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Optimizing the company's portfolio by using linear programming to introduce private-label products

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Abstract

Background: The beginning of the new millennium brings the emergence of several different trends in the industry. The development of information and communication technologies causes changes in consumers' lifestyles, which requires implementing an omnichannel sales strategy. Increasing competition and market concentration create a need to develop innovative business models for leading retail chains. More than just the traditional marketing mix elements need to be present to achieve the desired business results. Creating "own branded products" appears to be an essential goal of companies in the retail trade.

Purpose: The paper aims to determine whether one of the decisive motives for using “Private label,” the achievement of a higher level of profit, is stated while ensuring a better negotiating position for the company in modern marketing channels.

Study design/methodology/approach: The paper compares the business results before and after using "private label" items within the range of the observed companies by calculating the gross and net profit margins. The optimal solution of the business models is reached using linear programming methods, which will maximize retail companies' overall profitability.

Findings/conclusions: The results of empirical research showed that the company increased its realized profit by introducing the three "Private label" products. Thus, the initial hypothesis that the introduction of a private trademark improves the overall level of profit is verified.

Limitations/future research: This research's limitations are caused by the fact that it was conducted in one market. The general validity of the conclusions should be tested in other geographic areas and markets of other product categories.

Keywords

Profitability calculation, private label, linear programming problem, portfolio optimization, retail sector

Introduction

Over the past few decades, the operations of retail companies have experienced a transformation due to the emergence of various trends in the retail sector (Rust, 2020). The development of the digital revolution (Hunt & Rolf, 2022), changes in the lifestyle of consumers (Mainardes et al., 2023), the growth of the degree of market concentration (Knežević et al., 2014) and increased internationalization (Knezevic & Szarucki, 2013; Knežević & Delić, 2015) have led to the emergence of evolution in the design of marketing channels in retailing. With the development of information and communication technologies and intensified digitalization (Knežević & Butković, 2020) comes the growth of "contact points" between sellers and buyers and the development of new electronic channels for marketing the company's production program. The growth in the number of marketing channels led to the standardization of prices and the personalization of the available assortment, all to avoid the "cannibalization" of own sales points (Geyskens et al., 2010). Due to the high saturation of the market space, maximizing the overall profitability of the selling points of the given chains becomes increasingly challenging. With the further appearance of competitors that generate a large part of the market share, the degree of concentration reaches unimagined levels.

The increase in the liberalization of trade flows caused the appearance of more subjects of retail networks in different market areas along with the process of removing barriers to entry. With the growth of competition, it becomes more and more difficult to achieve business results (Dawes & Nenycz-Thiel, 2013). An effective tool for improving the profit rates of retail companies is becoming a trademark either in retail operations or in product assortment (Lovreta et al., 2020).

Companies that mainly deal with product sales begin creating their own assortment under their own brand by getting involved in creating products, sometimes for their plants (Ailawadi, et al., 2008). This process has been evident and increased among large retailers in Southeastern Europe over the past decades. It is quantitatively proven that introducing private label products on retail shelves affects the growth of the company's profits (Garrido-Morgado & Gonzalez-Benito, 2024).

The initial part of this paper will refer to the definition of the term "Private label" in the sphere of the retail industry. The paper continues by presenting the methodology for calculating the profitability of domestic retail chains. An analysis of the current situation will be carried out using a reliable methodology for calculating the profitability of retail companies through the expression of gross and net profit margins, and an overview of future business directions will be provided. The procedure for calculating the observed retail company's gross and net profit margins will be presented in detail. Following this, the term "turning point" will be defined as an effective tool for making business decisions. Accordingly, five stages in calculating the necessary level of turnover in the observed retail company are highlighted, along with a graphical representation of the breaking point model. Thereafter, the effect of introducing products under a private trademark within the sales assortment will be examined.

The last part of the paper will involve the strategic development of a business model for profit maximization using linear programming methods (Hillier & Lieberman, 2015). The paper's primary goal will be to correctly determine the optimal solution for producing articles with a private label. In this way, the company will maximize business profit and optimize all aspects of business (Gielens et al., 2023). By using the program for mathematical analysis and operational management, "QM for Windows v5", the optimal combination of production of articles from the private label category will be detected. In the last part of this paper, recommendations will be provided to the managers of the observed trading company to develop an effective business strategy and improve overall business performance.

1. Theoretical background

1.1. Defining the concept of private label

Private label ("PL") refers to a group of products sold under the brand controlled by a trading company. Lovreta et al., (2020) suggest that they are commercial brands for mark items, which a retail company designs and places on the shelves of its stores. Fraser (2009) implies that the implementation and usage of private labels, as a part of retail strategy, develops over time and influences consumers' choices within the store. Therefore, the importance of private labels implies the aspiration of the retail chain to identify the products it can use to differentiate itself in relation

to competing retail companies, increasing profit at the same time (Dai, at al., 2023).

Some of the decisive motives for the development of the private label mark can be listed in the following order:

1. Achieving a competitive advantage in the observed market area.
2. Implementation of the strategy of positioning and market differentiation.
3. Using backward integration to increase market concentration.
4. Completion of the offer package by retail companies.
5. Independence when introducing a new product.
6. Increasing sales margins by introducing "Private Label" products.

At the beginning of the new millennium, "private labels" are becoming increasingly popular in the business models of leading European retail chains. It is estimated that "private brands" represent 10% to 40% of the total sales of consumer goods, making them a key assortment element of prominent retail companies. In relation to market penetration of private brands, the most developed area is Western Europe. According to a report, in Great Britain, "PL" products make up 43% of total product sales, in Germany 39%, while in France they are at the level of 34%. On the other hand, the presence of "private label" in the USA is at the level of 20% (Bontemps et al., 2008).

Regardless of the minor market penetration out of continental Europe, a growing trend in using its trade brands can be diagnosed in almost all developed world economies. By reviewing the results of the modern business model of leading companies in retail trade, we can conclude that most trading companies own production brands, which are indispensable aspects of a successfully built assortment. These products are priced up to 40% lower than national brands sold by manufacturers (Steenkamp et al., 2010).

The trend of developing private brands is becoming more common in the early years of the new millennium in the retail industry. Developing the "Private label" concept is directly related to strengthening retailers' role in marketing channels (Fraser, 2009), i.e. taking a leading position in relation to producers of well-known national brands (Li, et al., 2024). The own trade brand is developed by large and concentrated retail systems that successfully bear the risk of such business, along with the process of establishing vertical exchange relations.

In the case of large manufacturing companies, the linear programming method is used to optimize the assortment by introducing private brands (Karray & Martin-Herran, 2022).

The increasing use of private labels in the business models of retail companies leads us to propose the following hypothesis:

H1: The integration of a "Private label" within a retail company's assortment affects the growth and overall level of its profitability.

1.2. The use of "Private label" in the business practice of a domestic retail chain

In the modern business environment, no product is brought to the market without a clearly defined brand. Manufacturers are investing an increasing level of effort in labelling their products to differentiate themselves from the product brands of the largest competing companies (Trninić, 2023). Producers get an additional threat in developed market economies - "trademark". Every company in the retail industry is focused on having recognizable manufacturer brands that will fill the shelves of their stores and not threaten the position of private trade brands (Gielens et al., 2021). The reputation of a retail chain depends on the inclusion of renowned brands (İpek et al., 2016). Companies are increasingly developing their brands with the need to achieve a stronger market position and higher profits (Shopova, 2023).

The significantly lower buying price of "Private label" compared with branded products, less investment in promotional activities, and other lower marketing costs ensure the improvement of the overall level of profitability of retail chains (Remeňová et al., 2023). Data from the Harvard Business Review report indicate that by using "Pl", companies from the USA increase their net profit rates by 2-5%, while companies from Europe have an increase of 5-10% (Quelch & Harding, 1996).

The analysis of the annual financial reports of retail chains from the territory of the Republic of Serbia for 2022/2023 is carried out based on the "Statistical Office of the Republic of Serbia." The research calculates the profit of a retail company in the Serbian market by introducing dairy "Private label" products.

Using linear programming to calculate profitability and gross profit margins, we analyze the current situation and prove the change in the profit level due to the introduction of "Private

label" products. The reason for introducing dairy "Private label" products is related to the wide assortment of this product category. We begin the business performance analysis by separating elements to calculate gross and net profit margins.

Table 1 Elements of income and expenditure (in RSD million)

	Net turnover (NT)	15,308.345
-	Cost of goods acquired (CGR)	12,864.589
=	Gross margin (GM)	2,443.756
-	Operating costs (OC)	2,026.385
	Salaries (Employed, Staff, and administration) (IN)	1,225.994
	Annuity and Rent (RN)	121.583
	Marketing and Promotion (MP)	101.319
	Maintenance and Amortization (MA)	243.166
	Other expenses (OS)	334.353
-	Interest on capital (Ki)	40.371
=	Total costs (TC)	2,066.756
	Variable costs (VC)	1,131.102
	Fixed costs (FC)	935.654
=	Net income before taxes (EBIT)	377
-	Taxes (TX)	110
=	Net income after taxes (NIAT)	287

Source: the authors' calculation

2. Profitability calculation methodology

2.1. Calculation of the net profit of the designated retail chain "A"

The business performances highlighted in Table 1 indicate the realized profit level and the gross margin of the retail chain "A," which was achieved during 2022/2023. Company "A" gross margin was 2,443.756 million RSD in the year's fourth quarter. Due to the generated total operating costs of 2,066.756 million RSD, the company achieved a net profit before tax of 377 million RSD. Net profit after tax is obtained by subtracting the value of tax from the value of net profit after tax, which in this case amounts to 287 million RSD.

Calculation of the Gross Margin Rate (GMR) indicates the difference between the total turnover at sales prices and the cost of goods sold at buying prices without considering the operating costs. The gross margin rate represents a percentage of the trading company's net turnover. It is necessary to gain insight into the net turnover (NT) and gross margin (GM) of the observed retail company during 2022/2023 to calculate the gross margin rate. The paper continues by presenting the formula for calculating the gross margin rate of the observed retail company "A":

GMR = GM / NT *100

GMR = 2,443.756 / 15,308.345 * 100

GMR= 15.96%

GM - Gross margin

NT - Net turnover

GMR - Gross margin rate

The Net Profit Margin (NPM) rate measures the profitability of the entire company and is expressed as a percentage of the realized net turnover. To calculate the rate of net profit margin (NPM), the achieved net turnover (NT) and the value of net profit after tax (NIAT) of the observed trading company must be known.

The net profit margin (NPM) of the observed retail company "A" will be calculated through the following formula:

NPM = NIAT / NT *100

NPM = 287 / 15,308.345 * 100

NPM= 1.9%

NPM – Net profit margin

The two calculated indicators of the retail company's profitability are the starting point for further analysis. The following text will show how the inclusion of an adequate volume of sales of private-label products affects the change in these indicators.

2.2. The breaking point as an effective tool for making business decisions

Modern and traditional approaches to managing profitability and gross margin alike rely on the use of break-even models. It is an instrument suitable for analyzing and planning the key elements of the profit margin in retail companies (Lovreta et al., 2020). It is noticeable that the breaking point model has been reliably used when monitoring the level of achieved profitability of the company, as well as for making strategic decisions to improve existing business performance (Molinillo et al., 2016). The reason for the wide use of the breaking point model is related to the possibility of monitoring the impact of the planned level of the profit margins, as well as simulating the effect of changing each variable on the overall level of profitability of retail companies.

The methodology for calculating the company's break-even point (BP) is divided into five different stages and presented as follows:

1. Classification of total costs
2. Calculation of the rate of variable costs
3. Calculation of the gross margin rate
4. Calculation of the marginal income rate
5. Calculation of the breaking point

TC = FC + VC

RVC = VC / NT *100

GMR = GM / NT *100

RMI = GMR – RVC

BP = FC / RMI *100

Calculation of the value of the breaking point on the example of the observed trading company "A":

TC = FC + VC

TC = 935.654 + 1,131.101

TC = 2,066.756 million RSD

RVC = VC / NT *100

RVC = 1,131.101 / 15,308.345*100

RVC = 7.39%

GMR = GM / NT *100

GMR = 2,443.756 / 15,308.345 * 100

GMR = 15.96%

RMI = GMR – RVC

RMI = 15.96% - 7.39%

RMI = 8.57%

BP = FC / SMI *100

BP = 935.654 / 8.57% *100

BP = 10,917.782 million RSD

The obtained breaking point (BP) for 10,917.782 million RSD shows us the lower limit below which the company should not operate: achieve a lower volume of net turnover in unchanged business circumstances. A guaranteed profit can be made by a retail company only above a certain threshold. Decision-makers at retail companies and creators of business strategies must consider the value of the break-even point when planning the net turnover of their points of sale. The successful strategic positioning of the company relies on calculating the breaking point (BP) in the first step. Only after that, the next step is designing the marketing performance and creating additional value to create a consumer experience.

3. Use of "private label" as a tool for increasing profits of retail companies

The previous analysis showed the business volume necessary for the company to enter the profitability zone. The following analysis aims to find a way to increase profitability. Within the range of retailers' management tools today, several key concepts determine their competitive advantage and profitability, such as category management, personalization, and customization of the offer (Tešić & Bogetić, 2022), but also private label management, which is the focus of this analysis.

By calculating the breaking point as a quotient of total fixed costs and the marginal income rate, we obtained a value of 10,917.782 million RSD. The achieved value of the "BP" represents the lower limit of the total turnover level of the retail chain "A," below which one should not do business (Lovreta et al., 2020). For example, company "A" achieves a turnover of 4,390.563 million RSD, higher than the breaking point level. The retail chain "A" introduces a private trademark to improve the overall profit. The "dairy products" category was selected as the most suitable for creating a private brand.

In reviewing the business performance of the given company, we can see that the net turnover increased by 1,837 million RSD and the procurement costs by 1,764 million RSD. The introduction of new products within the assortment of the retail company "A" brings about significant changes in the company's business results. The private trade brand "A Plus" is marketed by placing new products from the "dairy products" category in its stores' existing refrigerated display racks. After the inclusion of the private label in the company's business model, an increase in the gross margin by 865.295 million RSD is projected, a percentage of 26.2%. In terms of net profit after paying tax, the retail company realizes a direct increase in net profit of 607.608 million RSD. Due to the increased net turnover and profit level, the company must pay more to the prescribed tax duties settlement account. In addition, the increase in profit is accompanied by a projected increase in total costs of 47.687 million RSD. As an input for the calculation of the turnover increase, the prices of new products are presented in the following table, compared with the prices of major national brands.

Table 2 Prices of products from the category of private trademark (PL)

PL	Products	Price per product
1	"Yogurt A plus" (1l)	139,99
2	"Cheese spread A plus" (100g)	109,99
3	"Kajmak A plus"(250g)	169,99
4	"Milk A plus" (1l)	154,99
5	"Sour cream A plus" (180g)	68,99
6	"White cheese A plus" (250g)	244,99
7	"Mozzarella A plus" (125g)	189,99
8	"Fruit yogurt A plus" (330g)	94,99

Source: the authors´ calculation

Calculation of the projected profitability of the company "A" after the introduction of the "PL" products was derived according to the following proportions:

NT * 12%

(calculated growth rate based on balance positions/published in the "ABR" database)

NT = 15,308.345 + 15,308.345 *0.12%

NT* = 17,145.346 million RSD

ΔNT = NT* – NT

ΔNT = 17,145.346 – 15,308.345

ΔNT = 1,837.000 million RSD

ΔNT – Modified Net turnover

GM = NT – CGR

GM = 17,145.346 – 14,364.000

GM = 2,781.000 million RSD

TC = OC + Ki

TC = FC + VC

FC = 989.553 million RSD

TC = 1,318.793 + 858.650 + 47.000

TC = 2,224.443 million RSD

EBT* = GM – TC

EBT*= 2,781.000 – 2,224.443

EBT*= 556.557 million RSD

EBT*- New net income before taxes

EB = EBT* – TX

EB = 556.557 – 222.622

EB= 333.936 million RSD

GMR* = GM / (NT*) *100

GMR* = 2,781.000 / 17,145.346 *100

GMR* = 16.2%

NPM*= (EBT*)/(NT*) *100

NPM*= 556.557 / 17,145.346 *100

NPM*= 3.2%

NT*- New net turnover

NPM*- New net profit margin

The projected impact of the new sub-category on retailer's profitability is significant. When introducing new products from the private brand group into the assortment of company "A", the gross margin rate increases from 15.96% to 16.2% annually. On the other hand, the net profit margin grew from 1.9% to 3.2% annually. Critical sources of this profit increase are marketing cost savings since there is no need to invest in branding, trade marketing, and similar expenses, which are non-avoidable when the manufacturer brand is in question. From the above, the conclusion is that overall profitability of retail company "A" has changed from 287 million RSD to 333.936 million RSD due to the introduction of products from the private label category ("Private label"). However, the critical question is how to optimize the assortment of the new sub-category of "PL" products, and linear programming is proposed as the tool to solve it.

4. A model for maximizing profit through linear programming

In a series of annual financial reports of leading retail chains from the territory of the Republic of Serbia, the possibility of achieving a larger volume of net turnover (NT) and improving the profitability of the sales facilities is shown. As a strategy to increase gross margins (GM) and net profit margins (NPM), retail companies are redefining their product range and marketing various products under their brand name (Krasnov et al., 2017). By entering contractual relations with small producers and starting their production facilities, the retailers above ensure the production of a sufficient number of products they market under their name. Therefore, the retail company "A" starts its production of dairy products in three different plants.

The primary goal of this paper is to indicate the optimal solution in terms of the production of products with a private trademark ("Private label"), i.e. to indicate which items the company can produce on a larger scale to realize the maximization of business profits (Klamroth et al., 2015). Based on the realized net profit after paying tax (556.557 million RSD) and the individual prices of dairy products from the private label category of the retail company "A," the realized profit per product unit was calculated (Milić et al., 2019). Based on Table 3, it can be seen that the product "Mozzarella A plus" (Private label 7), with thirty-six (36) units per product, provides the highest profit per unit, followed by the item "Kajmak A plus" (Private label 3) with thirty-two (32) units per product. At the same time, the lowest value of profit per product unit is achieved by the product "Sour cream A plus" (Private label 5), with

eight (8) units per product, followed by the item "Fruit yoghurt A plus" (Private label 8).

Table 3 Calculation of profit per product unit

PL products	Private trademark name	Profits per unit of product
PL1	"Yogurt A plus"	27
PL2	"Cheese spread A plus"	21
PL3	"Kajmak A plus"	32
PL4	"Milk A plus" (UHT)	30
PL5	"Sour cream A plus"	8
PL6	"White cheese A plus"	47
PL7	"Mozzarella A plus"	36
PL8	"Fruit yogurt A plus"	18

Source: the authors´ calculation

A different production capacity is needed, which is expressed in the production time, and the calculation is presented in the following table:

Table 4 Overview of production capacities for one year

	"PL"	"PL"	"PL"	"PL"	"PL"	"PL"	"PL"	"Pl8"	(A period of one year)
P1	0.5h	0.5h	0.5h	0.3h	0.5h	1.2h	0.9h	1.4h	g≤ 46080 h
P2	0.3h	0.7h	0.8h	0.2h	0.4h	1.4h	0.8h	1.8h	g≤ 69120 h
P3	0.4h	0.6h	0.7h	0.5h	0.7h	1.5h	1.2h	2h	g≤57600 h
Pf	27	21	32	30	8	47	36	18	

Source: the authors' calculation

The company is introducing production plants with limited capacities to introduce the "PL" trademark from the dairy products category. The value of the variables in the model provides the optimal objective function, subject to the constraint conditions. Since the equations have fewer constraints than the number of variables, with the presence of non-negativity variables, the assortment is optimized using linear programming methods. Based on these preconditions, a linear programming model was developed to find the optimal solution for the size of "Private label" product production. The results are presented in three tables.

Table 5 Output from program number 1: Linear programming model of retail company A

(untitled) Solution

	PL 11	PL 12	PL 13	**PL14**	PL 15	PL 16	PL 17	PL 18
Maximize	27	21	32	**30**	8	47	36	18
Plant 1	0.5	0.5	0.5	**0.3**	0.5	1.2	0.9	1.4
Plant 2	0	0	0	**0**	0	0	0	0
Plant 3	0	0	0	**0**	0	0	0	0
Solution	0	0	0	**153600**	0	0	0	0

Source: the authors' calculation

Table 6 Output from program number 2: Linear programming model of retail company A

(untitled) Solution

	PL 21	PL 22	PL 23	**PL24**	PL 25	PL 26	PL 27	PL 28
Maximize	27	21	32	**30**	8	47	36	18
plant 1	0	0	0	**0**	0	0	0	0
plant 2	0.3	0.7	0.8	**0.2**	0.4	1.4	1.4	0.8
plant 3	0	0	0	**0**	0	0	0	0
Solution	0	0	0	**345600**	0	0	0	0

Source: the authors' calculation

Table 7 Output from program number 3: Linear programming model of retail company A

(untitled) Solution

	PL31	PL32	PL33	PL34	PL35	PL36	PL37	PL38
Maximize	27	21	32	30	8	47	36	18
Plant 1	**0**	0	0	0	0	0	0	0
Plant 2	**0**	0	0	0	0	0	0	0
Plant 3	**0.4**	0.6	0.7	0.5	0.7	1.5	1.2	2
Solution	**144000**	0	0	0	0	0	0	0

Source: the authors' calculation

Using the "QM for Windows v5" program, the solution to the linear programming problem was achieved. The growth of the company's profit due to introducing a private trademark amounted to 18,864.600 million RSD.

The optimal solution is achieved when introducing the product PL_{14} ("Milk A plus") with 153.600, PL_{24} ("Milk UHT A plus") with 345.600, and product PL_{31} ("Yogurt A plus") with 144.000 units.

Table 8 Output from program number 4: Linear programming model of retail company A

Variable	PL11	PL12	PL13	**PL14**
Status	NonBas	NonBas	NonBas	**Basic**
Value	0	0	0	**153600**

Variable	PL21	PL22	PL23	**PL24**
Status	NonBas	NonBas	NonBas	**Basic**
Value	0	0	0	**345600**

Variable	**PL31**	PL32	PL33	PL34
Status	**Basic**	NonBas	NonBas	NonBas
Value	**144000**	0	0	0

Source: the authors' calculation

5. Discussion and implications

Developing one's own label implies the strategic introduction of various products within the sales range (Muruganantham & Priyadharshini, 2017). Private-label products find their place on the shelves of all major retail companies. Introducing "PL" into the daily business model requires systematicity and a time lag so consumers can become better acquainted with the new brand and develop purchasing habits for the given items (Walsh & Mitchell, 2010). For this reason, our research involves the initial phase of creating a private-label product program by introducing three items ($PL_{14}, PL_{24}, PL_{31}$) within the available range of dairy products in an observed retail company. The decisive motive for the gradual introduction of products with their trademarks refers to attracting consumers' attention and checking the satisfaction achieved after the first consumption of the product.

The values of additional variables of the set model suggest full capacity utilization in the company's three production facilities (Mandal, 2021). In all production parts of the company, there is a zero value of additional variables, indicating the absence of excess working hours concerning maximum capacity utilization (Carter, et al., 2018).

Thus, the results of linear programming verify the hypothesis that the introduction of additional workers in the mentioned plants is positively correlated with the change in the level of profitability of the given company (Klamroth et al., 2015). From all of the above, it is necessary to send a proposal to the managers of all company's plants to hire an additional number of workers in order to increase business performance and improve the current business model. When analyzing the degree of increase in profit observed by individual plants, it is concluded that the most significant growth (150 units) is ensured by increased capacity within plant number 2.

Analyzing the set business model of the retail company, we observe the best combination of "Private Label" products PL_{14}, PL_{24} and PL_{31}, and obtain an optimal solution through linear programming methods. In that case, the observed retail chain achieves profit maximization of 18,864.000 million RSD. The recommendation addressed to the managers of company "A" would be to start the production of the product PL_{14} (plant number 1), product PL_{24} (plant number 2), and product PL_{31} (plant number 3) in the previously established quantities to achieve the optimal solution (Dächert et al., 2017). It is the point at which the company achieves the highest possible business result. By analyzing the values of additional variables in this model, we conclude that all three plants have variables with a value of zero. It was confirmed that working hours are fully utilized in all three production plants.

As a result of analyzing existing and additional variables in the company's business models, a series of conclusions can be drawn about hiring more workers in order to improve business further. The additional variable within Plant 1 equals zero, which implies full labor employment within the plant. Hiring an additional worker in Plant 1 would increase profitability by 100 profit units. In the second plant, the "dual variable" value is 150 units.

The research suggests that hiring one additional working hour results in an increase in profit by 150 units. In the third plant, we have space to increase working hours and hire an additional workforce. The value of the "dual variable" of 67.5 refers to an increase in the number of working hours by 1 unit, which leads to a rise in the profit level of the company "A" by 67.5 monetary units. In such a case, the recommendation to the company "A" managers would be to hire more workers in all three production plants, i.e. to increase available working capacities. However, without the former calculation, this kind of capacity increase would be risky and without the now available prioritization.

Conclusion

The concluding considerations of this paper refer to the confirmation of the hypothesis that the use of “PL” in the business models of leading retail companies contributes to achieving a higher level of overall profitability of their outlets (Olbrich et al., 2016). In this regard, we conclude that most retail companies develop their brands, which are an integral part of their successful assortment at their sales outlets. The prices of such items are 30-40% lower than other brands of leading companies that mainly perform manufacturing activities (Steenkamp et al., 2010). Due to a more favorable price, less investment in promotional activities, and lower costs of own-brand product components, an increase in the level of profitability of companies from the retail industry is achieved (Meza & Sudhir, 2010). When reviewing the critical motives for introducing” PL” products, more of them were identified, leading retailers to include them in the daily offer of their sales shelves (Ter Braak et al., 2014).

The introduction of own-branded products ("private label") contributes to a double-digit percentage growth of the achieved net turnover,

which directly improves the operations of the observed retail company. After calculating the essential profitability items of prominent trading companies, the method of calculating the break-even point is additionally presented. The breaking point of 10,917.782 million RSD constitutes the lower limit of the required net turnover, with a gross margin rate of 15.96% and a net profit margin rate of 1.9%. The procedure for introducing a private brand into the assortment was carried out within the "dairy products" category. Due to the determination of the profit rate per product unit, the start of production was ensured within three different production facilities.

Based on the result of linear programming, an optimal business model was obtained in this category of dairy products. The introduction of products PL_{14} ("Milk A Plus"), PL_{24} ("Milk UHT A Plus,"), and PL_{31} ("Yogurt A Plus") represents the starting point of the launch of the private label ("private label") products in this retail company. The importance of the private trademark in the company's strategic positioning on the market was pointed out.

By carrying out the empirical part of this research, it was shown that with the introduction of the three "private label" products, the company increased the realized profit by 18,864.000 million RSD. By comparing the company's business model before and after the introduction of products with its label, a conclusion was reached about the interdependence between using a private trademark and the growth of overall profitability.

Calculation of profitability after the introduction of the "private label product" shows that the gross margin rate (GMR) increased from 15.96% to 16.2%. The net profit rate (NPM) grew from 1.9% to 3.2%. In absolute terms, the realized net turnover (NT) increased from 15,308.345 million RSD to 17,145.346 million RSD. When the net profit after tax is calculated, the increase in profit through the redefinition of the product assortment is noticeable. We conclude that the company's total profitability has changed from 287 million RSD to 333.936 million RSD. Carrying out the calculation of the obtained results, we detect an increase in earnings of 46.936 million RSD in one business year. When introducing products with a private trademark within the range of the given company, the company would make a profit of 18,864.000 million RSD.

By simple calculation, the company would achieve a share of "private label" products of 40% from the total growth of profit after the expansion of the available assortment. Considering all this, the initial hypothesis that introducing a private trademark improves the overall profit level is verified. Furthermore, the overall business performance of leading companies in the retail industry is improved based on enhanced position in the vertical supply chain (Rueda et al., 2017).

The limitations of this research stem from the use of a case study approach, which limits the scope of the analysis. An additional limitation is that the research was conducted in one market, and the general validity of the conclusions should be tested in other geographic areas and markets of different product categories. In future research, this type of analysis should be conducted on a more significant number of companies to generalize the proposed conclusion.

Future research should certainly involve observations at multiple time points to examine the temporal relevance of the proposed conclusions.

Declarations

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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