



Analytics Bayer

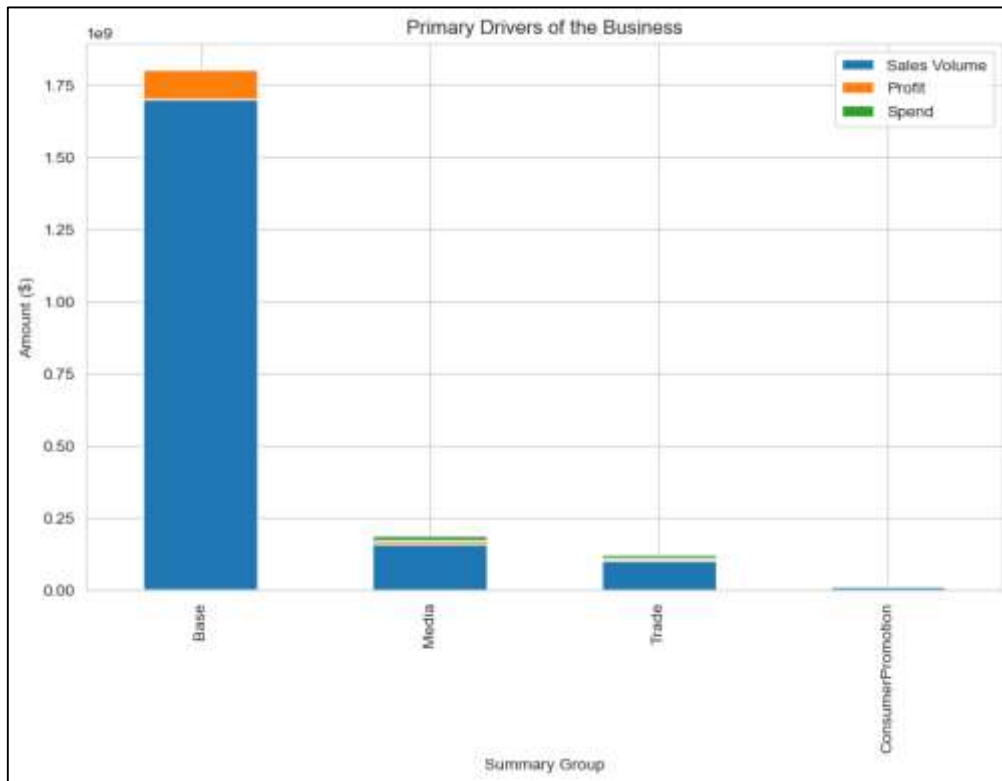
-Yash Ashish Parte (NJIT, MS Data Science)



Ask

- What are the Primary Drivers of Bayer?
- How is cost benefit analysis for different tactics?
- What help the business grow or decline recently?
- How is the Sales funnel improving month-wise?
- Are there any quarterly trends on how different Tactics improve?
- How are summary groups performing in terms of Profit, Spend, and Sales Volumes?

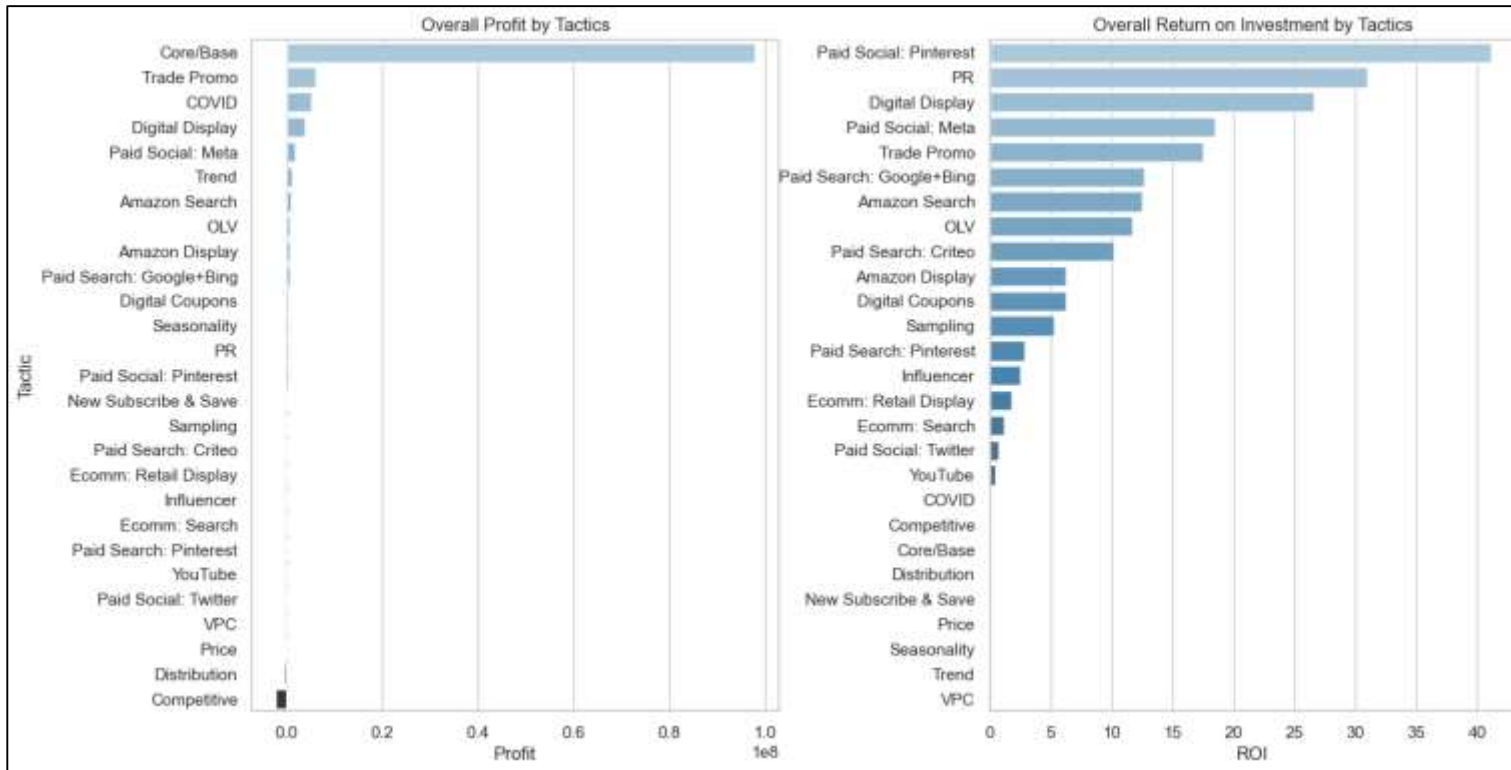
Primary Drivers of the Bayer



- Core/Base tactic plays major role in Base group
- Three surprising trends,
 1. Trade Promo in Trade group
 2. Covid tactic in Base group
 3. 3 of the Base group tactics makes loss with VPC being the last actual Profit-making tactic
- Among the top 10 Profit generating tactics, 6 of them were from Media Group

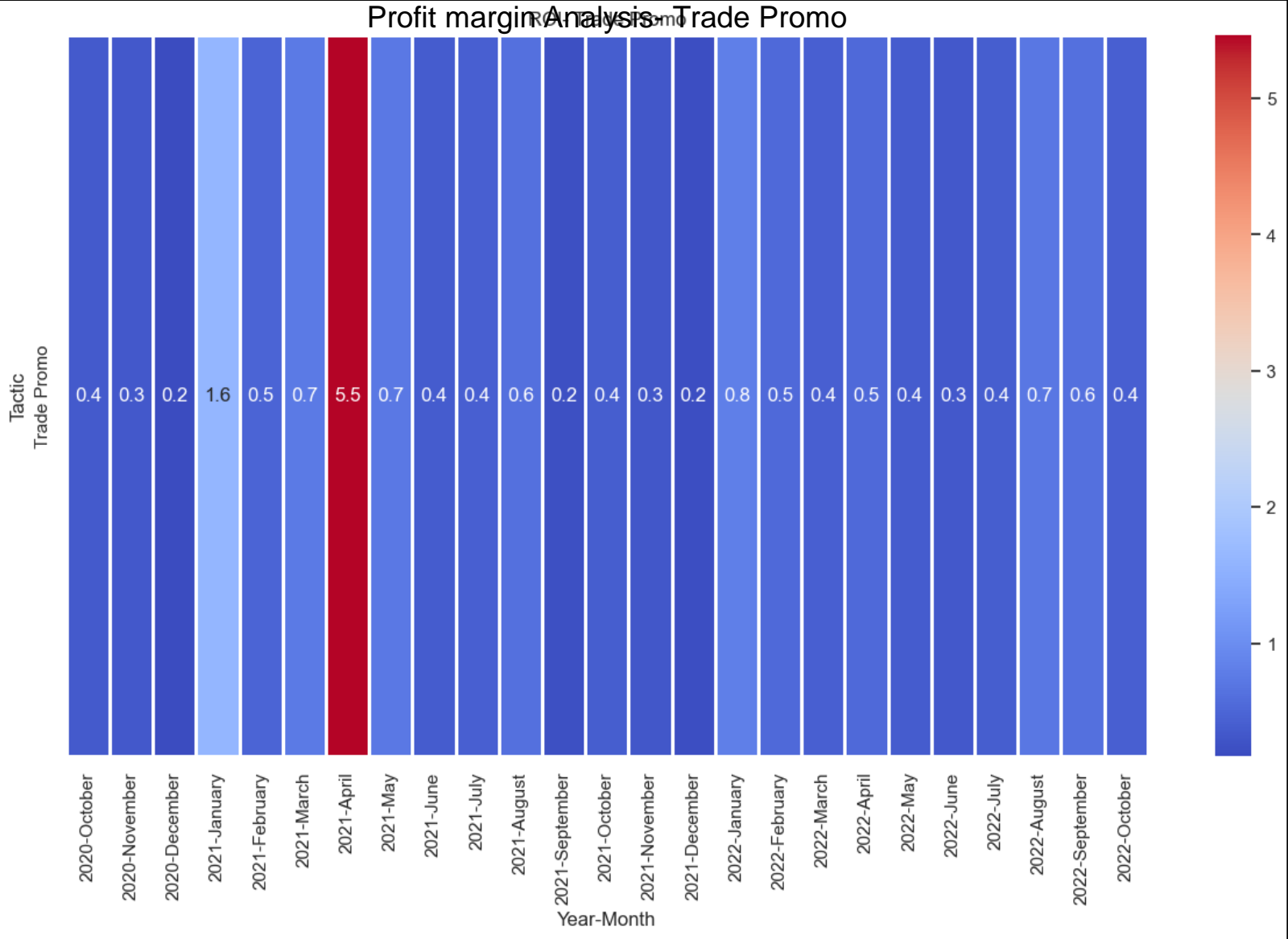
Cost Benefit Analysis

Overall Profit Analysis



Profit Margin Analysis

- Paid Social: Pinterest was the tactic with highest ROI.
- From October 2020 to September 2022, this tactic had an ROI between 0.0 to 0.7, except October 2022 (31.4)

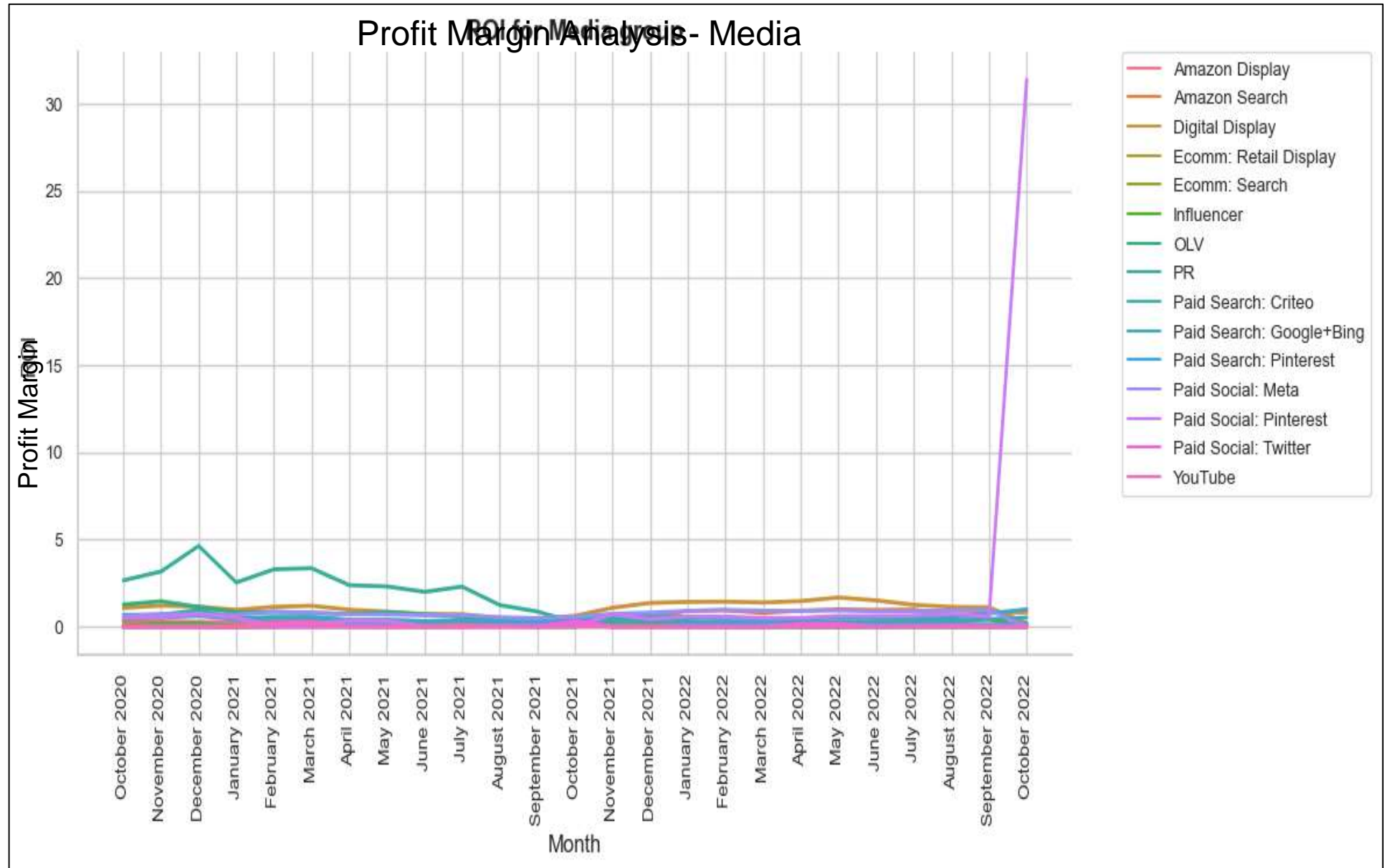


Highest ROIs and in what month?

- Tactics with top 10 ROIs were dominated by Media Group, with 9 out of 10 spots
- Trade Promo from Trade Group had the 5th highest ROI in all of tactics
- Heatmaps in the next slide gives an idea of tactics performance for all the months and years

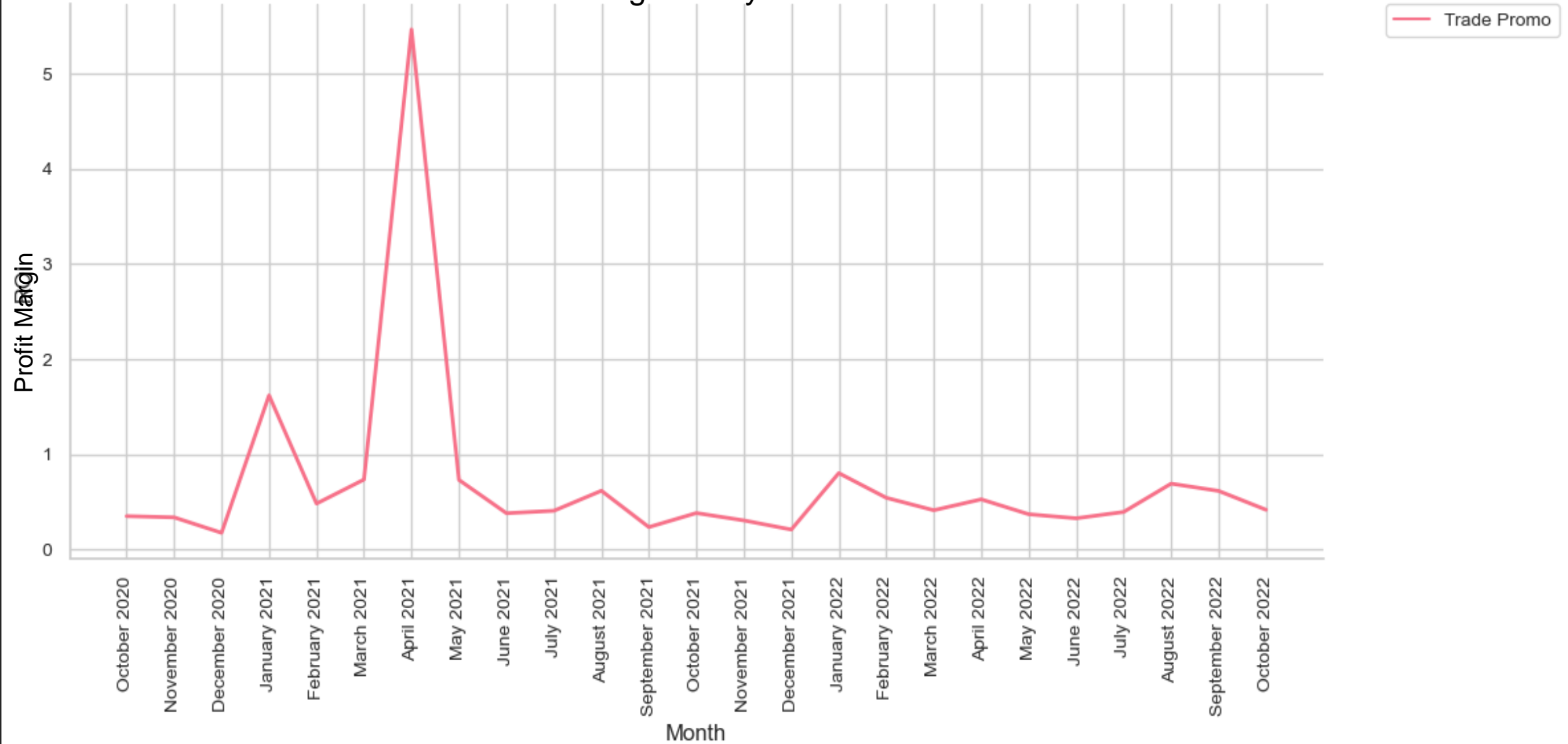
- More Spend and Less ROI is a Tactic with major concern, Trade Promo has the highest Spend, but the ROI is near 75th percentile of the values of ROI for Tactics, whereas the maximum ROI is 41.15
- Using the Statistical approach, the Spend for Trade Promo is the max amount.

Channel Analysis- Media



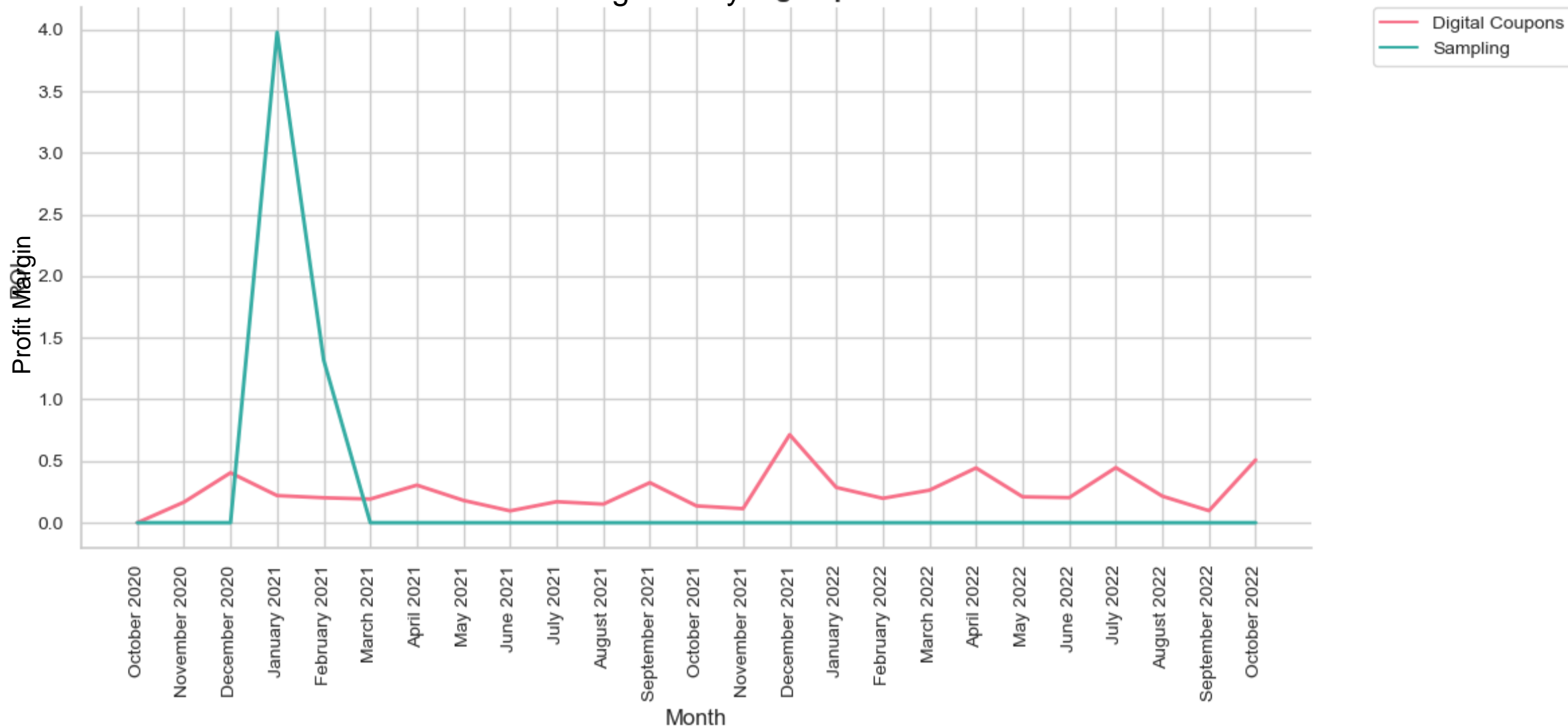
Channel Analysis- Trade

Profit Margin Analysis Trade



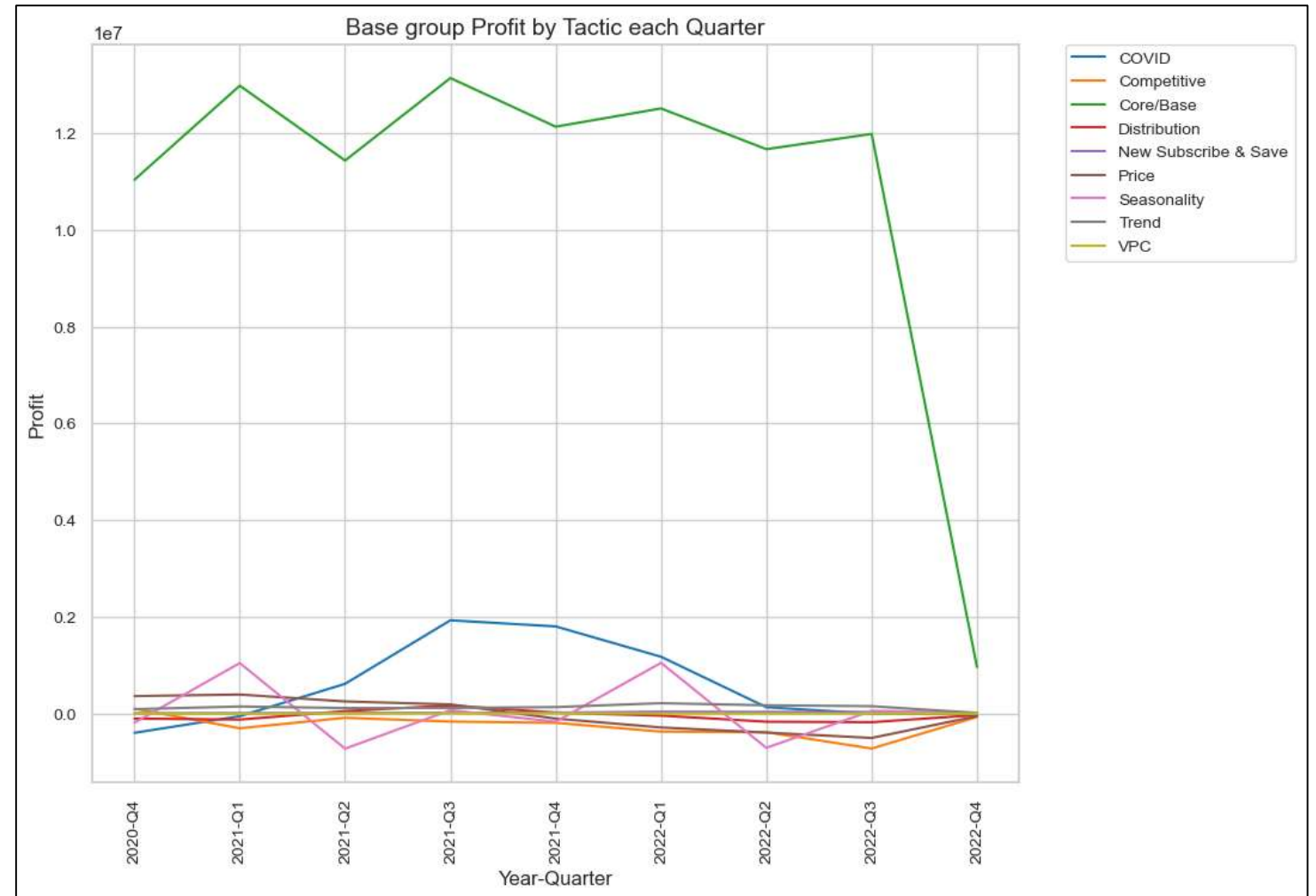
Channel Analysis- Consumer Promotion

Profit Margin Analysis for Consumer Promotion



Quarterly Analysis Profit-Base

- Core/Base tops the Quarterly Profits in Base Group
- In Media group Digital display is the highest profit-making tactic in majority of quarters

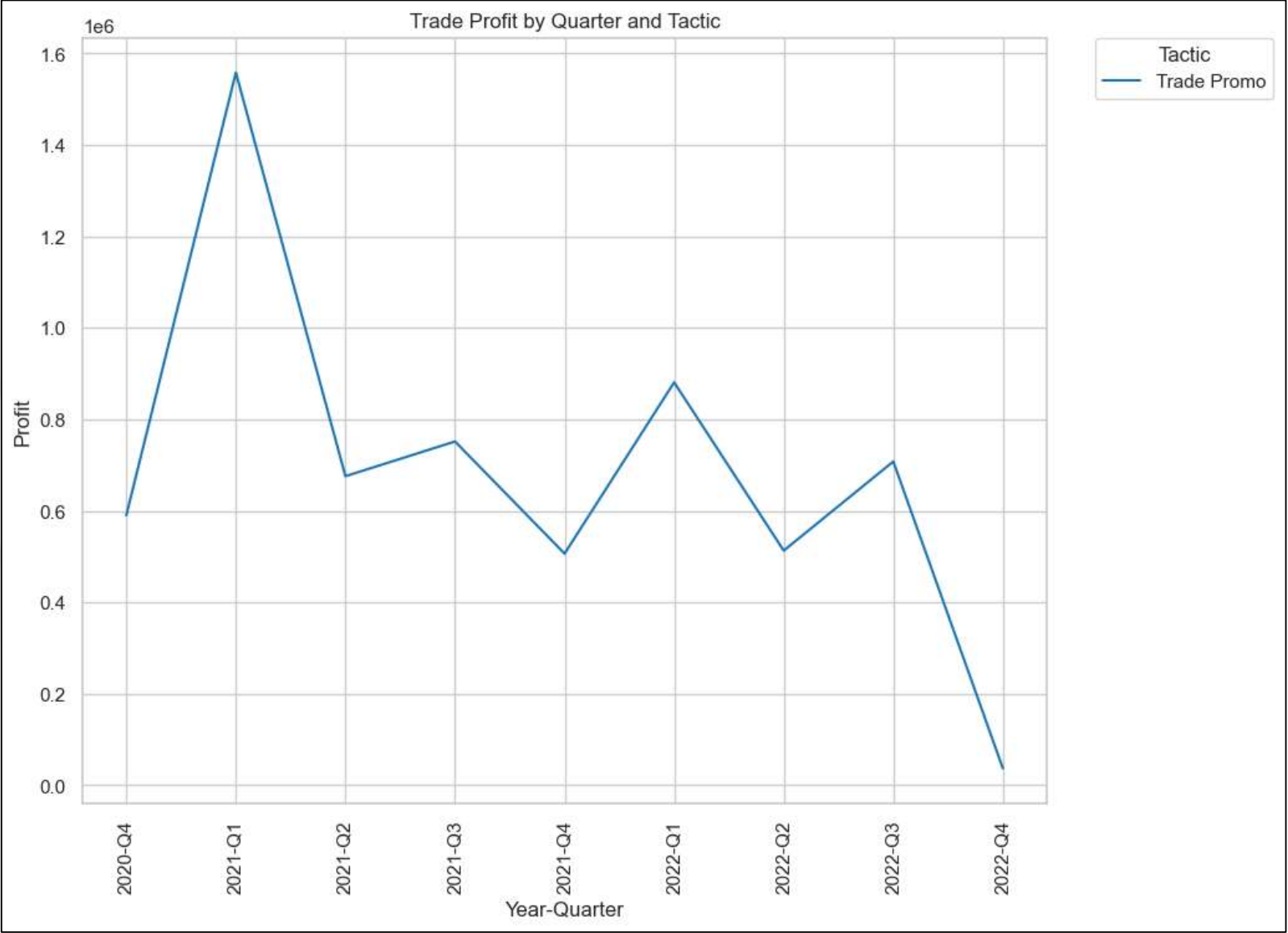


The chart displays the profit generated by various marketing tactics over a three-year period. The Y-axis represents profit, ranging from 0 to 800,000. The X-axis represents the year and quarter, from 2020-Q4 to 2022-Q4. The legend identifies 15 different tactics, each represented by a unique line style and color. Digital Display (green dotted line) is the most profitable tactic, peaking at over 700,000 in 2022-Q2. Amazon Search (orange dashed line) is the second most profitable, peaking at around 450,000 in 2022-Q1. Other tactics like Influencer (black dash-dot line) and PR (black dashed line) show significant peaks in 2021-Q3. Most tactics show a decline in profit towards the end of the period, particularly in 2022-Q4.

| Year-Quarter | Digital Display | Amazon Search | Influencer | PR | Amazon Display |
|--------------|-----------------|---------------|------------|--------|----------------|
| 2020-Q4 | 780,000 | 120,000 | 10,000 | 10,000 | 50,000 |
| 2021-Q1 | 680,000 | 200,000 | 10,000 | 10,000 | 120,000 |
| 2021-Q2 | 620,000 | 360,000 | 10,000 | 10,000 | 110,000 |
| 2021-Q3 | 130,000 | 140,000 | 360,000 | 10,000 | 80,000 |
| 2021-Q4 | 220,000 | 80,000 | 10,000 | 10,000 | 180,000 |
| 2022-Q1 | 600,000 | 450,000 | 10,000 | 10,000 | 50,000 |
| 2022-Q2 | 710,000 | 270,000 | 10,000 | 10,000 | 30,000 |
| 2022-Q3 | 200,000 | 160,000 | 10,000 | 10,000 | 20,000 |
| 2022-Q4 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |

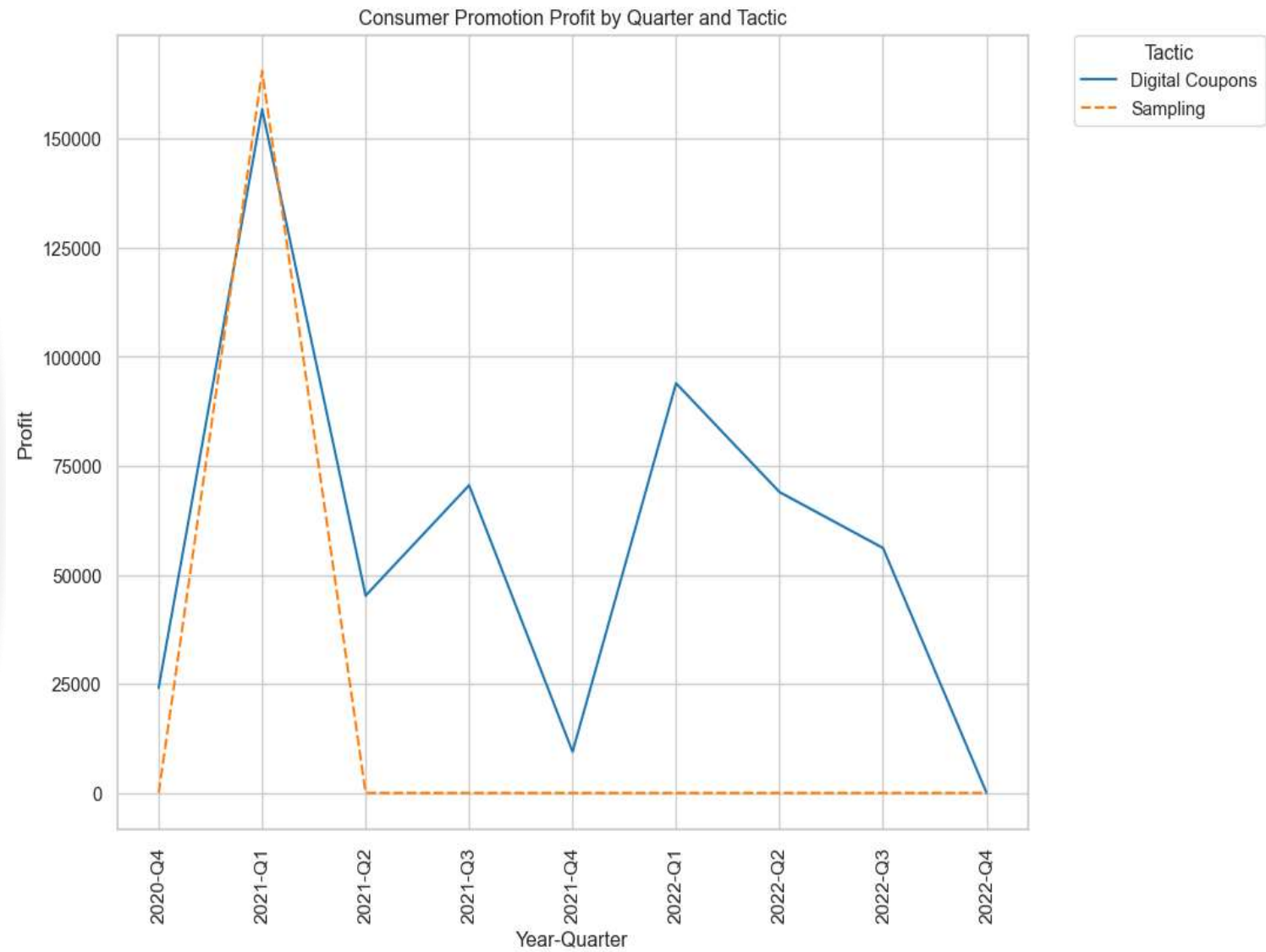
Quarterly Analysis

Profit-Trade

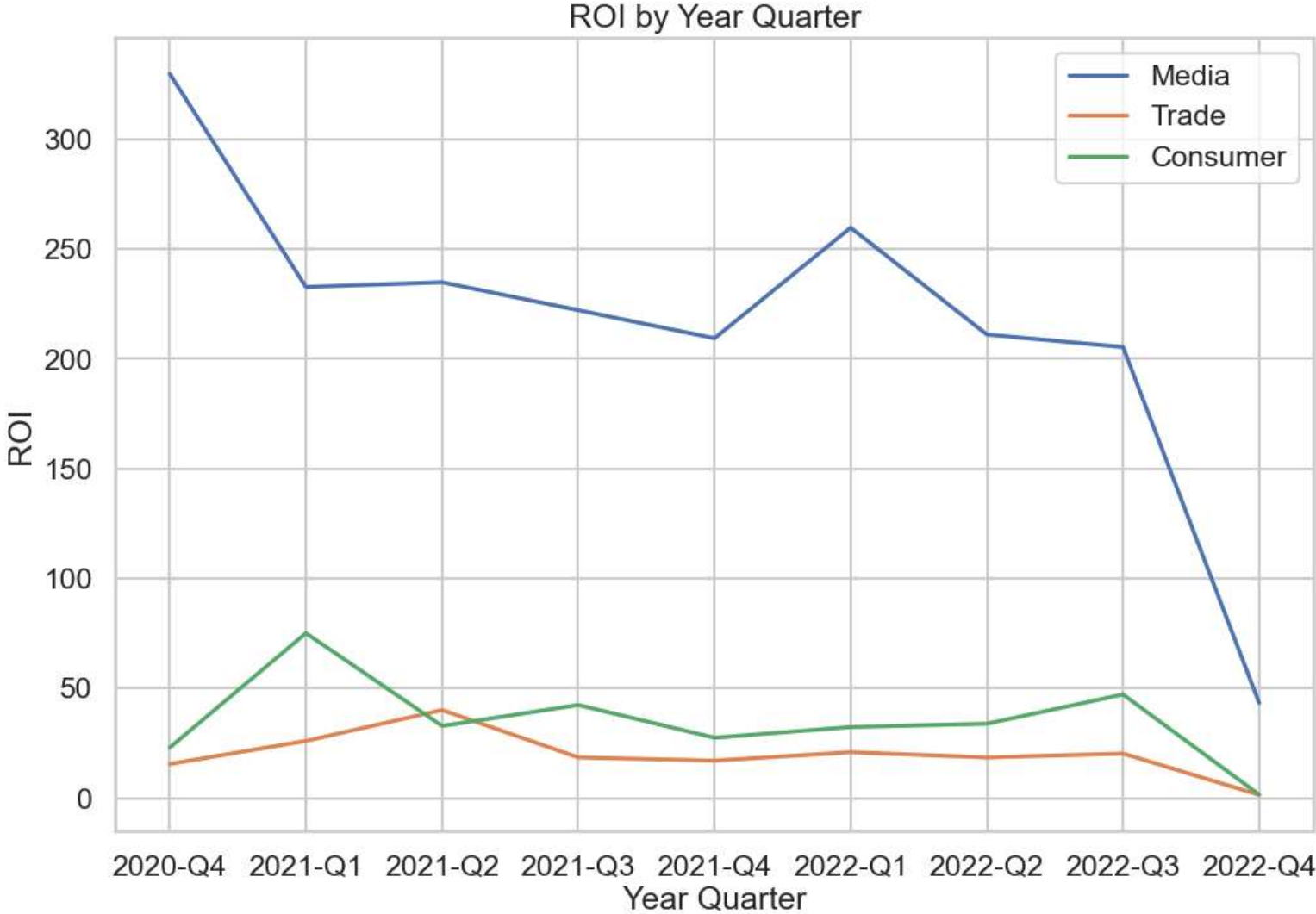


Quarterly Analysis

Profit- Consumer Promotion



ROI Analysis



Quarter-wise highest Profit-making Tactic

| Year | Quarter | Tactic | Group |
|------|---------|-----------|-------|
| 2020 | Q-4 | Core/Base | Base |
| 2021 | Q-1 | Core/Base | Base |
| 2021 | Q-2 | Core/Base | Base |
| 2021 | Q-3 | Core/Base | Base |
| 2021 | Q-4 | Core/Base | Base |
| 2022 | Q-1 | Core/Base | Base |
| 2022 | Q-2 | Core/Base | Base |
| 2022 | Q-3 | Core/Base | Base |
| 2022 | Q-4 | Core/Base | Base |

Quarter-wise Media highest Profit-making Tactic

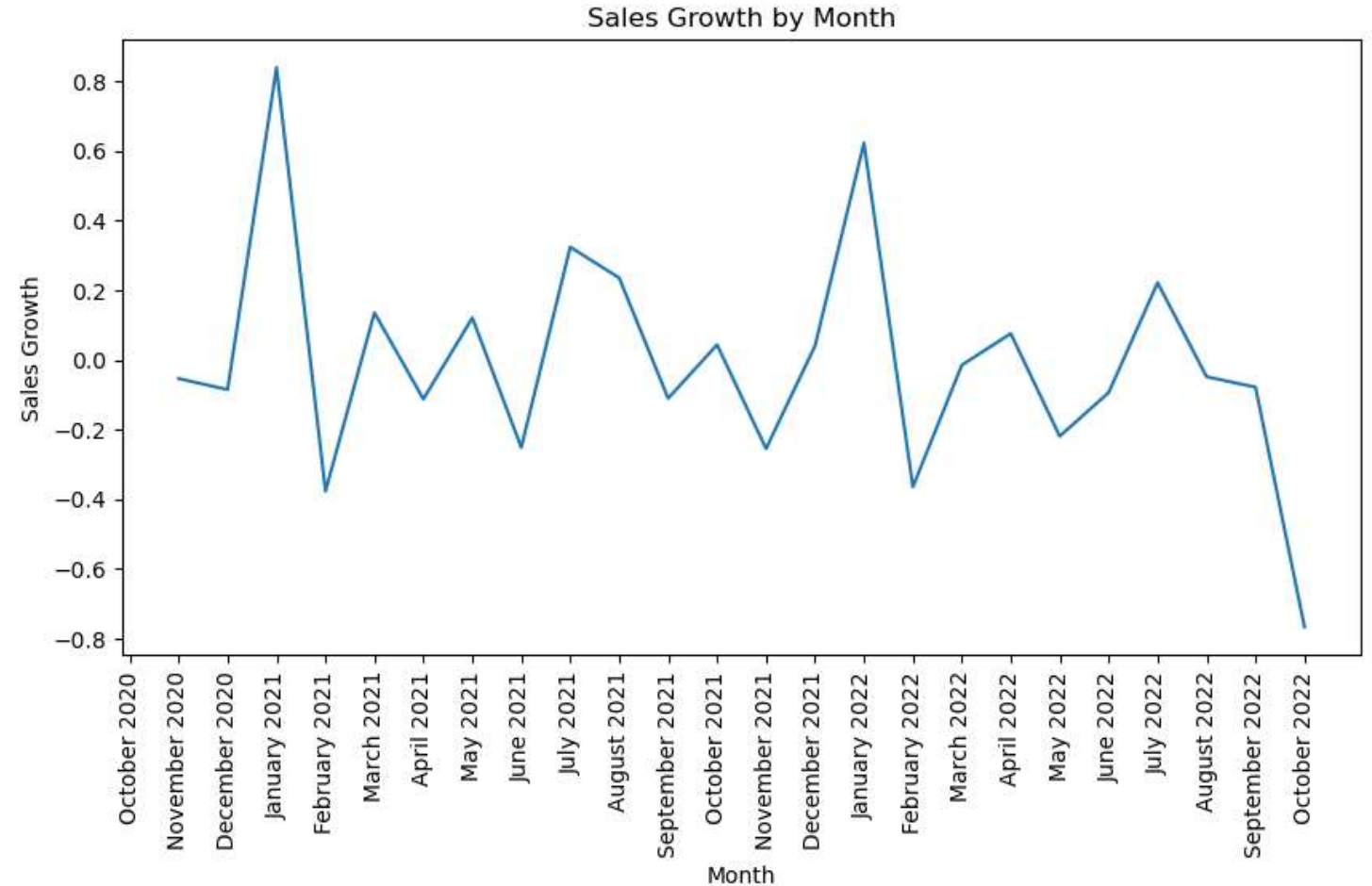
| Year | Quarter | Tactic |
|------|---------|-----------------|
| 2020 | Q-4 | Digital Display |
| 2021 | Q-1 | Digital Display |
| 2021 | Q-2 | Digital Display |
| 2021 | Q-3 | PR |
| 2021 | Q-4 | Digital Display |
| 2022 | Q-1 | Digital Display |
| 2022 | Q-2 | Digital Display |
| 2022 | Q-3 | Digital Display |
| 2022 | Q-4 | Amazon Search |

Quarter-wise Consumer Promotion highest Profit-making Tactic

| Year | Quarter | Tactic |
|------|---------|-----------------|
| 2020 | Q-4 | Digital Coupons |
| 2021 | Q-1 | Sampling |
| 2021 | Q-2 | Digital Coupons |
| 2021 | Q-3 | Digital Coupons |
| 2021 | Q-4 | Digital Coupons |
| 2022 | Q-1 | Digital Coupons |
| 2022 | Q-2 | Digital Coupons |
| 2022 | Q-3 | Digital Coupons |
| 2022 | Q-4 | Digital Coupons |

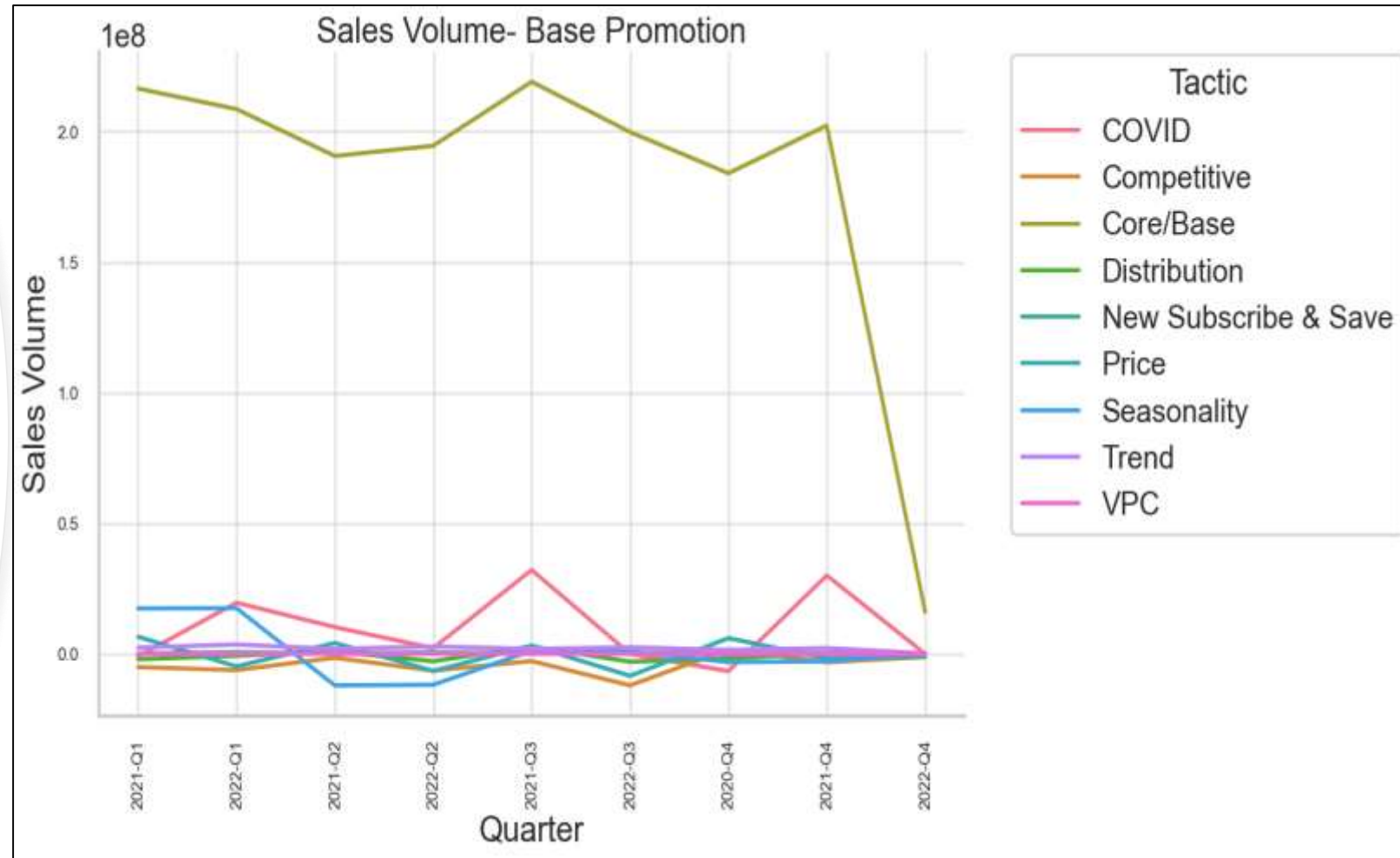
Sales Volume Analysis

- Sales growth shows the Bayer's historical Sales Volume periodic increase month-wise starting from October 2020
- Many factors influence the sales growth, e.g., COVID-19, with the decline of first wave, a rise in the sales growth has been seen at the last quarter of 2020, and as the second wave July 2021, a steep downwards slope till November 2021

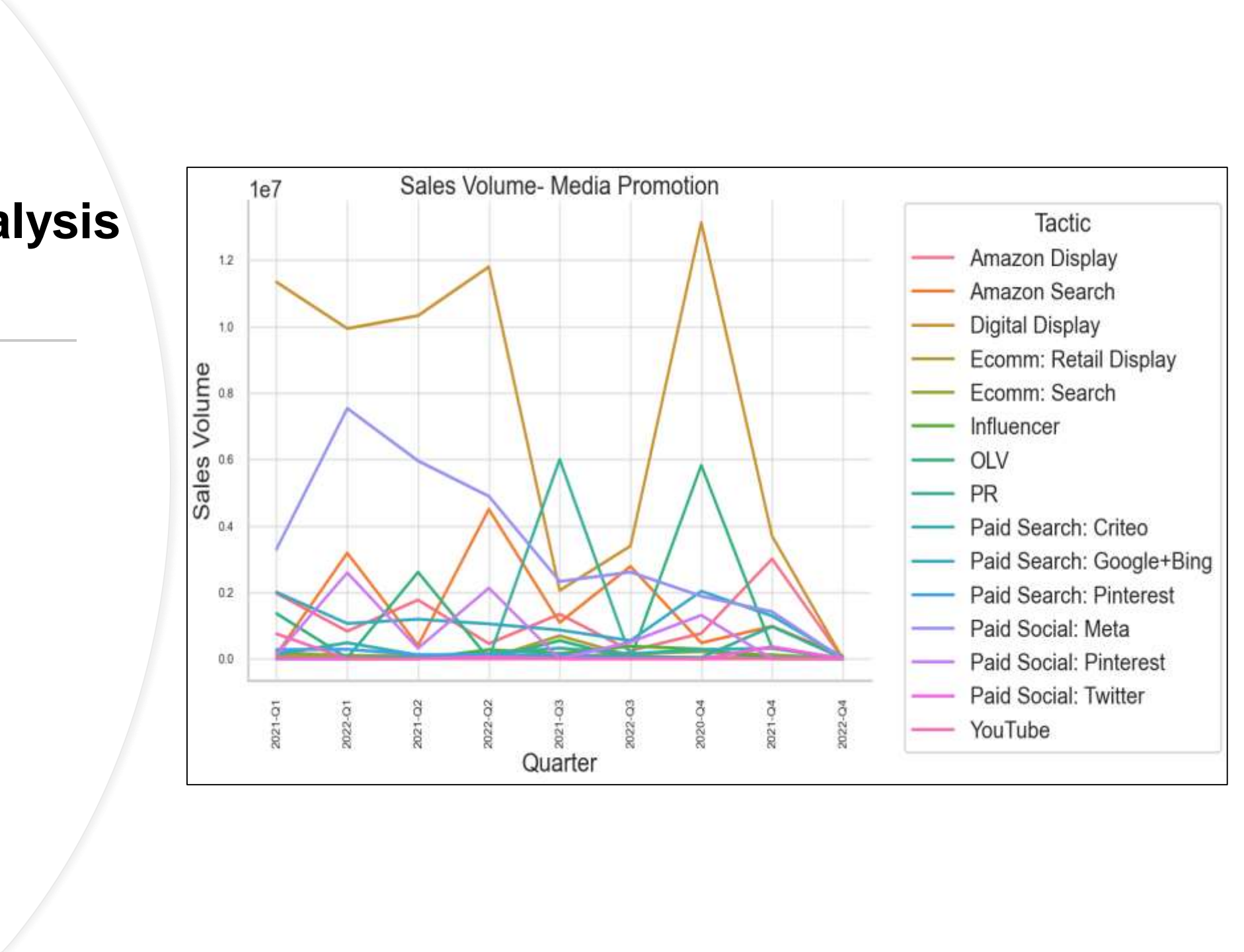


Sales Volume Analysis

Base



100



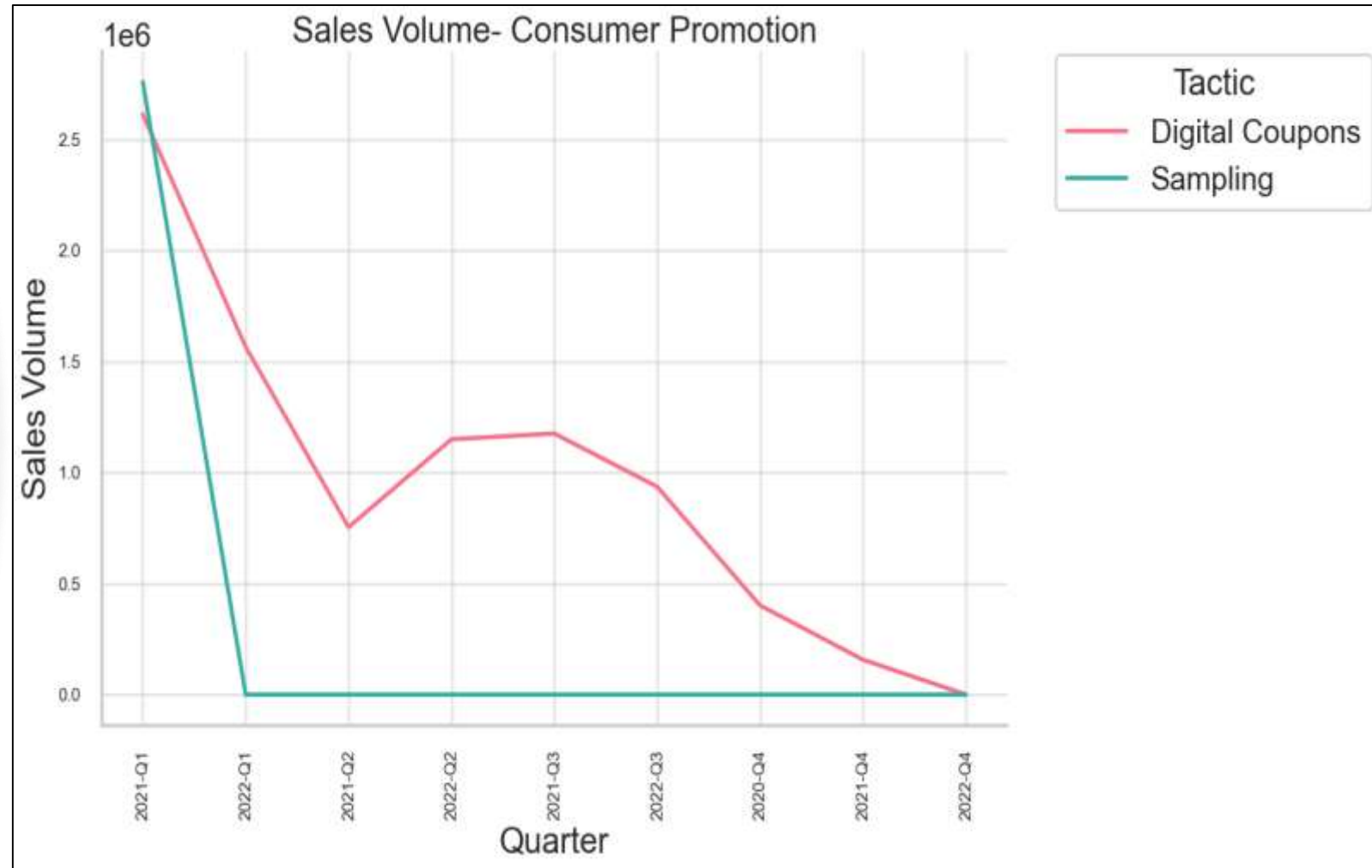
Sales Volume Analysis

Trade



Sales Volume Analysis

Consumer Promotion



Usability of Resources and low Profit

- For all the 4th Quarter of 2020 to the 3rd Quarter of 2022, Trade Promo tactic of Trade Group, despite giving the second highest profit overall, use the most expenditure, with most sales volume, generating the lowest profit. In the 4th Quarter of 2022, PR tactic of Media Group, replaces Trade Promo.
- The same trend follows for the high expenditure, low sales volume and low profit, with the same tactics.
- The exact same trend for all quarters follow for the high spend, high sales volume, and high profit

Majority of Media tactics have performed well on Profit and ROI scale, or have they?

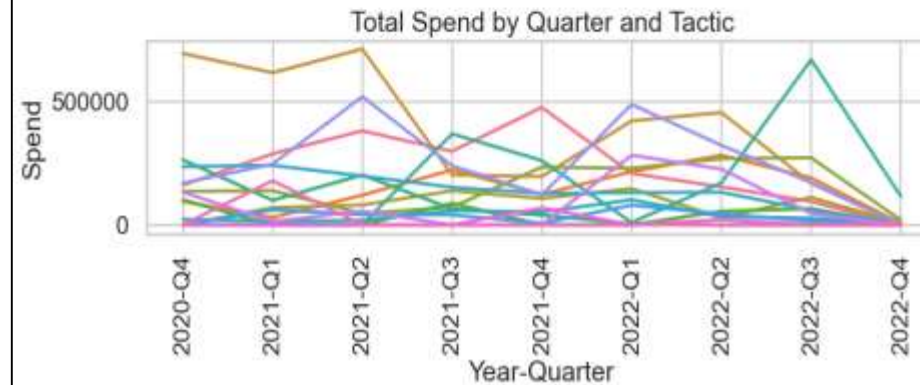
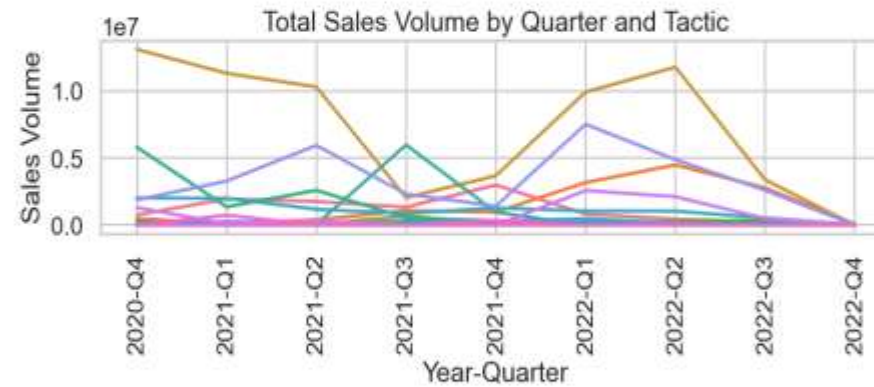
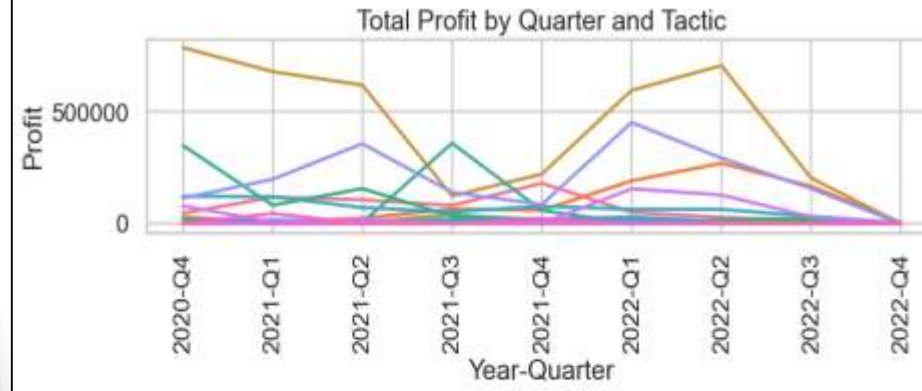
- We analyze this by understanding from the pair plot that higher Sales Volume, leads to higher Profit, and high Spending on campaigns, had a more linear relation to the Sales Volume.
- Let's see our Quarterly top tactics based on-
 1. High Spending, low Sales Volume
 2. High Spending, high Profit
 3. High Sales Volume, low Profit
 4. Low Sales Volume, high Profit
 5. Low Spending, high Profit

| Year | Quarter | High Spend, Low Sales | High Spend, High Profit | High Sales, Low Profit | Low Sales, High Profit | Low Spend, High Profit |
|------|---------|--------------------------|----------------------------|---------------------------|---------------------------|---------------------------|
| 2020 | Q4 | Digital Display | Digital Display | Digital Display | PR | PR |
| 2021 | Q1 | Digital Display | Digital Display | Digital Display | PR | PR |
| | Q2 | Digital Display | Digital Display | Digital Display | Ecomm: Search | PR |
| | Q3 | PR | PR | PR | PS: Pinterest | PS: Pinterest |
| | Q4 | Amazon Display | Amazon Display | Digital Display | PS: Pinterest | PS: Pinterest |
| 2022 | Q1 | PS: Meta | PS: Meta | Digital Display | PR | OLV |
| | Q2 | Digital Display | Digital Display | Digital Display | PR | Paid Social: Twitter |
| | Q3 | PR | PR | Digital Display | Paid Social: Twitter | Paid Social: Twitter |
| | Q4 | PR | PR | Amazon Search | Digital Display | Digital Display |

The figure consists of three vertically stacked line charts sharing a common x-axis representing time from 2020-Q4 to 2022-Q4. The y-axis for the top chart is Profit (scaled by 1e7), the middle chart is Sales Volume (scaled by 1e8), and the bottom chart is Spend. A legend on the right identifies eight tactics: COVID (red), Competitive (orange), Core/Base (yellow), Distribution (green), New Subscribe & Save (teal), Price (blue), Seasonality (light blue), and VPC (purple). The Core/Base tactic shows the highest values in both Profit and Sales Volume, while Spend is consistently near zero for all tactics.

| Year-Quarter | COVID | Competitive | Core/Base | Distribution | New Subscribe & Save | Price | Seasonality | Trend | VPC |
|--------------|-------|-------------|-----------|--------------|----------------------|-------|-------------|-------|------|
| 2020-Q4 | 0.05 | 0.05 | 1.1 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| 2021-Q1 | 0.1 | 0.1 | 1.3 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| 2021-Q2 | 0.05 | 0.05 | 1.1 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| 2021-Q3 | 0.2 | 0.2 | 1.3 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| 2021-Q4 | 0.15 | 0.15 | 1.2 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| 2022-Q1 | 0.1 | 0.1 | 1.2 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| 2022-Q2 | 0.05 | 0.05 | 1.1 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| 2022-Q3 | 0.05 | 0.05 | 1.1 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| 2022-Q4 | 0.05 | 0.05 | 0.1 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |

Tactic Performance Analysis- Media Group



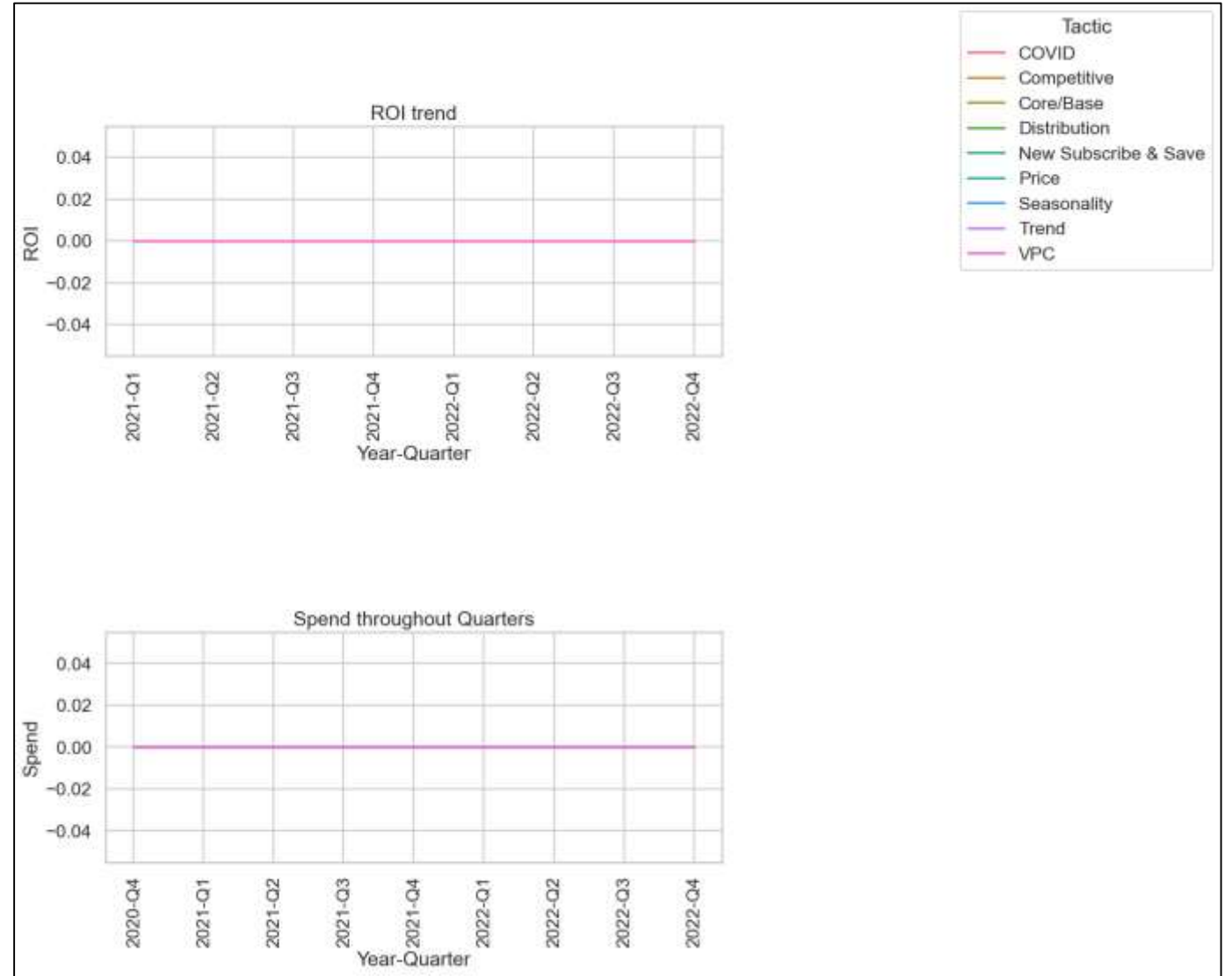
Tactic Performance Analysis- Trade



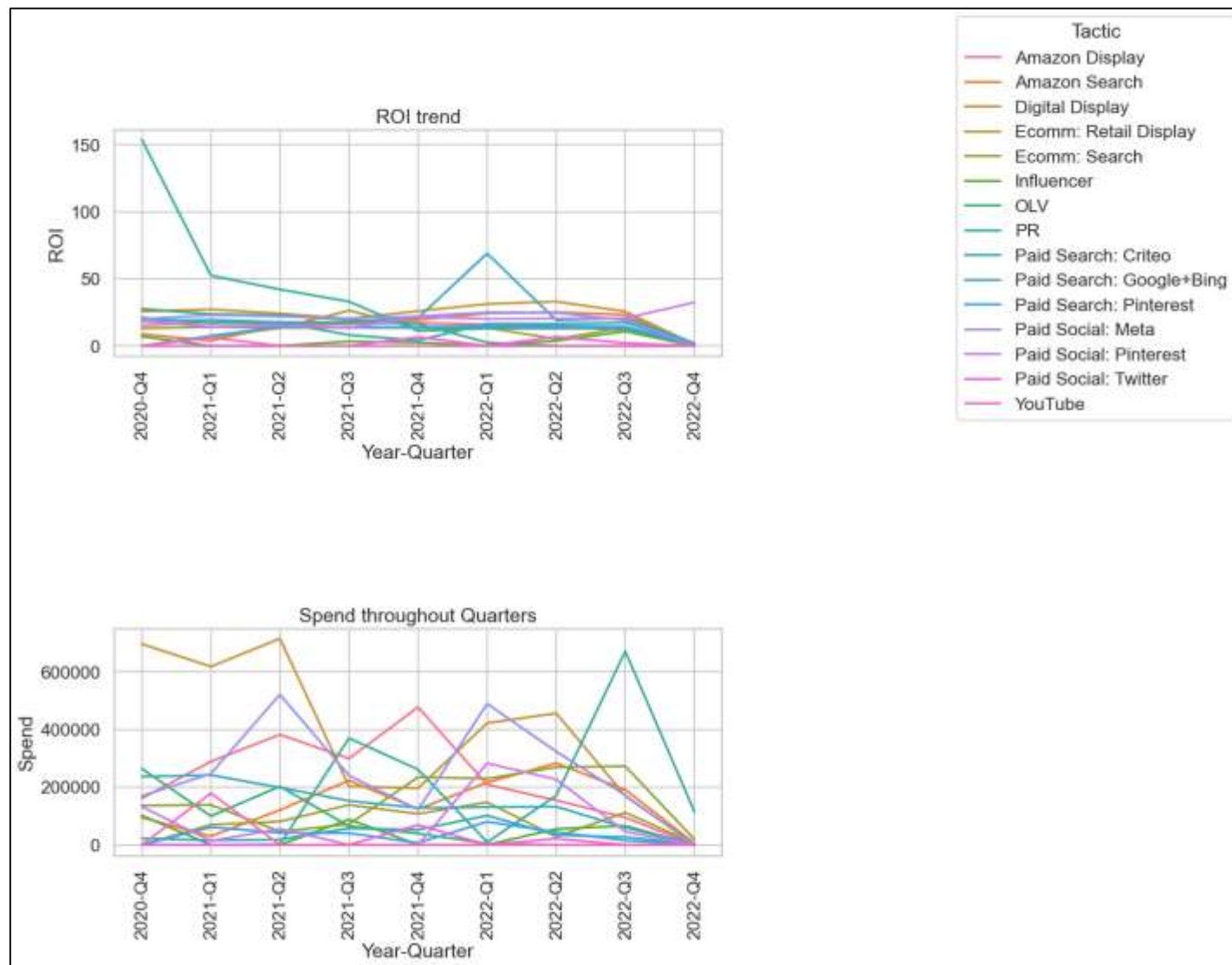
Tactic Performance Analysis- Consumer Promotion



Budget Allocation Analysis- Base



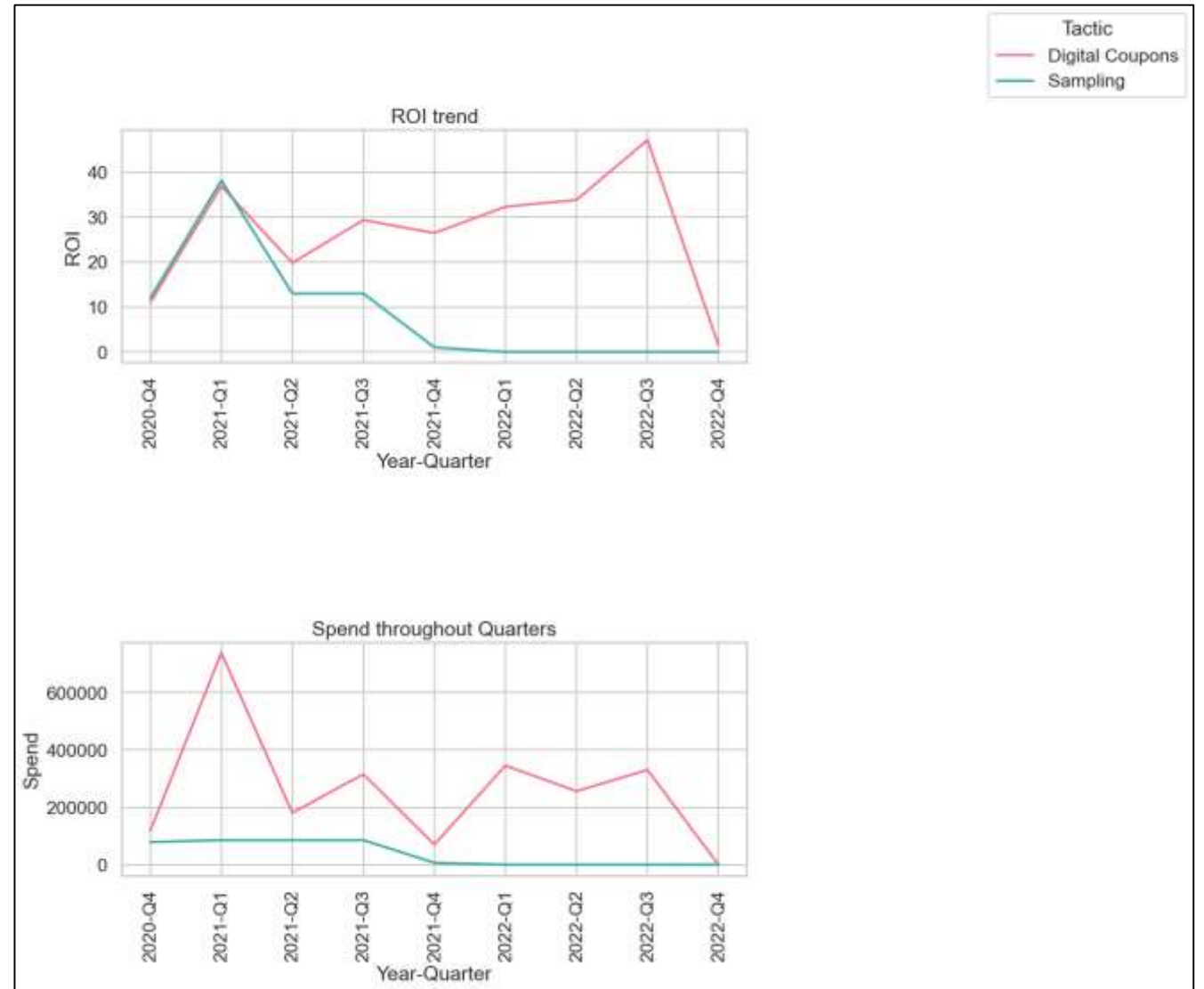
Budget Allocation Analysis- Media



Budget Allocation Analysis- Trade



Budget Allocation Analysis- Consumer Promotion

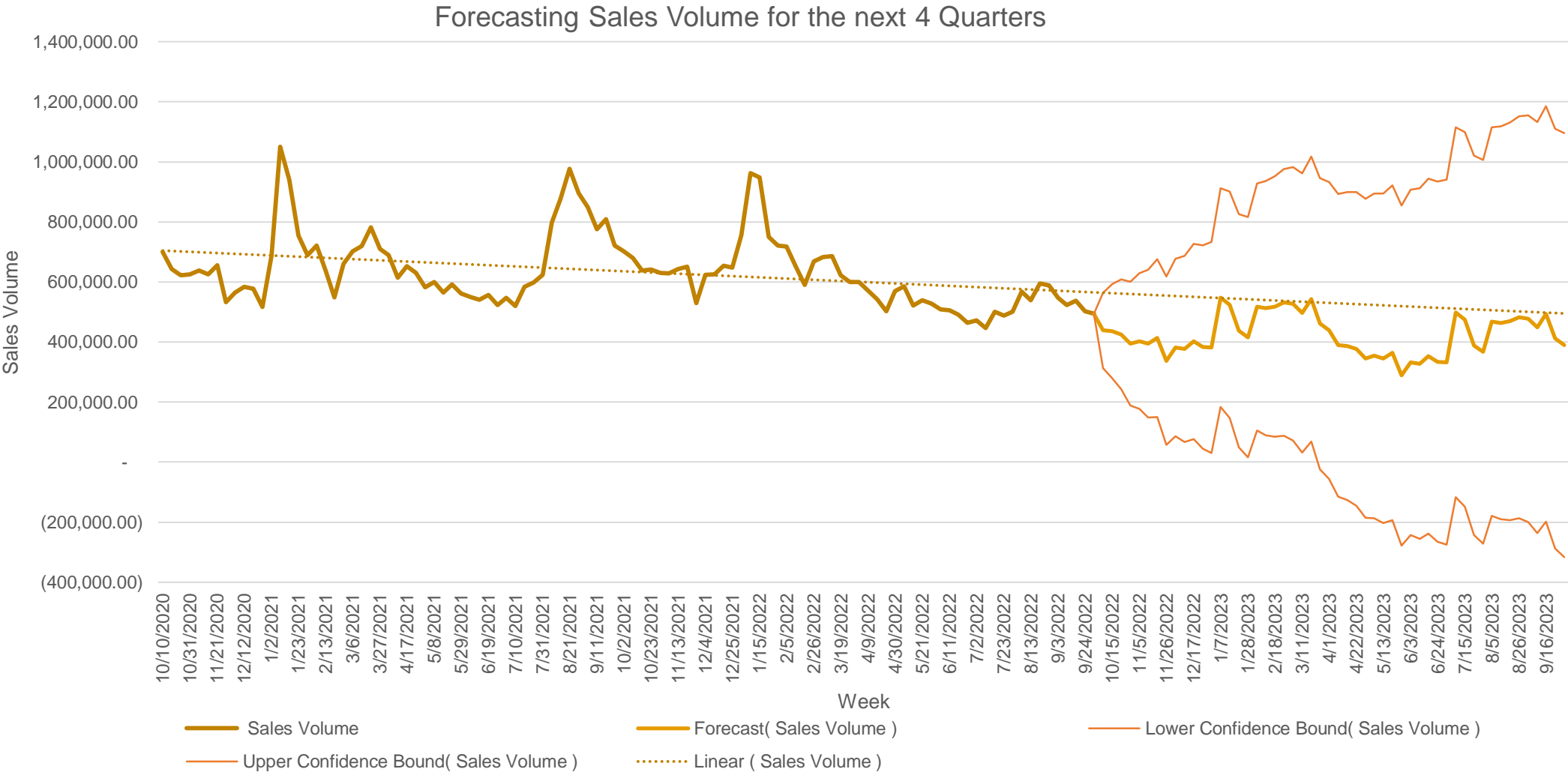


| Year | Quarter | Tactic | Spend | ROI | Year-Quarter | year | quarter | Tactic | Spend | ROI | Year-Quarter |
|------|---------|-----------------|---------------|-----------|--------------|------|---------|-------------|--------------|-----------|--------------|
| 2020 | 4 | Sampling | 78923.076924 | 12.000000 | 2020-Q4 | 2020 | 4 | Trade Promo | 2.215404e+06 | 15.471010 | 2020-Q4 |
| 2020 | 4 | Digital Coupons | 118411.123380 | 10.963537 | 2020-Q4 | | | | | | |
| 2021 | 1 | Sampling | 85500.000001 | 38.164872 | 2021-Q1 | 2021 | 1 | Trade Promo | 1.731692e+06 | 25.985764 | 2021-Q1 |
| 2021 | 1 | Digital Coupons | 738890.974363 | 36.887681 | 2021-Q1 | | | | | | |
| 2021 | 2 | Digital Coupons | 180822.263490 | 19.807815 | 2021-Q2 | 2021 | 2 | Trade Promo | 8.786200e+05 | 40.055911 | 2021-Q2 |
| 2021 | 2 | Sampling | 85500.000001 | 13.000000 | 2021-Q2 | | | | | | |
| 2021 | 3 | Digital Coupons | 315567.739812 | 29.348720 | 2021-Q3 | 2021 | 3 | Trade Promo | 1.997392e+06 | 18.461526 | 2021-Q3 |
| 2021 | 3 | Sampling | 85500.000001 | 13.000000 | 2021-Q3 | | | | | | |
| 2021 | 4 | Digital Coupons | 70092.013559 | 26.436051 | 2021-Q4 | 2021 | 4 | Trade Promo | 1.776534e+06 | 16.992757 | 2021-Q4 |
| 2021 | 4 | Sampling | 6576.923077 | 1.000000 | 2021-Q4 | | | | | | |
| 2022 | 1 | Digital Coupons | 345713.025310 | 32.306319 | 2022-Q1 | 2022 | 1 | Trade Promo | 1.438567e+06 | 20.855757 | 2022-Q1 |
| 2022 | 1 | Sampling | 0.000000 | 0.000000 | 2022-Q1 | | | | | | |
| 2022 | 2 | Digital Coupons | 256212.115214 | 33.818427 | 2022-Q2 | 2022 | 2 | Trade Promo | 1.263035e+06 | 18.446125 | 2022-Q2 |
| 2022 | 2 | Sampling | 0.000000 | 0.000000 | 2022-Q2 | | | | | | |
| 2022 | 3 | Digital Coupons | 330540.809855 | 47.148673 | 2022-Q3 | 2022 | 3 | Trade Promo | 1.280548e+06 | 20.220976 | 2022-Q3 |
| 2022 | 3 | Sampling | 0.000000 | 0.000000 | 2022-Q3 | | | | | | |
| 2022 | 4 | Digital Coupons | 74.825011 | 1.509082 | 2022-Q4 | 2022 | 4 | Trade Promo | 8.855686e+04 | 1.418582 | 2022-Q4 |
| 2022 | 4 | Sampling | 0.000000 | 0.000000 | 2022-Q4 | | | | | | |

Tactic Comparison Analysis

Consumer Promotion vs Trade Group ROI vs Spend Comparison quarterly

Forecasting Sales Volume



Conclusions

- Sales Volume / Profit = 16.66
- **STOP** Spending on **Trade Promo**
- **INVEST** in Consumer Promotion Group- especially in Discount Coupons strategy
- In Media, invest in tactics- *Digital Display, Paid Search: Meta, Google + Bing, Pinterest, Amazon Search, PR*