



Music in the Air

Focus on monetisation, Emerging Markets and AI; updating global music industry forecasts

2023 was a turning point for the music industry in many respects, marked by the first ever major price increase by global streaming platforms, the modernisation of outdated royalty payment structures and the deployment of Generative AI. We expect to see further progress in these areas in 2024 and beyond, including: (i) a second round of headline price increases and/or product-led price increases; (ii) the launch of new super premium plans catering to superfans; (iii) the adoption of artist-centric payment models by more streaming platforms; and (iv) the development of a framework and monetisation avenue for the use of music content by Generative AI models, either through the first commercial licensing agreements between tech companies and rights holders or through establishing legal precedents. As the monetisation of paid subscription improves, we believe there is also an opportunity to better monetise the vast pool of freemium users and evolve the ad-supported offering to improve paid conversion rates.

We update our global music industry forecasts, overall raising our 2024-30E CAGR slightly to +7.6%, reflecting a stronger outlook for the live music and music publishing segments. In recorded music, our raised physical sales assumptions are offset by reduced ad-supported streaming growth (partly reflecting more limited upside from TikTok monetisation) and the faster subscription revenue mix shift towards Emerging Markets, which we analyse in more detail in this report.

Overall, we see future industry dynamics and positive developments around monetisation as supportive for our global music industry coverage.

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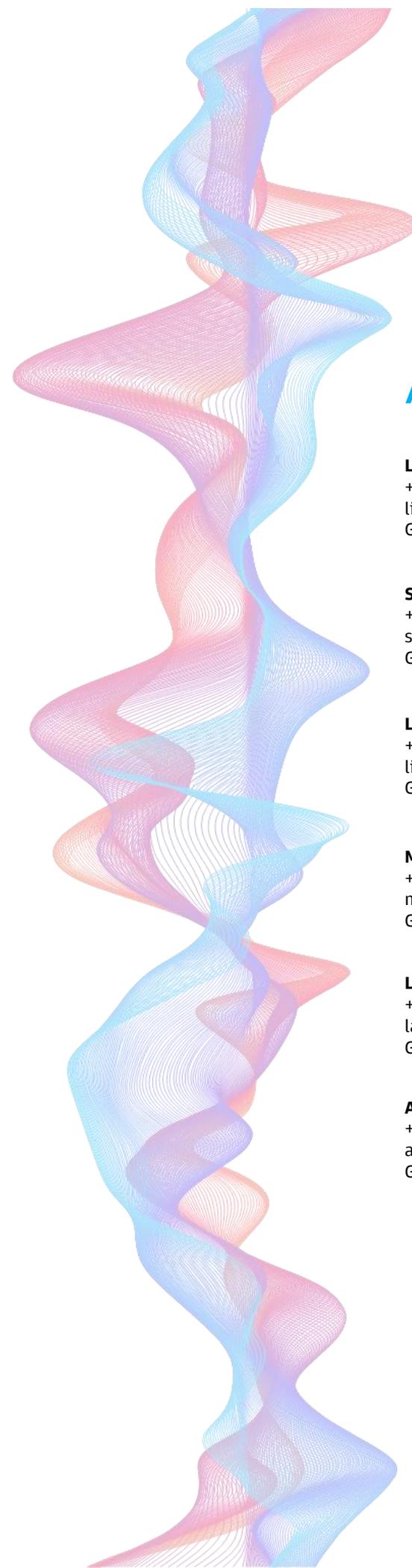
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PM Summary

2023 was a turning point for the music industry in many respects, marked by the first ever major price increase by global streaming platforms, the modernisation of outdated royalty payment structures and the deployment of Generative AI. We expect to see further progress in these areas in 2024 and beyond, including: (i) a second round of headline price increases and/or product-led price increases; (ii) the launch of new super premium plans catering to superfans; (iii) the adoption of artist-centric payment models by more streaming platforms; and (iv) the development of a framework and monetisation avenue for the use of music content by Generative AI models, either through the first commercial licensing agreements between tech companies and rights holders or through establishing legal precedents.

Raise global music industry forecasts on stronger live and publishing outlook

We update our global music industry forecasts, overall raising our 2024-30E CAGR to +7.6% (from +7.4%) and absolute estimates for 2030 by 12%. This reflects a stronger outlook for the live music (2030 estimates raised by 31%) and music publishing segments (2030 estimates raised by 4%), whilst our recorded music forecasts are reduced modestly (-1% in 2030) as higher physical sales assumptions are offset by reduced streaming growth forecasts across ad-funded (reflecting more limited upside from TikTok and a more mature online video market) and paid (reflecting an increased revenue mix shift towards lower ARPU emerging markets).

Entering a new era of improved music monetisation: headline price increases, extra product/ feature monetisation, super premium plans catering to superfans

Whilst global streaming services have implemented their first ever round of major price increases over the past 18 months, we believe that music streaming subscriptions continue to offer good value for consumers (in fact, the average revenue per stream fell by 10% yoy in 2023), with monetisation lagging that of the video streaming industry (SVOD) by about 10 years. Future rounds of price increases may take the form of headline price increases across all plans or more nuanced product or feature-led price increases (e.g. charging for audiobooks or Hi-Fi audio, or the launch of new super premium plans catering to superfans). We continue to model a c.3% average annual price increase within our streaming revenue forecasts for developed markets, whilst we see 13% incremental revenue uplift potential from the monetisation of superfans by 2030. As the monetisation of paid subscription improves, we believe that there is also an opportunity to better monetise the vast pool of freemium users and evolve the ad-supported offering to improve paid conversion rates.

Modernising of the streaming payout model underway but no immediate financial impact

As the volume of new tracks uploaded onto streaming services continues to grow (rising 11% yoy again in 2023), with Generative AI likely to further accelerate this trend, we believe that the traditional 'pro rata' streaming payout model between DSPs and labels will need to be modernised. We see the changes recently introduced by Deezer and Spotify as a positive step in this regard, and would expect other streaming services to follow in the coming year. We do not assume an immediate financial benefit for the major music companies, but have gained more confidence in their ability to offset future potential dilution from fraud and noise (including gen AI created content).

Emerging Markets driving next phase of subscription streaming growth and reshaping royalty distribution and capital allocation priorities

We estimate that EM contributed 60% of net subscriber additions in 2023, and forecast this share to rise to 70% by 2030. The growing mix shift towards EM has major implications for future industry growth, distribution of royalties and capital allocation priorities amongst major industry participants. In particular, we note that (i) EM ARPU is c.4x lower than in DM, (ii) paid conversions are low with a vast and growing pool of freemium users that could switch over time, (iii) the competitive landscape is more fragmented, with the major music companies commanding a lower market share than in DM, and (iv) local non-English acts are taking share domestically and internationally. As a result, we believe that the major music companies will deploy more resources and capital to grow their share of local acts and local music markets over the coming years, through signing more local acts (e.g. scaling local A&R teams), distribution agreements with local labels (which are low risk but low margin) and acquisitions (e.g. WMG's recent interest in Believe).

Generative AI: towards a new framework and monetisation avenue for the use of music IP?

We believe that the past 12 months have largely allayed initial fears around the impact of Generative AI for music labels. We have seen broad alignment across the major industry participants in limiting AI deepfakes and ensuring a controlled deployment of the new technology, while the flood of new AI generated content onto streaming services has not yet materialised. That said, we believe the industry is still in an experimental phase, new gen AI music start-ups are proliferating and the protection of music copyrights remains a challenge. We look for the first commercial licensing agreements between tech companies and rights holders and rulings on major pending lawsuits to help establish a clearer framework and monetisation avenue for the use of music content by Generative AI models.

Market share shifts amongst record labels and DSPs

Market share for the top 3 major labels remained broadly stable in 2023, with Sony Music gaining c.0.3ppt share, mainly at the expense of WMG, while UMG and independents' shares were broadly unchanged, based on our calculations. Meanwhile, bigger competitive shifts are taking place in the distribution landscape, with Spotify regaining market share for the first time and YouTube continuing to be the major gainer globally, largely at the expense of local streaming services, Apple Music and Amazon Music. Tencent Music and NetEase in China continue to see strong subscriber momentum and count more subscribers than Apple Music and Amazon Music combined globally.

Raise global music industry forecasts by c.10% on stronger 2023 and slightly raised 2024-30E CAGR of 7.6%

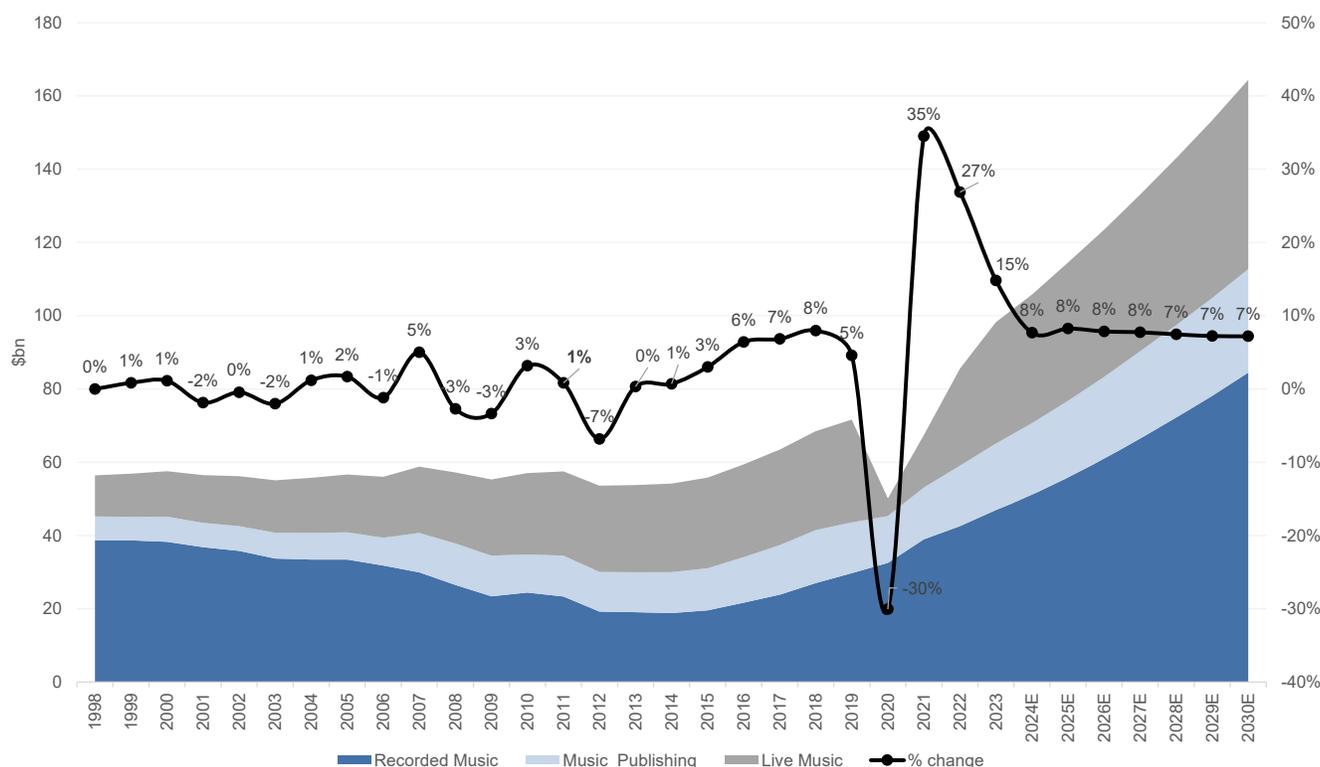
We update our global music industry model following the publication of the 2023 recorded music market figures from IFPI, and reflecting the latest trends and datapoints.

The global music market (recorded, publishing and live) grew faster than expected in 2023, up 15% yoy (GSe +7% yoy), driven by stronger than expected growth in live music (we estimate +25% yoy, leaving the market c.20% above 2019 levels), and better than expected growth in recorded music and music publishing (+10%/+11% yoy respectively).

We forecast global music industry revenues to grow at +7.9% yoy in 2024 (+7.8% prior), with a return to more normalised live music growth of +6.0% yoy (+5.0% prior), solid recorded music growth of +8.9% yoy (+9.3% prior) and publishing growth of +9.2% yoy (+8.5% prior). Our 2024-30E industry revenues increase by c.10% on average on the back of a higher 2023 base, as well as a slightly raised 2024-30E CAGR of +7.6% (+7.4% prior). The improved growth outlook is mainly driven by a higher music publishing CAGR of +7.8% (+7.6% prior) and live music CAGR of +6.6% (+5.0% prior), partly offset by a slightly lower recorded music CAGR of +8.1% (+8.6% prior). Within recorded music, we lower our streaming growth forecasts to a 10% CAGR (+11% prior), mainly reflecting lower ad-funded and emerging platform revenues assumptions, as well as a faster subscription revenue mix shift towards EM. We discuss these forecasts in greater detail below.

Exhibit 1: We expect the global music industry to grow revenues +7.9% yoy in 2024, and sustain this growth rate thereafter

Global music market (recorded, publishing, live) breakdown (\$bn, LHS), % growth (RHS)



Source: Music and Copyright, Company data, Goldman Sachs Global Investment Research, IFPI Global Music Report 2024

Exhibit 2: We raise our global music market forecasts (based on net revenues) over 2024-30 by c.10% on average, mainly driven by live music while our recorded music forecasts are broadly unchanged

New vs. old forecasts

	2023		2024E		2025E		2030E		% change			
	New	Old	New	Old	New	Old	New	Old	2023	2024E	2025E	2030E
Global Music Market (\$bn)**	\$98.3	\$92.0	\$106.0	\$99.2	\$114.8	\$107.1	\$163.7	\$151.4	7%	7%	7%	8%
Global Music Market (\$bn)*	\$70.8	\$65.1	\$76.1	\$69.8	\$82.4	\$75.1	\$116.5	\$104.4	9%	9%	10%	12%
Recorded Music Market (\$bn)*	\$28.6	\$28.2	\$31.2	\$30.8	\$33.9	\$33.7	\$49.5	\$50.1	2%	1%	1%	-1%
Music Publishing Market (\$bn)*	\$9.0	\$8.8	\$9.9	\$9.6	\$10.7	\$10.4	\$15.3	\$14.7	3%	3%	3%	4%
Live Music Market (\$bn)*	\$33.1	\$28.1	\$35.1	\$29.5	\$37.7	\$31.0	\$51.7	\$39.5	18%	19%	22%	31%
Recorded Music												
Physical (\$bn)*	\$5.1	\$4.5	\$5.2	\$4.4	\$5.5	\$4.3	\$6.4	\$3.9	14%	20%	28%	65%
Performance (\$bn)*	\$2.7	\$2.6	\$2.9	\$2.7	\$3.1	\$2.9	\$4.0	\$3.6	5%	7%	9%	11%
Sync (\$bn)*	\$0.6	\$0.7	\$0.7	\$0.7	\$0.8	\$0.8	\$1.0	\$1.0	-8%	-4%	-2%	-1%
Download (\$bn)*	\$0.9	\$0.8	\$0.8	\$0.6	\$0.7	\$0.5	\$0.3	\$0.2	20%	28%	36%	84%
Streaming												
Streaming Market (\$bn)**	\$37.6	\$38.4	\$42.0	\$43.7	\$46.4	\$49.0	\$73.0	\$80.3	-2%	-4%	-5%	-9%
Streaming Market (\$bn)*	\$19.3	\$19.6	\$21.5	\$22.4	\$23.9	\$25.2	\$37.8	\$41.4	-2%	-4%	-5%	-9%
Paid Streaming Market (\$bn)**	\$26.4	\$26.9	\$29.8	\$30.2	\$33.0	\$33.5	\$49.7	\$51.7	-2%	-1%	-1%	-4%
Ad funded Streaming Market (\$bn)**	\$11.2	\$11.5	\$12.3	\$13.5	\$13.4	\$15.5	\$23.3	\$28.6	-2%	-9%	-13%	-19%
Paid Subscribers (mn)	667	663	749	738	824	811	1,205	1,200	1%	2%	2%	0%
Developed Market (mn)	367	381	400	413	430	442	558	579	-4%	-3%	-3%	-4%
Emerging Market (mn)	300	282	350	325	394	370	647	621	6%	7%	7%	4%
Annual ARPU (\$)**	\$42.2	\$43.0	\$42.0	\$43.1	\$42.0	\$43.3	\$42.6	\$44.6	-2%	-2%	-3%	-5%

* Net revenues (i.e. record label or publisher share; total revenues from ticket sales and sponsorship for Live Music); **Gross revenues

Source: Music & Copyright, Company data, Goldman Sachs Global Investment Research, IFPI Global Music Report 2024

Exhibit 3: Our growth forecasts are slightly raised on higher assumptions for live music and publishing

New vs. old forecasts

% growth rates	2023		2024E		2025E		2030E		% change			
	New	Old	New	Old	New	Old	New	Old	2023	2024E	2025E	2030E
Global Music Market **	14.8%	7.2%	7.9%	7.8%	8.3%	7.7%	7.1%	7.1%	7.6pp	0.1pp	0.6pp	0.0pp
Global Music Market *	16.8%	7.0%	7.6%	7.3%	8.2%	7.3%	7.0%	6.7%	9.8pp	0.3pp	0.9pp	0.2pp
Recorded Music Market *	10.2%	7.5%	8.9%	9.3%	8.8%	9.1%	7.4%	8.2%	2.7pp	-0.4pp	-0.3pp	-0.8pp
Music Publishing Market *	10.9%	8.2%	9.2%	8.5%	8.6%	8.7%	7.2%	6.6%	2.7pp	0.7pp	-0.1pp	0.6pp
Live Music Market **	25.0%	6.0%	6.0%	5.0%	7.5%	5.0%	6.5%	5.0%	19.0pp	1.0pp	2.5pp	1.5pp
Recorded Music												
Physical *	13.4%	-2.4%	3.1%	-2.6%	4.1%	-1.9%	3.2%	-1.0%	15.8pp	5.7pp	6.1pp	4.2pp
Performance *	9.5%	5.0%	7.0%	5.0%	7.0%	5.0%	5.0%	5.0%	4.5pp	2.0pp	2.0pp	0.0pp
Sync*	4.7%	7.0%	10.0%	6.0%	9.0%	6.0%	5.0%	5.0%	-2.3pp	4.0pp	3.0pp	0.0pp
Download*	-2.6%	-20.0%	-15.0%	-20.0%	-15.0%	-20.0%	-15.0%	-20.0%	17.4pp	5.0pp	5.0pp	5.0pp
Streaming												
Streaming Market **	10.3%	11.9%	11.6%	13.9%	10.4%	12.1%	8.8%	9.8%	-1.6pp	-2.3pp	-1.7pp	-1.0pp
Streaming Market *	10.4%	12.0%	11.7%	13.8%	11.0%	12.4%	8.8%	9.8%	-1.6pp	-2.1pp	-1.4pp	-1.0pp
Paid Streaming Market **	11.2%	12.6%	12.7%	12.2%	10.9%	11.0%	7.4%	8.1%	-1.4pp	0.5pp	-0.1pp	-0.7pp
Ad funded Streaming Market **	8.2%	10.3%	9.1%	18.0%	9.1%	14.8%	12.0%	13.2%	-2.1pp	-8.9pp	-5.7pp	-1.2pp
Paid Subscribers	14.2%	12.5%	12.3%	11.4%	10.0%	9.9%	6.7%	7.2%	1.7pp	1.0pp	0.1pp	-0.5pp
Developed Market	10.8%	9.6%	8.9%	8.3%	7.6%	7.0%	4.4%	5.0%	1.2pp	0.7pp	0.6pp	-0.6pp
Emerging Market	18.7%	16.7%	16.5%	15.5%	12.8%	13.6%	8.7%	9.3%	2.0pp	1.0pp	-0.8pp	-0.6pp
Annual ARPU	-2.9%	-1.3%	-0.4%	0.2%	-0.2%	0.4%	0.5%	0.8%	-1.6pp	-0.6pp	-0.5pp	-0.3pp

* Net revenues (i.e. record label or publisher share; total revenues from ticket sales and sponsorship for Live Music); ** Gross revenues

Source: Music & Copyright, Company data, Goldman Sachs Global Investment Research, IFPI Global Music Report 2024

Exhibit 4: 2023 recorded music market growth was c.3ppt better than we expected, mainly driven by Physical, Performance and Download, while Streaming growth came in 1.6ppt below our expectations

Global recorded music constant currency growth in 2023

% cc growth rates	2023		Actual vs GSe (%)
	Actual	GSe	
Recorded Music	10.2%	7.5%	2.7pp
Streaming Market	10.4%	12.0%	-1.6pp
Physical	13.4%	-2.4%	15.8pp
Performance	9.5%	5.0%	4.5pp
Sync	4.7%	7.0%	-2.3pp
Download	-2.6%	-20.0%	17.4pp

Source: Goldman Sachs Global Investment Research, IFPI Global Music Report 2024

Recorded Music: expect ongoing solid growth trends but with different revenue mix

2023 global recorded music growth came 2.7ppt ahead of our expectations

IFPI released its Global Music Report earlier this year, confirming another strong year of growth for the global recorded music market; this was up by 10.2% yoy in constant currency, ahead of our prior expectations of 7.5% yoy, to reach a total value of \$28.6bn in 2023, which was 2% ahead of our \$28.2bn forecast.

Most segments came in ahead of our expectations, with the exception of streaming and sync. Physical sales grew +13% yoy (GSe -2% prior), helped by strong growth in vinyl and CD sales (+15%/+14% yoy respectively), which has largely been driven by serving superfans. Performance rights grew +c.10% yoy (GSe +5% prior), benefiting from the continued Covid reopening (public performance revenues grew +17% yoy), while Downloads & Other Digital were down -c.3% (GSe -20% prior), marking the slowest rate of decline for the format since 2013, supported by strong growth in mobile personalisation and other revenues. Sync growth decelerated to +5% (GSe +7% prior) on the back of record growth in 2022 and the impact from the US writers' and actors' strike.

Subscription streaming growth came in weaker than expected (+11.2% vs. GSe +12.6% prior) mainly owing to lower paid streaming ARPU (-2.9% yoy in 2023 vs. GSe -1.3%), whilst the number of paid streaming users came in marginally higher than expected (667mn vs. GSe 663mn prior). Overall, the paid streaming market added +83mn new subscribers in 2023, compared with +75mn/+92mn in 2022/21, and in line with the average pace of net adds across 2019-20. Whilst the rate of ARPU decline improved (-2.9% yoy in 2023 vs. -7% yoy in 2022), helped by headline price increases by major platforms through the year, we believe that the miss vs. our forecasts reflected: (i) the ongoing negative ARPU mix shift towards emerging markets, which accounted for c.60% of 2023 subscriber growth (we estimate EM ARPU is 4x lower than that of DM) and (ii) ongoing dilution from family plans and bundles. Ad-supported streaming was also weaker than our expectations (+8.2% vs. GSe +10.3% prior), due to (i) a slower than expected recovery in the global advertising market and (ii) a lower growth contribution from emerging platforms such as TikTok, YouTube Shorts and Instagram Reels (+15.3% yoy vs GSe: 25%, a marked deceleration from +30.9%/+41.3% yoy in 2022/21).

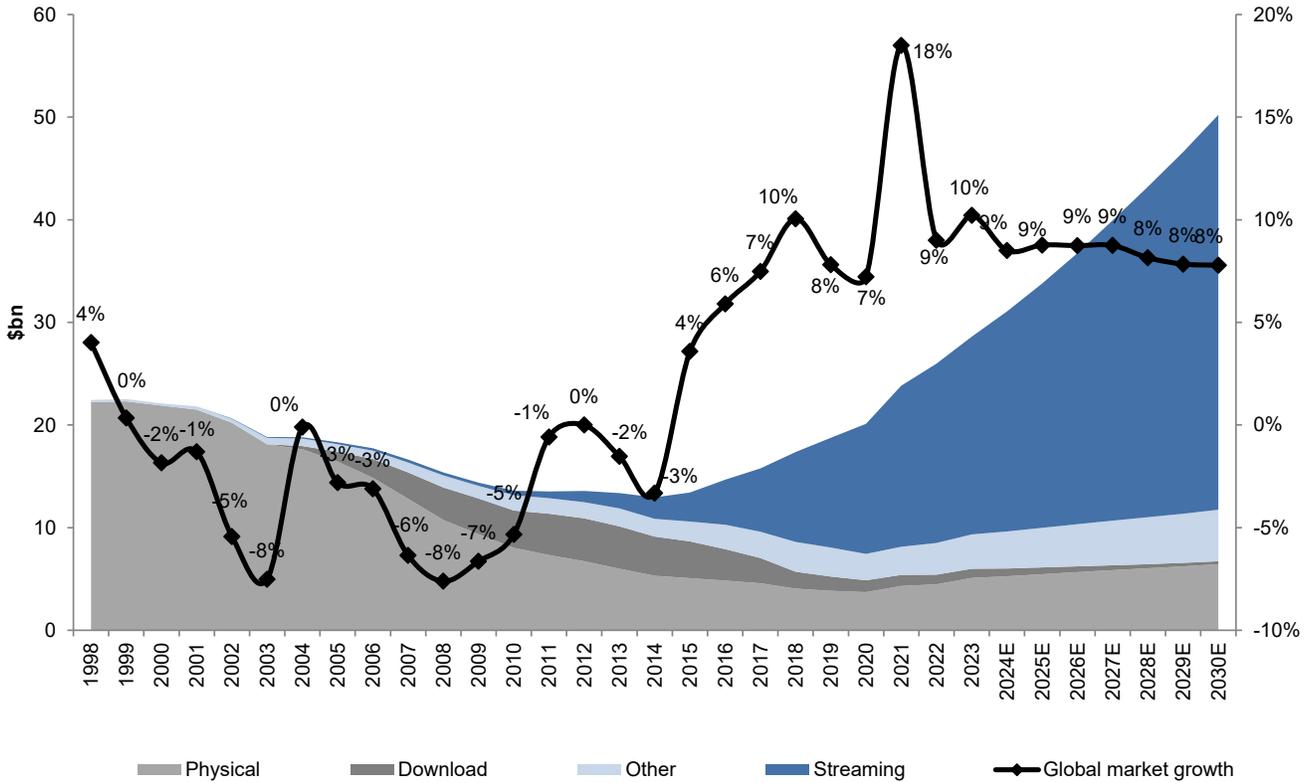
Recorded music forecasts remain broadly unchanged as lower streaming forecasts are more than offset by higher growth elsewhere

For 2024/25, we slightly lower our recorded music growth forecasts to 8.9%/8.8% yoy respectively (vs. 9.3%/9.1% prior). We lower our 2024/25 streaming (subscription & ad-supported) revenue growth forecasts, expecting streaming revenue (record label share) growth of +11.7%/+11.0% yoy in 2024/25 (+13.8%/+12.4% prior), mainly due to lower ad-supported streaming revenues as we reflect the impact of the UMG/TikTok dispute and a more gradual recovery in video advertising, as well as an accelerated subscription revenue mix shift towards EM. This still represents an improvement on the 2023 growth of +10.4%, mainly driven by the Spotify headline price increases (three quarters of the contribution in 2024).

For 2024-2030, we now forecast an **+8.1% revenue CAGR (+8.6% prior)**, with the main assumptions detailed below:

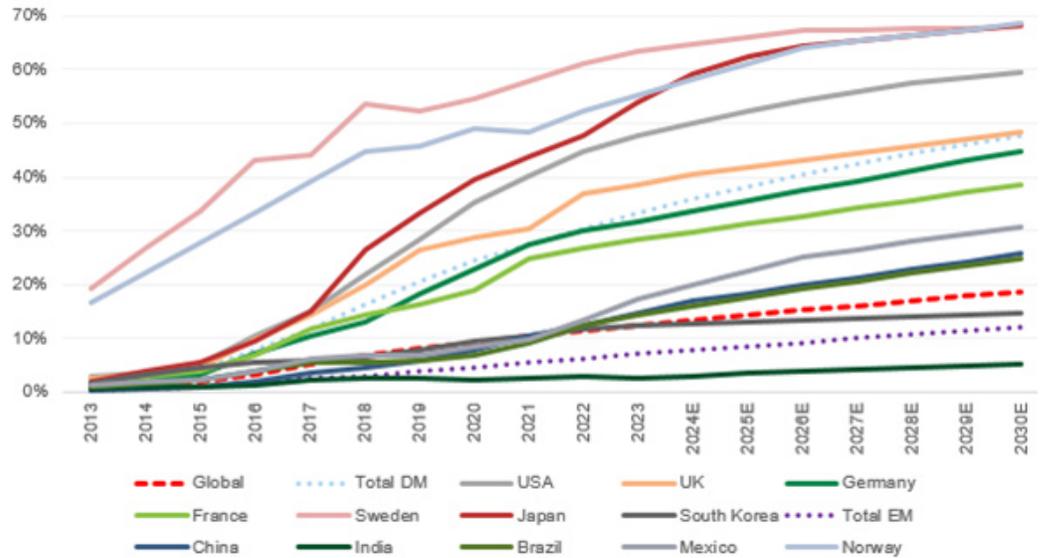
- **Paid streaming: Our revenue forecasts decrease by 4% over 2024-30, mainly due to the lower 2023 base (2% miss) and lower ARPU assumptions (related to the EM/DM shift)** to reach \$49.7bn/\$26.3bn (gross/net) in 2030. This implies a +9.4% CAGR 2024-30 (+9.8% prior). Within the mix, we broadly maintain our **paid subscriber forecasts at 1.205bn in 2030** (1.200bn prior), based on **global paid streaming penetration (as a % of internet users) rising to 18.6% in 2030 from 12% in 2023**, with **DM penetration rising to 48% in 2030 from 33% in 2023**, and **EM penetration rising to 13% in 2030 from 7% in 2023**. We assume a global ARPU decline of -0.4% in 2024 (vs. +0.2% prior, and -2.9% in 2023) and broadly flat ARPU across 2024-2030 (GSe +0.5% prior). Given the ongoing deceleration in DM volume growth as markets mature, this implies a greater reliance on improving pricing in these markets to drive revenue growth in the future, whilst the priority in EM will likely remain volume growth over monetisation. We continue to model 3% average headline pricing growth in DM per annum, mostly offset by the dilution from EM and family plans/bundles. We do not include at this stage any potential benefit from the introduction of new premium pricing tiers.
- **Ad-funded streaming:** We reduce our forecasts for ad-funded streaming, which we now expect to grow at an 11.6% CAGR 2024-30 vs. 14.6% previously, reflecting lower growth assumptions across video and emerging platforms (in particular TikTok). For 2024, we reflect the impact of the non-renewal of the licensing agreement between UMG and TikTok, which UMG estimated at c.1% of group revenues on an annual basis (implying c.\$118mn across recorded and publishing). From 2025, we assume a more gradual step up in payments from TikTok to the recorded music industry, resulting in an overall emerging platform revenue CAGR of 16.1% for 2024-30E (from 19.3% previously).
- **Physical:** We raise our physical sales forecasts materially (2024-30 revenue CAGR of +3% vs. -2% previously) as we believe that the return to growth observed in the past three years can be sustained, owing to an improving mix shift towards vinyl, which has recorded double-digit growth across the past four years, as well as the revival of CD sales (c.+7% growth per year on average over the past three years). We believe Physical sales have become one of the major routes to monetise the superfans, with Luminate's 2023 mid-year Music Report highlighting that physical music buyers in the US are more than twice as likely to be music superfans and spend 80% more money on music than the average listener.

Exhibit 5: We forecast the global recorded music market to grow 8.5%/8.8% in 2024/2025 and at an 8.1% CAGR 2024-2030E
 Global Recorded Music market revenues (\$bn, LHS), % growth (RHS)



Source: Goldman Sachs Global Investment Research, IFPI Global Music Report 2024

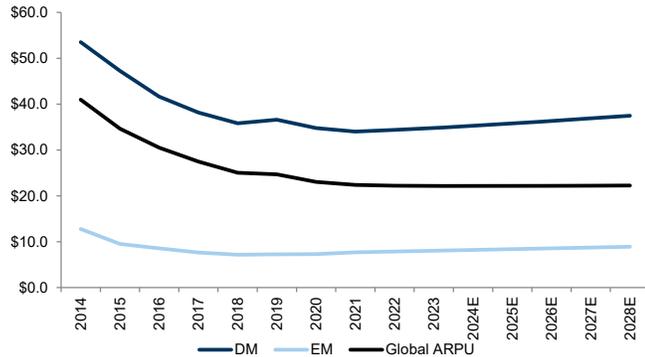
Exhibit 6: We forecast global paid streaming penetration to increase to 19% in 2030 from 12% in 2023
 Streaming penetration by market (as % of Internet users), 2013-30E



Source: Goldman Sachs Global Investment Research, IFPI Global Music Report 2024

Exhibit 7: Global ARPU has begun to stabilise over the last couple of years, which we expect to continue as improved DM monetisation offsets dilution from EM...

Paid streaming ARPU - Global, DM and EM



Source: Goldman Sachs Global Investment Research, IFPI Global Music Report 2024

Exhibit 8: ... which broadly tracks the improved ARPU trends seen at Spotify

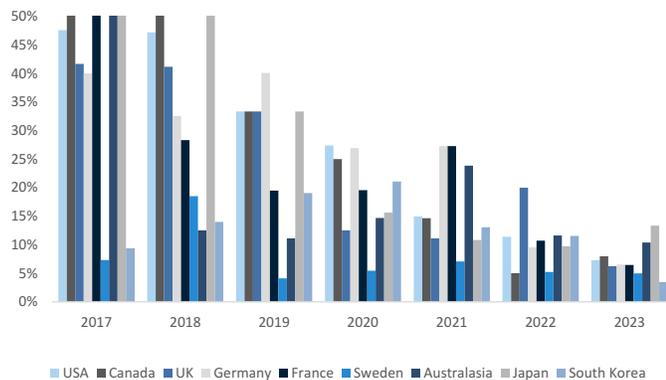
ARPU growth yoy - Spotify & Global



Source: Company data, Data compiled by Goldman Sachs Global Investment Research, IFPI Global Music Report 2024

Exhibit 9: Subscription volume growth has slowed across the main developed markets, implying greater reliance on pricing to drive future revenue growth

Paid subscriber yoy growth in developed markets, 2017-23



Source: IFPI Global Music Report 2024, Goldman Sachs Global Investment Research

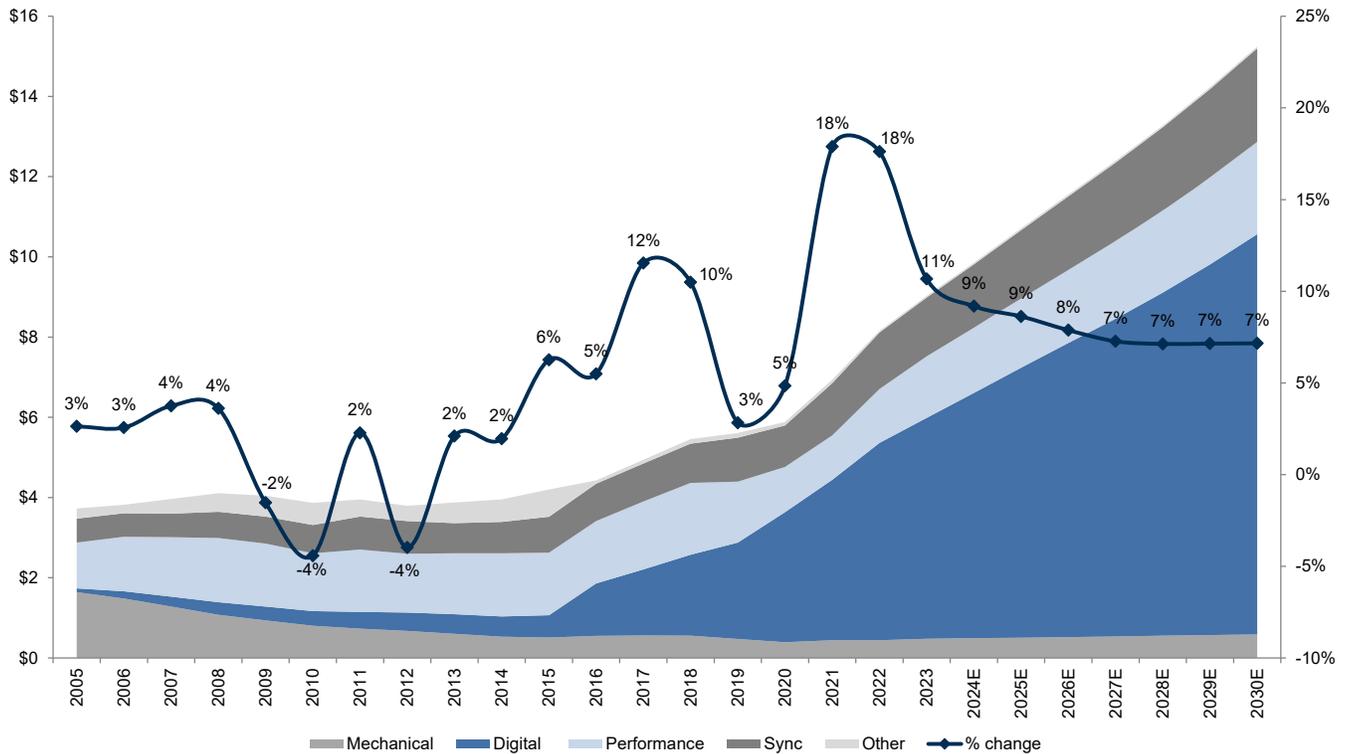
Music Publishing: expect another year of outperformance vs. recorded music, raise 2024-30E CAGR to +7.8% yoy (from +7.6%)

The Music Publishing market enjoyed a strong year of revenue growth in 2023, up 11% yoy on the back of the record growth seen in 2022/21, and outperforming once again the recorded music market. We believe that the publishing industry benefited from strong growth in performance and streaming royalties, the step-up in CRB statutory mechanical rates for streaming and physical sales in the US and ongoing improvement in catalogue monetisation. We slightly raise our growth forecasts to c.9% in 2024/25, slightly ahead of the recorded music market growth, with a 7.8% CAGR for 2024-30E (from +7.6% prior), taking music publishing to \$15.3bn in 2030. In 2024 in particular, we expect to see further improvement in CRB rates to 15.2% (from 15.1%) for streaming and to 12.40 cents (from 12.0 cents) for physical products and digital downloads in the US, as well as an acceleration in sync revenue growth given the impact of the US

writers’ strikes in 2023. That said, in April, Spotify re-categorised its Premium subscribers as ‘bundles’, allowing it to pay a rate lower than the headline 15.2% of mechanical royalties in the US; we note that the NMPA believe this violates the agreed settlement in 2022 and is currently reviewing its options.

Exhibit 10: We forecast the Music Publishing market to grow by c.9% in 2024/2025 after a strong +c.11% last year

Global Music Publishing market revenues (\$bn) and % growth



Source: Music & Copyright, OMDIA, Company data, Goldman Sachs Global Investment Research

Live Music: improved growth outlook driven by strong demand and supply tailwinds

The live music industry continued its strong rebound in 2023, with estimated revenues of \$33.1bn in 2023 (vs. \$26.5bn in 2022) based on the trends reported by various industry players such as Live Nation and CTS Eventim. In 2023, we estimate that the industry grew 25% yoy, well ahead of our prior 6% forecast, and reaching 118% of 2019 levels. This is driven in our view by a strong schedule that featured many artists who had not toured since pre-Covid, in particular Taylor Swift and Beyonce, driving both attendance (owing to larger venues) and pricing power (due to perceived scarcity of these artists in the short term). This also once again demonstrates the resilience of concert spending amidst elevated inflation and pressure on consumer spending, and the growing structural demand for experiences, particularly amongst Gen Z and Millennials. In 2024, we expect activity to normalise (+6% yoy), given the tough comps following the release of pent-up demand and supply. Looking forward, we expect live music to remain an attractive market with a solid growth outlook (GSe +6.5% 2024-30 CAGR, from +5% previously), given strong secular demand & supply tailwinds.

Increasing supply of artists touring. On the supply side, we see long-term growth driven by the globalisation of music (i.e. artists from anywhere in the world can have a global fan base to tour to thanks to the proliferation of streaming) and stronger financial incentives for artists to tour (e.g. top artists earn up to c.95% of their income from touring). Live entertainment companies have spoken to strong supply in 2024. For example, Live Nation stated with 4Q23 earnings that show count is pacing up double-digits yoy across its larger-format footprint (e.g. amphitheaters, arenas & stadiums) for 2024. Similarly, MSG Entertainment has noted that it expects a low-double-digit yoy increase in bookings for its fiscal year 2024 (ends June 30), with yoy concert bookings pacing ahead by a fairly strong double digit for 1HFY25 at The Garden in NYC.

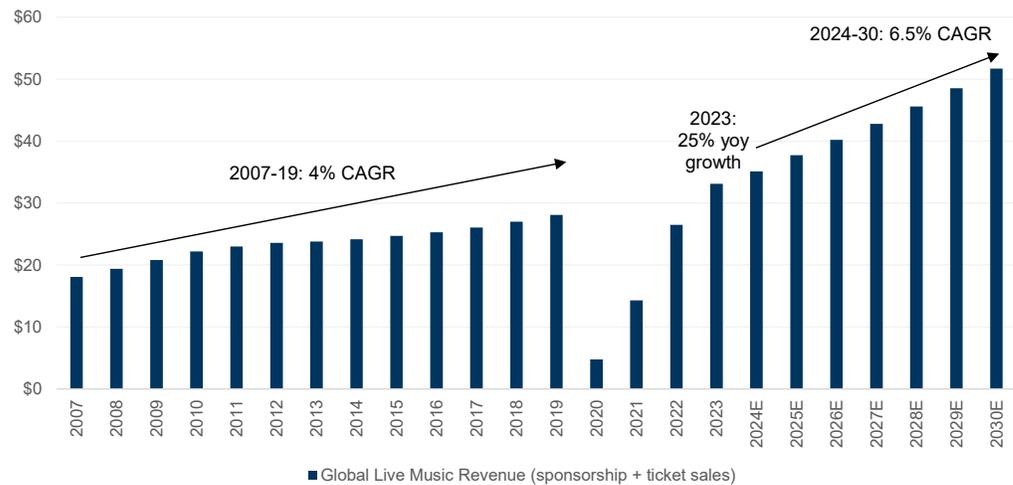
As mentioned, 2023 was a historically robust stadium year in terms of supply, as many top artists came back from multi-year touring hiatuses with new music post-Covid. In 2024, we expect that the concert slate will mix-shift more towards smaller and mid-sized venues such as amphitheaters as global artists temporarily pare back touring following a busy stretch, and as some larger venues across Europe come offline for large events such as the Olympics and UEFA Euro 2024.

Robust demand for Live Music. Over the long term, we believe that demand for live entertainment will be driven by i) supportive demographic and consumer trends, and ii) the increased awareness of and social value attributable to live events brought about by streaming and social media.

In our view, continued momentum even after a tougher 2022/23 consumer backdrop lends weight to our thesis that demand for live events has structurally increased on a global basis coming out of the pandemic, and is less cyclical compared to other types of consumer discretionary categories. Despite pressures on consumer wallets from inflation, rate increases, resumed student loan repayments, corporate layoffs and more in the last 12-24 months, which is when fans would have started saving for/planning to buy tickets for 2024, demand for tickets continues to be robust. For instance, Live Nation noted on its last earnings call that it continues to see durable consumer demand trends across its business, despite a somewhat uncertain economic backdrop, noting that ticket sales, show close outs, and per caps all continue to trend strongly. There is some evidence of a slowdown, however, with The Coachella Festival's first of two weekends selling out after 27 days in 2024, compared with 4 days in 2023 and just 40 minutes in 2022 when it returned after a two-year hiatus.

Exhibit 11: We believe live music revenues will grow at a faster pace post-Covid given strong secular tailwinds

Global Live Music market (\$bn)

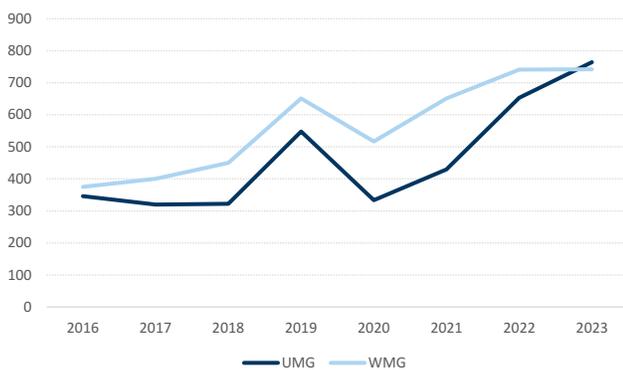


Source: PWC, Goldman Sachs Global Investment Research

The major labels have a relatively low exposure to live music, and this is mainly through their merchandising division and live performance royalties. We forecast UMG’s merchandising revenue (we estimate around half is related to touring) to normalise in 2024 (GSe: +5% yoy) following +18% in 2023. Meanwhile, we expect WMG’s Artist services & expanded-rights revenue, which includes direct-to-consumer merchandise sales, touring, concert promotion and ticketing, to remain lacklustre at +1% in FY24 (excluding a \$45mn impact from a cost efficiency plan) following a -1.5% decline in FY23, on the back of a light touring schedule and tough comps.

Exhibit 12: Merchandising revenues have recovered strongly post-Covid for UMG/ WMG

\$mn

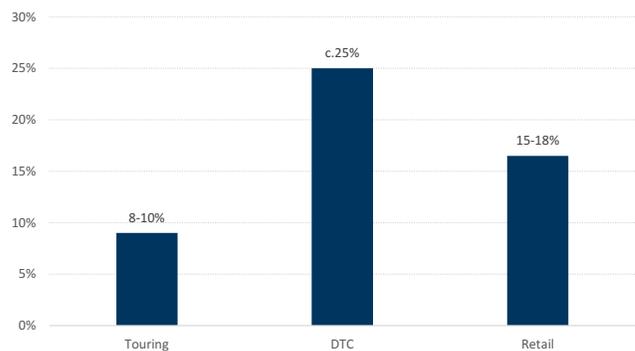


*WMG refers to Artist services and expanded-rights revenues

Source: Company data, Goldman Sachs Global Investment Research

Exhibit 13: Touring-related activity is the lowest-margin business within UMG’s merchandising business

Illustrative UMG merchandising gross margin



Source: Company data, Goldman Sachs Global Investment Research

Data from the IFPI Global Music Report 2024 was used to create material in this report. All statements using IFPI data represent Goldman Sachs' interpretation of data, research opinion or viewpoints published as part of the IFPI Global Music Report 2024, and have not been reviewed by IFPI. Each IFPI publication speaks as of its original publication date (and not as of the date of this report.)

Entering a new era of improving music monetisation

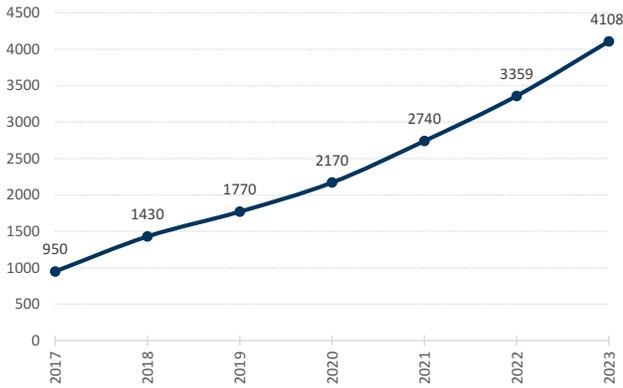
Over the past 18 months, all major streaming platforms have announced their first ever comprehensive price increases across standard and family plans following a decade of stagnant prices. These price increases appear to have had little or no impact on subscriber growth and churn rates despite a context of elevated inflation and consumer spending pressure, which in our view constitutes clear evidence that music streaming subscriptions remain a compelling value proposition for consumers. Indeed, the number of audio streams continued to rise in 2023 (+23% yoy globally) whilst the implied ARPU per stream declined further (-10% yoy globally). We believe that the industry can sustain improved pricing in the future, either through a recurring cadence of headline price increases or more tactical, product-led price increases, as well as developing innovative DTC offerings that can cater to superfans. As premium plan pricing continues to improve, we believe that the audio ad-supported streaming offering will also need to evolve to improve the monetisation of ad-supported users (for instance through higher ad loads and CPMs, or through introducing an advertising light tier for a small charge) and/ or support higher conversion rates towards the premium plan (through placing greater content or feature restrictions on the freemium service), which we address in the later section: *Ad-supported streaming market maturing; lower monetisation upside from emerging platforms*.

Music monetisation still lags consumption and other forms of content

The fall in the barriers to distribution and creation of music content has led to a surge in the number of songs released and consumed. The consumption of audio streams globally has quadrupled since 2017, while even in a more mature market like the UK, the consumption of streams has increased 2.5x since 2017. However, the monetisation of music content has significantly lagged consumption due to the (i) lack of price increases, (ii) dilution from bundles and (iii) lack of customer segmentation, in our view. It has also notably lagged the monetisation of other forms of content such as SVOD, where Netflix has seen its standard rate increase by 94% in the US since 2013 or c.15% every two years. We calculate that the implied revenue per audio stream (both subscription and ad supported) has declined by 28% since 2017, while the revenue per streaming hour on Spotify is 2x lower than on Netflix (caveat: this is based on the latest data available – 2021 for SPOT and 2023 for Netflix), with this difference likely greater if 2023 data was available for Spotify.

Exhibit 14: The consumption of audio streams globally increased 23% yoy in 2023, more than quadrupling since 2017

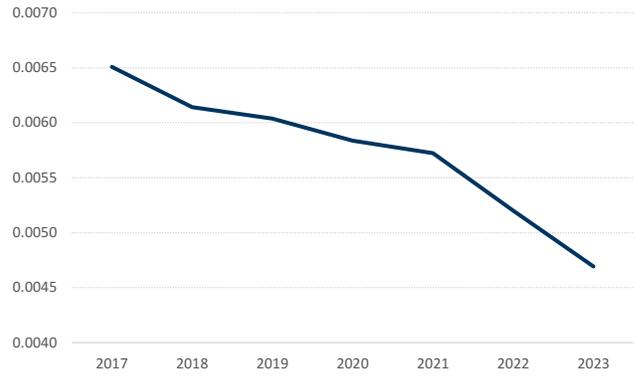
Global On-Demand Audio Song Streams (bn)



Source: Luminate

Exhibit 15: Revenue per stream fell 10% yoy in 2023 and was 28% lower than in 2017

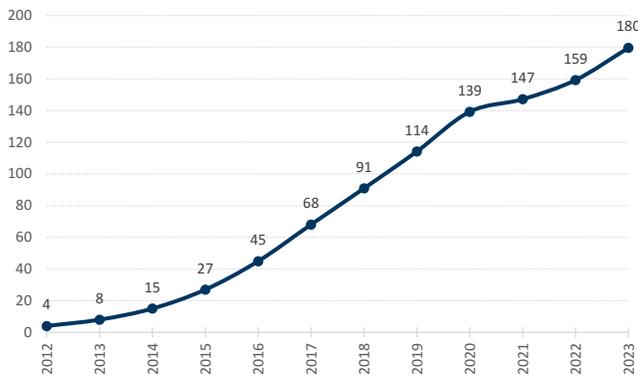
Global revenue per stream, \$



Source: Luminate, IFPI Global Music Report 2024

Exhibit 16: Even in a more mature streaming market like the UK, audio stream consumption rose 13% yoy in 2023 and was 2.5x higher than in 2017

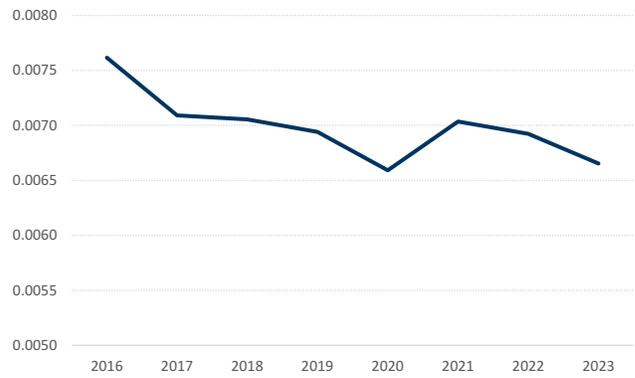
UK Annual Audio Song Streams (bn)



Source: BPI

Exhibit 17: Revenue per stream has been more resilient in the UK, but was still down 4% yoy in 2023 and down 6% vs. 2017

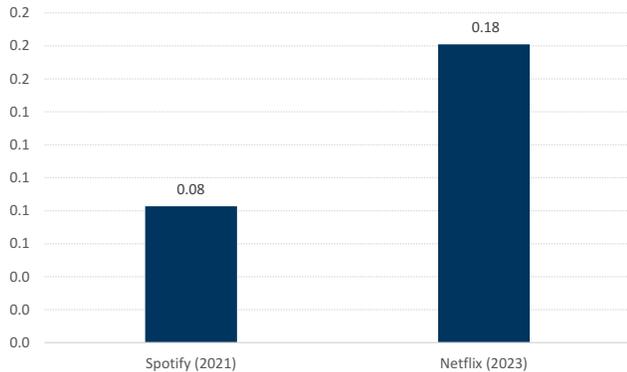
UK revenue per stream, \$



Source: BPI, IFPI Global Music Report

Exhibit 18: Revenue per streaming hour is over 2x higher for Netflix compared to Spotify (we believe that the difference is likely higher if 2023 data was available for Spotify)

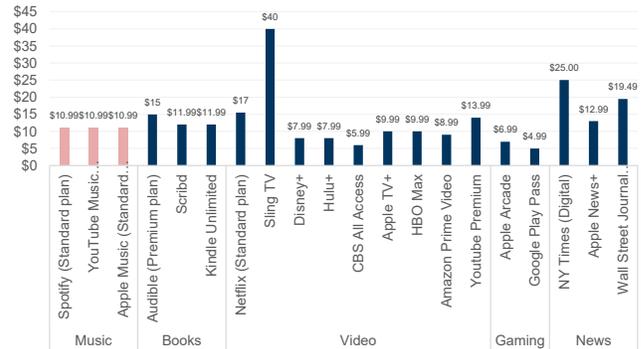
Revenue per hour streamed, \$



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 19: The price of a standard music streaming subscription in the US is currently still lower than many other entertainment subscriptions

Monthly price of various entertainment subscription offerings in the US

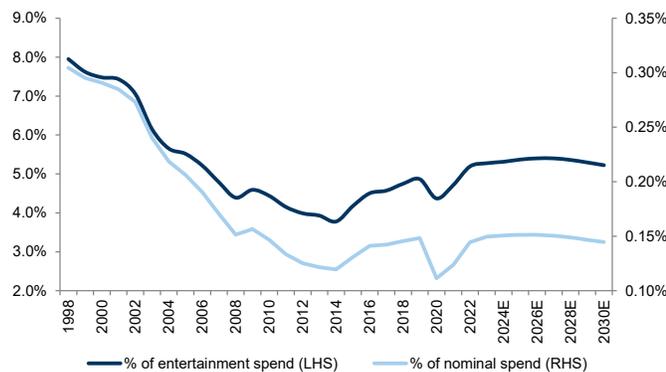


Standard subscription i.e. excluding promotional periods, as of April 2024

Source: Company data, Data compiled by Goldman Sachs Global Investment Research

Exhibit 20: Music revenue as a % of entertainment spend remains well below the 1998 peak

Entertainment includes: Recreational and Cultural Services, Newspapers, Magazines, Books and Stationery



Source: Euromonitor, Goldman Sachs Global Investment Research

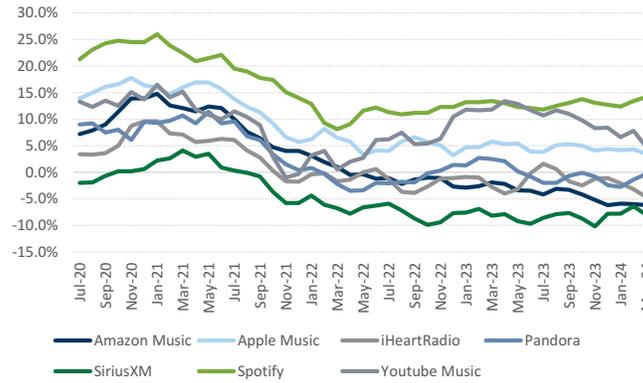
Entering a new era of improved pricing for music subscriptions

Over the past 18 months, we have seen the first price increases for over a decade on standard subscription plans across major markets from all the major global streaming platforms. Spotify, YouTube, Apple and Amazon Music increased prices on their standard individual plans across major markets, including the US, by 10% to \$10.99 from \$9.99, as well as implementing a range of 7%-20% price increases on student & family plans. Furthermore, we have seen local players in emerging markets such as China begin to significantly raise prices as they look to improve monetisation, with Tencent Music raising prices by 30% in mid-2023 (on auto-renewal subscribers for Android users, with iOS price increase following in Jan-24), while still maintaining near record levels of paid net adds. Based on our industry conversations and judging by the number of net subscriber additions in 2023, these price rises appear to have had negligible/no impact on churn and new customer acquisitions. Furthermore, data from customer experience

strategy firm HundredX shows that the Net Purchase Intent (i.e. the net share of surveyed consumers who expect to spend more on a product vs. spend less) has picked up in the last two months for Spotify in the US following the price increase in September 2023.

Exhibit 21: Spotify has been the notable outperformer among music streaming services on NPI...

Net Purchase Intent (NPI) is the net share of surveyed consumers who expect to spend more on a product vs. spend less, Jul 20-Mar 24 (US)



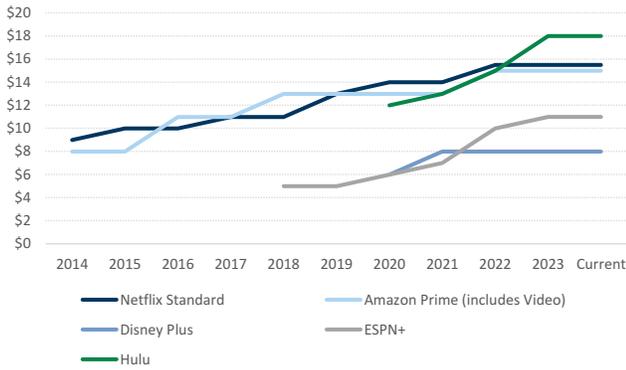
Source: HundredX

We believe that we have (re)-entered a period of improved pricing, and would expect the industry to work towards implementing headline price increases on a recurring basis; these could be similar to the price increases adopted in other industries such as SVOD (we note that Netflix started to introduce regular price increases 10 years ago), or more tactically driven by product innovation and improved customer segmentation, including the launch of higher priced super-premium tiers to cater to the superfans.

We have already seen early evidence of streaming services rolling out their second round of price increases, starting in September 2023 with Deezer, which hiked its Individual Premium prices by 9% to €11.99 per month (from €10.99) in its EU markets, around 18 months after its first round of price increases. We also note comments made in March by Believe’s CEO, who stated that he expects to see another round of price increases this year, most likely in the second half; this has been included in company financial guidance. More recently, Spotify has announced another round of price increases on its Standard Individual (+9% to £11.99 a month), Duo (+13% to £16.99 a month) and Family Plan (+11% to £19.99 a month) in the UK effective from May, with similar price increases in Australia and Pakistan, only eight months after raising prices in these markets. However, according to [Bloomberg](#), this round of price increases mainly helps to cover the cost of audiobooks, with a new audiobook-free, basic tier to be introduced for the same price as the existing Individual Plan (i.e. £10.99). A similar price increase is expected to follow in the US later this year, according to Bloomberg. We believe that this does not preclude Spotify (and other DSPs) from implementing a new round of price increases related to the core music offering, which we would expect to take place at the end of 2024 or early 2025.

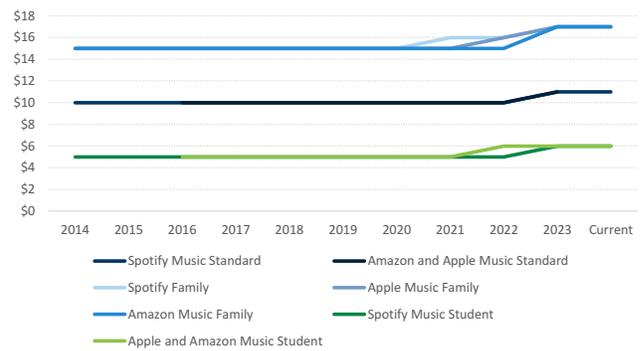
In our Music Industry Model, **we continue to assume 3% annual pricing growth in DMs within our global paid subscription revenues** (see earlier section: *Raise global music industry forecasts by c.10% on stronger 2023 and slightly raised 2024-30E CAGR of 7.6%*). For 2024, we reflect the impact of the announced price increases (mainly Spotify), representing a c.1.2ppt/2.5ppt boost to 2024E global recorded music market/global paid streaming revenues. We acknowledge that not all DSPs will raise prices at the same time and in every market; however, certain years may see larger/smaller price increases on average than others.

Exhibit 22: In the US, the monthly subscription price for SVOD services has been rising by 15% nearly every two years for the past decade
SVOD monthly subscription prices (\$), US



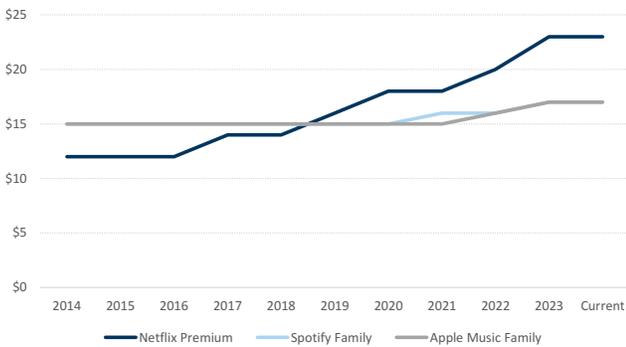
Source: Company data, Data compiled by Goldman Sachs Global Investment Research

Exhibit 23: We believe that the music industry is lagging SVOD by 10 years
Music monthly subscription prices (\$), US



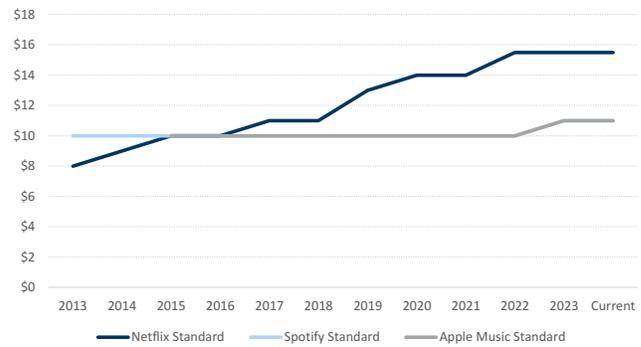
Source: Company data, Data compiled by Goldman Sachs Global Investment Research

Exhibit 24: In the US, Netflix has increased its Premium plan price by 92% since 2014, while Spotify/Apple have raised the Family subscription price by 13% since 2020/21
Spotify/Apple Music Family vs. Netflix Premium price (\$), US



Source: Company data, Data compiled by Goldman Sachs Global Investment Research

Exhibit 25: Spotify/Apple Music's standard subscription is still 35% cheaper than Netflix in the US
US standard plan price (\$) - Netflix, Spotify, Apple Music



Source: Company data, Data compiled by Goldman Sachs Global Investment Research

Improved audience segmentation and monetisation of superfans

As highlighted last year, we believe that there is an opportunity for the industry to improve monetisation beyond headline price increases, through a premium segmentation of their user base. The current streaming model does not distinguish between its users, charging each the same flat monthly fee, independent of the level of engagement with the platform and its artists, despite the wide availability of data. We estimate the superfan addressable market opportunity at \$4.5bn (\$4.2bn prior), implying 26% upside to our current 2025 paid streaming revenue estimates, based on the assumption that 20% of paid streaming subscribers can be defined as superfans of at least one artist and that such superfans would be spending 2x more on music than an average individual. While we would expect a strong appetite from superfans for the opportunity to gain further access to their favourite artists through their streaming platform, we believe that not all superfans would be monetised immediately given it may take some time/ iterations for the new product and offering to be fully optimised, and such offering may vary depending on the service (different DSPs have different audiences and different factors that drive engagement). As a result, in assessing the potential addressable market, we assume a gradual increase in the % of the superfan base with additional monetisation from 10% in 2025 to 60% in 2030. Overall, we believe that the improved monetisation of superfans could represent \$3.3bn of incremental revenue by 2030, or a 13% uplift to paid streaming revenues. We flex these key assumptions for 2030 in the sensitivity tables below.

We would expect the industry (record labels, artist managers, DSPs) to work on this opportunity, experiment and roll out either new superfan apps or new super premium tiers on existing streaming services over the next 12-24 months. We have started to see increased focus across the industry on this topic, with the CEOs of major music companies highlighting the need to strengthen the artist-fan relationship through superfan experiences and products. WMG is currently working on an app that enables artists to connect directly with their superfans, having previously invested in various start-ups focused on monetising super fandom including Fave (alongside Sony Music), and Beppr. UMG has signed an expanded long-term agreement with HYBE which includes further collaboration with its global superfan platform Weverse to bring UMG artists closer to their fans. Streaming services also appear to be endorsing the opportunity, with Spotify being the first major streaming service reportedly working on a new 'supremium' tier, which would be priced at a premium to its current offerings, and include access to high-fidelity audio among other features (Bloomberg, April 3).

Exhibit 26: We see a potential addressable market opportunity of \$4.5bn for superfan monetisation

Illustrative example of TAM opportunity from superfan monetisation in paid streaming

Illustrative Superfan TAM	2025
Paid streaming revenue (\$bn)	17.5
Paid subscribers (mn)	824
ARPU (\$)	22.2
% of subs that are superfans	20%
Implied number of superfans (mn)	165
Implied number of non- superfans (mn)	660
Potential uplift in spend of a superfan vs non-superfan	2x
Implied superfan ARPU (\$)	44.5
Non-superfan ARPU (\$)	22.2
Superfan paid streaming revenue (\$bn)	7.3
Non-superfan paid streaming revenue (\$bn)	14.7
Total paid streaming revenue incl. superfan monetisation (\$bn)	22.0
Potential revenue uplift (\$bn)	4.5
Uplift vs. base paid streaming revenue	26%

Source: Goldman Sachs Global Investment Research

Exhibit 27: Assuming a progressive ramp up of monetisation of superfans would indicate a 7% /13% uplift to our 2030E global recorded music revenue/ paid streaming revenue

Illustrative example of revenue opportunity from superfan segmentation in paid streaming

	2025	2026	2027	2028	2029	2030
GSe paid streaming revenue - label share (\$bn)	17.5	19.2	21.0	22.7	24.5	26.3
GSe paid subscribers (mn)	824	902	979	1055	1130	1205
Implied ARPU (\$)	22.2	22.3	22.3	22.4	22.4	22.6
% of superfans	20%	20%	20%	20%	20%	20%
Implied number of superfans (mn)	165	180	196	211	226	241
Implied number of non- superfans (mn)	660	722	783	844	904	964
% of superfans with additional monetisation	10%	20%	30%	40%	50%	60%
Number of superfans with additional monetisation (mn)	16.5	36.1	58.7	84.4	113.0	144.6
Potential uplift in spend of a superfan vs non-superfan	2.0x	2.0x	2.0x	2.0x	2.0x	2.0x
Implied superfan ARPU (\$)	44.5	44.5	44.6	44.7	44.9	45.1
Non-superfan ARPU (\$)	22.2	22.3	22.3	22.4	22.4	22.6
Revenue uplift from superfan monetisation (\$bn)	0.4	0.8	1.3	1.9	2.5	3.3
% boost to paid streaming revenue	2%	5%	7%	9%	11%	13%
% boost to total recorded music revenue	1%	2%	4%	5%	6%	7%

Source: Goldman Sachs Global Investment Research

Exhibit 28: We flex our key assumptions based on the propensity of superfans to pay more than non-superfans and the % of music streaming users that are superfans...

% boost to total streaming revenue with superfan segmentation (2030, %)

	% boost to total streaming revenue	% of superfans				
		10.0%	15.0%	20.0%	25.0%	30.0%
Uplift in superfan monetisation	1.25x	2%	3%	3%	4%	5%
	1.50x	3%	5%	7%	8%	10%
	1.75x	5%	8%	10%	13%	15%
	2.00x	7%	10%	13%	17%	20%
	2.25x	8%	13%	17%	21%	25%
	2.50x	10%	15%	20%	25%	30%
	2.75x	12%	18%	23%	29%	35%

Source: Goldman Sachs Global Investment Research

Exhibit 29: ...which indicates a 1%-19% uplift to recorded music revenue in 2030

% boost to total recorded music with superfan segmentation (2030, %)

% boost to total recorded music revenue		% of superfans				
		10.0%	15.0%	20.0%	25.0%	30.0%
Uplift in superfan monetisation	1.25x	1%	1%	2%	2%	3%
	1.50x	2%	3%	4%	4%	5%
	1.75x	3%	4%	5%	7%	8%
	2.00x	4%	5%	7%	9%	11%
	2.25x	4%	7%	9%	11%	13%
	2.50x	5%	8%	11%	13%	16%
	2.75x	6%	9%	13%	16%	19%

Source: Goldman Sachs Global Investment Research

The K-Pop case study: K-pop agencies such as HYBE and SM have been developing various business models in recent years to cultivate and monetise fandom. The largest superfan platform is HYBE's Weverse, which enables fans and artists to communicate with each other in an open space (fan community), purchase video content (e.g. reality shows, behind-the-scene footage) as well as albums, merchandise and online concerts on the Weverse Shop page, and subscribe to Weverse DM (private fan-artist message service). It is also used to publish official statements by HYBE on behalf of its artists. Started initially as a platform exclusively for HYBE's artists (such as TXT, BTS) in 2019, it has been expanding over the years to onboard external artists (both K-Pop and non K-Pop) including from YG Entertainment and Universal Music. As of 4Q23, the platform had 122 active fan communities and 10mn MAUs (doubling in three years). Although still a small contributor to HYBE's overall revenue, the platform has been a major driver of HYBE's annual Fanclub & Other revenues (5% of group revenues) growing at 40% CAGR over 2020-23.

Exhibit 30: K-pop agencies such as HYBE and SM have been developing various business models in recent years to cultivate and monetise fandom

Summary of K-Pop fandom platforms

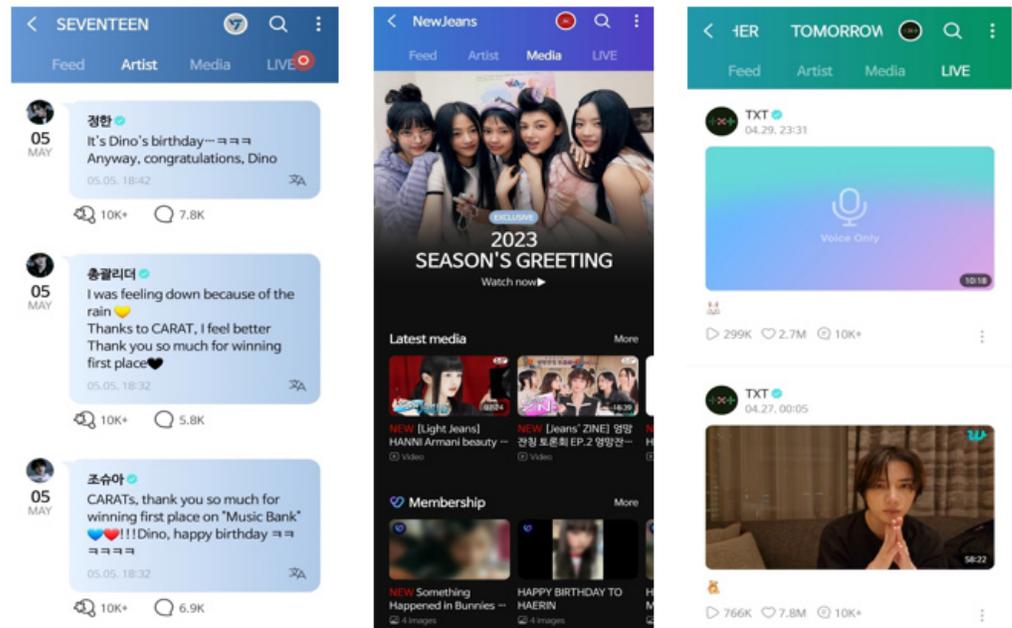
Owner	Name of Platform	Number of Users	Key Features	Price
HYBE	Weverse	10.1mn MAUs	Fan community, Video content, Weverse Shop (purchase albums, merch and online concerts)	Fanclub membership KRW 20,000-30,000 annually*
SM	SMTOWN		Online store; plans to integrate Online concert and fan community onto platform	
SM	Beyond Live	91 shows	Online concert	
Dear U	DearU bubble	2.3mn subscribers	Private fan-artist message subscription platform	KRW 4,500 won monthly

*Refers to fanclub membership sold via Weverse

Source: Company data, Press reports, Data compiled by Goldman Sachs Global Investment Research

Exhibit 31: Fans communicate with artists via articles and comments (LHS) and live chatting during streaming (RHS) on fan-only platforms such as Weverse...

HYBE - Weverse platform UX screenshots

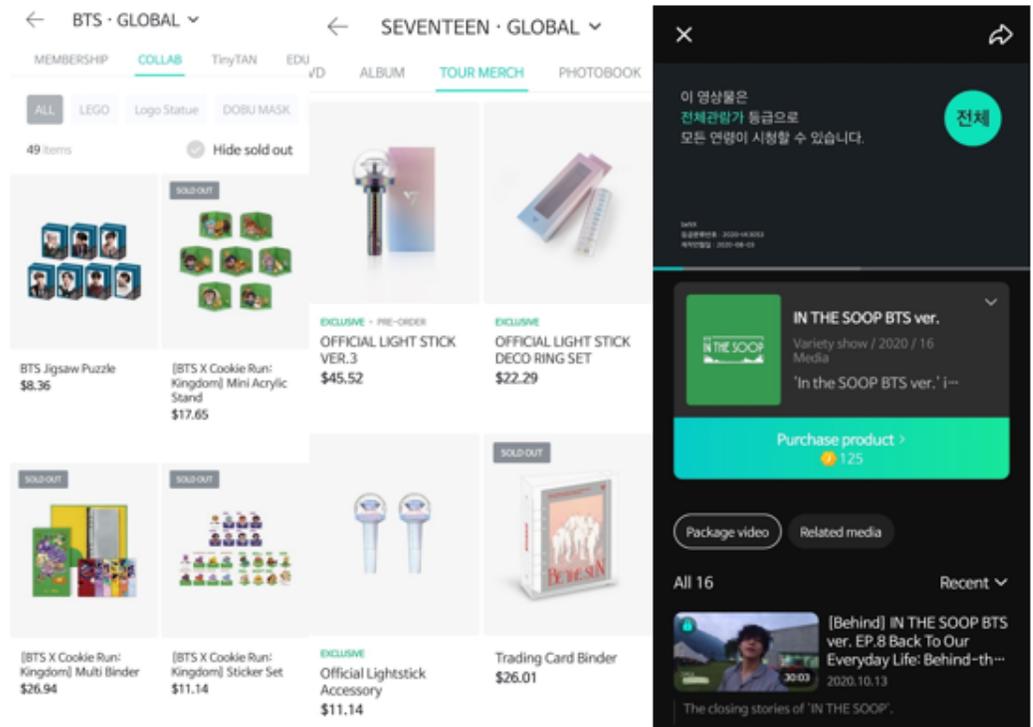


Articles auto-translated from Korean

Source: Weverse

Exhibit 32: ... and K-pop agencies apply various business models to further monetise the loyal fanbase

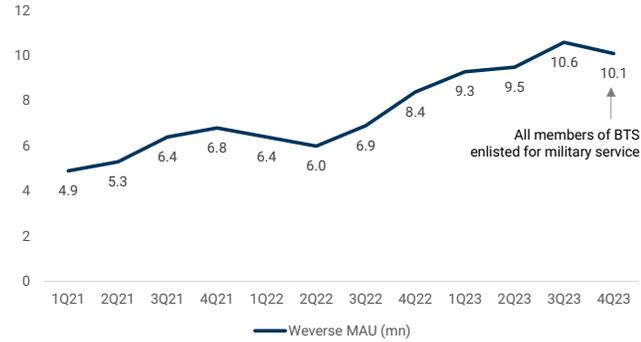
Illustrative example - Weverse Shop / Weverse



Source: Weverse Shop, Weverse

Exhibit 33: Weverse's MAUs have doubled over the last three years...

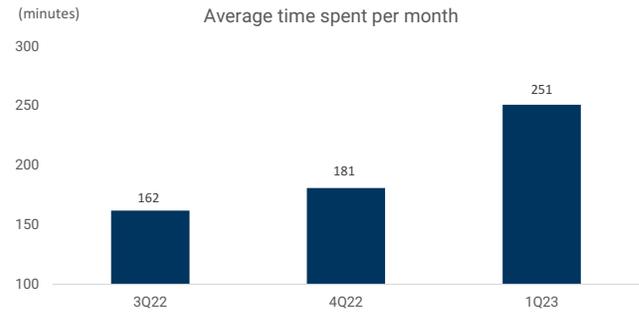
Weverse MAU trend



Source: Company data

Exhibit 34: ...while average time spent on the platform per month has also grown significantly

Weverse average time spent per month

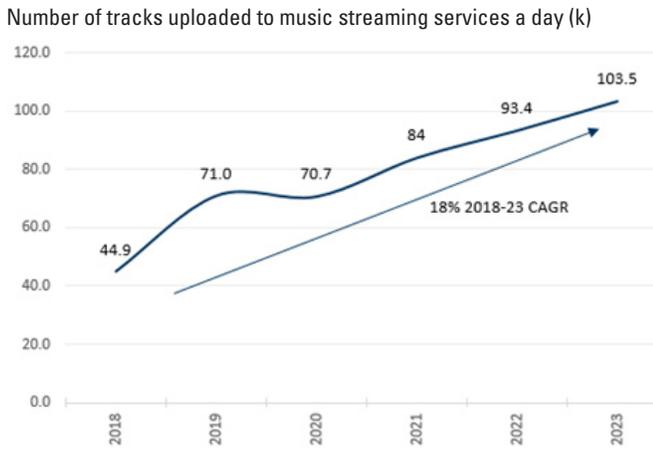


Source: Company data

Modernising of the streaming payout model underway

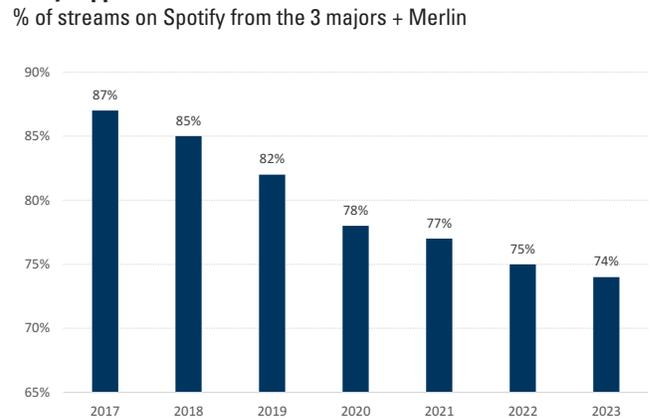
Last year, we argued that the economic model between DSPs and labels needed to evolve. Labels have been paid based on the ‘pro rata’ model since the advent of streaming in 2008, based on the share of overall streams by all users for its artists, with 1 stream representing any song that is played for 30 seconds or more. This methodology has become increasingly questionable given: (i) the rise of the long tail of content that is being treated equally to premium music content, particularly with the rise of gen AI, (ii) the rise of fraudulent/ artificial streams and (iii) the role of algorithms pushing lower royalty content. In 2023, the number of tracks uploaded per day onto music streaming services rose further by 11% yoy, to 103.5k tracks, from 93.4k in 2022 and just 45k in 2018 (+18% 2018-23 CAGR). We believe that the surge in new tracks uploaded daily coupled with the outdated payout model is partly responsible for the market share loss of the major music companies on Spotify (although we believe that the dilution from faster EM growth is playing a larger role).

Exhibit 35: The number of tracks uploaded to music streaming services each day has increased rapidly over the last few years (+18% 2018-23 CAGR)



Source: Luminate, Data compiled by Goldman Sachs Global Investment Research

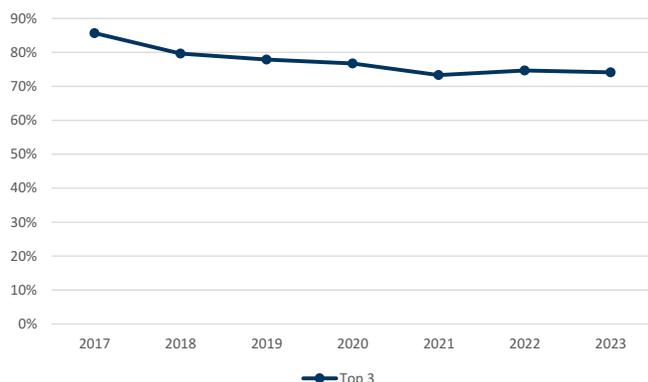
Exhibit 36: The 3 majors + Merlin have seen their share of streams decrease from 87% in 2017 to 74% in 2023 (note that 2023 saw “only” 1ppt share reduction)



Source: Spotify

Exhibit 37: Similarly, the 3 majors' streaming market share has fallen from c.85% in 2017 to 74% in 2023, although share has been broadly stable since 2021

Streaming market share for 3 major labels, 2017-23



Source: Company data, Goldman Sachs Global Investment Research, IFPI Global Music Report 2023

Over the past 12 months, we have seen early progress towards addressing some of these issues through modernising the model by Deezer and Spotify, and we expect more DSPs to introduce similar royalty payout changes in the near future. While we do not factor in an immediate financial benefit for the major music companies, we believe that such changes will help the major rights holders preserve their market share and minimise the future dilution of their payouts from the ongoing increase in volume of content uploaded onto the streaming services, which will likely be further exacerbated by the use of gen AI tools. Interestingly, we note that while the number of songs uploaded per day on average rose c.10% yoy in 2023, the 2023 average was actually down c.14% compared to the 1Q23 average, which could be attributed to the industry's increased efforts at tackling the long tail and fraud as part of the shift to artist-centric models.

1. **Deezer** announced the launch of its Artist-Centric Model with UMG in September 2023, having previously publicly launched an initiative earlier in the year to explore the model. The five key changes in the model were: (i) introducing a double boost to streams of professional artists, defined as having at least 1k streams per month by at least 500 users, (ii) introducing another double boost for streams of songs that users actively search for rather than being algorithmically served to them, (iii) de-monetising non-artist noise content from the royalty pool, (iv) tackling fraud through an updated and stricter fraud detection system, and (v) capping each user's monetisation of streams at 1k per month. We note that Deezer began the rollout of the new model in its home French market in October 2023, and in February the company announced that nearly all its content providers were operating under this new model in the country. At its 1Q24 results, Deezer indicated that it has removed 26mn songs (out of c.120mn tracks) since October, including duplicates and noise. UMG noted that a fully implemented Artist-Centric Model over time could shift around 7%-10% of royalties back to real artists, with 1/3 from addressing fraud, 1/3 from removing clutter from the long tail, and 1/3 from boosting higher value engagement.

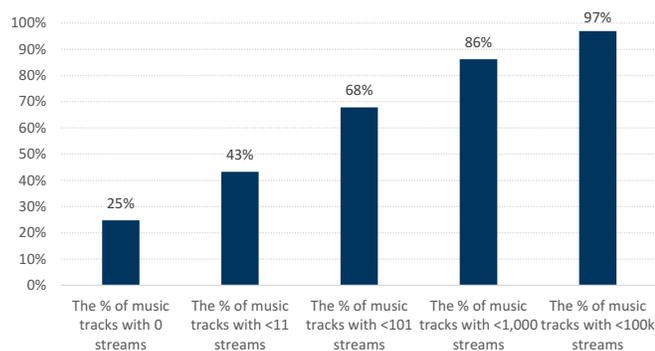
2. Spotify announced in November 2023 that it will make three changes to its royalty model, which became effective from April 1, 2024: (i) tracks that receive <1k streams within a 12-month period will not qualify for royalties, (ii) labels and distributors will be charged €10 for any track found to have >90% of its streams deemed fraudulent, and (iii) non-music noise tracks must be streamed for >2 minutes (vs. 31 seconds for all tracks previously) in order to qualify for royalties (the latter being implemented since Feb 1). Data from Luminate shows that 158.6mn or 86% of all tracks had fewer than 1,000 plays in 2023 on streaming services with hundreds of millions of MAUs, whilst Spotify data suggest that 60% of the tracks in 2022 had fewer than 1,000 plays. Spotify expects all the changes to the model to drive an additional c.\$1bn in revenue towards emerging and professional artists over 5 years. Assuming the incremental revenues were distributed in line with existing market shares, we believe this would represent a c.1% boost to major labels’ annual streaming growth, mainly at the expense of bad actors.

Exhibit 38: We are beginning to see streaming platforms experiment with new payout models

Platform	Changes to streaming models
SoundCloud	In April 2021, SoundCloud launched its user-centric model through 'Fan-Powered Royalties' to independent artists on its platform. Within a year, the company claimed that, on average, independent artists were earning 60% more than they would have on the previous 'pro rata' model. In May 2022, Merlin signed a licensing deal enabling their artists to participate in SoundCloud's user-centric payout model, and in July 2022, WMG became the first major label to adopt the model on SoundCloud.
TIDAL	In Jan 2023, UMG and TIDAL announced that they would work together to explore an innovative new economic streaming model to better reward the value provided by artists and more closely reflect the engagement of subscribers with the artists and music they consume the most.
Deezer	In March 2023, UMG and Deezer announced an initiative to investigate potential new economic models for music streaming that more fully recognize the value artists create. Further, in September 2023 it launched an Artist Centric Model with UMG which it rolled out in France in October 2023 and this February it announced that all its providers
Spotify	In November 2023, Spotify announced that it was going to make three changes to its royalty model aimed at reducing fraudulent practices and expecting it to drive an additional c.\$1bn in revenue towards emerging and professional artists over the next few years. The company confirmed that changes became effective from April 1, 2024.

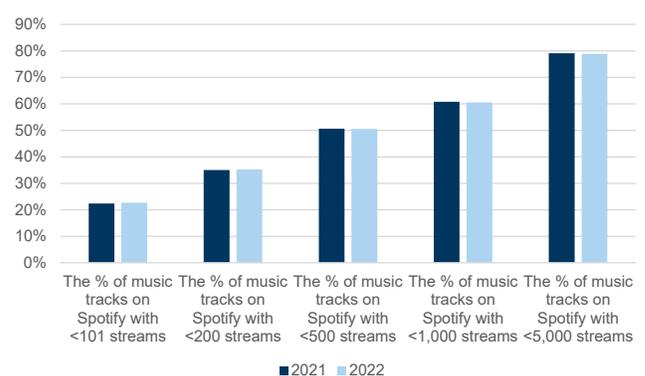
Source: Press reports, Company press releases

Exhibit 39: 86% of tracks globally had <1,000 streams in 2023, including 25% with zero streams...



Source: Luminate

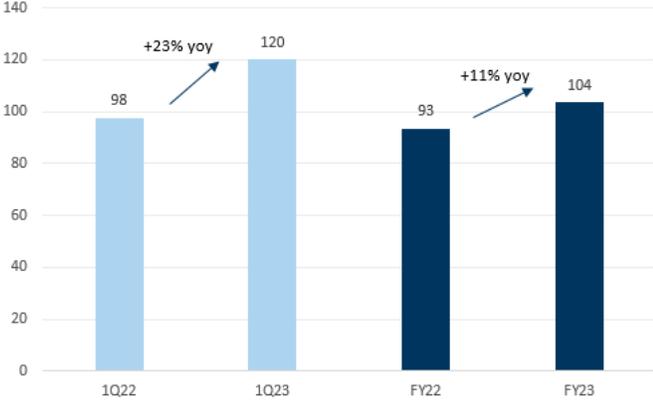
Exhibit 40: ...and c.60% of tracks on Spotify had fewer than 1k streams in 2022



Source: Spotify

Exhibit 41: The average number of tracks uploaded in 2023 was however lower than in 1Q23

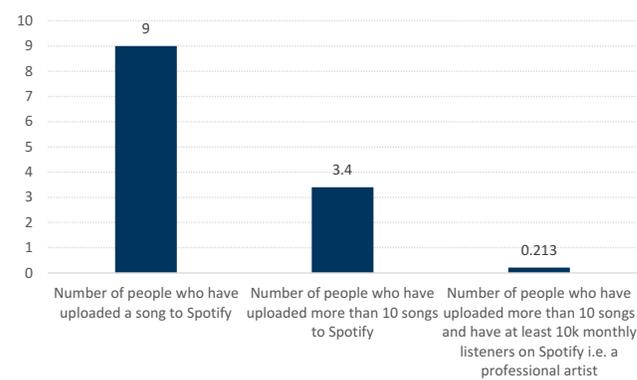
Number of tracks uploaded to music streaming services a day (k)



Source: Spotify, Luminate, Data compiled by Goldman Sachs Global Investment Research

Exhibit 42: Majors + professional acts represent just c.2% of the total number of acts who have ever uploaded on Spotify

mn



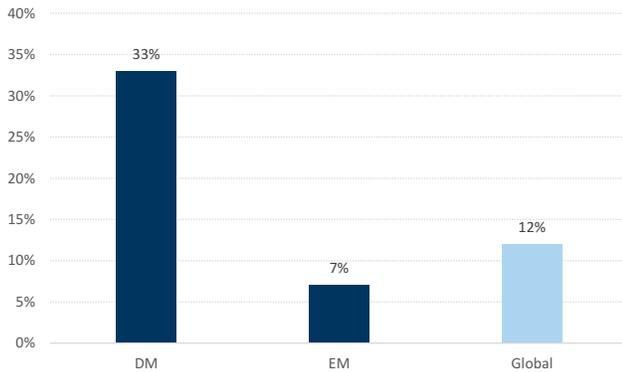
Source: Spotify

Emerging Markets to drive next phase of streaming growth & capture greater investments

Emerging markets have become the major driver of subscription growth since 2021, and we expect their contribution to continue to rise to nearly 70% by 2030, although the revenue contribution will likely remain more modest at 22% by 2030 given lower ARPU. At the same time, local music genres and artists are rising in popularity domestically and more importantly internationally. We lay out the main differences in characteristics between EM and DM music markets and believe that the ongoing mix shift towards EM will have major implications for future industry growth, redistribution of royalties and capital allocation priorities.

Exhibit 43: Paid subscriber penetration in EM was 7% in 2023 compared to 33% in DM, on our estimates

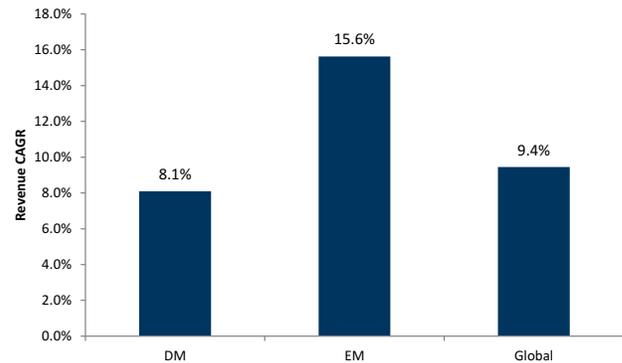
Paid streaming penetration (as % of Internet users), 2023



Source: Goldman Sachs Global Investment Research, IFPI Global Music Report 2024

Exhibit 44: We expect paid streaming revenue to grow at a 9.4% CAGR across 2024-30E (from 9.8%), with EM growing nearly 2x as fast as DM

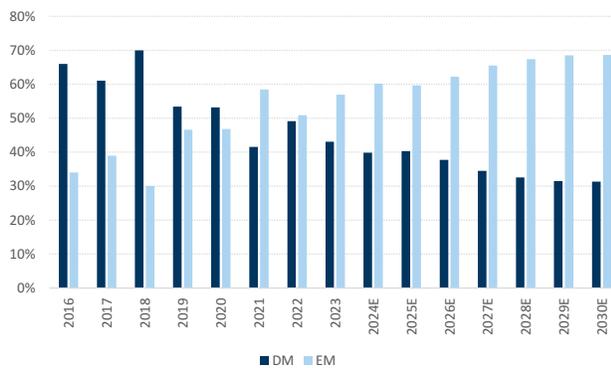
Paid streaming revenue growth by market (DM, EM and Global), 2024-30E



Source: Goldman Sachs Global Investment Research, IFPI Global Music Report 2024

Exhibit 45: EM has driven more than 50% of net additions since 2021, and we expect this to rise to c.70% by 2030...

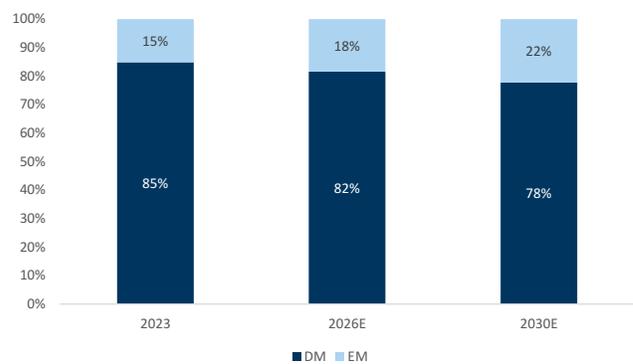
% of paid subscriber net adds from DM and EM



Source: Goldman Sachs Global Investment Research, IFPI Global Music Report 2024

Exhibit 46: ... although the EM contribution to paid streaming revenue will likely continue to lag, at 22% by 2030E

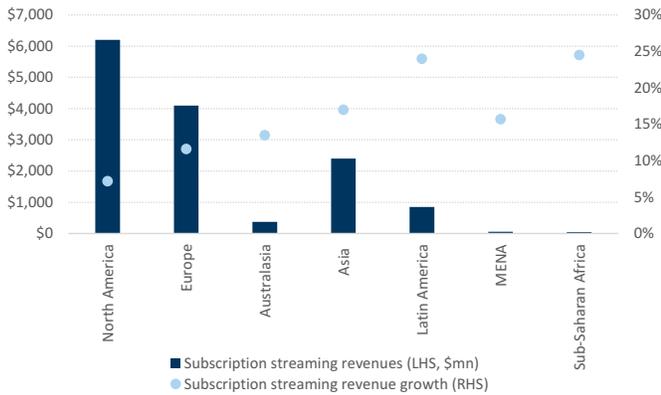
Share of global paid streaming revenue - EM vs DM



Source: Goldman Sachs Global Investment Research, IFPI Global Music Report 2024

Exhibit 47: Latin America, Asia and Africa exhibited the strongest subscription revenue growth in 2023

Subscription streaming revenues (LHS, \$mn) and growth (RHS, %) by region, 2023

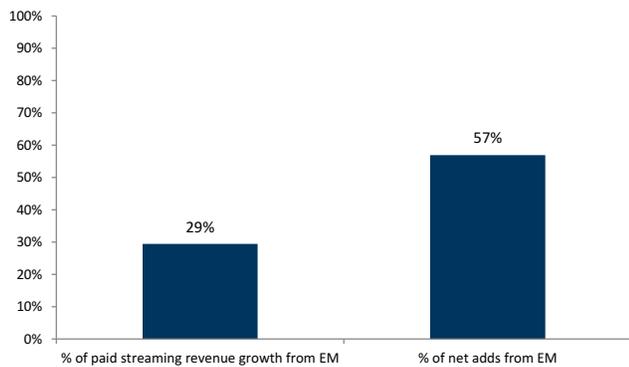


Source: IFPI Global Music Report 2024

1. We calculate that EM ARPU (\$8) is c.4x lower than DM (\$34), based on record label share. As a result, we estimate that EMs contributed to only 29% of the paid subscription revenue growth in 2023 (vs. 60% of net adds). We see an opportunity for EM pricing to improve over time, as income levels improve across these regions. In particular, we note that TME’s paid streaming ARPU grew 16% yoy in 2023 on the back of major price increases. However, we believe that the key focus for market participants will remain on driving volume growth over monetisation in the coming years, whilst improving monetisation will be a bigger priority in the more mature music markets where subscription growth has been slowing.

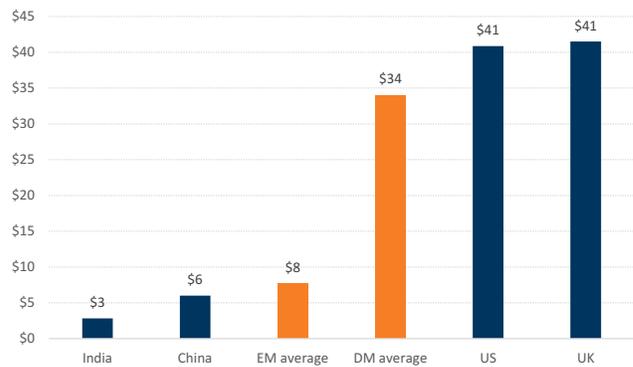
Exhibit 48: 29% of paid streaming revenue growth came from EM in 2023...

% of paid streaming revenue growth and paid subscriber net adds from EM in 2023 (GSe)



Source: IFPI Global Music Report 2024, Goldman Sachs Global Investment Research

Exhibit 49: ... with EM ARPU still c.4x lower than in DM ARPU 2023, \$



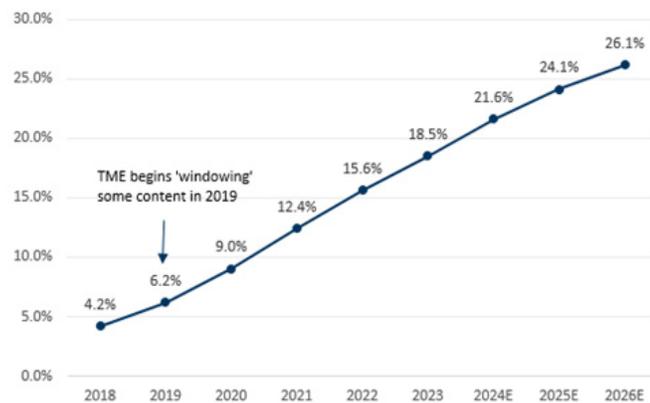
*Record label share ARPU

Source: Goldman Sachs Global Investment Research, IFPI Global Music Report 2024

2. Paid conversion is notably lower in EM. For instance, Tencent Music’s paying ratio was 18% in 2023, which is 2x lower than Spotify’s 39%. In India, we estimate that there were 20mn paid users across all streaming services out of a total MAU of c.200mn users in 2023, which would imply a 10% paying ratio. In Africa, this ratio would be even lower, at around very low single digit percent. The large base of existing ad-supported users in EM constitutes an attractive pool of new subscriber acquisition over time, given paying ratios tend to improve over time as the music markets mature, user engagement increases and more importantly as major streaming services increase the level of differentiation between the premium and freemium offerings. For example, Tencent Music’s paying ratio increased from 4% in 2018 to 18% in 2023, and we expect it to rise to 26% by 2026, partly driven by the decision to gradually shift more premium music content behind the paywall (from 10% of all tracks on the platform in 2019 to 20% in 2021).

Exhibit 50: Tencent Music’s paying ratio has increased significantly since 2018...

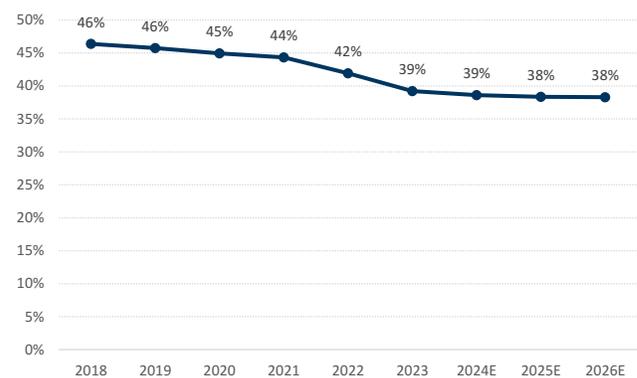
Tencent Music paying ratio (year-end)



*GSe: Average paying ratio for 2024-26E

Source: Company data

Exhibit 51: ...although it is still 2x lower than Spotify's
Spotify's paid subs/MAUs ratio (year-end)

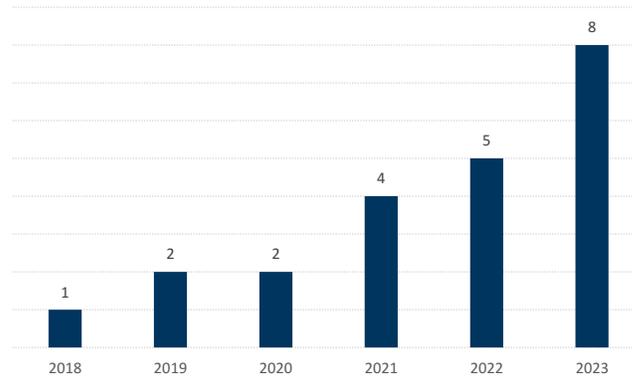


Source: Company data, Goldman Sachs Global Investment Research

3. Non-English Acts have become increasingly popular in their home markets but also internationally. For instance, the number of non-English-language acts in IFPI’s Global Artists Charts increased to 8 in 2023 (out of 20), from just 1 in 2018. Similarly, there has been a -4.8ppt decrease in English-language music’s share amongst the top 10k most-streamed songs in the US, according to Luminate data. The rise of major local acts – namely from K Pop, Latin, and Afrobeats – is an enduring trend in our view that is contributing to the improved monetisation of domestic music markets.

Exhibit 52: The number of non-English-language acts in IFPI’s Global Artists Chart continues to rise

Number of non-English-language acts in IFPI Global Artist Chart (out of 20), 2018-23



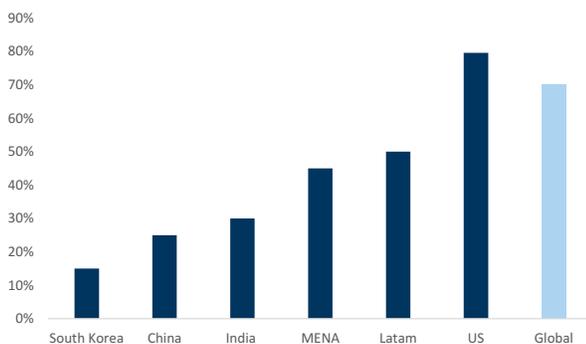
Source: IFPI Global Music Report 2024

4. Emerging markets are more fragmented, with the 3 major music companies accounting for c.20-40% market share in aggregate, compared to over 70% in developed markets on our estimates.

We believe that building market share in EM will be an increasing priority for the major music companies, although this will take time, especially if done organically. We note however the successful example of Sony Music increasing its market share over time to c.20% in India and c.30-35% in Latin America, as well as also being the number 1 major label in Africa, whilst Warner Music mentioned that it had grown its market share in MENA to c.20% in 2023, from single-digits a couple years earlier, driven by acquisitions such as Qanawat.

Exhibit 53: The 3 major music companies command a much lower market share in non-English music markets relative to DM...

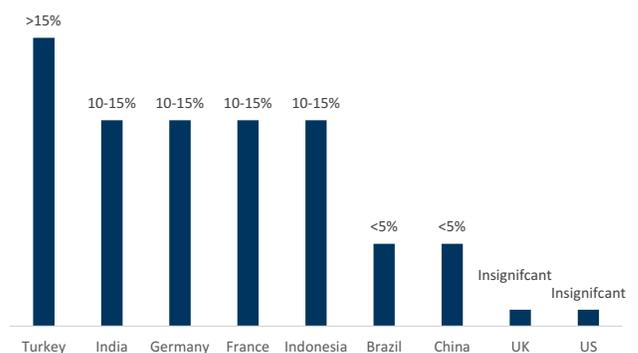
Top 3 major label recorded music market share by geography (GSe), 2023



Source: Goldman Sachs Global Investment Research

Exhibit 54: ...meanwhile, Believe has relatively higher market shares in local music markets with insignificant presence in English music markets

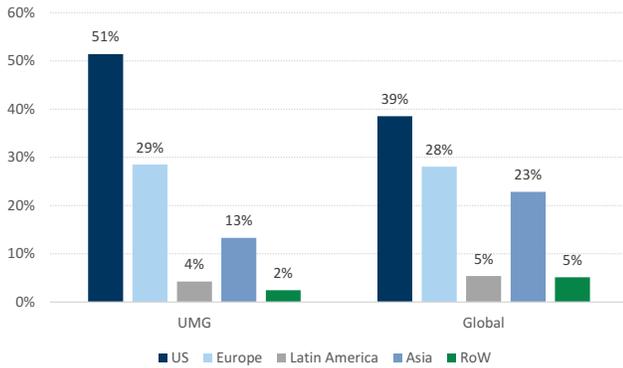
Believe’s market share by geography (on digital music sales, 2019)



Source: Believe

Exhibit 55: UMG’s revenues are more exposed to the US and less exposed to Asia relative to global revenues...

Breakdown by region of recorded music revenues, 2023

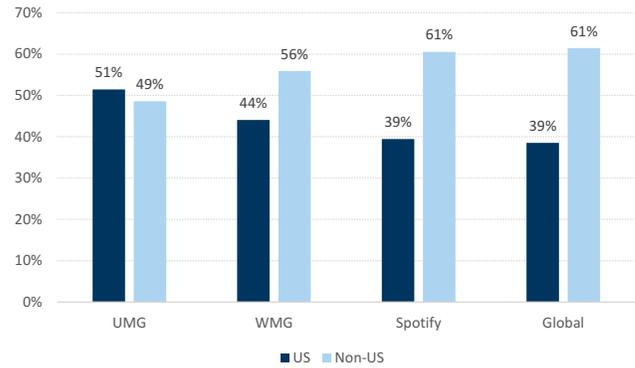


*UMG US refers to North America

Source: Company data, IFPI Global Music Report 2

Exhibit 56: ... while both UMG and WMG derive a greater proportion of their revenues from the US than Spotify and the global market...

Breakdown of US vs non-US recorded music revenues, 2023

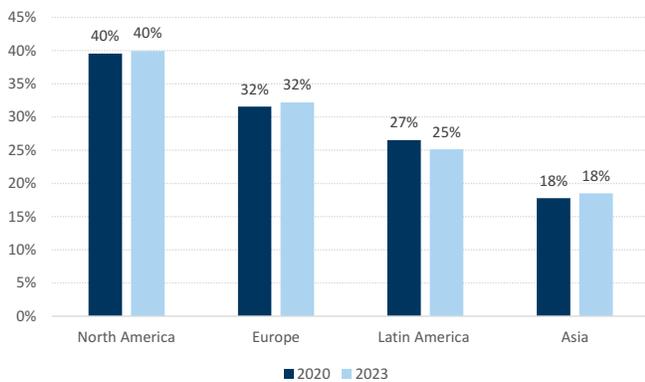


*UMG US refers to North America **WMG refers to FY23 ***Spotify refers to group revenues

Source: Company data, IFPI Global Music Report 2024

Exhibit 57: ... with UMG’s recorded music market share higher in developed markets

Implied UMG recorded music revenue market share



Source: Company data, IFPI Global Music Report 2024

As a result of the above-mentioned shifts, we believe that the major music companies will deploy more resources and capital to grow their share of local acts and local music markets over the coming years, through signing more local acts (e.g. scaling local A&R teams), distribution agreements with local labels (which are low risk but low margin) and acquisitions. We have already seen a step up in acquisitions/ partnerships by major labels ([Exhibit 58](#)), including the announced majority investment of Nigeria-based Mavin Global and acquisition of UAE-based Chabaka Music by UMG, the acquisition of a majority stake in Dubai-based concert promoter Mac Global and publishing partnership with India-based Big Bang Music by Sony Music and the acquisition of Indian artist management company E-Positive and African-based Africori by WMG. We see Sony Music in particular as well positioned to capture future EM growth, given Sony’s historical investments in these markets (it is the number 1 major music company in Latam, India and Africa) and sizeable presence in the artist and label services space (through the acquisition of The Orchard in 2013, although the asset at the time was predominantly US-based, and more recently AWAL). We believe that UMG has a natural

scale advantage, making it a well-positioned distribution partner as evidenced by the renewal of its agreement with South Korea's HYBE and new strategic partnership with China's TF Entertainment. In our view, WMG has a relatively smaller exposure to the EM and artist and label services segment, and may look to further expand into these areas, as demonstrated by the recent declared interest in acquiring Believe, one of the larger independent artist and label services companies with a relatively outsized presence in select emerging countries, although plans were subsequently abandoned.

Exhibit 58: UMG, SMG and WMG have all been expanding their presence in emerging markets

Details of strategic partnerships and investments in EM

UMG	Sony Music	WMG
In Jun 22, launched Virgin Music Label & Artist services in Africa to support independent artists, labels and influencers in the region	In Feb 22, launched Sony Entertainment Talent Ventures India, to offer actors, musicians, sportspersons, gamers and content creators in India opportunities for co-ventures, metaverse solutions, brand partnerships and management	In Jan 22, acquired Africori, an Africa-based music company with 7,000 artists and 850 clients
In Jul 22, partnered with Mdundo, an Africa-based music services company which has 17mn MAU across Africa	In May 22, launched RCA Records, a China-based label to focus on the Greater China Region	In Jan 22, launched EH Brazil, a Brazil based label focused on the Northeast region of Brazil with almost 60 mn population
In Jul 22, launched momX, a Vietnam-based label aimed at finding, developing and introducing new local artists	In Jul 22, partnered with Craft Media, an Egypt-based music and event production company with the aim to sign Arabic superstars	In Nov 22, launched 'Out of Order' label, which an EM based label that will highlight artists from regions including Africa, India, the Middle East, Southeastern Europe and Eastern Mediterranean
In Sep 22, acquired majority stake in TM Ventures, an India-based music and entertainment company to work across talent management, entertainment consultancy and live/events business	In Oct 22, partnered with GHMZA, a Kuwait-based creative studio to promote emerging Khaleeji pop artists in Middle East	In Jan 23, partnered with ABS-CBN, a Philippines-based company with one of the largest music catalogues in the country, for global publishing
In Aug 23, acquired Chabaka Music, a UAE-based music company, with more than 150 independent artists and local labels	In Nov 22, acquired majority stake in Mac Global, a Dubai-based concert promoter	In Feb 23, acquired a majority stake in Divo, the largest digital media and music company in South India with more than 30,000 songs released in 2022
In Nov 23, partnered with REPRESENT, an India-based talent management company	In May 23, partnered with Tips Music, an India-based label which has a catalogue for 30,000+ songs and 5,500+ albums across 24 languages for global distribution	In Apr 23, launched Gorgona, a Mexico-based label which will be completely run and managed by women, focused on promoting female artists
In Jan 24, acquired Saban Music, with is a LatAm based music company	In Aug 23, partnered with Big Bang Music, an India-based label for global publishing	In Apr 23, partnered with Cross Ratio Entertainment, Singapore's largest independent label. Cross Ratio has more than 200 music distribution artists
In Feb 24, re-launched EMI Records, based in Philippines, which will provide grassroots support for local talent and support new artists	In Nov 23, acquired Punto Ticket and Teleticket, based in Chile and Peru to provide ticketing systems and related services to concert promoters and venues in the region	In Oct 23, invested in HuManagement, a GCC-based company in talent representation with over 300 creators in MENA
In Feb 24, partnered with DGMC, a MENA based company to create the regions first Music City		In Oct 23, acquired E-Positive, Indian artist management and live events company promoting more than 15,000 shows
In Feb 24, made majority investment in Mavin Global, which is a Nigeria-based independent label with over 1bn streams on Spotify		In Dec 23, launched Joint Artist Agency called "Touring the World" with OCESA Seitrack, a LatAm based management and promotion company with more than 20 years of experience in building touring and commercial structures in LatAm
In Apr 24, new strategic partnership with TF Entertainment, a major player in the China pop scene		In Jan 24, partnered with Giraffe, a Pakistan based music company which has produced global hits like 'Pasoori'

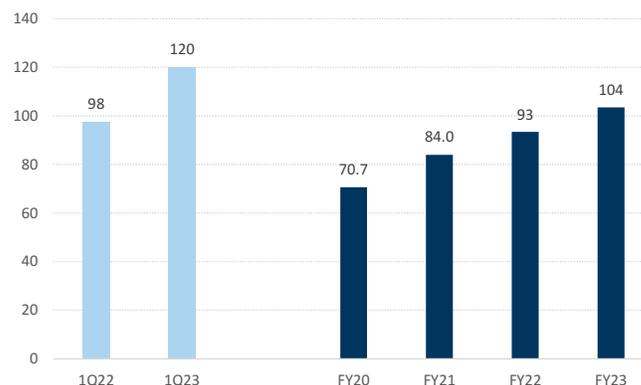
Source: Company data, Goldman Sachs Global Investment Research

Generative AI: music industry largely aligned as regulation begins to emerge but IP protection risks remain

We believe that the past 12 months have largely allayed initial fears around the impact of Generative AI for the music industry. We have seen alignment across the industry in limiting AI deepfakes, particularly by the major industry players, while the flood of new AI generated content onto streaming platforms has not yet materialised in a meaningful way, nor has it had an impact on the label revenue pool so far, supported by the changes starting to be made to streaming royalty models. That said, the industry is still currently in an experimental phase with regard to Generative AI, with a number of strategic partnerships in the application of the technology and a rise in new entrants looking to capitalise on the technology posing risks to music IP protection. Overall, we believe the vast majority of AI-generated content will likely be non-professional/low-quality and will not be uploaded onto streaming platforms due to the lack of licenses and given DSP's growing efforts to tackle the long tail. Instead, we see greater value for the industry in more professional artists utilising the technology as part of their music creation and production process, as well as for marketing purposes to grow artists' audiences. Meanwhile, we continue to believe that the large music companies are in a relatively better position to protect their artists and IP given their financial resources and leverage with the DSPs, as well as to capitalise on the first potential commercial licensing opportunities. We note that YouTube partnered with UMG to launch a Music AI incubator last year, which we believe highlights that key players in the music ecosystem (labels/DSPs) are working together to control the deployment of Generative AI before the regulatory framework catches up with the technological advancements.

Exhibit 59: The average number of tracks uploaded in 2023 grew 11% yoy but fell 14% vs. 1Q23 levels, suggesting that there has not yet been a flooding of AI generated content on major music streaming services

Number of tracks uploaded to music streaming services a day (k)



Source: Spotify, Luminate, Data compiled by Goldman Sachs Global Investment Research

AI regulation beginning to emerge; copyright challenges are ongoing

For Generative AI to be able to 'create' a track in the synthetic 'voice' of an artist, the model would have been trained on a large dataset which includes original (copyrighted) soundtracks by the artist. As such, the ability for Generative AI to be able to use copyrighted songs is critical, although the concept of whether this would be permitted as a fair use under US copyrights law is currently being tested in court. Whilst we believe that this places the largest owners of proprietary IP in the best position to leverage the technology (themselves), there may be a considerable legal and technical challenges for a content owner to protect its IP, such as preventing its IP from being used by LLMs without the appropriate licence, requiring an LLM to obtain a licence to use its IP and then detecting that the IP has been used and proving that there has been a breach of copyright. For instance, UMG indicated that the number of AI generated songs uploaded to streaming platforms using its rights has increased by 175% since August 2023 and c.47% of the take-down notices issued so far were related to the underlying vocal and instrumental, while the other half were a violation of copyright, trademark or right of publicity claim.

In the meantime, the number of music AI apps continue to grow, ranging from apps allowing users to generate songs through a short text-prompt (e.g. Suno AI) to apps allowing users to clone artist voices (e.g. Jammable or Vocalist AI). Many of these apps do not have a licence and are the subject of legal action. Important ongoing cases in this area include: (i) UMGP, Concord Music and ABKCO filing a lawsuit alleging copyright infringement in lyrics from at least 500 songs against Anthropic via its chatbot Claude, and seeking \$150k per work infringed, (ii) The New York Times lawsuit against OpenAI and its partner Microsoft for infringing on its copyright by using its articles to train an AI model filed in Dec 2023, with OpenAI filing a motion to dismiss four of the claims in Feb 2024, and (iii) the Getty Images lawsuit against AI art generator Stable Diffusion for copyright infringement, which is now set to go to trial in the UK, having originally been filed in the Delaware federal court in Feb 2023.

We note that there have been a number of new proposed laws and regulations framing the use of Generative AI. In the US, both chambers of Congress are now proposing to provide a nationwide set of rules to address the use of AI generating unauthorised replicas of individuals' and artists' voices and likenesses, and establish a 'right of publicity' (which is an IP right that protects the unauthorised use of a person's likeness, voice or other aspects of their identity) at the federal level in the US. Meanwhile, the European Commission has formally endorsed a comprehensive AI Act, which includes ensuring that all AI companies observe EU copyright law, with any use of copyright protected content requiring the authorisation of the rightholder concerned, and that AI companies provide a sufficiently detailed summary of the content used for training of Generative AI models.

Exhibit 60: Summary of regulatory proposals related to AI in the US, EU and UK

Name	Details
NO FAKES (Nurture Originals, Foster Art, and Keep Entertainment Safe) Act	Introduced to the US Senate in Oct-23, in attempt to protect voice and visual likeness of all individuals from unauthorized recreations from generative AI.
No AI FRAUD (Fake Replicas And Unauthorized Duplications) Act	Introduced to the US House in Jan-24, in attempt to prevent unauthorised creation and use of AI-generated replicas of an individual's voices and likenesses, which specifically cites the AI-generated "Heart on my Sleeve" track that mimicked the vocals and styles of Drake and The Weeknd as an example.
Generative AI Copyright Disclosure Act	Introduced to the US House in Apr-24, which would require developers of generative AI technology to disclose the use of any copyrighted materials in training their algorithms, and received support from a number of trade groups across the music industry.
ELVIS (Ensuring Likeness Voice and Image Security) Act	Tennessee adopted the ELVIS Act in Mar-24, which will go into effect on July 1, and updates the State's existing right of publicity with the aim to protect artists' voice from the misuse by AI. We note that right of publicity laws at the State level in the US are currently inconsistent.
EU AI Act	In Apr-24, the European Council formally endorsed the final text of the EU AI Act, which was first proposed in 2021. Organisations will have between 6 and 36 months to comply with its provisions, depending on the type of AI system they develop or deploy.
Music Streaming Sector Resolution	In Jan-24, the European Parliament voted to implement a new legal framework around the music streaming sector, which included a suggestion for DSPs to introduce labels on AI-generated tracks and urged non-consented deepfakes to be tackled, although this framework is non-legislative and non-binding.
Artificial Intelligence (Regulation) Bill	In Mar-24, the AI (Regulation) Bill received a second reading in the House of Lords, having first been introduced in Nov-23. The guiding principle revolves around transparency, with the development and deployment of AI must be in conjunction with existing consumer and data protection as well as intellectual property laws. The Bill also includes an establishment of an AI Authority.

Source: Data compiled by Goldman Sachs Global Investment Research

Expect music industry to be aligned to ensure controlled and responsible deployment of Generative AI

We have seen the key players in the music ecosystem (labels/DSPs) working together to control the deployment of Generative AI. While the incentives for rights holders to protect their IP is obvious, we believe that it is also in the interest of DSPs to limit the potential flood of new music being uploaded to their platforms (e.g. if Generative AI is left unchecked, this could result in millions of songs being uploaded onto streaming services daily compared to c.100k currently), given the resulting potential damage to user experience and the costs involved in supporting and monitoring uploads. Unlike at the end of the 1990s, when the music industry faced significant challenges with digital piracy, the industry today is a lot more structured, with a handful of streaming companies controlling most of the music streams and three music companies owning the vast majority of catalogues, which we believe makes it easier for the industry to remain in control. We have seen major partnerships between key music industry players around AI, including YouTube laying out key AI music principles which had been shaped by UMG, and the above-mentioned partnership on Music AI incubator. Deezer highlighted that one of the reasons for its adoption of the artist-centric model was to tackle AI-generated content on the platform and has tightened its provider policies to reduce content being uploaded to its platform. The company noted that although it remains at >100k tracks uploaded per day, this has remained fairly stable, and it has not seen the flood of AI-generated content that it expected. Meanwhile, Luminate data suggests that on average 103.5k new tracks were uploaded to streaming services daily in 2023, up 10.5% yoy, but the FY2023 average was actually down vs. the 1Q2023 average, which suggests that the increased focus on tackling the long tail and fraud may have had some impact. Of the 184mn tracks measured on streaming services, 43% had <10 streams during 2023, and 86% had <1k streams, according to Luminate.

However, it is worth noting that there have been disagreements around Generative AI in the music industry. For example, UMG and TikTok did not renew their licensing agreement at the end of January, with UMG citing a number of reasons including concerns about TikTok's use of AI.

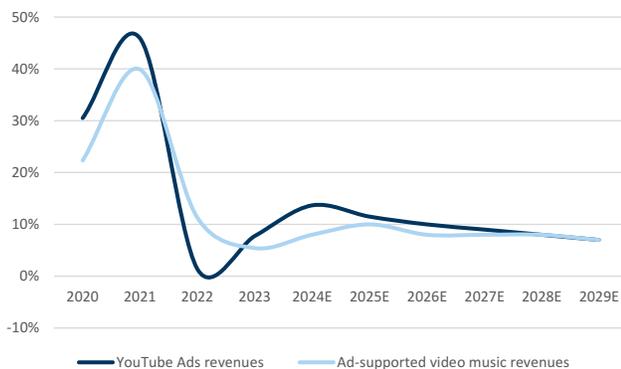
Ad-supported streaming market maturing; lower monetisation upside from emerging platforms

Following a volatile year marked by a broader cyclical slowdown in global advertising demand, we expect ad-supported streaming revenues to improve gradually through 2024 (+9%), underpinned by an improving macro environment, and accelerate towards low-double-digit growth thereafter. We have reduced our 2024-30 ad-supported growth forecasts to +11.6% from 14.6% previously, mainly reflecting a slower-than-expected recovery during 2023, as well as a less bullish view on the revenue opportunity from emerging platforms, and particularly from TikTok.

Ad-supported streaming revenue came in at +8% in 2023 vs. 15% in 2022, below our expectation of +10%, with a slowdown observed across both ad-supported audio (+10% in 2023 vs. +17% in 2022) and video (+5% in 2023 vs +11% in 2022). This was still c.2ppt ahead of the global digital advertising market (ex display and search). Within ad-supported audio, the social media category growth showed a marked deceleration to +15% in 2023 vs. +30% in 2022, which, despite being largely fixed licensing fees and therefore less cyclical in nature, partly reflected in our view the lapping of the prior year’s step-up from the renewal of the Meta deal. With emerging platform deals typically lasting two years, we see upside from a potential renewal of the Meta deal in 2024. The disappointment also came from the lack of major improvement in licensing terms from the TikTok renegotiation with the record labels. For instance, WMG’s advertising revenue growth improved only slightly to 10% in 4QCY24 following the renewal of its TikTok deal, from 7% the prior quarter, implying a c.\$25mn annual step up or 0.4% group revenue boost.

Exhibit 61: We expect global ad-supported video music revenues to grow marginally below YouTube

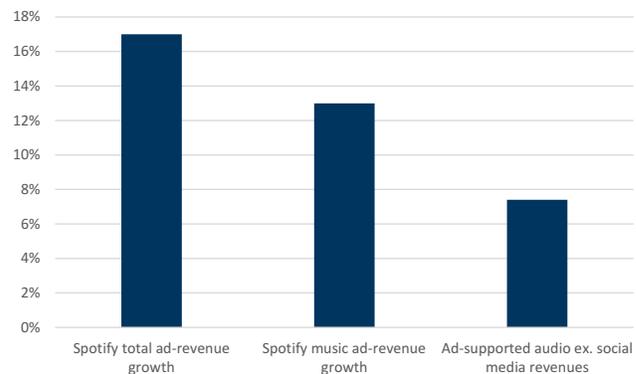
YouTube Ads revenue growth vs. global ad-supported music video revenue growth, % yoy



Source: Company data, Goldman Sachs Global Investment Research, IFPI Global Music Report 2023

Exhibit 62: Spotify’s music ad-revenue grew ahead of the global ad-supported audio market in 2023 but below Spotify’s total advertising revenue, reflecting the share shift towards non-music content

Spotify total/music ad-revenue growth vs. global ad-supported audio ex. social media revenue growth, 2023

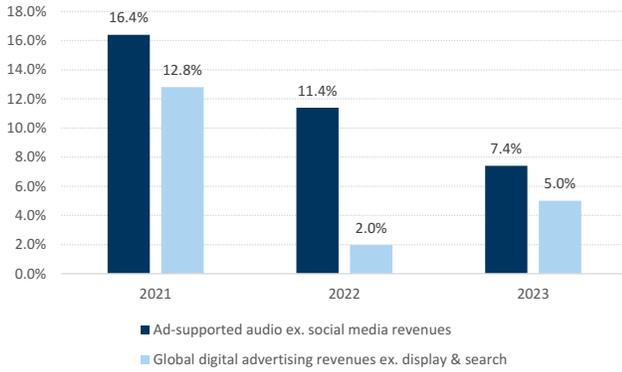


*Spotify music ad revenue growth estimated based on public qualitative quarterly comments by the company

Source: Company data, IFPI Global Music Report 2023

Exhibit 63: Music ad revenues continued to outperform global digital ad revenues in 2023

Global ad-supported audio ex. social media revenue growth vs. global digital ad revenue ex. display & search, 2021-23



Source: Goldman Sachs Global Investment Research, IFPI Global Music Report 2023, eMarketer

Exhibit 64: Music ad funded streaming growth is converging with global ad trends and is becoming more cyclical

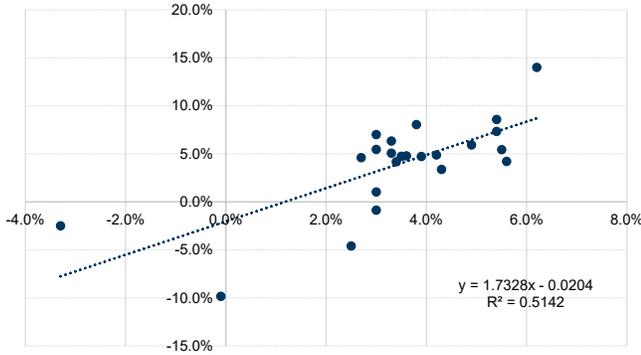
Global real GDP, ad market & music ad-supported streaming growth, %



Source: MAGNA, IFPI Global Music Report 2023, Data compiled by Goldman Sachs Global Investment Research

Exhibit 65: Global advertising expenditure has shown correlation with global real GDP growth

Global advertising expenditure vs global real GDP growth, 2001-2023



Source: MAGNA Global, Company data, Goldman Sachs Global Investment Research

Disclosure Appendix

Reg AC

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