CRASH-TESTED

The Businesses Built to Outlast Recessions

Neerja | Fisher | Siluni | Minh

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Five crises.
Twenty-eight years.
One pattern: some businesses break - others weather the storm.

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OUR MISSION

Predict how a future recession will impact Vancouver businesses by analyzing five major crises from the last 25 years. We will reveal the rise-and-fall patterns that determine which Vancouver businesses endure recessions, and which ones are most at risk in the next downturn.

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THE BIG FIVE

.com Crash

A massive tech bubble burst wiped out thousands of internet startups and shook global markets.

2000-2002

Great Recession

A housing market collapse and credit freeze triggered a worldwide financial crisis and deep recession.

2008-2009

Oil Crash

A sharp fall in global oil prices caused major losses for energy companies and exporters.

2014-2016

COVID Crisis

A global pandemic forced shutdowns, disrupted supply chains, and reshaped nearly every business sector.

2020–2021

Interest Rate Shock

Rapid interest rate hikes to fight inflation slowed borrowing, cooled housing, and strained many businesses.

2022-2023

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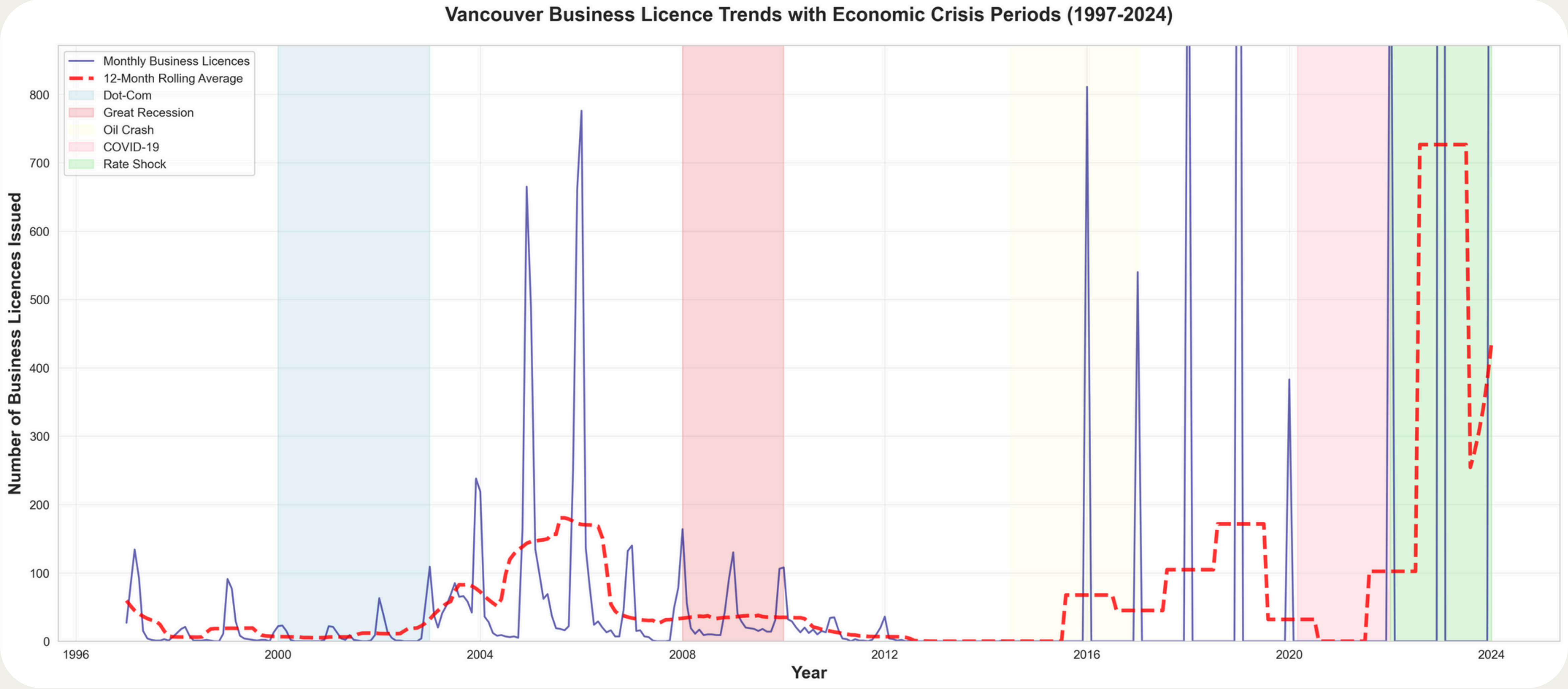
METHODOLOGY

1. Took the Vancouver business dataset
2. Filtered by business categories
3. Compared survival, entries, and exits during each crisis year range
4. Identified sectors: resilient vs vulnerable
5. Looked for cross-crisis consistency



Visualization of license exchange from 1999-2024

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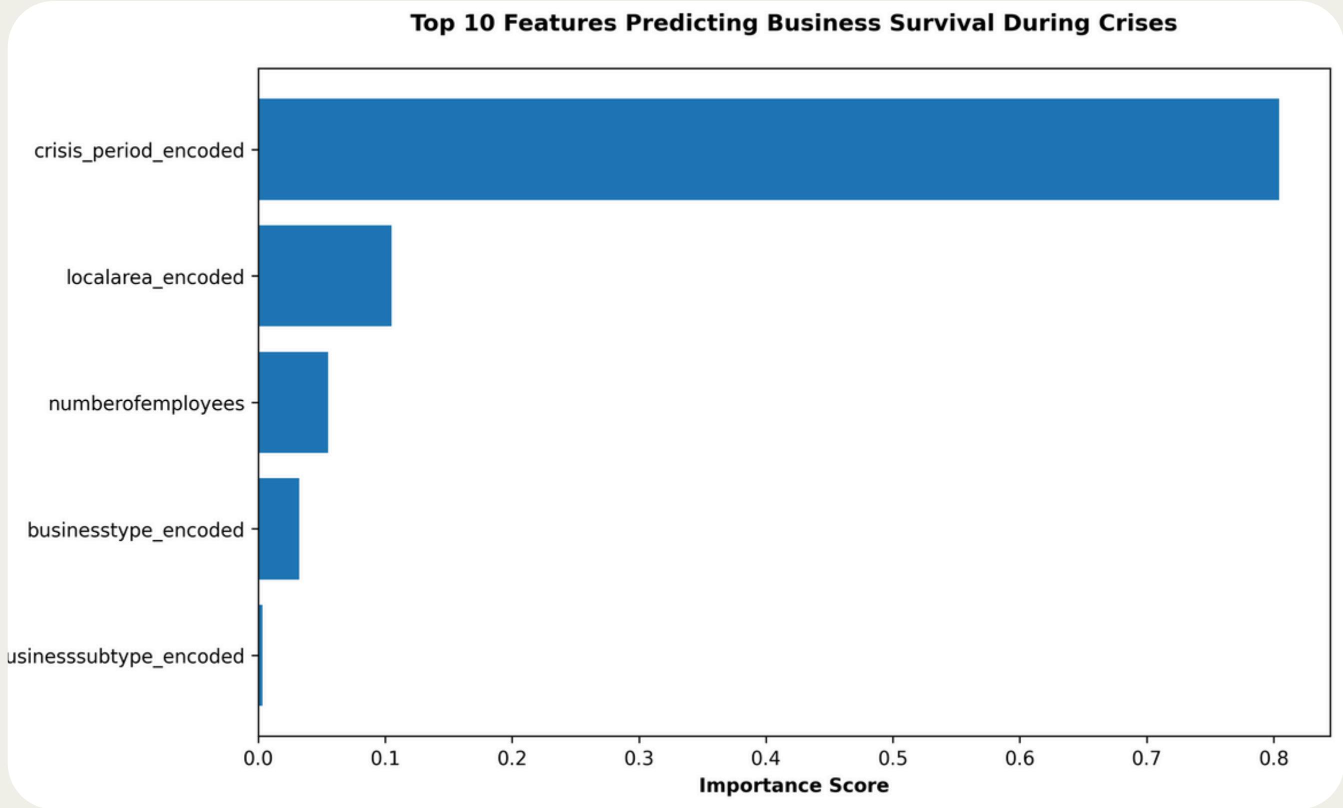
RANDOM FOREST CLASSIFIER

Executive Summary

This analysis develops a machine learning model to predict which types of businesses in Vancouver are most vulnerable during economic crises. By analyzing ~26,000 business licenses from 1997-2024 across five major economic downturns, we identify vulnerability patterns and provide predictive insights for future recessions.

```
RandomForestClassifier(
    n_estimators=100,       # 100 trees for stable predictions
    max_depth=10,           # Limits tree depth to prevent overfitting
    class_weight='balanced', # Adjusts for imbalanced classes
    random_state=42         # Reproducibility
)
```

Predictors for business health during economic crisis



Survival Rate Calculation

For each business type, we calculate:

Actual Survival Rate = (# survived) / (# total during crises)

Predicted Survival Probability = Model's average predicted probability for that type

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.COM CRASH (2000-2002)

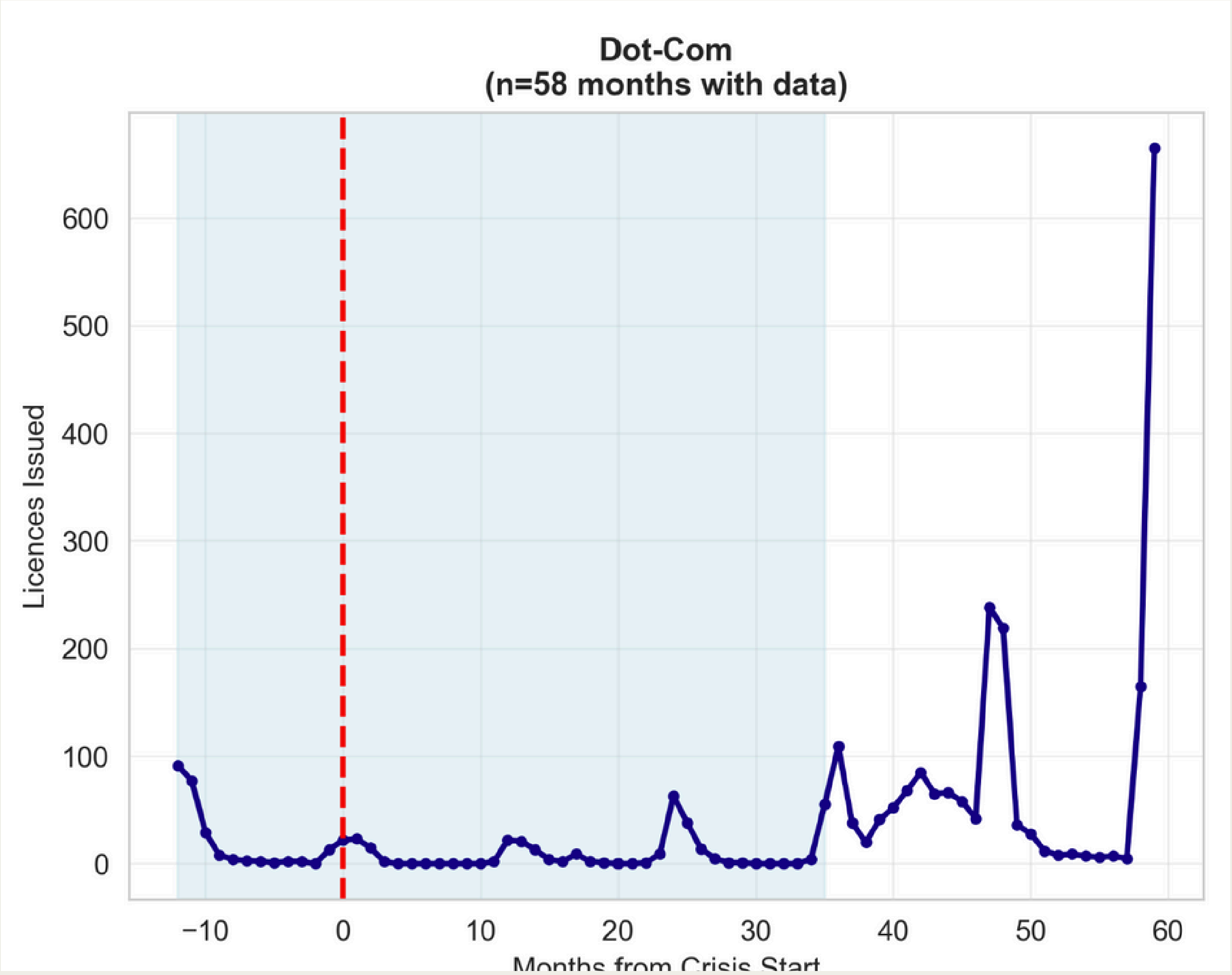
A massive overvaluation of internet startups led to a tech bubble. When companies failed to generate profits, investor confidence collapsed and markets plunged.

Survivors:

- Consumer staples
- Utilities
- Discount retailers

Sinkers:

- Technology (software, hardware, dot-com companies)
- Telecommunications
- Venture-funded startups



WHY? Consumers shifted spending toward essentials during market uncertainty, while tech companies with weak fundamentals collapsed once investor money dried up.

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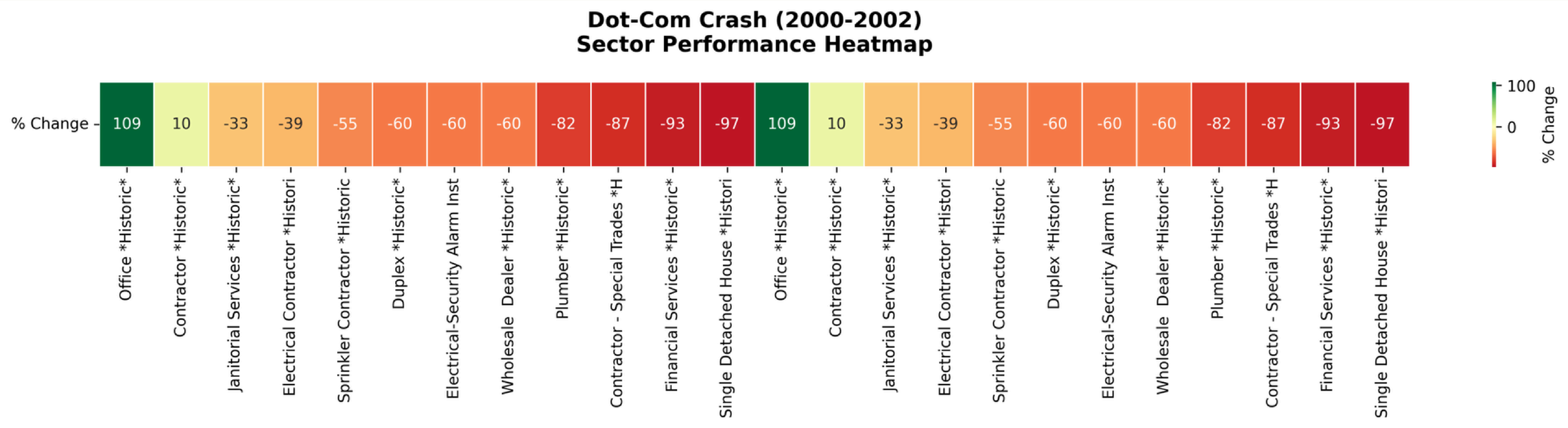
HOW DIFFERENT SECTORS PERFORMED IN THE .COM CRASH



GREAT RECESSION (2008–2009)

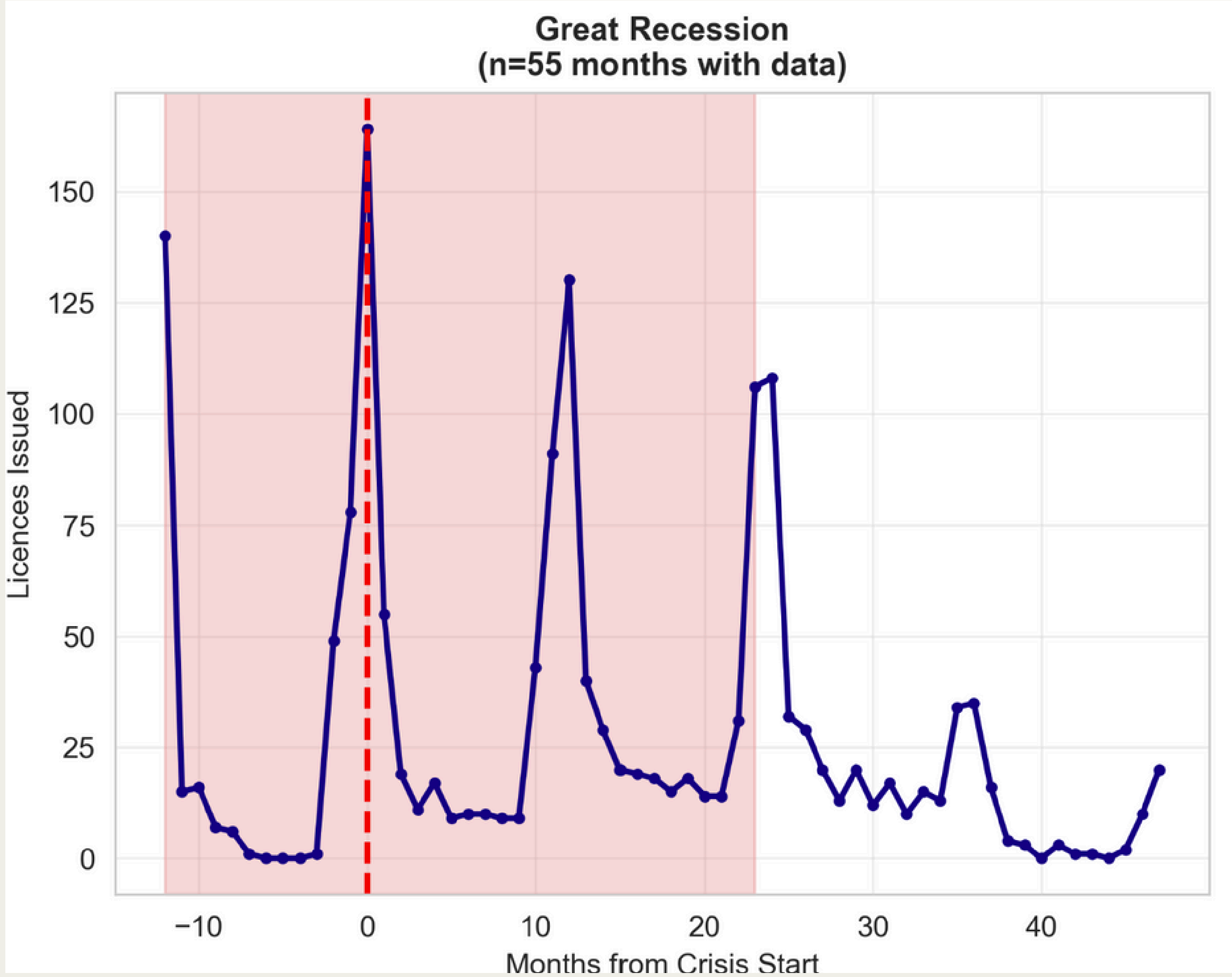
A housing bubble inflated by risky mortgages burst, triggering a global credit freeze and financial system breakdown.

Survivors:

- Discount retail
- Healthcare
- Fast food / quick service restaurants

Sinkers:

- Real estate and construction
- Financial services
- Automotive



WHY? Consumers tightened budgets but still needed affordable essentials (boosting discount retail and fast food). Housing and finance collapsed due to foreclosures and toxic debt exposure.

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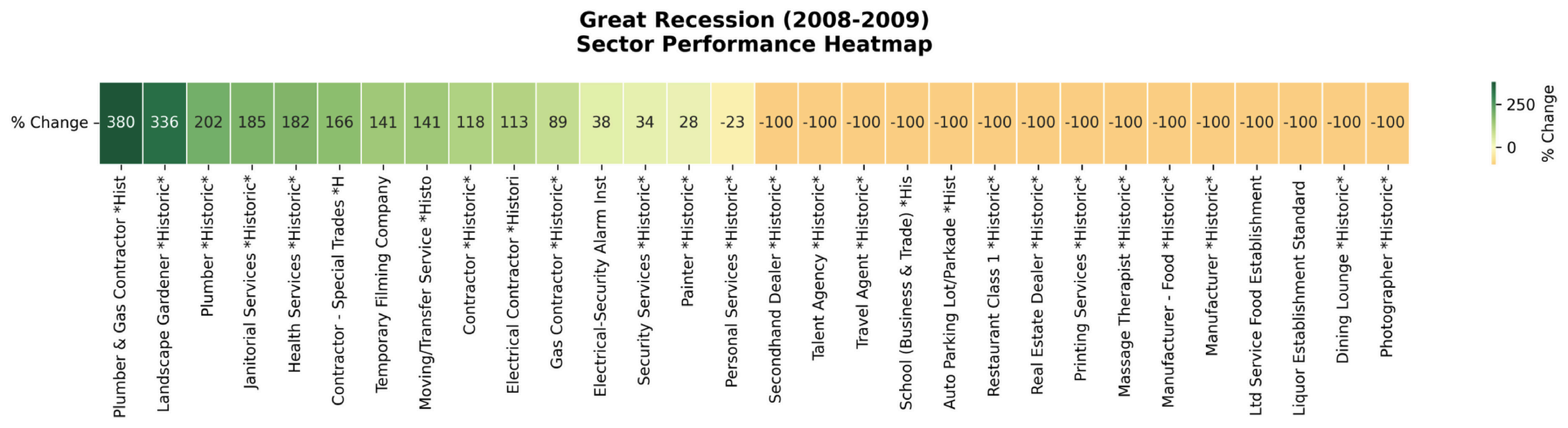
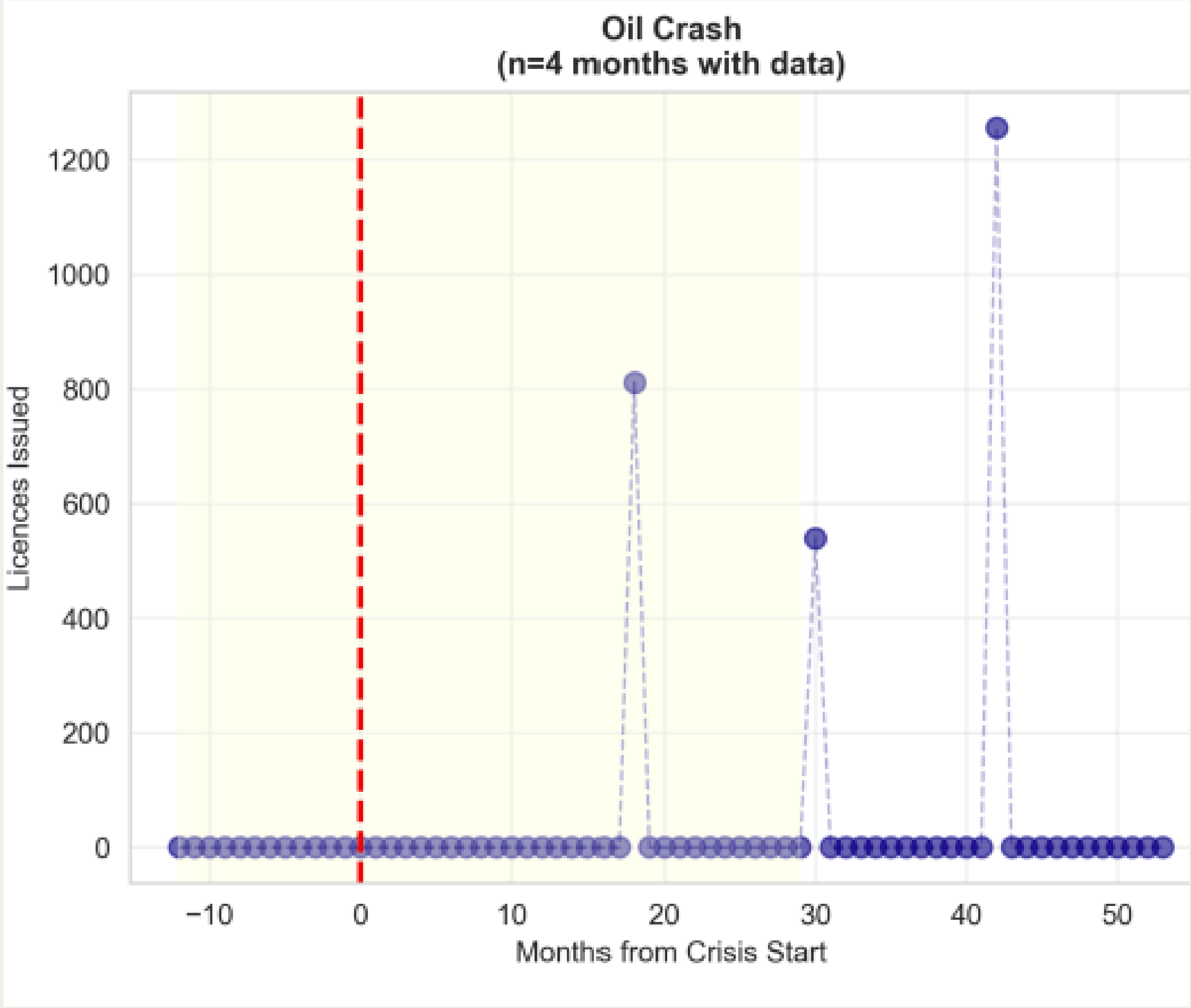
HOW DIFFERENT SECTORS PERFORMED IN THE GREAT RECESSION



OIL PRICE CRASH (2014–2016)

A global oversupply of oil combined with weak demand caused oil prices to fall more than 60%, hitting energy-dependent economies.



Survivors:

- Transportation and airlines
- Manufacturing
- Consumer discretionary

Sinkers:

- Oil and gas
- Mining
- Energy-related services

WHY? Cheap fuel cut costs for airlines and transportation, while energy companies experienced major losses from low oil prices and halted drilling projects.

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COVID-19 ECONOMIC COLLAPSE (2020–2021)

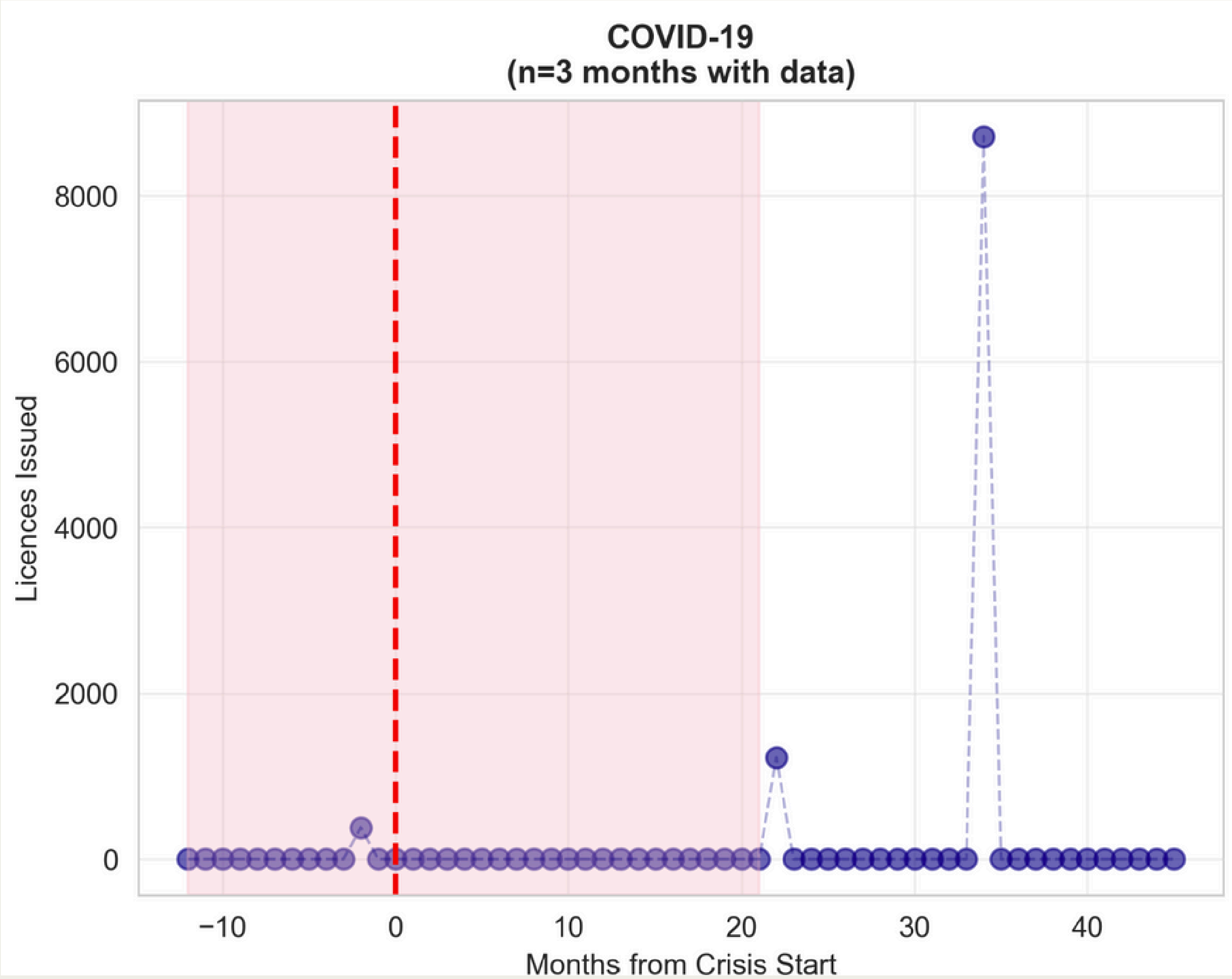
A global pandemic triggered lockdowns, border closures, and severe supply chain disruptions, halting in-person economic activity.

Survivors:

- E-commerce
- Tech (remote work tools)
- Delivery services
- Health and biotech

Sinkers:

- Tourism and hospitality
- Restaurants
- Retail (in-person)
- Aviation



WHY? People shifted to online shopping, remote work, and delivery, while travel-dependent and in-person services collapsed due to restrictions and safety concerns.

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INTEREST RATE SHOCK (2022–2023)

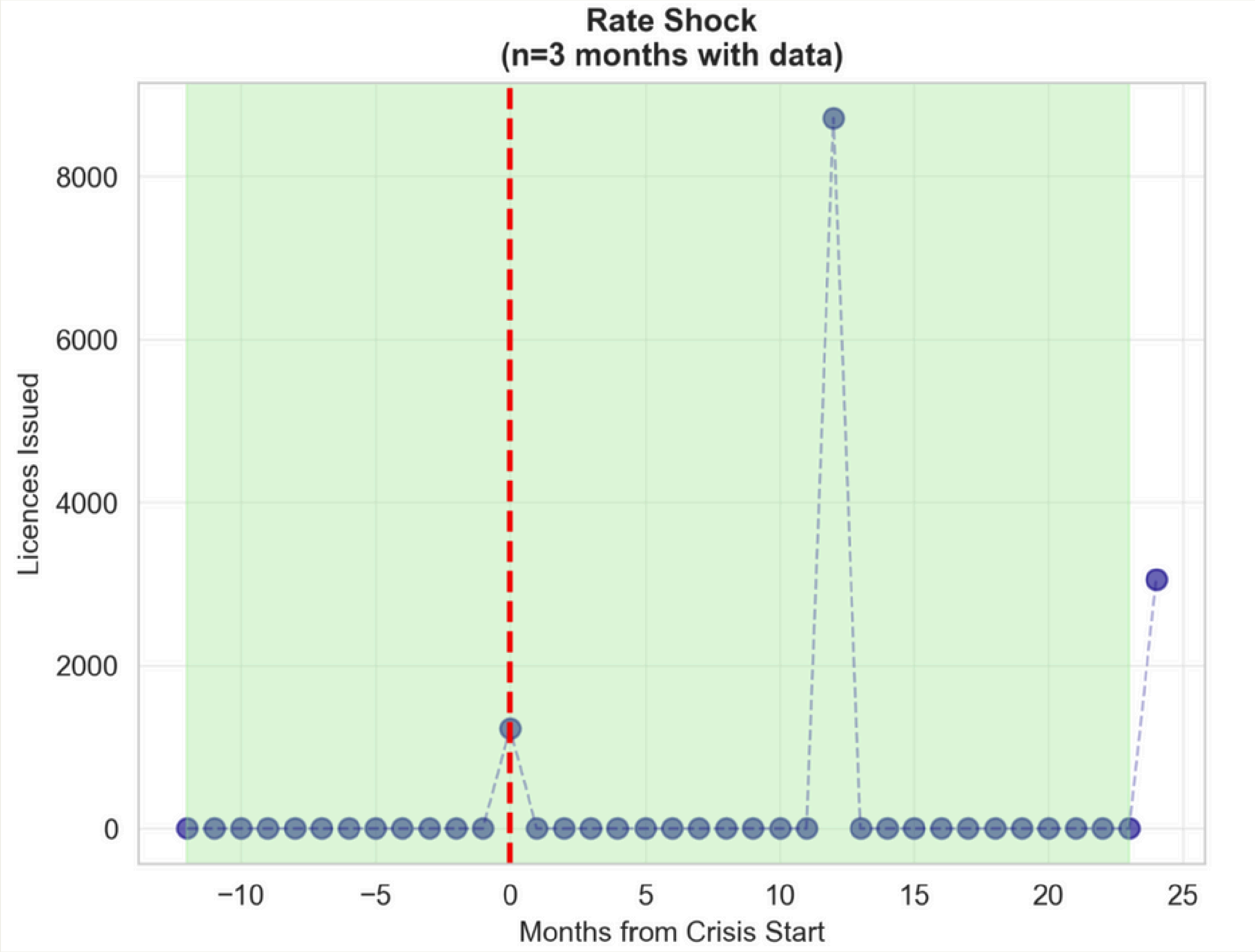
Central banks raised interest rates rapidly to fight inflation, making borrowing expensive and slowing economic activity.

Survivors:

- Banks (higher lending margins)
- Energy companies
- Certain essential services

Sinkers:

- Real estate
- Construction
- Tech and startups
- Consumer discretionary



WHY? High rates made mortgages, loans, and business financing harder to access, crushing rate-sensitive industries like real estate and tech. Essentials held steady, and energy benefited from global commodity pricing.

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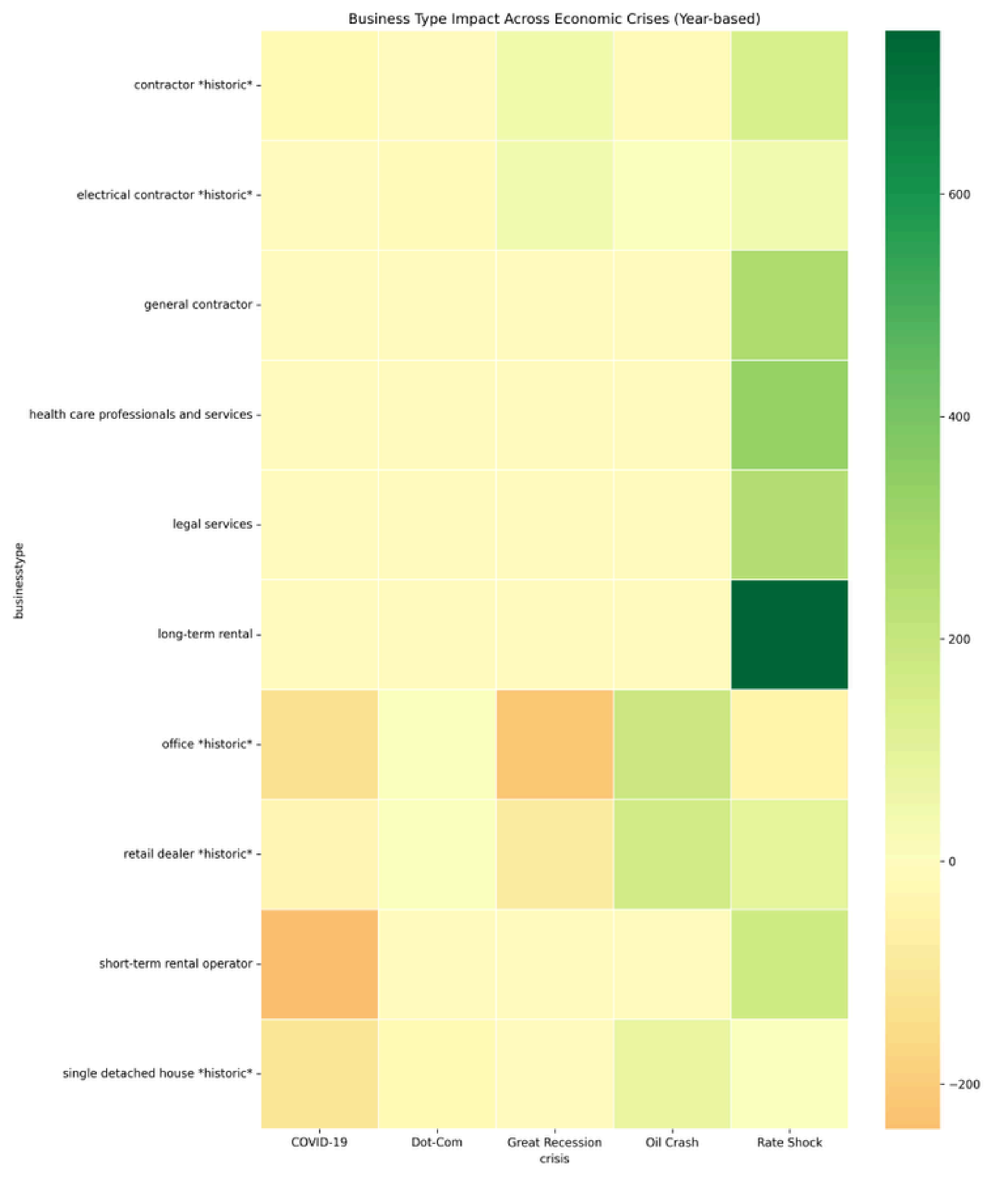
PATTERNS ACROSS FIVE CRISES



- Highlights which business categories historically survive or fail during recessions.
- Trades like janitorial services, plumbers, and painters show strong resilience.
- Capital-intensive or specialized sectors (roofers, sprinkler contractors, vending) show the lowest survival rates.
- Provides a baseline for predicting which industries are at highest risk in the current recession.

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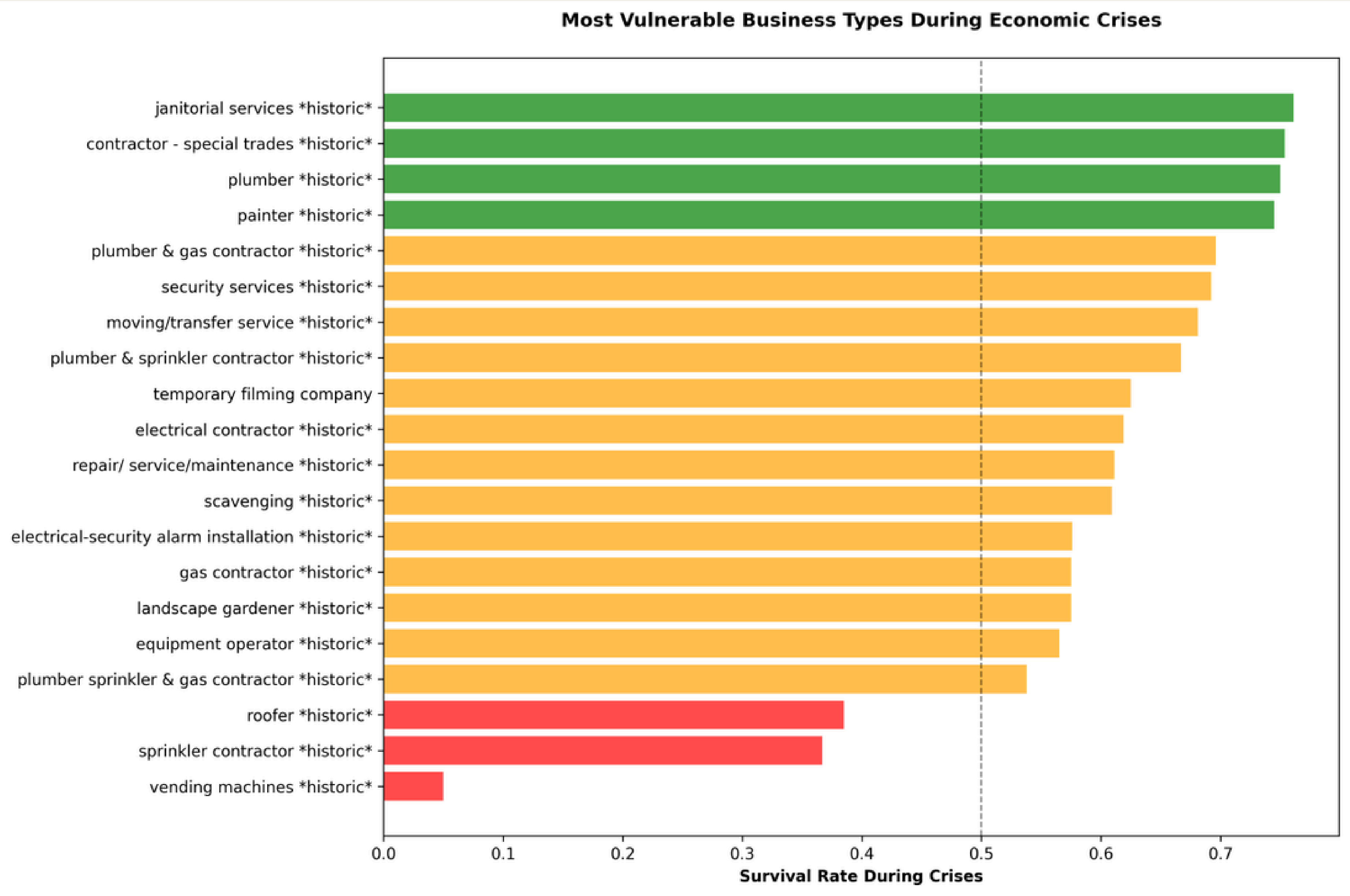
PATTERNS ACROSS FIVE CRISES



- Compares how different industries were affected across major crises.
- Most sectors saw mild impacts in earlier recessions.
- The current rate-shock recession shows unusually large swings — especially in long-term rentals, contractors, and professional services.
- Indicates the current downturn is structurally different from past crises.

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WHAT THIS MEANS FOR TODAY

Based on 25 years of data, patterns across past recessions reveal which sectors are resilient, which are vulnerable, and how businesses and policymakers can act. The current rate-shock recession is structurally different, showing larger swings in certain industries and requiring targeted strategies.

At-Risk Sectors:

- Long-term rentals, contractors, professional services
- Capital-intensive or specialized sectors (roofers, sprinkler contractors, vending)
- Retail categories dependent on discretionary spending
- Tourism, hospitality, and in-person services

Resilient Sectors:

- Essential trades like janitorial services, plumbing, painting
- Healthcare, logistics, and delivery services
- Discount retail and essential groceries
- Tech services supporting remote work and digital infrastructure

Actionable Implications:

- Businesses should prioritize cash flow management and reduce exposure in vulnerable sectors
- Policymakers can focus targeted support on industries most likely to fail
- Recognize structural shifts in the economy post-COVID and adapt strategies accordingly
- Use historical patterns as a baseline, but plan for unusually large swings in the current recession

IMPORTANT CAVEATS & CONTEXT

- Dataset is Vancouver-specific, may not generalize to other regions or countries
- External global factors (trade, energy prices, pandemics, inflation shocks) are not fully captured
- Some sectors have structural changes post-COVID (e.g., shift to remote work, online retail growth)
- Historical patterns show trends and baselines, not guarantees; every recession has unique elements
- Data measures openings/closures, not revenue, profit, or employment, so financial health is inferred indirectly
- Smaller sectors or niche industries may be underrepresented in the dataset
- Timing differences across crises may impact sector performance differently, limiting direct comparison

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CONCLUSION

- Our analysis of Vancouver's business landscape across five major crises revealed clear patterns of resilience and vulnerability among different sectors. While some industries, such as consumer staples, healthcare, e-commerce, consistently maintained or recovered their business activity, others, including big tech related sectors and tourism and transport experienced significant declines.
- The impacts of each crisis varied, with events like COVID-19 and the interest rate shock showing sharper disruptions compared to earlier crises.
- These trends highlight opportunities for future business development in resilient and rapidly recovering sectors, while also suggesting areas where policy support may be most needed.
- Overall, understanding these historical patterns provides valuable guidance for entrepreneurs, investors, and policymakers in anticipating which types of businesses are likely to thrive or struggle in the coming years.

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Acknowledgments

Vancouver Open Data: *For providing comprehensive business license datasets*

DSCI Hackathon Organizers: *For the opportunity and support*