

Analysis of the Development of Home Scale Machines in the Food and Beverage Industry

(Case Study in Ready-to-Serve Coffee Sub-Sector)

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Abstract

Indonesia is a country experiencing demographic growth, especially in the productive age. This growth has several consequences, among others, from income and consumption levels. The increase in the people's standard of living affects various industries, including the food and beverage industry. Apart from macroeconomic and demographic factors, technological factors play an essential role in increasing production. In this case, the availability of coffee machines on a home scale. This machine's existence enables small businesses to start their coffee cafe businesses to compete with large coffee companies. This research uses existing analytical tools between market potential analysis and boarding house structure analysis. This analysis found that there was a decrease in the barrier to entry to the ready-to-serve coffee industry. As a consequence, there are vast opportunities for small businesses to start a business using home-scale machines. This study explains the phenomenon of the rapid development of small-scale coffee in Indonesia in recent years.

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1. Introduction

Indonesia's food and beverage industry has experienced rapid development in the last ten years. Several things drive this, including demographic factors and increasing purchasing power [1]. Demographically, Indonesia's population continues to grow with a large proportion of young people. These young consumers tend to follow trends and consume increasingly varied foods and beverages. The increase in the economy causes consumers to allocate their consumption capacity to improve the quality of the essential goods they consume. Food and beverages are the staples of consumption increase.

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Large companies in Indonesia realized this by starting to segment their products. One example is instant noodle products, which now have various segments from premium to economic ones. Although the market trend is increasing, this trend presents a challenge for large food and beverage producing companies [2].

In the previous era, the idea applied was the idea of economies of scale. When a company's product is in a mature product phase, the next thing to do is to use economies of scale. With economies of scale, the cost per item will be smaller so that profits can be increased [3].

This established process disrupted by changing market conditions. In recent years the Indonesian economy has experienced positive growth. The low population decreases and advances to the near-poor, and the middle-class population is getting bigger [4]. If consumers' standard of living increases, the direct effect of consumption will be on the consumption of goods and services of necessities consisting of food, clothing, and shelter. Based on the elasticity theory, several things affect elasticity, including frequency, the size of the income used, the level of demand, and the existence of substitutes. By using this measure, consumers will prioritize their consumption of food needs.

Consumers who have increased purchasing power will not make the price factor the only determining factor in buying a product. With increasing purchasing power, consumers will use taste as another determining factor. The consequence of this is that the market becomes increasingly segmented as the tastes of consumers vary. This segmentation is especially so varying in the food and beverage industry, where the flavor spectrum varies widely. A consumer can have a spicy taste, but the spicy taste is actually medium spicy and not very spicy when investigated further. Diversity is a challenge for mass production.

From the company side, changes in consumer purchasing power are opportunities and challenges. The opportunity is because, in economic value, the food and beverage industries' market potential is growing. This study examines the changing trends that occur in the food and beverage industry and how food and beverage factories can adapt to various changes in the food and beverage industry. This research is descriptive, applying existing models to show how home machines in the food and beverage industries can develop in this new era. The approach used is with models in the engineering economics sub-field [5].

2. Literature Review

Economic engineering sees an industrial change from two perspectives. The first is the production and supply chain point of view. The second is an economic point of view which is the application in the industrial world. For this research, the first thing to examine is the industry's characteristics and how efficiency and productivity affect the dynamics of supply and demand in the industry.

2.1. Production Characteristics and Supply Chain of the Food and Beverage Industry

In the modern era, food and beverages are no longer produced manually but by using production machines. The goal of modern food and beverage manufacturing is to create food and beverage products that are standardized and large quantities to achieve economies of scale.

However, unlike other manufacturing companies, food and beverage manufacturers have several specificities. The first specialty is raw materials. The primary raw materials for food and beverage companies come from agricultural products. This relation means that the continuity and smooth operation of raw materials for the food and beverage industry depend on the agricultural cycle. At risk, food and beverage companies expose to risks from the business cycle and risks from the agricultural cycle. Unlike other raw materials, agricultural products have a relatively short shelf life, and their availability is not the same at all times. Therefore, companies need to carry out governance in regulating raw material inventory, starting from taking raw materials, transportation, storage to pre-production.

Food and beverage companies required by regulations to fulfill special provisions in their production processes. Food and beverage producers have limitations in creating products with a maximum shelf life in the production process. Food and beverage producers cannot use preservatives or chemical additives carelessly. Another challenge is in the composition of raw materials. Raw materials such as salt can serve to preserve even though the product is not dangerous. Their use is still limited in the composition of raw materials to avoid long-term effects on consumer health. Another thing to consider in the production process is the use of food-grade equipment. This specification means that the equipment used has exceptional quality and must have cleanliness standards above other manufacturing companies.

Next is the process of distributing food and beverage products. Food and beverage products, in general, have light characteristics but have a relatively large volume. Furthermore, food and beverage products cannot just be stacked like other products to avoid excessive pressure. Even when shipping and storing food and beverage products, it is necessary to separate them separately.

After the goods distributed, food and beverage products still have limitations in shelf life. This limitation will cause food and beverage products to be sold relatively short compared to other manufactured products [6].

2.2. Demand and Supply in the Food and Beverage Industry

Demand is influenced by five factors, namely input prices, substitution prices, number of suppliers, technology and price expectations in the future. The uniqueness of the food industry is that, on the one hand, it is a defensive industry, that is, an industry that is less affected by the business cycle. On the other hand, this industry is connected with suppliers who are affected by the agricultural cycle. Substituting the only direct substitution of food and beverage products is people making food and drinks at home. Consumption of foodstuffs will stop at a certain point because a person limits how much he can eat. Only after this point has passed will he start using the excess funds for other secondary or even tertiary consumption. Technology is a factor that will be discussed here on how technology changes affect supply [7].

$$Q_x^s = f(P_x, W, \dots)$$

$$Q_x^s = \text{Intercept} + \left(\begin{matrix} \text{Sensitivity} \\ \text{to its} \\ \text{own price} \end{matrix} \right) P_x - \left(\begin{matrix} \text{Wage} \\ \text{sensitivity} \end{matrix} \right) W \dots\dots\dots (1)$$

From the supply side, the supply of the food and beverage industry, six factors influence demand, namely one qualitative and five quantitative factors. Qualitative factors, namely taste and consumer preferences. Meanwhile, the quantitative factors consist of consumer income, price changes of related products, advertising expenditure, number of consumers and consumer expectations of future prices. Qualitatively, the taste is a variable factor in food and beverage, especially concerning the diversity of products in this industry. Income will directly affect the ability of consumers to consume food and beverages. However, because a consumer has limitations in consuming food and beverages, the changes that mainly occur are food quality changes. The increase in the quantity of food and beverage consumption depends on the population's population or demographics. For advertising spending here is a very influential factor, especially for large companies.

Meanwhile, small and medium enterprise use a type of advertisement but in a limited form. These advertisements are like giving discounts to the public at business, providing free samples and opening discounts and various other forms. The last one is the expectation of future prices. Because food and beverages are goods with limited storage, price expectations will not have much effect considering the short timeframe for consuming or storing food and beverage ingredients [8].

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Furthermore, the next influencing factor is elasticity. Elasticity can derive from the elasticity of demand and elasticity of supply. Supply elasticity is the change in the number of producers offered when the good rises or falls by a specific price. Meanwhile, demand elasticity is when consumers demand change when there is an increase or decrease in price. When discussing the dynamics of demand and supply, these three things will be related to one another, namely the theory of demand, the theory of supply and elasticity.

3. Research Method

This research is a quantitative conceptual study to build a model that can be an alternative for food and beverage producers to adapt to today's competitive era [9].

This research first tries to analyze the potential size of the food and beverage market in Indonesia. The market potential analysis is applying an analysis of consumer growth trends and purchasing power levels. Furthermore, after the market's potential power can be estimated, the next analysis is the effect of technology on the demand and supply of foodstuffs.

The influence of technology will apply to small and large companies. By looking at the cost of the company's structure, part of the company's business operations will be illustrated, especially in the production section.

The data used are secondary data from the Central Bureau of Statistics, data from the food and beverage association and various other supporting data. Data collection for trends has been limited for the last five years and ended before the COVID-19 pandemic in 2020 because the pandemic is an outlier. In order to avoid outlier, the data are focused on 2018 and 2019. There has been a rapid development in the number of small-scale food and beverage sellers.

4. Research Method

4.1. Market Potential

Market potential consists of two factors, namely quantity and price. In this case, the food and beverage industry's quantity represents the demographics of the Indonesian population. Meanwhile, the price represents the purchasing power of the people. The interaction between these two factors ultimately determines the size of the market potential. In this case, purchasing power and demographics must match.

An example is that individuals with young demographics will have lower purchasing power than individuals with senior demographics. However, on the other hand, the young demographic population consume more food than this senior demographic. This population with young demographics will spend a more significant part of their income on consuming food and drinks. In theory, the lower a person's income, the higher the share used to consume necessities. Then the market potential is the total of all segments of the demographics and the level of consumption.

$$\text{Market Potential} = PP_1 \times \text{Demography}_1 + PP_2 \times \text{Demography}_2 + \dots \quad (3)$$

Table 1 shows the population data obtained from the Central Statistics Agency. This table shows several things. First, the population distribution in Indonesia is uneven and spread out, especially in Java. From 2010 to 2020, there was a significant increase in population, especially in big cities. Population growth is relatively slow compared to the previous decade, namely 2001 to 2010.

Table 1. Indonesia Population 2010 and 2020

Provinsi	2010	2020
Sumatera	50.630.931	571.149.279
Jawa	136.610.590	1.541.054.814
Bali Nusa Tenggara	13.074.796	147.492.060
Kalimantan	13.787.831	155.535.551
Sulawesi	17.371.782	195.964.810
Maluku Papua	6.165.396	69.549.609
INDONESIA	237.641.326	2.680.746.123

Source: Badan Pusat Statistik, 2020

Meanwhile, if viewed by age, the population's age composition will be shown in table 2. If the population's composition divide into three major parts, before the productive age, productive age, and productive age, fifty per cent of Indonesia's population will be in the productive age category. Abroad, the productive age is up to 65 years, especially in developed countries. If this measure used to divide the composition of Indonesia's population, more than

60 per cent of Indonesia's population is of productive age. There are two corners of the field that contradict each other in this measure. First, the retirement age in Indonesia is 55 years. So if this research uses the age of 65 years, it becomes unusual. However, on the other hand, most of the Indonesian population works in the informal sector and does not even know the retirement age. By considering the second reason, this study uses a limit of 65 years as the limit of productive age.

Table 2. Indonesian Demography

	0-15	15-50	50
Sumatera	5,99	75,87	18,14
Jawa	7,60	69,39	23,02
Bali Nusa Tenggara	6,76	72,74	20,49
Kalimantan	6,36	74,37	19,27
Sulawesi	6,58	73,46	19,95
Maluku Papua	5,24	78,90	15,87
INDONESIA	6,42	74,12	19,46

Source: Badan Pusat Statistik, 2020

Table 3 shows the average income in each region that is a weighted average number consisting of the average income from various sectors. These sectors include the informal sector, casual workers, part-time workers, contract workers and formal workers. There are differences by region. This difference is because Indonesia adheres to the division of wages based on the region, or in local terms, it is called the Provincial Minimum Wage. The extent of the effectiveness of this wage provision is in one province.

Tabel 3. Minimum Wages in Indonesia

Provinsi	Jutaan Rupiah
Sumatera	3.371.977.600
Jawa	9.273.311.319
Bali Nusa Tenggara	464.242.004
Kalimantan	1.253.208.888
Sulawesi	1.052.037.498
Maluku Papua	370.901.150
INDONESIA	15.785.678.474

Source: Badan Pusat Statistik, 2020

By combining the data in table 1, table 2 and table 3, we can calculate Indonesia's market potential. This figure shows the total consumption capacity and is not limited to just one industry. It is necessary to analyze consumption expenditures to find out how much industrial consumption is. In the food and beverage industry, which is a basic need, the community's average percentage for basic needs used. For example, for the most basic class, fifty per cent of the income will be spent on food and beverage consumption. As for the middle class, thirty per cent of the income spent on consumption. Furthermore, for high purchasing power classes, only ten per cent of income will be spent on consumption [10]. Therefore, to calculate the market potential, from all these factors, equation two can be formed:

$$\text{Food and Beverage Industries Market Share} = W_1I_1D_1 + W_2I_2D_2 + W_3I_3D_3 \dots\dots (4)$$

Indonesia potential market share calculation in table 4.

Table 4. Indonesia Market Potential

Weighted	Demografi	Income	Potensi Pasar (juta)
50%	25	Rp1.990.791	Rp24.602.616
30%	230	Rp3.562.698	Rp245.776.866
10%	13	Rp6.676.813	Rp8.949.400
100%	268	Rp4.135.569	Rp279.328.881

Source: Author, 2021

If using the twenty-five per cent range, the estimated market share of food and beverage ingredients in Indonesia will range from 200 to 300 trillion rupiahs. Indofood, the largest food and beverage company in Indonesia, has an income of around IDR 76 trillion. If all the big companies add up, these big companies' total income will reach around 150 trillion rupiahs. With the assumption that the total market potential of food and beverage companies is 300 trillion, there are still around 150 trillion market shares that large companies have not controlled.

After knowing the potential market share of the food and beverage industry, the next step is to look at some of the remaining market potentials that small companies and MSMEs can control.

This study uses a boarding house structure as a guide to analyzing changes in the industry and their impact on MSMEs. In general, the cost structure consists of fixed costs and variable costs. Variable costs consist of employee costs and costs to produce food and beverages. Fixed costs consist of costs to buy machinery or capital expenditures and rent. Small companies and MSMEs have simpler components to be easier to analyze the components affected by technological changes.

Machine



Fig. 1. Coffee Machinery 1892 until 2020

Source: Otten, 2020

The food and beverage industrial machinery are now experiencing a price decline. One example is that of the coffee machine. Figure 1 shows the espresso technology developed from 1892 to the present. The low price of espresso machines at this time allows the mushrooming of coffee cafes throughout Indonesia. The challenge for food and beverage companies like coffee cafes in the first place was the price of the machines. When the machines' price becomes affordable, the consequence is that competitors can enter the industry [11].

Espresso machines are now available for millions of rupiah. This small scale machine is much cheaper than the coffee machines used in international coffee chains such as Starbuck, ranging from over a hundred million rupiahs. In the past, it cost hundreds of millions to make a coffee cafe. With the expensive machines, the machine depreciation allocation becomes large. This expensive machine then allocated to a cup of coffee ordered by consumers [12].

Rent

Large, high-power espresso machines force vendors to rent a space large enough to house the machine and provide high power. Those that meet the criteria of this specification are houses, shop houses or places in shopping centres. These are places that require expensive rents. This two scenario means that in cost, there will be two large fees borne by the consumer. The first cost is the depreciation cost of the machine. The second boarding house is the rent for the

place. Finally, this high cost causes a high selling price. When the product's selling price is high, the targeted segment will automatically be the upper middle segment. When a business wants to serve middle to upper-class consumers, its appearance must follow. This necessity has led to an increase in the premises' design and finishing costs [13].

Expensive machines will force entrepreneurs to rent expensive premises and end up selling expensive products. This stage is a stage that generates a high cost to start a business. The consequence is that to set up a coffee cafe business requires high costs, which are a hurdle or barrier for small entrepreneurs and MSMEs. Therefore, in Indonesia, when small entrepreneurs and MSMEs have access to cheap machines, the machines' cost is not a barrier. Because existing coffee cafes target the upper middle segment, the small-scale coffee business targets segments that large coffee companies do not target. The small coffee business chooses the middle to upper segment, which in Indonesia is a large segment. This development can be seen in real terms in the growth of small-scale coffee in Indonesia from 2018 to 2019 before the COVID-19 pandemic. Below is an example of comparing the cost structure of small coffee companies and large coffee companies.

Table 5. Comparison between Coffee Chain and A Small Coffee Shop

	Coffee Chain	Small Coffee Shop
Machine cost	200.000	3.000
Daily allocation	160	6
Rent	500.000	30.000
Daily allocation	2.000	120
Total allocation	2.160	126
Sales per day	100	100
Allocation per cup	22	1,26

Source: Author, 2021

Table 4 shows a comparison between using a large-scale machine with a small-scale machine that is now widely available. Of course, the selling price of the two cafes' products will be different, but at least it can be seen that big coffee cafes have almost 20 times the cost allocation of small cafes.

The coffee industry is just one example. This pattern can occur in various sectors in the food and beverage business. The example in table 4 illustrates how the boarding structure analysis applies to the food and beverage industry. The same format can apply to other businesses in the food and beverage sector.

Managerial consequences

The existence of small-scale machines could be seen from various sides. For big business people, this can be a threat. Small-scale machines will lower the barrier to entry. The lowering of the barrier to entry means that it will make it easier for competitors to enter, which will reduce the company's competitive value in the industry. However, for small entrepreneurs and MSMEs, this is an opportunity to start a business with affordable capital. In the end, a new era of the competition will emerge. From the consumer side, consumers will benefit if there is healthy competition in the market, and the market is not only controlled by a handful of players with large capital [14].

5. Conclusion

Technological developments could be seen from various sides. Technology can make products more high quality. On the other hand, technology can also make the production process more efficient and economical. One example raised in this study is small-scale food and beverage technology that provides access to small entrepreneurs and MSMEs.

This study analyzes the development of the food and beverage industry in Indonesia. Several factors can explain the number of small entrepreneurs and MSMEs entering the food and beverage industry. The first factor analyzed in this study is changes in demographics and income levels that increase market potential. The second factor is the technology factor, which reduces machines' price and makes production tools affordable for small entrepreneurs and

MSMEs. These two factors have contributed to the growth of small entrepreneurs and MSMEs in Indonesia, especially in the 2018 to 2019 period.

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