

The background is a solid orange color. In the top left, there are two orange slices. In the top right, a hand is holding a glass dropper with a gold-colored cap, containing a yellow liquid. In the bottom left, there is another orange slice and a green leaf. A white line runs vertically down the right side, and a white line runs horizontally across the bottom, intersecting at a point. A white line also runs diagonally from the top right towards the intersection point.

End-to-End Business Intelligence Case Study

# Titanium Dioxide Exposure & Regulatory Risk Intelligence **U.S. Cosmetics Industry**

Abhinav Noel Norbert

Business Intelligence | Data Analytics

Power BI • SQL • Python • Data Modeling • DAX

# Executive Summary

## Problem

Titanium Dioxide is a widely used cosmetic ingredient under increasing regulatory scrutiny, but the industry's actual dependency is poorly understood.

## What I Built

A full end-to-end BI solution to quantify Titanium exposure across products, categories, and companies.

## Why It Matters

Any regulatory restriction would cause industry-wide disruption, not isolated impact.



## Key Result

- **86.6%** of cosmetic products contain Titanium
- **75%** of companies are exposed
- Largest brands carry the highest absolute risk

# Business Context & Objective

## Industry Context

- Cosmetics rely heavily on chemical additives
- Titanium Dioxide used for pigmentation, opacity, and UV protection
- Increasing global regulatory and ESG pressure

## Objective

Answer four business questions:

1. How widespread is Titanium usage?
2. Which product categories are most dependent?
3. Which companies face the highest risk?
4. Where is regulatory exposure concentrated?

### Data Source

California Safe Cosmetics Program (CSCP)

### Data Scale

- 36,972 cosmetic products
- 604 companies
- 123 regulated chemicals
- Reporting period: 2009-2020

### Data Grain

Each record represents **one chemical used in one product**



# Dataset



# Data Preparation & Validation

## Steps Performed

- Raw CSV ingestion
- Python-based data audit and cleaning
- Standardized dates, chemical identifiers, and categories
- SQL-based KPI validation
- Ensured consistency across Python, SQL, and Power BI

## Why This Matters

Guarantees **trustworthy metrics** for business decision-making.



# Data Model (Star Schema)

## Why Star Schema

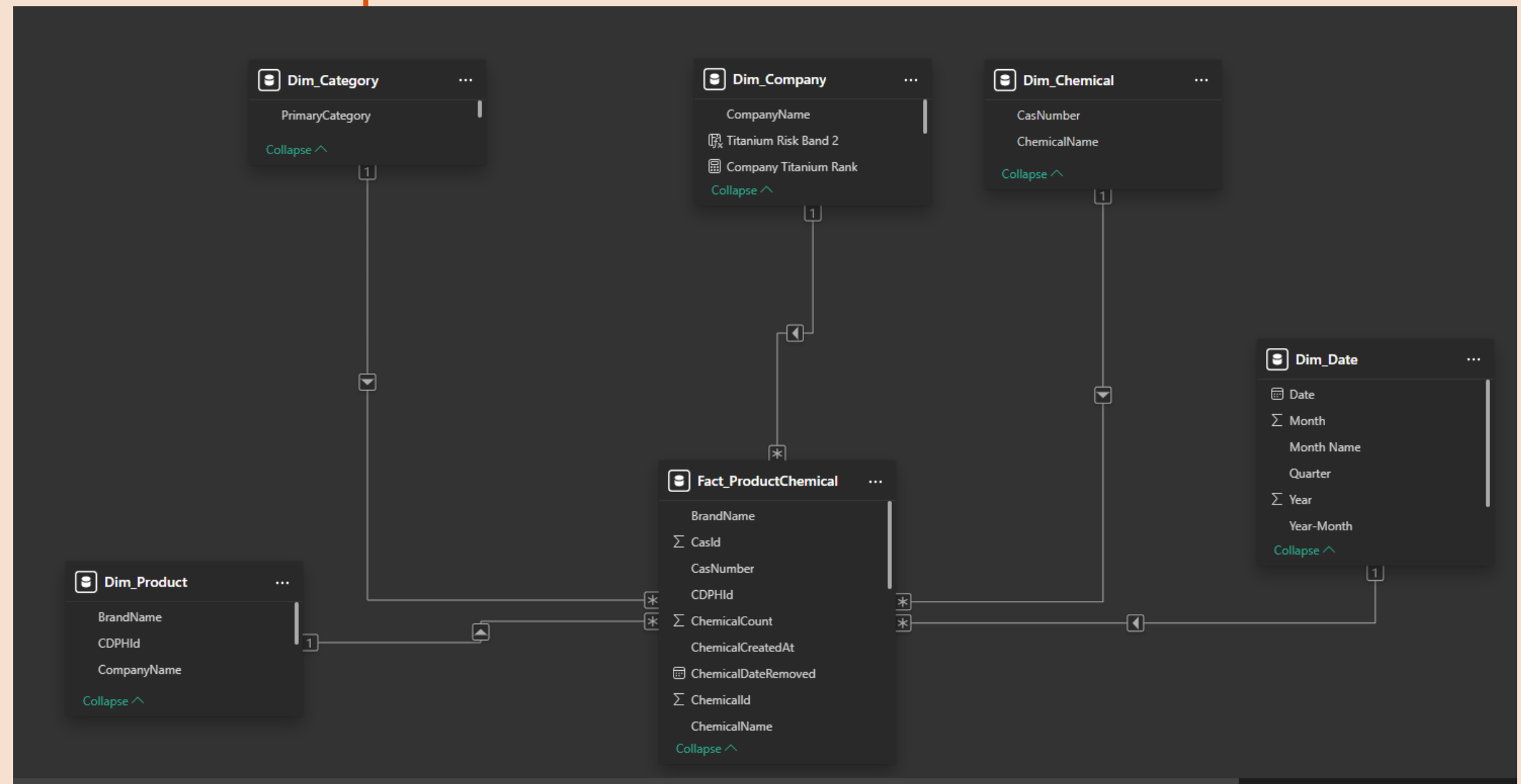
- Accurate aggregations
- Scalable BI design
- Reliable DAX calculations
- Supports time intelligence and drill-downs

## Fact Table

- Product x Chemical relationships

## Dimension Tables

- Product
- Company
- Chemical
- Category
- Date



### Core KPIs

- Total Products
- Titanium Products
- Titanium Penetration %
- Companies Using Titanium

### Risk Innovation

Instead of ranking companies by percentage alone, I created:

**Titanium Risk Score =  
Number of Titanium  
Products per Company**

This surfaces **true exposure**,  
not misleading ratios.



# Key Metrics & Logic

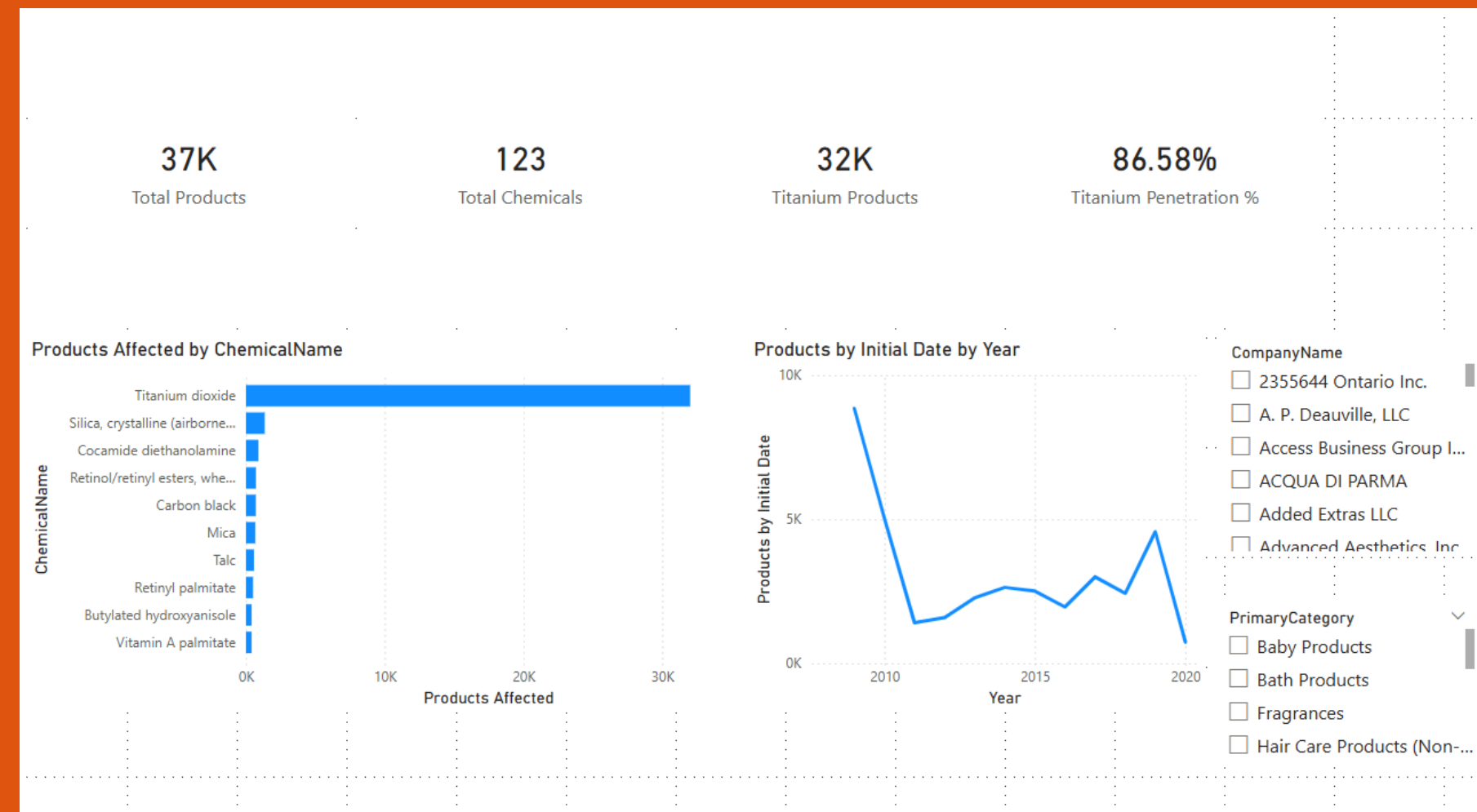
# Market-level Insights

## Findings

- 86.6% of cosmetic products contain Titanium
- Dependency remains high over 12 years
- No meaningful shift away from Titanium

## Business Interpretation

Titanium is a **structural dependency**, making regulatory action highly disruptive.





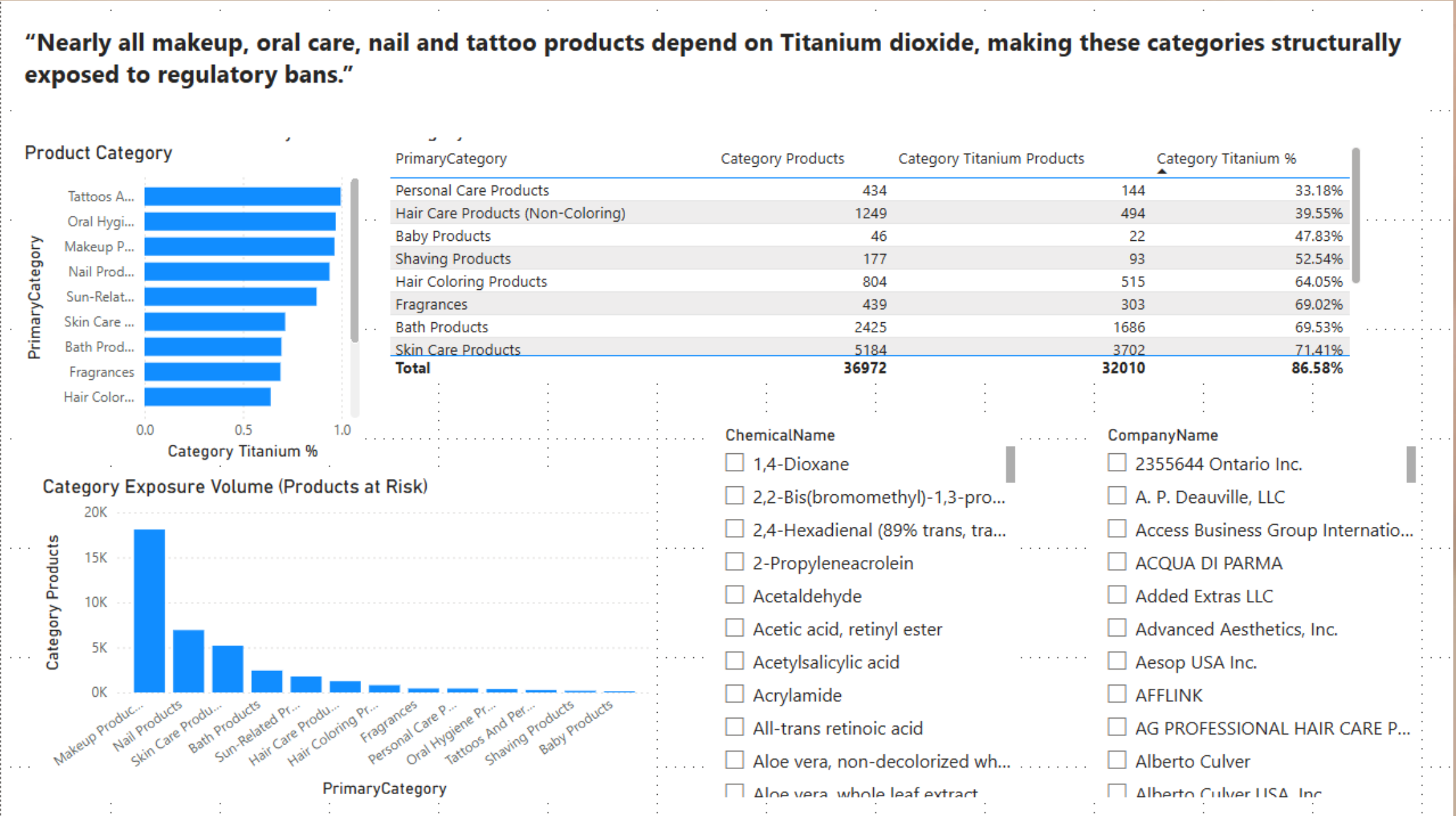
# Category-level Risk Insights

## Highest Risk Categories

- Makeup (Non-Permanent)
- Nail Products
- Oral Hygiene
- Tattoos & Permanent Makeup

## Key Insight

These categories are **chemically locked-in**, making reformulation costly and complex.



# Company-level Risk Insights

## Risk Concentration

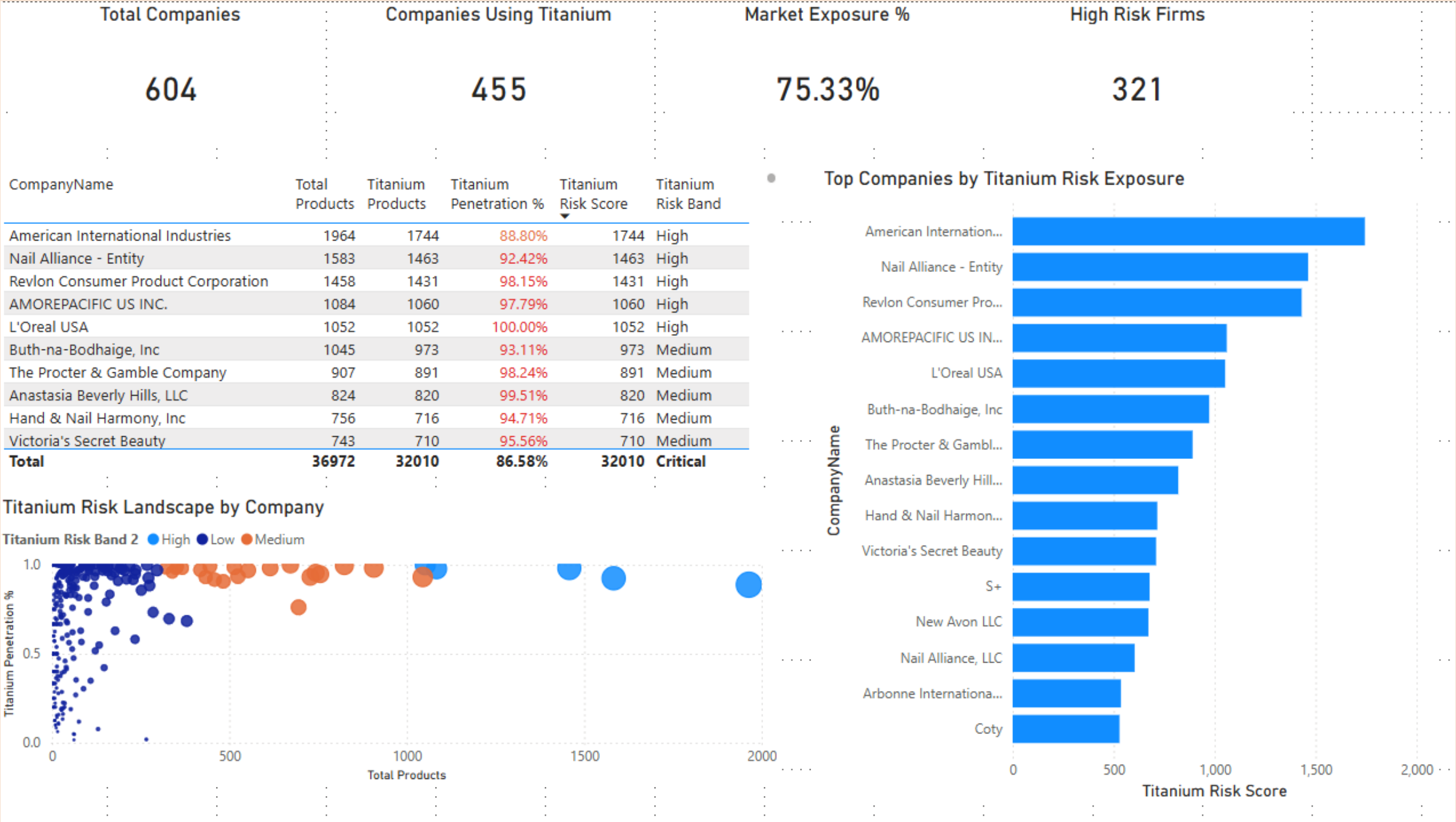
- Large companies dominate Titanium exposure
- High dependency x large portfolios = extreme risk

## Top Exposure Companies

- American International Industries
- Nail Alliance
- Revlon
- AMOREPACIFIC
- L'Oréal USA

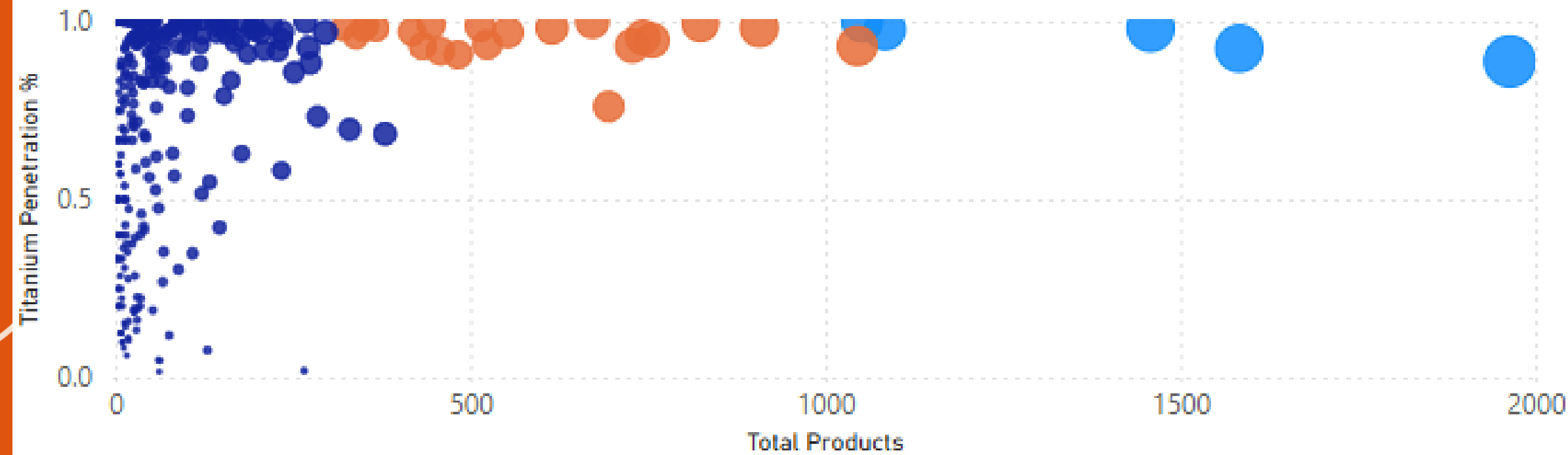
## Insight

Regulatory action would impact **market leaders first**, not fringe brands.



## Titanium Risk Landscape by Company

Titanium Risk Band 2 ● High ● Low ● Medium



### What the Chart Shows

- X-axis: Company size (Total Products)
- Y-axis: Titanium dependency (%)
- Bubble size: Titanium exposure volume
- Color: Risk band (Low → Critical)

### Why This Matters

Visually identifies **systemic risk clusters** in the industry.

# Risk Landscape (Scatter Analysis)

# Business & Regulatory Implications



## **For Regulators**

Focus on high-impact companies and categories first

## **For Companies**

- Prioritize reformulation in high-risk segments
- Diversify ingredient sourcing

## **For Investors**

Titanium exposure is a hidden ESG and regulatory risk



# Skills Demonstrated



## What This Project Proves

- End-to-end BI ownership
- Strong data modeling fundamentals
- Advanced DAX & ranking logic
- Business-driven insight generation
- Dashboard design for decision-makers

# FINAL TAKEAWAY



Regulatory risk in the cosmetics industry is **not evenly distributed** – it is concentrated in the **largest brands and most popular product categories**.





# Thank you

This project demonstrates how bi can be used to **anticipate risk**, not just report numbers.