Choosing the Optimal Location for Semiconductor Wafers AT Plant

An Analysis Based on Financial, Logistics, and Supply Chain Costs

Introduction

- Intel is evaluating several potential locations for its next assembly and test (AT) plant for semiconductor wafers.
- Key decision criteria include operational costs, logistics efficiency, government incentives, market access, and labor availability.
- This presentation explores financial performance, supply chain transportation costs, and a decision matrix to assess the optimal location.

Financial Terminology

Return on Equity

ROE = Net Income / Equity

Measure of overall profitability of shareholders investment.

Where Net Income is the net amount of assets generated by a business through operations

ROE at one point in time does not give us the right analysis. We need to look at the trends over time and compare across financial timeline

Financial Terminology

Dupoint Framework has three components to measure the efficacy of ROE

a) Profitability

b) Efficiency

c) Leverage

Financial Terminology

Leverage ratio

How much money has been borrowed to purchase the asset

Leverage ratio = Total asset / Stockholder's equity

How many assets were acquired via equity that has been put in the business

Financial Terminology

Efficiency ratio

Measures how much sales are generated from the company's assets

Total Sales / Total Assets

Financial Terminology

Profitability Ratio

The more sales we have, the higher our income is going to be , which gives profitability ratio

How much income is generated from sales

Net income / Sales

Financial Terminology

Yes, you are absolutely correct! The **Return on Equity (ROE)** can indeed be broken down using the **DuPont Analysis** as:

$$ROE = \text{Profitability} \times \text{Efficiency} \times \text{Leverage}$$

Where:

- **Profitability** is measured as **Net Income / Sales** (Profit Margin)
- **Efficiency** is measured as **Sales / Total Assets** (Asset Turnover)
- **Leverage** is measured as **Total Assets / Equity** (Equity Multiplier)

This breakdown helps in analyzing which component is driving changes in ROE and allows for a more detailed understanding of financial performance.

Financial Statement

Exhibit 3 Combined Income Statement and Balance Sheet, Intel Corp. (in $ millions)

	Dec-00	Dec-01	Dec-02	Dec-03	Dec-04	Jun-05
Sales	33,726	26,539	26,764	30,141	34,209	36,734
Cost of Goods Sold	9,429	9,649	8,389	8,253	9,591	11,259
Gross Profit	24,297	16,890	18,375	21,888	24,618	25,475
SG&A	8,986	8,260	8,543	8,736	9,466	9,797
EBITDA	15,311	8,630	9,832	13,152	15,152	15,678
Depreciation & Amortization	4,807	6,052	5,042	4,972	4,860	4,724
EBIT	10,504	2,578	4,790	8,180	10,292	10,954
Other Income/Expenses	4,793	(273)	(418)	(614)	225	452
Pretax Income	15,141	2,183	4,204	7,442	10,417	11,358
Total Income Taxes	4,606	892	1,087	1,801	2,901	3,113
Net Income	**10,535**	**1,291**	**3,117**	**5,641**	**7,516**	**8,245**
Assets						
Cash and Equivalents	13,823	11,550	12,587	16,164	17,172	14,824
Other Current Assets	4,129	2,607	2,574	2,960	2,999	3,448
Inventories	2,241	2,253	2,276	2,519	2,621	2,739
Current Assets - Other	957	1,223	1,488	1,239	1,266	1,179
Current Assets - Total	21,150	17,633	18,925	22,882	24,058	22,190
Net PP&E	15,013	18,121	17,847	16,661	15,768	16,624
Other Investments	3,712	1,474	2,056	3,077	3,726	-
Intangibles	5,941	5,127	5,164	4,364	4,396	-
Other Assets	2,129	2,040	232	159	195	7,699
Total Assets	**47,945**	**44,395**	**44,224**	**47,143**	**48,143**	**46,513**
Liabilities						
Total Current Liabilities	8,650	6,570	6,595	6,879	8,006	7,780
Long Term Debt	707	1,050	929	936	703	430
Deferred Taxes	1,266	945	1,232	1,482	855	689
Total Equity	**37,322**	**35,830**	**35,468**	**37,846**	**38,579**	**37,614**
Total Liabilities	**47,945**	**44,395**	**44,224**	**47,143**	**48,143**	**46,513**

Financial Overview (2000-2005)

- Key Metrics for Intel:
- - Sales: $33.7B (2000) → $36.7B (2005)
- - Net Income: $10.5B (2000) → $8.2B (2005)
- (AMD competitor)
- - Total Assets: $47.9B (2000) → $46.5B (2005)
- Trend: Profitability dipped in 2001 but recovered steadily by 2005.

Key Financial Ratios Over Time

- - Profitability (Net Income/Sales): 2000: 31.2%, 2001: 4.9%, 2002: 11.6%, 2005: 22.4%
- - Efficiency (Sales/Total Assets): 2000: 0.70, 2001: 0.60, 2005: 0.79
- - Leverage (Total Liabilities/Total Equity): 2000: 1.28, 2001: 1.24, 2005: 1.24
- - Return on Equity (Net Income/Total Equity): 2000: 28.2%, 2001: 3.6%, 2005: 21.9%

Effect of Probability Ratio

- **2000 to 2001**: Profitability dropped from **31.2%** to **4.9%**, a significant decline. This could be explained by the economic downturn (the dot-com bubble burst) and external factors such as reduced demand for Intel's products.

- **2002 to 2005**: Profitability consistently improved from **11.6%** in 2002 to **22.4%** in 2005. This suggests Intel became more efficient, potentially from operational improvements, cost reductions, or recovering market conditions.

Timeline for Semiconductor Wafers Transportation

- 1. Sample Preparation: 7 days
- 2. Sample Shipping (by AIR): 7 days
- 3. Sample Assessment: 7 days
- 4. Negotiation: 0 days
- 5. Production / Manufacturing: 30 days
- 6. Quality Inspection: 1 day
- 7. Revisions: 3 days
- 8. Buffer Time: 10 days
- 9. Local Transportation to Sea Port: 2 days
- 10. Documentation, Customs Clearance: 2 days
- 11. Carrier Loading at the Port: 2 days
- 12. Transportation (by Sea): 30 days
- 13. Unloading at Port / Airport: 2 days
- 14. Customs Clearance: 2 days

Cost Breakdown for Semiconductor Wafers Transportation

- Sample Outsourcing Costs (Imaginary Values):
- - Item Price (500 units): $100,000
- - Palletization: $50/pallet = $500
- - Air Freight (Port-to-Port): $2,500
- - Air Surcharge: $300
- - Certificate of Origin: $100
- - Insurance: $500
- - Customs Duty (5%): $5,000
- - Import VAT (15%): $15,750
- - Final Delivery: $1,500
- - Total Estimated Costs: $126,420

Key Criteria for Plant Location Decision

- 1. Operational Costs (Profitability) – 20%
- 2. Infrastructure and Logistics (Efficiency) – 15%
- 3. Government Incentives (Leverage) – 15%
- 4. Market Access (ROE) – 15%
- 5. Political and Economic Stability – 10%
- 6. Labor Availability and Costs – 10%
- 7. Logistics and Transportation – 15%
- Rationale: Balancing Intel's profitability and operational efficiency.

Operational Cost (Profitability)

- Intel's operational costs significantly impact profitability. To maintain competitiveness in the semiconductor market, minimizing labor, utilities, and overhead costs is essential when locating the AT plant, as highlighted in the case study and supply chain document.

Infrastructure and Logistics (Efficiency)

- Logistics efficiency, including transportation and port access, is vital for timely delivery. As the supply chain document highlights, logistics impacts timelines and customs clearance. I prioritized logistics due to Intel's need for customer proximity and swift market deployment.

Government Incentives (Leverage) – 15% Weight

The availability of government incentives, such as tax breaks and subsidies, directly influences Intel's decision-making. Incentives help reduce capital expenditures and operating costs, improving Intel's financial leverage.

In the case study, several countries offered favorable government incentives, which makes this a key factor in deciding where to locate the new plant, hence the 15% weighting.

Market Access (ROE/Strategic Advantage) - 15% Weight

Being closer to key markets is crucial for Intel to achieve faster delivery times and increase market penetration. This is particularly important for serving high-growth regions such as China and Southeast Asia.

As highlighted in the case study, strategic advantage through market access can significantly impact Intel's return on equity (ROE) by allowing them to generate better returns from their investments. For this reason, market access carries a significant 15% weight.

Political and Economic Stability - 10% Weight

A stable political and economic environment ensures fewer disruptions in the long-term operation of the AT plant. While this is important, it doesn't directly affect the day-to-day costs or efficiency of the plant, so I assigned it a moderate weight

The case study suggests political and economic stability as a factor, but it's not the top consideration when balanced against cost and logistical concerns.

Logistics and Transportation - 15% Weight

The supply chain document highlights the critical role of logistics and transportation in determining shipment timelines, costs, and overall supply chain efficiency. It emphasized factors like transportation mode (air vs. sea), handling, customs, and shipment timelines, which all have a direct impact on Intel's ability to move products efficiently.

Efficient logistics also reduce costs and ensure timely delivery to Intel's customers, making this a key criterion, particularly given the importance of timely product launches in the technology sector.

Labor Availability and Costs - 10% Weight

Having access to a skilled labor force at competitive rates is essential for Intel's operations. The supply chain document underlines how labor impacts both production and operational costs, which in turn affects profitability.

However, since Intel's assembly and test operations are not as labor-intensive as their fabrication plants, I gave this a lower weight (10%) compared to more direct factors like operational costs and logistics.

Decision Matrix for Location Selection

Title: Decision Matrix for Location Selection

Content:

Criteria	Weight	China (Dalian)	India (Chennai)	Thailand (Amata)	Vietnam (HCMC)
Operational Costs	0.20	5	4	4	5
Infrastructure and Logistics	0.15	4	3	3	3
Government Incentives	0.15	4	4	3	4
Market Access	0.15	5	4	4	3
Political and Economic Stability	0.10	3	3	4	3
Labor Availability and Costs	0.10	4	4	3	5
Logistics and Transportation	0.15	5	3	3	3
Total Score		4.40	3.75	3.65	3.85

Recommended Location: China (Dalian)

- Total Score: 4.40
- Advantages:
- - Strong infrastructure and logistics
- - Competitive operational costs
- - Proximity to key Asian markets
- - Favorable government incentives
- Conclusion: China's Dalian location offers the best balance of cost, efficiency, and strategic market access.

Summary and Conclusion

- - Intel’s financial ratios and transportation cost analysis support the decision to choose China (Dalian).
- - The decision matrix indicates that Dalian provides the best combination of cost-efficiency, logistics, and market access.
- - This location will support Intel's growth and supply chain optimization for semiconductor wafers.

Questions and Answers