Business Competitive Elasticity: An Equational Analysis of How Competitive a Business is in a Market

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ABSTRACT

This paper introduces the Elastic Demand Index (EDI), a novel approach to analysing the competitive elasticity of businesses within a market. The EDI formula discusses the limitations of traditional demand elasticity models, such as Price Elasticity of Demand (PED) and Cross-Price Elasticity of Demand (CPED), by incorporating additional market factors that influence consumer behaviour. The EDI formula integrates Competition Intensity (CI), Market Influence (MI), Buyer Confidence (BC), and Consumer Sensitivity (CS) to provide a more comprehensive understanding of how various dynamics affect demand elasticity.

In addition to the EDI model, the paper also presents the Price-Perception Elasticity Index (PPEI), a variation of the EDI formula that incorporates the Van Westendorp Price Sensitivity Meter (PSM) to account for consumer price perceptions. The PPEI adjusts the EDI by introducing a Van Westendorp Price Factor (VW), which reflects the proximity of a product's actual price to the customer's perceived Optimal Price Point (OPP) and the Range of Acceptable Prices (ROP). This variation allows businesses to understand not only how external market conditions affect demand elasticity but also how closely their pricing aligns with customer expectations, adding a psychological dimension to the analysis of price elasticity.

Through a detailed exploration of the EDI and PPEI formulas and their components, the paper explores and demonstrates how these approaches offer a more nuanced analysis of market conditions, particularly for companies operating in competitive and rapidly changing environments. By incorporating factors such as competition, brand strength, consumer sentiment, and price perception, both the EDI and PPEI models allow businesses to predict demand changes more accurately. This enables firms to optimize pricing strategies, improve market positioning, and sustain profitability in complex markets by considering not only price fluctuations but also the broader market landscape and customer price perceptions.

The paper concludes that the Elastic Demand Index (EDI) and its variation, the Price-Perception Elasticity Index (PPEI), represent significant advancements in the field of economic analysis, providing a more holistic and practical tool for assessing competitive elasticity. By moving beyond the traditional focus on price and incorporating multiple dimensions of market behaviour, these models offer substantial advantages for businesses seeking to navigate the complexities of modern market environments and better align pricing strategies with consumer expectations.

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Introduction

Elasticity of demand is a fundamental concept in economics that measures how the quantity demanded of a good or service responds to changes in price. Understanding demand elasticity is crucial for companies as it directly influences pricing strategies, revenue forecasts, and overall market positioning. Traditional approaches to measuring demand elasticity typically involve the basic price elasticity of demand formula, which is calculated as the percentage change in quantity demanded divided by the percentage change in price. While this formula provides a general understanding of how sensitive consumers are to price changes, it does not fully capture the complexities of the modern market environment where various external and internal factors influence consumer behaviour.

In the context of businesses operating in competitive and dynamic markets, the traditional elasticity model often falls short in capturing the nuances of market influence, buyer confidence, and consumer sensitivity—factors that play a significant role in determining demand elasticity. To address this gap, this paper introduces a more comprehensive formula for analysing the elastic demand of companies: the Elastic Demand Index (EDI). The EDI is designed to integrate traditional economic principles with additional factors that are crucial in today's business landscape. This essay provides a detailed exploration of the EDI formula, its components, and its potential applications in business analysis. The EDI formula is as follows:

$$\text{EDI} = \frac{(\Delta Q/Q) \times (\text{CI} \times \text{MI})}{(\Delta P/P) \times (\text{BC} \times \text{CS})}$$

In this formula, $\Delta Q/Q$ represents the percentage change in quantity demanded, and $\Delta P/P$ represents the percentage change in price. The additional variables—

Competition Intensity (CI), Market Influence (MI), Buyer Confidence (BC), and Consumer Sensitivity (CS)—are introduced to provide a more nuanced analysis of demand elasticity. This essay argues that by incorporating these variables, companies can gain deeper insights into their pricing strategies and better navigate the complexities of the market.

Theoretical Foundations

The concept of demand elasticity has been extensively studied in economic theory, with early contributions dating back to Alfred Marshall's work on supply and demand. Marshall's price elasticity of demand formula laid the foundation for understanding how price changes affect consumer behaviour (Marshall, 1920). The traditional formula is straightforward: it calculates the responsiveness of quantity demanded to price changes, assuming all other factors remain constant. However, the assumption of ceteris paribus (all else being equal) often does not hold in real-world scenarios, where various external factors can influence demand.

In more complex market environments, factors such as brand influence, market competition, and consumer confidence play significant roles in shaping demand elasticity. These factors are not accounted for in the traditional elasticity formula, leading to potential inaccuracies in demand forecasts and pricing decisions. Contemporary research has explored various extensions to the basic elasticity model, incorporating factors like income elasticity, cross-price elasticity, and advertising elasticity to capture a broader range of influences (Stigler, 1969). However, these extensions often focus on specific aspects of the market, such as income changes or the impact of complementary goods, rather than providing a holistic view of the factors influencing demand elasticity.

The Elastic Demand Index (EDI) formula introduced in this essay builds on the traditional elasticity model by integrating additional factors that reflect the complexity of modern markets. These factors-Competition Intensity (CI), Market Influence (MI), Buyer Confidence (BC), and Consumer Sensitivity (CS)-are derived from both economic theory and empirical observations in market research. By incorporating these variables, the EDI formula offers a more comprehensive tool for analysing demand elasticity, particularly for companies operating in competitive and rapidly changing markets.

Application of the EDI Formula

The EDI formula can be applied in various contexts to analyse the elastic demand of companies. For instance, consider a company that is planning to introduce a price increase for one of its products. Using the traditional elasticity formula, the company might predict that demand will decrease by a certain percentage based on historical data. However, by applying the EDI formula, the company can incorporate additional factors such as the current level of competition, its market influence, and the confidence and sensitivity of its consumers.

For example, if the company operates in a highly competitive market (high CI), with moderate market influence (MI), and is targeting price-sensitive consumers (high CS), the EDI formula might predict a more significant decrease in demand than the traditional model. This more nuanced prediction would allow the company to adjust its pricing strategy, perhaps by implementing a smaller price increase or by enhancing the perceived value of the product to reduce price sensitivity.

The EDI formula can also be used in reverse to determine the potential impact of reducing prices or introducing promotional discounts. By understanding how each factor influences demand elasticity, companies can make more informed decisions about pricing, marketing, and product development.

When conducting a survey to gather the data required for the Elastic Demand Index (EDI) calculation, it is crucial to include an initial series of questions that allow respondents to be categorized into different market demographics.

This practice is not only essential for the accuracy of the EDI analysis, but it also enables a deeper understanding of the varying characteristics of a company's customer base. By gathering demographic information at the beginning of the survey, businesses can segment their client base into distinct market groups, which provides a more nuanced and precise analysis of demand elasticity across different customer types. Understanding these demographic divisions allows businesses to analyse their demand elasticity at both macro and micro levels, providing insights into how different market segments may respond to price changes and how these responses influence overall business strategy. Moreover, by identifying different behavioural patterns across customer segments, businesses can discover untapped growth opportunities within their existing clientele.

The inclusion of demographic questions in the survey is important because not all customers respond to price changes in the same way. Market segments can vary significantly in their price sensitivity, purchasing habits, brand loyalty, and perceived value of products or services. These differences may be driven by a variety of factors, including age, income level, geographic location, industry, business size, and buying behaviour. For example, a company that sells consumer electronics may have both individual customers and corporate clients. These two groups will likely have very different price sensitivities and motivations for purchasing, and thus their demand elasticities will differ. By segmenting the client base into these demographic categories at the beginning of the survey, the business can calculate separate EDI values for each group, offering a more refined analysis. This segmentation allows businesses to understand how different customer demographics contribute to the overall demand elasticity and identify which groups are more price-sensitive and which are less affected by price changes.

Furthermore, breaking down the client base into market segments through demographic questions enables businesses to assess the EDI calculation at a micro level. This provides the opportunity to pinpoint specific segments within the customer base that show varying degrees of elasticity. For instance, in a company that operates globally, customers in different regions may have different responses to price changes due to varying economic conditions, cultural factors, or competition levels.

A price increase that leads to inelastic demand in one region may result in highly elastic demand in another. By segmenting customers according to geographic location, the company can adjust its pricing strategies based on the price sensitivity of each region, leading to more effective and regionally tailored approaches. The same logic applies to other demographic factors such as industry type or business size. A small business may respond to price changes differently than a large corporation due to differences in purchasing power and budget constraints. By understanding these differences, the company can design more specific and targeted pricing strategies that align with the unique

characteristics of each customer segment.

Moreover, including demographic questions in the survey is critical for identifying potential growth sectors within the company's current customer base. By analysing the EDI data at the segment level, businesses can detect which market groups are growing or exhibiting changes in price sensitivity over time. For example, a company may find that a certain demographic, such as younger customers or customers from a specific geographic area, is becoming less price-sensitive, indicating a potential growth sector. These customers may be willing to pay more for premium services or products, or they may exhibit a strong brand loyalty that makes them less responsive to price increases. By identifying these growth segments, the company can focus its marketing efforts and product development on these groups, offering tailored services that meet their needs and capitalize on their willingness to spend more. Conversely, the company may discover market segments that are highly price-sensitive and elastic, signalling that these groups are at risk of switching to competitors if prices increase. This knowledge allows businesses to either adjust pricing to retain these customers or strategically reduce investments in these segments while focusing on more profitable sectors.

Additionally, market segmentation through demographic questions allows businesses to evaluate not only overall demand elasticity but also demand elasticity across different product or service categories. A company that offers multiple product lines or services may find that demand for one product is highly elastic while demand for another is inelastic. For instance, a retailer that sells both basic apparel and luxury items might find that price sensitivity is much higher for basic products than for luxury goods. By segmenting the customer base based on their purchasing preferences, the company can calculate separate EDI values for each product category, leading to more effective pricing decisions across different lines. This approach also helps businesses understand cross-segment effects, such as whether customers who purchase one product are more likely to respond to price changes in another product category.

Ultimately, by including a series of demographic questions at the beginning of the survey, businesses can enhance the precision and relevance of the EDI calculation. Demographic segmentation allows for the investigation of demand elasticity at a granular level, enabling businesses to understand how different customer groups respond to price changes. This understanding is essential for formulating effective pricing strategies that cater to the unique needs of each segment, ensuring that price adjustments are implemented in a way that maximizes profitability without alienating key customer groups. Furthermore, the ability to identify potential growth sectors within the current customer base provides businesses with opportunities to expand and capitalize on changing market dynamics. In contrast, segments that show high elasticity can be managed with alternative strategies, such as promotions or bundled offerings, to minimize customer loss. In sum, demographic segmentation is a powerful tool for businesses seeking to optimize their pricing strategies and better understand the diverse needs and behaviours of their customers. By integrating this approach into the EDI calculation, companies can achieve more informed and strategic decision-making, leading to stronger financial performance and greater market competitiveness.

Discussion

Competition Intensity (CI) is a crucial variable in the analysis of market demand elasticity. It quantifies the degree of competition within a market, capturing the extent to which firms are vying for the same pool of customers. In markets characterized by high competition intensity, consumers have multiple options to choose from, making them more sensitive to price changes. This heightened sensitivity is a key driver of elastic demand, where even minor price fluctuations can lead to significant shifts in consumer purchasing behaviour. Conversely, in markets with low competition intensity, consumers have fewer alternatives, leading to more inelastic demand where price changes have a muted effect on the quantity demanded.

Theoretical Underpinnings: Porter's Five Forces

The concept of competition intensity is deeply rooted in Michael Porter's Five Forces model, a widely recognized framework for analysing the competitive forces that shape industry dynamics. Porter (1980) identifies five key forces that determine the competitive intensity and, consequently, the profitability of a market. These forces are the threat of new entrants, the bargaining power of suppliers, the bargaining power of buyers, the threat of substitute products or services, and the intensity of competitive rivalry.

- **Threat of New Entrants**
  The threat of new entrants refers to the ease with which new competitors can enter the market and challenge existing firms. When barriers to entry are low—such as minimal capital requirements, easy access to distribution channels, or weak brand loyalty—new firms can quickly enter the market, increasing competition intensity. In such scenarios, existing companies must often lower prices or enhance product offerings to retain market share, leading to greater demand elasticity. For instance, in the retail industry, the rise of e-commerce platforms has lowered entry barriers, allowing numerous small businesses to compete with established retailers, thus increasing competition intensity.

- **Bargaining Power of Suppliers**
  The bargaining power of suppliers refers to the ability of suppliers to influence the price and quality of inputs. In markets where a few suppliers dominate, they can exert significant pressure on companies by raising prices or reducing the quality of goods. This can lead to increased production costs, which companies might pass on to consumers in the form of higher prices. However, if the market is highly competitive, firms may be unable to raise prices without losing customers, who can easily switch to alternatives. In this way, high supplier power can contribute to competition intensity by forcing firms to compete on price, thereby increasing demand elasticity.

- **Bargaining Power of Buyers**
  The bargaining power of buyers is the influence customers have over the pricing and quality of products. In markets where buyers have significant power—due to factors such as the availability of alternative products, price sensitivity, or the ability to purchase in large volumes—competition intensity is typically higher. Firms in such markets must be responsive to consumer demands for lower prices, better quality, or additional features. As a result, the demand becomes more elastic as consumers are more likely to switch to competitors if their needs are not met. This is particularly evident in industries like consumer electronics, where rapid technological advancements and numerous alternatives give buyers considerable leverage.

- **Threat of Substitute Products**
  The threat of substitute products refers to the likelihood that customers will switch to alternative products or services that fulfill the same need. The presence of close substitutes in the market increases competition intensity, as firms must compete not only with direct competitors but also with alternative solutions. For example, in the beverage industry, traditional soda companies face competition not just from other soda brands but also from substitutes like flavoured water, energy drinks, and coffee. The availability of these substitutes makes consumers more responsive to price changes in any one product category, thus contributing to higher demand elasticity.

- **Intensity of Competitive Rivalry**
  The intensity of competitive rivalry is the degree of competition between existing firms in the market. High rivalry often leads to price wars, frequent promotional offers, and continuous innovation as companies strive to differentiate themselves. This fierce competition increases the elasticity of demand, as consumers can easily switch to another brand if prices rise. Industries with high competitive rivalry, such as the airline industry, where numerous airlines compete on routes, prices, and services, typically exhibit highly elastic demand. Customers in these markets are highly price-sensitive and will readily switch airlines for marginal price differences or slightly better services.

Quantifying Competition Intensity (CI)

In the context of the Elastic Demand Index (EDI), Competition Intensity (CI) is normalized on a scale from 0 to 1, where higher values indicate more intense competition. The normalization process involves quantifying the competitive forces within a market and translating these into a standardized index that can be compared across different industries and markets.

- **Market Share Distribution**
  One method for quantifying competition intensity is to analyse the distribution of market share among competing firms. Markets where a few firms dominate (oligopolistic markets) typically have lower competition intensity compared to markets where market share is more evenly distributed (competitive markets). The Herfindahl-Hirschman Index (HHI) is a commonly used measure for this purpose. It calculates market concentration by summing the squares of the market shares of all firms in the industry. A high HHI indicates a more concentrated market with lower competition intensity, while a low HHI suggests a more competitive market with higher CI. The HHI can be normalized to fit the 0 to 1 scale used in the EDI formula.

- **Entry and Exit Rates**
  The rate at which firms enter and exit a market also provides insight into competition intensity. High entry rates suggest low barriers to entry and greater competition, while high exit rates can indicate that competition is so intense that only the most efficient firms survive. By analysing industry data on firm entry and exit, CI can be quantified. For instance, industries with frequent new entrants and exits, such as the tech startup ecosystem, typically exhibit higher competition intensity. Normalizing these rates to the 0 to 1 scale allows for their inclusion in the EDI calculation.

- **Price-Cost Margins**
  Price-cost margins, or the difference between a firm's pricing and its marginal cost, can also be used to gauge competition intensity. In highly competitive markets, price-cost margins tend to be lower as firms are forced to price closer to marginal cost to remain competitive. Conversely, in less competitive markets, firms can maintain higher margins. By analysing industry-wide price-cost margins, CI can be inferred. A lower average margin across firms indicates higher competition intensity, which can then be normalized to fit within the EDI framework.

- **Competitive Behaviour Analysis**
  Another approach to quantifying competition intensity is through the analysis of competitive behaviours such as pricing strategies, marketing expenditures, and innovation rates. Industries where firms frequently engage in aggressive pricing strategies or invest heavily in marketing and R&D tend to have higher competition intensity. This can be measured by tracking the frequency and intensity of price changes, promotional activities, and new product launches within an industry. These behaviours reflect the level of rivalry and competitive pressure that firms face and can be used to calculate a CI value that reflects the overall competitiveness of the market.

Implications of Competition Intensity for Business Strategy

Understanding and accurately measuring competition intensity is essential for firms as they develop pricing strategies, forecast demand, and plan market entry or expansion. A high CI value suggests that firms must be highly responsive to market conditions and consumer preferences. In such markets, even minor price changes can lead to significant shifts in market share as consumers readily switch to competitors. Therefore, companies operating in high CI environments must focus on differentiation strategies to maintain customer loyalty and reduce the elasticity of demand. This can include investing in brand equity, enhancing product quality, or offering unique features that are difficult for competitors to replicate.

Moreover, high competition intensity often requires firms to adopt dynamic pricing strategies, where prices are continuously adjusted based on market conditions, competitor actions, and consumer behaviour. Advanced analytics and machine learning models can be employed to optimize pricing in real-time, allowing firms to remain competitive while maximizing profitability. Additionally, firms in highly competitive markets may benefit from exploring niche segments where competition is less intense, allowing for greater pricing power and more inelastic demand.

In contrast, in markets with low competition intensity, firms have greater pricing power and can maintain higher margins without significantly affecting demand. These firms may focus more on maintaining their market dominance through economies of scale, exclusive partnerships, or regulatory advantages that prevent new entrants. However, even in these markets, firms must be vigilant of potential disruptors or changes in consumer preferences that could increase competition intensity and erode their market position.

Globalization has further complicated the concept of competition intensity as firms now face competition not only from domestic rivals but also from international players. The opening of global markets has increased the number of competitors and the availability of substitutes, thus intensifying competition.

For example, the entry of low-cost producers from emerging markets has increased competition intensity in industries such as consumer electronics, textiles, and automotive manufacturing. This global competition requires firms to continuously innovate and improve efficiency to remain competitive, leading to greater demand elasticity.

Additionally, the rise of digital platforms and e-commerce has lowered barriers to entry across many industries, increasing competition intensity even further. Companies can now reach global audiences with relatively low upfront costs, leading to an influx of new competitors in markets that were previously dominated by a few large players. This shift has made understanding and managing competition intensity even more critical for firms operating in the global marketplace.

Competition Intensity (CI) is a critical factor in determining the elasticity of demand within a market. High CI values indicate a highly competitive market environment where consumers have multiple alternatives, making them more sensitive to price changes. By quantifying CI using methods such as market share distribution, entry and exit rates, price-cost margins, and competitive behaviour analysis, firms can better understand the competitive dynamics of their industry. This understanding allows for more informed strategic decisions, particularly in pricing, market positioning, and innovation. As globalization and technological advancements continue to increase competition intensity across industries, the ability to accurately measure and respond to CI will.

Comparative Analysis of the Elastic Demand Index (EDI) and Other Methods of Analyzing Competitive Elasticity
The Elastic Demand Index (EDI) formula is designed to offer a comprehensive understanding of demand elasticity by integrating multiple dimensions of market dynamics, a feature that sets it apart from traditional methods. This analysis compares the EDI formula with other established methods used to assess competitive elasticity, highlighting the unique advantages of the EDI approach in modern market environments.
The EDI formula, expressed as:

$$\text{EDI} = \frac{(\Delta Q/Q) \times (\text{CI} \times \text{MI})}{(\Delta P/P) \times (\text{BC} \times \text{CS})}$$

introduces variables such as Competition Intensity (CI), Market Influence (MI), Buyer Confidence (BC), and Consumer Sensitivity (CS) to capture a broader range of factors that influence consumer behaviour and pricing strategies.

This approach contrasts with traditional methods like the **Price Elasticity of Demand (PED)**, which is calculated as:

$$\text{PED} = \frac{\Delta Q/Q}{\Delta P/P}$$

PED offers a basic measure of how responsive consumers are to price changes by focusing solely on the relationship between price and quantity demanded. While PED's simplicity is advantageous for providing an easily interpretable metric, it operates under the assumption that all other factors remain constant, an assumption that is often unrealistic in complex market conditions.

Consequently, PED may not adequately capture the influence of external factors such as competition intensity, brand strength, and consumer confidence, all of which can significantly affect demand elasticity.

Another traditional approach, the Cross-Price Elasticity of Demand (CPED), measures the responsiveness of the quantity demanded for one product when the price of a related product changes:

$$\text{CPED} = \frac{\Delta Q_A/Q_A}{\Delta P_B/P_B}$$

where Q_A is the quantity demanded of product A, P_B and is the price of product B. CPED is particularly useful in markets where products are either substitutes or complements, providing insights into how price changes in one product affect demand for another. However, like PED, CPED's narrow focus on price fails to consider broader market dynamics such as market share, brand equity, or consumer sentiment.

Market Share Analysis provides another perspective by assessing competitive elasticity through changes in market share relative to price changes. A significant shift in market share in response to a price change suggests high elasticity, whereas stable market shares indicate inelastic demand. Although this method offers a competitive-focused view, it primarily relies on historical data, which may not accurately predict future market dynamics. Moreover, it often overlooks qualitative aspects of competition, such as brand perception and consumer loyalty, which are crucial for understanding demand elasticity.

Brand Equity Models, such as those proposed by focus on the value a brand name adds to a product. These models consider factors like brand awareness, perceived quality, and brand loyalty, with high brand equity typically leading to less elastic demand as consumers are willing to pay premium prices for trusted brands. While these models offer a more holistic approach by considering psychological and emotional factors that influence consumer decisions, they often lack the precision of quantitative methods like PED or CPED. Additionally, they concentrate primarily on the brand itself, without fully integrating external market conditions such as competition intensity or consumer confidence [1,2].

In contrast, the EDI formula provides a more comprehensive analysis by integrating both traditional economic measures and broader market dynamics. Unlike methods that focus solely on price changes, the EDI formula incorporates multiple dimensions of market behaviour, offering a more nuanced understanding of how various factors interact to influence demand elasticity. The inclusion of Competition Intensity (CI) in the EDI formula allows for a more accurate reflection of competitive dynamics. In highly competitive markets, consumers are more likely to switch brands in response to price changes, leading to higher elasticity. This competitive aspect is not adequately addressed by traditional methods like PED or market share analysis, which do not consider the intensity of competition as a variable in their calculations.

Market Influence (MI) captures the impact of brand equity and market share on demand elasticity. Companies with strong market influence can maintain higher prices without significantly reducing demand, as consumers perceive their products as superior or essential. This factor is particularly important in markets where brand loyalty plays a significant role in consumer behaviour. Traditional methods often overlook this aspect, while the EDI formula explicitly integrates it. The inclusion of Buyer Confidence (BC) and Consumer Sensitivity (CS) in the EDI formula provides additional insights into how consumer sentiment and price sensitivity influence demand elasticity. These factors are especially relevant in markets where economic conditions and consumer perceptions play a crucial role in shaping demand, aspects often neglected in traditional methods.

The EDI formula's primary advantage lies in its ability to provide a more holistic view of demand elasticity by integrating multiple dimensions of market dynamics. This approach is particularly useful for companies operating in complex and competitive markets where traditional methods may fail to capture the full range of factors influencing consumer behaviour. The EDI formula's inclusion of CI, MI, BC, and CS allows companies to tailor their pricing and marketing strategies more effectively, considering not just price sensitivity but also brand equity, market competition, and consumer confidence.

The EDI formula also reflects the complexities of real-world markets, where factors such as competition intensity, brand influence, and consumer confidence significantly impact demand. By incorporating these variables, the EDI formula offers a more realistic and practical tool for businesses to assess and respond to changes in market conditions. Additionally, the EDI formula enhances strategic decision-making by providing a clearer picture of how various market factors influence demand elasticity. This is particularly valuable in highly competitive markets, where understanding the interplay between price, competition, and consumer behaviour is crucial for maintaining profitability and market share.

The Elastic Demand Index (EDI) formula represents a significant advancement in the analysis of competitive elasticity. By integrating multiple dimensions of market dynamics—Competition Intensity (CI), Market Influence (MI), Buyer Confidence (BC), and Consumer Sensitivity (CS)-the EDI formula provides a more comprehensive and nuanced understanding of demand elasticity than traditional methods such as Price Elasticity of Demand (PED), Cross-Price Elasticity of Demand (CPED), Market Share Analysis, and Brand Equity Models. While the EDI formula is more complex and requires detailed data collection, it offers substantial advantages for businesses operating in competitive and dynamic markets. The EDI formula's holistic approach makes it a more effective tool for strategic decision-making, enabling companies to better navigate the complexities of modern market environments.

Integrating Price Modelling into the Elastic Demand Index (EDI) Using the Van Westendorp Pricing Model

The Elastic Demand Index (EDI) model, as discussed above, is ideal for analysing the relationship between price changes and demand. By incorporating variables such as Competition Intensity (CI), Market Influence (MI), Buyer Confidence (BC), and Consumer Sensitivity (CS), the EDI provides businesses with insights into how price fluctuations may impact their market share and consumer behaviour. However, while the EDI offers a robust framework for understanding demand elasticity, it does not explicitly account for consumer perceptions of price. This gap in the EDI model can be addressed by integrating the Van Westendorp Price Sensitivity Meter (PSM) into the formula, adding a layer of price perception to the traditional analysis.

Rationale for Incorporating the Van Westendorp Pricing Model into the EDI Formula

The Van Westendorp Price Sensitivity Meter (PSM) is a widely recognized pricing model that helps businesses understand customer perceptions of different price points for a product or service [3]. The model asks respondents to identify four key price thresholds: the price at which a product is perceived as too expensive, too cheap, a bargain, and expensive but still acceptable [4]. These responses enable businesses to determine the **Optimal**

Price Point (OPP) and the **Range of Acceptable Prices** (ROP). The OPP is the price at which customers are most likely to perceive the value as balanced or "just right", while the ROP defines the acceptable price range within which customers find the product's pricing reasonable without compromising its perceived value [5]. By applying the Van Westendorp model, businesses can gain valuable insights into customer price perceptions, allowing them to avoid setting prices that are either too high, which can lead to lost sales, or too low, which may erode the perceived quality of the product [6].

The primary limitation of the traditional EDI formula is that it focuses exclusively on the mechanical relationship between price changes and demand, without considering how price perceptions influence elasticity. While the EDI accounts for factors like competition and market influence, it does not capture the psychological component of consumer pricing behaviour. Integrating the Van Westendorp model into the EDI can address this issue by factoring in the psychological price thresholds consumers use when making purchasing decisions. This approach can provide businesses with a more accurate reflection of demand elasticity by considering both external market conditions and internal consumer perceptions.

The enhanced EDI formula, now termed the Price-Perception Elasticity Index (PPEI), incorporates a Van Westendorp Price Factor (VW), which adjusts demand elasticity based on the proximity of the actual price to the customer's perceived OPP and ROP. The revised PPEI formula is:

$$PPEI = \frac{(\Delta Q/Q) \times (CI \times MI)}{(\Delta P/P) \times (BC \times CS) \times VW}$$

Where:
$\Delta Q/Q$: Represents the percentage change in quantity demanded.

$\Delta P/P$: Represents the percentage change in price.
CI, MI, BC, and CS are derived from market dynamics and consumer behaviour.
VW is the Van Westendorp Price Factor, calculated as:

$$VW = \frac{Actual\ Price - Optimal\ Price}{Range\ of\ Acceptable\ Prices}$$

The VW factor accounts for how aligned the actual price is with consumer price expectations. If the actual price is near the OPP, the VW will be closer to 1, indicating that the price aligns well with consumer expectations, and demand elasticity is relatively stable. If the actual price falls outside the ROP, the VW will increase, amplifying the price elasticity and indicating that consumers are more likely to respond negatively to price changes.

Optimal Clients for the PPEI Model

The integration of the Van Westendorp model into the EDI formula is particularly beneficial for clients in industries where price sensitivity and consumer perception of value play a significant role in purchasing decisions. These industries typically involve consumer goods or services where the relationship between price, perceived quality, and brand loyalty is complex and critical to the firm's success. The following types of clients would benefit most from this modified formula:

Retail and Consumer Goods Companies: Businesses selling fast-moving consumer goods (FMCGs) such as clothing, electronics, and food products often operate in highly competitive

markets where price is a key differentiator. For these companies, understanding how customers perceive the price and quality of their products is essential. Consumers in these markets tend to have a wide array of alternatives, making them more sensitive to price increases. For instance, a t-shirt company would benefit from using the PPEI model to determine how slight variations in pricing impact customer purchasing behaviour, particularly when there are numerous competing brands offering similar products.

Luxury and Premium Brands: Companies selling luxury goods or premium products may not compete on price in the traditional sense, but their customers are still highly attuned to perceived value. Integrating the Van Westendorp model into the EDI allows luxury brands to strike the delicate balance between maintaining an image of exclusivity and ensuring that their prices are not perceived as exploitative. Luxury brands must ensure that their prices are high enough to reflect premium quality while still within the acceptable range for their target demographic. For example, a high-end watch manufacturer could use the PPEI to avoid pricing their products too low, which could diminish the brand's premium image, or too high, which could alienate their customer base.

Subscription-Based Services and Software as a Service (SaaS) Providers: Subscription-based businesses and SaaS companies often rely on recurring revenue models, where customer retention is critical. For these clients, price elasticity may fluctuate based on the perceived value of the service over time. Customers may be willing to tolerate incremental price increases if they believe the service provides consistent value. However, a sudden price hike could lead to cancellations if the new price exceeds the perceived value threshold. The PPEI model helps these companies understand where their pricing stands relative to customer expectations and retention rates, enabling them to adjust prices more strategically.

Healthcare and Wellness Providers: Healthcare services, including medical, dental, and wellness providers, often operate in environments where customers have to weigh both cost and quality of care. Patients may accept higher prices if they perceive the quality of care to be superior, but they could also become price-sensitive if they feel the costs outweigh the benefits. By incorporating price perception into the EDI model, healthcare providers can more accurately set prices that align with patient expectations. For example, a physical therapy clinic could use the PPEI to ensure their pricing aligns with the perceived quality of their services while remaining competitive in a market with numerous alternatives.

E-Commerce and Digital Marketplaces: Online retailers and digital marketplaces are prime candidates for the PPEI model. In these markets, consumers can easily compare prices across different vendors, leading to increased price sensitivity. However, e-commerce companies that establish strong brand loyalty and perceived value can mitigate the impact of price changes. The PPEI model allows e-commerce businesses to adjust pricing based on how closely the price reflects consumer perceptions of value. For instance, an online electronics retailer might use the PPEI to determine how slight price adjustments for popular items like smartphones or laptops affect demand, while also considering customer expectations regarding quality and service.

The addition of the Van Westendorp Price Factor (VW) to the EDI formula will significantly enhances the depth and precision of the model. Traditionally, the EDI provides businesses with a means of understanding how demand fluctuates in response to price changes by examining external market conditions and competition. However, this approach assumes a somewhat mechanistic view of price elasticity, where the relationship between price and demand is viewed in isolation from consumer psychology. The Van Westendorp model adds an additional layer of complexity by introducing price perception into the equation, offering businesses insights into the psychological thresholds that drive consumer behaviour.

The inclusion of the VW factor allows businesses to better gauge how customers respond to specific price points and how these responses impact overall demand. The VW factor ensures that price elasticity is not only driven by market conditions, but also by how well the price aligns with customer expectations. This insight is particularly important in markets where customers are highly sensitive to price-value relationships. For example, if a company increases the price of a product but the new price remains within the Range of Acceptable Prices (ROP), the VW factor will moderate the impact of the price increase on demand. However, if the price exceeds the ROP, the VW factor will amplify the elasticity, signalling to the company that further price increases could significantly harm demand.

Moreover, the PPEI model allows businesses to anticipate consumer responses to future pricing strategies. By incorporating the Van Westendorp model, businesses can simulate how potential price changes will affect both demand and customer perceptions before implementing these changes. This foresight can prevent companies from making pricing decisions that could result in unintended losses in market share or customer loyalty. For example, a t-shirt company considering a price increase can use the PPEI model to assess whether the new price will push the product out of the acceptable range for its target customers. By doing so, the company can make informed decisions that balance revenue generation with customer retention.

The PPEI model also adds depth to the EDI by providing businesses with a more holistic view of customer behaviour. Traditional EDI models treat price sensitivity as a relatively static factor, but the Van Westendorp model reveals that price sensitivity can fluctuate based on consumer perceptions of value. By integrating these perceptions into the formula, businesses can better understand how dynamic factors such as brand loyalty, product quality, and market positioning interact with pricing strategies. This approach enables businesses to adopt more flexible and adaptive pricing models that respond to both external market conditions and internal customer expectations.

Incorporating the Van Westendorp Pricing Model into the Elastic Demand Index (EDI) enhances the formula by adding a crucial psychological dimension to the analysis of price elasticity. The revised Price-Perception Elasticity Index (PPEI) offers businesses a more comprehensive understanding of how price changes impact demand by considering both external market forces and internal consumer perceptions. This approach is particularly beneficial for businesses in industries where price sensitivity and perceived value are critical to purchasing decisions, such as retail, luxury goods, subscription services, healthcare, and e-commerce.

The PPEI model allows businesses to align their pricing strategies with customer expectations, ensuring that prices remain within an acceptable range while optimizing demand. By integrating price perception into the formula, businesses gain deeper insights into how customers evaluate the value of their products or

services, enabling them to make more informed and strategic pricing decisions. Ultimately, the PPEI provides businesses with a powerful tool for navigating the complexities of modern markets, where consumer behaviour is influenced by both economic factors and psychological perceptions of value [7-12].

Conclusions

The Elastic Demand Index (EDI) and its variation, the Price-Perception Elasticity Index (PPEI), as proposed in this paper, represent significant advancements in the analysis of demand elasticity, particularly in competitive markets. By integrating multiple dimensions of market behaviour, the EDI formula moves beyond the limitations of traditional models such as Price Elasticity of Demand (PED) and Cross-Price Elasticity of Demand (CPED), offering a more comprehensive and nuanced understanding of how various factors influence consumer behaviour and market dynamics. The inclusion of variables such as Competition Intensity (CI), Market Influence (MI), Buyer Confidence (BC), and Consumer Sensitivity (CS) allows for a more accurate and holistic assessment of demand elasticity, making the EDI formula a more effective tool for businesses operating in complex and rapidly changing environments.

However, for clients who wish to deepen their understanding of how consumer price perceptions impact demand elasticity, the integration of the Van Westendorp Price Sensitivity Meter (PSM) provides an even more sophisticated approach. The Van Westendorp analysis introduces the concepts of the Optimal Price Point (OPP) and the Range of Acceptable Prices (ROP), offering insights into how customers perceive pricing in relation to value. When incorporated into the EDI, this variation—now termed the PPEI—enables businesses to adjust demand elasticity based on the proximity of their actual pricing to the customer's perceived price thresholds.

The traditional approaches to measuring demand elasticity, while useful in their simplicity, often fail to capture the full range of factors that affect consumer behaviour in real-world markets. The PED model, for instance, focuses solely on the relationship between price and quantity demanded, operating under the assumption that all other factors remain constant. This assumption is rarely valid in practice, where numerous external and internal variables, such as competition, brand strength, and consumer sentiment, play crucial roles in shaping demand. Similarly, CPED, while offering insights into the interdependencies between related products, still primarily emphasizes price as the central driver of demand changes. Both methods, therefore, lack the ability to provide a truly comprehensive analysis of demand elasticity, particularly in markets characterized by high competition and rapidly evolving consumer preferences.

The EDI formula addresses these shortcomings by incorporating additional variables that reflect the complexities of modern markets. Competition Intensity (CI) quantifies the level of competition within a market, capturing the extent to which firms are vying for the same pool of customers. In highly competitive markets, consumers have more alternatives, making them more sensitive to price changes. This heightened sensitivity is a key driver of elastic demand, where even minor price fluctuations can lead to significant shifts in consumer purchasing behaviour. Conversely, in markets with low competition intensity, consumers have fewer alternatives, leading to more inelastic demand where price changes have a muted effect on the quantity demanded. By quantifying CI and including it in the EDI formula, businesses can gain a more accurate understanding of how competitive pressures influence demand elasticity, enabling them to make more informed strategic decisions.

Market Influence (MI), another key component of the EDI formula, reflects the power and influence of a company's brand or product in the market. Companies with strong market influence can often maintain higher prices without significantly reducing demand, as consumers perceive their products as superior or essential. This aspect of demand elasticity is particularly important in markets where brand loyalty and perceived quality play significant roles in consumer decision-making. Traditional elasticity models often overlook the impact of brand strength on demand, leading to potential inaccuracies in demand forecasts and pricing strategies. The inclusion of MI in the EDI formula allows businesses to better account for the role of brand equity in shaping consumer behaviour, providing a more realistic and practical tool for assessing demand elasticity in markets where brand perception is a critical factor.

Buyer Confidence (BC) and Consumer Sensitivity (CS) are also integral to the EDI formula, offering additional insights into how consumer sentiment and price sensitivity influence demand elasticity. Buyer Confidence reflects the overall sentiment of consumers regarding their purchasing decisions, which can be influenced by various factors, including economic conditions, product quality, and brand trust. In markets where buyer confidence is high, consumers are more likely to continue purchasing a product even in the face of price increases, leading to more inelastic demand. Conversely, low buyer confidence can result in higher elasticity, as consumers become more price-sensitive and are more likely to switch to alternative products. Consumer Sensitivity, on the other hand, measures how sensitive consumers are to price changes, directly affecting the elasticity of demand. By including BC and CS in the EDI formula, businesses can gain a deeper understanding of how these behavioural factors influence demand elasticity, allowing them to tailor their pricing and marketing strategies accordingly.

While the EDI formula provides a substantial advancement over traditional elasticity models, the inclusion of the Van Westendorp model in the PPEI variation adds even greater precision. The Van Westendorp PSM captures the customer's perceived value of a product, which is crucial for accurately determining the elasticity of demand. By integrating the Van Westendorp model into the EDI, businesses can assess the degree to which their actual pricing aligns with the perceived optimal price point (OPP) and range of acceptable prices (ROP). This allows for the introduction of a Van Westendorp Price Factor (VW) into the EDI formula, which adjusts the calculated demand elasticity based on whether the price is within the acceptable range perceived by customers.

The Van Westendorp Price Factor (VW) is calculated as follows:

$$VW = \frac{\text{Actual Price} - \text{Optimal Price}}{\text{Range of Acceptable Prices}}$$

This factor adds an additional layer of complexity to the EDI by adjusting demand elasticity to account for how closely the actual price aligns with customer expectations. If the actual price falls within the ROP and is close to the OPP, the VW will be near 1, indicating that the price is well-aligned with customer expectations and that demand will remain relatively stable. However, if the actual price is significantly above or below the OPP, the VW will increase, amplifying the demand elasticity and signalling that consumers are more likely to react negatively to the price change.

The application of the EDI formula in various market contexts demonstrates its utility as a more effective tool for analysing demand elasticity. For instance, when a company plans to introduce a price increase for one of its products, the traditional elasticity formula might predict a decrease in demand based solely on historical data. However, by applying the EDI formula, the company can incorporate additional factors such as the current level of competition, its market influence, and the confidence and sensitivity of its consumers. This more nuanced prediction would allow the company to adjust its pricing strategy, perhaps by implementing a smaller price increase or by enhancing the perceived value of the product to reduce price sensitivity. Similarly, the EDI formula can be used to assess the potential impact of reducing prices or introducing promotional discounts, enabling businesses to make more informed decisions about pricing, marketing, and product development. When incorporating the Van Westendorp model, this prediction becomes even more refined, as the company can gauge whether the proposed price increase falls within the ROP and, if not, adjust the price increase to better align with consumer expectations.

Moreover, the PPEI formula offers significant advantages for businesses operating in global and digital markets, where competition intensity is often heightened by the presence of international players and the ease of market entry. The rise of e-commerce and digital platforms has lowered barriers to entry across many industries, leading to an influx of new competitors and intensifying competition. In such environments, traditional models of demand elasticity may fail to capture the full impact of global competition and digital disruption on consumer behaviour. The EDI formula, with its inclusion of CI, MI, BC, and CS, provides a more comprehensive framework for understanding how these factors influence demand elasticity in global and digital markets, helping businesses to navigate the complexities of the modern marketplace. The addition of the Van Westendorp model to the EDI formula further refines this analysis by allowing businesses to understand how price perception varies across global markets and adjust their pricing strategies accordingly.

The Elastic Demand Index (EDI) formula, and its variation with the Van Westendorp model (PPEI), represent significant advancements in the analysis of competitive elasticity. By integrating multiple dimensions of market dynamics-Competition Intensity (CI), Market Influence (MI), Buyer Confidence (BC), Consumer Sensitivity (CS), and the Van Westendorp Price Factor (VW)-the PPEI provides a more comprehensive and nuanced understanding of demand elasticity than traditional methods such as Price Elasticity of Demand (PED) and Cross-Price Elasticity of Demand (CPED). The holistic approach of the EDI and PPEI models makes them more effective tools for strategic decision-making, enabling companies to better navigate the complexities of modern market environments. While these models are more complex and require detailed data collection, they offer substantial advantages for businesses operating in competitive and dynamic markets, providing a more accurate and practical tool for assessing demand elasticity and informing pricing strategies. As globalization and technological advancements continue to reshape markets, the ability to accurately measure and respond to competitive elasticity, while also understanding consumer price perceptions, will become increasingly critical for businesses seeking to maintain profitability and market share. The EDI and PPEI formulas stand as robust and innovative approaches to meeting these challenges, offering new paradigms for understanding and managing demand elasticity in the context of modern business.

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