The Global Diamond Industry 2018

A resilient industry shines through
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Note to readers

Welcome to the eighth annual report on the global diamond industry prepared by the Antwerp World Diamond Centre (AWDC) and Bain & Company. This year’s edition covers industry developments in 2017 and the first half of 2018 and takes a close look at key industry trends.

We begin with important developments along the value chain. In subsequent sections, we review factors that influenced rough diamond production and sales, midstream performance and global diamond jewelry demand in major markets.

We also provide an update on the long-term outlook for the diamond industry through 2030. The 2030 supply-demand forecast considers announced production plans, recent changes in mining operations, potential additional sources of supply, expected changes in global and regional macroeconomic parameters, and potential effects of lab-grown diamonds.

Readers looking for a brief overview of this report can find key points below:

- **Following a period of high volatility, 2017 was strong for the diamond industry, with approximately 2% growth across all segments of the value chain.** In 2018, revenues are expected to grow again, even accelerating in the mining and jewelry retail segments. Volatility persisted in 2018; the final outcome for the year will be determined by sales performance during the holiday season.

- **Rough diamond mining companies delivered unprecedented production growth of nearly 20% in volume in 2017.** The production increase came mostly from mines with lower-quality assortments. Mining company revenues grew by 2% overall, indicating a positive trajectory for the second year in a row. In 2017, some major producers reported decreases in their EBIT margins, mostly due to currency appreciation in production countries. However, mining companies’ profitability bounced back in the first half of 2018.

- **Midstream profitability remained positive with margins of about 1% to 3%.** Assuming the demand for diamond jewelry continues to rise through the end of 2018, overall profitability of the cutting and polishing segment is expected to improve. Midstream inventories increased in 2017–18, particularly in lower-quality and small-size assortments, as midstream players prepared to ride another demand surge for those categories in 2018. India continued to grow its leadership position in the cutting and polishing segment due to lower labor costs, a favorable regulatory environment and relatively better access to financing. Even though financing availability remains an issue in the midstream segment, transparent and financially healthy companies report little impact on their ability to secure funding.

- **In line with positive luxury market trends, global diamond jewelry sales grew 2% in US dollar terms in 2017,** fueled by strong macroeconomic fundamentals in the US, resurging demand from Chinese millennials, and increasing sales in the self-purchasing category in China.
The demand for diamond jewelry is expected to accelerate in 2018. However, if the trade war between the US and China continues, it may have a negative effect on the growth prospects for global demand in the short to medium term.

Three key industry trends are shaping the future of the diamond industry.

One of the most important opportunities is the increasing influence of digital technologies. Emerging and maturing digital technologies are affecting all parts of the value chain, enabling diamond producers, midstream players and retailers to increase efficiencies within their operations. Marketing efforts that use digital technology can also deliver superior customer experiences.

The second trend is the growing presence of lab-grown diamonds. Lab-grown diamonds are clearly here to stay. De Beers Group’s launch of a lab-grown fashion jewelry retailer called Lightbox Jewelry, and the US Federal Trade Commission ruling on diamond terminology were major news in 2018. Lightbox does not provide grading reports for its products, as it states that grading reports exist as a record of a diamond’s rarity and, therefore, its value — with products that can be mass-produced to a particular recipe, Lightbox notes that grading reports could confuse consumers about the value of their lab-grown stones. The effects on natural diamond demand and price will depend on consumers’ perceptions and preferences. If the natural diamond industry can differentiate its stones from lab-grown diamonds (perhaps positioning lab-grown diamonds as fashion jewelry rather than luxury items), the effect on natural diamond demand by 2030 will be limited up to 5% to 10% in value terms. Given the pace of declining production costs and wholesale and retail prices, we expect lab-grown stones to become accessible to a wider consumer audience, potentially increasing demand for diamonds in general. In the short to medium term, growth of lab-grown diamonds will be limited by manufacturing capacity, access to technology and intellectual property, and availability of funding.

The third key trend is the shifting preferences of younger generations of consumers. Younger generations of consumers are causing industry players to rethink their sales and marketing strategies. The self-purchase product category continues to grow as millennial and Generation Z’s female spending power increases. Younger generations are also more inclined to consider the opinions of social influencers, customer reviews and “likes” when making purchasing decisions. Social media shopping is expected to increase significantly as the spending power of Gen Z rises. Many retailers are already strategizing how the shifts in preferences will change their approaches to marketing and operations.

The long-term outlook for the diamond market remains positive. Rough diamond supply is projected to be negative 1% to 1% annually in volume terms. We expect demand for natural rough diamonds to stay flat or grow up to 2% annually through 2030 in real terms (2% to 4% in nominal), backed by strong fundamentals in the US and the continued growth of the middle class in China and India. Our outlook incorporates possible demand substitution from lab-grown diamonds, which is estimated to be 5% to 10%. It also reflects fundamental long-term supply and demand factors rather than short-term fluctuations.
1. Recent developments in the diamond industry

- Every segment of the value chain improved in 2017, with industry revenue growing around 2%. In 2018, we expect revenues to continue to trend upward, and project accelerated growth in the mining and jewelry segments.

- Revenue for rough diamonds increased, continuing a climb that started in 2016. Revenue growth for rough diamonds is largely attributed to increased production by smaller players. The top five mining company aggregates faced unfavorable exchange rates in 2017, which contributed to lower profit margins of about 5%.

- Cutting and polishing revenues increased slightly in 2017 due to healthy demand, marking a turnaround from prior years. Average profitability was stable at 1% to 3%, with the most efficient players delivering margins of around 10%. We expect cutting and polishing profitability to improve in 2018, supported by rising prices for polished diamonds and increased demand for diamond jewelry.

- Midstream inventory has increased in anticipation of higher demand, particularly in lower-quality and smaller-sized assortments.

- Global retail sales of diamond jewelry increased in 2017 due to a strong economy in the US, the world’s largest diamond jewelry market. A resurgence of luxury spending among Chinese millennials also contributed to the increase.

- De Beers Group launched Lightbox Jewelry, a lab-grown fashion jewelry retailer with a new linear pricing model and no grading reports for its products, in September 2018. Along the value chain, companies are evaluating how to strategically respond.

- Performance across the value chain was strong during the first half of 2018, with accelerated growth expected among mining companies and jewelry retailers. The final outcome for the year hinges on holiday sales in December.
**Figure 1:** Barriers to entry and bargaining power vary across the diamond value chain

<table>
<thead>
<tr>
<th>Rough diamonds</th>
<th>Polished diamonds</th>
<th>Diamond jewelry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>Cutting and polishing</td>
<td>Jewelry manufacturing</td>
</tr>
<tr>
<td>• Exploration of diamond resources</td>
<td>• Sale of rough diamonds from producers</td>
<td>• Jewelry design and manufacturing</td>
</tr>
<tr>
<td>• Rough diamond production, processing and sorting</td>
<td>• Rough diamond trading</td>
<td>• Polished diamond trading</td>
</tr>
<tr>
<td>Sales</td>
<td>Sales</td>
<td>Retail sales</td>
</tr>
<tr>
<td>• Rough diamond trading</td>
<td>• Cutting and polishing rough diamonds to produce polished diamonds</td>
<td>• Polished diamond wholesale</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. of players:</th>
<th>Top 5 players control 70%</th>
<th>~100 players</th>
<th>~5,000 players</th>
<th>&gt;10,000 players</th>
<th>Large retailers control ~35% of the market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry barriers:</td>
<td>high</td>
<td>high</td>
<td>low</td>
<td>low</td>
<td>medium</td>
</tr>
<tr>
<td>Bargaining power:</td>
<td>high</td>
<td>medium</td>
<td>low</td>
<td>low</td>
<td>medium</td>
</tr>
</tbody>
</table>

Source: Bain & Company

**Figure 2:** Revenues improved throughout the process, and the trend is expected to accelerate in 2018

<table>
<thead>
<tr>
<th>Rough diamonds</th>
<th>Polished diamonds</th>
<th>Diamond jewelry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough diamond sales</td>
<td>Cutting and polishing</td>
<td>Jewelry manufacturing</td>
</tr>
<tr>
<td>Sales</td>
<td></td>
<td>Retail sales</td>
</tr>
</tbody>
</table>

Global revenues by value chain segment, $

*Forecast (F) made based on FY 2017 results

Note: Jewelry manufacturing value is estimated at approximately 65% of retail sales based on historic average.

Sources: Company data; Kimberley Process; Euromonitor; Bain & Company
Figure 3: Profitability in the rough diamond segment trended down in 2017 but is expected to rebound in 2018

Figure 4: Rough diamond sales were stable in 2017 and are expected to rise in 2018

World rough diamond sales by producers (including sale of inventories), $ billions

Average price per carat sold (including sale of inventories), $

Notes: Analysis of exploration and production is based on data for ALROSA, De Beers Group, Rio Tinto, Dominion Diamond Mines, Petra Diamonds; analysis of large chains is based on data for Chow Sang Sang, Chow Tai Fook, Gitanjali Jewels, Lohfloot, Signet Jewelers, Tiffany & Co., Titan Company. Sources: Publication analysis; company data; expert interviews; Bain & Company.
**Figure 5**: Rough and polished diamond prices trended up during the first half of 2018

![Graph showing diamond prices](image)

*Price index shows change in market price for like-for-like diamond categories weighted according to global rough and polished product mix.

**Figure 6**: Midstream inventories grew in 2017, largely with smaller and lower quality diamonds

![Accumulated inventory graph](image)

Note: Technological inventories are diamond stocks necessary to maintain regular production and the selling cycles of cutters and polishers, and polished diamond traders (around 9 months of total stock coverage).

Sources: Company data; Kimberley Process; expert interviews; Bain & Company
2. Rough diamond production

• All of the top mining companies increased production in 2017, leading to an unprecedented 19% growth in rough diamond production; volume reached 151 million carats in 2017, breaking an eight-year trend of flat output. However, the increase was largely attributed to the processing of lower-quality supplies and tailings, diminishing the effect on revenues.

• Canada, the Democratic Republic of the Congo, Australia, Botswana and Russia accounted for 90% of the output increase in 2017. Canada led the way, with the largest production increases coming from commercial mining efforts in Gahcho Kué and Renard, both of which started production in 2016 and early 2017.

• We believe that 2017 was the pinnacle production level for the natural diamond supply. From here on, output is expected to remain stable at best. Miners’ plans and actual production volumes in the first half of 2018 suggest production may even decline in the near future.

• The most significant decreases are expected from Mirny in Russia and Voorspoed in South Africa, resulting from their closure; Jubilee in Australia from lower-grade mining; and Argyle, also in Australia, because of depleted reserves in its block cave. Meaningful increases are expected from Orapa and Jwaneng in Botswana.

• Currency adjustments in production countries lowered the EBIT margins (earnings before interest and taxes) for De Beers Group and ALROSA in 2017. ALROSA returned to positive in the first half of 2018 and maintains the highest margin in the segment, attributable to rises in rough diamond prices, currency devaluation and strong cost containment. Petra reported negative EBIT margin in 2017 but rebounded in 2018.

• Merger and acquisition activity was focused on the mining segment, with key industry players investing in mining resources and operations. De Beers Group purchased Chidliak, a diamond resource in Canada; ALROSA increased its shares in Catoca from 33% to 41%.
**Figure 7**: Rough diamond production grew by 19% in 2017, and may decline slightly in 2018

### Annual production, million carats

<table>
<thead>
<tr>
<th>Year</th>
<th>Output increase</th>
<th>Output decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>127</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>126</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>151</td>
<td></td>
</tr>
<tr>
<td>2018E*</td>
<td>147</td>
<td></td>
</tr>
</tbody>
</table>

*Estimated based on company production plans

Notes: Only diamonds tracked by Kimberley Process are included; 2018 data is preliminary estimate and is to be updated with 2018 Kimberley data; due to rounding, some totals may not correspond with the sum of the separate figures; DRC is Democratic Republic of the Congo.

Sources: Company data; Kimberley Process; expert interviews; Bain & Company

**Figure 8**: Five countries accounted for 90% of the output increase in 2017

### Annual production by country, million carats

<table>
<thead>
<tr>
<th>Country</th>
<th>2016</th>
<th>2017</th>
<th>Output increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>25</td>
<td>151</td>
<td>~0</td>
</tr>
<tr>
<td>Botswana</td>
<td>126</td>
<td>151</td>
<td>~0</td>
</tr>
<tr>
<td>Australia</td>
<td>3</td>
<td>147</td>
<td>~0</td>
</tr>
<tr>
<td>DRC</td>
<td>2</td>
<td>3</td>
<td>~0</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>25</td>
<td>~0</td>
</tr>
<tr>
<td>South Africa</td>
<td>1</td>
<td>2</td>
<td>~0</td>
</tr>
<tr>
<td>Canada</td>
<td>10</td>
<td>1</td>
<td>~0</td>
</tr>
<tr>
<td>Other 2</td>
<td>2</td>
<td>3</td>
<td>~0</td>
</tr>
<tr>
<td>Other 3</td>
<td>1</td>
<td>1</td>
<td>~0</td>
</tr>
</tbody>
</table>

Notes: Only diamonds tracked by Kimberley Process are included; 2018 data is preliminary estimate and is to be updated with 2018 Kimberley data; due to rounding, some totals may not correspond with the sum of the separate figures; DRC is Democratic Republic of the Congo.

Sources: Company data; Kimberley Process; expert interviews; Bain & Company
The Global Diamond Report 2018

**Figure 9:** All of the top mining companies increased production in 2017

Annual production, million carats

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018E*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALROSA</td>
<td>125</td>
<td>127</td>
<td>126</td>
<td>151</td>
<td>147</td>
</tr>
<tr>
<td>De Beers Group</td>
<td>36</td>
<td>48</td>
<td>47</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>Rio Tinto</td>
<td>19</td>
<td>17</td>
<td>15</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td>Petra Diamonds</td>
<td>16</td>
<td>19</td>
<td>12</td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td>Dominion Diamond Mines</td>
<td>3%</td>
<td>3%</td>
<td>19%</td>
<td>19%</td>
<td>19%</td>
</tr>
<tr>
<td>Other</td>
<td>30%</td>
<td>3%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
</tr>
</tbody>
</table>

**YOY change**


<table>
<thead>
<tr>
<th></th>
<th>19%</th>
<th>–3%</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALROSA</td>
<td>30%</td>
<td>3%</td>
</tr>
<tr>
<td>De Beers Group</td>
<td>33%</td>
<td>3%</td>
</tr>
<tr>
<td>Rio Tinto</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Petra Diamonds</td>
<td>22%</td>
<td>22%</td>
</tr>
<tr>
<td>Other</td>
<td>20%</td>
<td>20%</td>
</tr>
</tbody>
</table>

* Estimated based on company production plans

Notes: Dominion Diamond Mines production includes 40% Diavik and 100% Ekati, and 2017 estimate is based on H1 2017 as the company was delisted and no longer publishes the data; only diamonds tracked by Kimberley Process are included; 2018 data is a preliminary estimate and is to be updated with 2018 Kimberley data

Sources: Company data; Kimberley Process; expert interviews; Bain & Company

**Figure 10:** Diamond producer margins showed mostly positive dynamics in the first half of 2018

**EBIT margin, %**

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018H1</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALROSA</td>
<td>45</td>
<td>53</td>
<td>56</td>
<td>47</td>
<td>54</td>
</tr>
<tr>
<td>De Beers Group</td>
<td>26</td>
<td>21</td>
<td>23</td>
<td>25</td>
<td>22</td>
</tr>
<tr>
<td>Rio Tinto</td>
<td>35</td>
<td>42</td>
<td>41</td>
<td>41</td>
<td>41</td>
</tr>
<tr>
<td>Petra Diamonds</td>
<td>32</td>
<td>25</td>
<td>8</td>
<td>51</td>
<td>–11</td>
</tr>
</tbody>
</table>

Notes: Rio Tinto, BHP Billiton revenues and EBIT include diamond mining only; Petra Diamonds data converted from year ending in June to year ending in December, based on company reports for full year and half year; 2017 impairment charges are taken into consideration for Petra Diamond EBIT/EBITDA calculations

Sources: Company data; Bain & Company
Healthy growth in the diamond jewelry retail market supported a 2% increase in cutting and polishing revenue, putting the segment on positive ground in 2017.

While the cutting and polishing segment grew overall, profit gains in 2017 were mostly limited to producers of small stones. Companies that specialize in large, high-quality stones experienced pressure from retailers in 2017. That trend reversed in the first part of 2018. To sustain profitability, cutting and polishing companies are focusing on four strategies: managing inventory levels, shortening production cycles, optimizing yields and expanding operations. Technology is leading improvements in the cutting and polishing segment, from digitally mapping and modeling stones to automating cutting processes.

Because of its low labor costs, favorable regulatory environment and relatively easier access to financing, India continued to gain market share in 2017. India’s growth came primarily at the expense of China and other countries. India accounts for more than 90% of global polished diamond manufacturing by value, and it dominates in all size segments, including the value-add segment of larger stones.

In China, cutting and polishing revenue increased in 2017, backed by strong domestic jewelry demand.

Access to affordable financing continues to be an issue for some midstream players. Following several defaults in India, some banks have tightened credit requirements. However, transparent and financially healthy players in the cutting and polishing segment reported only limited influence on their ability to secure funding.
Figure 11: India’s dominance of the cutting and polishing industry grew in 2017

Net import of rough diamonds to cutting and polishing countries, $

![Graph showing net import of rough diamonds to cutting and polishing countries from 2013 to 2017 with India, China, and Other regions.

Sources: Gem & Jewellery Export Promotion Council; International Trade Centre; Antwerp World Diamond Centre; China Customs Statistics; Israeli Central Bureau of Statistics; Bain & Company

Figure 12: Differences in cost efficiency accounted for regional market-share changes in the cutting and polishing segment

- **India**: Continuous cost optimization attracted volumes from other regions
- **Advancement of technologies and skills led to share gain in larger stones**
- **Relatively more developed diamond financing infrastructure is in place** (India accounted for ~40% of all borrowings, but affordable financing remains an issue)

- **China and Southeast Asia**: China is the No. 2 country by cost efficiency, but its relatively higher cost structure proved sensitive to margin pressures in 2015
- **Cutting and polishing sector grew in line with domestic diamond jewelry demand in 2017**

- **Africa**: Market stagnation occurred due to relatively low productivity and high cost structure despite efforts to increase role in global cutting and polishing industry
- **Increase in volumes available for beneficiation due to production growth in region in 2018**

- **Other**: Traditionally strong in large stone manufacturing, but slowly relinquishing positions to India even in more expensive categories due to aging workforce and high costs
- **Lack of affordable financing available to cutting and polishing companies in selected countries (Israel, US, Russia)**
- **Efforts underway in Russia to consolidate local cutting and polishing industry to make it more competitive**

Sources: Expert interviews; Bain & Company
Figure 13: Labor and financing are key factors in the manufacturing costs of polished diamonds

Cost structure of cutting and polishing* for a typical Indian C&P player ($/ct, 2017)

<table>
<thead>
<tr>
<th>Size</th>
<th>Small size (0.2–0.3 ct)</th>
<th>Midsize (0.3–1 ct)</th>
<th>Large size (1+ ct)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production</strong></td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td><strong>Selling &amp; admin</strong></td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td><strong>Financing</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Key factors that affect profit

- **Revenue**
  - Effective assortment management
  - Diverse client base

- **Financing**
  - Financial transparency to secure low interest rate
  - Shorten cutting and polishing cycles to reduce requirements for working capital
  - Access to affordable financing

- **SG&A**
  - Online distribution system to reduce selling costs
  - Lean management organization

- **Production**
  - Automation of production processes
  - Optimization of yields
  - Access to skilled talent pool

*Excluding raw materials costs
**Includes management and administrative compensation, insurance, utilities, logistics, marketing and certification costs
Note: C&P is cutting and polishing
Sources: Company data, expert interviews, Bain & Company
The luxury category has been stable compared with global GDP for the past five years, marking a resilience to generational shifts. The luxury segment has adapted to changing consumer preferences and behavior. Keeping in line with luxury market trends, global diamond jewelry sales grew 2% in US dollar terms in 2017. Demand for diamond jewelry is expected to continue or even accelerate in 2018, steered by high demand from affluent consumers.

An increase in retail diamond jewelry sales is attributed to a strong economy and favorable macroeconomics in the US, namely growing consumer credit, shrinking unemployment and higher wages.

Demand in China grew for the first time since 2013, picking up momentum from millennial buyers. Favorable adjustments to tax and customs policies should support continued Chinese growth. The online channel is expected to bring additional diamond jewelry sales to regions in China with limited physical retail footprint.

As in years past, India had the highest potential for diamond jewelry retail growth, yet its revenues remained flat. Despite inflation and a weaker rupee in the first half of 2018, personal disposable income is expected to grow in India and provide basis for increase in demand.

In 2017, performance was tempered in Europe by lower consumer confidence and in Japan by weak economic fundamentals. Both are positioned to rebound in 2018, thanks to higher tourism volume and euro appreciation in Europe and decreased unemployment in Japan.

If the US and China continue to dispute trade terms, economic growth prospects in both countries could be negatively affected, or consumer confidence could dwindle. While nothing detrimental has materialized, the potential outcomes of an ongoing trade war should be considered.
**Figure 14:** Personal luxury and diamond jewelry spending remained stable relative to GDP over the past five years

<table>
<thead>
<tr>
<th>Year</th>
<th>Personal luxury</th>
<th>Diamond jewelry</th>
<th>Global GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>~3%</td>
<td>~2%</td>
<td>~2%</td>
</tr>
<tr>
<td>2014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018E</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Personal luxury goods include luxury jewelry, watches, beauty goods, apparel and accessories
Sources: The Economist Intelligence Unit, Bain & Company Luxury Goods Worldwide Market Study, 2013–18

**Figure 15:** Global sales of diamond jewelry in 2018 are expected to see the highest growth in five years

**Worldwide diamond jewelry retail sales YOY growth rate, $**

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth Rate</td>
<td>9%</td>
<td>5%</td>
<td>3%</td>
<td>0%</td>
<td>~2%</td>
</tr>
</tbody>
</table>

**Worldwide personal luxury goods market YOY growth rate, $**

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth Rate</td>
<td>6%</td>
<td>4%</td>
<td>1%</td>
<td>0%</td>
<td>4%</td>
</tr>
</tbody>
</table>

*Compared with previous year
**Figure 16:** The diamond jewelry market is expected to grow across most major geographical regions

Global diamond jewelry market in 2017, $K

<table>
<thead>
<tr>
<th>Region</th>
<th>CAGR (2016–17)</th>
<th>CAGR (2017–18E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>China</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>Europe</td>
<td>▼</td>
<td>▲</td>
</tr>
<tr>
<td>India</td>
<td>▼</td>
<td>▲</td>
</tr>
<tr>
<td>Japan</td>
<td>▼</td>
<td>▲</td>
</tr>
<tr>
<td>The Gulf*</td>
<td>▼</td>
<td>▲</td>
</tr>
<tr>
<td>Other</td>
<td>▲</td>
<td>▲</td>
</tr>
</tbody>
</table>

Key trends and performance in 2017–18

- Slow recovery from demonetization and Goods and Services Tax introduction
- Rising inflation and depreciating rupee
- Shift to organized retailing amid continued struggles of the less formal sector
- Weak economic fundamentals balanced by yen appreciation
- Labor market and consumer spending improvement
- Steady inbound tourism growth in luxury retail capitals
- Decreasing consumer confidence following Brexit and US tensions
- Acceleration of euro appreciation catalyzing domestic consumption
- Increasing demand for nonbridal jewelry from millennials
- Government adjustment on tax and customs to boost consumption
- Healthy GDP growth and consumer-confidence upward trend
- Robust employment with job creation and wage growth
- Tax cuts positively affecting consumption
- Increasing demand from affluent customers

*Includes Saudi Arabia, United Arab Emirates, Oman, Bahrain and Qatar
Note: China includes Hong Kong
Sources: Publication analysis; Euromonitor; Bain & Company

**Figure 17:** Currency movements in 2018 support diamond jewelry retail growth, in US dollar terms

Change of currency value vs. $, 2017 average vs. 2016 average

- China: -2%
- India: 3%
- Japan: -3%
- Eurozone: 2%
- The Gulf*: No change

Change of currency value vs. $, 2018** average vs. 2017 average

- China: 4%
- India: -3%
- Japan: 2%
- Eurozone: 6%
- The Gulf*: No change

*Includes Saudi Arabia, United Arab Emirates, Oman, Bahrain and Qatar
**Estimate based on average of first 9 months of 2018
Sources: Thomson Reuters; Bain & Company
Three trends have the highest potential to affect the diamond industry in the near term: advancements in digital technologies, the development of lab-grown diamonds and generational shifts in consumer preferences.

Among other benefits, digital technologies are aiding transparency and efficiency efforts across all segments of the value chain. For example, in 2017 and early 2018, blockchain projects were launched to help consumers confidently identify the origin of their diamonds. Mining companies are using predictive maintenance, real-time controls and artificial intelligence to mitigate rising operating costs. Cutting and polishing players are pursuing advanced solutions in digital mapping, modeling and manufacturing to shorten production cycles and ultimately move toward fully automated processes to manufacture polished diamonds. Consumer behavior is also changing as technology matures; social media, for example, is enabling and influencing new direct-to-consumer and online sales models.

Two important events occurred in 2018 regarding the lab-grown diamond market. In July, the US Federal Trade Commission amended its Jewelry Guides, clarifying “a diamond is a diamond” regardless of its origin. In September, De Beers Group launched a lab-grown fashion jewelry retailer called Lightbox Jewellery that introduced a new pricing paradigm. Lightbox uses a linear pricing model, reflecting the linear cost of production, whereby all lab-grown stones cost $800 per carat, regardless of size. Lightbox also does not provide grading reports for its products. As the lab-grown industry continues to evolve and lab-grown diamond prices decline, players along the entire natural diamond value chain will need to determine how to respond and how to position their products with consumers.

While much attention has been paid to millennial buyers, their successors in Generation Z have been gaining buying power, forcing the industry to rethink marketing and sales strategies. Self-purchase sales and social media shopping are expected to increase, attracting younger generations of diamond buyers with distinct preferences.
Figure 18: Digital technologies affect all segments of the value chain

<table>
<thead>
<tr>
<th></th>
<th>Diamond producers</th>
<th>Cutters and polishers</th>
<th>Jewelry manufacturers</th>
<th>Retailers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet of Things (IoT)</td>
<td>Real-time controls</td>
<td>Inventory tracking</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Remote operating center</td>
<td></td>
<td>Quality controls</td>
<td>Omnichannel touchpoints</td>
</tr>
<tr>
<td>Data science, advanced analytics and artificial intelligence</td>
<td>Predictive maintenance</td>
<td>3D mapping and modeling</td>
<td>Personalized marketing and loyalty campaigns</td>
<td></td>
</tr>
<tr>
<td>Autonomous activities</td>
<td>Predictive analytics/demand forecasting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Autonomous vehicles</td>
<td>Automated cutting and polishing</td>
<td>3D printing</td>
<td>In-store assistance</td>
</tr>
<tr>
<td></td>
<td>Fully automated sorting</td>
<td>Automated diamond grading</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cybersecurity and design for veracity</td>
<td>Distributed ledger/blockchain</td>
<td></td>
<td></td>
<td>Digital inscription/digital watermarking</td>
</tr>
</tbody>
</table>

Source: Bain & Company

Figure 19: Digital is redefining business models for diamond jewelry retailers

- **Seamless integration of physical and digital worlds**
  - Digital-savvy customers switch between offline and online channels
  - Functions like “click and collect,” online returns and online stock availability are becoming industry standard

- **Transformation of the retail experience**
  - Strategy for fewer but “bigger and better” stores with focus on in-store experience
  - Facing price competition from online players, retailers spur traffic to physical stores with shopping and entertainment

- **Growing role of influencers and social media shopping**
  - Digital-age customers select and buy products via social networks
  - Disrupters like Catbird challenge big brands with Instagram campaigns and microinfluencer partnerships

Source: Bain & Company
Figure 20: Industry players must adapt their marketing strategies to attract younger consumers

<table>
<thead>
<tr>
<th>Today’s customers</th>
<th>Tomorrow’s customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Generation X &amp; late millennials)</td>
<td>(Early millennials &amp; Generation Z)</td>
</tr>
</tbody>
</table>

- Tech-literate ➔ Tech-innate
- Independent and self-reliant ➔ Collaborative and global-minded
- Value work-life balance ➔ Work toward own definition of success
- Require omnichannel ➔ Keen on social media shopping
- Pragmatic ➔ Ethical

Source: Bain & Company

Figure 21: Strategic questions for different industry players

- **Mining companies**
  - How can we use digital to improve our operations?
  - What assortment will be affected by lab-grown diamonds? What does it mean for our asset portfolio?
  - What should the approach to marketing strategy be? How can we build a successful brand around our supply?

- **Cutters and polishers**
  - How can we use digital to further optimize yields and shorten cutting and polishing cycles?
  - What opportunities can an automated process offer?
  - How can we redesign our distribution system to ensure confidence from retailers?
  - How do we ensure profitable growth of our business?

- **Retailers**
  - How can we make use of social influencers and ensure readiness for social media shopping?
  - Should lab-grown diamonds be introduced into portfolio? How could this affect our brand and reputation?
  - How should we adjust footprint, product design, assortment and marketing messages to remain competitive with other products?

- **Lab-grown producers**
  - What changes are required to the business model of the future with increased competition and rapid price decrease?
  - Should the bet be on industrial or jewelry segment?
  - How can we achieve cost leadership?
  - Is it necessary, and if so, how do we build a successful consumer brand?

Source: Bain & Company
Lab-grown diamonds have existed for more than 60 years, with limited effect on the natural gem-quality market. But advancements in technology have pushed the lab-grown market into a more competitive position. Most notably, new chemical vapor deposition (CVD) technology deeply cut the cost to produce larger, higher-quality diamonds. Today, it costs $300 to $500 per carat to produce a CVD lab-grown diamond, compared with $4,000 per carat in 2008.

As production costs have dropped, retail prices have followed. The retail price of gem-quality lab-grown diamonds nearly halved in the past two years, while wholesale prices dropped threefold. Prices are expected to decrease even further as production efficiencies increase, new competitors enter the market and the segment commoditizes.

Lab-grown diamond producers have two options: to pursue gem-quality production for retail jewelry sales or to produce diamonds for high-tech applications. The latter option has the greatest potential for long-term growth and profitability, as well as low barriers to entry. Sensors, semiconductors and medical cutting tools, for example, present an emerging market for CVD-produced diamonds.

The current gem-quality, lab-grown polished diamond capacity is estimated at 2 million carats majority of which is melee (diamonds size less than 0.18 carats). By 2030, the market could grow to between 10 million and 17 million carats, if the segment can sustain its current growth rate of 15% to 20% annually supported by consumer demand and attractive economics. But we believe manufacturing capacity will be a major limiting factor in the short to medium term.

Ultimately, marketing and consumer perception will determine the effect of lab-grown diamonds on the natural diamond market. Three scenarios exist: Consumers could perceive lab-grown and natural diamonds as interchangeable, as two different products, or somewhere in between. Marketing could uphold the value of natural diamonds, especially if the prices of lab-grown diamonds continue to drop. It’s probable that consumers will view lab-grown diamonds as fashion jewelry but not luxury goods, limiting the effect on natural diamond demand.
**Figure 22:** Lab-grown diamonds have existed for more than 60 years

**Figure 23:** There are two technologies for producing lab-grown diamonds (industrial and jewelry)

### HPHT
- **High pressure, high temperature**
- Imitation of the natural circumstances for diamond growth
- Share of lab-grown diamond market by volume (industrial and jewelry): ~99%
- Special features:
  - Cheap in comparison with CVD
  - Variety in terms of structure and sizes
  - High mechanical properties
- Applications:
  - Largely used in construction industry for abrasive qualities

### CVD
- **Chemical vapor deposition**
- Produced layer by layer in a chamber filled with ionized gas
- Share of lab-grown diamond market by volume (industrial and jewelry): ~1%
- Special features:
  - Optical transparency
  - Excellent semiconducting properties
  - High thermal conductivity
- Applications:
  - Mostly used in high-tech, medical and jewelry manufacturing industries

Note: CVD is chemical vapor deposition
Sources: Company data, expert interviews, Bain & Company
Figure 24: Since 2008, CVD production costs have decreased tenfold, with further reductions expected

Production cost of lab-grown 1ct G VS polished diamond (industry average estimate)

![Graph showing production cost decrease from 2008 to 2018.]

- ~$4.0K in 2008
- ~$1.6–$2.0K in 2013
- ~$0.3–$0.5K in 2018
- Including electricity cost of ~$15–$30

Notes: Carat (ct) refers to final weight of polished diamond; production cost excludes polishing and certification; electricity cost of ~$15–$30 is equivalent to ~200–400 kWh
Sources: Expert interviews; Bain & Company

Figure 25: The retail price of gem-quality lab-grown diamonds nearly halved in the past two years, while wholesale prices dropped threefold

Price of lab-grown diamond as a percentage of natural (1ct G VS polished)

![Graph showing price decrease for retail and wholesale.
Retail price: ~80% in Q4 2016, ~70% in Q4 2017, ~65% in Q4 2018
Wholesale price: ~70% in Q4 2016, ~55% in Q4 2017, ~50% in Q4 2018

Note: Values calculated with the average discount and price for the given period.
Sources: Thomson Reuters; expert interviews; online retailers’ websites; Bain & Company
Figure 26: The high-tech segment has the highest growth and margin potential for lab-grown diamonds

Major applications of lab-grown diamonds

<table>
<thead>
<tr>
<th>Technology</th>
<th>Traditional use</th>
<th>High-tech use</th>
<th>Jewelry use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use</td>
<td>HPHT</td>
<td>Mostly CVD</td>
<td>Mostly CVD</td>
</tr>
<tr>
<td>Maturity of market</td>
<td>Mature</td>
<td>Emerging</td>
<td>Developing</td>
</tr>
<tr>
<td>Growth potential</td>
<td>Low</td>
<td>Very high</td>
<td>High</td>
</tr>
<tr>
<td>Current profitability</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Expected profitability</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
</tr>
</tbody>
</table>

Figure 27: Production capacity will limit lab-grown market growth in the short to medium term

Expected growth in lab-grown diamond capacity (aggressive expansion scenario), Mct gem-quality polished

Sources: Company data; expert interviews; Bain & Company
Figure 28: Three potential market scenarios exist based on how consumers perceive lab-grown diamonds

**Low differentiation**
Customers will see lab-grown and natural diamonds as interchangeable except for highest-quality stones

-25% to -30% impact on natural value (2030)

**Medium differentiation**
Customers will differentiate two products on occasion except for low-quality stones

-10% to -15% impact on natural value (2030)

**High differentiation**
Customers will consider natural and lab-grown diamonds as two different products

-0% to -5% impact on natural value (2030)

Unmet demand due to capacity constraints

Source: Bain & Company
Based on our analysis, we expect natural rough diamond supply to change at an average annual rate of negative 1% to 1% in volume terms through 2030. We expect demand to grow 0% to 2% in real value terms during the same time frame. Our current outlook versus the forecast from the previous year incorporates revised macroeconomic forecast, possible demand substitution from lab-grown diamonds, and reflects fundamental supply and demand factors rather than short-term fluctuations. The short-term supply-demand balance depends on the actions of major producers and efficiencies along the diamond pipeline.

We expect China and the US to maintain their leading roles in the diamond jewelry market. Real GDP growth of 2% to 3% per year will fuel US demand, and expansion of the middle class will reinforce China’s positive long-term demand trend.

India continues to show promising signs of growth, even amid its current market challenges. As India’s middle class expands and bridal jewelry is adopted, demand should follow.

Europe and Japan are expected to remain relatively stable, with modest long-term growth prospects.

The rough diamond supply is reasonably predictable over the next 5 to 10 years. However, financial challenges, production mix updates and overall uncertainty over future market conditions could force or delay production. As mining companies can adjust output to react to changing market conditions, production may fluctuate at existing mines.

We based our rough diamond supply forecast on an analysis of existing mines and anticipated production at planned new mines. Our projections also include potential supply from new sources, such as tailings from older mines, reopening of distressed mines, activation of options in resource development plans and recycling of secondhand diamonds.
Figure 29: Long- and short-term factors are driving the rough and polished diamond supply-demand balance, as well as prices

Long-term factors

- Consumer preference trends
  - Diamond jewelry share in total jewelry consumption
  - Usage of diamonds in engagement and wedding jewelry
  - Acceptance of lab-grown diamond jewelry

- Macroeconomic fundamentals
  - PDI and GDP growth for developed markets
  - Dynamics of middle-class households

- Supply fundamentals
  - Long-term performance of current mines (including depletion)
  - Introduction of new mines
  - Exploration of new deposits and tailings processing

Short-term factors

- Short-term volatility of macroeconomic factors (e.g., regional or global crises)
- Geopolitical conflicts affecting consumer confidence
- Pipeline efficiency as indicated by accumulating inventories
- Market confidence of midstream players
- Liquidity of midstream players

Note: PDI is personal disposable income
Source: Bain & Company

Figure 30: Announced new projects could add up to 21 million carats per year in rough diamond production

Forecasted rough diamond production of new mines, million carats, optimistic scenario

Note: Other smaller projects include Lace and Ghaghoo mines in case they start being operational in future in optimistic scenario
Sources: Company data; expert interviews; Bain & Company
Figure 31: Even in optimistic scenarios, rough diamond production is expected to decrease in short term, led by the depletion of existing mines.

Rough diamond supply, million carats, 2017–30, optimistic scenario

Rough diamond supply, million carats, 2017–30, base scenario

Notes: Additional sources can come from tailings retreatment and production from new reserves that are identified in existing mines as a result of brownfield exploration and development; additional sources also could include potential projects that are not in development now but may become viable should rough prices increase.

Sources: Company data; Kimberley Process; expert interviews; Bain & Company.

Figure 32: Real global GDP and PDI are expected to grow at 3% annually, fueling demand for diamond jewelry.

Real (2017 prices) global GDP, $ trillions

Real (2017 prices) PDI, $ trillions

Note: PDI is personal disposable income.
Sources: Euromonitor; Bain & Company.
Figure 33: Growth of middle class in China and India is expected to reinforce positive long-term demand trend

Middle class in China and India (estimated), millions of people

<table>
<thead>
<tr>
<th>Year</th>
<th>China</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>264</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>308</td>
<td></td>
</tr>
<tr>
<td>2022</td>
<td>352</td>
<td></td>
</tr>
<tr>
<td>2024</td>
<td>393</td>
<td></td>
</tr>
<tr>
<td>2026</td>
<td>436</td>
<td></td>
</tr>
<tr>
<td>2028</td>
<td>478</td>
<td></td>
</tr>
<tr>
<td>2030</td>
<td>519</td>
<td></td>
</tr>
</tbody>
</table>

Note: Middle class is defined as the population between 75% and 125% of median income
Sources: Euromonitor; Bain & Company

Figure 34: The supply-demand outlook is moderately optimistic, with growth estimated at 0%–2% in real terms (2%–4% in nominal)

Rough diamond supply and demand, $ billions (in real terms), 2000–30, 2018 prices, constant exchange rates, optimistic and base scenarios

Note: Rough diamond demand has been converted from polished diamond demand using historical ratio of rough diamond and polished diamond values; change in 2030 demand outlook versus previous year’s forecast is driven mostly by revised macroeconomic forecast and potential substitution from lab-grown diamonds
Sources: Kimberley Process; Euromonitor; Economist Intelligence Unit; company reports; expert interviews; Bain & Company
Figure 35: Delayed production of 2014–16 materialized in production growth in 2017–18, exceeding previously announced plans

Actual rough diamond production vs. publicly announced plans, million carats

Sources: Company data; Kimberley Process; expert interviews; Bain & Company
Glossary

- Average price per carat sold — indicator used to estimate change in value of diamond assortment realized in specific period (including sales of stock produced in previous periods); to estimate average price per carat sold, total value of diamonds sold is divided by total volume of diamonds sold.
- Beneficiation — the process by which producing governments seek to extract more value from their natural resources by developing downstream industries in their own countries; typically it involves commitments by producer companies to set up local cutting centers and hire local workers.
- CAGR — compound annual growth rate, a year-on-year growth rate over a specified period of time.
- Carat — one of the four main diamond characteristics, the others being color, cut and clarity; 1 carat = 250 mg.
- CVD — chemical vapor deposition, a high-temperature but normal-pressure process to grow lab-grown diamonds.
- Gem-quality diamonds — diamonds used for jewelry manufacturing.
- HPHT — high-pressure, high-temperature; a process using large presses to grow lab-grown diamonds.
- Kimberley Process — certification commitment aimed at prevention of conflict diamond sales.
- Lab-grown diamonds — diamonds produced in laboratories using HPHT or CVD methods; also known as synthetic diamonds.
- Market price index — indicator that shows change in market price for like-for-like diamond categories weighted according to global rough and polished product mix.
- Operating profit — profit from main operations before interest and tax.
- Personal disposable income — amount of money that households have available for spending and saving after paying income taxes.
- Reserves — resources known to be economically feasible for extraction.
- Resources — valuable deposits that could potentially be economically extracted at a later point.
Key contacts for this report

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