Arizona Fab Simulation Report

An Analysis of Overall Yield Under Different Operating Scenarios

Report Generated: 2025-06-22

About This Report and the RVH Model

This report analyzes four manufacturing scenarios. Each scenario is presented on two pages to tell a story of cause and effect.

This simulation uses a Rough Volatility Hypothesis (RVH) model, which treats the factory's defect rate not as a simple average, but as a dynamic path with 'roughness' and 'long memory'. Think of it like the ocean: a simple model sees average wave height, but the RVH model captures the difference between a calm sea and a stormy one where waves are clustered and unpredictable. This allows for a much more realistic assessment of manufacturing risk.

The code that generated this report was written using Google AI Studio

Scenario: Idealized Static Fab

This scenario models an idealized, non-volatile factory. The Defectivity Path is a flat line, representing a perfect average with no real-world instability. This provides a useful, but unrealistic, best-case financial benchmark. The resulting yields are high and entirely predictable, ignoring the risks of process variation and excursions that impact all real manufacturing environments.

Summary of Results:

Customer	Overall Yield	Shippable Dies	Test Load
A	95.0%	4,824,394	14.4%
N	69.1%	502,788	25.8%
DMA	85.0%	1,800,998	18.0%
Q	92.0%	1,124,337	4.3%

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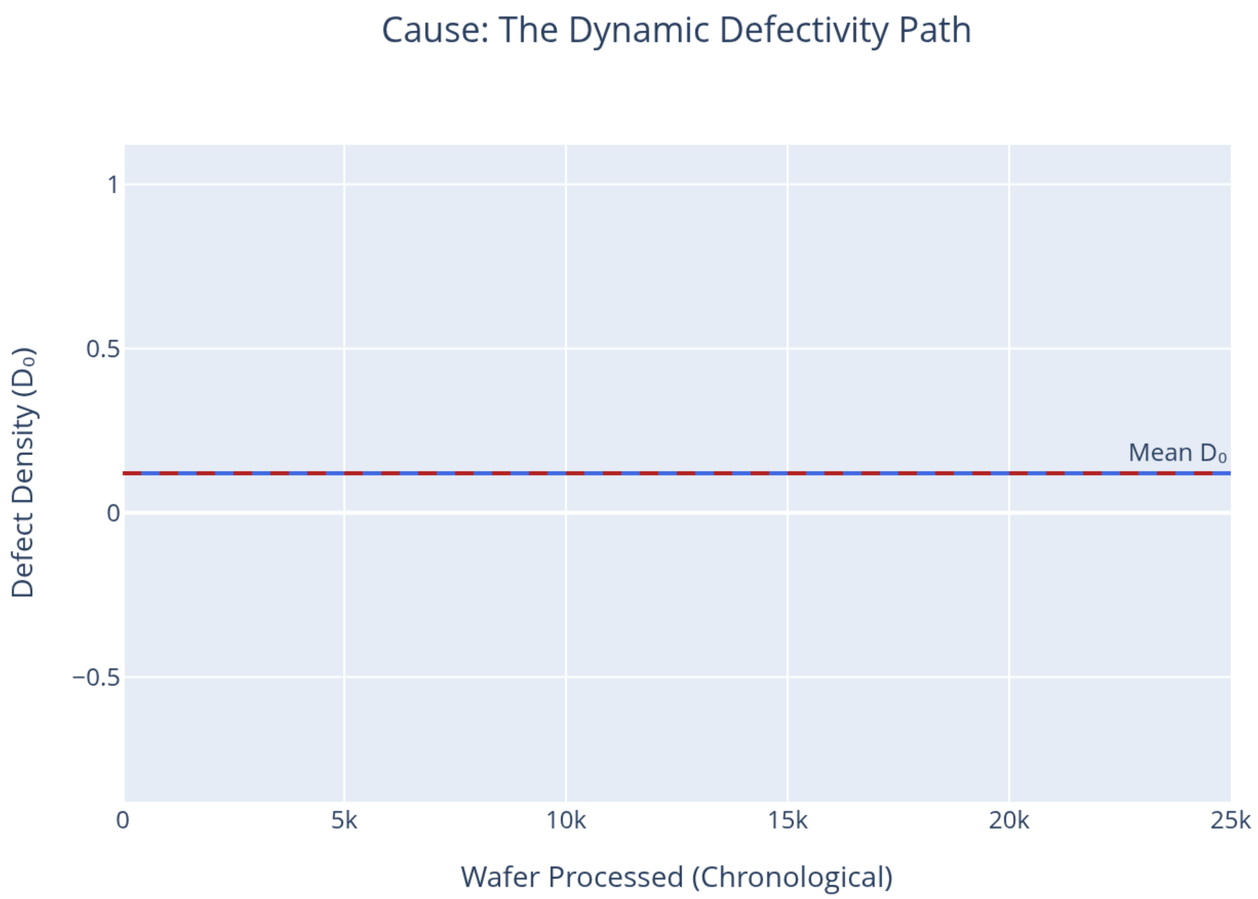
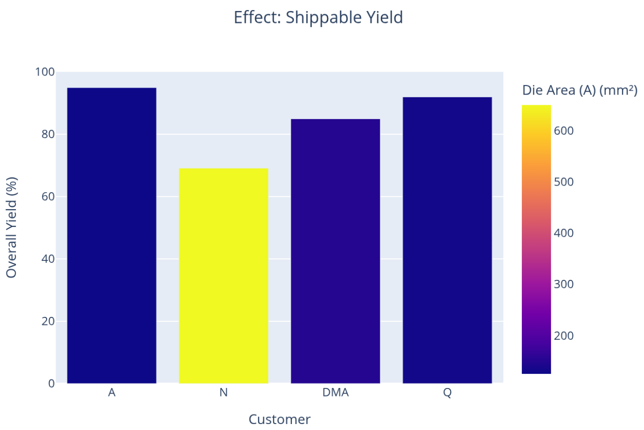
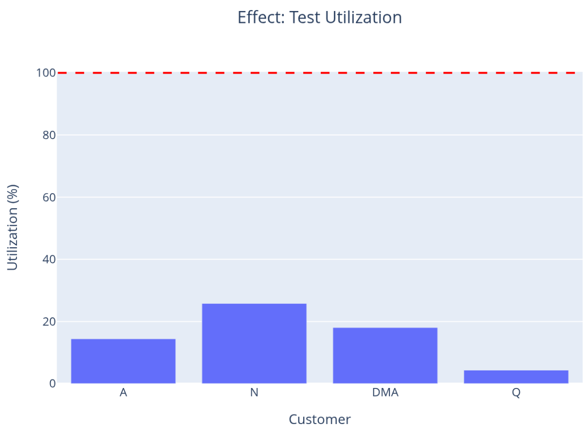
Visual Analysis of Scenario Impact

The chart below visualizes the underlying process stability (the 'Cause') for this scenario. The subsequent charts show the direct impact on production yield and operational load (the 'Effects').







Scenario: Stable Fab with Low Volatility

This scenario represents a realistic, well-run fab. Its Defectivity Path is not flat but exhibits low-level 'roughness' and minor fluctuations around the mean. This is the signature of a process that is in control but subject to normal statistical variation. This stability allows for high and relatively predictable overall yields, serving as the ideal operational target against which other scenarios can be measured.

Summary of Results:

Customer	Overall Yield	Shippable Dies	Test Load
A	**95.0%**	**4,824,417**	**14.4%**
N	**69.2%**	**503,604**	**25.8%**
DMA	**85.0%**	**1,801,073**	**18.0%**
Q	**92.0%**	**1,124,394**	**4.3%**

Visual Analysis of Scenario Impact

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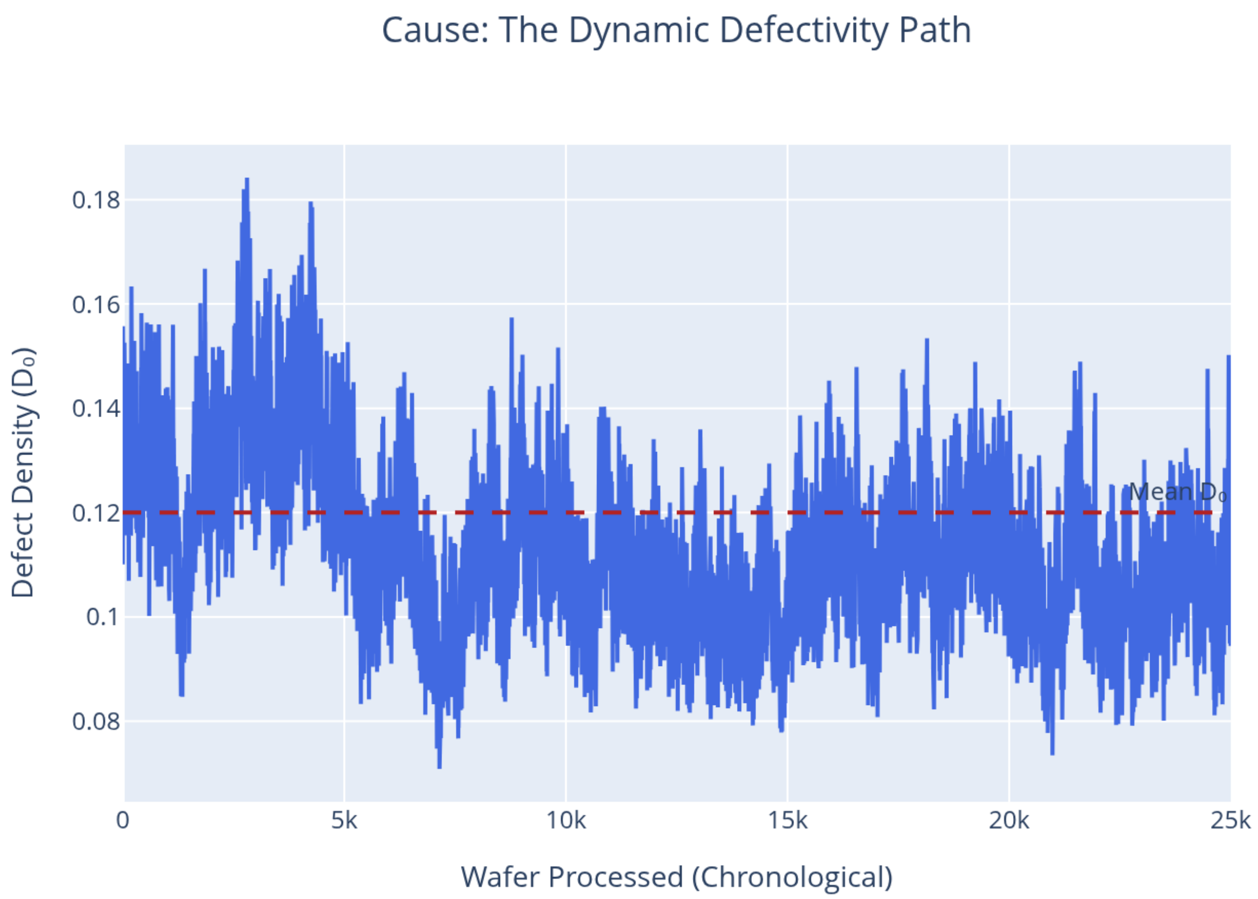
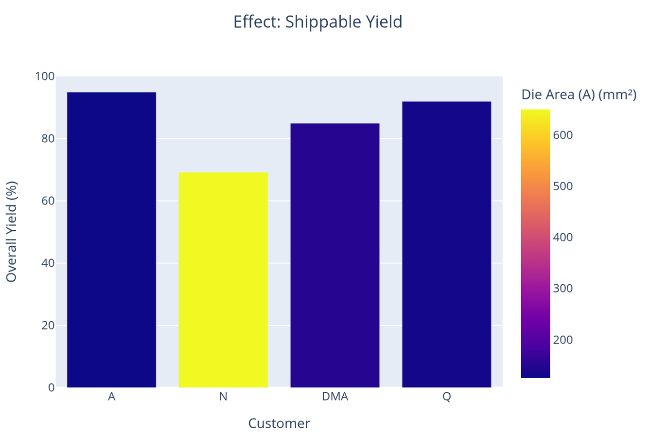
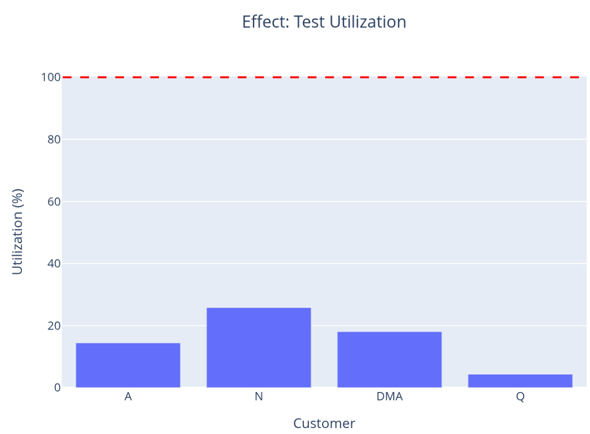






Scenario: Big Chip Yield Challenge

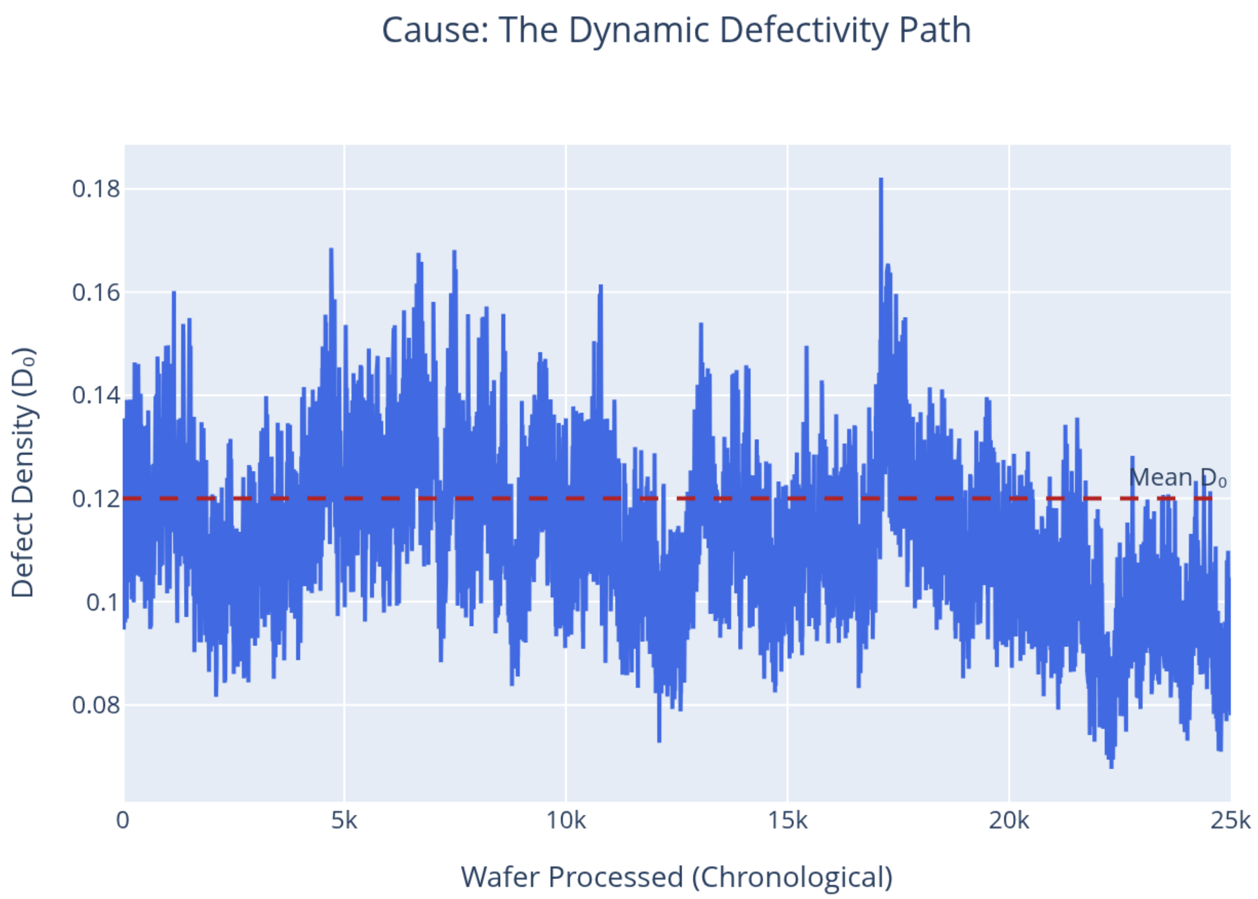
Here, we model a next-generation product from customer 'N' with a massive 850mm2 die area. The fab's underlying process remains stable, identical to the previous scenario. However, the larger die area drastically reduces functional yield due to the higher probability of a random defect. This illustrates a key principle: even a perfectly stable process faces a severe statistical yield penalty for larger, more complex chips.

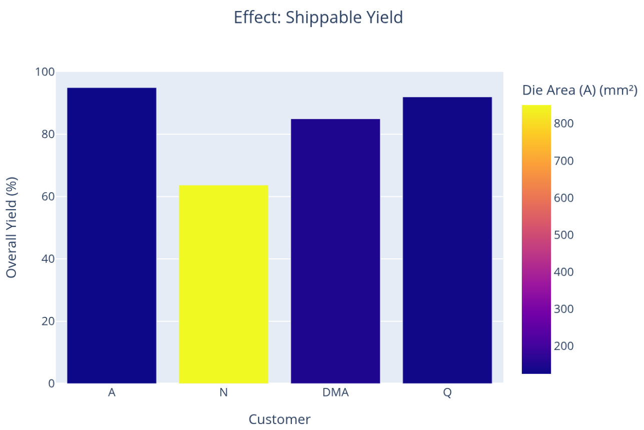
Summary of Results:

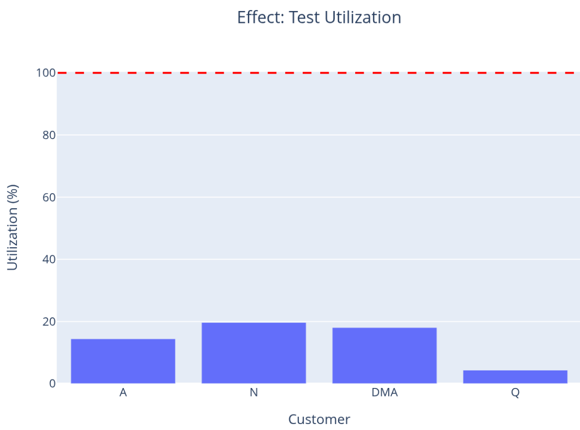
Customer	Overall Yield	Shippable Dies	Test Load
A	95.0%	4,824,482	14.4%
N	63.7%	353,511	19.7%
DMA	85.0%	1,801,096	18.0%
Q	92.0%	1,124,404	4.3%

Visual Analysis of Scenario Impact

The chart below visualizes the underlying process stability (the 'Cause') for this scenario. The subsequent charts show the direct impact on production yield and operational load (the 'Effects').







Scenario: Unstable Fab Risk

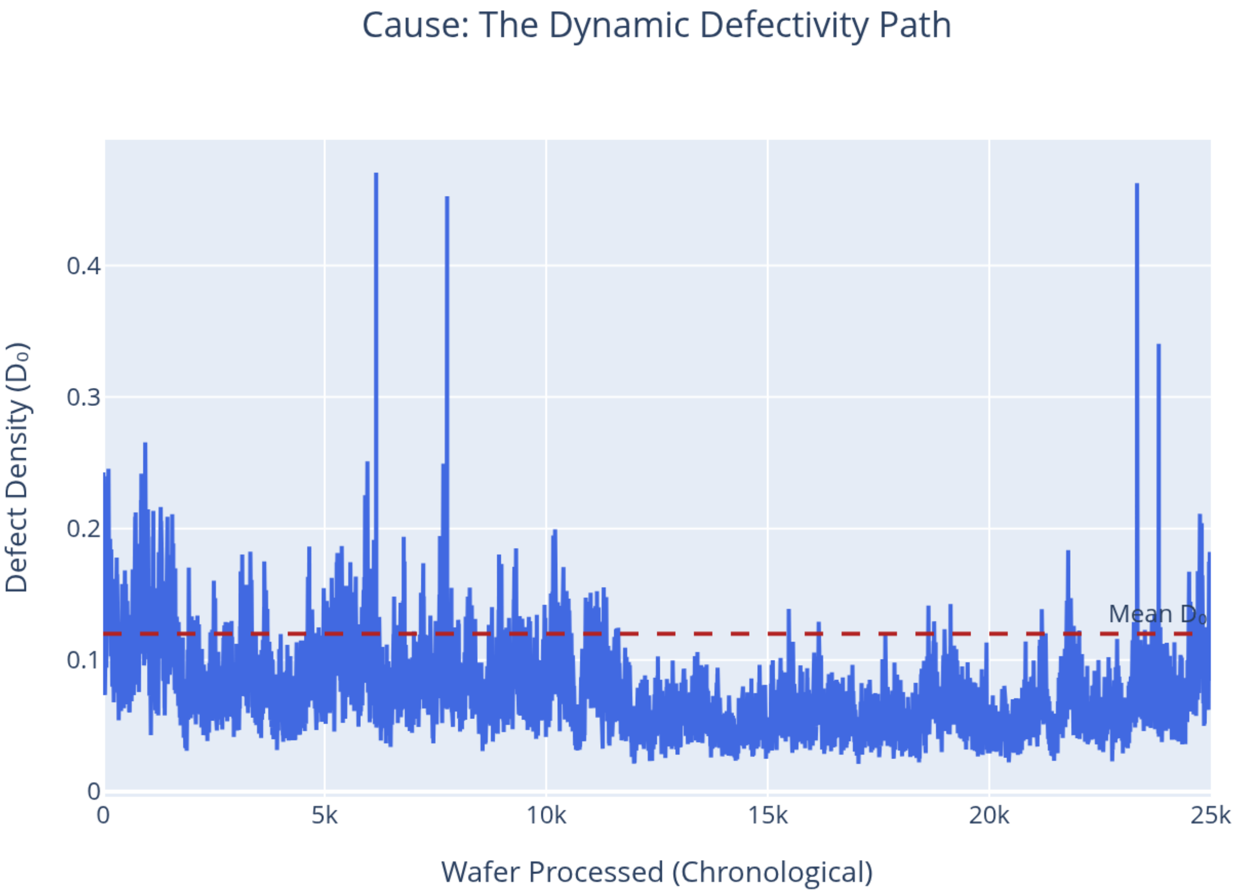
This scenario simulates a period of high process instability. The Defectivity Path is chaotic, with large, persistent swings and major excursion spikes. This volatility directly damages the functional yield of all customers. Furthermore, such instability degrades Parametric Yield, as modeled here with lower factors. This shows how poor process control creates a systemic risk that severely impacts the final output of shippable, profitable products.

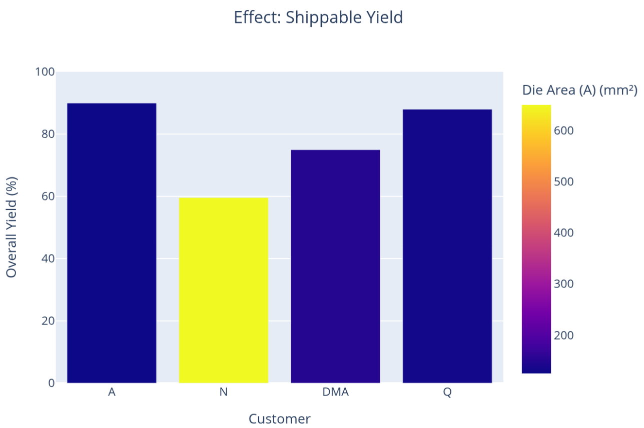
Summary of Results:

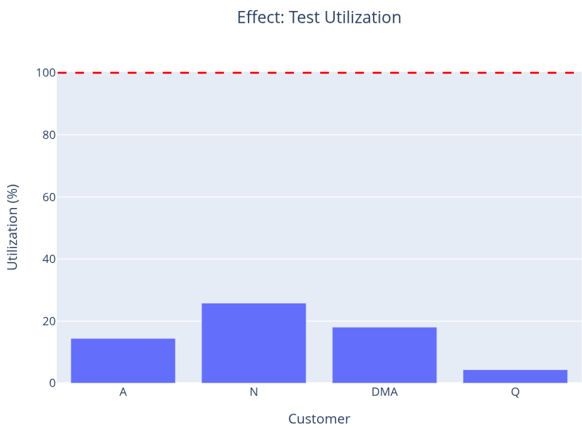
Customer	Overall Yield	Shippable Dies	Test Load
A	90.0%	4,570,892	14.4%
N	59.6%	433,743	25.8%
DMA	75.0%	1,589,574	18.0%
Q	88.0%	1,075,587	4.3%

Visual Analysis of Scenario Impact

The chart below visualizes the underlying process stability (the 'Cause') for this scenario. The subsequent charts show the direct impact on production yield and operational load (the 'Effects').







Summary: The Financial Impact of Instability

To quantify the financial cost of manufacturing risk, this section directly compares the total output of shippable dies across three key scenarios. The bar chart below visualizes the stark difference in production for each customer.

1. **The Cost of Reality:** Even moving from an 'Ideal' static process to a well-controlled 'Stable' one introduces minor volatility, resulting in an output loss of approximately **-0.0%**. This represents the inherent, unavoidable risk of real-world manufacturing.

2. **The Cost of Instability:** The drop from the 'Stable' fab to the 'Unstable' one is far more severe, causing an additional loss of **7.1%** in shippable product. This demonstrates that poor process control is not a minor issue but a primary driver of lost revenue and profitability. Investments in monitoring and excursion prevention yield direct, quantifiable returns.