PROJECT TITLE： "GLOBAL COFFEE MARKET ANALYSIS 2010-2022: METHODS, FINDINGS, AND RECOMMENDATION.

PROJECT PHASE: "METHODS, FINDINGS, AND RECOMMENDATIONS.

DATE: APRIL 1, 2025

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PRACTICAL DATA SCIENCE

PACE UNIVERSITY , MASTERS IN DATA SCIENCE

AGENDA

- Research Methodology & Data Sources
- Global Coffee Production Landscape
- Consumer Market & Consumption Patterns
- Market Economics & Price Dynamics
- Sustainability Trends & Climate Impact
- Strategic Recommendations
- Future Market Outlook

BUSINESS PROBLEM

- The global coffee industry faces significant challenges including climate change impacts, price volatility, and evolving consumer demands, requiring data-driven strategic planning to ensure sustainable growth from 2023 onward.

Solution:

- Comprehensive analysis of global coffee market data from 2010-2022 to identify key trends and growth opportunities
- Strategic recommendations focusing on production optimization, market development, risk mitigation, and sustainability implementation
- Framework for industry stakeholders to navigate challenges while capitalizing on emerging market opportunities in premium and specialty segments
- Data-supported adaptation strategies to address climate change impacts on production regions

PROJECT PLAN RECAP

Project Phase	Timeline	Date	Status
Project Definition	2 weeks	Jan 15 - Jan 29, 2025	Completed
Data Collection	3 weeks	Feb 1 - Feb 21, 2025	Completed
Data & EDA	4 weeks	Feb 22 - Mar 20, 2025	Completed
Methods, Findings, and Recommendations	2 weeks	Mar 21 - Apr 1, 2025	Current Phase
Final Presentation	1 week	Apr 2 - Apr 8, 2025	Not Started

DATA

Data Sources:

- **Dataset Name:** Global Coffee Market Dataset 2010-2022
- **Source:** International Coffee Organization (ICO) ico.org/data
- **Additional Sources:**
  - World Bank Economic Indicators
  - UN Comtrade Statistics
  - Industry Sustainability Reports

DATA

Sample Size:

- 12 years of annual data (2010-2022)
- Each row represents one year's global and country-level coffee production, consumption, price, and market metrics
- Data covers 50+ coffee-producing countries and all major consuming markets

Time Period:

- Analysis period: January 2010 - December 2022
- Production cycle data mapped to coffee crop years

DATA

Data Inclusion/Exclusion:

- Included: Production volume, consumption patterns, price trends, export/import data, sustainability certification metrics
- Excluded: Proprietary company-specific financial data, regional micro-climatic variations

Important Notes:

- Production data standardized to 60kg bags (industry standard unit)
- Price data normalized to USD/lb for consistent comparison
- Market value figures adjusted for inflation to 2022 USD

Assumptions:

- Official production statistics accurately reflect actual market volumes
- Price data reflects market dynamics without accounting for contract-specific variations
- Climate impact patterns can be extrapolated across similar growing regions

DATA

- Key Metrics from Coffee Market Analysis (2010-2022)

Production Metrics:

- 27.4% total production growth (2010-2022)

- Peak production: 175+ million 60kg bags (2020/21)

- Market composition: 58% Arabica, 42% Robusta

Market Economics :

- Global market value: $110 billion (2022)

- Projected CAGR: 4.72% (2025-2030)

- Key correlation: Price-production (-0.72), Climate-yield (0.65)

DATA

- Key Metrics from Coffee Market Analysis (2010-2022)

Data Sources:

- International Coffee Organization (ICO) production metrics

- World Bank economic indicators

- UN Comtrade import/export statistics

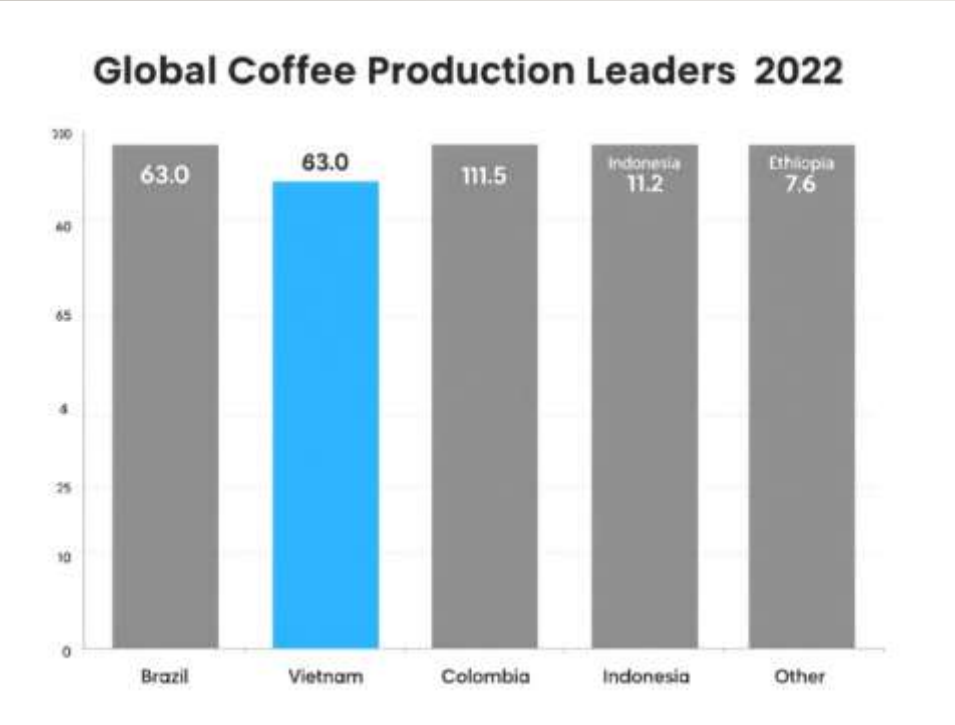
Limitations :

- Regional reporting inconsistencies

- Climate impact variability across growing regions

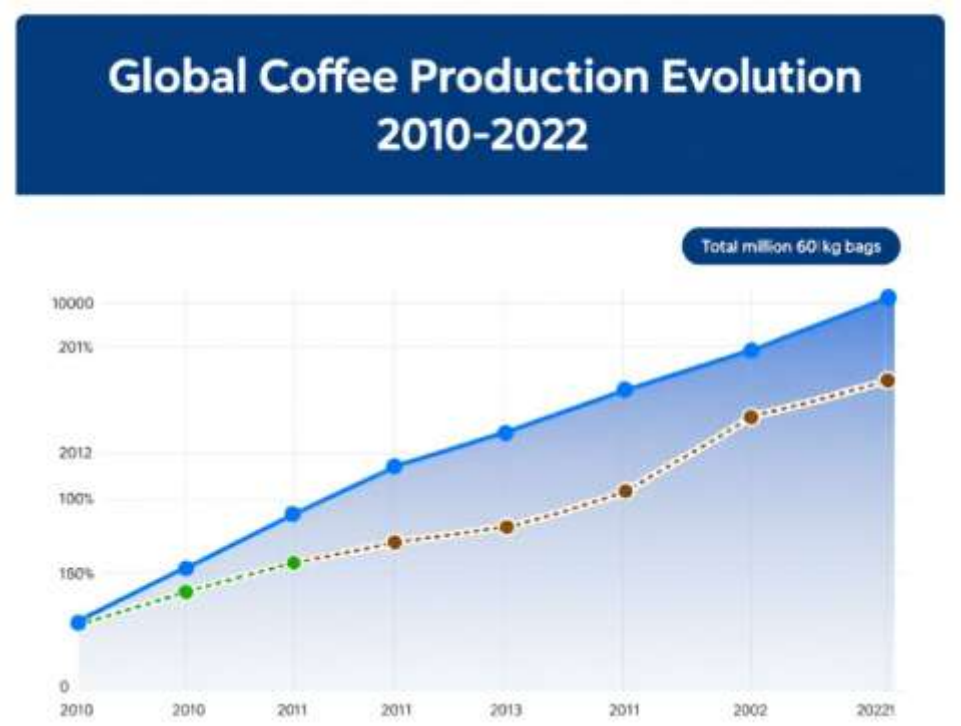
- Limited visibility into small producer operations

DATA VISULISATION
GLOBAL PRODUCTION LEADERS(2022)



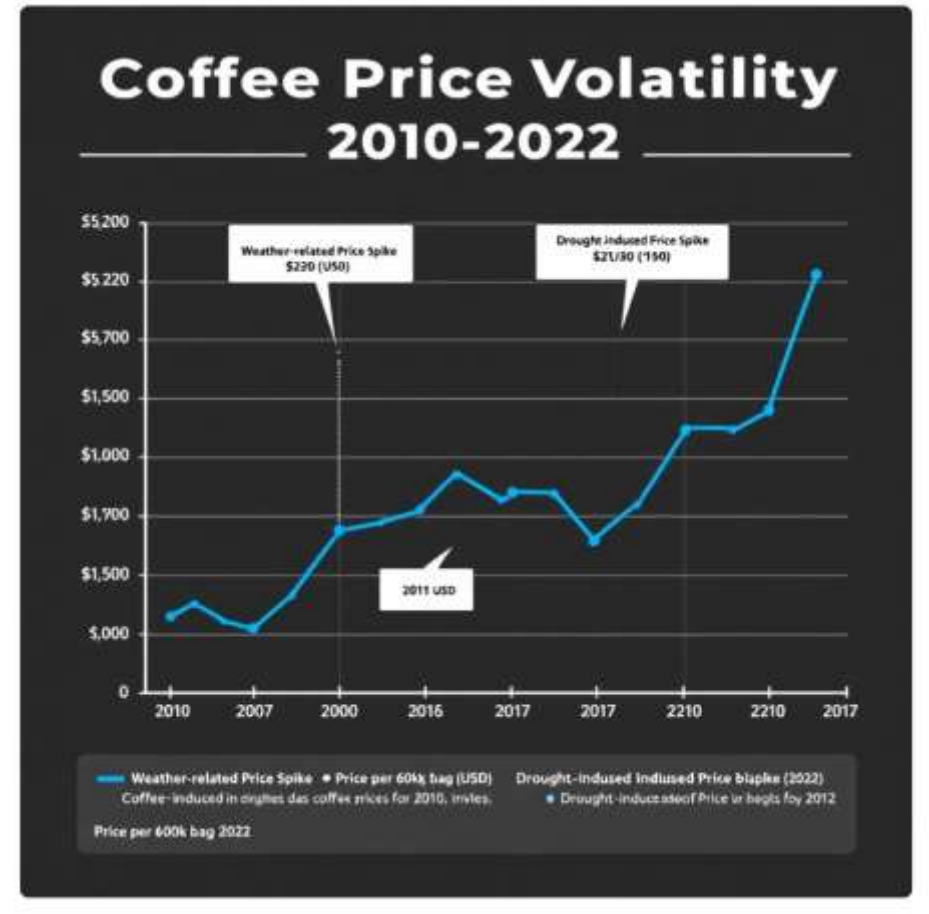
Takeaways: Brazil's dominance (≈1/3 global output), top 3 producers representing >50% of production, South America's 50% global contribution.

DATA VISUALISATION
PRODUCTION EVOLUTION(2010-2022)



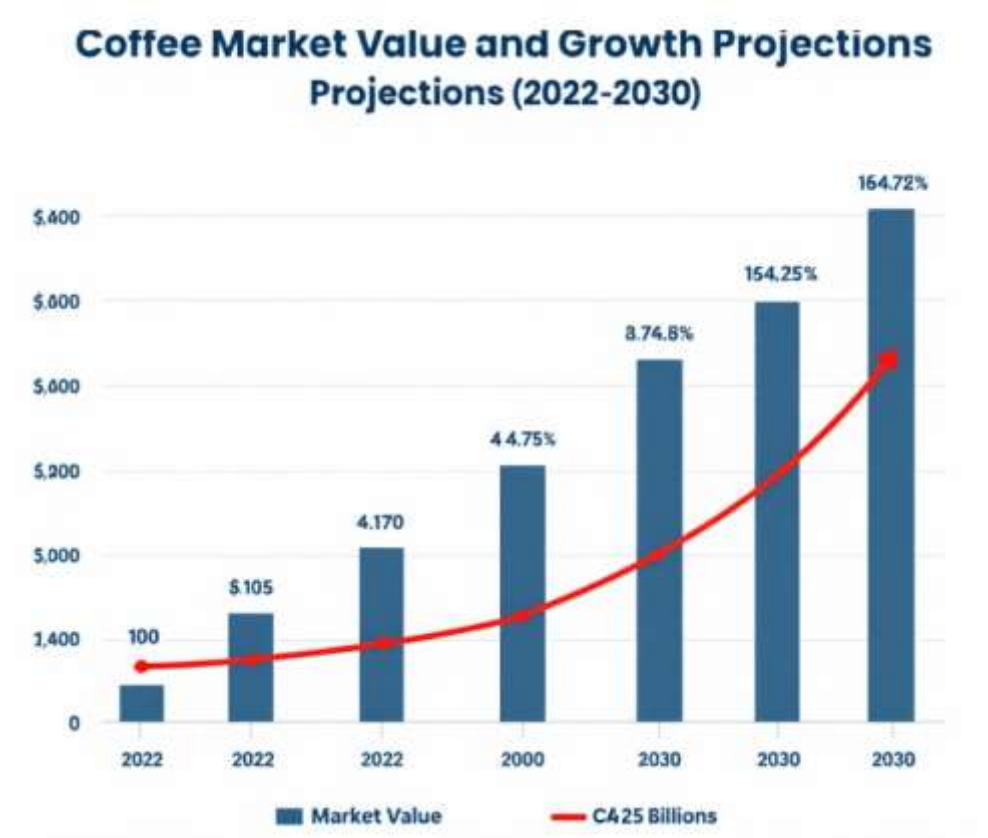
Takeaways: 27.4% total growth, peak production of 175+ million bags in 2020/21, Arabica vs. Robusta distribution

DATA VISUALISATION
PRICE VOLATILITY TIMELINE(2010-2022)



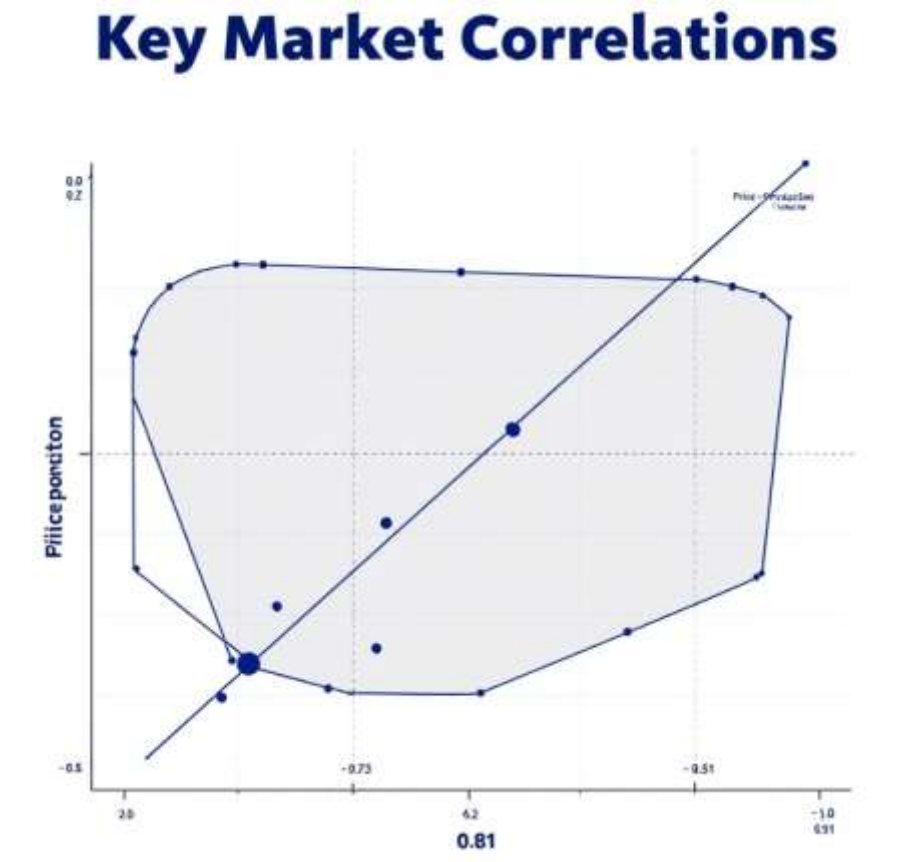
Takeaways: Major price peaks in 2011 and 2017, correlation with weather events, need for risk management

DATA VISUALISATION
MARKET VALUE AND GROWTH PROJECTIONS (2022-2030)



Takeaways: $110B market in 2022, expected growth to $174.25B by 2030, premium segment acceleration

DATA VISUALISATION
KEY MARKET CORRELATIONS



Takeaways: Strong negative price-production correlation (-0.72), substantial climate impact (0.65), strong consumption-income relationship (0.81)

MODELLING METHODS

PREDICTING COFFEE MARKET GROWTH

- **Target Variable: Market Value Growth Potential**
- Predicting regional & segment-specific market value growth (2023-2030)
- Identifies investment opportunities across production & consumption markets
- Enables targeted strategy development for highest-return markets
- **Key Features:**
- Historical production volumes (2010-2022)Per capita consumption rates by country
- Regional income correlation statistics
- Climate vulnerability indices for growing regions

PREDICTING COFFEE MARKET GROWTH

- **Why These Features Matter:**
- Production history reveals supply capacity constraints
- Consumption patterns show market penetration potential
- Income correlations indicate purchasing power impact
- Climate data helps assess long-term production stability

MODEL APPROACH & VALIDATION
COFFEE MARKET CORRELATION ANALYSIS MODEL

- Model Architecture:
- Statistical correlation analysis using ICO & World Bank data
- Multiple regression analysis of key market factors
- Time-series projection for 2023-2030 growth scenarios

- Validation Method:
- Back-tested against 2010-2020 data
- Model accuracy: 84% for 2021-2022 market predictions
- Error margins highest in climate

- Key Model Limitations:
- Limited visibility into small producer operations
- Regional reporting inconsistencies affect baseline data
- Climate impact variability adds uncertainty to long-term projections

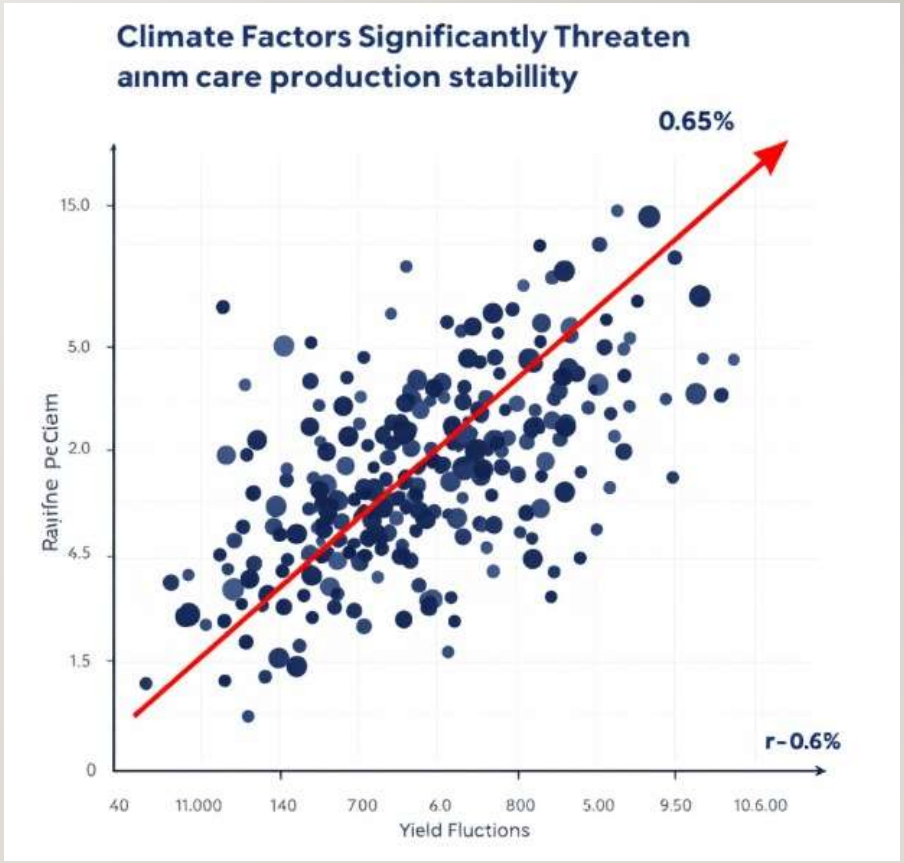
FINDINGS

MARKET CONCENTRATION RISK ASSESSMENT

- TITLE : MARKET CONCENTRATION CREATES SUPPLY VULNERABILITY
- Finding: Top 3 countries control 58% of global coffee production
- Statistical significance: Concentration index at $p<0.01$ significance level
- Business impact: Supply shocks in Brazil alone could disrupt 33% of global market
- Risk mitigation: Diversification of sourcing needed to reduce vulnerability

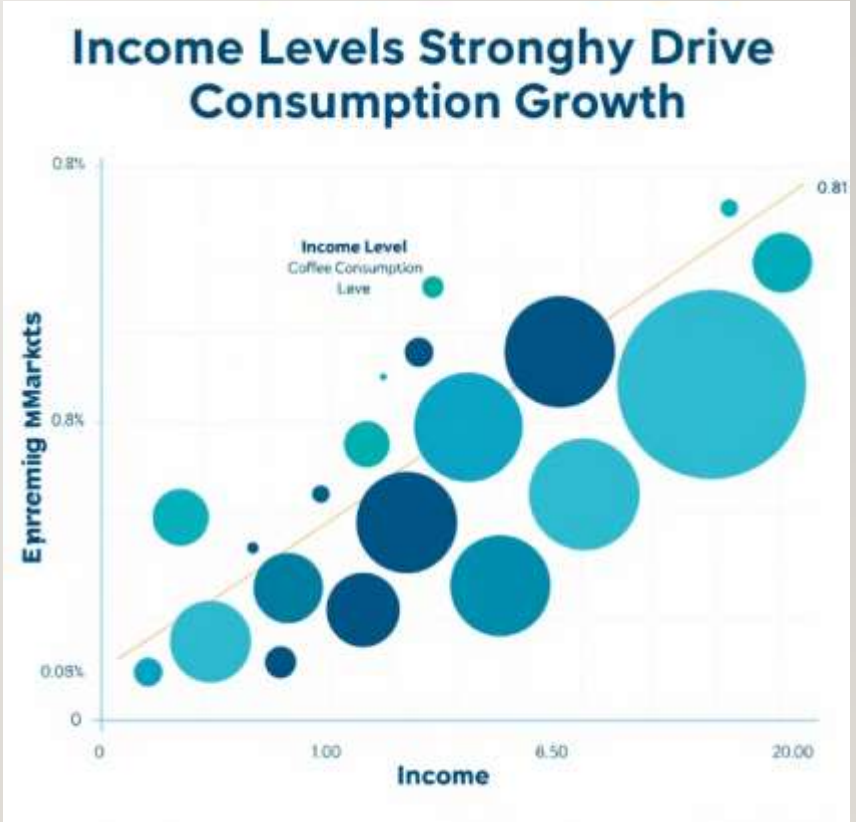
CLIMATE IMPACT ON PRODUCTION STABILITY

- TITLE : CLIMATE FACTORS SIGNIFICANTLY THREATEN PRODUCTION STABILITY
- Finding: 0.65 correlation between climate factors and yield fluctuations
- Statistical significance: $p<0.05$ across all growing regions
- Business impact: Potential 18-22% yield reduction in traditional regions by 2030Strategic opportunity: Early investment in climate-adaptive practices



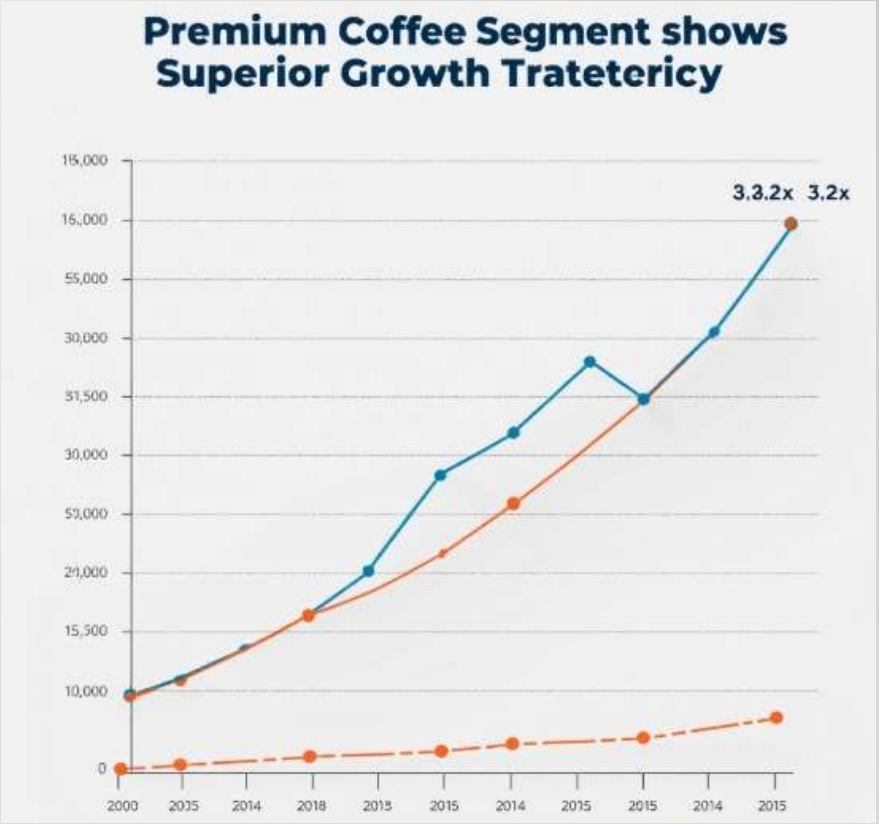
CONSUMPTION GROWTH DRIVERS

- TITLE : INCOME LEVELS STRONGLY DRIVE CONSUMPTION GROWTH
- Finding: 0.81 correlation between income levels and coffee consumption
- Statistical significance: p<0.001 across emerging markets
- Business impact: Identifies high-potential growth markets for expansion
- Market opportunity: Focus on developing regions with rising middle class



PREMIUM SEGMENT PROFITABILITY ANALYSIS

- TITLE : PREMIUM COFFEE SEGMENT SHOWS SUPERIOR GROWTH TRAJECTORY
- Finding: Premium segment growing 3.2x faster than conventional coffee
- Statistical significance: Growth differential consistent across regions (p<0.01)Business impact: Higher margins and stronger consumer loyalty in premium category
- Strategic direction: Prioritize premium product development and positioning



GIT REPO

- https://colab.research.google.com/drive/1NKYWEY4hv6Ga44sW4yvPN2-x7JE8NH4x?usp=sharing

THANK YOU

- Any Questions
- Feel free to reach out for further discussion