

Product Life Cycle Theory Revisited – Do Products Decline Automatically?

Wali I. Mondal

Ph.D., Professor of Economics, National University

Abstract- In 1966, Raymond Vernon published a seminal paper titled "International Investment and International Trade in the Product Cycle." Deviating from the Heckscher-Ohlin theorem, which was based on two products, two countries and two factors, commonly referred to as 2x2x2 model, Vernon explained the life cycle of a product originating in a single country and passing through three stages. The Vernon model was elucidated in three stages, namely, location of new product, the maturing product and the standardized product. However, subsequent studies interpreted the life cycle of a product in four stages: introduction, growth, maturity and decline. Some studies decomposed the decline phase in two stages, namely, saturation and abandonment. The Vernon model was a significant contribution to the international trade theory, which until then explicitly or tacitly assumed that developed countries would produce, specialize and export capital-intensive goods to less developed countries which, in return, produce, specialize and export labor-intensive goods to developed countries. Vernon's explanation of the phases or cycles from introduction to decline gained traction as the *Product Life Cycle*. In recent years, wholesale and retail trade acquire products which are produced in both developed and less developed countries and brand them with a unique name identified by the seller. Even though some of these wholesale and retail trade firms decline and ultimately vanish, many products sold by them find home in a successful wholesale or retail trade. The "decline" cycle for these products is unclear. In this paper, we analyze the development of a unique group of products sold under the banner of Kirkland by a wholesale trade, namely Costco, and compare them to three other wholesale and retail trade. We conclude that the product cycle does not follow the stages elucidated by Vernon for this group of products, and likely similar groups of products. In doing so, we will present statistical evidence about the growth and maturity of a product based on the fundamental principle of profit maximization and consumer choice which was not considered by Vernon.

Key words: Product Life Cycle, International Trade, Comparative Advantage, Factor Endowment, 2X2X2 model

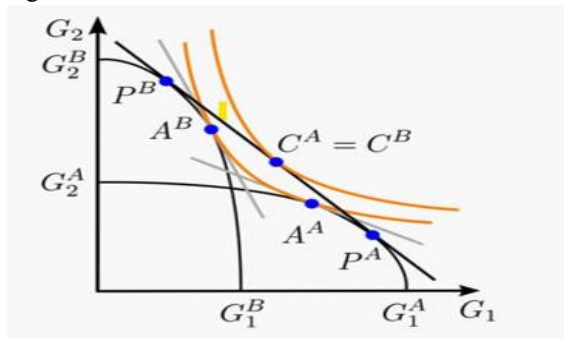
I.INTRODUCTION

The focus of this paper is product life cycle in the context of international trade theory expanded by Vernon. This calls for a brief review of the evolution of international trade theory. The basis for international trade was first mentioned by Adam Smith (1776) as one country having an *absolute advantage* over another country. Smith's postulate of absolute advantage was later abandoned as the basis for international trade. Later on, in the context of international trade, the concepts of product and market were described by J. B. Say in *A Treatise on Political Economy* (1803). Say postulated that "A product is no sooner created, than it, from that instant, affords a market for other products to the full extent of its own value". This postulate became known as Say's Law and has been interpreted as "Supply creates its own demand". However, the foundation of International Trade theory is ascribed to Ricardo (1817), who observed that both England and Portugal were making two goods, namely cloth and wine but were not aware of the comparative advantage each possessed in producing one good over another. Specifically, Ricardo observed that England had a comparative advantage in the producing cloth while Portugal had a comparative advantage in the producing wine. Thus, if England specialized in producing cloth and Portugal specialized in producing wine and opened trade between themselves, both countries would gain from trade. Ricardo's postulate became known as the Theory of Comparative Advantage. In postulating the theory of comparative advantage, Ricardo assumed a single factor of production used by both countries, perfect mobility of the factor of production between both countries, no transportation cost, no barrier to

trade and perfect knowledge about the product by the consumers. With these assumptions, Ricardo demonstrated that before trade took place both countries produced two goods using one factor of production, namely labor. However, the amount labor required to produce the two goods were not the same in England and Portugal. Ricardo showed that England required less man hours than Portugal to produce one unit of cloth. On the other hand, Portugal required less man hours than England to produce one unit of wine. Thus, England had a comparative advantage in the production of cloth and Portugal had a comparative advantage in the production of wine. Therefore, England would specialize in the production of cloth and Portugal would specialize in the production of wine. The specialization in the production of one good by one country and a different good by another country would lead to increased consumption by both countries leading to *gains from trade*.

Ricardo's theory of comparative advantage was further modified by Heckscher (1919), Ohlin (1933), Stolper-Samuelson (1941) and Samuelson (1948, 1949, 1953 and 1971). Heckscher and Olin extended the Ricardian model with several assumptions, most important of those assumptions being two factors of production instead of a single factor. For this reason, the Heckscher-Ohlin (H-O model) is commonly referred to as 2X2X2 model meaning two factors of production, two goods and two countries. Other important assumptions of the H-O model which extend the Ricardian theory are different endowments of the two factors of production, namely labor and capital. In addition, the H-O model incorporates the fundamental assumptions of perfect competition in the short run including identical prices of the two goods, similar taste of consumers and fixed technology.

Figure 1: Heckscher-Ohlin Model



Source:

https://en.wikipedia.org/wiki/Heckscher%E2%80%993Ohlin_model

Figure 1 depicts the fundamental assumptions of the Heckscher-Ohlin theorem. In the Figure, two countries, A and B are producing and consuming at points A^A and A^B respectively. The points represent no trade where production equals consumption. The countries have different initial factor endowments and are in an autarky situation. After trade takes place, both countries consume more of the two goods at a higher production possibility frontier, where $C^A = C^B$. After the publication of Ohlin's paper in 1939, the H-O theorem was re-examined by Stolper and Samuelson (1941) and by Samuelson (1948). It was contended that with the assumptions of perfect competition and similar technologies, notably with identical production function in two trading countries, the factor prices would tend toward equalization over time. This contention came to be known as Factor Price Equalization Theory.

II. INTERNATIONAL TRADE UNDER IMPERFECT COMPETITION

The H-O model and the Stolper-Samuelson theorem of Factor Price Equalization assumed perfect competition. The implicit assumption of perfect mobility of factors ignored transportation costs and restrictions on the free movement of products across national boundaries due to barriers to international trade, notably tariff and quota. Tariff, either ad valorem or specific, is imposed by many countries on imports of goods. Ad valorem tariff is imposed on the value of a good as a percentage of its price, often calculated as a percentage over the Cost, Insurance and Freight (CIF) of the product. Higher price imported goods will incur higher ad valorem tariff than lower price goods. Specific tariff, on the other hand, is imposed as a tax on imported goods irrespective of its price. Both of these types of tariffs are levied by countries for a variety of reasons, including protection of a domestic industry in its early stage, known as the infant industry argument and generating revenue. Unlike tariff which does not restrict the quantity of a good that can be imported, quota limits the quantity of a good that can be imported or exported. Quotas limit the supply of goods, which usually leads to a higher price. Countries that impose quota may opt for

absolute quota, which is the number or quantity of a good that can be imported or tariff-rate, which can be lower tariff rate up to certain quantity and a higher tariff rate afterwards. A type of quota, known as Voluntary Export Restraints (VERs) may be imposed by an exporting country which may have reached an agreement with an importing country to set a limit on how much the exporting country can export. It is important to note that both tariff and quota serve to increase the price of imported goods. Also, except for VERs, tariff and quota may lead to retaliation, otherwise known as trade war, the net effect of which is an increased price of the imported goods, paid mostly by the consumers

III.DEALING WITH TRADE BARRIERS: FROM GATT TO WTO

The Second World War witnessed discontent among nations on issues relating to international trade and tariff. The less prosperous nations relied on imports of industrial raw materials and basic necessities including food grains but were faced with paying high tariffs. This prompted a group of 23 nations to convene in Geneva, Switzerland resulting in the establishment of the General Agreement on Tariffs and Trade (GATT) in 1948. The main purpose of the GATT was to promote international trade by reducing tariffs and non-tariff barriers such as quota. From its creation until 1994, GATT deliberated trade barriers through conferences known as rounds. The eighth round of trade negotiation, known as the Uruguay Round, created a new body known as the World Trade Organization (WTO). As of 2023, the membership of the WTO stands at 166 countries. The charter of the WTO is broader, which includes reduction of tariff on goods and services and intellectual property. The following is quoted from the WTO web site, “The World Trade Organization (WTO) is an intergovernmental organization that regulates and facilitates international trade. Established on 1 January 1995, pursuant to the 1994 Marrakesh Agreement. It succeeded the General Agreement on Tariffs and Trade (GATT), was created in 1948. As the world's largest international economic organization, the WTO has 166 members.” (<https://www.wto.org/>). It is to be noted that WTO is the only international organization dealing with trade issues between nations, but it is not an organ of the United Nations.

IV.INTERNATIONAL TRADE AND ECONOMIC DEVELOPMENT: UNCTAD

In 1964, the United Nations General Assembly created a separate permanent body known as the United Nations Conference on Trade and Development (UNCTAD) to promote trade, investment and development in developing countries. UNCTAD has 190 members. The following is quoted from the web site of the UNCTAD “Globalization, including a phenomenal expansion of trade, has helped lift millions out of poverty. But not nearly enough people have benefited. And tremendous challenges remain. Founded in 1964, we support developing countries to access the benefits of a globalized economy more fairly and effectively. And we help equip them to deal with the potential drawbacks of greater economic integration. To do this, we provide analysis, facilitate consensus-building, and offer technical assistance. This helps them to use trade, investment, finance, and technology as vehicles for inclusive and sustainable development.”(<https://unctad.org/about>)

V.VERNON AND PRODUCT LIFE CYCLE THEORY

The foregoing discussion provides a context for Vernon’s Product Life Cycle Theory (PLC). While Vernon’s model is an improvement over the classical theory of international trade, it ignores the modern-day complexities of product movement, particularly marketing of a product for profit maximization. Technological improvements have allowed products to be redesigned and renamed with the major ingredients being retained. Vernon did not provide any explanation for ultimate *decline* of a product due to a variety of reasons, high tariff being one. For example, Jim Beam a popular whiskey produced in Kentucky, USA had the largest consumer market in Canada. In the second half of 2025, the President of United States imposed a high tariff on many Canadian imports including the whiskey which resulted in a significant reduction of profit for the whiskey exporter. As a result, in December 2025, the producer of Jim Beam closed one of its largest distilleries for at least one year, ostensibly to “invest in improvements” (<https://apnews.com/article/jim-beam-bourbon-distillery-shutdown-kentucky-a8303cd04005a9108ff43690faad421b>) Whether the

product will ultimately decline or change its appearance, quality and content is still unknown. In addition to barriers to trade, products bought and sold internationally are evaluated by the sellers with a goal of providing feedback to the manufacturers for improvement. Such feedback is triggered by consumer surveys. The process of obtaining feedback is mutually beneficial to the producers and the sellers. In the following section, we evaluate product decline in relation to profit-maximizing strategies of three leading wholesale and retail trade companies of the United States and conclude our analysis of price discrimination and market segmentation by one of the most profitable wholesale and retail sellers known globally as Costco (<https://www.costco.com/>).

VI. DECLINE OF PRODUCT OR DECLINE OF TRADERS?

During the past four decades, successful entrepreneurs have taken advantage of the technological improvements in selling a variety of products in international markets. However, the basic dule of profit-maximization, equality of marginal revenue and marginal costs has not been adhered to by some well-established wholesale and retail traders. Two such recently declined traders are Sears, Roebuck and Company (<https://en.wikipedia.org/wiki/Sears>) and K-Mart (<https://www.kmart.com/>). On the other hand, Costo has followed the fundamental principles of consumer's preferences in diversification of product line, successful price discrimination strategies and push for quality of brands evidenced by a relatively small Stock Keeping Units (SKUs).

VII. DEMISE OF SEARS, ROEBUCK AND CO

Sears, Roebuck and Co, commonly known as Sears was the oldest and most successful retail trade company founded in 1892 by Richard Warren Sears and Alvah Curtis Roebuck. In 1986, it was ranked as the largest retailer of the United States (<https://en.wikipedia.org/wiki/Sears>). The company conducted business in physical locations and through catalog sales. The company was highly successful until it diversified its product line and failed to capture the fast-growing e-commerce business. In its peak, Sears had built the tallest skyscraper in 1973 in its

headquarters in Chicago, now known as Willis Tower (<https://www.willistower.com/>).

Several well-known products such as Kenmore, Craftsman, Diehard and Lands' End were owned by Sears but produced by many manufacturers. The Kenmore line of appliances including washers, dryers, vacuum cleaners, refrigerators and freezers was part of Sears since 1913. Other brands such as Craftsman, Diehard and Lands' End were also associated with sears. Sears declared bankruptcy in 2018 and as of December 2025, there were only 6 stores left of this global company. It is notable that many of the products acquired and sold by Sears did not "decline" and are being sold by other companies including Amazon (<https://search.yahoo.com/search?fr=mcafee&type=E210US1276G0&p=Sears%27+own+brad+of+product>) and Auto Zone (www.autozone.com)

VIII. RISE AND FALL OF KMART

The history of Kmart begins with Sebastian S. Kresge and John G. McCrory. The pair of American entrepreneurs opened two modest stores in 1897 in Memphis, Tennessee and Detroit, Michigan. By 1907, the venture grew to eight cities in three States and Kresge became the sole owner. The retail trade company conducted business in various names until 1962 when it was named as the Kresge Company and sold its product under the banner of Kmart. The company gained corporate status in 1977. Like Sears, Roebuck and Company, Kmart was a highly successful retail trade company selling a variety of products. In 1986, Kmart was ranked as the second largest retail trade company with Sears being the largest. Kart continued to grow in sales with other names including Big Kmart and Super Kmart in several countries. In 2000, the company had 2,200 stores in the United States, Puerto Rico, Guam and the Virgin Islands (<https://www.britannica.com/money/Kmart>).

The success story of Kmart as a retailer did not last long. The company diversified its business to the extent that its customers could not relate its identity. There are various reasons for the gradual decline of the company which started in the mid-1990s leading up to its declaration of bankruptcy in January 2002. The company ultimately closed its doors in October 2024. Like Sears, Kmart sold numerous products identifiable with the brand. These included clothing, pots and pans,

appliances and furniture. These products are being sold by other retailers in their original names or under different names.

IX.COSTCO: COMBINING PLC AND PROFIT-MAXIMIZATION PRINCIPLES

Barriers to trade, notably tariff and intense competition are parts of doing business in the world marketplace. Sears and Kmart failed not so much for barriers to trade which were insignificant then, but for their strategies to compete. Some of the products they adopted or developed are still in the market. It is likely that some of these products may decline over time for being non-competitive.

Costco is the world's most profitable wholesale and retail business at this time. The company arrived later in the market for wholesale and retail trade but has secured its place as the fastest growing retailer in the United States and several foreign markets. It has adopted and developed several products under its banner of Kirkland, which continue to be popular with consumers thereby enhancing profitability of the seller. In the following section, we trace the origin of Costco and its profit-maximizing principles, which have allowed the company to grow the sales of one brand as well as other established brands.

Costco, as it is known today, started business in this name in 1993; however, the company started its journey in 1976 under the banner of Price Club, named after its founder Sol Price. In 1983, Price Club merged with Costco, founded by James Sinegal and Jeff Brotman. The merged company PriceCostco later incorporated itself as Costco in 1993. From the inception, the business entities known as Price Club under the banner of Costo and Price Costco defined their operation as selling to members only. As of January 2026, Costo membership stood at 145.2 million in 15 countries including the United States. There are 914 Costco stores world-wide ranging in size from 77,000 square feet to 235,000 square feet. Costco's revenue totaled \$275.2 billion in fiscal year 2025, up 8.17% year-over-year (Y-O-Y) <https://capitaloneshopping.com/research/costco-statistics/>). The Y-O-Y growth rate of Costco exceeds the world's largest retail trade company Walmart with \$681 billion in global revenue for its fiscal year 2025 (up 5.07% ,Y-O-Y) ([statistics/ \). The second largest global retail company Amazon sells exclusively to online customers, which makes revenue data non-comparable.](https://capitaloneshopping.com/research/walmart-</p>
</div>
<div data-bbox=)

Costo follows Vernon model of the first three phases, namely, introduction, growth and maturity. The company introduces products with established name brands and at the same time, contracts with producers of other consumer goods to create a unique brand known as Kirkland. The Kirkland brand products ranges include consumer goods including beverages, candy and snacks, cleaning tools, dairy and eggs, disposables, frozen foods, janitorial supplies, meat and seafood, pantry and dry goods, and even office products. Both types of products go through the growth phase under the management of the company. The high growth rate of the products as reflected in the Y-O-Y revenue of the company derives from the fundamental profit-maximizing principles that include high volume sales of a limited number of quality products and services, consumers preferences and three degrees of price discrimination.

A typical Costo store carries 3,700 to 4,000 Stock Keeping Units (SKUs) compared to 75,000 to 150,000 SKUs carried by a Walmart store or a Walmart Super Center. The limited number of products sold by Costco is viewed by its members as quality products. The company allows its buyers a choice of comparing and contrasting its own brand, Kirkland and other established brands.

X.COSTCO: PROFIT-MAXIMIZING STRATEGY AND CONSUMER REVIEW

Addressing consumer concerns has enabled Costco to attain and sustain the continuous growth of the company. We analyzed 949 recent consumer reviews on Costco found in <https://www.consumeraffairs.com/retail/costco-wholesale.html> , retrieved on April 10, 2025 The goal was to evaluate if Costo heeded consumer concerns in its decisions to

Reviews were classified as follows: 5* 281, 4* 77, 3* 40, 2* 52 and 1*503. The 1* reviews were mostly complaints and were excluded from the χ^2 test of independence. The Frequency Distribution of the remaining 450 observations was based on consumer's perception of price as one attribute, and quality and customer service as the second attribute. Numbers in parenthesis are expected values.

Table 1: Frequency Distribution of Consumer Opinion, April 10, 2025

	5*	4*	2&3*	Total
Price	151 (132.38)	31 (36.28)	30 (43.34)	212
Other	130 (148.62)	46 (40.72)	62 (48.66)	238
Total	281	77	92	450

The Chi-Square Test of Independence

- ❖ H_0 : Consumer rating is independent of revenue growth
 - H_a : Consumer rating is *not independent* of revenue growth
- ❖ $\chi^2 = \Sigma(O-E)^2 / E = 2.62 + 2.33 + .77 + 2.33 + .68 + 3.66 = 12.39$
- ❖ The critical value of χ^2 with 2 d.f. = 5.99
- ❖ Conclusion: H_0 cannot be accepted
- ❖ Discussion: Our analysis of consumer rating shows that Costco reviewed all ratings and addressed negative issues raised in rating 1*

Costco Pricing – Three Degrees of Price Discrimination

Price Discrimination is a common strategy used by most retailers. However, Costco successfully employs all three degrees of price discrimination to maximize its profit

<https://www>

- ❖ First degree price discrimination: an example is partnering with auto dealers of both high-end and popular brands for purchase of new cars and service
- ❖ Second degree price discrimination: the “wholesale” status of the company allows *bundle sales*, as opposed to less successful strategy such as buy one get one free
- ❖ Third degree price discrimination: even in a short distance, Costco gauges the consumer demand for various products and prices grocery items and appliances at different rates.

XI.SUMMARY AND CONCLUSIONS

In this paper, we traced the origin of international trade theory, notably the classical theories developed by Smith, Say and Ricardo. We noted the transition of the theory from a single factor model to 2X2X2 model meaning two factors of production, two goods and two countries. However, the transition of the international trade theory from the classical to the neo-classical era

maintained the assumptions of perfect competition and ignored transportation costs. More importantly, ramifications posed by various types of barriers to trade were ignored by both classical and neo-classical international trade theories. Later on, in a seminal paper published in 1966, Raymond Vernon integrated products and international trade and observed that a product passes through four stages in the global market. The Vernon model was elucidated in three stages, namely, location of new product, the maturing product and the standardized product. However, subsequent studies interpreted the life cycle of a product in four stages: introduction, growth, maturity and decline. Some studies decomposed the decline phase in two stages, namely, saturation and abandonment. The Vernon model was a significant contribution to the international trade theory, which until then explicitly or tacitly assumed that developed countries would produce, specialize and export capital-intensive goods to less developed countries which, in return, produce, specialize and export labor-intensive goods to developed countries. Vernon’s explanation of the phases or cycles from introduction to decline gained traction as the *Product Life Cycle*. In recent years, wholesale and retail trade have devised strategies of acquiring products which are produced in both developed and less developed countries and brand them with a unique name identified by the seller. We observed that this practice keeps the products in shelves for an indefinite period of time, and contrary to Vernon’s observation, they do not decline naturally over time. Further, we tested the hypothesis that consumer choice is independent of revenue growth of a company. This statistical test has a far-reaching implication in that the profit-maximization strategies employed by a wholesale or retail trade company significantly impacts its staying power in the market. We compared and contrasted the rise and fall of two retail trade companies, namely Sears, Roebuck and Company and K-Mart, with Costco, which is rated as the most profitable wholesale and retail trade company which conducts business through both onsite stores and online. We conclude that rise and fall of a product

depends on consumer preferences and the basic principles of competition and profit-maximization followed by a company.

REFERENCES

- [1] Heckscher, E. 1919. The effect of foreign trade on the distribution of income. *Ekonomisk Tidskrift*: 497–512. Translated as chapter 13 in American Economic Association, Readings in the theory of international trade. Philadelphia: Blakiston, 1949, and a new translation is provided in Flam and Flanders (1991).
- [2] Jones, Ronald W.; The New Palgrave Dictionary of Economics, 2nd edition, 2008. Edited by Steven N. Durlauf and Lawrence E. Blume
- [3] Ohlin, B. 1933. Interregional and international trade. Cambridge, MA: Harvard University Press.
- [4] Ricardo, David (1817), *On the Principles of Political Economy and Taxation* (1 ed.), London: John Murray, ISBN 9783487409290, *retrieved 2012-12-07* via Google Books
- [5] Ricardo, David (1817). *On the Principles of Political Economy and Taxation*. J. Murray.
- [6] Samuelson, P. 1948. International trade and the equalization of factor prices. *Economic Journal* 58: 163–184.
- [7] Samuelson, P. 1949. International factor-price equalization once again. *Economic Journal* 59: 181–197.
- [8] Samuelson, P. 1953. Prices of factors and goods in general equilibrium. *Review of Economic Studies* 21: 1–20.
- [9] Samuelson, P. 1971. Ohlin was right. *Swedish Journal of Economics* 73: 365–384.
- [10] Samuelson, P. 1992. Factor-price equalization by trade in joint and non-joint production. *Review of International Economics* 1: 1–9
- [11] Santana, Roy (2017). "70th anniversary of the GATT: Stalin, the Marshall Plan, and the provisional application of the GATT 1947", *Journal of Trade Law and Development*, Volume 9, pp. 1-20.
- [12] Say, Jean-Baptiste (1803). *A Treatise on Political Economy*. Translated from the fourth edition of the French in 2001. Batoche Books Kitchener. p. 57.
- [13] Smith, Adam (1977) [1776]. *An Inquiry into the Nature and Causes of the Wealth of Nations*. University of Chicago Press. ISBN 0226763749
- [14] Stolper, W., and P. Samuelson. 1941. Protection and real wages. *Review of Economic Studies* 9: 58–73; also in Deardorff and Stern (1994).
- [15] Tomz, Michael; Goldstein, Judith L; Rivers, Douglas (May 2007). "Do We Really Know That the WTO Increases Trade? Comment". *American Economic Review*. 97 (5). Nashville, Tennessee:

Internet References

- [1] *American Economic Association: 2005–2018*.
- [2] <https://www.amazon.com/>
- [3] <https://apnews.com/article/jim-beam-bourbon-distillery-shutdown-kentucky-a8303cd04005a9108ff43690faad421b>
- [4] <https://capitaloneshopping.com/research/costco-statistics/>
- [5] <https://capitaloneshopping.com/research/walmart-statistics/>
- [6] <https://www.consumeraffairs.com/retail/costco-wholesale.htm>
- [7] <https://www.costco.com>
- [8] www.autozone.com
- [9] <https://internationalecon.com/Trade/Tch40/T40-2.php>
- [10] <https://www.kmart.com/>
- [11] <https://www.thestreet.com/retail/costco-history-timeline>
- [12] www.unctad.org
- [13] <https://www.walmart.com/>
- [14] <https://en.wikipedia.org/wiki/Sears>
- [15] www.wto.org
- [16] <https://search.yahoo.com/search?fr=mcafee&type=E210US1276G0&p=Sears%27+own+brad+of+products>