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**#MWC24MP**

# Private Networks Fashion: Spectrum for Industries

# Welcome Remarks

Luciana Camargos  
Head of Spectrum  
GSMA

# Moderator

Carol Sosa Leguizamón  
Spectrum Policy Director  
GSMA

# Private networks do not equal private spectrum

Ross Bateson

Spectrum Special Advisor

GSMA

# AT&T to Bring Elevated Wireless Experience to DFW Airport

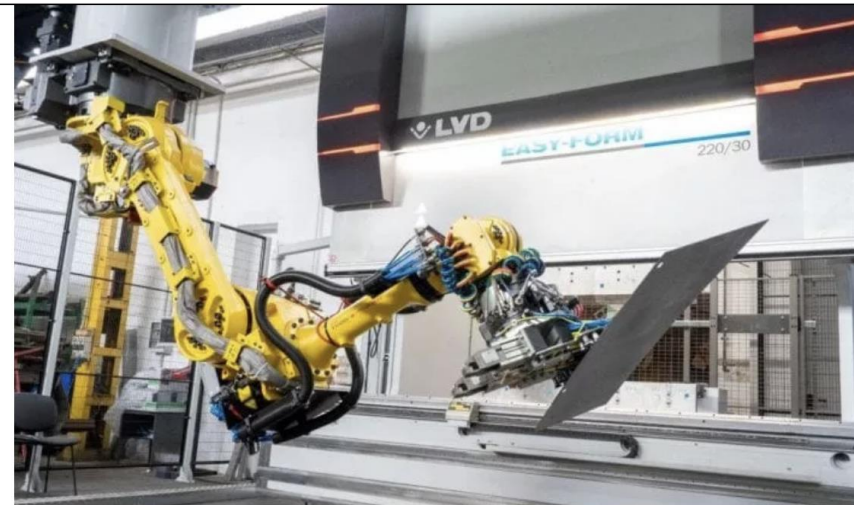
We're modernizing and expanding DFW Airport network to support airport operations and provide reliable, high-capacity connectivity.

share    

Subscribe to AT&T news



# Reti private 5G di Tim, l'azienda salentina Ilmea tra le prime in Italia a dotarsene



Da due anni, l'impresa con sede nel piccolo villaggio di Boncore, frazione di Nardò, investe in sistemi di efficientamento della produzione in ottica Industria 4.0

# Port of Hamburg is ready for 5G

## Operators and ecosystem players are vying to address private 5G opportunity

June 19, 2023



The debate over whether or not enterprises should have access to dedicated spectrum in India has been heated.



Guangzhou Metro 5G + Smart Metro

“5G technology facilitates the digital development of the traditional urban rail transit industry by driving the transformation from the traditional multi-layer, complex and fixed network to the flat, lightweight and updateable architecture. First, the high reliability of 5G network enables trains to better perceive the operating environment and their own operating status, thereby improving the transportation capacity of metro lines. Second, the massive connections of 5G network facilitate the establishment of a visual resource scheduling system for each line of the urban rail transit network. The system is designed to monitor the status of passengers and trains in real time, and improve the efficiency of operation and management. Finally, the large bandwidth of 5G network brings about new customer service platforms, allowing timely and accurate access to services in abundant transportation scenarios in the entire metro travel chain through multiple online and offline channels, and improving the travel experience.”

Cai Changjun  
Deputy General Manager of Guangzhou Metro Group

Partners   

# Airtel partners Tech Mahindra to deploy captive private network at Mahindra's Chakan Facility

## Puerto Bahía digitalizará su terminal portuaria con soluciones de Claro y Nokia

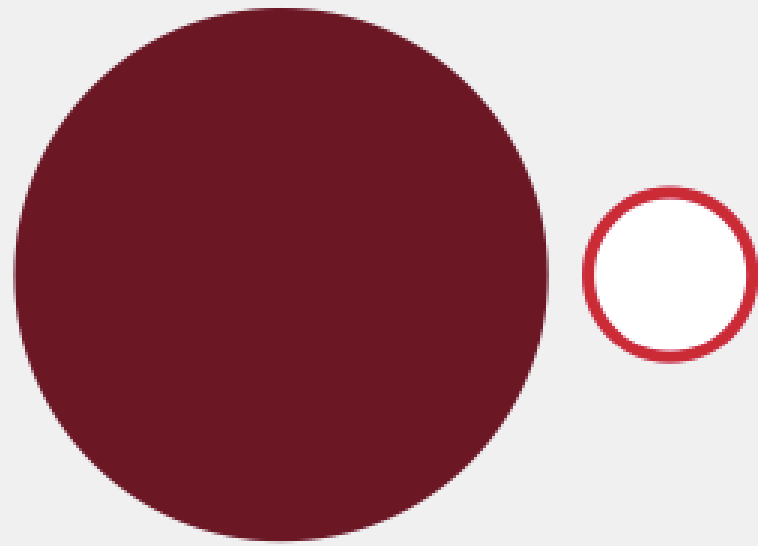
Sharon Durán — May 10, 2023

CLARO COLOMBIA COLOMBIA NOKIA



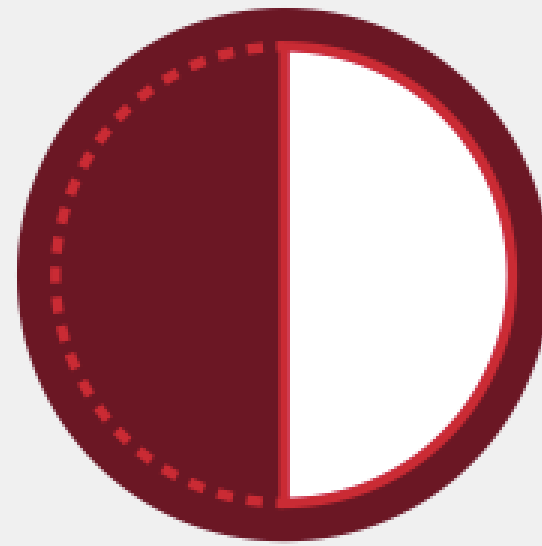
# Spectrum Methodologies

Set aside spectrum



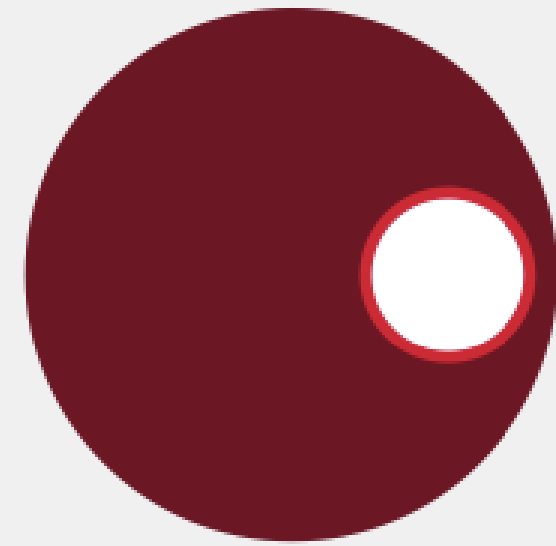
Assigning a range of spectrum to be exclusively licenced to industry users

Spectrum sharing framework



Enabling several users to access spectrum simultaneously

Licence conditions for public mobile operators



Enabling or requiring public mobile operators to deploy private networks or lease spectrum



# Impact of Carve-Outs



100 MHz channels possible for three existing MNOs

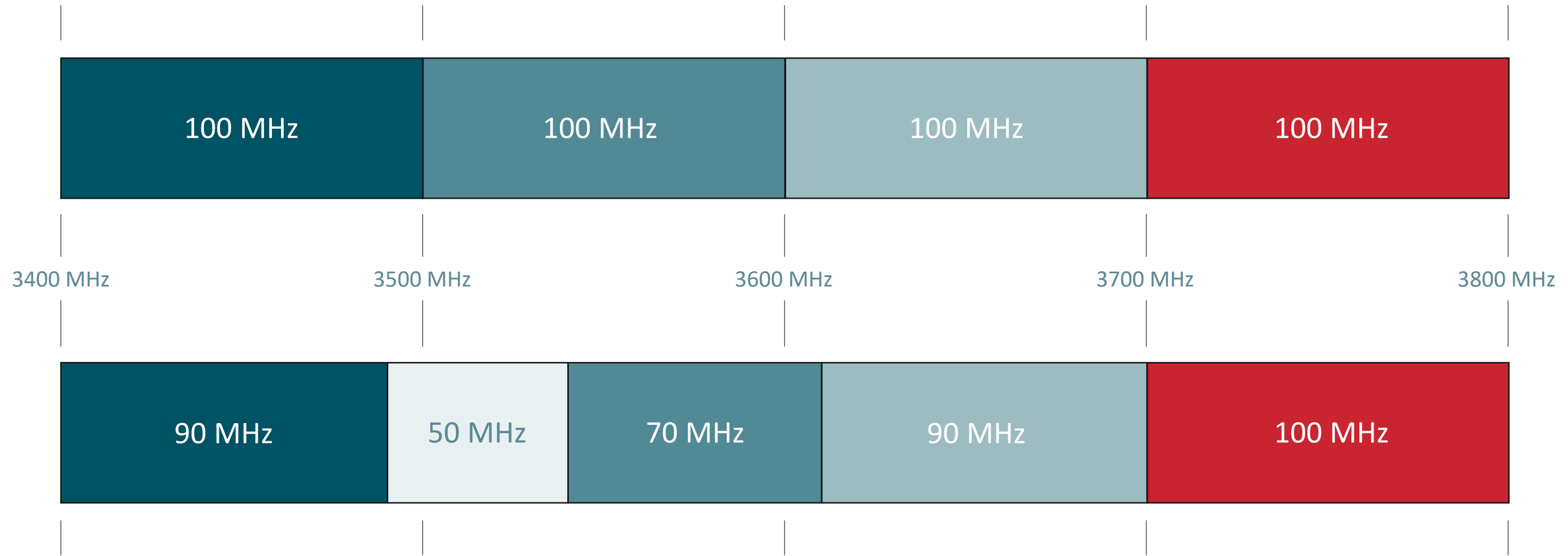
Balanced competition through equal bandwidth



Unknown efficiency of carve-out

# Spectrum Scarcity

After auction



A fourth operator joins and carve-out creates spectrum scarcity



Imbalanced 3.5 GHz assets harm competition

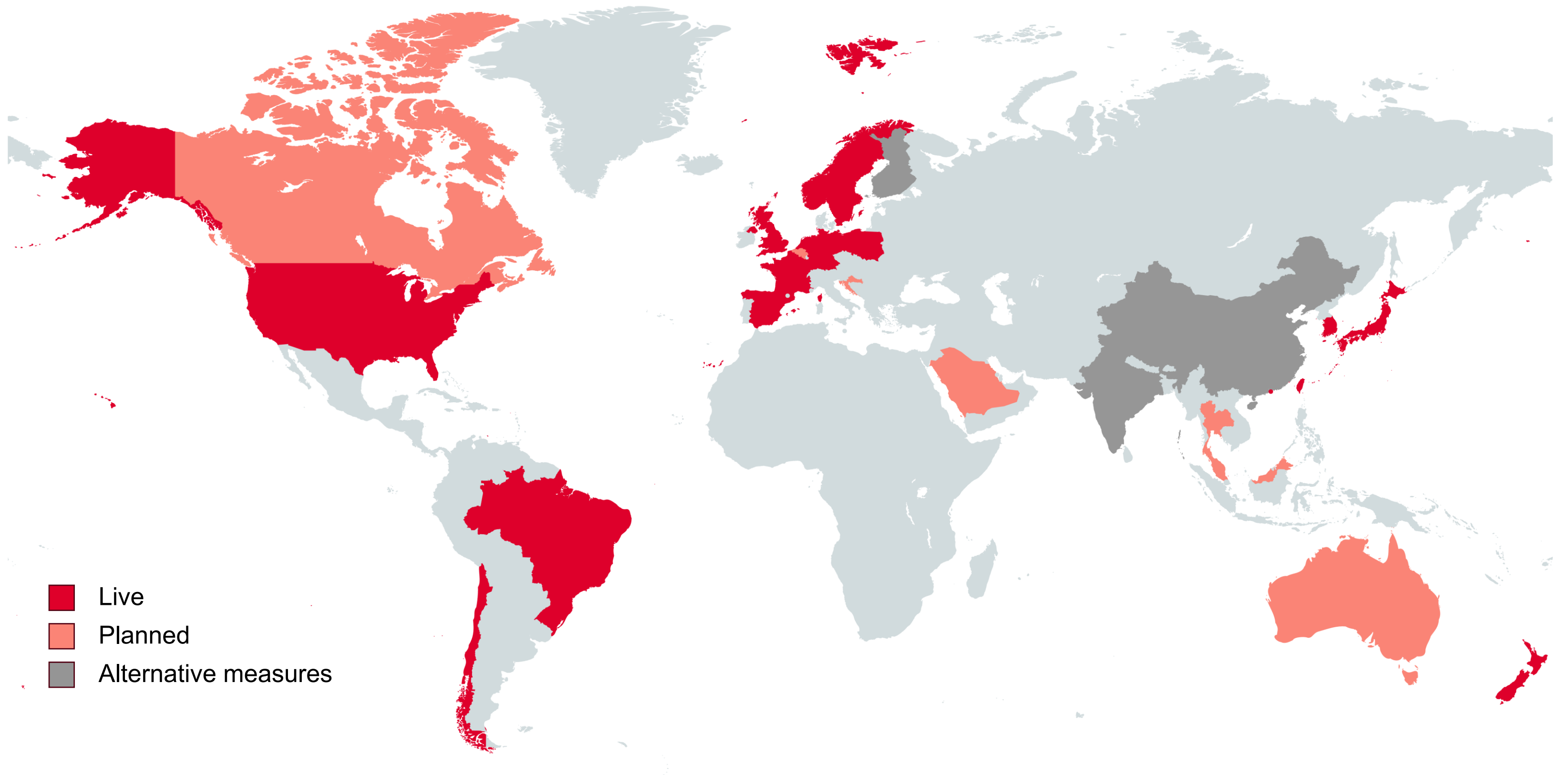


High prices paid at auction

# Set-Asides Regulation

February 2024

**GSMA**<sup>TM</sup>



- Live
- Planned
- Alternative measures

# Correlation Claims



**Spectrum continues to be the one single element essential for the existence of a private network market.**

- The most active countries are those where spectrum is available for industries and enterprises. The US (43% of all announcements) and Germany (8% of announcements) were the countries with the highest number of recorded announcements as of the end of 2020.

### Dedicated spectrum is driving growth

- Strong positive correlation between liberalised spectrum and PMN adoption
- **The US** with CBRS continues to lead the way, followed by Germany
- Growth in 1Q23 in Western Europe, with **France, Spain, Belgium and the Netherlands** rising more than 10%

Note that figures do not include anonymous references where locations are hidden

Country	Category	% change in quarterly net additions
United States	Countries with dedicated spectrum for industry	10%
Germany	Countries with dedicated spectrum for industry	9%
China	Countries with dedicated spectrum for industry	2%
United Kingdom	Countries without dedicated spectrum for industry	6%
Japan	Countries with dedicated spectrum for industry	6%
Finland	Countries with dedicated spectrum for industry	6%
France	Countries with dedicated spectrum for industry	12%
Sweden	Countries with dedicated spectrum for industry	6%
Republic of Korea	Countries with dedicated spectrum for industry	6%
Spain	Countries with dedicated spectrum for industry	15%
Australia	Countries with dedicated spectrum for industry	7%
Russia	Countries without dedicated spectrum for industry	9%
Austria	Countries without dedicated spectrum for industry	9%
Poland	Countries without dedicated spectrum for industry	13%
Brazil	Countries considering dedicated spectrum for	13%
India	Countries without dedicated spectrum for industry	13%
Taiwan	Countries with dedicated spectrum for industry	17%
Canada	Countries without dedicated spectrum for industry	17%
Belgium	Countries with dedicated spectrum for industry	17%
Netherlands	Countries with dedicated spectrum for industry	17%
Czechia	Countries with dedicated spectrum for industry	17%
Hungary	Countries without dedicated spectrum for industry	17%
Mexico	Countries without dedicated spectrum for industry	17%
Peru	Countries without dedicated spectrum for industry	17%
Denmark	Countries with dedicated spectrum for industry	17%

- Ongoing information vacuum leading to incorrect assumptions
- New GSMA Intelligence analysis

# Digital Industry without Downside

## China is first out of the gate to Industry 4.0

The race towards the 5G-powered Fourth Industrial Revolution is on and China has a decisive head start

## 5G as a Catalyst of China's Economic and Social Development

The number of virtual private 5G networks for enterprises and vertical industries is over 16,000. The progress is leading global 5G development and has boosted China's digital economic development.

## Finland

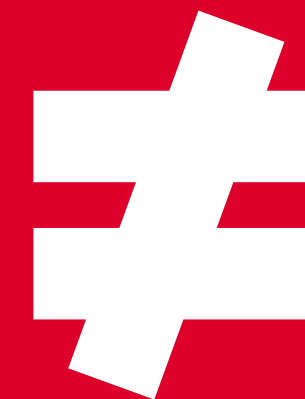
Incentivising innovation without set-asides through licence conditions and cooperation

“Finland met the spectrum needs of nationwide and private networks without a set-aside in any core bands. In doing so, the authorities created an efficient compromise that has preserved spectrum usability and created incentives to invest in mobile connectivity.”



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Private  
Networks



Private  
Spectrum

[GSMA Set-Asides Page](#)

SPECTRUM for the benefit of billions

# Cost-benefit analysis of spectrum carve-outs

Jakub Zagdanski  
Senior Economist  
GSMAi

**SSMG**

# Cost-benefit analysis of spectrum carve-outs

26<sup>th</sup> of February  
2024

**AUTHORS**

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Kalvin Bahia



# Set-asides as a spectrum licensing option:



## Impact on industry users:

- + Geographic (local) licensing
- + Certainty of access and tenure
- ? Interference management



## Impact on consumers:

- Reduced spectrum availability
- Inefficiency of spectrum use
- Associated economic cost

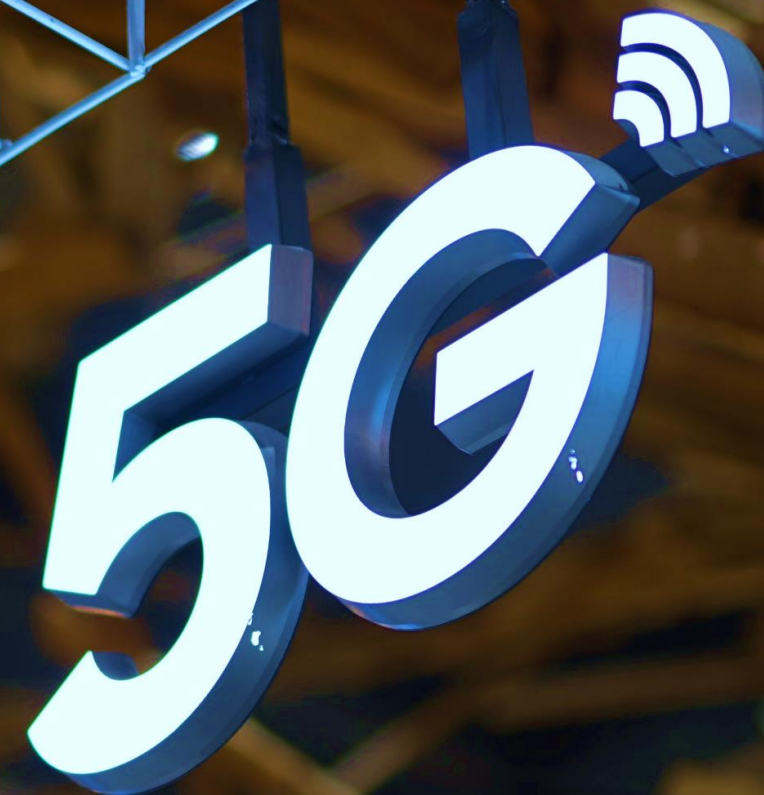
# Are set-asides worth it?

## Part 1 (The benefit):

Is there evidence of an impact on adoption of private networks (and enterprise digitalization more generally) beyond loose associations?

## Part 2 (The cost):

What is the magnitude of the negative impact on public networks quality?



# Correlation does not mean causation

Set-asides policy



Private network adoption



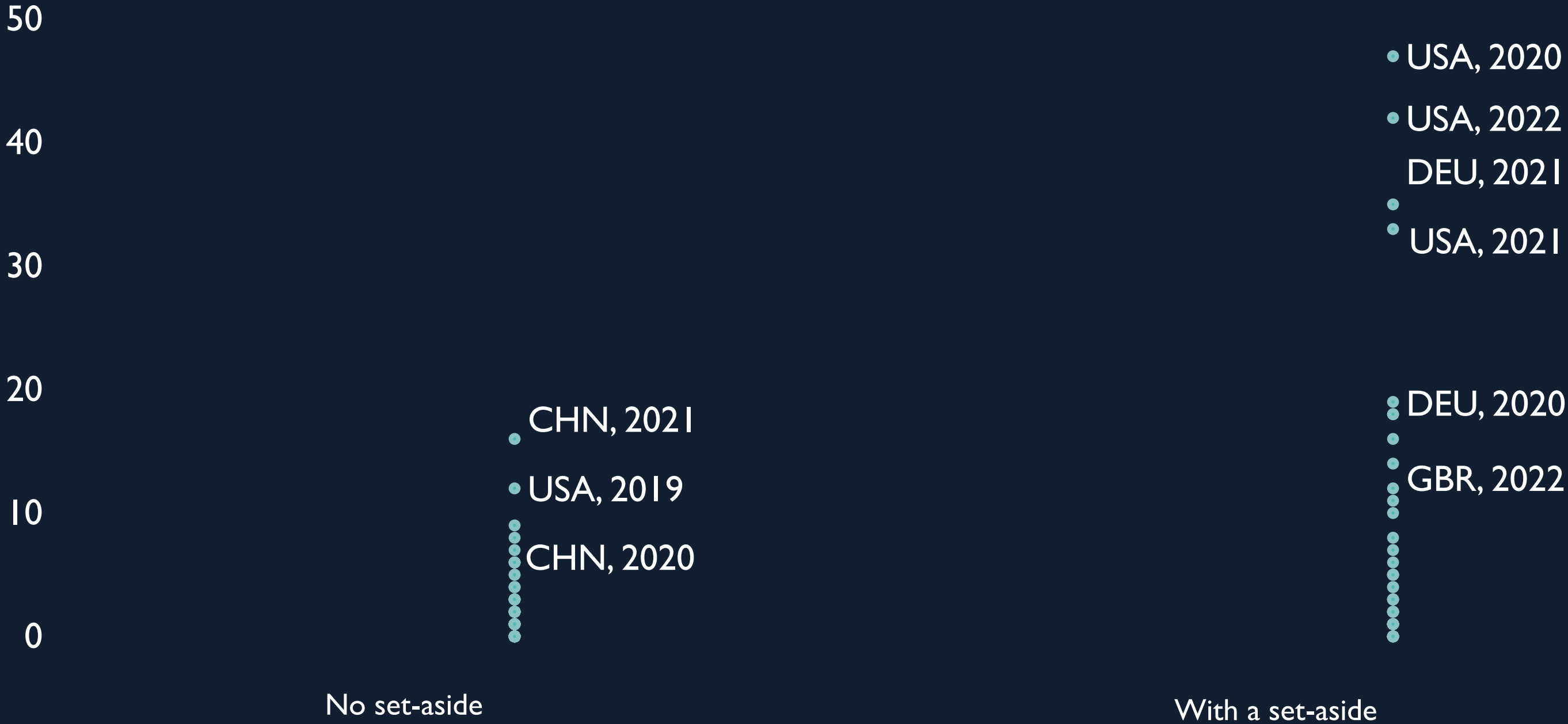
Time trend and effect of other confounders



Private networks would invariably grow over time as 5G is rolled out, regardless of set-asides: naïve comparison could be capturing just that

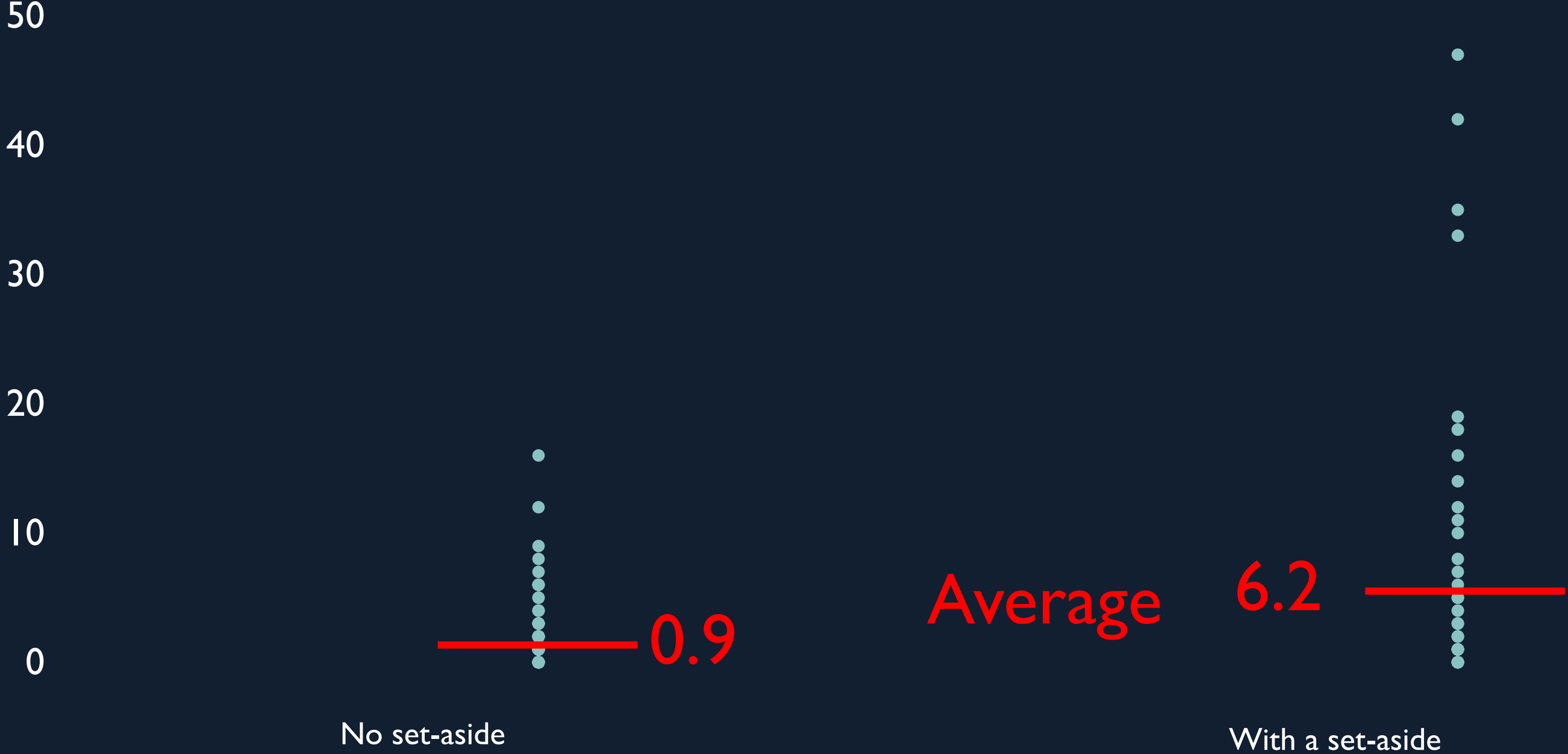
# Examining raw correlations

Private network customer launches per year



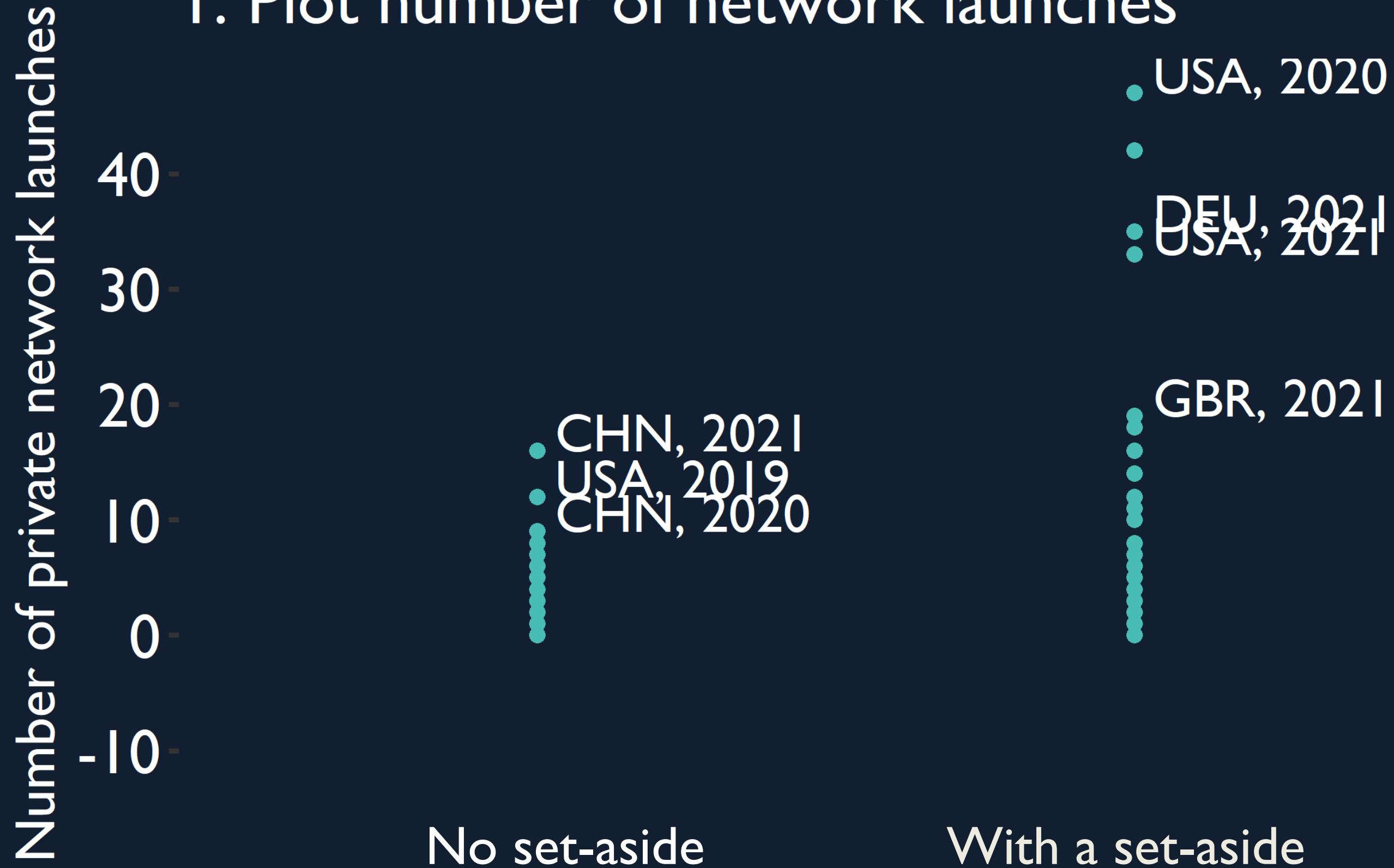
# Naively, spectrum set-asides are associated with five times greater number of launches

Private network customer launches per year

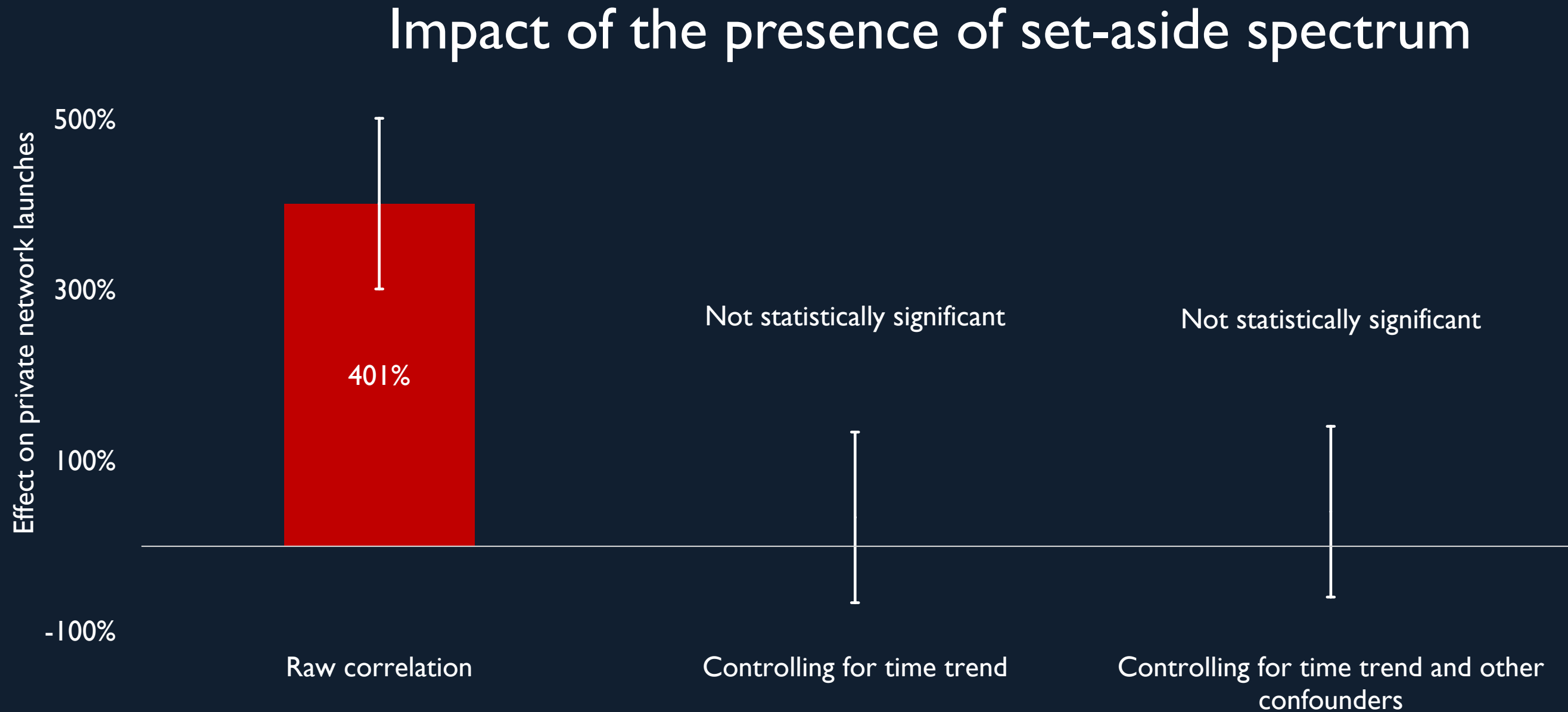


# Impact vanishes once we control for time trends

## I. Plot number of network launches

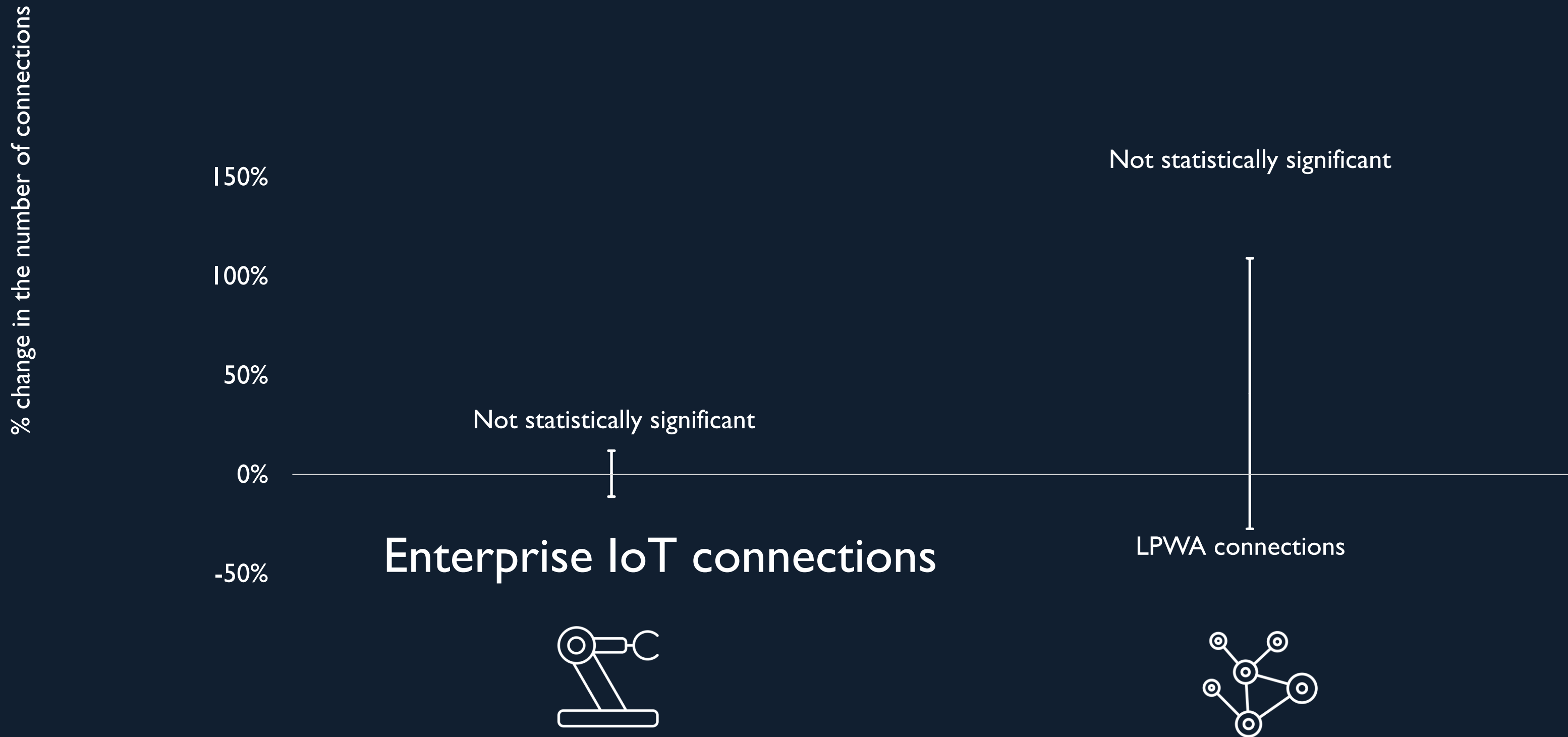


# Impact of set-aside spectrum vanishes once controlling for time trends and other confounders



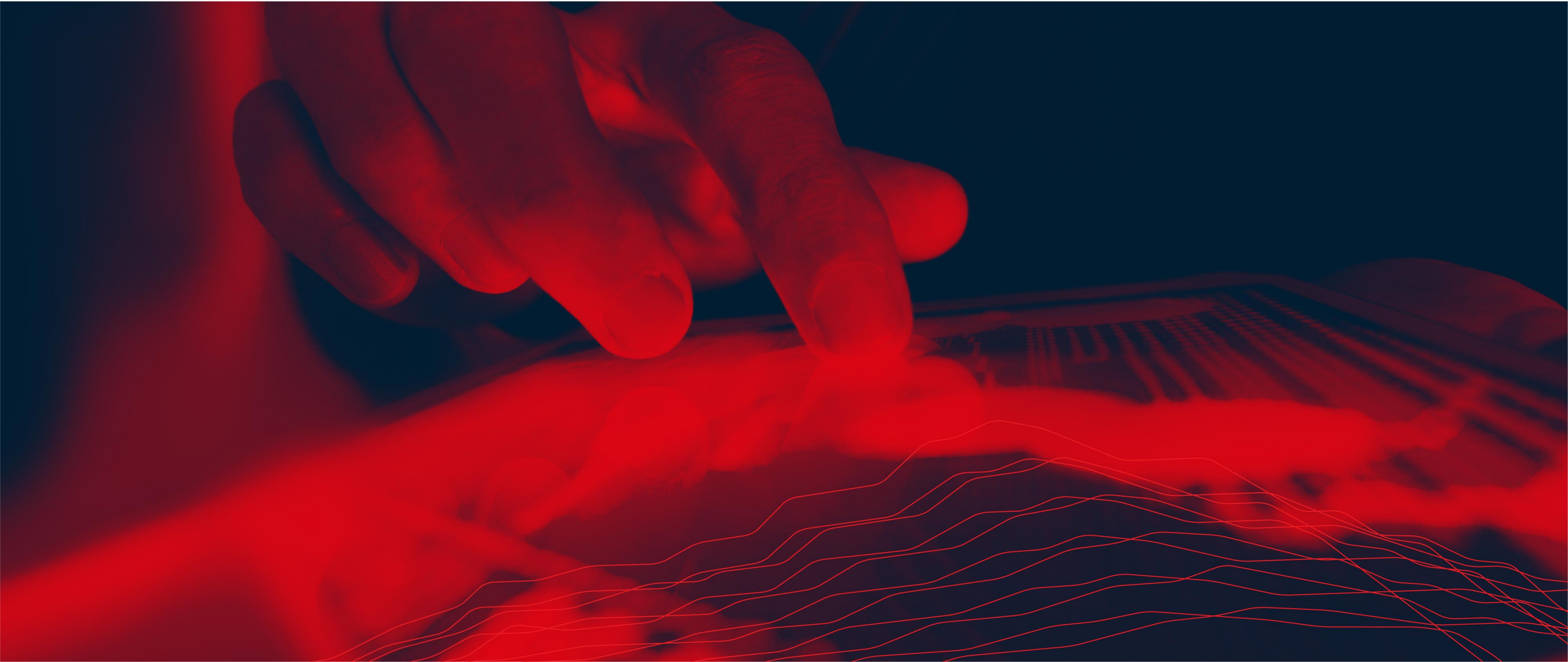
# Alternatively, digitalization of enterprises can be measured by the number of IoT connections:

Impact of the presence of set-aside spectrum



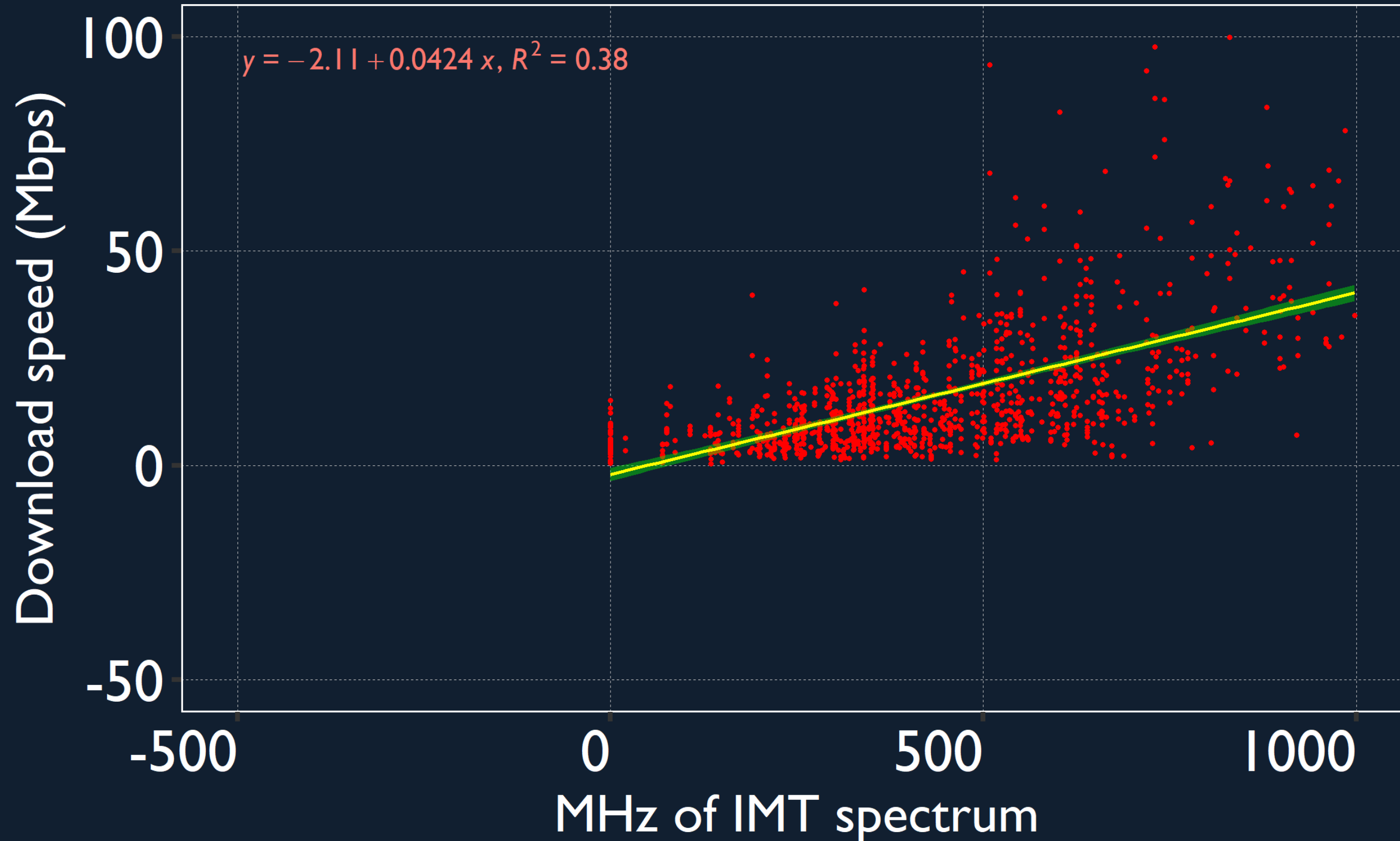


# Part 2 (The cost): Impact of spectrum availability on public network speeds



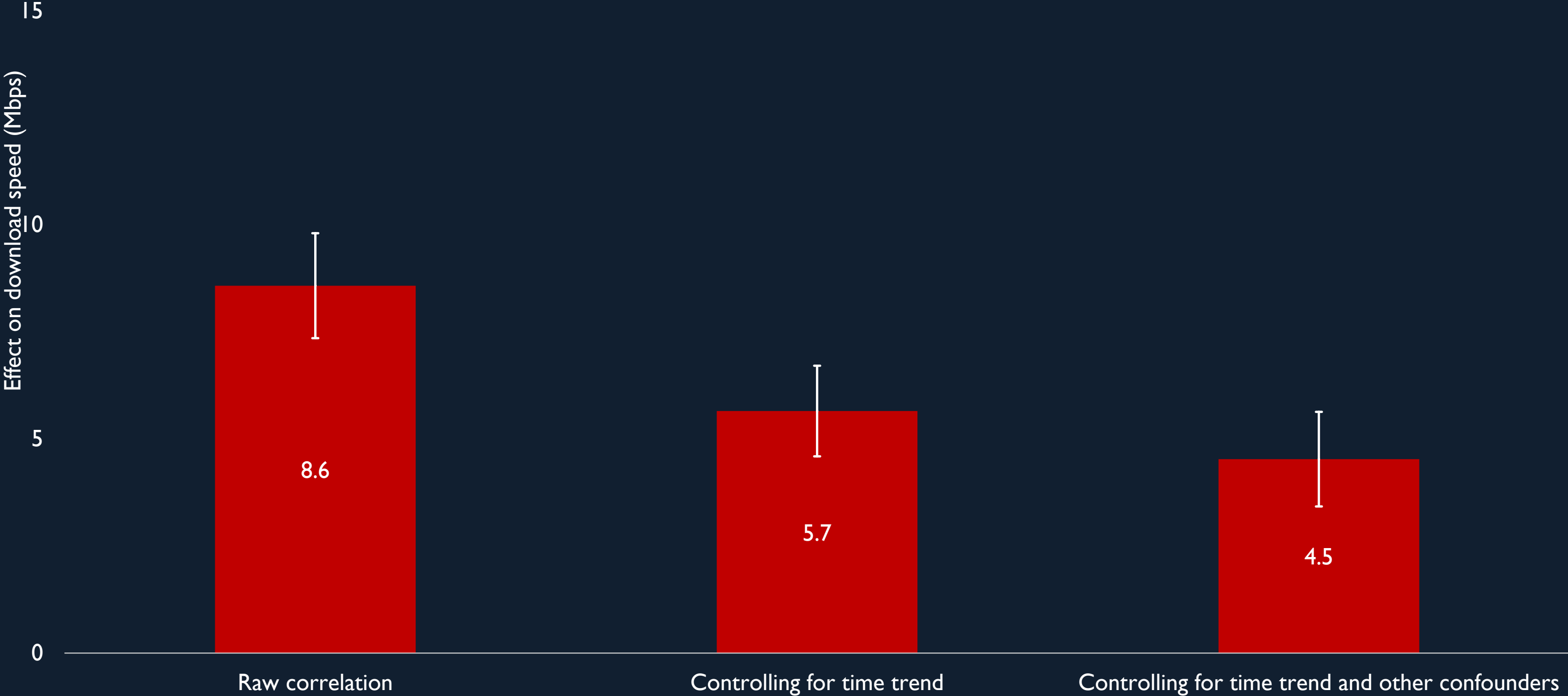
# Impact of spectrum remains once controlling for confounders

## I: Plot speed against spectrum

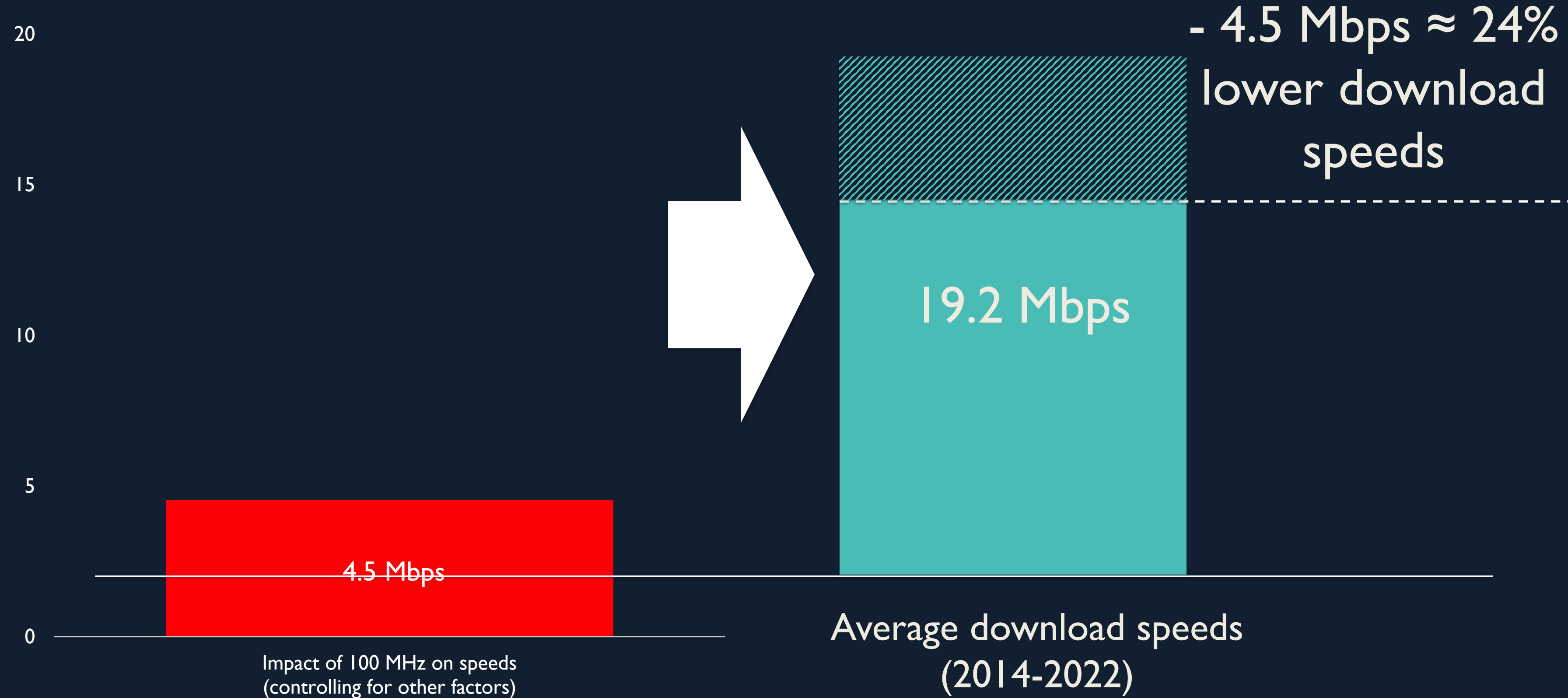


# More spectrum means faster public mobile networks

Impact of 100 MHz of additional IMT spectrum on download speeds (Mbps, 2014-2022 avg.)



A typical set aside amount (100 MHz) would mean speeds  
**24% lower**



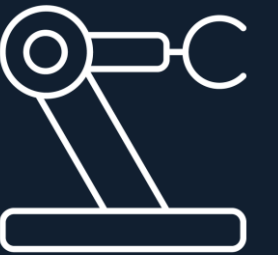
# Bottom line:

- Data do not support the arguments that setting aside spectrum boosts adoption of private networks or promotes a faster digitisation of enterprises
- However, the trade-off is clear: Additional 100 MHz of spectrum was associated with 4.5 Mbps (or about 24%) higher public network download speeds
- Policymakers should not base their decisions on naïve comparisons

Median set aside:  
100 MHz of spectrum



Uncertain impact on private network adoption or digitalisation of enterprises



24% greater public network download speeds



GSMA™  
**Intelligence**

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Kalvin Bahia ([kbahia@gsma.com](mailto:kbahia@gsma.com))

The full study report will be published in April



# Use case example: 5G deployments

Hai Thoo Cheong,  
Vice President Mobile Engineering  
Singtel



## Private Networks Fashion: Spectrum for Industries

Use case example: 5G deployment

Cheong Hai Thoo

Vice President, Mobile Voice & Engineering





# Singapore focus to drive technology adoption in manufacturing and smart nation

## Industry 4.0

- 5G as key enabler for significant investments in the manufacturing sector to drive technology adoption
- Apply robotics and automation in manufacturing processes



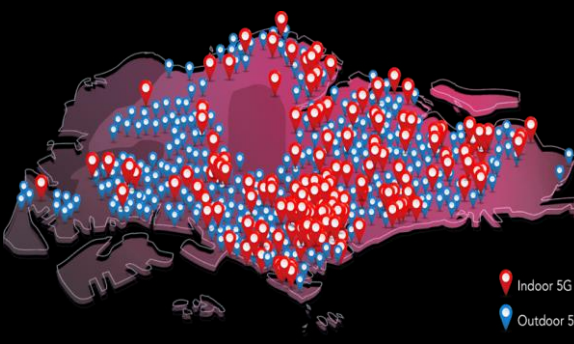





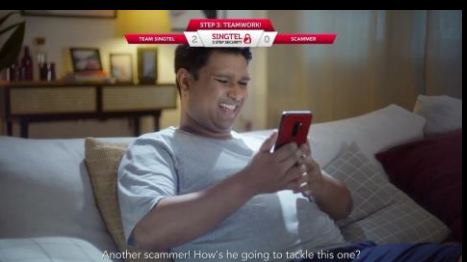
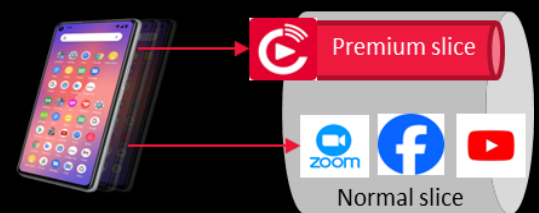


## Smart Nation

- Aims to be the global front-runner in secured, resilient, innovative 5G application and services
- Aggressively launching initiatives that incorporate 5G to digitise and enhance public services



# Singtel has been building up its 5G SA capabilities to support consumer's different traffic demands

 <p><b>NSA LAUNCH</b></p>	<p><b>SA LAUNCH</b></p> 	 <p><b>WORLD'S FIRST NATIONWIDE 5G SA</b></p>	<p><b>NETWORK SLICING WITH PRIORITY ACCESS</b></p> 	<p>Express yourself. Connect even when everyone else can't.</p>  <p>The Event 5G Express Pass prioritises your 5G data so you'll get to share the best moments, even in the crowd.</p> <p><b>MONETIZATION ON NETWORK SLICING</b></p>
<p><b>2020</b></p>	<p><b>2021</b></p>	<p><b>2022</b></p>	<p><b>2023</b></p>	<p><b>2024</b></p>
<p><b>5G MARKET TRIAL</b></p> 	<p>A dedicated Singtel 5G highway.</p>  <p>In a FIFA World Cup™ first, Singtel has applied the most advanced 5G network slicing technology on CAST and Singtel TV GO.</p> <p>Exclusively for Singtel 5G customers, enjoy dedicated capacity and priority streaming for that ultra-smooth viewing experience — even in high-traffic areas.</p> <p><b>NEW 5G PLANS, GAME PACKS, AR CONTENTS, DATA PASSES WITH QoS UPLIFTS</b></p>	 <p><b>WORLD'S FIRST COMMERCIAL NETWORK SLICE</b></p>	<p><b>PIONEER SECURITY AS A SLICE (SECAAS)</b></p> 	 <p><b>CONTINUE TO DEVELOP NEW NETWORK SLICING</b></p>

# Enterprise's mission critical operations require 5G network slicing with guarantee QoS

## Government

Smart Construction Solutions

Autonomous Environment Service Vehicle

Disaster Site Management

Drone-enabled Remote Inspections

5G@SENTOSA

## Security

5G Integrated Command Centre for Security Services

## Transport

5G Aviation Testbed

## Medical

Enhanced Surgery & Clinical Care

## Industries 4.0

Advanced Manufacturing

AGV Fleets at Port

EV Trials

5G Sandbox

## Smart Retail

Smart Retail

## Innovations & Partnerships

Singtel + Intel Multi-access Edge Computing

Singtel + Microsoft Azure Multi-access Edge Computing  
5G and MEC

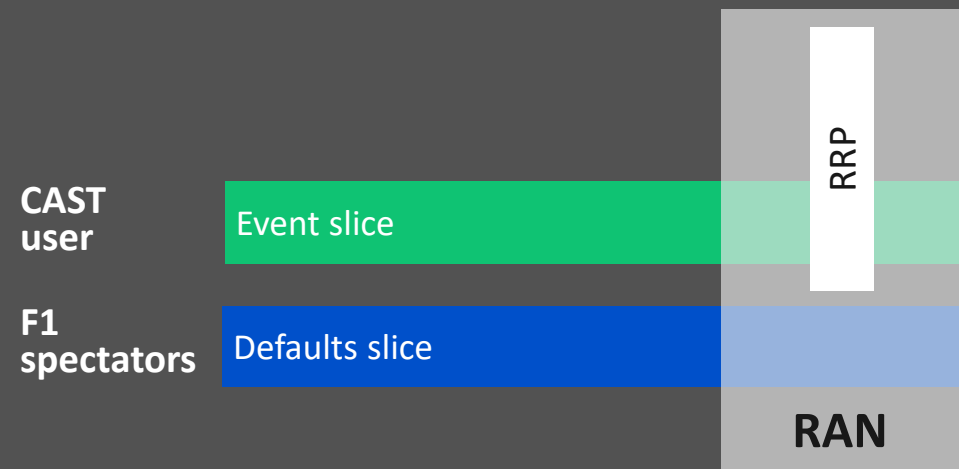
Singtel + SAP Intelligent Edge Aggregator solution

# 5G network slicing is a key enabler for 'private network' coexistence with public network

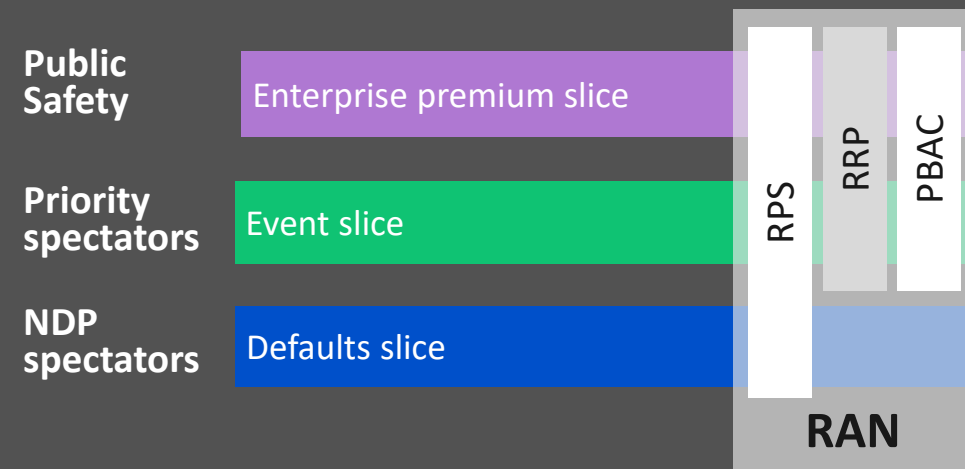
- Private networks provide on-premise enhanced security, control, and performance with designated coverage. However, they present challenges such as long deployment time, high initial costs, expertise needs and regulatory policies.
- Spectrum are finite and scarce resource
- 5G network slicing enables CSP to provide 'private network' like deployment to meet specific enterprise requirements
- 5G network slicing accelerate Enterprise GTM with CSP ready infrastructure

# Singtel leading the commercialization of network slicing

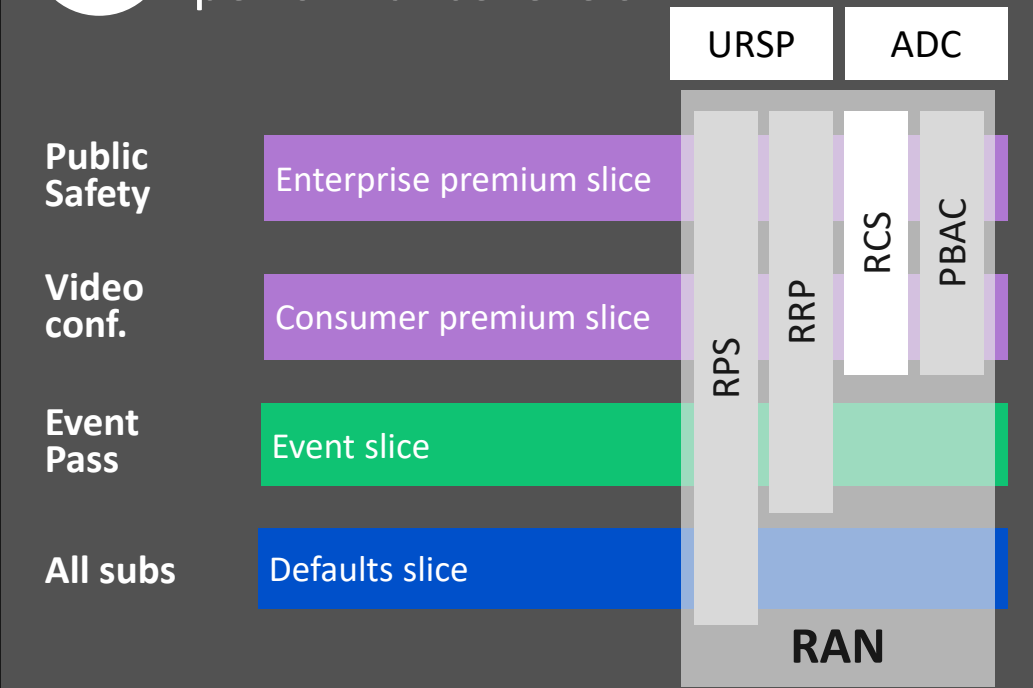
## 1 F1 slicing and radio resource partitioning



## 2 Slicing with priority-based admission control for National Day Parade



## 3 Multiple applications and performance levels

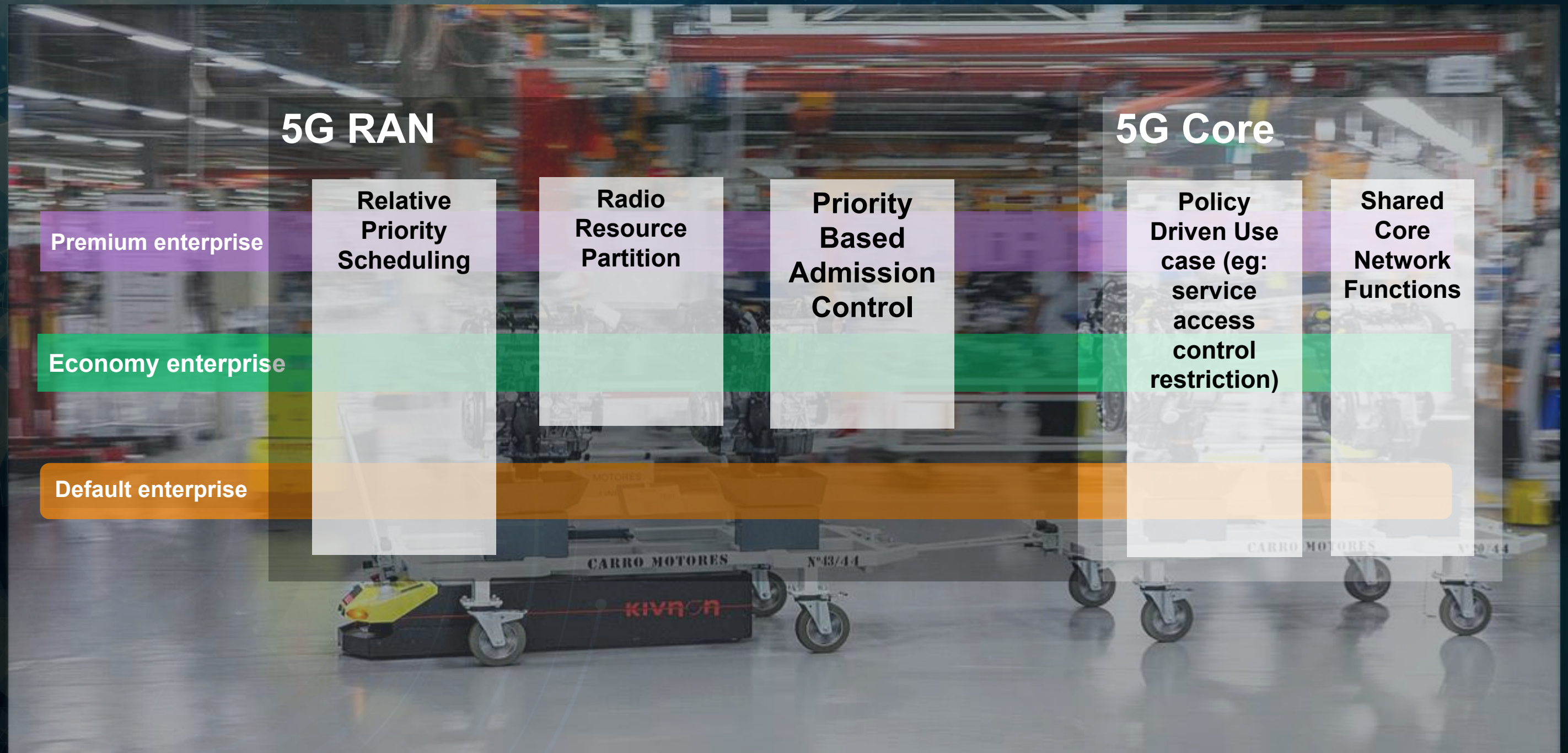


# Singtel leverages on network slicing as 'private network' to deliver enterprise use case

## Use cases



Mission critical, airport, manufacturing, port, campus network



Enterprise and Consumer sharing the same network and logically separated

# Singtel offers Network Slicing to different categories of enterprise use cases

## Nationwide offering

Subscription connected to a slice with certain characteristics and SLA of different triers

Eg: Bus, EV charger, drones etc

## Localised offering

Off-the-shelf solution, including a pre-configured slice for more horizontal standard solutions like security and surveillance use cases

## Localised offering with geofenced dedicated connect

Reserved prioritized and dedicated slice with SLA for the campus area. Can be permanent or scheduled

Eg: manufacturing factories

**Thank You**





# Roundtable

Moderator: Carol Sosa Leguizamón  
Spectrum Policy Director  
GSMA

# Closing Remarks

Carol Sosa Leguizamón  
Spectrum Policy Director  
GSMA