

PLATINUM PERSPECTIVES

Quantifying the impact of semiconductor constraints

Uncertainty regarding the global semiconductor shortage increases downside risk for automotive demand for all PGMs. However, our analysis suggests that automaker efforts to protect higher margin product lines protects platinum demand more than palladium.

Global automotive manufacturing has been experiencing supply chain challenges, including the well-publicised global semiconductor shortage. The shortage stems from increased demand for personal electronic equipment since 2020, exacerbated by COVID related semiconductor production disruption and shutdowns in 2020 and 2021. In response, automakers have suspended production lines, and/or limited the availability of optional extras (e.g. automatic handbrakes) to reduce per-vehicle semi-conductor requirements. Automotive production challenges are reportedly more acute in North America and Asia, than in Europe, which is potentially more detrimental for palladium than platinum.

Uncertainties around the duration of supply chain challenges as well as automaker ability to thrift semi-conductors to support vehicle production numbers, are leading to a wide range of global vehicle production estimates for 2021-2023. We will update our 2021 forecast in the next *Platinum Quarterly* (on November 24th), but we present below a range of vehicle production scenarios and the flow-through impact on platinum and palladium demand, as well as sensitivities in that demand to changes in the global vehicle product mix.

Global vehicle production scenarios and corresponding variations in platinum and palladium automotive demand vs. base case estimates, Light Vehicle (LV) + Heavy Duty (HD)

Changes in PGM automotive demand with changes in vehicle production (LV + HD)

		2021F	2022F	2023F
Low Disruption (WPIC Scenario)	(M Units)	86.0	95.0	93.0
Base (Fitch Solutions)*	(M Units)	85.4	89.3	92.2
High Disruption (WPIC Scenario)	(M Units)	82.0	85.0	94.0
Low Disruption Platinum Variance	(koz)	+19	+212	+29
High Disruption Platinum Variance	(koz)	-116	-157	+66
Low Disruption Palladium Variance	(koz)	+60	+385	+83
High Disruption Palladium Variance	(koz)	-361	-458	+190

Source: Metals Focus, LMC Automotive, Johnson Matthey, Fitch Solutions, WIPIC Research, *Fitch Solutions vehicle production estimates used as the basis for the trend in vehicle production outlook and matched with WIPIC PQ'Q2 2021 estimate for automotive platinum demand in 2021.

A key assumption in our vehicle production scenarios is that consumer demand remains unchanged despite supply constraints, thus we anticipate automakers respond to pent up demand as supply chain challenges ease. The spread in automotive platinum demand between the scenarios is as much as 369koz in 2022 compared to 843koz for palladium. **Beyond the automotive production scenarios, there is also scope for vehicle manufacturers to prioritise higher margin products, which are typically more favourable for platinum demand.** To put this into context, our base case estimate is for a 35koz variation in platinum demand for every 1M change in global auto production, if cuts are spread evenly across all product lines. This shrinks to 28koz/million vehicle reduction, if automakers prioritise producing higher margin, platinum utilising vehicles. The corresponding move in palladium would be an increase from 105koz to 109koz, highlighting that palladium is less sensitive to changes in the vehicle production mix than platinum.

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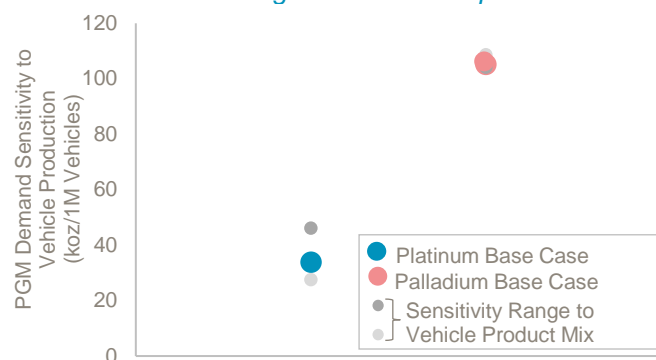
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Absolute change in PGM automotive demand per 1M change in total vehicle production (LV+HD), and sensitivities to changes in LV vs. HD production mix



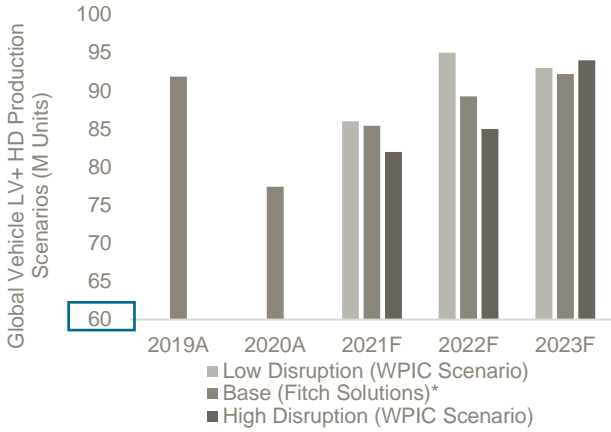
Source: Metals Focus, Johnson Matthey, WIPIC Research, ** Product mix sensitivity ranges reflect automaker efforts to direct semiconductor supplies to protect higher margin product lines (large LV & HD), typically favourable for platinum demand, vs. constraints forcing prioritisation of LV output (more favourable to palladium demand).

The key conclusion is that palladium appears more vulnerable than platinum to vehicle production downside risks due to a) greater supply chain challenges in the US and Asia, and b) a likely desire for OEMs to protect production of higher margin vehicles, which typically utilise platinum. Importantly, this is probably only easing, but not eliminating palladium's undersupply challenges. Most importantly, the chip shortage adds less to any platinum oversupply estimates for 2021 than the market might be assuming.

Platinum's attraction as an investment asset arises from:

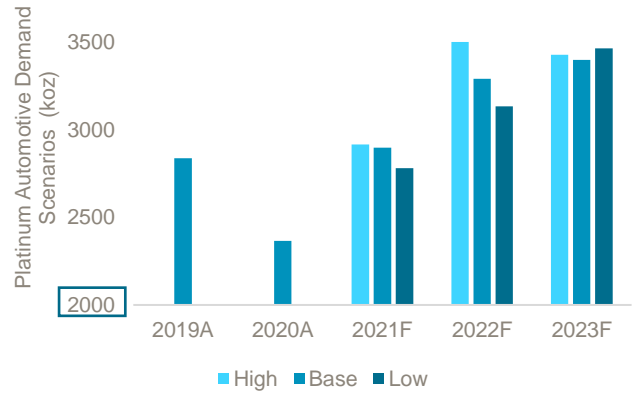
- Supply severely constrained for three more years despite some new investment in mining capacity
- Platinum price is near all-time lows relative to gold and near record lows relative to palladium
- Automotive PGM demand growth should continue due to increasingly restrictive emissions rules
- Market balance and price mismatches between palladium and platinum drives substitution
- Investment demand is softer after two record years but price and fundamentals remain attractive

Figure 1: Consumer vehicle demand is expected to remain unchanged despite supply constraints, leading to production upticks as challenges are overcome



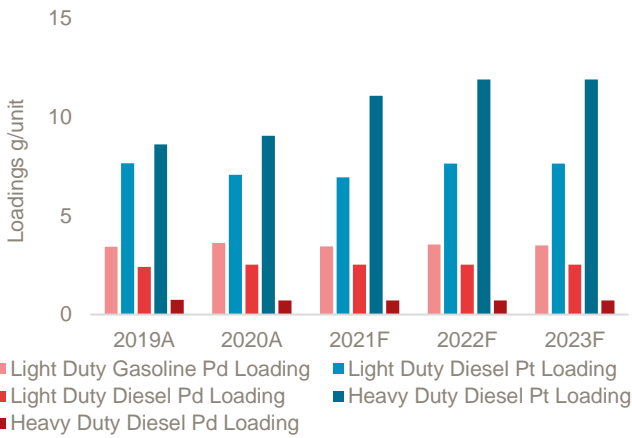
Source: OICA, Fitch Solutions, WPIK Research, *Fitch Solutions vehicle production estimates used as the basis for the trend in vehicle production outlook

Figure 2: Platinum automotive demand response is similar to changes in vehicle production volumes, assuming the HD/LV mix matches recent years



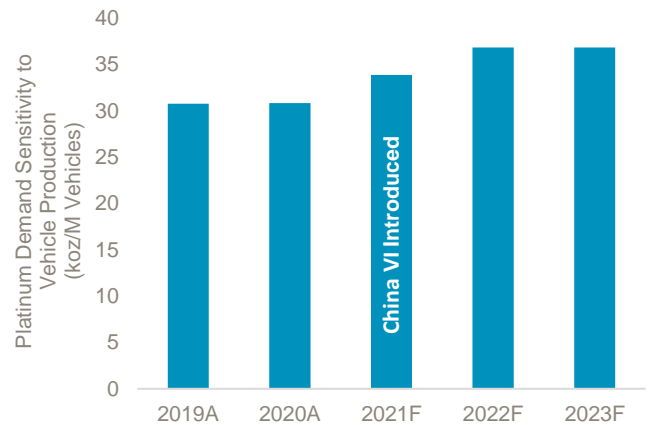
Source: Metals Focus, Johnson Matthey, WPIK Research

Figure 3: ...but if automakers can direct chips to higher margin vehicle categories (large LV and HD) platinum volumes benefit vs. palladium (varies per region)



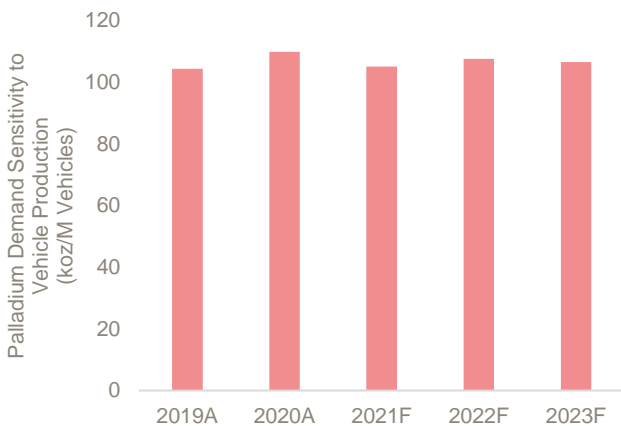
Source: WPIK Research

Figure 4: The full introduction of China VI is expected to increase global average platinum loadings, and this is before substitution in light duty gasoline vehicles



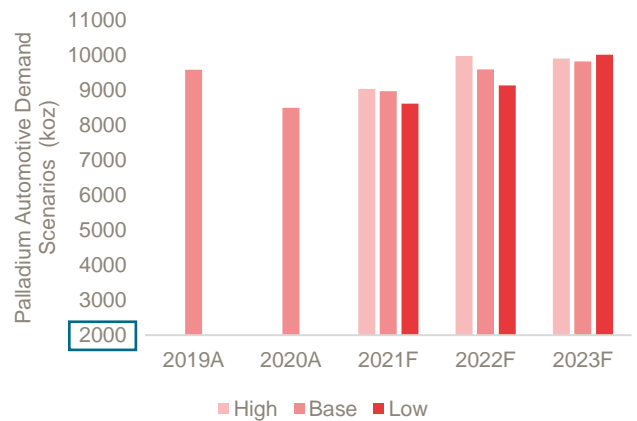
Source: WPIK Research

Figure 5: Average palladium loadings are estimated to remain more constant...



Source: Metals Focus, Johnson Matthey, WPIK Research

Figure 6: ...and Palladium automotive demand is estimated to show less sensitivity to the LV/HD vehicle mix



Source: Metals Focus, Johnson Matthey, WPIK Research

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