1 The Horizontal Boundaries of the Firm

1.1 The Horizontal Boundaries

1. The horizontal boundaries of the firm is one of the most fundamental concepts in business strategy.

2. A firm’s horizontal boundaries identify the quantities and varieties of products and services that it provides. It consists of two dimensions:
   - **Scale of the Firm.** What is the size of the firm relative to the market?
   - **Scope of the Firm.** In which markets does the firm operate?

3. Why is it that most businesses sell more than just one product? How many products/services should be provided?

4. What key factors determine firms’ horizontal boundaries and the market structure?

5. Example One: Steel Products.

6. Example Two: Pepsi.
7. Example Three: Toyota. [https://www.youtube.com/watch?v=6Vkg7i6lTQ]

8. THREE key determinants of a firm’s horizontal boundaries (the textbook lists only the first two, but the third one is as important as the other two):
   
   (a) Economies of Scale
   (b) Economies of Scope
   (c) Consumer Heterogeneity and Price Discrimination

9. Horizontal boundaries and market structure: Examples.

   (a) In microprocessors, steel, and airframe manufacturing, economies of scale are huge and a few large firms dominate.
   (b) In website design, hairdressing, restaurants, economies of scale are minimal and small firms are the norm.
   (c) In some other industries, such as beer and computer software, large market leaders (Anheuser-Busch, Microsoft) coexist with small firms (Boston Beer Company, Blizzard Entertainment), as small firms find their niches where economies of scale are less important.
1.2 Economies of Scale

1. **Definition of Economies of Scale.** The production process exhibits economies of scale when $AC(q)$ is decreasing in $q$.

(a) Recall that if $AC$ declines as output increases, then $MC$ of the last unit produced must be less than $AC$.
(b) Economies of scale is a key determinant of a firm’s horizontal boundaries.
(c) It also determines internal organization, market structure and entry.
(d) When economies of scale are huge $\implies$ only a few firms exist in the market. Examples: microprocessors and airframe manufacturing. Similarly, IT industry is highly concentrated due to strong economies of scale. Here is Australian Broadband Market in 2014:

(e) When economies of scale are insignificant $\implies$ a large number of small firms coexist in the market. Examples: apparel design and management consulting.

2. **Sources for Economies of Scale.**

(a) Spreading of fixed costs
(b) Specialization and learning by doing

3. **Spreading of Fixed Costs**
(a) Production always involves fixed costs

(b) Fixed costs include: set-up costs, equipments, rents, training expenses, and R&D

(c) The Pharmaceutical Merger Wave (Go over Example 2.4, page 75)

(d) Example. A production line of aluminum cans costs $50 million, which is paid through a business loan. Suppose the loan interest rate is 10 percent. The fixed costs expressed on an annualized basis amount is $5 million per year. Suppose the full capacity of the production line is 500 million cans per year. The average fixed cost under full capacity is one cent per can. The average fixed cost under 25 percent of capacity is 4 cents per can.

(e) When the costs of productive capital such as factories and assembly lines represent a significant percentage of total costs, we say that production is capital intensive. Fixed costs are high in capital intensive industries, so in these industries we commonly observe economies of scale. The steel industry is one such example.

4. Specialization and Learning by Doing

(a) The productivity increases with output due to specialization or learning by doing.

(b) "The division of labor is limited by the extent of the market" Adam Smith.

(c) The division of labor is refers to the specialization of productive activities, such as when a financial analyst specializes in the analysis of start-up biotech companies. Such specialization often requires upfront investments that should be treated as fixed costs – for example, the analyst must do considerable research on the biotech industry before having the credibility to compete for clients.

(d) The extent of the market refers to the magnitude of demand for these activities, such as the demand for financial advice about start-up biotech companies.

(e) Adam Smith’s theorem states that individuals or firms will not make specialized investments unless the market is big enough to support them. In other words, larger markets will support narrower specialization.

(f) General practitioners are disproportionately located in smaller towns, as they do not fare well in larger markets which have a wider assortment of specialists. A small town may have a pet store that caters to owners of all kinds of critters. A big city will have dog groomers, salt-water aquarium boutiques, and exotic bird stores.

(g) Go over Example 2.2, page 63. Understand cost curves for general and thoracic surgeons.

(h) The learning curve refers to advantages that flow from accumulating experience and know-how.
(i) Learning could be task-specific or firm-specific.

(j) Learning by doing in medicine (Example 2.3, page 72).

- Experienced physicians obtain better outcomes for their patients (volume/outcome relationship). In other words, there is a positive correlation between volume and outcome.
- January/July Effect. Mortality rates at teaching hospitals spike in early January and July. The main reason is that medical residents usually change their specialty rotations in January and July. Patients are being treated by doctors with no/less experience.
- High-quality physicians receive more referrals $\Rightarrow$ outcomes drive volume, not vice versa. How to assess the effect of learning by doing?
- The volume/outcome relationship holds for established physicians. The mortality rates for cardiac surgery vary from below 2 percent to above 10 percent. Look at the effect of retirement of a geographically proximate heart surgeon. When a surgeon retires, volumes of other surgeons can increase by 20 patients or more annually. Surgeons who treat more patients after the retirement of a colleague enjoy better outcomes: each additional surgical procedure reduces the probability of patient mortality by 0.14 percent.

1.3 Economies of Scope

1. **Definition of Economies of Scope.** The production process exhibits economies of scope if the total cost of producing two different products is lower when they are produced by a single firm instead of two separate firms.

2. For example, Apple’s core competency in engineering allows it to make popular cell phones, laptops, and tablets.

3. Mathematically, let $TC(q_x, q_y)$ denote the total cost to produce $q_x$ units of good $X$ and $q_y$ units of good $Y$. A production process exhibits scope economies if

$$TC(q_x, q_y) < TC(q_x, 0) + TC(0, q_y)$$

4. **Sources for Economies of Scope.**

   (a) Spreading of fixed costs

   (b) Specialization and learning by doing

5. Some Examples.
(a) Hamburgers and fries (both share food storage, preparation facilities, and ..).
(b) Tape and message notes (share the same know-how on chemical adhesives).
(c) General Motors Corp. GM provides an excellent example of a corporation with broad economies of scope. The firm operates four automobile groups: Cadillac, Buick, Chevrolet, and GMC.
(d) Hub-and-spoke networks in the airline industry (Read: Example 2.1, page 61. Understand the load factor.)

6. Special Sources of Economies of Scale and Scope (Go over p64-p68)

   (a) Economics of Density
   (b) Purchasing
   (c) Advertising
   (d) Research and Development
   (e) Physical Properties of Production
   (f) Inventories

7. Diversification. Go over the example of Haier: The World’s Largest Consumer Appliance and Electronics Firm (Example 2.6, p 84)

1.4 **Consumer Heterogeneity and Price Discrimination**

1. Consumers vary considerably in their needs/preferences, which gives firms incentives to offer a variety of products to the market.

2. There are two types of product differentiation: Horizontal Product Differentiation and Vertical Product Differentiation.
3. Horizontal Product Differentiation. When products are different according to features that can’t be ordered in an objective way. Horizontal differentiation can be linked to differentiation in colours (different colour versions for the same good), in styles (e.g. modern / antique), in shapes, in flavours, and in tastes. Normally with horizontal differentiation the firm sets a unique price for all of them.

4. Vertical Product Differentiation. The firm produces several products, and those products can be ordered according to their objective quality from the highest to the lowest. The firm charges different prices to different products. Examples include:

(a) Airlines offer first class, business, and economy seats.
(b) Computers with different processing speeds.
(c) Cars with different add-ons (features): http://www.toyota.com.au/camry/range

5. The purpose of vertical product differentiation is to extract the surplus from high-valuation consumers. Jules Dupuit (1849) talked about why a railroad company offers different classes of carriages:

"It is not because of the few thousand francs which would have to be spent to put a roof over the third-class carriages or to upholster the third-class seats that some company or other has open carriages with wooden benches. What the company is trying to do is to prevent the passengers who can pay the second class fare from traveling third class; it hits the poor, not because it wants to hurt them, but to frighten the rich. And it is again for the same reason that the companies, having proved almost cruel to the third-class passengers and mean to the second-class ones, become lavish in dealing with first-class passengers. Having refused the poor what is necessary, they give the rich what is superfluous."

6. When to offer multiple products without the presence of economies of scope?

7. A Simple Thought Experiment.
Suppose CJ&Hao Air is the only airline in the world that flies from Melbourne to Paris. Recently, CJ&Hao Air has ordered a new aircraft A083 from Airbus to replace the old one. There are two seating configuration options available:

Option 1. Three standard seats (called Economy Class)

Option 2. One spacious seat (called Business Class) and one standard seat

CJ&Hao Air has to decide which seating configuration to adopt. There are three potential travelers to take the Melbourne-Paris trip: Emma 1, Emma 2, and Emma 3. Based on the previous experience, CJ&Hao Air estimates that the distribution of willingness to pay among travelers is as follows:

<table>
<thead>
<tr>
<th></th>
<th>Emma 1</th>
<th>Emma 2</th>
<th>Emma 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Class</td>
<td>$1000</td>
<td>$600</td>
<td>$600</td>
</tr>
<tr>
<td>Economy Class</td>
<td>$450</td>
<td>$400</td>
<td>$400</td>
</tr>
</tbody>
</table>

However, CJ&Hao Air does not know "which Emma is which Emma," so first-degree price discrimination is not feasible. Assume the marginal cost is zero, so CJ&Hao Air's goal is to maximize the total revenue. To do so, first CJ&Hao Air has to choose the seating configuration, and then determine the price for the seat(s) in each Class. We assume all seats in the same Class should be charged at the same price. To make our life easier, we assume that when several travelers compete for the same seat(s), the priority order is Emma 1 > Emma 2 > Emma 3 (for otherwise a rationing rule has to be specified.).

Question 1. What is the optimal pricing strategy under each seating configuration option?

Question 2. To maximize the total revenue, which option should CJ&Hao Air choose?

Suppose now the distribution of willingness to pay changes to the following:

<table>
<thead>
<tr>
<th></th>
<th>Emma 1</th>
<th>Emma 2</th>
<th>Emma 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Class</td>
<td>$1500</td>
<td>$1200</td>
<td>$1200</td>
</tr>
<tr>
<td>Economy Class</td>
<td>$1000</td>
<td>$800</td>
<td>$800</td>
</tr>
</tbody>
</table>

Redo Questions 1 and 2.

8. Damaged goods. Many manufacturers intentionally damage a portion of their production in order to price discriminate consumers. By producing an inferior substitute, the manufacturer can sell to customers who do not value the superior product so much, without decreasing demand for the superior product very much.

9. Example 1: Intel Chips. In 1991, Intel first made a fully functioning 486DX processor chip, and then they produced a budget chip, the 486SX, that was manufactured from 486DX by disabling
the integrated math coprocessor. The processor greatly speeds up computations. Since disabling the coprocessor was costly, the 486SX chip is strictly inferior to the 486DX, but more expensive to produce. Nevertheless, it sold for $333 as compared to $588 for the 486DX.

10. Example 2. IBM LaserPrinter E. In 1990 IBM introduced the LaserPrinter E as an alternative to the well established Laser Printer. The E was identical to the standard model in every respect except that it contained extra chips whose function was to slow down the printing speed by half.


(a) Electronics company Sharp made several DVD players in the same Shanghai plant, including two with model numbers DVE611 and DV740U.

(b) Both players are exactly the same except one difference. DVE611 is able to play PAL DVD discs. DV740U lacks this function (as claimed by Sharp).

(c) What is the best way to produce the two DVD players? Opening and Operating two production lines? Or...

(d) The figure below shows a hacked remote control of the DV 740U DVD player. The function of playing PAL DVD discs was hidden under the cover.

(e) By cutting a hole on the cover, you can turn a less expensive DVD player into a full-featured one.

(f) Two reasons why Sharp did this: Price Discrimination and Economies of Scope.

![Remote Control Image]

### 2 The Vertical Boundaries of a Firm

#### 2.1 Definition of Vertical Chain

1. The production of any good or service, from pop recordings to cancer treatment, usually requires many activities.

2. The process that begins with the acquisition of raw materials and ends with the distribution and sale of finished goods and services is called *vertical chain*. Early steps in the vertical chain are *upstream* and later steps are *downstream*.

Example. Furniture Industry
3. One central issue in business strategy: how to organize the vertical chain?

(a) All activities in a single firm?
Kimberly Clark’s Scott Paper cuts its own timber, mills it, makes paper products, and distributes them to the market.
Italian fashion icon Benetton dyes fabrics, designs and assembles clothing, and operate retail stores.

(b) Or rely on independent firms in the market?
Nike outsources most of the tasks in the vertical chain to independent contractors.

2.2 The Vertical Boundaries of a Firm

1. The *vertical boundaries* of a firm define the activities that the firm itself performs as opposed to purchases from independent firms in the market.

2. A firm’s decision to perform an activity itself or to purchase it from an independent firm is called a *make-or-buy* decision.

3. Typical make-or-buy decisions for a manufacturer include whether to develop its own source of raw materials, provide its own shipping services, or operate its own retail website. Go over Example 3.1 on page 91 to understand what Apple makes and what it buys for the iPhone.

4. Make and buy are two extremes along a continuum of possibilities for vertical integration:
5. To resolve the associated make-or-buy decisions, the firm must compare the benefits and costs of using the market as opposed to performing the activity in-house.

6. Benefits and costs of using the market

**Benefits**
- Market firms can achieve economies of scale
- Market firms could be more efficient and innovative
- Market firms eliminate bureaucracy

**Costs**
- Coordination of production flows may be compromised
- Private information may be leaked
- Costs of transacting with independent market firms

7. Benefits of using the market: Economies of Scale

- Market firms may possess proprietary information or patents that enable them to produce at lower cost.
- They might be able to aggregate the needs of many firms, thereby enjoying economies of scale.
- For example, Chrysler’s decision to produce or buy antilock brakes.
  - Low quantity → outsource
  - High quantity → produce by itself

![Diagram](image.png)

8. On the other hand, transactions among market firms can create serious problems.

9. Problem of outsourcing. Go over Example 3.5 on page 108 to understand why Boeing had a three-year delay of its first 787 Dreamliner plane.

10. Vertical Integration versus Outsourcing

11. How Apple Made ‘Vertical Integration’ Hot Again — Too Hot, Maybe

(a) The article lists some examples of vertical or horizontal integration as well as outsourcing.

(b) Google acquired mobile-device maker Motorola Mobility and manufactured smart phones and television set-top boxes.

(c) Microsoft makes hardware for its Xbox gaming system.

(d) Samsung, a large technology conglomerate, has thrived by making everything from LCD panels to processors, televisions and smart phones. But Sony, which has attempted to meld content, TVs and game systems like the PlayStation, has yet to find a way to make the disparate parts gel.

(e) Apple for 35 years has championed a vertical model, which features an integrated hardware-and-software approach. For instance, the iPhone and iPad have hardware and software designed by Apple, which also designed its own processors for the devices.

(f) However, Apple’s integrated approach in the PC market did not work to the firm’s benefit when it was battling Microsoft in the 1980s and ’90s.

(g) In its current form, Apple has found a way to balance vertical integration with an outsourcing model. For instance, Apple focuses on design and integration, but Foxconn actually puts together iPads and iPhones.

Reading List.
Chapter 2; Chapter 3