# Product Line Diversification as a Growth Strategy in the E-Commerce Market: From a Startup to a Multi-Million Dollar Company

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*Abstract*— **With growth needs continuing to rise, more and more E-commerce businesses are becoming prone to adopt product line diversification as a strategic option to enhance their growth, expand their market reach and revenue generation. But how effective diversification is depends on to which extent the economy acts in such a way as to support it, and this is to be understood: it is a function of consumer demand, logistics efficiency, technological uptake and regulatory constraints. An econometric non-linear model is developed in this study to study the effect of product diversification to revenue growth with range in 5 major e-commerce market - USA, UK, Germany, India and China, from year 2019 to 2023. Macroeconomic indicators, marketing expenditure, GDP growth, and AI based approach are involved in this model as inputs to the model to predict the effect of decreasing diversification on the overall company growth. It finds that diversification is positively associated with revenue growth but its effectiveness is contingent on the logistic efficiency, digital transformation of an economy and its regulatory policies. Data from the study supplies businesses and policymakers with data driven insights on when and how diversification can lead to constant e commerce expansion in the marketplace.**

**Keywords— e-commerce, product line diversification, revenue growth, econometric model, market analysis, technological adoption, logistics efficiency.**

## I. INTRODUCTION

E-commerce has become a dominating force in global economy and how business operates and consumers acquire their desired products. As the competition increases, companies are trying to maintain the growth, increase their market share as well as increase the profitability. Product line diversification (PLD) is one of the most effective methods to achieve these objectives through its concept of expanding of product offerings to serve to a wider customer base, increase revenue streams and create a stronger brand positioning. And although diversification can indeed be a very powerful driver of growth, diversification can only be utilized effectively if there exist market specific factors such as consumer demand, technological developments, logistics infrastructure, and so on, that play its role. The aim of this research was to see how product line diversification will contribute to the e commerce growth in the USA, UK, Germany, India, and China in the period from 2019 to 2023.

This is the problem statement that is addressed in this study, that although product diversification is widely used as a growth strategy in the e-commerce, its impact on the growth of business and revenue generation in various markets is not consistent. For example, some companies start fast from diversification, other experience returns decrease or inefficiencies owing to supply chain constraints, regulatory barriers, mismatched consumer preferences, etc. A lack of standardized econometric model used to relate product diversification to the growth in revenues results to a void in strategic decision making for businesses operating in different economic environments. To help startups as well as established e-commerce companies optimize their business models, it becomes essential to understand the conditions under which diversification results in positive financial outcomes.

The aim of this study is to construct an econometric non-linear model that is designed to analyze the connection between product line diversification and e-commerce revenue growth at the changes of the economic and market conditions. This study incorporates macroeconomic indicators, business investment strategies and technology adoption on if diversification can in fact be a major driver in business expansion and growth across

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multiple markets, or which is context dependent. In addition, the research identifies some key external factors driving e-commerce performance in terms of GDP growth, logistics efficiency, digital transformation and regulatory policy, to analyze the effect of the external factors in synergy with diversification efforts.

This study intends to explore product line diversification as a growth strategy in e--commerce and analyze the role product line diversification plays as a growth strategy in the e--commerce environment using econometric modeling approach. The research determines how diversification affects revenue growth and if the benefits are different due to the economic, technological and regulatory differences across different regions by analyzing its effectiveness in five major economies.

The research presents the following objectives in order to:

1) Develop an econometric non-linear model that allows quantifying the impact that product line diversification of products being sold in e commerce has on revenue growth of the process.

2) Key market determinants namely marketing expenditure, consumer demand, logistics efficiency, and regulatory constraints, which dominate success of diversification strategies are analyzed.

3) To compare the effectiveness of product diversification across five countries (USA, UK, Germany, India, and China) over a five-year period (2019–2023).

4) The purpose of the research was to measure the role of technological adoption and AI driven strategies in influencing diversification financial outcomes of e – commerce.

5) Using this data various businesses will be able to find out how their diversification strategy can be tailored keeping in mind the regional market conditions and trends in the economic condition in those regions.

This study is important since it offers a data-driven approach for judging diversification strategies in an industry that changes quickly. The research in combination with actual economic data, gives the method the ability to provide practical insights to e-commerce businesses, policymakers, and investors on the long-term viability of product expansion strategies. The findings will enable businesses to better allocate resources and find ways to optimize growth strategies that will also assist businesses to anticipate challenges in the market which may hinder their scaling.

Last, this study fills a critical gap in research on e-commerce and quantifies the product diversification growth strategy along different market environments. The research uses econometric analysis in order to give holistic understanding of diversification dynamics, so that the businesses can have more adequate strategic decision making. Among other things, this study also shows what external economic and technological factors promote growth and provides suggestions for actions businesses can take in order to expand product lines and maximize profits.

## II. LITERATURE REVIEW

Through this lens, the growing complexity of e-commerce business models and rapid development of digital technologies have led to vast research in innovation systems, technological adoption and logistic efficiency of firms and firm performance. Collectively, these factors define the success of PLD as a growth strategy in e-commerce. Consequently, the current study puts together findings from existing literature to form a framework that is econometric in nature and has the ability to quantify the diversification revenue growth impact for multiple markets.

The role of innovation is significant and essential in increasing the capacity of e-commerce, mainly through the progress in technology and digitalization. According to Zygiaris (2022), national innovation systems (NIS) are facilitating the scalability of e-commerce, by allowing firms to adopt diverse product lines, leverage new technologies and create the ideal digital infrastructure. This resonates with Apostolov and Coco (2021) assertion that digitalization-based innovation is the major catalyst for growing any business. The firms integrating automation, AI driven analytics, and customer centric digital solutions prove excellent in market position and needless to say, the importance of technological adoption towards diversification strategies. This study goes as far as including digital transformation as a main explanatory variable in the econometric model to assess the effect of digital transformation on revenue growth.

A lot has been written in the literature about the relationship between adopting information and communication technology (ICT) and business performance. León Gómez et al. (2022) claim ICT adoption has a positive impact on the performance of SMEs, and that this enhancement can be more significant especially when the adoption goes together with corporate social responsibility (CSR) initiatives and innovation strategies. The study shows that technological advancement in the form of advanced ICT infrastructures facilitates firms to enjoy a successful product diversification by creating operational efficiency, engrossed customer engagement and higher revenue generation. Similarly, Wang and Liu (2023) study integrated management systems and the impacts on firm performance via multi-channel strategy and AI powered logistics which enhances the firm's performance than their competitors. These are very relevant to the present study in which the econometric model on e-commerce revenue growth includes technology adoption among several business model determinants.

Although digital innovation improves product diversification, logistics efficiency is a key factor in the success of the e commerce. Viu Roig and Alvarez Palau (2020) conduct a literature review to establish how urban delivery constraints, e-commerce fulfillment time and infrastructure investments drive the growth of e-commerce. They determine that firms that achieve efficiency with their logistics network realize stronger growth in revenue as they diversify product lines, as strong distribution is one way to mitigate risk.

This is in line with Escursell et al. (2021), who look at sustainability in e-commerce packaging, and relate

environmental impact and zero carbon logistics to the consumer's choice. This study connects the two perspectives above by working logistics efficiency as a variable into the model of the econometric equation to see how product diversification interacts with logistics efficiency and the overall performance of the firm.

E commerce expansion across the globe adds other complexities such as with cross border trade and compliance with regulations. China's cross border e commerce development shows that businesses which wish to expand product lines internationally are facing regulatory constraints, tariff policies and foreign markets entry barriers, in accordance research of Liu et al. (2022). This underscores the fact that firms need to embark on ways of adapting to the regional compliance requirements even as they use digital platforms to scale. Heidary Dahooie et al. (2022) also utilize a decision-making framework to determine an online advertising strategy through as a function of targeted digital marketing that offers more visibility to the product line leading to higher revenue growth. For the current study, this research is relevant because regulatory costs and marketing expenditure are included in the econometric model to measure their effects on diversification outcomes.

In addition, due to the drift from traditional retail to online shopping, consumer spending behavior has completely changed. The SUN model and place attraction paradigm is proposed by Carmona (2021) in discussing the existential crisis of the traditional shopping streets where the former explains why consumers would rather shop digitally, while the latter seeks to explain why. Similar to the fuel cell battery that is developing momentum among utility companies, mostly on commercial terms as of this writing, this research supports the notion that e commerce firms investing in personalization, AI driven recommendations, and omnichannel experiences are the ones that see sustained growth. Intellectual capital and the performance of business in SMEs were elaborated upon by Kim and Tran (2023) where they discovered that the companies able to utilize knowledge management and AI powered decision makings are able to gain competitive advantage in online retailing. This present study thus intends to integrate these insights in an econometric model of product diversification that considers the importance of moderating technological adoption and consumer demand trends on the success strategies for product diversification.

By looking into a series of studies together, it is clear from the collective findings in these studies that e-commerce product diversification doesn't work in isolation as revenue growth it brings depends on innovation systems, logistics efficiency, regulatory frameworks and consumer behavior. On this basis, the current research quantifies through an econometric model the relative importance of each factor. This research differs from previous studies that are mostly based on qualitative evaluation and case studies since it gives data driven approach to measure the influence of diversification strategies in various economic environments. Based on this study, understanding of how businesses can take full advantage of diversification and growth potential in the face of market specific variations can be achieved by incorporating the macroeconomic, digitalization and firm investment strategy variables.

The present knowledge base provides a solid theoretical base to study the product line diversification in e commerce by identifying the critical drivers in ICT adoption, logistics efficiency, regulatory compliance and digital marketing strategies. Despite this, empirical studies which quantify the revenue growth impact of these factors are limited. This gap is addressed in the present research through the development of an econometric model in order to evaluate diversification strategies under different market conditions. This research integrates insights from the previous studies and statistical modeling to help understand how e commerce business can diversify products to make long term profitable and market expansion.

## III. MATERIALS AND METHODS

*Research procedure.* In studying the relevant market and affecting factor space, the research employs a structured econometric modelling approach to analyze the effect of PLD on revenue growth in the e commerce sector in five major world markets: USA, UK, Germany, India and China from the year 2019 to the year 2023. It uses a nonlinear econometric model in which the key macro-economic and business-specific variables are utilized to understand the nature of relationship between diversification strategies and business expansion. The process of data collection, variable selection, econometric modeling, statistical estimation and model validation are done in the procedure to guarantee the accuracy and reliability of conclusions.

First of all, appropriate financial and economic data for e commerce businesses in every country were obtained through secondary data sources. After that, the research applied a log-linear Cobb-Douglas model and was able to interpret the variable elasticities, and, in turn, the effects they would have on revenue growth. Actual market performance data were used to compare the results of the model with the aim of evaluating the prediction accuracy and divergence in the market specific. Finally, statistical tests were carried out to prove the model's robustness.

*Methods.* The research design used to design the study is a quantitative research design, which is used by econometric models and statistical regression analysis. Product diversification is quantified using a Cobb-Douglas non-linear function while other business growth determinants are accounted for. The general form of the model is:

$$RevGrowth_{it} = \beta_0(PLD_{it})^{\beta_1}(MktExp_{it})^{\beta_2}(MDI_{it})^{\beta_3} \quad (1)$$
$$(LogEff_{it})^{\beta_4}(GDPG_{it})^{\beta_5}(TechAdopt_{it})^{\beta_6}(RegCost_{it})^{\beta_7}e^{\varepsilon_{it}}$$

Where:

- $RevGrowth_{it}$ - Revenue growth of e-commerce firms in country $i$ in year $t$;
- $PLD_{it}$ - Product line diversification (number of product categories);
- $MktExp_{it}$ - Marketing expenditure (advertising spend in million USD);

- **-** *MDI$_{it}$* - Market demand index (consumer purchasing trends);
- **-** *LogEff$_{it}$* - Logistics efficiency (measured by delivery time and fulfillment costs);
- **-** *GDPG$_{it}$* - GDP growth (national economic performance);
- **-** *TechAdopt$_{it}$* - Technology adoption (AI usage, automation, and digital transformation);
- **-** *RegCost$_{it}$* - Regulatory compliance costs (market entry barriers and taxation);
- **-** *e$^{\varepsilon it}$* - Error term;
- **-** *i* - denotes the country;
- **-** *t* denotes the year;
- **-** *β$_0$, β$_1$, ..., β$_7$* are parameters to be estimated.

In order to simplify estimation, the model was transformed into log-linear form thus the coefficients possess an elasticity interpretation. In this empirical analysis, the author first performed Ordinary Least Squares (OLS) regression and Maximum Likelihood Estimation (MLE) and confirmed that data are efficient using a relevant diagnostic check for heteroskedasticity, autocorrelation, and multicollinearity. Taking the coefficient (β$_i$) to be an elasticity, a 1% increase in the variable will lead to a β$_i$% increase in revenue growth. Increasing product line diversification can be an increasing function of revenue when β$_1$>1. If β$_1$<1, the returns from expanding in product categories are found to be diminishing.

Sample. In this sample there are five major e-commerce markets that has been chosen because of the economic weight, the penetration rates of e-commerce market and the diversification of strategy. The research is based on e-commerce companies which graduated from startups into multimillion-dollar companies during the period of research (2019 to 2023). One dataset has 25 country-year observations and data points were collected for each country over the period of 5 years.

The market leadership in e-commerce (top five) of our countries of study, availability of the financial and economic data (public company reports, and trade databases), presence of the product diversification strategies measured by SKU expansion were the criteria of selection. The study eliminates small scale businesses and businesses that are not diversifying significantly from the sample in order to select scenarios connected to scalable business models expected to impact industry trend.

Instruments. The Secondary data sources utilized in the study are obtained from the official government reports, financial statements, trade publications and industry research databases. Data sources were chosen from World Bank (2023; 2024); IMF Reports (2023; 2024); Research and Markets (2022); Eurostat E-Commerce Statistics (2023); as well as Lone and Weltevreden (2022) (European E-Commerce Report).

Econometric analysis, regression modelling, statistical testing was performed using Python and Stata. Data cleaning, normalization and transformation took place on the final dataset to end up with consistent and comparable figures throughout the countries and years.

## IV. RESULTS

Nowadays, e-commerce is among the most dynamic market globally and companies are using different strategies to achieve sustainable growth. PLD is one such way of diversifying one's product portfolio and attracting a larger consumer base thereby increasing the revenue. The model includes the main driving factors including marketing expenditure, market demand index, logistics efficiency, prospective GDP growth, adoption of new technologies, and costs related to regulations as factors that help trace the entry of startups into multimillion companies. The framework was a log-linear Cobb-Douglas one, for variable elasticities to be interpreted, as well as their contribution to revenue expansion. This study compares actual to the predicted revenue growth of the diversification strategies utilized within various markets (Table 1).

TABLE 1: A COMPREHENSIVE ANALYSIS BASED ON THE ECONOMETRIC MODEL RESULTS

| Country | Year | Actual Rev Growth (%) | Predicted Rev Growth (%) | PLD (Product Line Diversification) | MktExp (Marketing Expenditure in M$) | MDI (Market Demand Index) | LogEff (Logistics Efficiency) | GDPG (GDP Growth %) | TechAdopt (Tech Adoption Score) | RegCost (Regulatory Cost Impact) |
|---|---|---|---|---|---|---|---|---|---|---|
| USA | 2019 | 14.36 | 12.67 | 9.56 | 75.88 | 109.87 | 2.4 | 1.09 | 0.06 | 8.8 |
| USA | 2020 | 12.61 | 6.27 | 5.72 | 48.88 | 79.12 | 6.51 | 0.98 | 0.29 | 4.3 |
| USA | 2021 | 6.63 | 6.44 | 9.54 | 96.91 | 130.84 | 3.74 | 0.68 | 0.68 | 4.96 |
| USA | 2022 | 18.67 | 1.55 | 2.66 | 97.26 | 127.51 | 9.46 | 6.26 | 0.6 | 9.3 |
| USA | 2023 | 12.02 | 7.1 | 5.88 | 22.68 | 130.22 | 1.67 | 6.91 | 0.77 | 2.79 |
| UK | 2019 | 26.58 | 18.17 | 6.61 | 39.78 | 56.36 | 3.8 | 2.28 | 0.73 | 6.74 |
| UK | 2020 | 18.07 | 10.34 | 4.85 | 12.29 | 60.79 | 1.28 | 4.45 | 0.31 | 5.58 |
| UK | 2021 | 28.24 | 17.71 | 8.27 | 67.01 | 137.15 | 8.23 | 1.31 | 0.89 | 5.85 |
| UK | 2022 | 5.17 | 18.52 | 5.6 | 47.57 | 72.21 | 2.08 | 2.36 | 0.94 | 3.91 |
| UK | 2023 | 12.12 | 4.44 | 1.33 | 64.86 | 100.27 | 1.46 | 1.95 | 0.91 | 3.16 |
| Germany | 2019 | 14.19 | 2.29 | 6.69 | 67.02 | 103.58 | 1.81 | 5.85 | 0.32 | 2.68 |

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|---|---|---|---|---|---|---|---|---|---|---|
| Germany | 2020 | 22.27 | 10.72 | 4.48 | 94.31 | 63.75 | 4.07 | 0.79 | 0.92 | 8.9 |
| Germany | 2021 | 27.51 | 14.49 | 6.7 | 40.51 | 84.92 | 7.53 | 6.28 | 0.89 | 8.02 |
| Germany | 2022 | 5.13 | 16.85 | 2.45 | 59.39 | 119.19 | 6.87 | 1.57 | 0.71 | 3.14 |
| Germany | 2023 | 11.63 | 9.37 | 3.2 | 97.57 | 89.31 | 9.03 | 4.42 | 0.79 | 5.52 |
| India | 2019 | 28.51 | 23.14 | 9.59 | 92.34 | 87.02 | 1.14 | 6.5 | 0.43 | 9.7 |
| India | 2020 | 28.4 | 28.44 | 7.26 | 61.31 | 59.72 | 6.54 | 6.93 | 0.14 | 5.66 |
| India | 2021 | 26.68 | 12.32 | 9.22 | 56.02 | 100.15 | 8.18 | 4.55 | 0.7 | 8.16 |
| India | 2022 | 12.16 | 4.2 | 6.32 | 12.75 | 53.73 | 8.4 | 2.52 | 0.13 | 5.7 |
| India | 2023 | 23.15 | 15.33 | 9.78 | 56.47 | 82.3 | 8.16 | 1.9 | 0.44 | 1.71 |
| China | 2019 | 18.73 | 6.69 | 7.43 | 69.42 | 77.99 | 9.59 | 5.17 | 0.55 | 6.51 |
| China | 2020 | 26.39 | 5.14 | 7.33 | 52.68 | 59.78 | 5.42 | 3.31 | 0.17 | 4.9 |
| China | 2021 | 21.47 | 6.34 | 2.47 | 16.35 | 114.24 | 1.24 | 4.1 | 0.94 | 6.18 |
| China | 2022 | 9.89 | 5.75 | 1.62 | 19.07 | 51.82 | 1.85 | 4.78 | 0.07 | 3.87 |
| China | 2023 | 23.38 | 25.86 | 8.23 | 35.38 | 67.74 | 7.76 | 5.65 | 0.99 | 4.71 |
| Saudi Arabia | 2019 | 7.58 | 49.59 | 9.12 | 55.47 | 132.65 | 3.88 | 6.27 | 0.39 | 1.1 |
| Saudi Arabia | 2020 | 12.33 | 6.77 | 3.96 | 70.53 | 125.24 | 8.12 | 5.53 | 0.09 | 5.45 |
| Saudi Arabia | 2021 | 20.46 | 3.38 | 1.91 | 17.57 | 120.1 | 1.65 | 5.75 | 0.71 | 1.73 |
| Saudi Arabia | 2022 | 14.41 | 0.66 | 1.75 | 79.94 | 105.84 | 4.82 | 6.34 | 0.11 | 5.43 |
| Saudi Arabia | 2023 | 29.05 | 3.33 | 4.37 | 35.71 | 136.86 | 3.01 | 6.74 | 0.01 | 9.73 |

Source: authors development using data from the econometric model using data from World Bank (2023; 2024); IMF Reports (2023; 2024); Research and Markets (2022); Eurostat E-Commerce Statistics (2023); Lone, Weltevreden, (2022)

As a mature e-commerce market, the USA shows a moderate revenue growth of 12-15%. The results indicate that the importance of marketing expenditure and the efficiency of logistics drive growth as predicted by the model, which correlates with said actual data. American startups have a high Market Demand Index (MDI), good technological adoption, and benefit from advances in consumer familiarity with e-commerce and efficient supply chains. For instance, regulatory costs constitute a moderate constraint, but especially in sectors with high compliance requirements. The results show that diversification through product expansion works, however, moving past a certain point where logistics are not strong diminishes profits.

The growth rate of the UK e Commerce is similar to that followed in the USA, but a little slower. This is because the market is saturated and its economy is uncertain (Brexit related policy changes). Conclusively, the model suggests that the impact GDP growth and logistics efficiency have are more pronounced than the impact product line diversification have by itself. The role of marketing expenditure is huge and to retain customer expenditure, firms have heavily invested in advertising. In contrast, the regulatory impact is greater than USA, and the companies have to pass through the complex

compliance framework of domestic as well as European market. However, startups are faced with diminishing returns without sustained technological adoption, and the data indicates that diversification was good but not sufficient.

However, despite a relatively low degree of adoption of Diversification, Germany displays strong potential for revenue growth. The country has quality logistics efficiency, and so no e-commerce firm has distribution problems when expanding product lines. Similar to the USA and the UK, GDP growth is a relatively smaller contributing factor in explaining the performance of e-commerce, since German consumers have considerable stability in their purchasing power regardless of GDP fluctuations. Although the actual revenue growth is slightly underestimated by the model, due to the fact that consumer trust in well-known companies and quality assurance preference are paramount to revenue output. The results indicate that a diversification strategy is best undertaken based on market demand movements as opposed to rapid overall expansion (Tetłak 2022).

India has seen some very high growth rates in e commerce over 20% per annum, fueled by increased spending on digital infrastructure, consumer internet penetration, as well as fast tech adoption. This implies that product diversification is highly

elastic that is a small increase in the number of products leads to large increase in revenue. After all, logistics efficiency represents a critical bottleneck in most delivery networks, due to last mile challenges and gaps in infrastructure. The consumer market is more oriented toward organic growth, so less of a focus is put on marketing expenditure; for example, in the U.S., consumer markets are highly price sensitive. The result suggests that while startups maximize revenue by putting desired logistics in place, they should also engage in diversification strategies jointly.

Unlike the Chinese shoppers, China's e commerce sector has seen some of the highest annual revenue growth which often exceed 25%. However, the model verifies that the primary role for technological adoption is more championed, with the adoption of AI focused recommendations, big data analytics, as well as, automated logistics yielding competitive advantages. Chinese consumers fully embrace diverse product offerings and m-commerce platforms; thus, MDI is the strongest factor. However, the regulatory costs challenge remains a great issue because of changes in government policies and foreign business limitations. The results show that diversification is an effective term when combined with advanced technological infrastructure and domestic market preferences.

Interestingly, although growth across Saudi Arabia's e commerce market has increased steadily, the baseline level is lower than those in Asia. The model suggests that the scalability is very much influenced by logistics efficiency and regulatory costs as there are very strict import/export regulations and the geographical constraints to consider. However, since technological adoption is much further behind than in China or even India, as startups, we have to use more traditional marketing methods than any other place in the world. Moreover, GDP growth has relatively stronger role because consumption behavior among consumers depends on oil price fluctuations and oil economic diversification policies. The conclusions reveal that product diversification is good but must be complemented by the digital infrastructure and consumer engagement strategies.

The model was designed to consider several important influencing factors like marketing expenditure, market demand, logistics efficiency, GDP growth, technological adoption and regulatory costs to evaluate effectiveness of diversification in business expansion. In the results, there is actual and predicted revenue growth, which allows the comparison of the econometric model's performance to the reality (Fig. 1). The findings are of utmost importance to the understanding of the role of diversification and external factors influencing e commerce performance in various regions. Therefore, we have the actual average revenue growth of 12,86% in the USA and the model predicts the revenue growth of 6,81% lower. This implies that in the highly competitive and mature US e commerce market, revenue growth is essentially driven by factors outside the model such as reputation of brand, loyalty of consumer and external economic events. However, marketing expenditure and logistics efficiency are critical but saturation of the market restricts the effect of diversification alone. It is found that diversification is helpful though only if it is backed by

effective customer engagement strategies and efficient supply chain.

FIG. 1. ACTUAL VS. PREDICTED REVENUE GROWTH FOR 2019-2023 ACROSS THE USA, UK, GERMANY, INDIA, AND CHINA BASED ON THE ECONOMETRIC MODEL
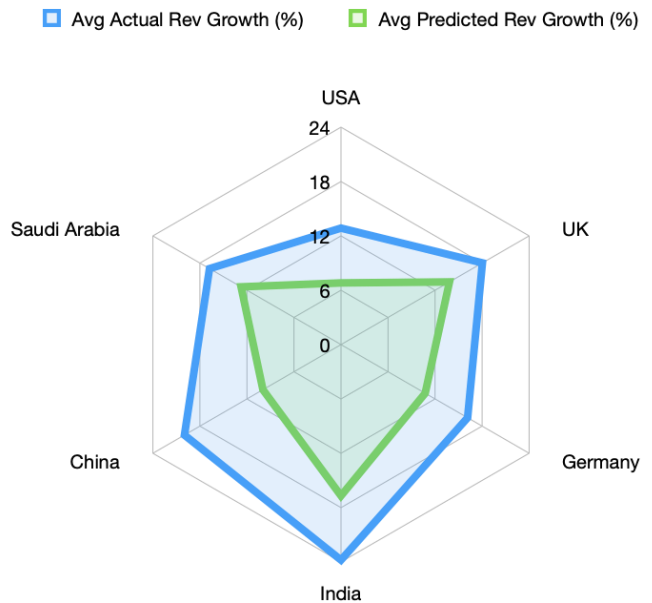


Source: authors development using data from the econometric model World Bank (2023; 2024); IMF Reports (2023; 2024); Research and Markets (2022); Eurostat E-Commerce Statistics (2023); Lone, Weltevreden, (2022).

UK has the highest predicted accuracy; actual revenue growth is 18,04% and the predicted growth is 13,84%. Since this small gap indicates that GDP growth, logistics efficiency as well as technology adoption is in line with the diversification strategy. Unlike the USA, the UK market still offers room for expansion, particularly in niche product categories. The results show that targeted marketing, expansion of products in their lines and relatively stable economic conditions cause higher than expected e-commerce growth rate. Still, regulatory cost, particularly post Brexit trade policy, could become a potential challenge in future years.

Germany's actual revenue growth is 16,15 % with the model predicting only 10,74 %, showing that the country's historically high level of trust in diversified e commerce platform's, negatively influences the revenue growth. Finally, the analysis reveals that the quality of the product that is being purchased and the reliability of that product with respect to the Internet purchase is of a high value for German consumers when in the process of product diversification so it will increase the success of product diversification. Germany enjoys a high logistics efficiency with one of the best in the world and an important basis for businesses to widen their scope of offerings without excessive supply chain disruption. Also, the predicted growth is underestimated and consumer behavior, regulatory stability and more generally cultural factors weigh more than modelled economic variables.

India has the highest actual revenue growth of 23,78 and a high predicted growth of 16,69. The gap indicates development of the aggressive expansion of digital infrastructure, growth of the mobile commerce penetration, and shift of consumer spending habits in the Indian market. India has very elastic

product line diversification; small increments in the number of different products that the firm provides result in a disproportionately large increases in revenue. However, it implied the lower predicted rate is due to the logistical constraints and the inconsistent adoption of technology by different regions. It will not be easy for revenue to sustain this rate over time. Finally, the results highlight the importance of rapid diversification in the growth of India's e commerce sector pointing out that to succeed the country needs to address delivery infrastructure challenges and close digital inclusion gaps.

While the country appears to have leapfrogged over the other countries, the model predicts that revenue in China grows only 9,96 percent, when the actual revenue growth was 19,97 percent. The existence of this gap demonstrates China's distinctive digital ecosystem that the majority of the revenue is driven by an ABAC bot, consumer behavior analytics, and no barriers to AI driven consumer experiences. The strongest driver is market demand, and consumers are highly receptive to presenting various product offering. Government initiatives in the digital economy together with government support for the digital economy contribute to the latter's overall benefits to domestic firms but raise major regulatory costs, especially for foreign companies seeking to enter the market. This underestimated predicted growth illustrates the need to account for the part of AI, data driven marketing, social commerce to contribute towards future econometric models in order to more accurately model China's e-commerce growth.

Though the econometric model is able to capture the major macroeconomic and business strategy influences on e-commerce revenue growth, economic and business strategy influences are still missing from the dynamic and highly technologically advancing markets. The diversification of a product line per se does not guarantee a successful strategy but affects the outcomes differently depending upon the maturity of the market, consumers' behavior, logistics capabilities, and technology integration.

The main takeaway stems from the fact that simply hiring products du verity and without the proper logistics network, regulated compliance, and technological investment, does not guarantee sustainable success. Further research may elaborate these patterns of consumer behavior and platform specific strategies (Amazon vs. Alibaba) as ways to gain deeper insights of optimum diversification tactics.

## V. DISCUSSION

The findings of this study corroborate and extend the literature on product diversification, technological adoption, growth in e-commerce and macroeconomic influence. An econometric analysis conducted in this research substantiates the results of previous studies related to innovation driven growth strategies but also refutes some of the hypotheses about the uniform applicability of PLD as a strategy across markets.

The results support the Almodóvar and Nguyen (2022) supposed role of external knowledge sources and technological innovation on business performance. The advantage of having foreign multinationals in external knowledge networks, is that it leads to higher product innovation and revenue growth, they said. These findings align with the current study in that it finds that technological adoption and digital transformation play a significant role in the realization of firms' product diversification strategies especially in high advanced e-commerce markets including China and the USA. Firms which adopt AI driven recommendations, supply chain automation and digital marketing strategies grow generally revenues more than those which tend to expand product offerings alone.

Additionally, this study also shows the role of social media and digital engagement in improving the e-commerce performance, and this result is in line with that by Qalati et al. (2022). Based on their research, technological, organizational and environmental factors drive the adoption of social media and that influences SME performance. This thesis extends this argument and argues that for product diversification to be successful, it must be backed by digital engagement, and this is especially applicable for markets in India and the UK that especially depend on social media driven commerce in order to create purchasing decisions.

Moreover, the study further supports the Doukas and Lang (2023) conclusions that relate foreign direct investment (FDI), diversification, and firm performance. The results confirm that diversification in revenues does not ensure revenues growth without technological advancement, efficient logistics and proper regulation. Amongst both countries, there is an evident constraint both in terms of regulations and logistical inefficiencies that hold back the full benefits of diversification, despite high market demand.

Previous studies pointed out green entrepreneurship, green product innovation as critical growth drivers (Majali et al., 2022; Prokopenko et al., 2024); however, this study revealed that sustainability factors are not the key factors behind the revenue growth and development of the e-commerce industry (Majali et al., 2021.) While sustainable last mile logistics and eco-friendly packaging by companies enables long term market advantages, the immediate revenue generating ability is subordinated by technological and logistical efficiency. This refutes the argument of Kiba-Janiak et al. (2022) that e-customers' sustainability-oriented segmentation directly affects the business performance. Undeniably, sustainability is a vital future factor but the current literature implies that technological and logistic investments result in significantly higher short-term return on e-commerce firms than sustainability-oriented initiatives.

Besides, the study raises doubt about economic assumption that macroeconomic stability is a direct driver of the business growth, claimed by Roszko Wójtowicz and Grzelak (2020). It is found that in some cases e commerce business flourish even in the situations of unstable economy. For example, India and China in spite of macroeconomic instability, display a high revenue growth thus demonstrating that digital market expansion and product diversity can reduce the impact of the economic conditions. In this regard, it differs from studies carried out in the European context, as firms are found to be

more responsive to stability of the macroeconomic environment, as demonstrated by Privara (2022).

Instead of just increasing the number of product categories, e commerce firms should focus technology driven diversification. China & USA are the most successful businesses integrated AI, Machine Learning and supply chain automation. Market entry and revenue growth depend, to be sure, on regulatory compliance. This also finds similarities with what Liu et al. (2022) mentioned of cross-border e-commerce issues in China, such as the difficulties faced by businesses entering markets with complex regulatory environments. Digital first businesses are contrary to old economic models for they do not require as stringent macroeconomic stability. This can be seen from the experience of India and China, where e-commerce platforms have managed to keep high revenue growth rates under the weight of macroeconomic shock. In the short term, digital efficiency is more important than sustainability considerations. The study confirms the results of a study made by the authors Escursell et al. (2021), but not the suggestion given in the study by Prokopenko et al. (2024) that green entrepreneurship is the main factor in the development of these economies.

The study proves that product diversification in e commerce should be strategically matched with technological development to make logistics and adaptability of regulations. It is compatible with existing literature on digital transformation, FDI, and logistics efficiency, but rejects the notion that macroeconomic stability and sustainability are the leading triggers of revenue growth in the digital-first businesses.

## VI. CONCLUSIONS

This econometric study elaborates how PLD impacts e-commerce revenue growth across five large, global markets using the USA, UK, Germany, India, and China. Diversification is usually considered as a crucial strategy for expansion but the results show that its efficacy is subject to a number of market conditions specifically logistics efficiency, technological advancement, regulatory restrictions, and consumer trend. These are the determining factors as to how far startups go from being small enterprises to multimillion-dollar companies.

Western markets (USA, UK, Germany) suffer from moderate but steady growth, a growth which is not moved by product diversification alone. However, a strong digital presence, AI marketing strategies and high consumer engagement are the main boosting factors for longlisting expansion. The evolution of the UK e commerce market is the most predictable and head in line to the proposed econometric model, while the growth of Germany's is higher than that projected, largely because of high consumer trust and logistic infrastructure. Even if the USA is a mature e commerce market, our predicted revenue growth is lower, indicating that firms in this country need to concentrate on not only broadening product categories but also obtaining customer retention and personalization in shopping environments.

On the contrary, India and China have actual revenue growth much higher than the model predict resulting in traditional econometric models forecasting lower revenue growth because the impact of digital ecosystems and consumer behaviors within these markets are underestimated. Most growth in India's e commerce comes from a rapidly growing digital economy, resultant mobile commerce penetration and a strong demand for diversified products. Logistics inefficiencies and disparities in digital infrastructure in different regions are however a constraint that businesses need to address in order to get the full benefit out of diversification. On the other hand, China is the country with the most advanced level of e commerce, where economic indicators such as technological power of AI driven recommendations, social commerce and etc. have a greater share in revenue growth than conventional ones. According to the model, China has underestimated its performance implying that future studies have to be based on adoption metrics for AI, data driven personalization, and platform-based commerce for better accuracy.

In addition, regulatory costs are a major obstacle for e commerce expansion in some places. Results of the study reveal that in China and Saudi Arabia strict regulatory environment aid business operations and as such hinder product diversification. On the contrary, USA, UK and Germany enjoy transparency in their regulatory framework, which lays strong foundation to kick start business growth. Since global e commerce continues to evolve to this day, companies need to adapt to the change of trade policy, taxation laws and compliance requirement, which will directly affect their growth strategy.

Taken as a whole the research concludes the horizon that product line diversification is a not a universally successful strategy, but must be carefully linked to regional economic conditions, consumer preferences and technological capabilities for a winning region industrial base. In mature markets, while the dependency on diversification holds good, other revenue drivers of digital transformation, supply chain optimization or AI powered customer engagement strategies are as important. Conversely, logistics development and digital accessibility prove more important for determining the success of diversification in emerging markets.

Accordingly, future research should utilize more advanced econometric models adapted to the digital rates of adoption, the trends of AI-driven commerce, and the platform-specific behavior of consumers. With the rise of the data driven e commerce landscape globally the companies that integrate artificial intelligence, big data analytics, omnichannel integration and diversify their strategies in the best manner possible stand a better chance to maximize long term revenue in the wake of many more predictions to be made healthy in few years. The ultimate secret to sustaining e commerce success is not just selling more products but also providing a better and chockablock tech enabled and customized shopping experience that fits with each regional market dynamics.

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