for its different end user industries, we use weighted forecasts of customer industries' output in each country. The weights we use are the consumption of silver for each end use by the different countries in 2022 in million ounces sourced from the World Silver Survey 2023.²

The forecasts of the different end user industries' output are sourced from Oxford Economics' Global Industry Model.³ This identifies and maps the supply chain linkages between economic sectors within countries and across regions and

¹ The Silver Institute. 2023. World Silver Survey 2023. Page 31.

² The Silver Institute. 2023. World Silver Survey 2023. Pages 45, 46, 47, 55, and 61.

³ [Oxford Economics' Global Industry Service](#)

connects them to the macroeconomic drivers of demand (consumer spending, investment, and government expenditures, etc). The model runs off Oxford Economics' latest macroeconomic forecasts to generate projections by industry.

The Global Industry Model forecasts gross output, gross value added, investment, and profits on both a nominal and real basis for over 100 industrial sectors across 77 countries.⁴ We use the forecasts of gross output in real terms in the belief this has the strongest relationship with the volume of inputs purchased, in particular, the quantity of silver used. Our analysis is underpinned by the assumption that the ratio of inputs to output is constant over the decade (2023-33). This means that the amount of silver input per unit of output remains unchanged.

The industries selected as the key consuming industries of silver are those that discussed in the World Silver Survey 2023, and the Silver Institute's other publications such as individual market reports.⁵ The industries (with their NACE codes) we have matched to each type of silver use are detailed in Table 1.⁶

Table 1: End user industries of silver and the industries' output forecasts we have used

Use of silver	Industries output used to forecast	NACE code
Electrical and electronics demand	Manufacture of electronic components and boards	26.1
	Manufacture of computers and peripheral equipment	26.2
	Manufacture of communication equipment	26.3
	Manufacture of consumer electronics	26.4
	Manufacture of electrical equipment	27
	Manufacture of other general-purpose machinery	28.2
Brazing alloys demand	Manufacture of basic iron and steel and of ferro-alloys	24.1
	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel	24.2
	Manufacture of other products of first processing of steel	24.3
	Manufacture of fabricated metal products, except machinery and equipment	25
	Manufacture of electronic components and boards	26.1
	Manufacture of general-purpose machinery	28.1
	Manufacture of other general-purpose machinery	28.2
	Manufacture of motor vehicles	29.1
Other industrial	Manufacturing minus all sectors listed above for electrical and electronics and brazing alloys demand	
Silverware	Manufacture of fabricated metal products, except machinery and equipment	25
Jewelry	Other manufacturing	32

⁴ On a nominal basis includes the impact of price changes on the indicator concerned. Real excludes the impact of price changes, so is a better measure of volume changes.

⁵ For example, Precious Metals Commodities Management LLC. 2022. [Silver in Brazing and Solder Alloy Materials](#). The Silver Institute Market Trend Report. and Metals Focus. 2021. [Silver's Growing Role in the Automotive Industry](#). The Silver Institute Market Trend Report..

⁶ Nomenclature of Economic Activities (or NACE) codes are a standard classification system of industries used by national statistical offices to classify business activities.

2.2 CHALLENGES WITH THE METHODOLOGY

Our methodology is not without its challenges. To be informative about the demand for silver, it assumes that the existing customer industries' output is made with fixed technology. Put more simply, the ratio of silver input in each unit of customer industries' output is held constant. This may not hold true if customer industries substitute in another material instead of silver, or alternatively change their technology requiring other inputs instead of silver. Box 1 discusses the practice of thrifting, when manufacturers try to reduce the silver content included in their products to reduce costs.

It is limited in the extent to which it can capture the emergence of new industries that require silver as an input, or existing customer industries to find different uses for silver as they develop their product range. This reflects its reliance on existing statistical definitions of industries.

More pragmatically, our choice of customer industry to match to each use type of silver may be too broad. Oxford Economics' Global Industrial Model forecasts 100 sectors, but the ones chosen maybe too aggregated to fully reflect the segment of the industry that uses silver. If so, the forecast for output may be inaccurate.

Our forecast of end user demand for silver based on output growth are likely to be more accurate the less structural change occurs at silver fabricators. This depends on the maturity of the technology they use (and hence the extent of thrifting) and any innovation that leads to new uses of silver. The two will have offsetting impacts, which are likely to vary over time. If thrifting dominates, our forecasts are best regarded as upper bounds.

BOX 1: THRIFTING

Silver is an expensive commodity to purchase (like other precious metals). Manufacturers that use silver as an input typically try to reduce the amount they use in their products in order to reduce costs and raise profitability. This process is called "thrifting". It is typically achieved through a variety of innovations, such as using thinner layers, substituting cheaper commodities for silver, or the miniaturization of components and subcomponents.

The rate at which thrifting occurs in manufacturing production processes typically changes as they mature. When a product is first introduced into the market, manufacturers typically want to make sure it works, so are prepared to use the best materials available. But over time, the firm that invented the product, or its competitors who seek to replicate it and undercut the first firm's prices, seek to lower their costs by reducing the amount of silver inputs they use. This typically occurs relatively rapidly after a product has been introduced to the market. As time progresses, the process slows as the easier or larger cost saving opportunities have

already been taken and there are progressively lower amounts of silver left to reduce or substitute with alternative cheaper commodities.

The opportunity for thrifting also depends on which product is being made and the industrial processes manufacturers use to make it. So the extent of thrifting, or the pace at which it is undertaken is not uniform across the different industrial uses of silver.

Manufacturers have an incentive to keep their production processes confidential. This is to prevent their competitors imitating them or stealing any innovations they make resulting from expenditure on R&D. This is likely to be particularly true when a product is new, or is young and evolving as different firms try to improve it. As a result, there aren't that many estimates of the extent of the thrifting of silver in industrial processes in the public domain. However, we have been able to find some estimates. CRU (2020) investigated the amount of silver used in photovoltaic cells used in solar panels.⁷ They find the amount of silver used fell significantly between 2009 and 2019.

The focus of this paper is forecasting fabricators' demand for silver over the next decade. As discussed above, the rate of thrifting is likely to vary according to the maturity of the production process and a host of other factors. As we have insufficient information to forecast thrifting rates over the next decade, we have chosen to suggest our forecasts are regarded as upper bounds for demand growth for silver based on forecasts of end user output growth.

⁷ CRU Consulting. 2020 [Silver's important role in solar power](#). The Silver Institute Market Trend Report

3. INDUSTRIAL SILVER

To investigate how the total demand for industrial silver may evolve over the next decade (2023 to 2033), we have split usage into the three industrial uses published in the World Silver Survey 2023. This publication disaggregates industrial demand for silver into that used by the electrical or electronics industry, used as brazing alloys to join two pieces of metal, and other (as a catchall category). This is useful for two reasons. First, the disaggregation makes it easier to align the first two categories to the end user industries for which we have output forecasts. Second, by detailing the weight of silver used (in million ounces) by the major countries where the different types of end users are located, we can select the relevant countries' industry's output growth forecasts.

3.1 ELECTRICAL AND ELECTRONICS DEMAND

Manufacturers of electronics and electrical applications are the major purchasers of industrial silver. In 2022, these industries consumed 371.5 million ounces.⁸ This equates to 67% of the silver used for industrial purposes in that year.

We can get some insight into how the electronics and electrical application manufacturers' demand for silver will develop by weighting together our forecasts of the three major constituent industries' output in each country by that nation's share of silver used in 2022. The three industries output which we use as a proxy for electrical and electronics demand for silver are manufacture of computers and peripheral equipment, electrical engineering; and other general-purpose machinery. The electrical engineering sector produces many of switches, relays, connectors, breakers and fuses used by electric vehicles. The same sector produces photovoltaic panels used in solar power generation. The recent growth in both have stimulated the demand for silver as discussed in greater detail in other reports by The Silver Institute.^{9,10}

Over the next decade, we forecast the global output of the electronics and electrical applications industry will grow by 55%. This is an annual average growth rate of 4.5%. The pace of growth is expected to be faster in the first five years (2023-28) compared to the second (2028-33), at an average of 5.4% versus 3.5% a year.

The majority of the output growth of the three industries over the next decade is forecast to occur in China. The country is forecast to have a 65% share of the growth in global electronics and electronic applications output between 2023 and 2033. It is followed by South Korea (5%), and the United States and Japan both at 3% (Fig. 1).

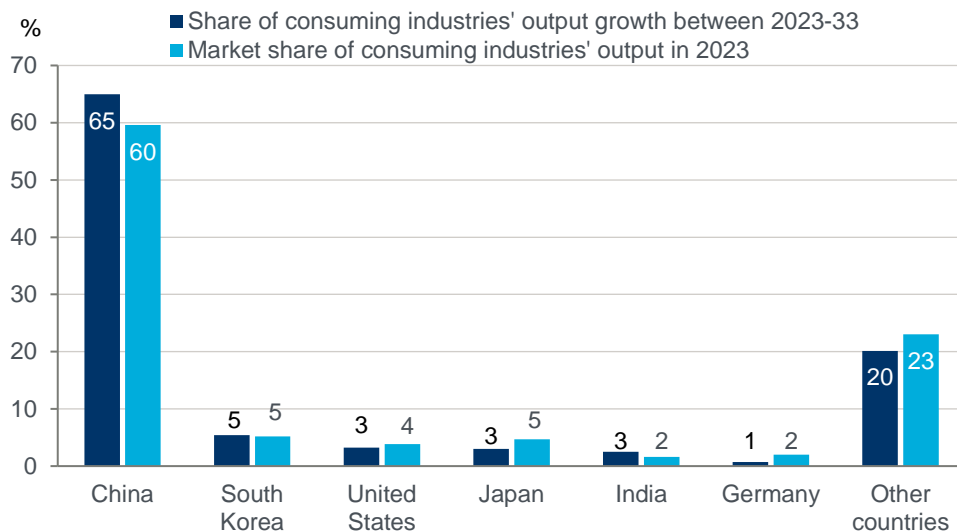
⁸ Silver Institute. 2023. World Silver Survey 2023. Page 45.

⁹ Metals Focus. 2021. [Silver's growing role in the automotive industry](#). The Silver Institute Market Trend Report.

¹⁰ CRU Consulting. 2020. [Silver's important role in solar power](#). The Silver Institute Market Trend Report.

By 2033, we forecast 60% of the three end user industries' production will be located in China. South Korea and Japan are both predicted to have a 5% share each.

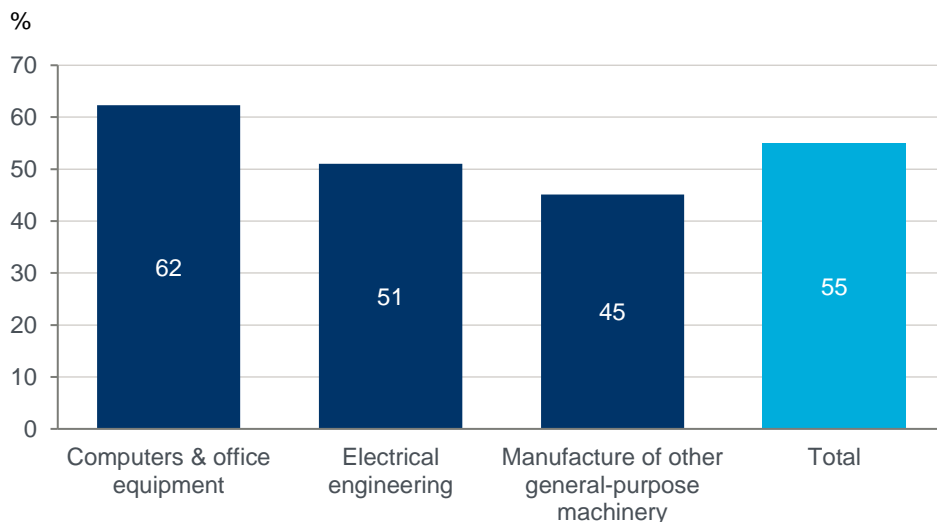
Fig. 1: Forecasts of selected countries' market share of electronics and electrical applications output in 2023 and 2033



Source: Oxford Economics

The output of the three end user customer industries are forecast to grow at different speeds. The most rapid growth in output is predicted to occur in the production of computers and office equipment. The output of the manufacturers of these products is forecast to increase by 62% between 2023 and 2033, an annual average growth rate of 4.5%. The output of electrical engineering products (including light and heavy-duty switchers, mobile phones, computers, and other products in which silver is an input) is forecast to increase by 51% over the decade, or an average annual growth rate of 3.8%. The output of the other general-purpose machinery industry which produces photovoltaic panels is expected to grow the slowest by 45% over the decade.

Fig. 2. Forecast growth in manufacturers of electronics & electrical applications output, 2023-2033



Source: Oxford Economics

3.2 BRAZING ALLOYS DEMAND

The World Silver Survey 2023 estimates that 49 million ounces of silver were used as brazing alloys in 2022. This constitutes 9% of global industrial demand for silver. The major end using countries for silver as a brazing alloy in 2022 were China, which used 39.8% of total, the United States at 13.9%, and Germany at 10.2%.¹¹

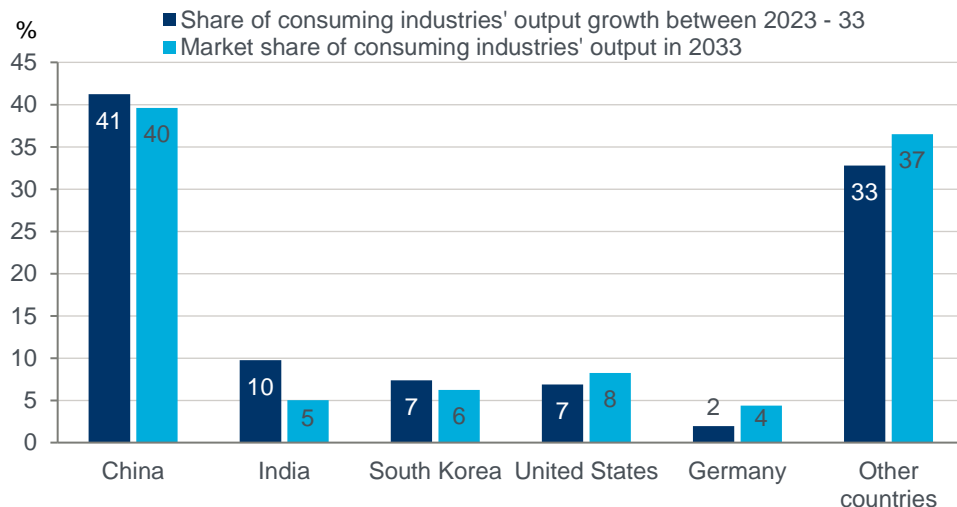
To investigate how demand for silver as a brazing alloy is likely to evolve over the next decade, we use forecasts of the output of five major end user industries. These are the manufacturing of motor vehicles, electronic components and boards, general purpose machinery, iron and steel, and structural metal products. As before, the different industries' combined output is weighted together using each country's share of silver used as a brazing alloy or solder in 2022.

Total output of all the major industries that use silver brazing and solder alloys is forecast to increase by 34% between 2023 and 2033. This equates to an annual average growth rate of 3.0%. The pace of growth is forecast to be faster in the first five years between 2023 and 2028 (3.6%) than in those that follow between 2028 and 2033 (2.3%).

Between 2023 and 2033, 41% of the growth in the five consuming industries' output is forecast to occur in China (Fig. 3). India and South Korea are predicted to have the second and third largest share of the five industries' output growth over the decade at 10% and 7%, respectively. This in part reflects the growth in the production of semiconductors, which are primarily located in China, but also in some Asian countries in general.

¹¹ Silver Institute. 2023. World Silver Survey 2023. Page 47.

Fig. 3: Forecast share of growth in output between 2023 and 2033 of industries using silver as a brazing alloy or solder

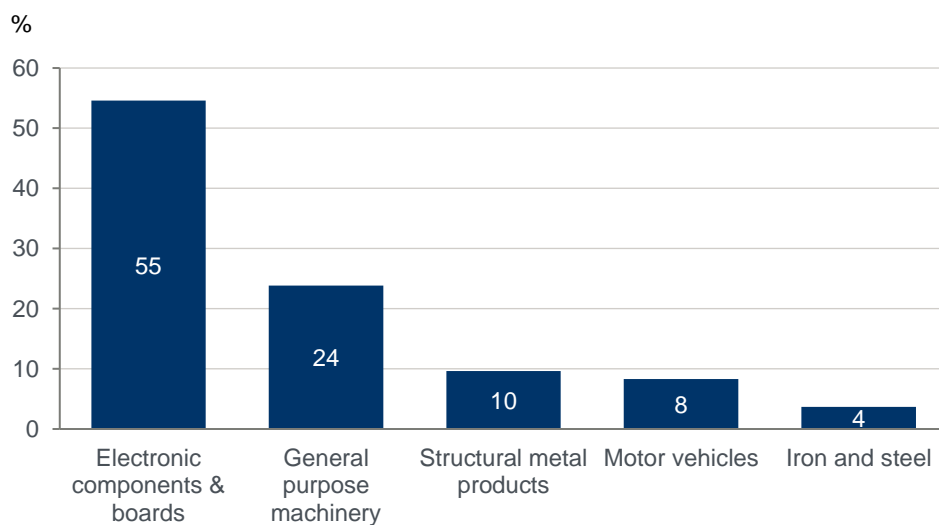


Source: Oxford Economics

By 2033, the forecasts suggest China will produce 40% of all the output of the five industries that use silver as a brazing alloy or solder. The US is forecast to have the second largest share at 8%, followed by South Korea at 6% and India at 5%.

Between 2023 and 2033, the output of electronic components and boards manufacturers is forecast to make the largest contribution to the five end user industries' output growth. This industry, which uses silver as a brazing alloy to produce printed circuit boards and some semiconductors, is expected to contribute 55% of the growth in output of the five sectors. Much of that output growth is predicted to occur in China and South Korea.

Fig. 4: Share in global output growth of industries using silver as a brazing alloy between 2023-33



Source: Oxford Economics

3.3 OTHER INDUSTRIAL DEMAND

World Silver Survey 2023 suggests that 24% of the industrial demand for silver as an input (or 136 million ounces) was used for other purposes in 2022.¹²

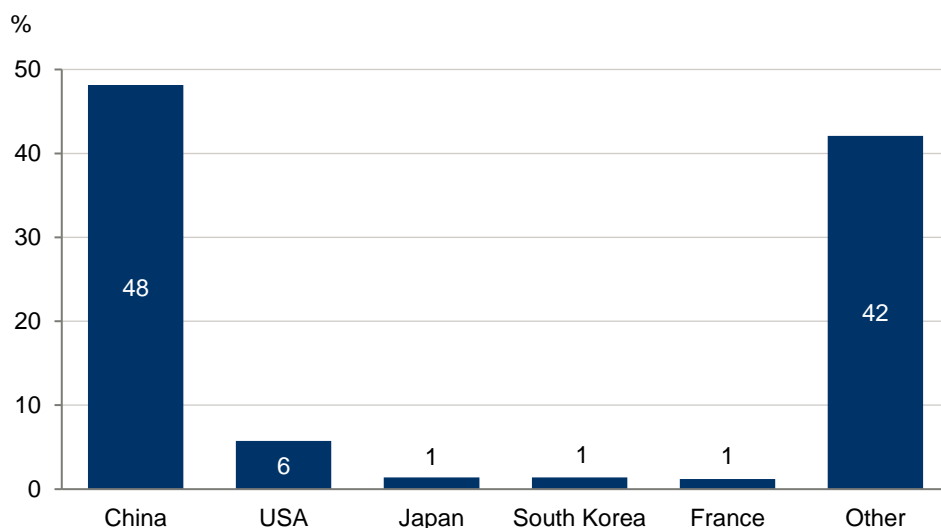
Given this is likely to cover a wide range of different industrial activities not classified as electrical/electronics or brazing alloys, we have used forecasts of the gross output of all manufacturing industry excluding those that purchase silver for electrical/electronics and brazing alloys. We have weighted these forecasts by each end user country's consumption of silver (in tons) used for industrial purposes excluding the two other sectors that have been identified separately.¹³

The forecasts suggest end user industries' output will increase by 26% between 2023 and 2033. Growth is predicted to be more rapid in the first five years at an annual average of 2.5% than the second five years at an average of 2.1% a year.

Between 2023 and 2033, just under half (48%) of the output growth of other industrial users of silver is forecast to occur in China (Fig. 5). Their counterparts in the United States are forecast to generate 6% of the additional output, with end user firms in Japan, South Korea and France each having a 1% share of the output growth. This suggests that demand for silver for other industrial purposes will expand in these countries.

To put that into context, 31% of the forecast growth in real global GDP between 2023 and 2033 is predicted to occur in China.¹⁴

Fig. 5: Forecast share of the expansion in output of other industrial end users of silver between 2023 and 2033



Source: Oxford Economics

¹² The Silver Institute. 2023. World Silver Survey 2023. Page 45.

¹³ The Silver Institute. 2023. World Silver Survey 2023. Page 67.

¹⁴ The global GDP forecasts used assume the exchange rate is constant at its 2022 level.

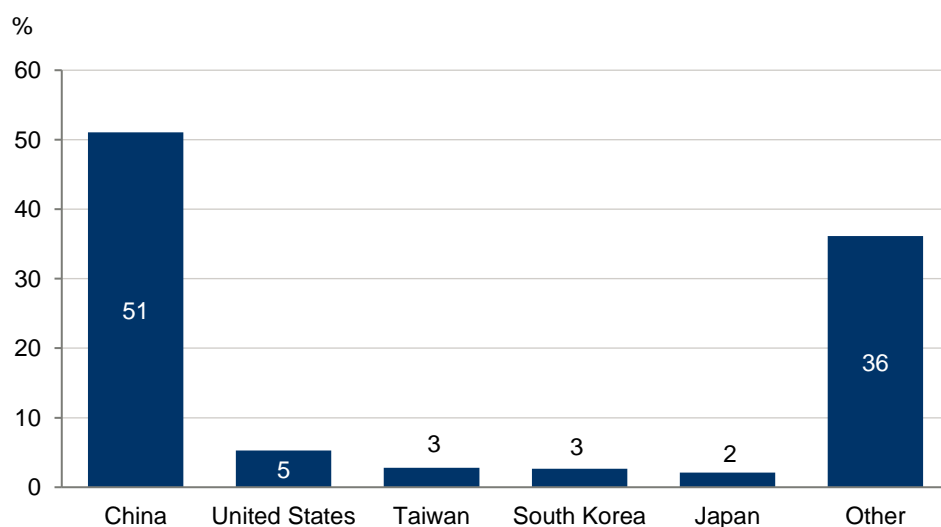
3.4 TOTAL DEMAND FOR INDUSTRIAL SILVER

Weighting the output growth forecasts of the three end-user segments by the volume of silver they used in 2022 gives us some insight into how demand for industrial silver may evolve over the next decade. Between 2023 and 2033, we forecast the output of end users of industrial silver will increase by 46% in real terms. This partly reflects two thirds of the usage in 2022 was by the electrical and electronics applications industry, which is forecast to exhibit the fastest growth in output at 55%, rather than the slower growing smaller segments.

The forecasts suggest the growth in demand for industrial silver will be faster in the first five years compared to the second. Between 2023 to 2028, the output of user industries is predicted to grow by an annual average of 4.6%, compared to 3.1% between 2028 and 2033.

Of the forecast growth in the output of sectors that use silver for industrial purposes over the next decade, 51% is predicted to occur in China (Fig. 6). The United States is forecast to have a 5% share in the additional output. Three Asian countries are expected to have a 2-3% share of the output growth. Overall, 76% of the additional output growth of industries that use silver as an intermediate input is predicted to occur in Asia.

Fig. 6: Share of global output growth of industries using silver as an input between 2023 and 2033



Source: Oxford Economics

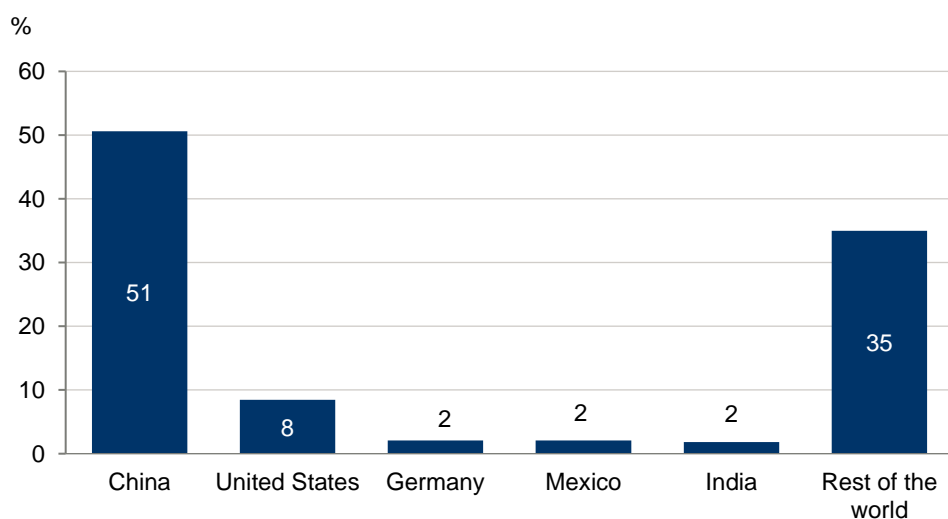
4. JEWELRY

The World Silver Survey 2023 contains data on the quantity of silver used by jewelry fabricators around the world. In 2022, 71% of the silver used to manufacture jewelry was used in Asia.¹⁵ Within this region, manufacturers in India used just under half (or 48%) of the silver used by jewelry fabricators around the globe.

According to NACE statistical breakdown of industries, the manufacture of jewelry is classified within the “other manufacturing” sector. We have weighted together the forecasts of the output of other manufacturing in each of the countries explicitly identified by the share of the million ounces of silver jewelry manufacturers used in 2022. The unidentified countries are assumed to grow in line with forecasts of world output of other manufacturing.

Our forecasts suggest that the demand for silver for jewelry manufacturing will increase by 34% between 2023 and 2033. Judged by the speed at which the other manufacturing sector’s output is forecast to increase, growth is predicted to be most rapid in the first five years (2023 to 2028) at an annual average of 3.4%, compared to 2.5% in the second five years.

Fig. 8: Selected countries’ share of the ‘other manufacturing’ sector’s output growth between 2023 and 2033



Source: Oxford Economics

Just over half of the growth in the global output of the other manufacturing sector between 2023 and 2033 is forecast to occur in China. The United States is forecast to have an 8% share of the additional other manufacturing output. Three countries including India are expected to generate 2% of the additional output.

¹⁵ The Silver Institute. 2023. World Silver Survey 2023. Page 55.

This suggests there will be some move in production from India to China over the next decade.

5. SILVERWARE

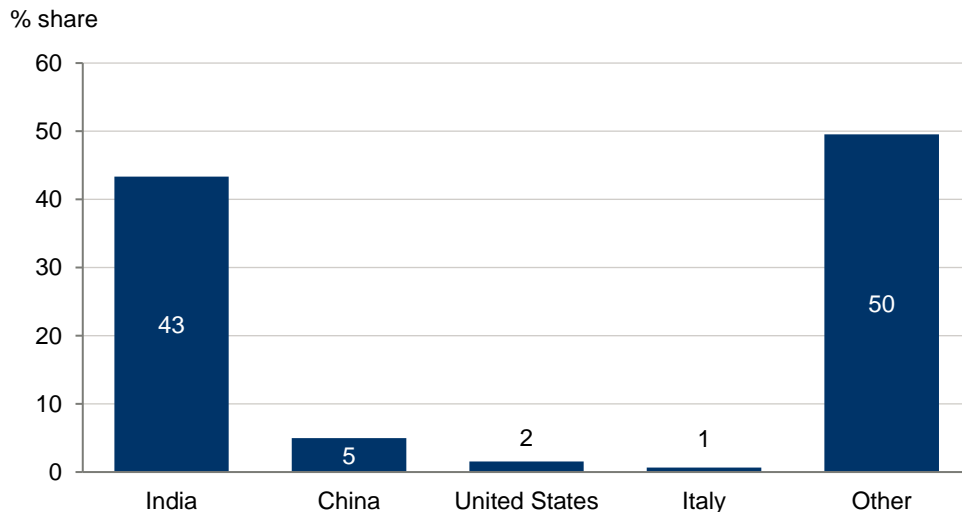
According to World Silver Survey 2023, 73% of the 2022 silverware market was due to India.¹⁶ A further 8% and 3% was used by silverware fabricators in Nepal and China, respectively.

In the NACE code statistical definition of industries' silverware fabrication lies within the structural metal manufacturing industry.

We forecast the output of the structural metal manufacturing industry (weighted by each countries' silverware fabricators usage) will increase by a total of 29% between 2023 and 2033. This is an average of 2.6% a year over the period. The rate of output growth is forecast to be more rapid in the first half of the period between 2023 and 2028 at 2.9%, than the later period between 2028 and 2033 at 2.4%.

Our forecasts suggest that most of the growth in the future demand for the metal by silverware fabricators between 2023 and 2033 is likely to come from Asian countries. We expect demand from India will contribute 43% of the growth in the demand for silver to be turned into silverware. This is less than their existing share of consumption at 73%.

Fig. 7: Forecast of the share of structural metal industry output growth between 2023 and 2033



Source: Oxford Economics

¹⁶ The Silver Institute. 2023. World Silver Survey 2023. Page 61.

6. CONCLUSION

In 2022, nearly three quarters of the world's demand for silver was as an intermediate input into various industries' production. This paper uses Oxford Economics' Global Industry Services' forecasts of how the output of end using industries around the globe are predicted to change between 2023 and 2033. It investigates these forecasts to see where in the globe that output is predicted to grow most rapidly. Assuming that the quantities of inputs required to produce that output remain broadly constant over time, this should have implications for the strength of demand for silver as an intermediate input, and where in the globe it will be used up in the manufacturing process.

This type of long term forecasting is useful as a guide to firms within the silver production industry as to how demand is likely to develop over the next decade. It should help them decide how best to target growing industries and where to locate their logistics, marketing and sales efforts.

There may however be unforeseen challenges to these forecasts. This may occur if the different fabricator industries undergo structural change (such as thrifting) or there are unforeseen economic shocks.



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