Science & Technology · GS - III

The growing strategic importance of advanced semiconductors has transformed export controls into an instrument of technological competition. Examine the challenges of enforcing such controls across transnational supply chains, particularly through third-country intermediaries.

EXAM YEAR	PAPER	SUBJECT
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MARKS	WORD LIMIT
15	~250 words

Answer Hint

Semiconductor geopolitics, export-control regimes, dual-use technology, re-export restrictions, end-user verification, third-country intermediaries, supply-chain transparency, technological sovereignty

Model Answer

Introduction

Advanced semiconductors are critical to artificial intelligence, defence systems and strategic computing. Their growing geopolitical significance has encouraged states to impose export restrictions, but complex global supply chains create opportunities for diversion.

Major Enforcement Challenges

1. **Third-country routing:** Intermediaries may use subsidiaries and front companies to conceal the actual destination of restricted technology.
2. **End-user verification:** Exporters may struggle to establish the identity and intended use of equipment beyond the first buyer.

3. **Jurisdictional differences:** Countries have different export-control laws, enforcement capacities and approaches to foreign restrictions.
4. **Dual-use character:** Advanced chips support both civilian applications, such as cloud computing, and military or strategic applications.
5. **Remote computing:** Access to chips installed in overseas data centres complicates the distinction between physical exports and cross-border access to computing capacity.

Implications

The alleged Megaspeed network illustrates how transnational corporate structures can complicate enforcement. Such cases also create compliance risks for technology firms and intermediary economies.

Way Forward

- Strengthen end-use monitoring and beneficial ownership disclosure.
- Improve intelligence-sharing and customs cooperation.
- Establish transparent re-export compliance mechanisms.
- Develop trusted semiconductor supply chains while protecting legitimate technology trade.

Conclusion

Export controls require coordinated enforcement beyond national borders. A balance between strategic security, technological innovation and legitimate international commerce is essential for effective technology governance.

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