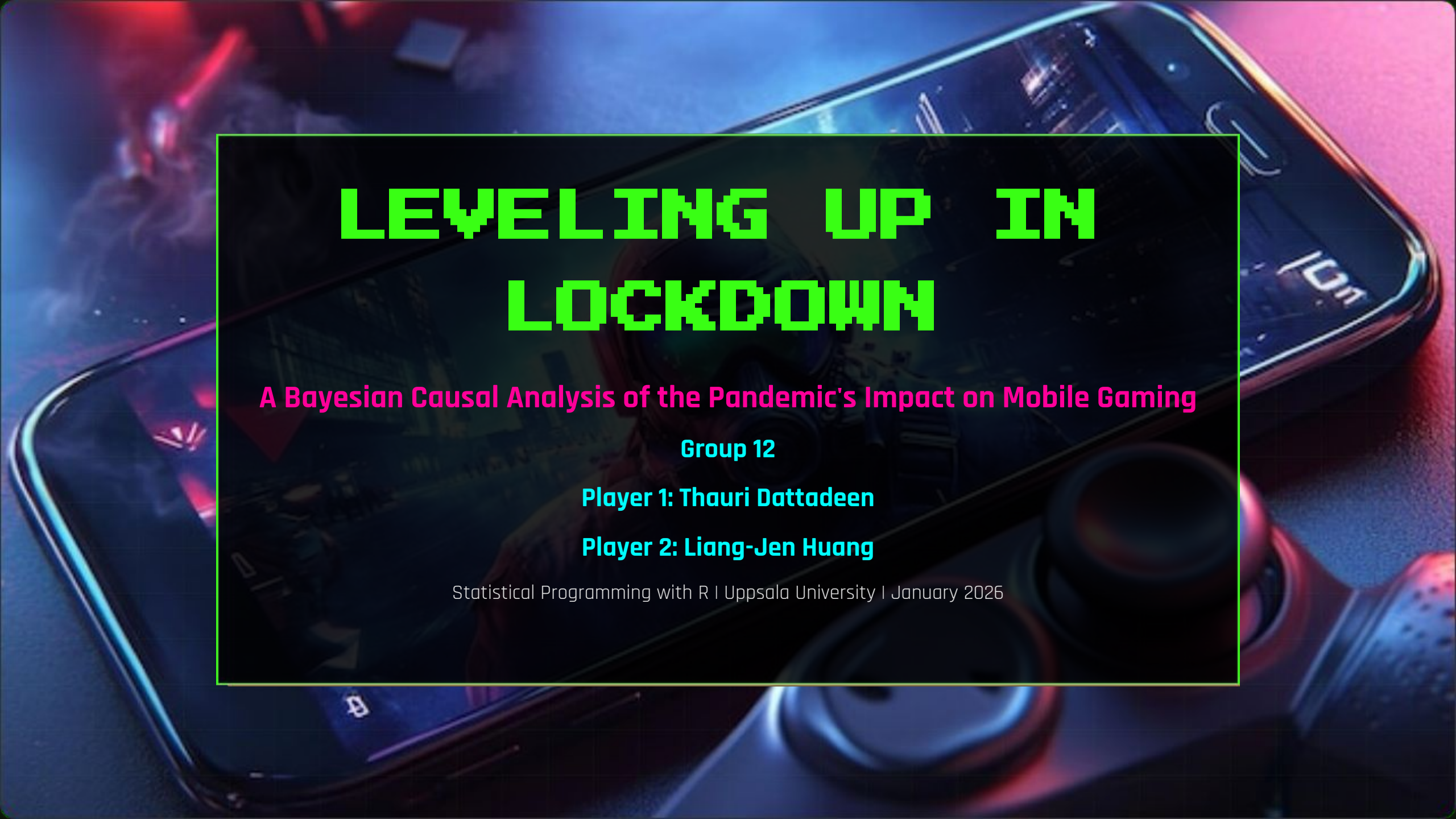


LEVELING UP IN LOCKDOWN

A Bayesian Causal Analysis of the Pandemic's Impact on Mobile Gaming

Group 12

Player 1: Thauri Dattadeen

Player 2: Liang-Jen Huang

Statistical Programming with R | Uppsala University | January 2026

MISSION BRIEFING: CONTEXT

THE SCENARIO

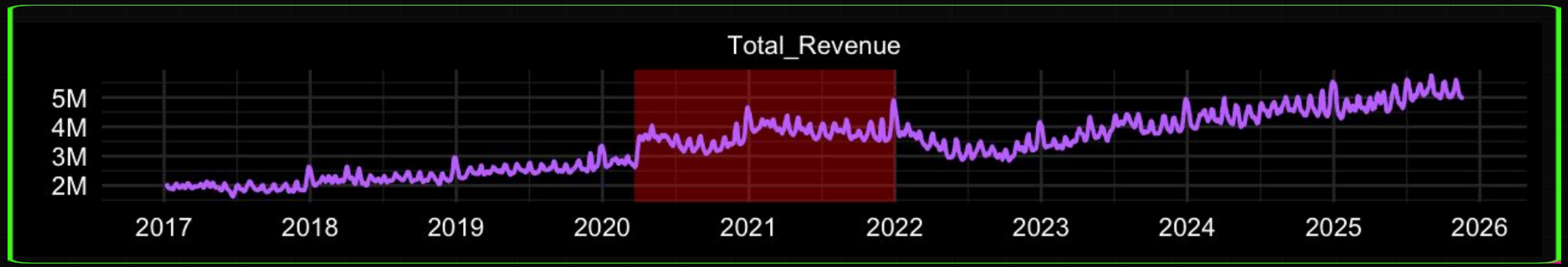
COVID-19 lockdowns forced the world indoors. Mobile gaming emerged as a primary entertainment source.

THE RESEARCH PROBLEM

Changes in behavior are observable, but correlation ≠ causality.

EXAMPLE DATA

I UK I Red Zones = COVID-19 Policies



CORE RESEARCH QUESTIONS

CAUSALITY

Did the pandemic truly cause an increase in downloads and revenue, or was it just trend continuation?

IMPACT SIZE

What is the estimated causal impact distinguishing it from pre-existing organic growth?

DURATION

Was the impact transient (temporary spike) or did it cause a permanent structural shift?

HETEROGENEITY

How did varying national policies (US, UK, Sweden, Taiwan) affect the impact?

INVENTORY: DATA & SCOPE

SENSORTOWER

Jan 2017 - Nov 2025

- **Acquisition:** Downloads
- **Engagement:** Daily Active User (DAU)
- **Monetization:** Revenue, Avg Rev per Daily Active User (ARPDAU)

MARKETS

Analyzing 4 diverse regions with varying policy responses:

USA, UK, Sweden, Taiwan

INTERVENTION

OxCGRT

Stringency Index

Used to pinpoint the exact timing of "lockdown" interventions for causal analysis.

THE ENGINE: BSTS MODEL

BAYESIAN STRUCTURAL TIME SERIES

We use BSTS to estimate a **counterfactual**: *What would have happened without the pandemic?*

This allows us to disentangle pandemic effects from underlying organic growth and seasonal patterns.

THE ALGORITHM

$$y_t = \mu_t + \gamma_t + \epsilon_t$$

μt : Local Linear Trend (Baseline growth)

$$\mu_{t+1} = \mu_t + \delta_t + \eta_{\mu,t}, \quad \eta_{\mu,t} \sim \mathcal{N}(0, \sigma_\mu^2)$$
$$\delta_{t+1} = \delta_t + \eta_{\delta,t}, \quad \eta_{\delta,t} \sim \mathcal{N}(0, \sigma_\delta^2).$$

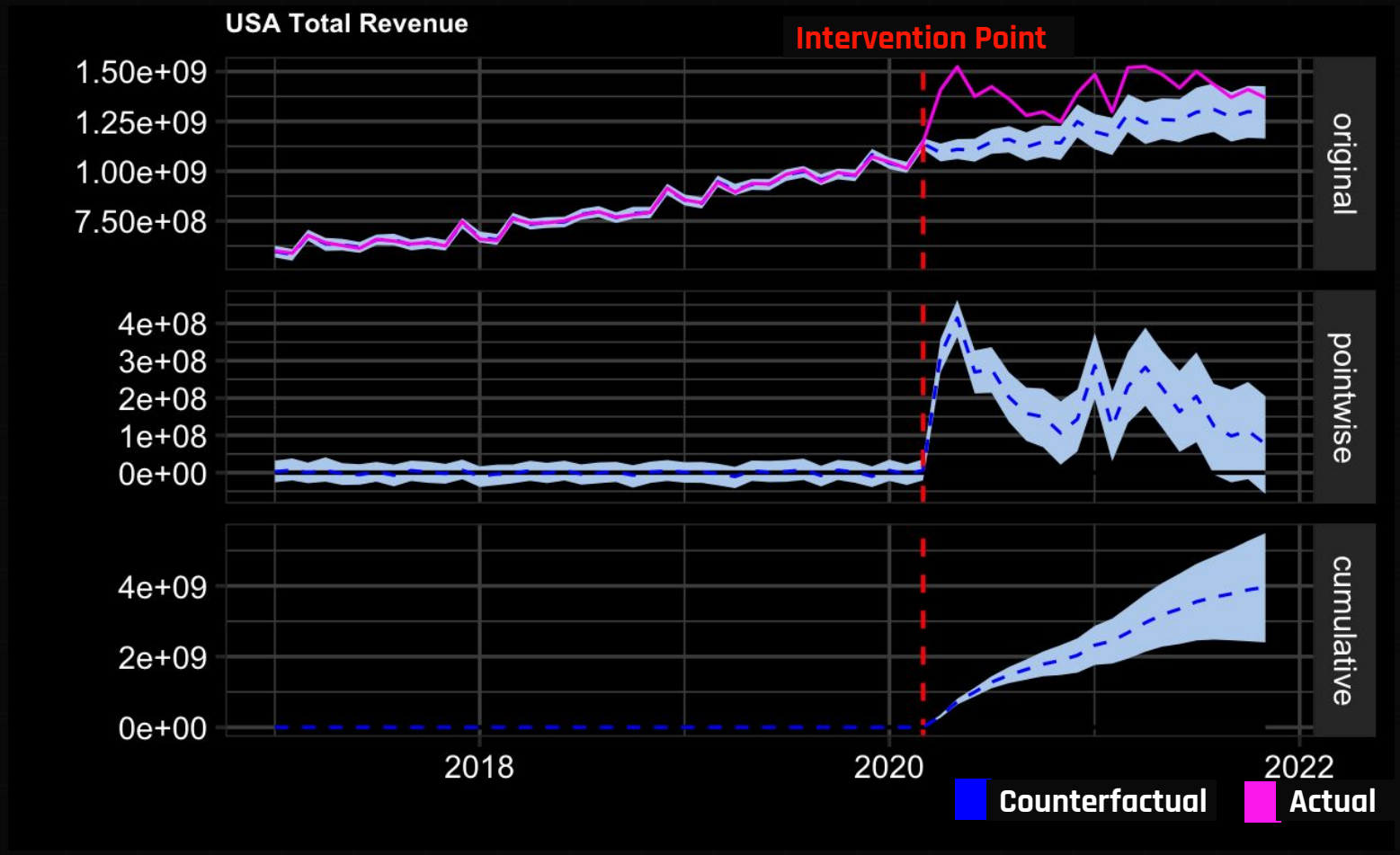
γt : Seasonality (S=12, Annual cycles)

$$\sum_{s=0}^{S-1} \gamma_{t+s} = \eta_{\gamma,t}, \quad \eta_{\gamma,t} \sim \mathcal{N}(0, \sigma_\gamma^2).$$

εt : Observation Error (Noise)

$$\epsilon_t \sim \mathcal{N}(0, \sigma_\epsilon^2).$$

Model Implementation



Applying the instructions

Counterfactual scenario created

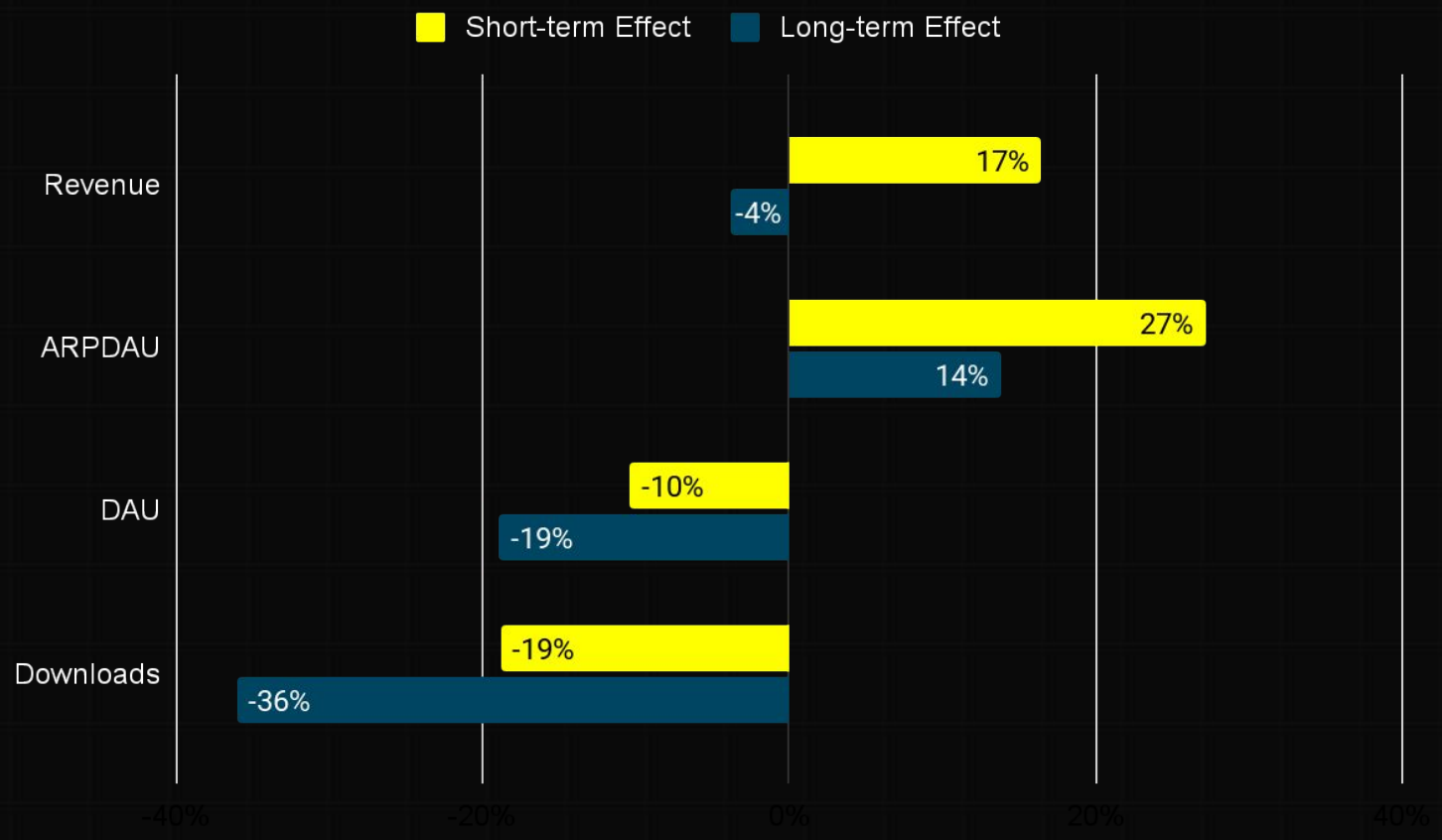
$$y_t = \mu_t + \gamma_t + \epsilon_t$$

Difference calculated between Actual and Modelled

Cumulative Difference over period

Visualization of the CausalImpact package logic: The difference between the solid pink line (reality) and dashed blue line (prediction) is the causal effect.

MISSION RESULTS: USA



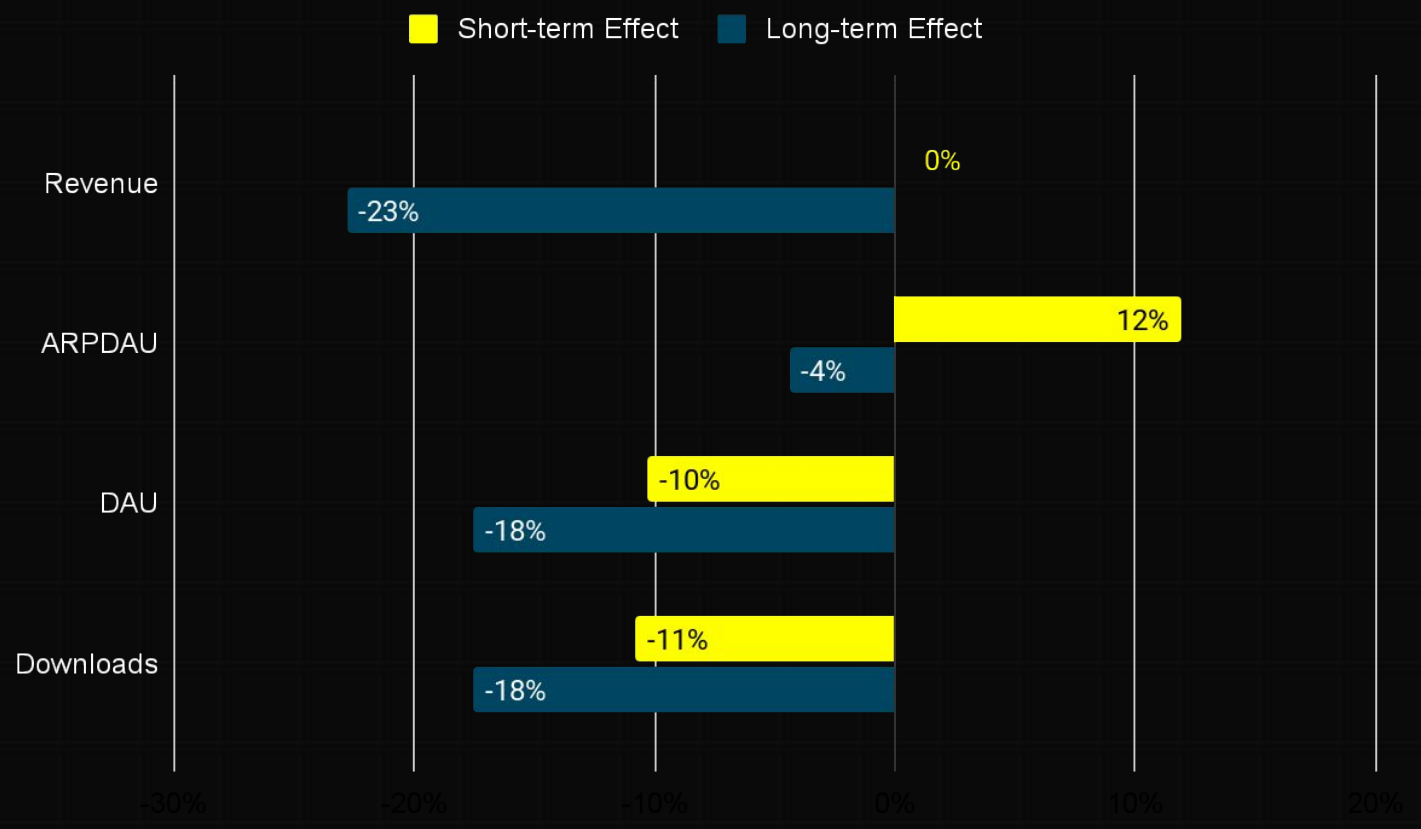
USA

- Strict Government restrictions

- Large short-term monetisation impact during the lockdown [significant]

- Negative impact on DAU and Downloads

MISSION RESULTS: SWEDEN



SWEDEN

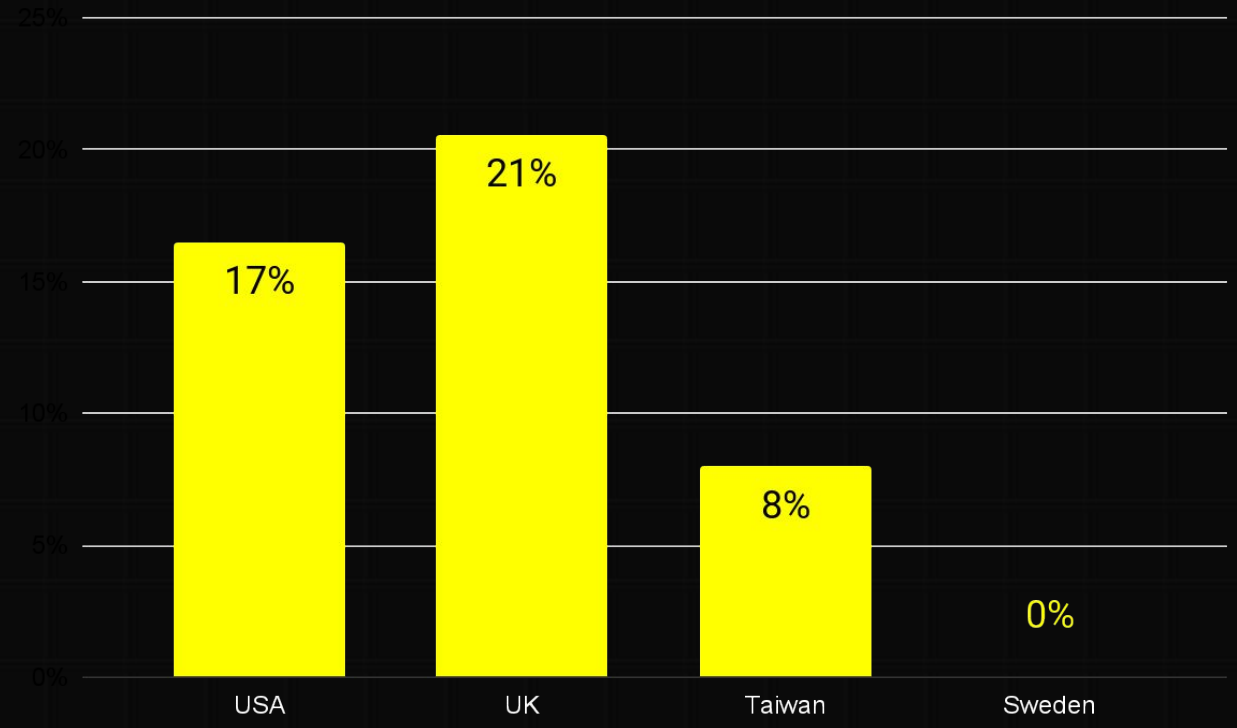
- Loose Government restrictions

- Small short-term monetisation impact during the lockdown [not significant]

- Negative impact on DAU and Downloads [not significant]

MISSION RESULTS: SHORT-TERM IMPACT

REVENUE RELATIVE EFFECT (Mean)



High Heterogeneity: US and UK showed massive monetization spikes. Sweden and Taiwan effects were weaker, likely due to less stringent policy responses.

THE LOOT DROP: SPENDING VS. GROWTH

MONETIZATION (REVENUE & ARPDAU)

SMALL INCREASE

Existing players spent more due to "Constraint-Induced Substitution."

With other entertainment closed, disposable income shifted to In-App Purchases.

USER BASE (DAU & DOWNLOADS)

FLAT or DECLINING

The pandemic did **not** lead to a sustained expansion of the player base.

Long-term effects on downloads were often negative or insignificant.

CONCLUSION: LEVEL COMPLETE?

- **Short-Term Boost:** The pandemic caused a temporary spike in spending where there were Strong Governmental Policies, not a permanent structural shift.
- **Existing Users:** Revenue growth was driven by current players "maxing out," not new players joining.
- **Reversion to Mean:** As restrictions relaxed, the "hard constraints" vanished, and behavior normalized.

VERDICT: TEMPORARY BUFF

QUEST COMPLETE

PRESS START FOR Q&A