THE RUBBER ECONOMY 1870 - 1930

Until the middle of the 19th century, the rubber market was limited by the physical properties of natural rubber. After Charles Goodyear's invention of vulcanisation in 1839, which modified natural rubber to withstand extreme temperature variation, the market for rubber goods widened significantly. Soon, the production of hoses, industrial bands, sheets, shoes and shoe soles was widespread across industrialised nations. It was, however, the popularisation of the bicycle that spurred the 'Rubber Boom' in the late 19th century. From the beginning of the 20th century onwards, the early development of the automobile and the burgeoning car tyre industry further accentuated the demand for rubber.

As the rubber market expanded, the production economy underwent a radical global shift from Brazil to Southeast Asia, ignited by a scandalous seed theft. One monopoly replaced another as the plantation model flourished and rubber was traded as a global commodity on an unprecedented scale. However, by 1930, with prices at historic lows despite massive consumption, the natural rubber market would have to adapt again and refine its economic model.

RUBBER TAPPING IN THE AMAZON RAINFOREST

Growing native to the Amazon rainforest, the rubber-producing tree *hevea brasiliensis* gave Brazil an initial advantage in the harvesting and export of natural rubber. Trees were not planted; instead, workers tapped latex from wild trees, often forming a co-operative within an area of land. In the early years of commercial rubber production, Brazil developed a high-wage cost structure because of labour scarcity and lack of competition. Without credit markets, workers had to finance their trips to the Amazon with loans to be paid back to their employer, a similar system to that of indentured servitude in the colonial United States. Likewise, provisions for growers and tappers had to be delivered to the region at great expense. Although very costly, Brazilian production was economically viable as long as demand remained steady (as expansion was constrained by labour and environment) and competition remained flat.

The work was often dangerous, as tappers were sent deep into the forest to find more undeveloped land with untapped, productive trees. Due to the rainforest climate, the tapping season only ran from August to January each year. Diseases such as malaria and yellow fever were rampant, and medical facilities rudimentary or non-existent. Wages often depended on the trading price of rubber and salaries were paid in goods such as cigarettes, food and tools. Although the market was not monitored and workers were sometimes brutally exploited by the landowners, tappers could also work as independent merchants, who made their way to nearby trading ports to get a better rate of pay for their work. At the local ports, the rubber trade was mainly controlled by Brazilian, British and American exporters. The rubber was usually sent onwards to European or American ports where it was traded on the commodities exchange.

SMUGGLING SEEDS FROM BRAZIL TO BRITAIN

Being a native species to the Amazon, it is not surprising that Brazil had a vested interest in keeping rubber tree seeds away from their competitors. With over 90% of natural rubber originating from Brazil until the first decade of the 20th century, the geographical exclusivity of the Amazon insured profits from rubber production remained steady and shielded the market from outsiders.

Hevea Brasiliensis

Hevea brasiliensis, the Pára rubber tree, or most commonly, rubber tree is a deciduous tree native to the rainforests of South America. Suited to low-altitude moist forests, wetlands and forest gaps, these fast-growing trees were first found in Brazil, Venezuela, Ecuador, Colombia, Peru and Bolivia. Today, commercial rubber plantations are common throughout much of Southeast Asia and Western Africa.

Latex Tapping

After six to eight years, latex 'milk' can be extracted from the tree in process known as tapping. Latex is found in vessels beneath the bark and forms part of the natural defence system of the plant. Within the cylindrical bark, these vessels spiral up the tree in a right-handed helix. By carefully cutting the bark, the vessels are broken and the latex repeatedly collected or 'tapped' without killing the plant.

Wood Harvesting

Latex production naturally declines with age, and after approximately thirty years, most rubber trees are no longer productive enough to remain economically viable. After felling, the rubberwood is commonly used to produce furniture.

Protecting the property rights of seeds proved to be futile, however, when in 1876 Henry Wickham, an English author and aspiring rubber expert, smuggled 70,000 seeds to London. Of those that survived the voyage, over 2,000 were raised at Royal Botanical Gardens in London (Kew Gardens) and then sent to Peradeniya Gardens in Ceylon (present-day Sri Lanka). In 1877 a case of twenty-two plants reached Singapore, which were planted at the Singapore Botanical Garden. In the same year, the first plant arrived in the Malay States. Since rubber trees needed between six to eight years to be mature enough to yield good rubber, tapping began for the first time in Southeast Asia the 1880s.

For his actions, the British government awarded Wickham with a knighthood for expanding the rubber prospects of the British Empire into the Far East. Although he did export the seeds under false pretences, the story has been embellished over time to add more excitement to his tale of illicit smuggling. Conversely in South America, Wickham is consistently criticised for his role in breaking apart the Amazon rubber monopoly and labelled a 'bio-pirate' for his theft. It is interesting to note that present-day commercial rubber trees in Southeast Asia can still be genetically traced back to Wickham's smuggled seeds.

SOUTHEAST ASIAN RUBBER PLANTATIONS

In Asia, the British and Dutch were able to draw upon their superior supply of capital and the vast availability of cheap colonial labour to transform rubber cultivation into a low-cost, labour-intensive industry. The plantation model depended on a sophisticated, organised system of labour and intensive use of land. While plants successfully grew across the region, it is Malaysia and Indonesia that most successfully perfected the rubber plantation model.

Although commercial planting began in Malaysia in 1895, there was a lack of capital to develop large-scale plantations until the rapid development of the automobile industry. High returns at the beginning of the 20th century (1906-1910) gave investors the confidence to expand plantation acreage year on year. By the end of 1911, there were over half a million acres of trees in the Malay States. Joint-stock companies, whereby capital was raised through stock issues on the London Stock Exchange, were created to exploit the colonial land grants awarded by the British government.

The production system in Malaysia provided key economic advantages over its Brazilian counterpart. Firstly, there was no tapping season as the climate permitted latex harvesting all year round. Secondly, the superior living conditions, access to medical care and relatively high wages drew workers from as far as Japan and China. Thirdly, the support of the British and Dutch colonial authorities provided oversight and structure, helping to attract foreign labourers, especially from India, to the plantations.

SUPPLY AND DEMAND

Prior to the birth of the mass-market automobile industry, the demand for rubber was associated with highly specialised components, consumer goods and bicycle tyres. The Brazilian rubber supply successfully kept pace with global demand, even throughout the bicycle craze of the 1890s. At this point, higher prices did not induce rapid increases in production or plantation expansion. In this context, the Brazilian rubber economy was a fairly efficient industry based on natural resources that were limited by the natural scarcity of labour and capital.

However, global rubber producers did not foresee the massive uptick in demand due to the expansion of the automobile industry in the first three decades of the 20th century. When demand rapidly surged, the cost structure of the plantation model facilitated the expansion and eventual domination of Southeast Asia in the rubber economy. In comparison to the plantation model, Brazilian workers were more costly and less productive. For Brazil to remain competitive, it would have been necessary to vastly expand transportation and domestic agriculture within the Amazonian hinterland, thus significantly lowering wages. There was no great appetite for such an expensive solution when coffee crops and general industrialisation offered better prospects for Brazil.

Also, although there had been many attempts, no plantation in South or Central America has ever reached full production. This is because they were all destroyed by leaf blight, a fungus specific to the rubber tree, before the crop reached physiological maturation. To date, all chemical, biological and agronomical measures to control the fungus have failed and a successful plantation has never come to fruition. At present, the fungus has not spread to other rubber-cultivating continents, in part due to the intensive control of international freight from South America to other tropical areas.

MARKET UNCERTAINTY

As the cultivated rubber trees in Asia reached maturation, the exported volume of plantation rubber exceeded the Brazilian wild rubber enough to supersede Brazil's market share and drive down prices to pre-Boom levels. Although investors were keen to increase acreage, the necessary wait for tree maturation caused an output lag of six to eight years that often led to periods of oversupply. Many investors were looking for a quick windfall and as many new plantations came into production, many others fell into debt and went bankrupt.

From a peak in 1910, prices followed a downward trend until the bottom dropped out of the market in 1921. Rubber producers were convinced by the British colonial authorities to restrict production. By 1924, demand was finally ahead of supply and prices began to rise rapidly. However, the nearby Dutch plantations continued to drive down prices until the production quotas were eventually scrapped in 1926.

Aside from plantation oversupply, rubber producers also found themselves with surplus capacity due to the technological advanced in the development of the pneumatic tyre. Although consumer demand was growing, the increasing efficiency of tyre design led to a decrease in the need for natural rubber. The change from corded to balloon tyres increased the average tyre tread mileage from 8,000 to 15,000 miles. The growth of tyre retreading in the 1920s resulted in further reductions in rubber. Better techniques in cotton weaving lowered friction and heat, thus extending the life of a tyre even further.

With suppliers increasing and demand decreasing, prices plummeted. Supply and demand were no longer predictable and over-confident suppliers often paid a stiff price. Similarly, tyre manufacturers who both welcomed and benefited from competition and technology, now pushed prices downwards and flattened demand. By 1930, global production and consumption were at record highs, yet prices hit new record lows for the 20th century.

1839 Charles Goodyear invents the vulcanisation process

1876 Henry Wickham smuggles rubber tree seeds from Brazil to England and later, Malaysia

1880s First rubber tapping takes place in Malaysia

1880s John Boyd Dunlop makes the first pneumatic tyre

1886 Karl Friedrich Benz patents a gasoline-powered automobile

1890s The bicycle craze takes hold

1895 Rubber tree planting on a commercial scale begins in Malaysia

1910 Rubber prices reach their peak

1911 Half a million acres of rubber trees exist across the Malay States

1920 Rubber prices bottom out

1920s Cars become widely available

1920s New technology and retreating increase tyre tread mileage

1924 Rubber prices begin to rise steeply

1926 Rubber production quotas scrapped

1930 Rubber production hits record high

CONCLUSION

The period 1870 to 1930 represented more than one radical transformation in the production, supply and demand of natural rubber. From wild trees growing native in the Amazon rainforest to cultivated plantations in Southeast Asia, the tapping of rubber trees became a global industry spearheaded by the colonial and capitalist interests of the British and Dutch empires. Stymied by high labour costs, geographical isolation and leaf blight, Brazil was forced to relinquish its monopoly on the rubber market.

Buoyed on by the promise of insatiable demand and quick profits, capital soon flowed rapidly to the plantations. However, many investors were left short when oversupply and technological advances saw prices tumble to record lows. Although lucrative, natural rubber proved itself to be a volatile and unpredictable commodity. While the automobile showed no signs of slowing down, the natural rubber economy (and the associated tyre manufacturing industry) gradually matured towards large-volume, low-cost production in an internationally competitive environment that bears the hallmarks of the rubber economy today.