GLOBAL CONNECTED TV (CTV) AD SUPPLY CHAIN TRENDS

Q3.2023

An analysis of the state of open programmatic CTV advertising, including top devices, trending categories, and ad fraud risk
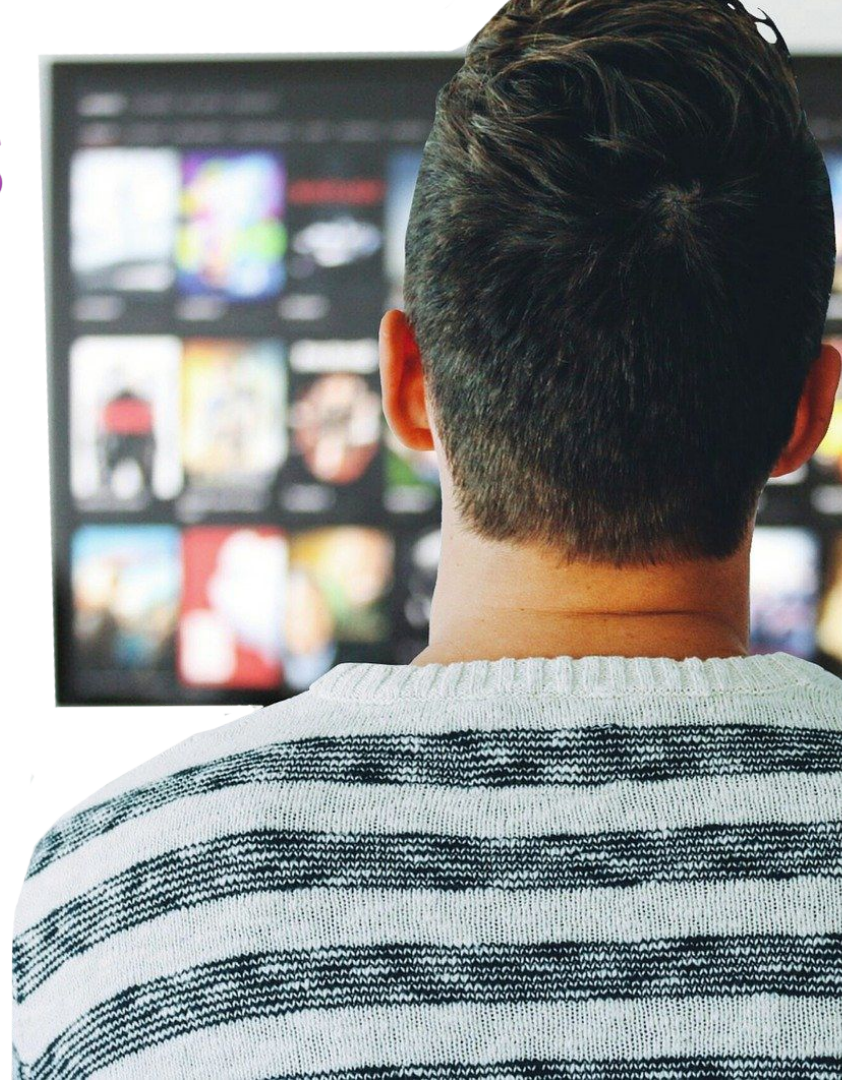
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A NOTE ABOUT THIS CTV RESEARCH

Pixalate's data science team analyzed programmatic advertising activity across over 300 million Connected TV ("CTV") devices and billions of ad transactions to compile this research. Pixalate's datasets consist predominantly of buy-side open auction programmatic traffic sources. In Q3 2023, Pixalate found CTV reaches 99% of U.S. households reachable by any form of programmatic ads.

Pixalate is sharing this data not to impugn the standing or reputation of any person, entity or app, but instead, to render opinions and report trends pertaining to CTV programmatic advertising activity.

Q3 2023 Trends: Ad spend, global growth, and device market share
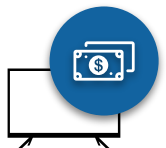
$5.3 billion in estimated global open programmatic **CTV ad spend** in Q3 2023
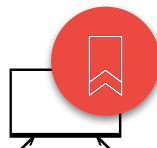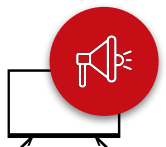
15% invalid traffic (IVT) rate in global open programmatic CTV in Q323

+39% YTD market share increase for Apple tvOS among CTV operating systems

25% YoY increase in # of **Roku** apps with open programmatic CTV advertising
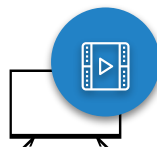
Roku holds 51% estimated global CTV device market share

Hulu was the top grossing app across Roku, Fire TV, & Samsung in N. America in Q323

+2%

YoY change in open programmatic CTV ad spend, according to Pixalate's estimates.

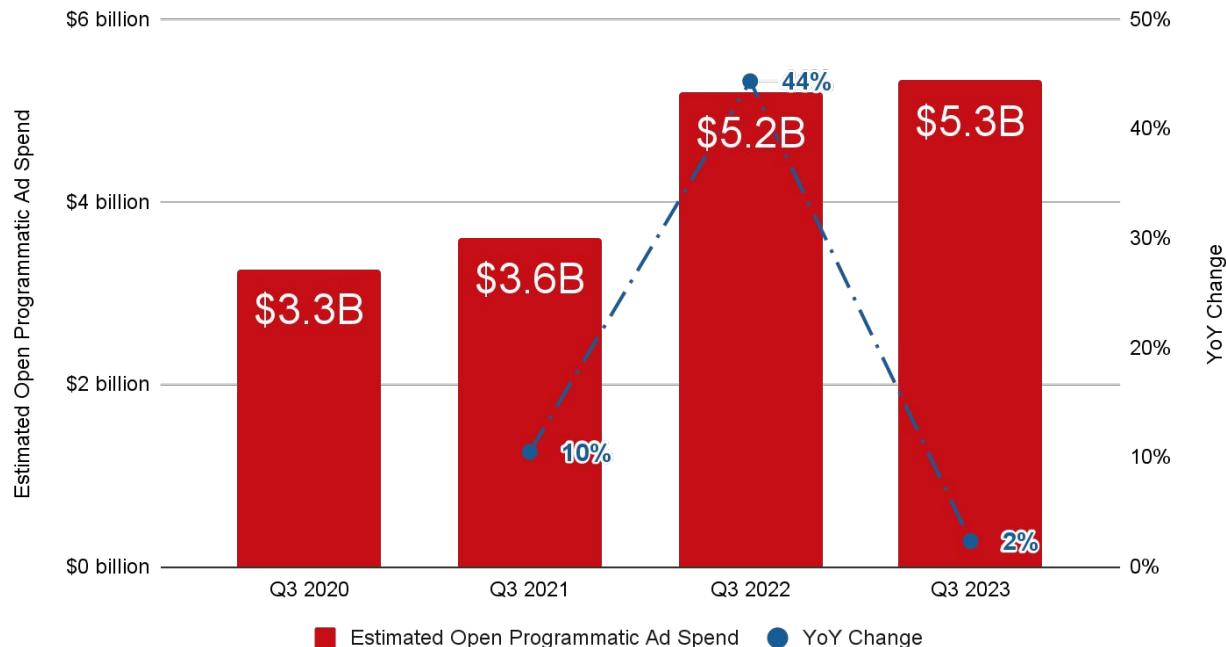**$5.3 billion in estimated global open programmatic CTV ad spend in Q323**

Open programmatic ad sales proxied for ad spend, as measured by Pixalate

CTV Ad Spend: Top grossing CTV apps in Q3 2023

Top 5 grossing CTV apps per platform based on estimated open programmatic advertising in North America, as measured by Pixalate

fire tv

Q223 Rank	App
1	hulu
1	philo
3	pluto tv
4	tubi Free Movies & TV
5	Paramount NETWORK

Samsung SMART TV

Q223 Rank	App
1	hulu
2	Samsung TV Plus
3	philo
4	redbox. FREE MOVIES & TV
4	sling

ROKU

Q223 Rank	App
1	hulu
2	pluto tv
3	tubi Free Movies & TV
4	sling
5	philo

CTV TRENDS

THE STATE OF THE AD MARKETPLACE

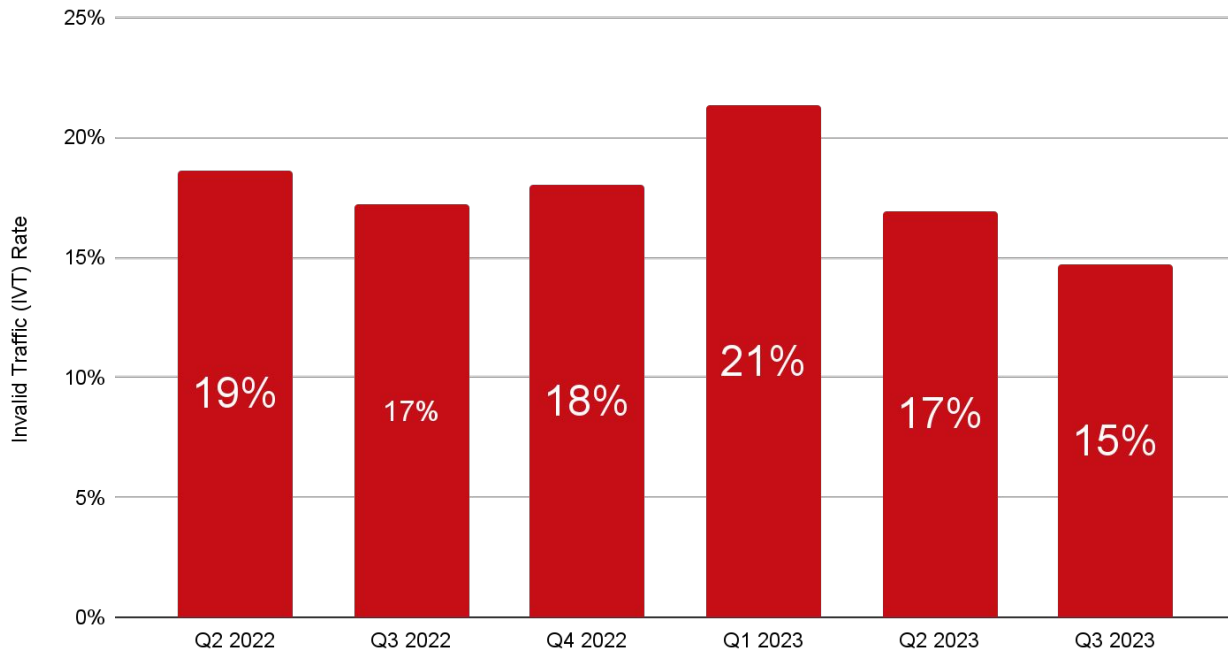Household Reach | Ad Spend | Ad Fraud

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-29%

decline in global open programmatic CTV invalid traffic (IVT) rate from Q123 to Q323, according to Pixalate's data.

Q323 had the lowest IVT rate for CTV in any quarter since Q221.

CTV invalid traffic (including ad fraud) drops to 15%

Invalid traffic ("IVT" - inclusive of ad fraud) by quarter in open programmatic CTV; global; as measured by Pixalate

Bar chart titled "Invalid Traffic (IVT) Rate" with y-axis from 0% to 25%:

Quarter	IVT Rate
Q2 2022	19%
Q3 2022	17%
Q4 2022	18%
Q1 2023	21%
Q2 2023	17%
Q3 2023	15%

CTV WORLDWIDE

GLOBAL AD SPEND TRENDS
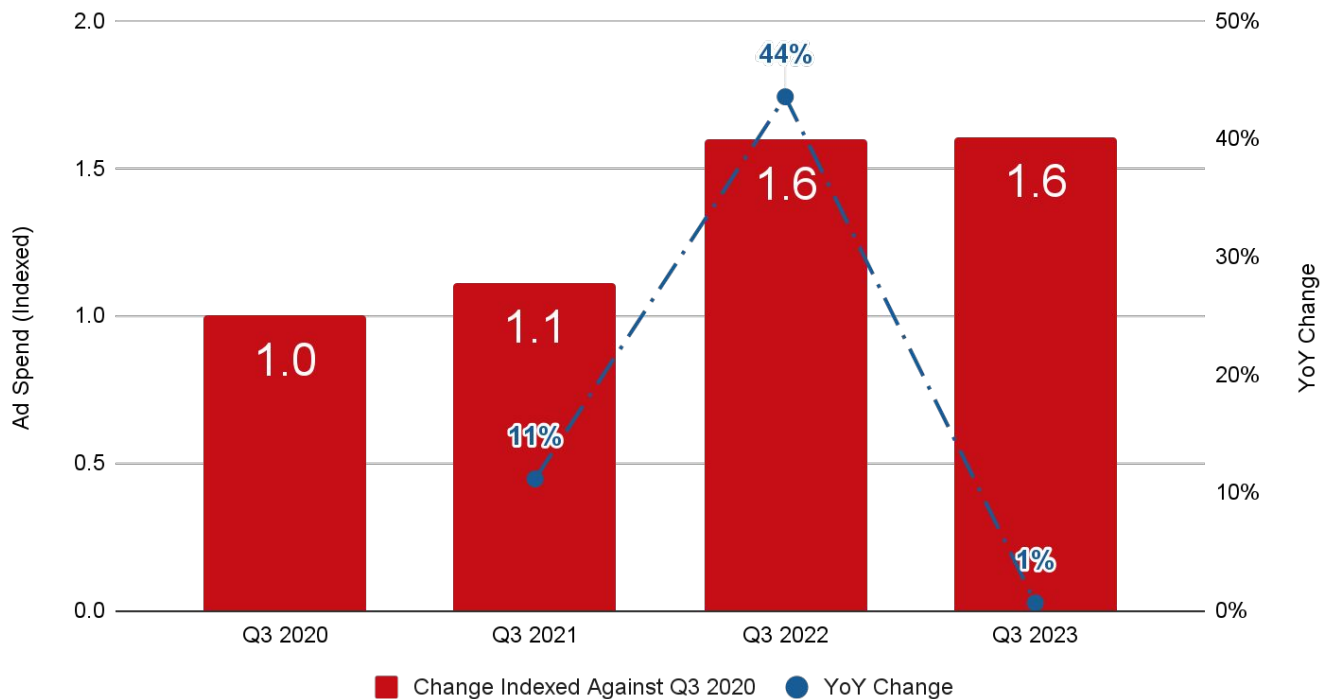
North America | APAC | EMEA | LATAM

pixalate

+60%

The North American CTV ad marketplace is up +60% over the last three years, according to Pixalate's data.

North America: CTV ad spend flat YoY

Open programmatic ad sales proxied for ad spend, as measured by Pixalate

Chart: Ad Spend (Indexed) and YoY Change

	Q3 2020	Q3 2021	Q3 2022	Q3 2023
Change Indexed Against Q3 2020	1.0	1.1	1.6	1.6
YoY Change		11%	44%	1%

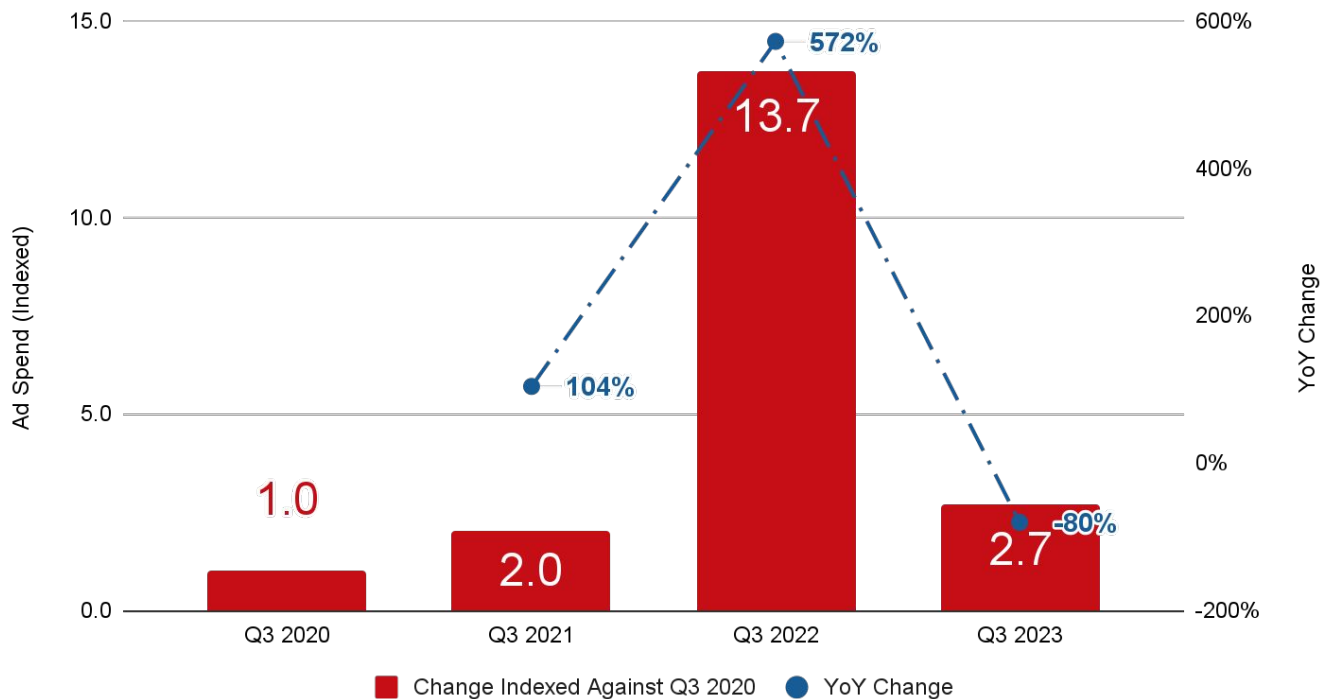Legend: ■ Change Indexed Against Q3 2020 ● YoY Change

+35%

increase in open programmatic CTV ad spend in EMEA over the last two years, according to Pixalate's data.

EMEA: CTV ad spend down 80% YoY

Open programmatic ad sales proxied for ad spend, as measured by Pixalate

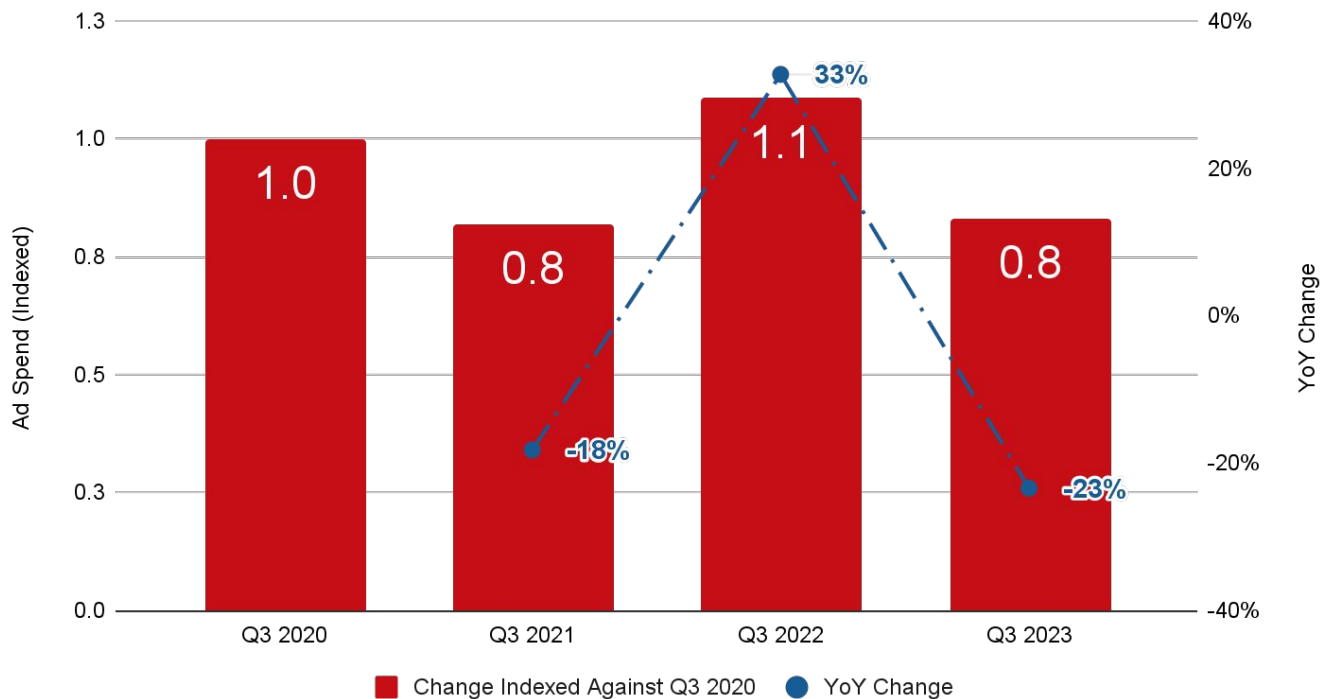■ Change Indexed Against Q3 2020   ● YoY Change

+/- 20%

In APAC, CTV ad spend in the third quarter has hovered in the same area - plus or minus 20% - dating back to 2020, according to Pixalate's data.

APAC: CTV ad spend down -23% YoY

Open programmatic ad sales proxied for ad spend, as measured by Pixalate
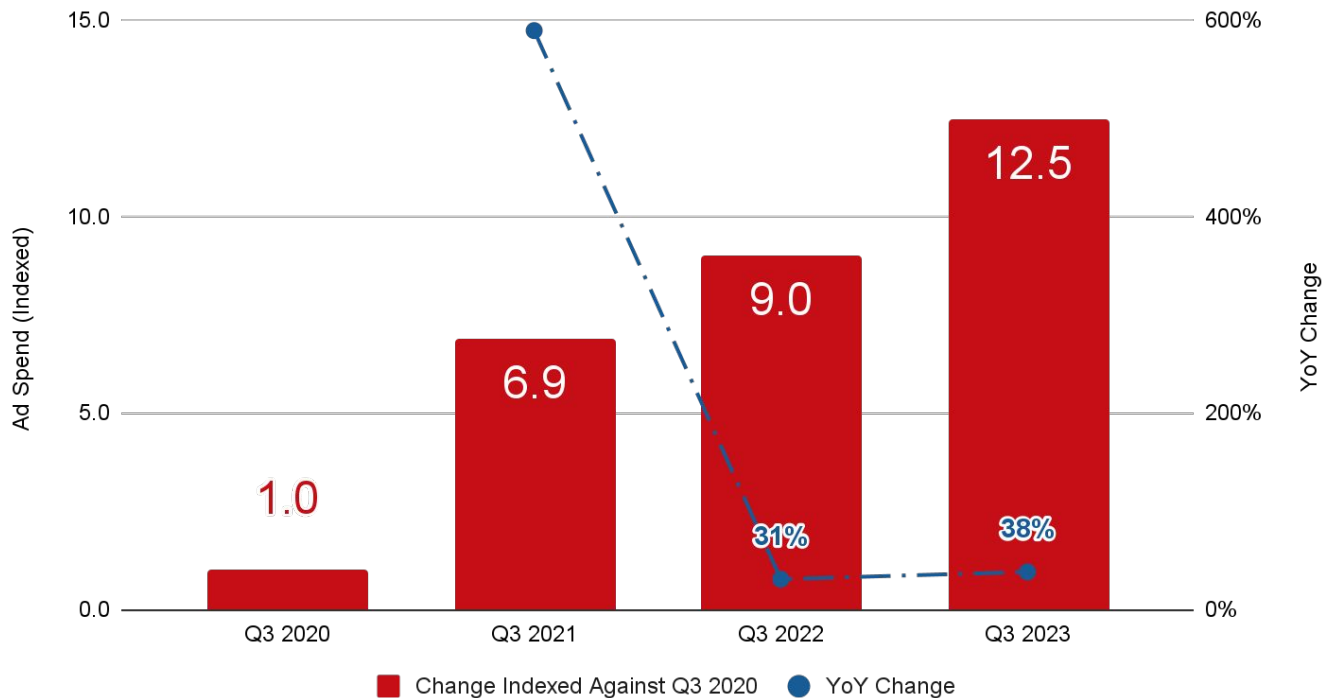

Chart showing Ad Spend (Indexed) bars and YoY Change line:
- Q3 2020: 1.0
- Q3 2021: 0.8, YoY Change -18%
- Q3 2022: 1.1, YoY Change 33%
- Q3 2023: 0.8, YoY Change -23%

Legend: ■ Change Indexed Against Q3 2020   ● YoY Change

+1,150%

rise in open programmatic CTV ad spend in LATAM over the last three years, according to Pixalate's data.

LATAM: CTV ad spend rises +38%

Open programmatic ad sales proxied for ad spend, as measured by Pixalate

Legend: ■ Change Indexed Against Q3 2020   ● YoY Change

Ad Spend (Indexed) values:
- Q3 2020: 1.0
- Q3 2021: 6.9
- Q3 2022: 9.0
- Q3 2023: 12.5

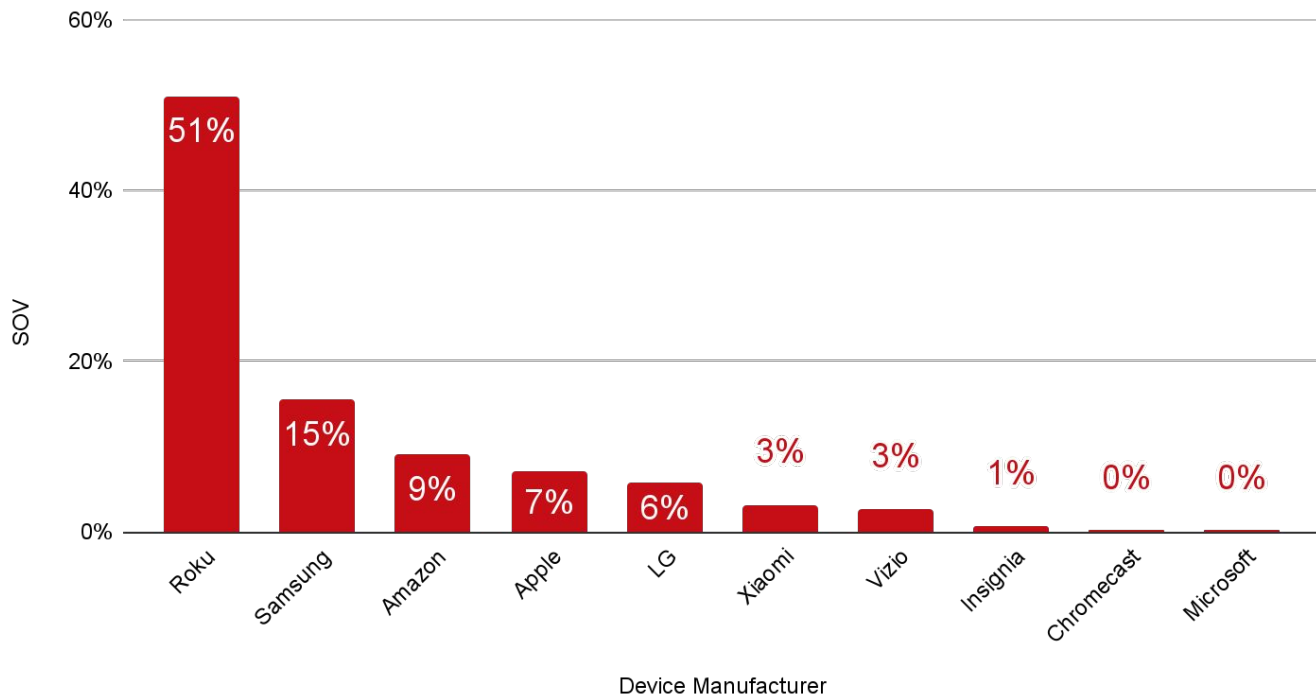YoY Change:
- Q3 2022: 31%
- Q3 2023: 38%

51%

estimated CTV device market share for Roku devices - Roku's best quarter since Q120, according to Pixalate's data.

What this stat means: 51% of all open programmatic CTV ads, as measured by Pixalate, were delivered to Roku devices.

Roku grows, tops 50% CTV device share of voice again

Share of voice of open programmatic ads sold by device type; global; Q323; as measured by Pixalate

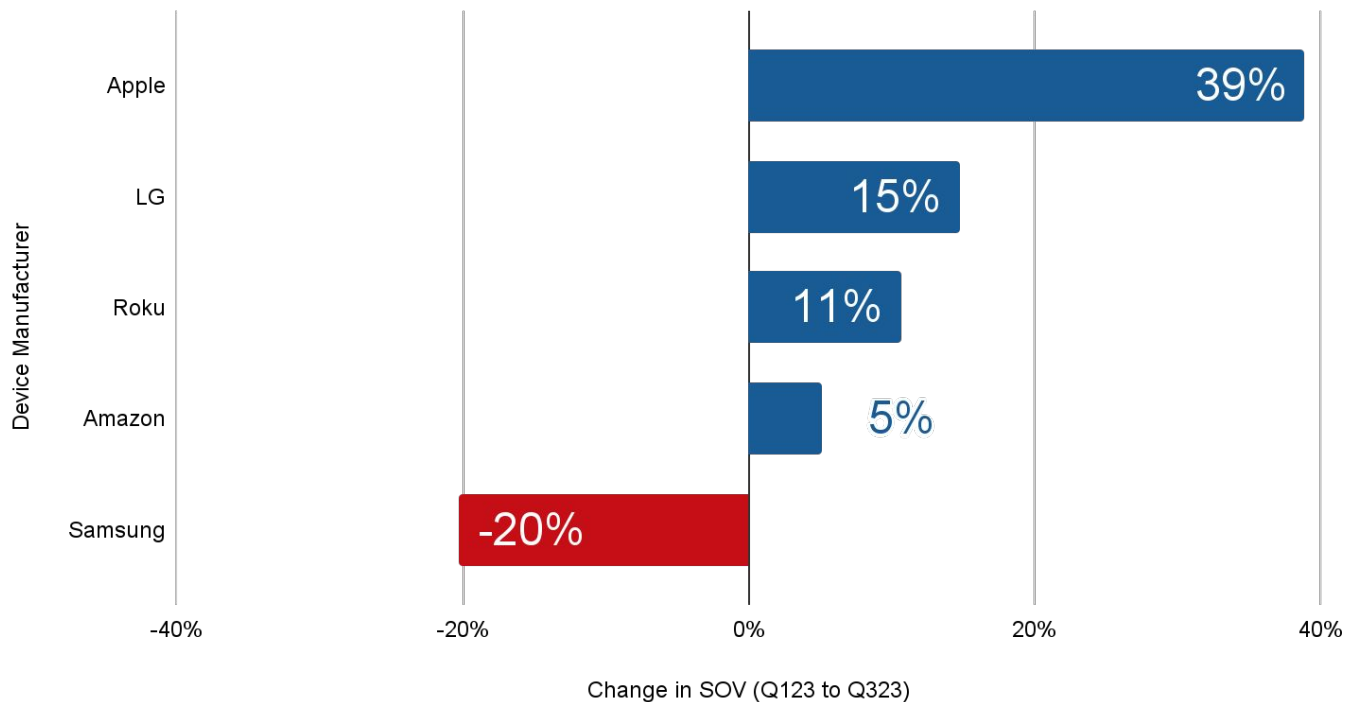Bar chart — SOV by Device Manufacturer:
- Roku: 51%
- Samsung: 15%
- Amazon: 9%
- Apple: 7%
- LG: 6%
- Xiaomi: 3%
- Vizio: 3%
- Insignia: 1%
- Chromecast: 0%
- Microsoft: 0%

Y-axis: SOV (0% to 60%)
X-axis: Device Manufacturer

+15%

YTD CTV ad market share gain for **LG** devices, according to Pixalate's data.

Samsung (-20% YTD) saw a QoQ decline in market share for the first time since Q421 to Q122.

* Among device manufacturers in the top five for total market share

Apple TV device market share leaps 39% YTD

% change in SOV of open programmatic CTV ads sold from Q123 to Q323 by device type; global; as measured by Pixalate

Chart: Change in SOV (Q123 to Q323) by Device Manufacturer

- Apple: 39%
- LG: 15%
- Roku: 11%
- Amazon: 5%
- Samsung: -20%

Y-axis: Device Manufacturer
X-axis: Change in SOV (Q123 to Q323), -40% to 40%

2.4x

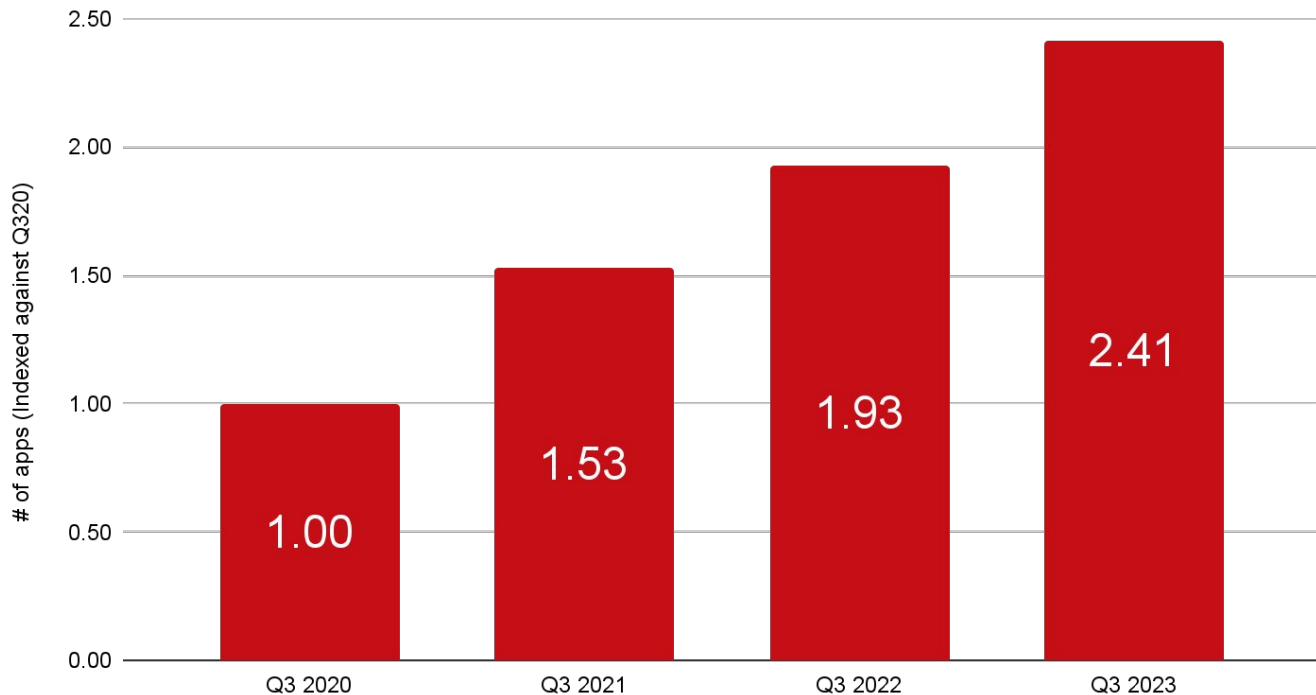growth over three years in the number of apps in the Roku Channel Store that support open programmatic advertising*, according to Pixalate's data.

minimum 50 invalid traffic-free ads sold per quarter, as measured by Pixalate

25% YoY increase in # of Roku apps with open programmatic ads
# of total apps in Roku Channel Store w/ open programmatic ads (>= 50 IVT-free ads sold) ; indexed against Q320; as measured by Pixalate

# of apps (Indexed against Q320)

Quarter	Value
Q3 2020	1.00
Q3 2021	1.53
Q3 2022	1.93
Q3 2023	2.41

News channels on Roku see programmatic ad market share double

% change in SOV of ad spend by Roku app category, Q123 vs. Q323; open programmatic ads sold proxied for ad spend; as measured by Pixalate
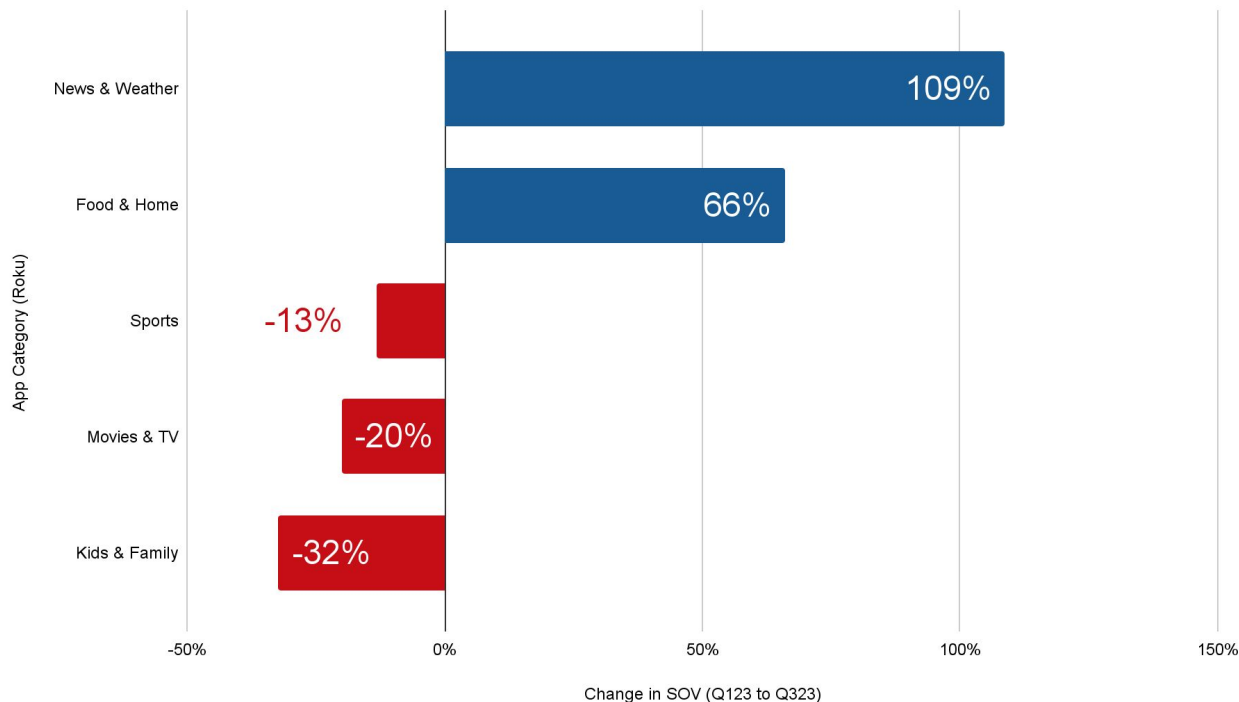
+66%

YTD market share rise for apps in the Food & Home category on Roku, according to Pixalate's data.

Top 5 Roku app categories with the highest Share of Voice of open programmatic CTV ads in Q223 are shown.

Chart — Change in SOV (Q123 to Q323) by App Category (Roku):

- News & Weather: 109%
- Food & Home: 66%
- Sports: -13%
- Movies & TV: -20%
- Kids & Family: -32%

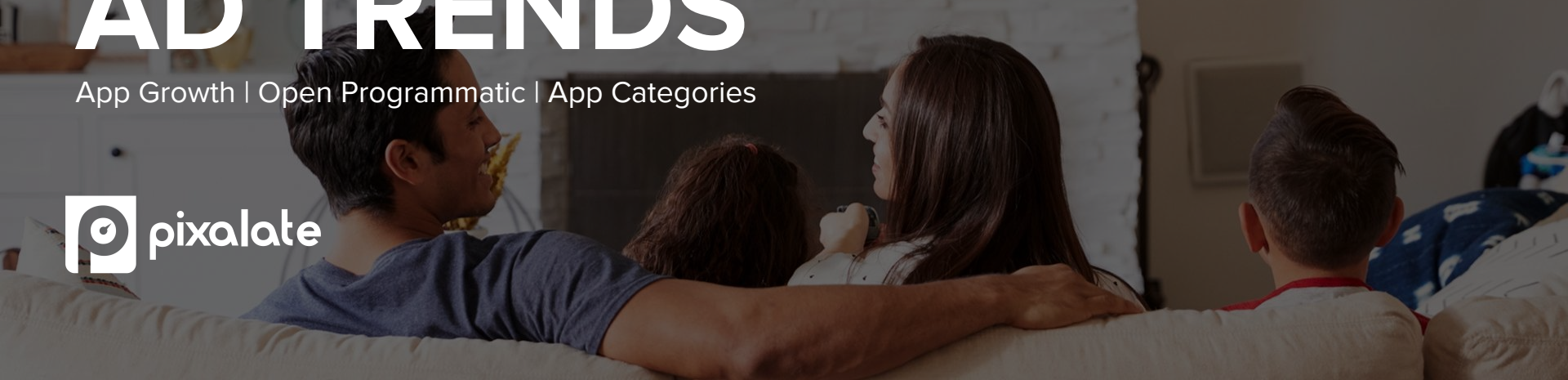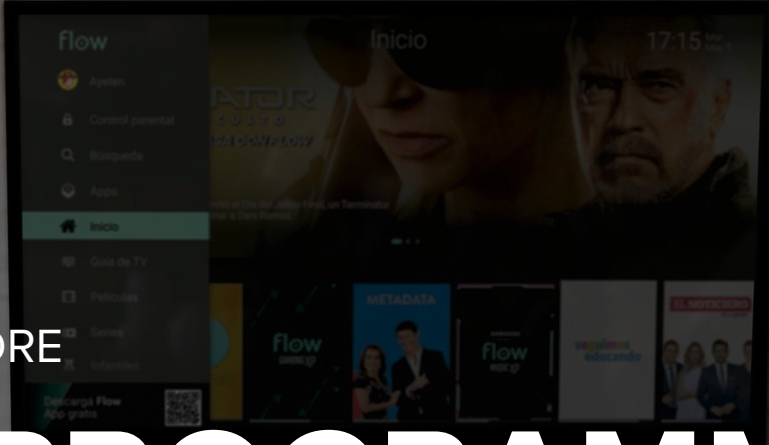X-axis: -50%, 0%, 50%, 100%, 150%

AMAZON FIRE TV STORE

OPEN PROGRAMMING AD TRENDS

App Growth | Open Programmatic | App Categories

+28%

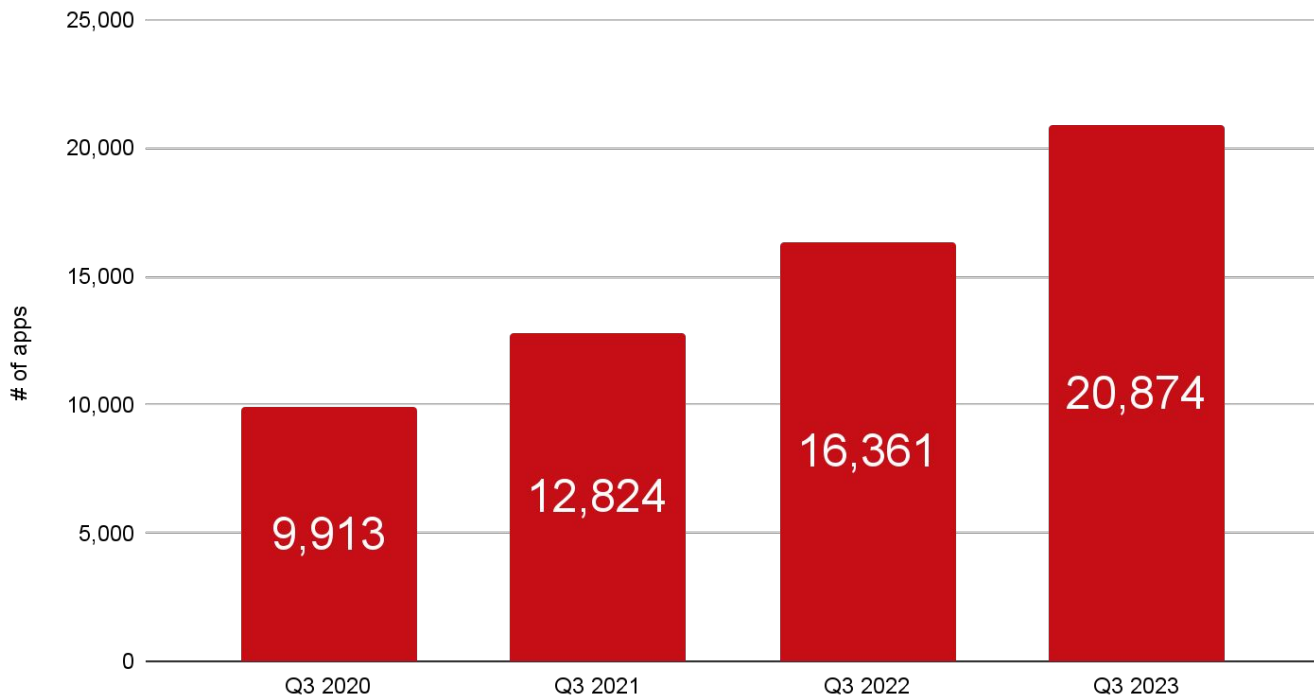YoY increase in the number of all apps in the Amazon Fire TV store, according to Pixalate's data.

Amazon Fire TV store tops 20k apps for the first time
# of total apps in Amazon Fire TV Channel Store; as measured by Pixalate

# of apps

25,000 —

20,000 —

15,000 —

10,000 —

5,000 —

0 —

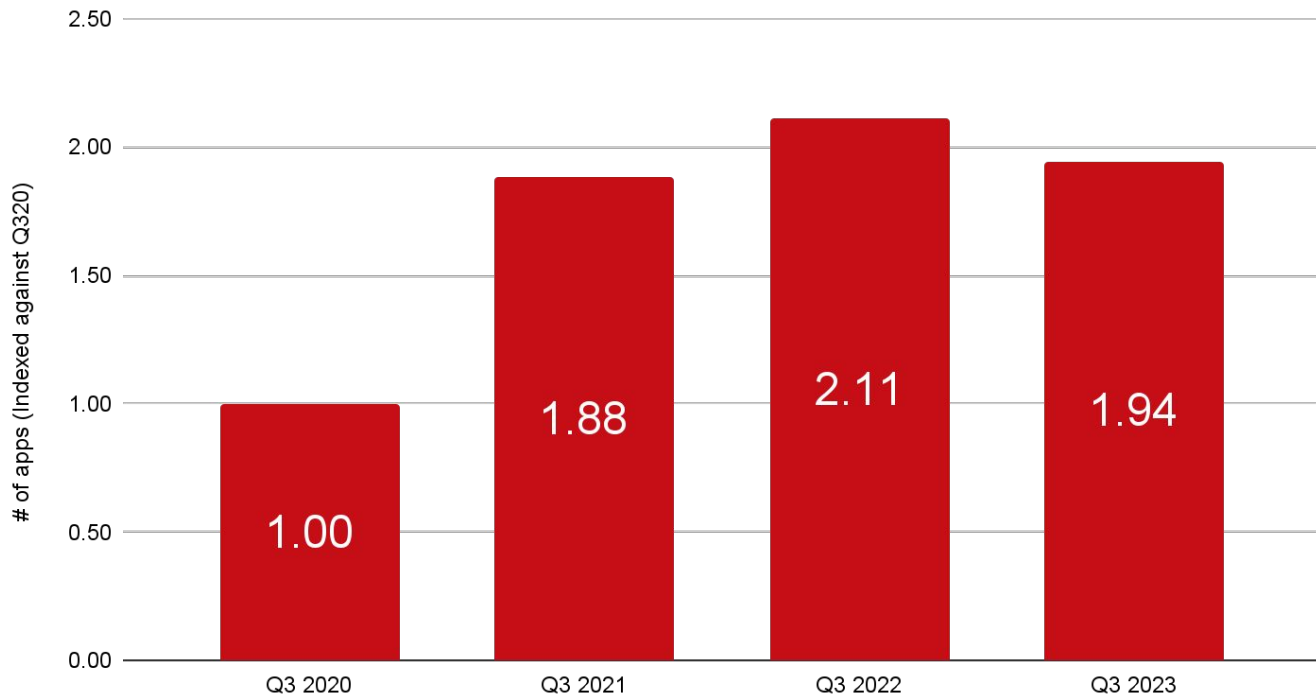| Q3 2020	Q3 2021	Q3 2022	Q3 2023
9,913	12,824	16,361	20,874

fire tv

-8%

YoY decrease in the number of apps in the Amazon Fire TV app store that support open programmatic advertising*, according to Pixalate's data.

minimum 50 invalid traffic-free ads sold per quarter, as measured by Pixalate

# of Amazon Fire TV apps with programmatic ads dips

# of total apps in Amazon Fire TV Channel Store w/ open programmatic ads (>= 50 IVT-free ads sold); indexed against Q320; as measured by Pixalate

162% programmatic ad market share increase for Fire TV News apps

% change in SOV of ad spend by Fire TV app category, Q123 vs. Q323; open programmatic ads sold proxied for ad spend; as measured by Pixalate
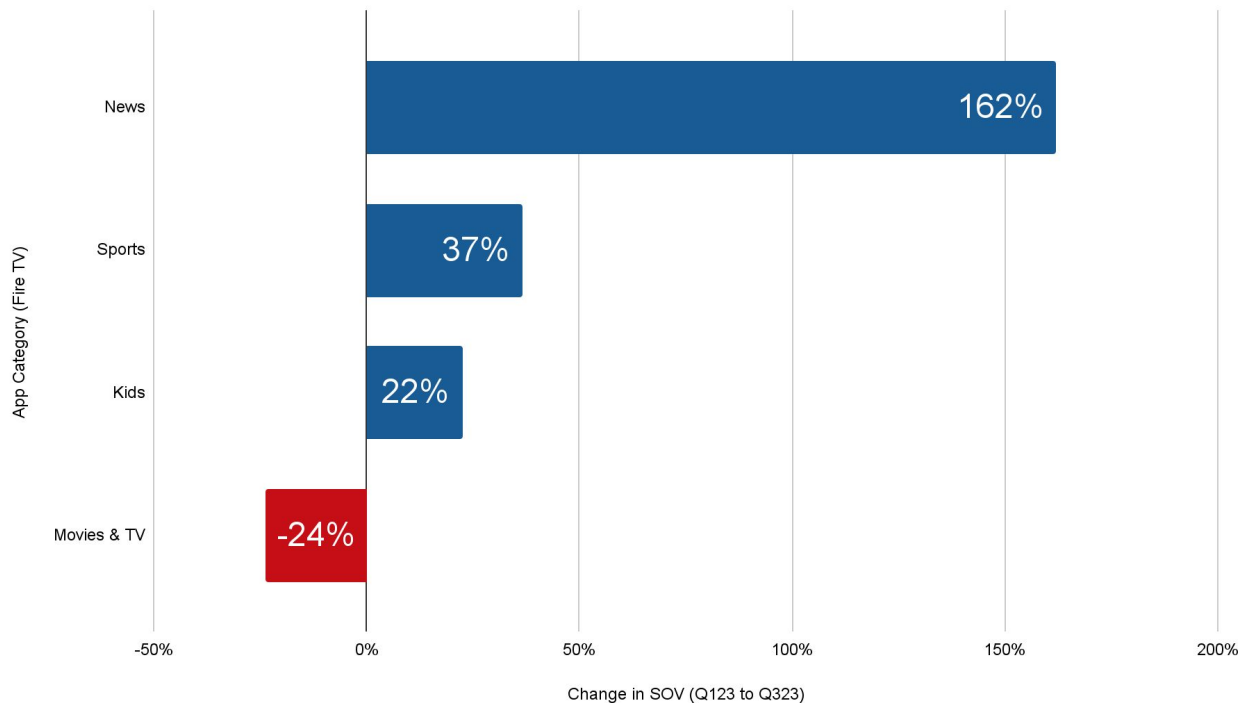
+37%

YTD market share rise for apps in the Sports category on Amazon Fire TV, according to Pixalate's data.

Top 4 Fire TV app categories with the highest Share of Voice of open programmatic CTV ads in Q223 are shown.

Samsung
SMART TV

SAMSUNG SMART TV STORE

OPEN PROGRAMMING AD TRENDS

App Growth | Open Programmatic | App Categories

pixalate

3.6k apps in the Samsung Smart TV store

# of total apps in Samsung Smart TV app store; as measured by Pixalate

Samsung
SMART TV

+2%

QoQ increase in the number of all apps in the Samsung Smart TV store, according to Pixalate's data.

# of apps

|	Q2 2023	Q3 2023
	3,567	3,633
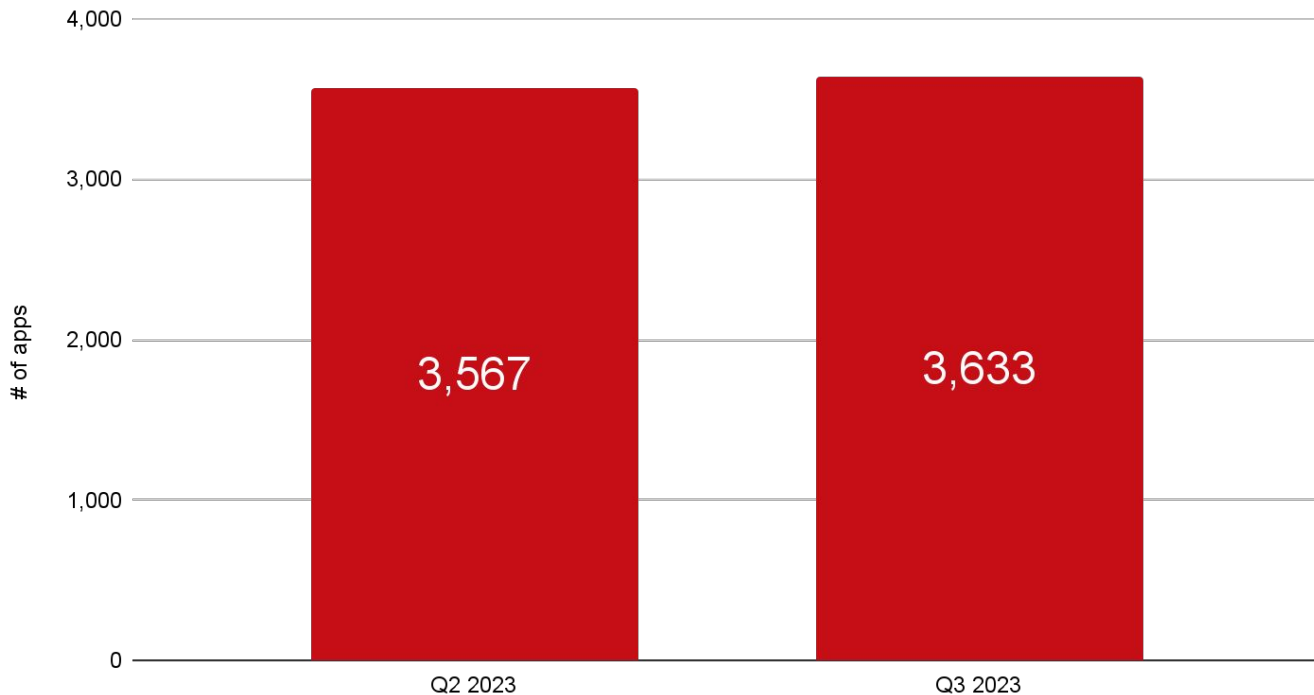
Samsung SMART TV

+6%

QoQ increase in the number of apps in the Samsung Smart TV app store that support open programmatic advertising*, according to Pixalate's data.

italic * minimum 50 invalid traffic-free ads sold per quarter, as measured by Pixalate

of Samsung smart TV apps with programmatic ads rises 6%

# of total apps in Amazon Fire TV Channel Store w/ open programmatic ads (>= 50 IVT-free ads sold); indexed against Q223; as measured by Pixalate

Bar chart — # of apps (Indexed against Q223):
- Q2 2023: 1.00
- Q3 2023: 1.06
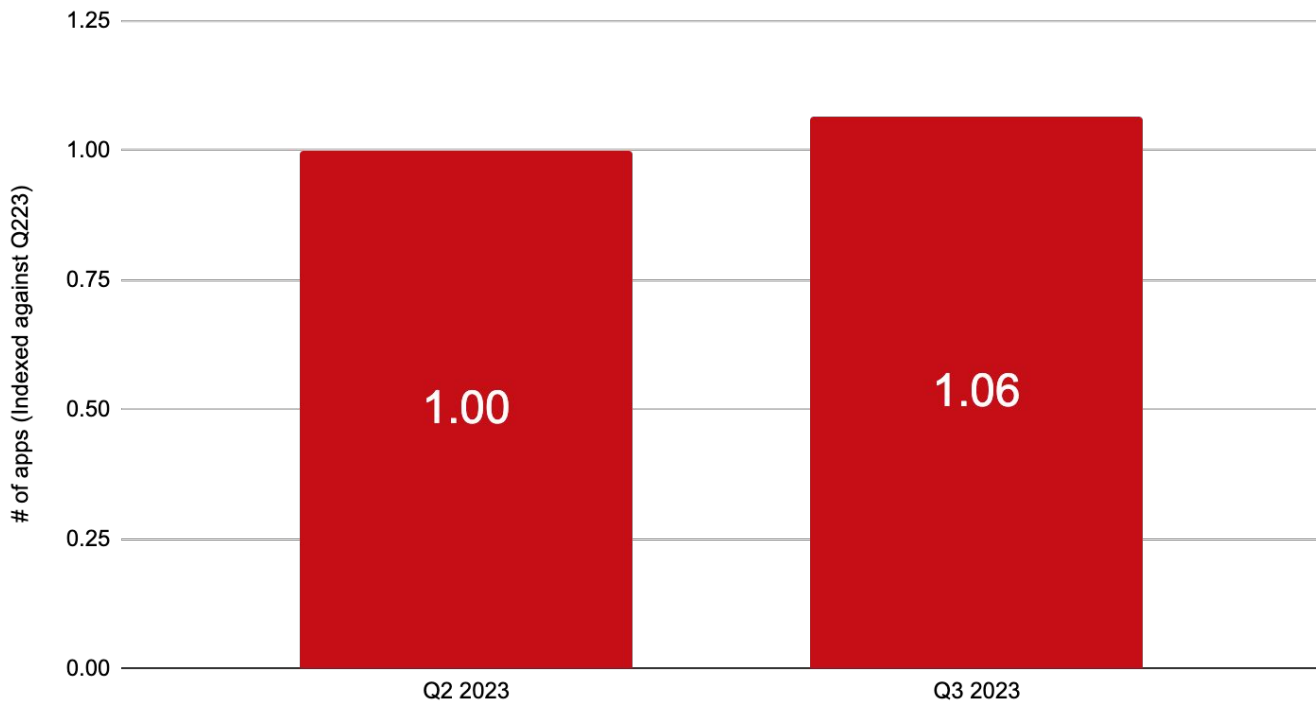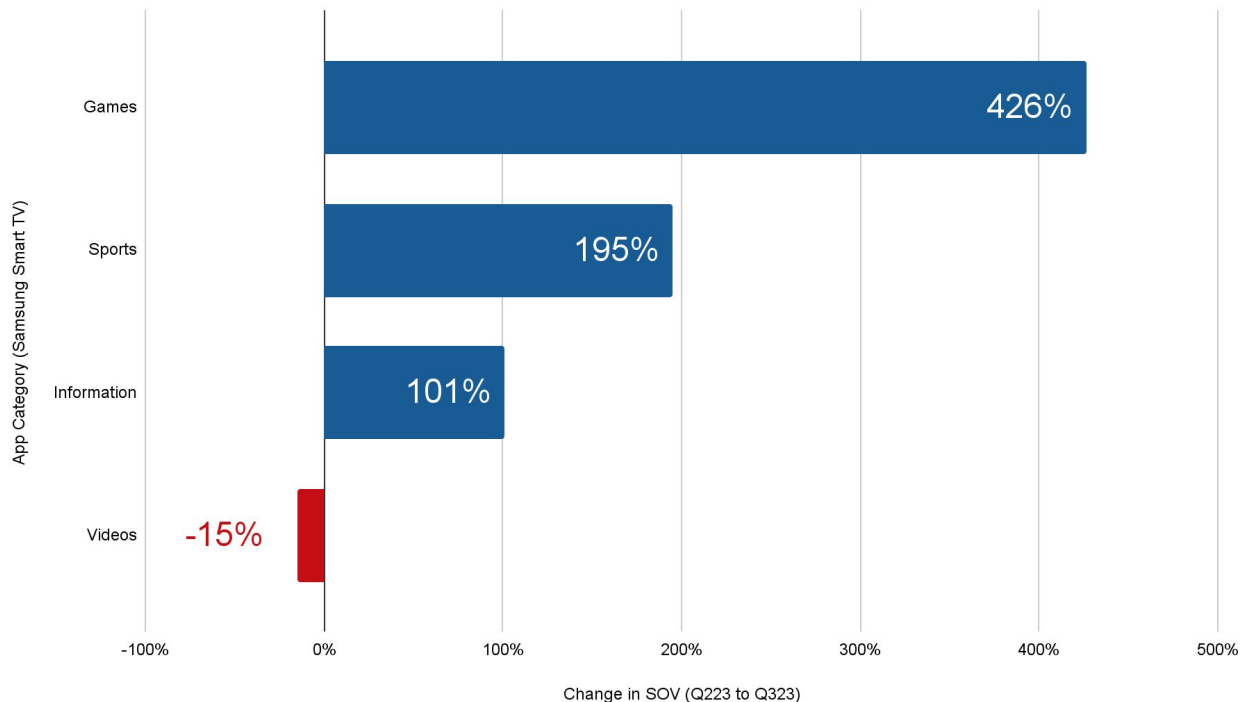
Samsung
SMART TV

+195%

QoQ market share rise for apps in the Sports category on Samsung Smart TV, according to Pixalate's data.

Top 4 Samsung Smart TV app categories with the highest Share of Voice of open programmatic CTV ads in Q323 are shown.

426% programmatic ad market share rise for Games apps

% change in SOV of ad spend by Samsung Smart TV app category, Q223 vs. Q323; open programmatic ads sold proxied for ad spend; as measured by Pixalate

App Category (Samsung Smart TV)

Category	Change in SOV (Q223 to Q323)
Games	426%
Sports	195%
Information	101%
Videos	-15%

Change in SOV (Q223 to Q323)

-100% 0% 100% 200% 300% 400% 500%

tvOS

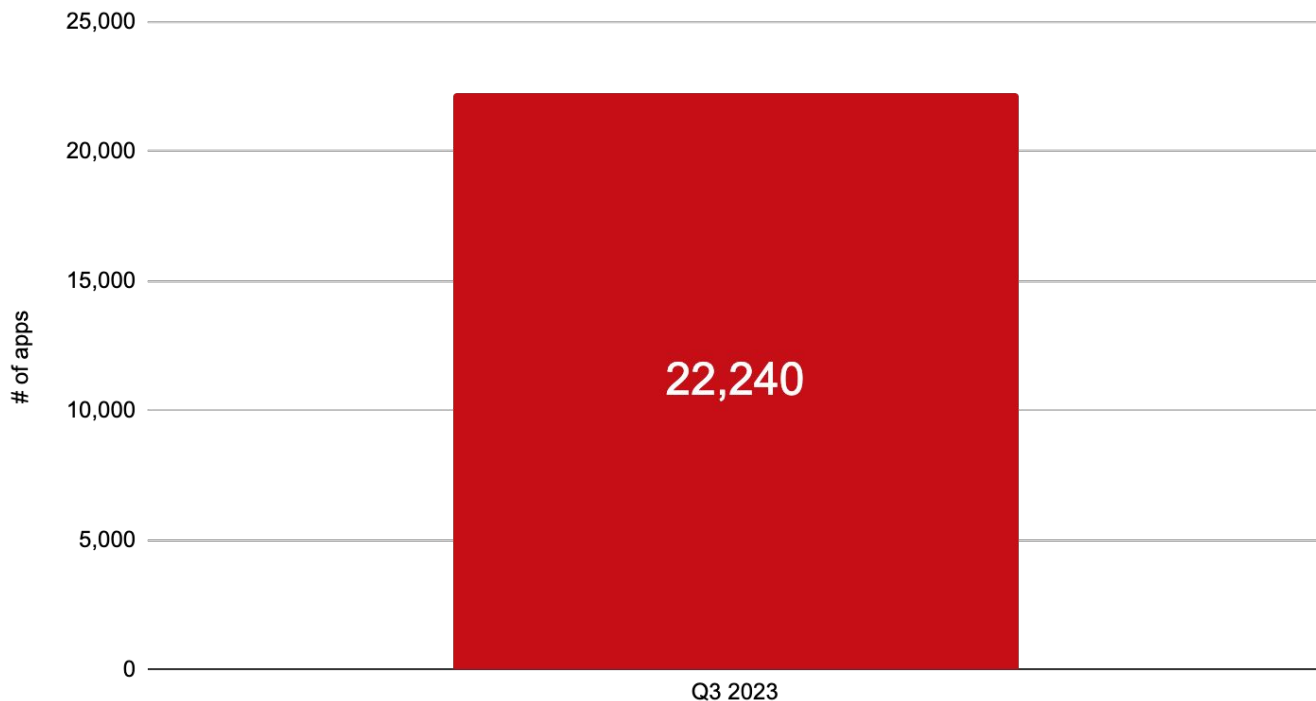# 2.4%

of Apple TV apps have open programmatic advertising, according to Pixalate's data.

minimum 50 invalid traffic-free ads sold per quarter, as measured by Pixalate

22k apps in the Apple TV app store

# of total apps in Apple TV app store; as measured by Pixalate

# of apps

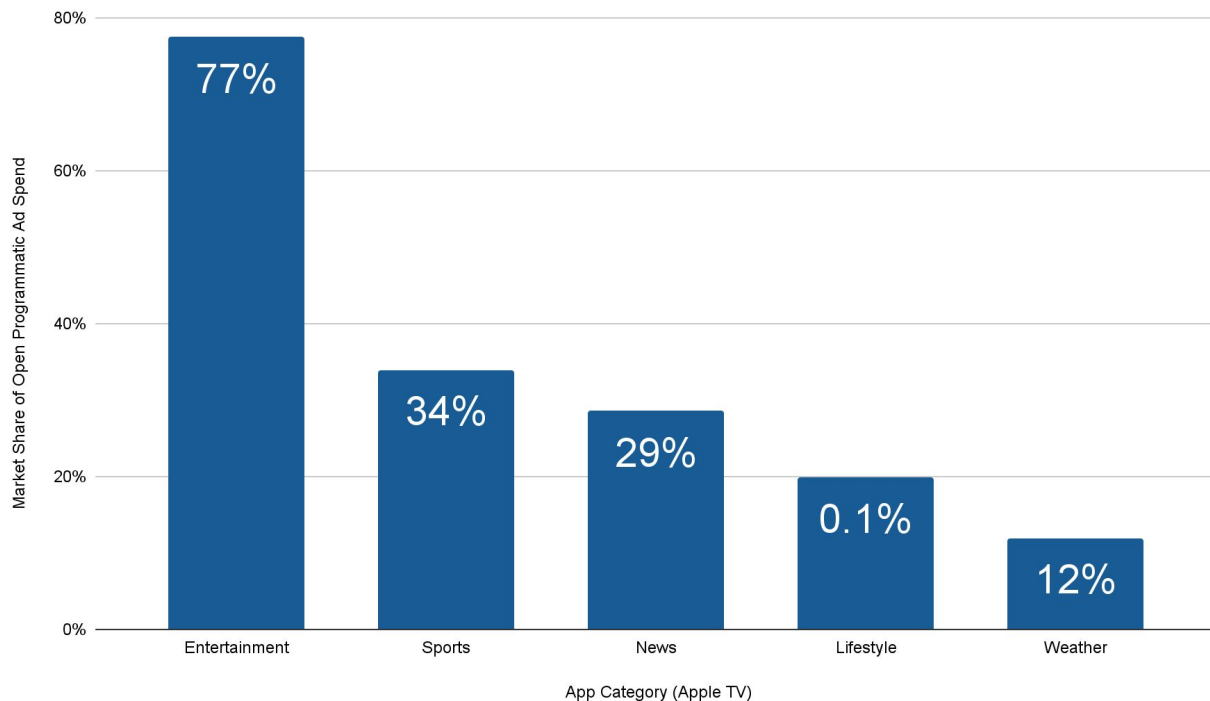| 25,000 | |
20,000	
15,000	
10,000	22,240
5,000	
0	

Q3 2023

tvOS

34%

ad market share for Sports apps on Apple TV in Q323, according to Pixalate's data.

(Some apps have multiple categories.)

Top 4 Apple TV app categories with the highest Share of Voice of open programmatic CTV ads in Q323 are shown.

77% ad market share for Entertainment apps on Apple TV

SOV of ad spend by Apple TV app category, Q323; open programmatic ads sold proxied for ad spend; as measured by Pixalate

Market Share of Open Programmatic Ad Spend

| App Category (Apple TV)	
Entertainment	77%
Sports	34%
News	29%
Lifestyle	0.1%
Weather	12%

15%

CTV OS market share for Android Q323, marking the third straight quarter Android has been at or above 15% after being under 10% all of 2022, according to Pixalate's data.

Tizen second in OS market share (17%)

Share of voice of open programmatic ads sold by operating system; global; Q323; as measured by Pixalate
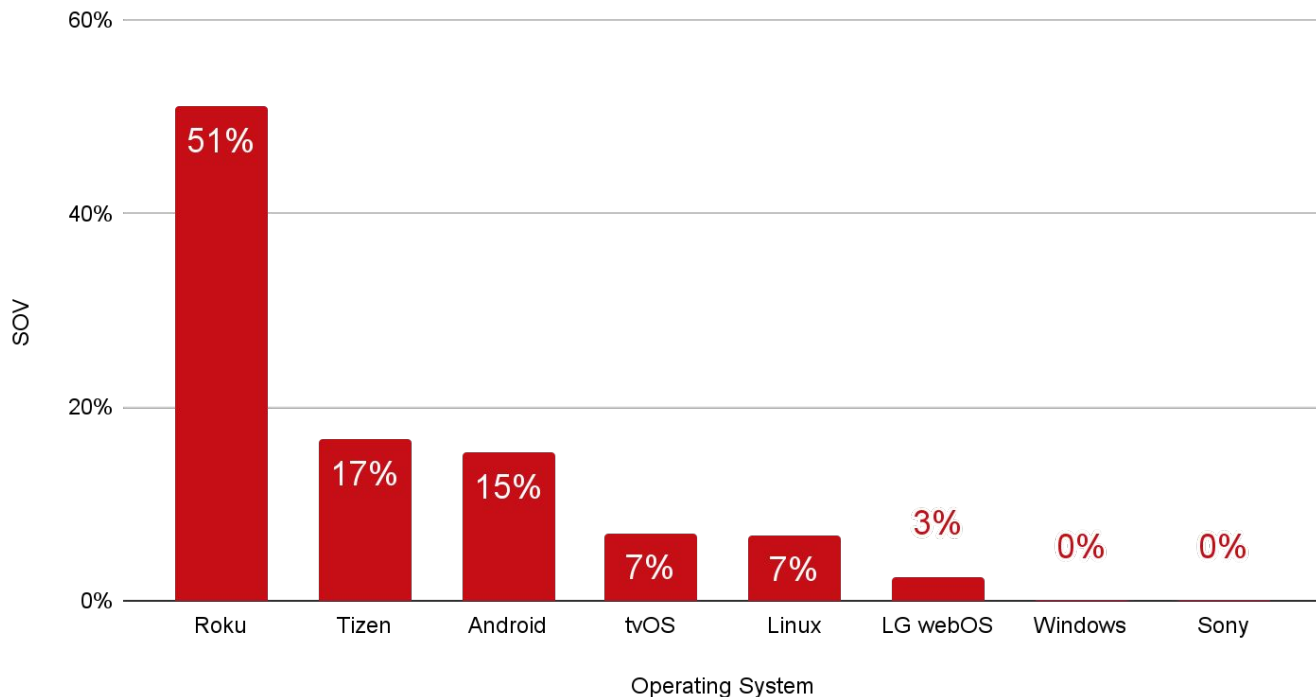
+10%

YTD increase in CTV operating system market share for Linux, based on open programmatic ads sold as measured by Pixalate.

Apple tvOS sees market share rise 39% YTD

% change in SOV of open programmatic CTV ads sold from Q123 to Q323 by operating system; global; as measured by Pixalate

Operating System

- tvOS — 39%
- Roku — 11%
- Linux — 10%
- Android — 3%
- Tizen — -14%
- LG webOS — -49%

Change in SOV (Q123 to Q323)

-50%   -25%   0%   25%   50%
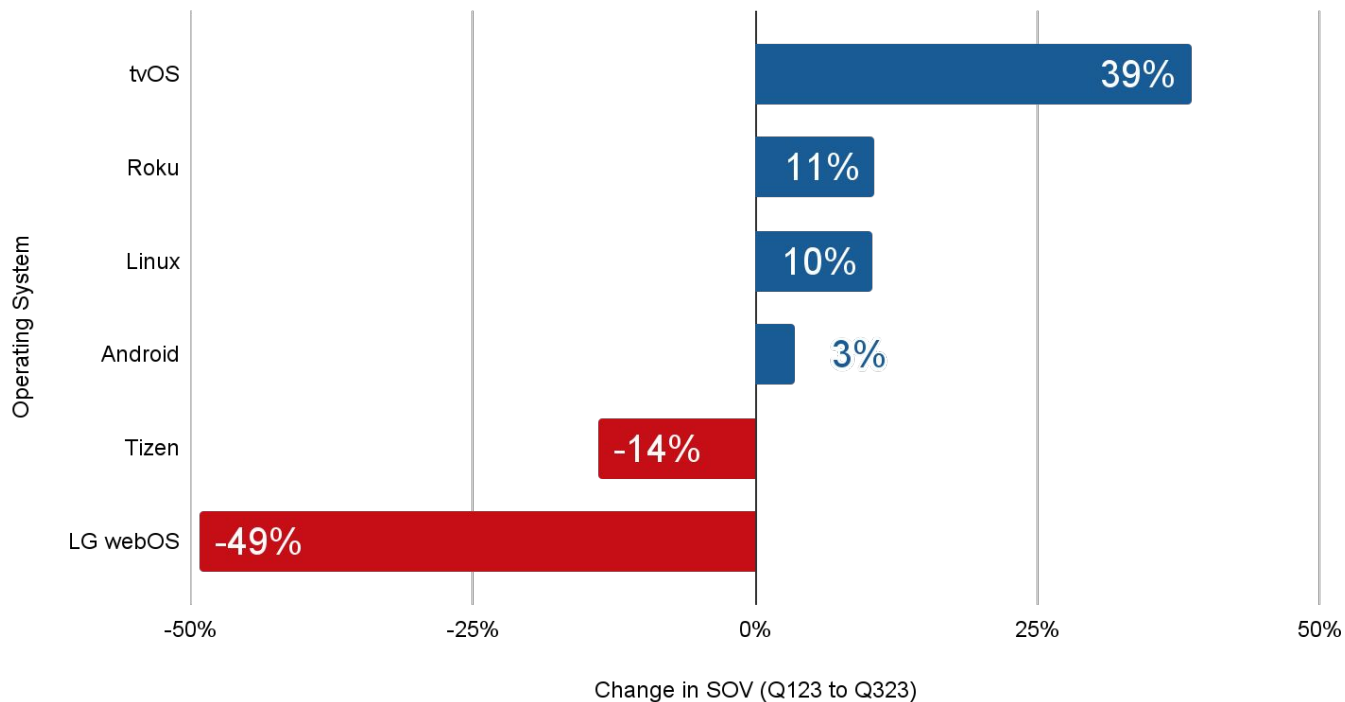
METHODOLOGY, DISCLAIMER & GLOSSARY

pixalate

Methodology

Pixalate's data science team analyzed programmatic advertising activity across over 300 million Connected TV ("CTV") devices and billions of ad transactions to compile this research. The research contained herein represents data collected by Pixalate from January 1, 2020 through September 30, 2023.

In the context of this report, programmatic ad transactions, as measured by Pixalate, are proxied for ad spend. The report examines global programmatic advertising activity. Pixalate's datasets — which are used exclusively to derive these insights — consist predominantly of buy-side open auction programmatic traffic sources.

Global Ad Spend Estimates

Pixalate global open programmatic CTV ad spend figures (page 5) were estimated using the following methodology:

- Total estimated global digital ad spend: $627 billion (Statista)
- CTV's estimate share: 9.5% (eMarketer)
- Upfronts' estimate share: 32% (eMarketer & eMarketer)
- Open programmatic's estimated share: 50% (Simpli.fi)
- Estimated yearly spend by quarter (Pixalate):
  - Q1: 20%
  - Q2: 21.7%
  - Q3: 26.3%
  - Q4: 32.1%

Disclaimer

The content of this report reflects Pixalate's opinions with respect to the factors that Pixalate believes can be useful to the digital media industry. Any data shared is grounded in Pixalate's proprietary technology and analytics, which Pixalate is continuously evaluating and updating. Any references to outside sources should not be construed as endorsements. Pixalate's opinions are just that, opinions, which means that they are neither facts nor guarantees.

Pixalate is sharing this data not to impugn the standing or reputation of any entity, person or app, but, instead, to report findings and trends pertaining to programmatic advertising activity across CTV apps in the time period studied. Pixalate does not independently verify third-party information.

Per the Media Rating Council (MRC), "'Invalid Traffic' is defined generally as traffic that does not meet certain ad serving quality or completeness criteria, or otherwise does not represent legitimate ad traffic that should be included in measurement counts. Among the reasons why ad traffic may be deemed invalid is it is a result of non-human traffic (spiders, bots, etc.), or activity designed to produce fraudulent traffic." Certain IVT is also sometimes referred to as "ad fraud." Per the MRC, "'Fraud' is not intended to represent fraud as defined in various laws, statutes and ordinances or as conventionally used in U.S. Court or other legal proceedings, but rather a custom definition strictly for advertising measurement purposes.

Glossary

Ad market share / share of voice (SOV): Based on the proportion of sold programmatic ads that go to a certain device, operating system, category, etc. For example, if Device X received 20 of 100 total ads one quarter, its market share would be 20%. If Device X then received 36 of 120 total ads the next quarter, its market share would have increased by 50% (from 20% to 30%).

Ad spend: In the context of this report, programmatic ads sold, as measured by Pixalate, are used as a proxy for ad spend.

Apps: An app is also sometimes called a "channel" when discussing CTV advertising. This report uses the term "app" for consistency. "Apps with programmatic ads" are based off app Bundle IDs in the ecosystem across all CTV app stores.

Connected TV/OTT: Also referred to as "CTV" in this report. Pixalate defines CTV based on the device being used by the end-user. Examples of CTV devices include Apple TV, Roku, Chromecast, Amazon Fire TV, Smart TVs, and gaming platforms.

Household adoption: The estimated percentage of U.S. households reachable that are reachable via any non-CTV form of programmatic advertising (such as mobile in-app), as measured by Pixalate that are also reachable via CTV programmatic advertising, as measured by Pixalate. Invalid traffic (IVT) is removed.

Programmatic CTV: The report examines global programmatic advertising activity across CTV devices. Pixalate's datasets consist predominantly of open auction programmatic traffic sources.

About Pixalate

Pixalate is the market-leading fraud protection, privacy, and compliance analytics platform for Connected TV (CTV) and Mobile Advertising. We work 24/7 to guard your reputation and grow your media value. Pixalate offers the only system of coordinated solutions across display, app, video, and CTV for better detection and elimination of ad fraud. Pixalate is an MRC-accredited service for the detection and filtration of sophisticated invalid traffic (SIVT) across desktop and mobile web, mobile in-app, and CTV advertising. www.pixalate.com

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