

# Multinational Firms and Global Supply Chains

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ECON 171 · Spring 2026 · Week 8

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# Today's Agenda

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1. Types of FDI: horizontal vs. vertical
2. The concentration-proximity trade-off
3. Vertical FDI and the cost-coordination trade-off
4. Outsourcing vs. in-house production, and transaction costs

# What We Aim to Learn

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- Why do firms cross borders as producers, not just as exporters?
- How do firms decide *where* to put production?
  - When is replicating production abroad (horizontal FDI) better than exporting?
  - When does trade policy push firms to “jump” tariffs?
- How do firms decide *how* to organise the supply chain?
  - What is the cost vs. coordination trade-off in fragmenting production?
  - Why has the share of fragmented production risen so much since the 1970s?
  - When is an arm’s-length supplier preferred to keeping the stage in-house?
  - What are transaction costs, and how do they justify integration?

# How much trade is multinational?

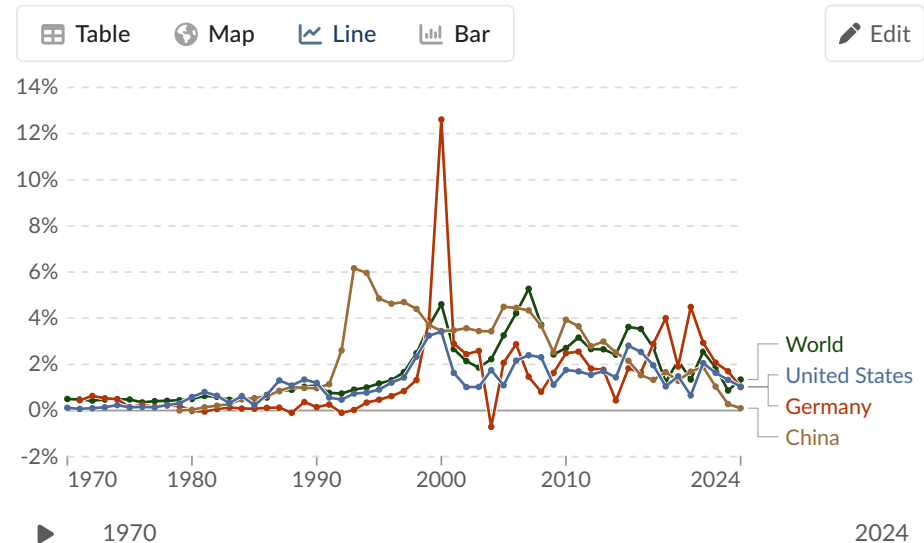
- Multinationals move *production* across borders, not just goods. The right unit of analysis is the firm, not the country.
- In **2024**, **44%** of US goods trade (\$2.3 T of \$5.3 T) — and **49.5% of US imports** — was related-party.
- Global FDI flows reached **\$1.6 T in 2025**, but have *lost ground* to GDP and trade since 2010.

Half of what the US buys from abroad is shipped *between a firm and its own affiliate*.

## Foreign direct investment, net inflows as share of GDP, 1970 to 2024

Our World  
in Data

Net inflows of foreign direct investment from foreign investors to the reporting economy.



Data source: IMF International Financial Statistics and Balance of Payments; World Bank International Debt Statistics and GDP estimates; and OECD GDP estimates (2026) – [Learn more about this data](#)

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Explore the data →

FDI inflows as % of host-country GDP · [OWID](#) (WB WDI / IMF BoP). Headline figures: US Census, *Related-Party Trade* 2024; UNCTAD, *WIR* 2025.

# Horizontal FDI: Toyota in Kentucky

## Replicate the plant abroad

- **1981:** US–Japan VRA caps Japanese auto exports to the US at **1.6 M cars/year**.
- **1988:** Toyota opens **TMMK** in Georgetown KY — its first wholly-owned US assembly plant.
- **Today:** ~ **9,400 employees**, **14 M+ vehicles** built. Builds Camry, RAV4 hybrid, Lexus ES for the US market.
- Same product, *replicated* inside the tariff wall.

**Horizontal FDI** — replicate production where *demand* is, to bypass trade costs.



*Plant Georgetown, KY — Toyota's first wholly-owned US assembly facility (opened May 1988).*

Image: Wikimedia Commons (Censusdata, CC BY-SA 3.0).

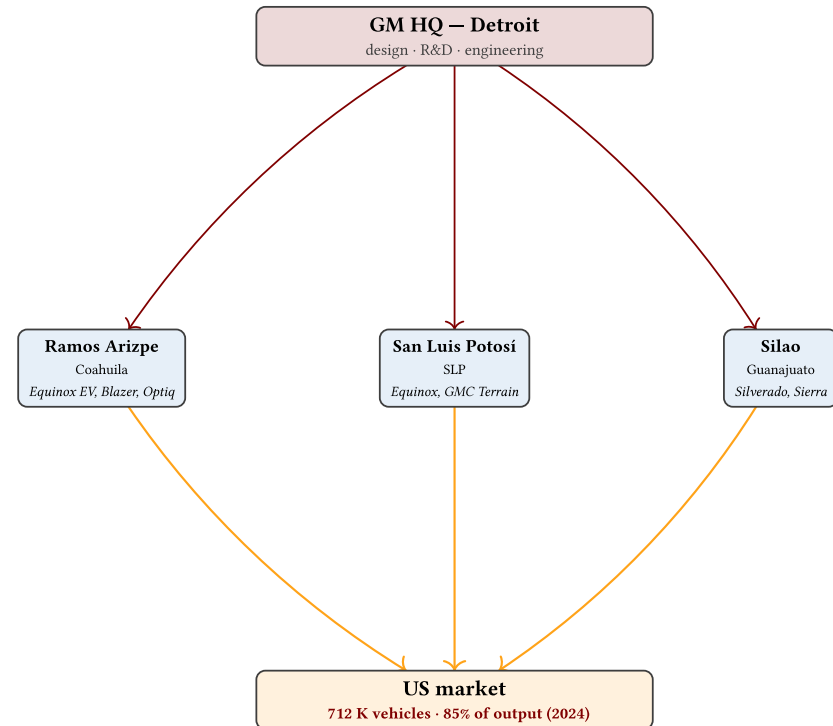
Source: APEC, *Toyota Motor Manufacturing Kentucky case study* (2025); Toyota Global, *75 Years of Toyota: Voluntary Export Restraints* (2012).

# Vertical FDI: GM in Mexico

## Fragment the chain across borders

- GM owns **three Mexican assembly plants** — *Ramos Arizpe* (Equinox / Blazer EV, Cadillac Optiq), *San Luis Potosí* (Equinox, GMC Terrain), *Silao* (light-duty Silverado / Sierra).
- In **2024**, GM exported ~ **85%** of Mexican output — about **712 K vehicles** — back to the US market.
- Design, R&D, and powertrain engineering remain in **Detroit**; stamping, paint, and final assembly fragmented across NAFTA / USMCA.
- Same firm, different stages, different countries.

**Vertical FDI** — chain *across* borders inside the firm, to chase factor-cost gradients.



*GM's Mexican production footprint — three wholly-owned plants, 85% of output exported back to the US in 2024.*

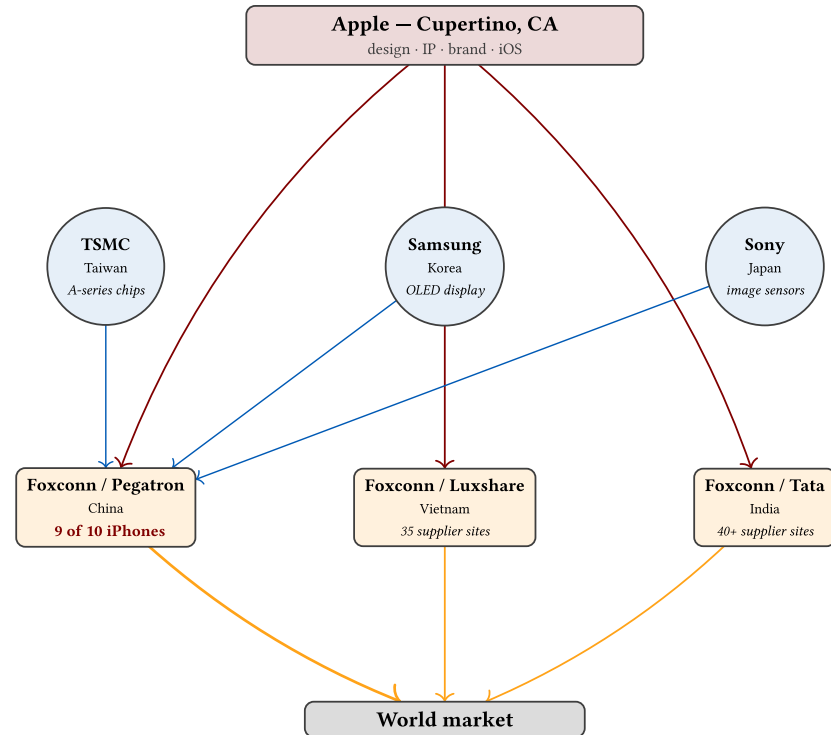
Source: Council on Foreign Relations, *Tariff Turbulence* (2025); *AméricaEconomía*, *Mexico's Automotive Surplus with the US* (2024).

# Outsourcing: Apple's iPhone

## ... or buy it on the market

- iPhone is **designed in Cupertino**; iOS, the App Store, the brand are owned by Apple.
- Components are bought from independents: **TSMC** chips (Taiwan), **Samsung** OLED (Korea), **Sony** sensors (Japan).
- **Assembly** by Foxconn / Pegatron / Luxshare — ~ **9 of 10 iPhones** still from China; Vietnam and India ramping fast.
- Apple owns *none* of these plants — every stage is an **arm's-length contract**.

**Outsourcing** — fragment the chain *without* owning any of it.



*The iPhone supply chain in 2025 — Apple designs in Cupertino, buys components and assembly from independent firms.*

Source: *Business Standard*, *India builds China-light Apple supply chain* (2025); AEI, *Apple's Supply Chain: Economic and Geopolitical Implications* (2024).

# Multinational Firms

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# Types of FDI: horizontal vs. vertical

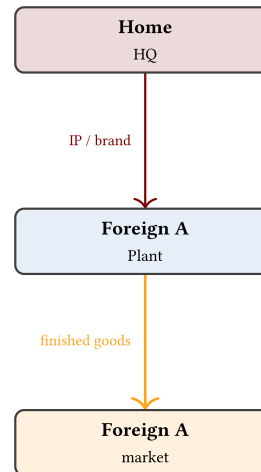
## Horizontal FDI — replicate the plant

- Replicate production *abroad* to serve a foreign market *locally* (e.g., **Toyota Kentucky**).
- Substitute for *exporting*: skip the trade cost  $\tau$ , duplicate the plant fixed cost  $F_{\text{plant}}$ . Common between *similar* economies (US  $\leftrightarrow$  EU autos, pharma).

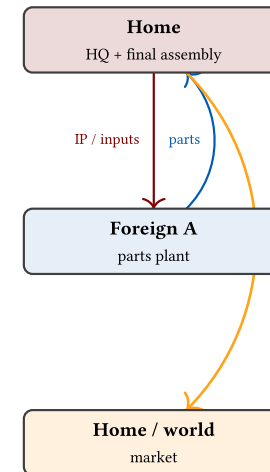
## Vertical FDI — fragment the chain

- Fragment the value chain across countries (e.g., **GM Mexico**); offshore the labour-intensive stages, keep capital-intensive at home.
- Driven by *factor-cost* differences; common between *dissimilar* economies (North  $\rightarrow$  South).

Horizontal FDI — replicate the plant



Vertical FDI — fragment the chain



Each arrow shows where the *finished good* ends up — that's the distinguishing feature across the three FDI types.

# Export-platform FDI & taking stock

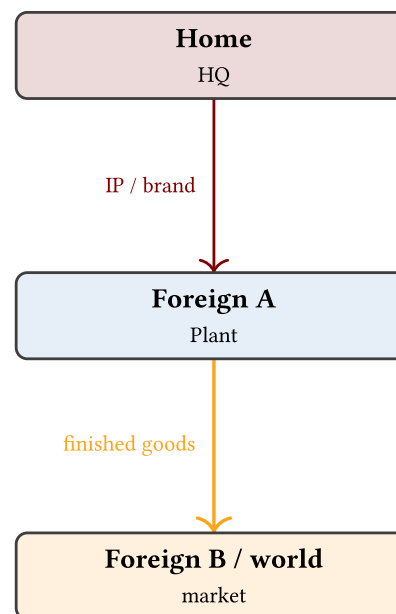
## Export-platform FDI — third-country sales

- Plant abroad serves a *third-country* market, not the host. Examples: **BMW Spartanburg** → world; **Toyota Mexico** → US; **Intel Ireland** → EU.
- A *hybrid* — replication (be inside the destination region) *and* factor-cost arbitrage motives.

## Taking stock

- The three patterns aren't exclusive — most large MNEs run *all three*. Horizontal dominates between developed countries; vertical and export-platform dominate North-South flows.

## Export-platform FDI — third-country sales



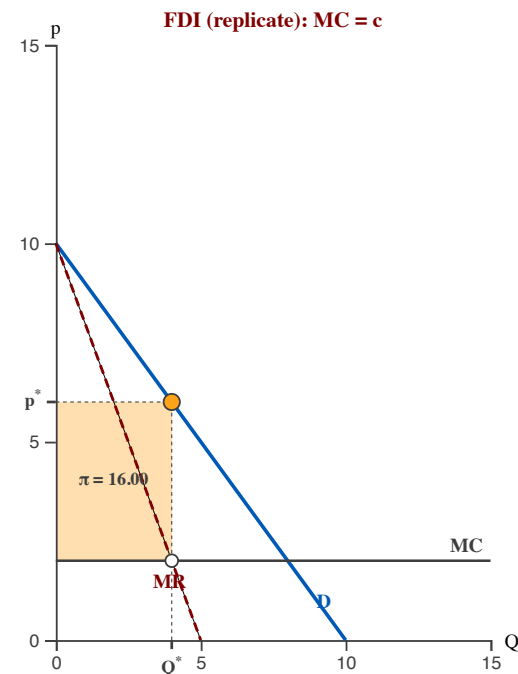
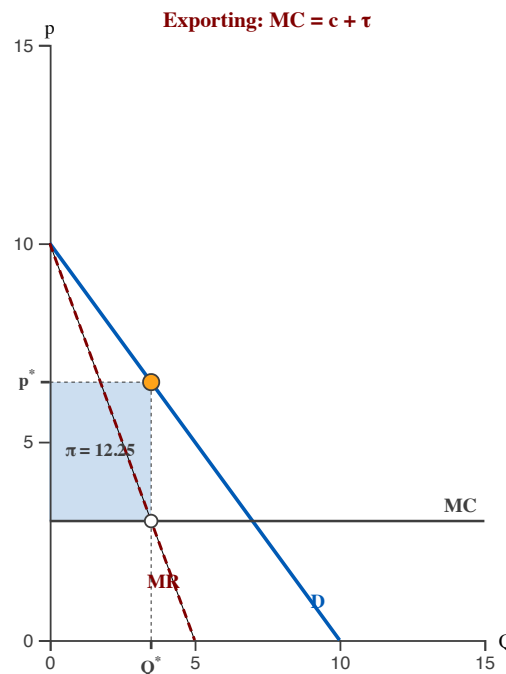
Examples: BMW Spartanburg → world; Toyota Mexico → US; Intel Ireland → EU.

**Further reading:** Markusen, *Multinational Firms and the Theory of International Trade* (MIT Press, 2002); Antràs, *Global Production* (Princeton, 2016); Helpman, Melitz & Yeaple, “Export Versus FDI with Heterogeneous Firms” (*AER*, 2004).

# Pricing under export vs. FDI

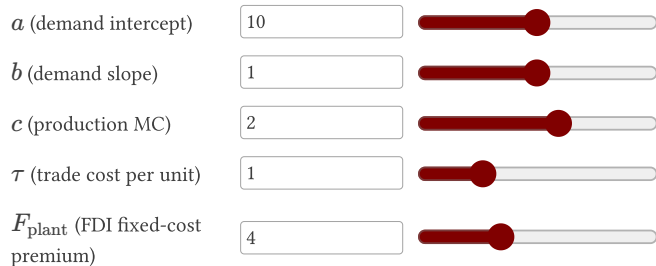
|                              |                                 |  |
|------------------------------|---------------------------------|--|
| $a$ (demand intercept)       | <input type="text" value="10"/> |  |
| $b$ (demand slope)           | <input type="text" value="1"/>  |  |
| $c$ (production MC)          | <input type="text" value="2"/>  |  |
| $\tau$ (trade cost per unit) | <input type="text" value="1"/>  |  |

- Foreign demand  $p = a - bQ$  — same in both panels.
- Firm picks  $Q$  to max  $(p - MC)Q \Rightarrow MR = MC$ .
- Export.**  $MC = c + \tau$ . **FDI.**  $MC = c$ .
- Lower MC slides the optimum *down D*: higher  $Q^*$ , lower  $p^*$ , larger variable profit  $\pi^{\text{var}} = (p^* - MC)Q^*$ .



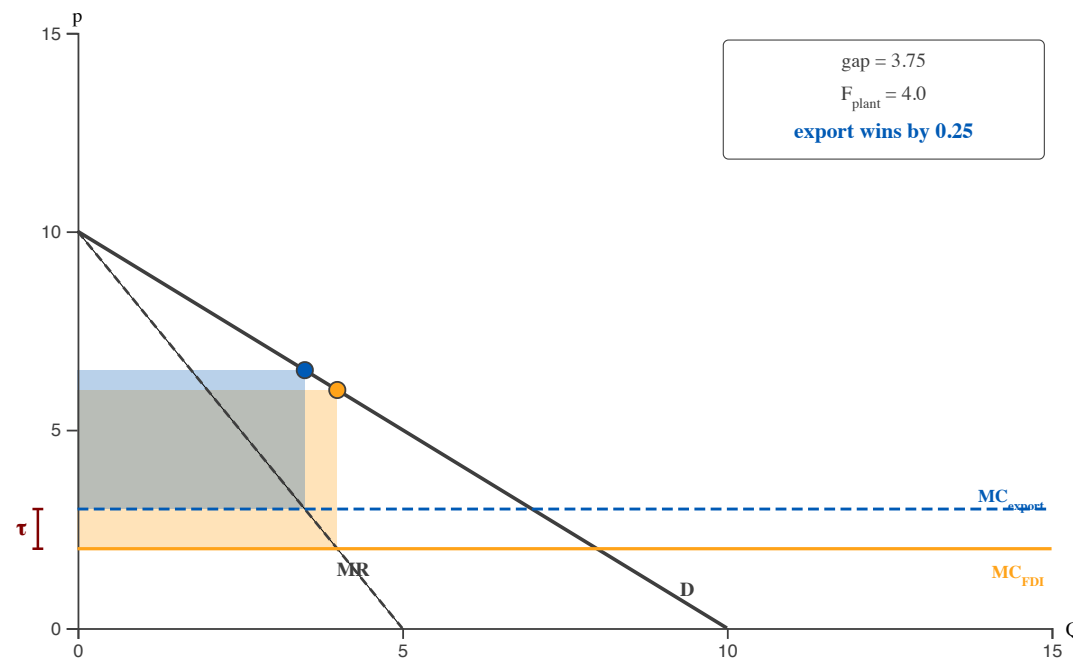
The gap  $\pi_{\text{FDI}}^{\text{var}} - \pi_{\text{export}}^{\text{var}}$  is what FDI buys you. It must clear the extra fixed cost  $F_{\text{plant}}$ .

# Concentration-Proximity Trade-off



- **Concentration motive.** One plant at home, export — pay trade cost  $\tau$  on every unit.
- **Proximity motive.** Plant in foreign market — skip  $\tau$  but pay extra fixed cost  $F_{\text{plant}}$ .
- Both strategies face the *same* demand, but at *different* MC. The trade cost  $\tau$  is the wedge.
- **FDI wins** when the variable-profit gap  $\pi_{\text{FDI}}^{\text{var}} - \pi_{\text{export}}^{\text{var}}$  exceeds  $F_{\text{plant}}$ .

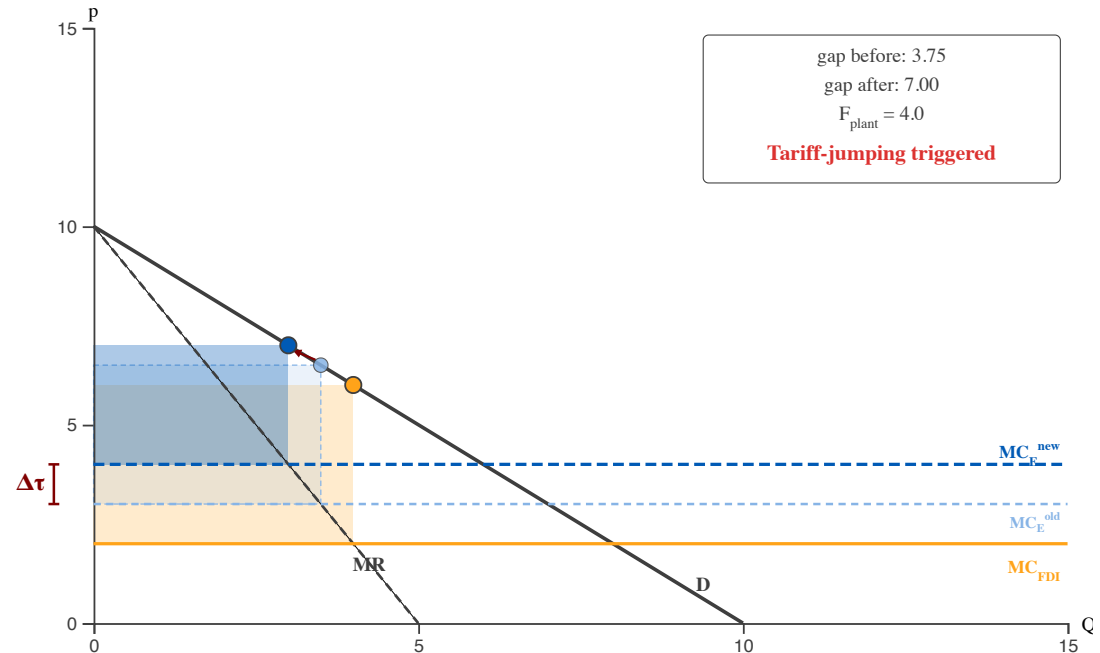
Higher  $\tau$  widens the gap; higher  $F_{\text{plant}}$  raises the bar. Try both sliders.



# Trade policy and horizontal FDI

$\tau$  (trade cost per unit)    
 $\Delta\tau$  (tariff increase)    
 $F_{\text{plant}}$  (FDI fixed-cost premium)  

- Tariff  $\Delta\tau$  shifts  $MC_{\text{export}}$  *up*;  $MC_{\text{FDI}}$  is unaffected.
- Export optimum slides *up* demand: smaller  $Q^*$ , higher  $p^*$ , smaller  $\pi_{\text{export}}^{\text{var}}$ .
- Variable-profit gap widens. If it now exceeds  $F_{\text{plant}}$ , the exporter *jumps the tariff* and opens an MNE plant.
- Classic case: 1981 US–Japan VRA  $\Rightarrow$  Honda, Nissan, Toyota open US transplants in the 1980s.



# Vertical FDI

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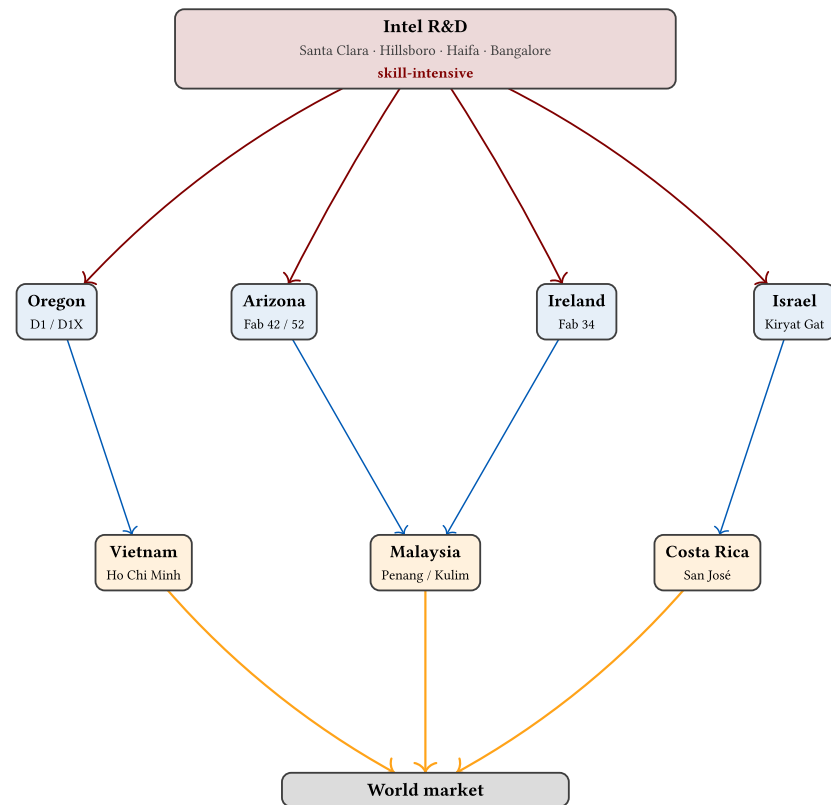
# Intel: one chip, four countries

Intel splits production of one chip into three stages — every box is *wholly owned* by Intel:

- **R&D · design** (*skill-intensive*) — Santa Clara, Hillsboro, Haifa, Bangalore.
- **Wafer fabrication** (*capital-intensive*) — Oregon, Arizona, Ireland, Israel.
- **Assembly · test · packaging** (*labor-intensive*) — Vietnam, Malaysia, Costa Rica.

The same firm runs the chain in four countries, picking each *stage*'s location separately.

**Vertical FDI** at full extent — chain across borders, *all in-house*.



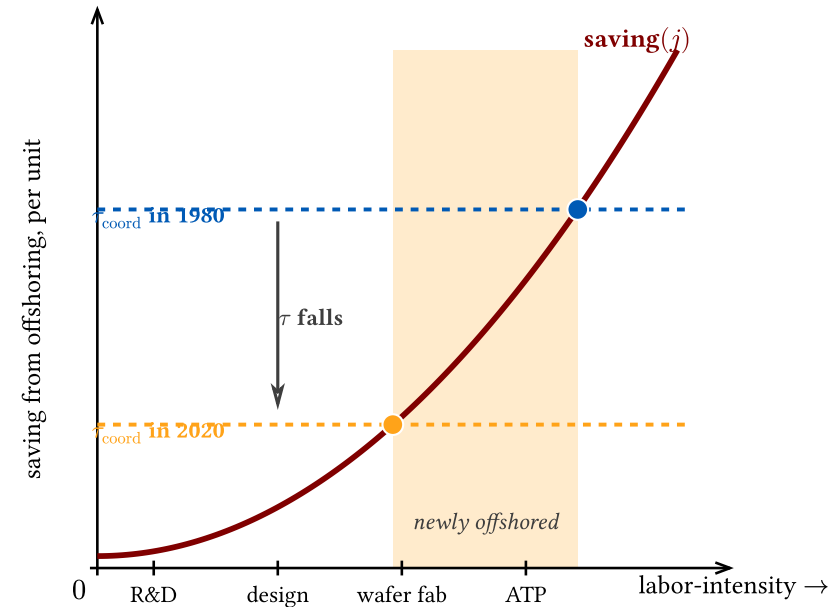
Each box = a wholly-owned Intel facility. Colour codes the stage's factor intensity.

Source: Intel, *Manufacturing Locations* (2024); Intel CSR Report 2023–24; Intel newsroom press releases (2021–2024).

# The cost-coordination trade-off

- Stage  $j$  uses inputs at intensities  $\alpha_j^L$  (labor) and  $\alpha_j^K$  (capital).
- Unit cost at country  $k$ :  $C_k(j) = w_k \alpha_j^L + r_k \alpha_j^K$ .
- Saving from offshoring:  

$$\Delta(j) = (w_H - w_F) \alpha_j^L + (r_H - r_F) \alpha_j^K.$$
- **Rule:** offshore stage  $j$  when  $\Delta(j) > \tau_{\text{coord}}$  (coordination friction).
- *Takeaways:* with  $w_H > w_F$ ,  $\Delta(j)$  rises in  $\alpha_j^L$  – labor-intensive stages go first; falling  $\tau_{\text{coord}} \Rightarrow$  more stages cross over.



Offshore stage  $j$  when the factor-cost saving exceeds the coordination friction  $\tau_{\text{coord}}$ .

**For now:** every offshored stage stays *in-house*. We relax this assumption in the next section.

Frameworks: Baldwin, *The Great Convergence* (Harvard, 2016); Grossman & Rossi-Hansberg, “[Trading Tasks: A Simple Theory of Offshoring](#)” (*AER*, 2008).

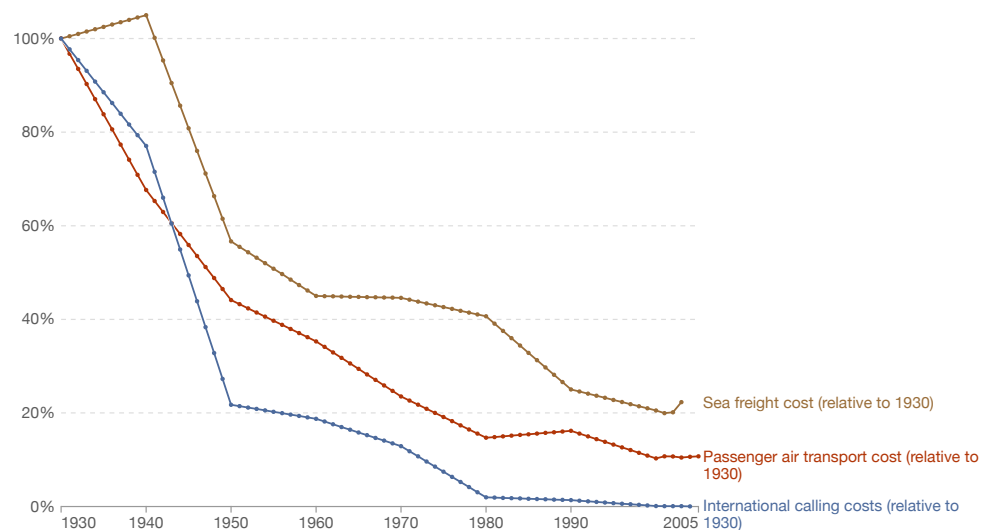
# The great unbundling: evidence

- **Country level**, 1970s → 2008: foreign value-added share of OECD exports roughly *doubled*; intermediate goods now ~**56%** of OECD goods trade.
- **Firm level**, 2023: ~**32%** of US multinationals' worldwide workforce sits in foreign affiliates; ~**24%** of their value added is produced abroad (BEA).
- Driver: real shipping costs ↓ ~**80%** vs. 1930; international call cost ≈ zero (chart →).
- **Since 2008** (“slowbalisation”): global foreign value-added share flat; US fell **12.1%** (2008) → **7.5%** (2020).

30 years of falling  $\tau_{\text{coord}}$  pushed firms toward fragmentation — but the trend has *stalled*.

## The decline of transport and communication costs relative to 1930

Sea freight corresponds to average international freight charges per tonne. Passenger air transport corresponds to average airline revenue per passenger-mile until 2000 spliced to US import air passenger fares afterwards. International calls correspond to cost of a three-minute call from New York to London.



Data source: Transaction Costs - OECD Economic Outlook (2007)

OurWorldInData.org/trade-and-globalization | CC BY

Sources: OECD-WTO TiVA (1995–2020); BEA, [Activities of US Multinational Enterprises 2023](#); OWID Trade & Globalisation (OECD *Economic Outlook* 2007).

# Outsourcing and Supply Chains

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# Outsourcing vs. In-house Production

## Relax the in-house assumption

- Until now each offshored stage was *in-house*. Now allow independent suppliers.
- *In-house* → own the foreign affiliate (FDI).  
*Arm's-length* → buy on the market (outsourcing).
- Each stage is now **here vs. abroad** and **inside vs. outside the firm** — a  $2 \times 2$ .

Whether to integrate depends on *transaction costs* — see the next slide.

Organisation of production — a  $2 \times 2$

|         | In-house<br>(integrated)                                                  | Arm's-length<br>(outsourced)                                                                     |
|---------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Home    | <b>Domestic in-house</b><br><i>Intel Oregon</i><br>wafer fab in Hillsboro | <b>Domestic outsourcing</b><br><i>Magna · Lear · BorgWarner</i><br>US tier-1 auto-parts supplier |
| Foreign | <b>Vertical FDI</b><br><i>GM Mexico</i><br>Detroit → Ramos Arizpe etc.    | <b>Offshoring</b><br><i>Apple ↔ Foxconn</i><br>design in Cupertino, assembly in China            |

Rows = *where* the stage is. Columns = *who owns* the stage.

# Transaction costs

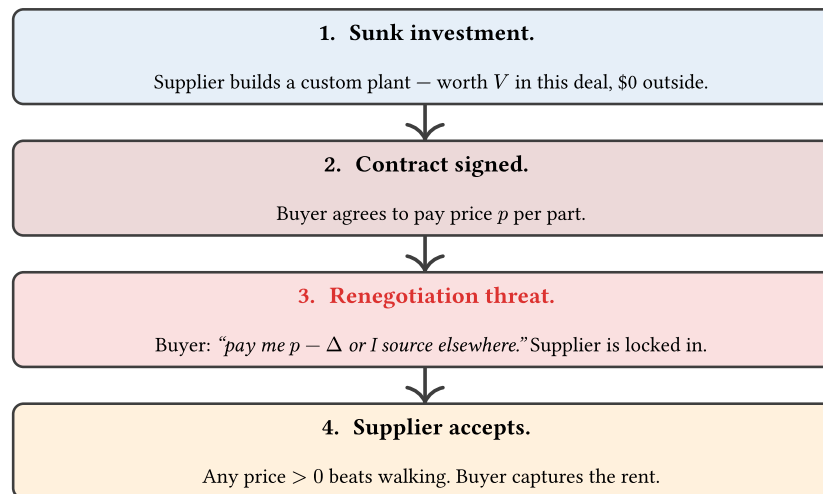
Coase (*Economica*, 1937): firms exist because **using the market is not free**. Beyond the price  $p$  a buyer also pays:

- **Search & info** — find suppliers, screen for quality.
- **Bargaining** — negotiate price, terms, contingencies.
- **Enforcement** — monitor delivery, defects, IP.
- **Adaptation** — renegotiate the unforeseen.

Williamson's three drivers (1975, 1985):

- **Asset specificity** — supplier's investment has no value outside this deal. *Decisive* → hold-up risk (right).
- **Uncertainty** — more contingencies ⇒ more renegotiation.
- **Frequency** — repeated deals need governance.

## The holdup problem



Classic case: GM acquires Fisher Body (1926). Klein–Crawford–Alchian (*JLE*, 1978).

**Rule.** High asset specificity, uncertainty, or frequency ⇒ *integrate*. Standardised, thick-market inputs ⇒ *outsource*.

References: Coase (*Economica*, 1937); Klein–Crawford–Alchian (*JLE*, 1978); Williamson, *Markets and Hierarchies* (1975) and *The Economic Institutions of Capitalism* (1985); Grossman & Hart (*JPE*, 1986); Hart & Moore (*JPE*, 1990).

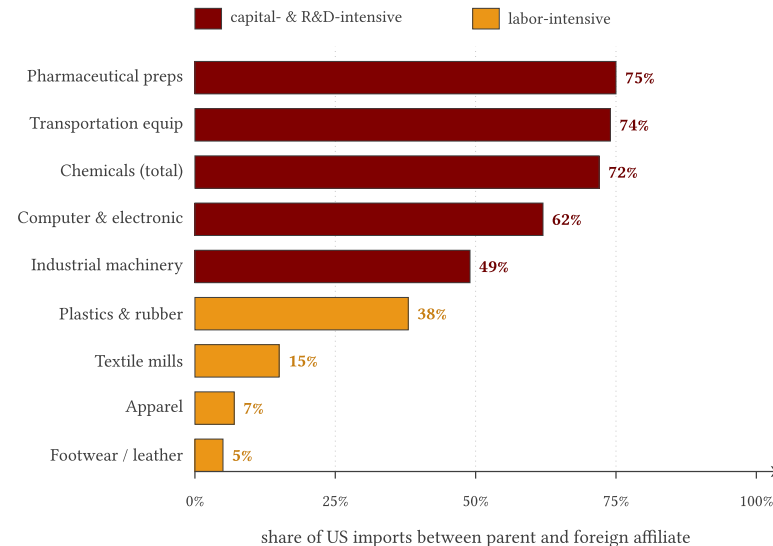
# What gets outsourced?

## Antràs (2003) headline result

- *Capital-intensive* inputs  $\Rightarrow$  **integrate** (intra-firm).
- *Labour-intensive* inputs  $\Rightarrow$  **outsource** (arm's-length).
- Logic: when HQ's investment is decisive (R&D, brand), the firm wants residual control. When the supplier's effort is decisive, it cedes ownership.
- *Country corollary* (Nunn, 2007): weaker contract enforcement  $\Rightarrow$  more integration.

The same firm chooses *different* governance for *different* inputs — pharma intra-firm, packaging arm's-length.

Intra-firm share of US imports, by industry



Source: US Census, *Related-Party Trade* exhibits (3-digit NAICS, 2009; the same five industries top the 2024 release). Pattern from Antràs (QJE, 2003).

**Further reading:** Antràs, “Firms, Contracts, and Trade Structure” (QJE, 2003); Nunn, “Relationship-Specificity, Incomplete Contracts, and the Pattern of Trade” (QJE, 2007); Antràs, *Global Production* (Princeton, 2016).

# Main take-aways

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- **Multinational firms cross borders as producers**, not just exporters. Distinguish **horizontal FDI** (replicate the plant in a foreign market) from **vertical FDI** (fragment the chain across borders).
- **Concentration-proximity trade-off**. Exporting pays a per-unit trade cost  $\tau$ ; FDI skips  $\tau$  but pays a fixed plant cost  $F_{\text{plant}}$ . FDI wins when the variable-profit gap  $\pi_{\text{FDI}}^{\text{var}} - \pi_{\text{export}}^{\text{var}}$  exceeds  $F_{\text{plant}}$ .
- **Tariffs are an asymmetric shock**. They raise  $\text{MC}_{\text{export}}$  only —  $\text{MC}_{\text{FDI}}$  is unchanged. A large enough  $\Delta\tau$  flips the regime to *tariff-jumping FDI* (1981 VRA, Honda/Nissan/Toyota in the US).
- **Vertical FDI follows cost-coordination logic**. Offshore stage  $j$  when factor-cost saving  $\Delta(j)$  exceeds coordination friction  $\tau_{\text{coord}}$ . Labor-intensive stages go first; falling  $\tau_{\text{coord}}$  explains *the great unbundling* since the 1970s.
- **Outsourcing vs. in-house is about transaction costs**. Hold-up risk, asset specificity, and incomplete contracts push relationship-specific stages *inside* the firm.

Multinationals make a *location* choice (where to put each stage) *and* an *organisational* choice (in-house vs. arm's length). Both choices respond to the primitives — factor prices,  $\tau$ ,  $F_{\text{plant}}$ , contracts.

# Skills you can now use

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## Solve the model

- From  $(a, b, c, \tau, F_{\text{plant}})$ , compute the monopolist's  $(Q^*, p^*, \pi^{\text{var}})$  under export vs. FDI and pick the winning mode.
- Find the threshold  $\Delta\tau$  at which an exporter becomes a tariff-jumping MNE for given  $F_{\text{plant}}$ .
- Rank stages by  $a_j^L / a_j^K$ , compute  $\Delta(j)$ , and predict which stages cross  $\tau_{\text{coord}}$ .
- Trace comparative statics in  $\tau, F_{\text{plant}}, \tau_{\text{coord}}, w_H - w_F$ .

## Interpret and apply

- Classify a real firm's setup (Toyota Kentucky, GM Mexico, Intel, Apple–Foxconn) as horizontal/vertical and in-house/outsourced.
- Predict the direction of FDI from a tariff change or transport-cost shock.
- Diagnose when transaction costs (hold-up, specificity) justify vertical integration of a stage.
- Suggest data measurements that can indicate trends and patterns in vertical FDI and outsourcing.

You can now move between **primitives** ( $\tau, F_{\text{plant}}, \tau_{\text{coord}}, \text{contracts}$ ) and **observables** ( $Q^*, p^*, \text{mode}, \text{location}$ ) — the firm-level layer that complements the country-level theories from earlier in the course.