Supply Chains and Pricing in Optics and Photonics

As 2022 begins, Optica’s Tom Hausken examines trends for optics and photonics products against the backdrop of the pandemic’s broader disruptions.

Before the pandemic, companies commonly received supplies “just in time” to keep inventory costs low. Now, however—given the pandemic’s much-publicized supply-chain disruptions—many are ordering “just in case.” Even if it means keeping more inventory, advance orders can prevent production from grinding to a halt.

Just-in-time delivery is not as prevalent in optics and photonics companies as in some other sectors. But optics and photonics companies are reporting delayed shipments, longer lead times and rising prices. Many suppliers are allocating shipments to preferred customers and asking for long-term purchasing agreements with heavy cancellation penalties. This allows suppliers to plan ahead—and illustrates the leverage that suppliers have as they pass increased costs and risks on to their customers.

While not all delays are necessarily due to the pandemic (companies commonly miss shipping targets for other reasons), they have compounded to a global scale. Optics and photonics companies report shortages in supplies as diverse as laser crystals, flashlamps and the metal for heat sinks. Most critical, though, are semiconductor chips, with some orders booked well into 2023.

Companies also report a shortage of skilled workers. As with goods, people are not where the industry needs them, which is driving wages and prices higher. Economists are debating whether these shortages will lead to short- or long-term inflation.

Prices decline in the long term

Short-term price fluctuations, attributable to shifting end-product demand and variations in factory utilization, are common in large-volume manufacturing of optics and photonics products, such as displays, LEDs and photovoltaics. For example, suppliers began to raise display panel prices in mid-2020 as the pandemic drove new demand for consumer products. Now, the supply chain is constraining production just as pandemic-driven demand may be nearly satisfied and the market enters its annual seasonal slump. As of this writing, display prices have been...
declining since August 2021 and are headed toward pre-pandemic levels.

Long-term price declines are typical and even necessary to optics and photonics and the tech sector overall. Declining prices enabled widespread adoption of large-screen TVs, smartphones with embedded cameras, photovoltaic panels and LED-based lighting.

While the average price of the mix of products sold in a particular year—the ratio of total revenues over unit sales—may be steady or even rise, prices of specific products generally decline as suppliers find ways to reduce manufacturing costs. This continues until prices cannot go down anymore and products reach maturity.

Meanwhile, manufacturers continue to release new, higher-performance products, such as lasers with increased output power or image sensors with increased pixel count. To measure price while controlling for performance, the industry uses figures of merit like US$/watt in high-power lasers and US$/Gbps in optical transceivers. But those price metrics, too, decline over time.

For photovoltaic modules for instance, the cost of manufacturing declined with increasing cumulative volume for most of the period since 1976, with the lower cost passed on to the customer in lower prices. Other factors also affect average prices; in recent years, government subsidies to producers let prices drop to near production cost. Module prices increased in 2021 but fell in most years.

The pressure on prices means that regularly introducing new and improved products is almost a necessity to stay in business. Competitors face a choice: maintain a pipeline of new, higher-performance products with healthy profit margins to support the average sales price, or be the lowest-cost manufacturer and win on volume. The industry’s success at reducing prices helps to expand the market but is one reason that manufacturers exit product lines.

**Inflation erodes prices and revenues**

Since prices in our industry don’t usually go up over the long term, we don’t usually talk about inflation. But inflation matters because it represents the declining purchasing power of money, including the money earned by optics and photonics manufacturers. Long-term inflation means that prices are declining more than the nominal values might suggest. And it erodes revenues, too.

For example, the laser market grew from an estimated US$11 million in 1963 to US$16 billion in 2020, for a compound annual rate of 13.6%. But the value of the dollar in 1963 wasn’t the same as it is today: US$11 million then is equivalent to nearly US$100 million today.

We can convert the historical dollars to constant (inflation-adjusted) dollars by discounting for an average global inflation rate of 3.9% compounded over the period 1963 to 2020. That yields average compound annual growth 9.4%, which is a more accurate measure of the organic growth of our industry—a phenomenal rate of growth across nearly six decades.

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