

# Taiwan

Potential 2035 economic impact of the metaverse

**US\$17-32**<sub>B</sub> per year





# Taiwan

Taiwan's edge in hardware manufacturing equips the economy to play a critical role in the metaverse value-chain – Taiwan's semiconductor foundries account for over 60% of the global market share in production,<sup>1</sup> and 92% for leading-edge semiconductor production.<sup>2</sup> These hardware firms provide a strong foundation for the growth of other firms along the metaverse value-chain. Taiwan Semiconductor Manufacturing Company (TSMC), the world's leading semiconductor foundry, has been chosen by Apple to develop advanced display technology for its proprietary AR devices.<sup>3</sup> Display and optical technologies are also crucial components of AR/VR devices which can be used to access the metaverse. Hence, Taiwan's advantages in manufacturing make it a frontrunner in AR/VR components development and procurement.

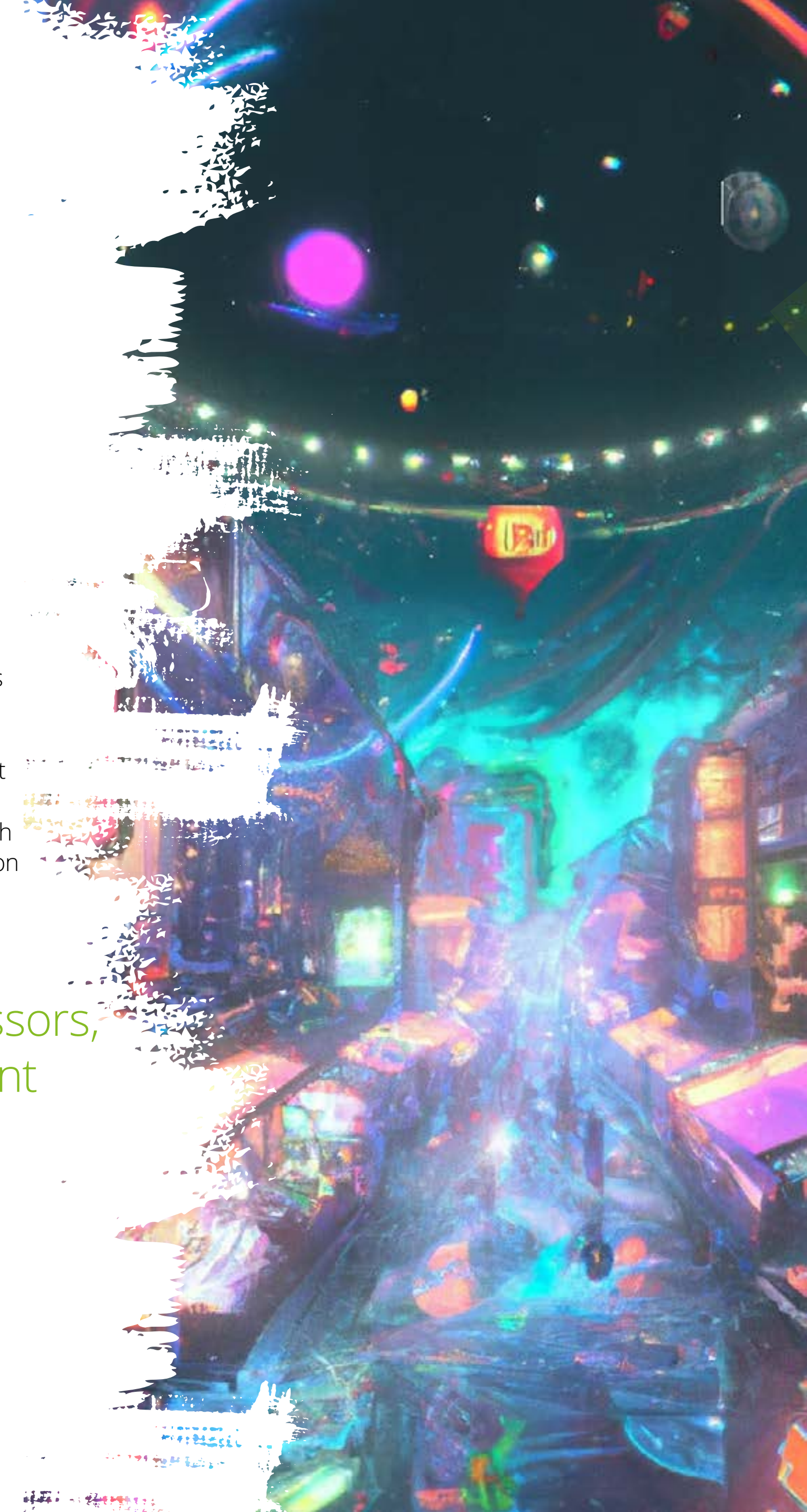
The economy has a lofty digital ambition to redefine internet access as a basic human right, paving the way for equitable access to the economic opportunities in the metaverse. The target is underpinned by a robust digital infrastructure plan, announced in 2017 by the Executive Yuan, Taiwan's highest administrative organ. Taiwan has committed to providing 1Gbps internet access in 90% of the territory to eliminate the urban-rural gap. It also plans to cultivate an innovative and digitally-adept workforce through an online innovative learning environment, and nurture digital creative and cultural content into a trillion-dollar industry (US\$33 billion).<sup>4</sup> Achieving these plans will expand the economic impact of the metaverse domestically.

Taiwan is touted as one of the world's first open digital democracies. Having piloted consensus-making digital platforms, Taiwan can help to extend these learnings into the metaverse. Policy-making that actively seeks consensus has helped the economy to sidestep the polarization and controversy that has been associated with other digital platforms.<sup>5</sup> The government has been in close collaboration with civic hackers which will begin enrollment tools to nurture a less divided citizenry. Transparency and collaborative decision-making are the principles of the Taiwan civic hackers, which leverage software to augment politics. As an open and interoperable metaverse could foster greater levels of collaboration through its network effects, Taiwan could serve as a beacon on navigating civic participation in the metaverse.

“Taiwan is a central node of the globe's semiconductor ecosystem and a cutting-edge pioneer on emerging technologies like hardware-software integration, chipsets, processors, 5G and Wifi6. Taiwan developers and artists have also won global awards for VR content creation. These are all essential elements in the metaverse.”

**Sandra Oudkirk, Director of American Institute in Taiwan @ Meta XR Hub Taiwan Launch Ceremony, 6 May 2022**

1. Department of Investment Services, Invest Taiwan, [Key Innovative Industries in Taiwan: Semiconductor Industry](#), 2021, p. 6.  
2. The White House, [Building Resilient Supply Chains. Revitalizing American Manufacturing and Fostering Broad-Based Growth](#), 2021, p. 12.  
3. Lauly Li and Cheng Ting-Fang, “[Apple Partners With TSMC to Develop Ultra-Advanced Displays](#),” Nikkei Asia, February 10, 2021.  
4. Executive Yuan, “[Executive Yuan Unveils Digital Infrastructure Project](#),” press release, March 21, 2017.  
5. RadicalxChange, “[Taiwan: Grassroot Digital Democracy that Works](#),” accessed October 3, 2022.





# Macroeconomic Determinants

- Taiwan's service sector makes up 61% of GVA and employs around 60% of the labor force. The main sectors contributing to Taiwan's economy are manufacturing (33.8%),<sup>6</sup> wholesale and retail trade (16.2%) and real estate (7.9%).<sup>7</sup> These sectors are expected to be impacted by the metaverse in the near to medium term.
- GDP per capita is \$28,371 - affordability of required immersive hardware may not be a limiting factor on the development of the metaverse.
- Strong export base, with external trade 118% of GDP. Exports reached record highs of US\$446 billion in 2021 despite the weak global economy due to heightened demand for its technological products<sup>8</sup>.
- Economies like China (40% of exports)<sup>9</sup> and US (15% of exports)<sup>10</sup> becoming self-sufficient in key technologies may pose challenges to Taiwan's role within the metaverse value chain.

## TAIWAN IN NUMBERS

Potential 2035 economic impact of the metaverse:

**US\$17-32B per year, 1.3-2.4% of GDP**

2020 GDP:

**US\$656B**

Per capita  
(Constant 2017 US\$):

**US\$28,371**  
(high income)

Key sectors:



ICT sector:



Population:

**23.6M**



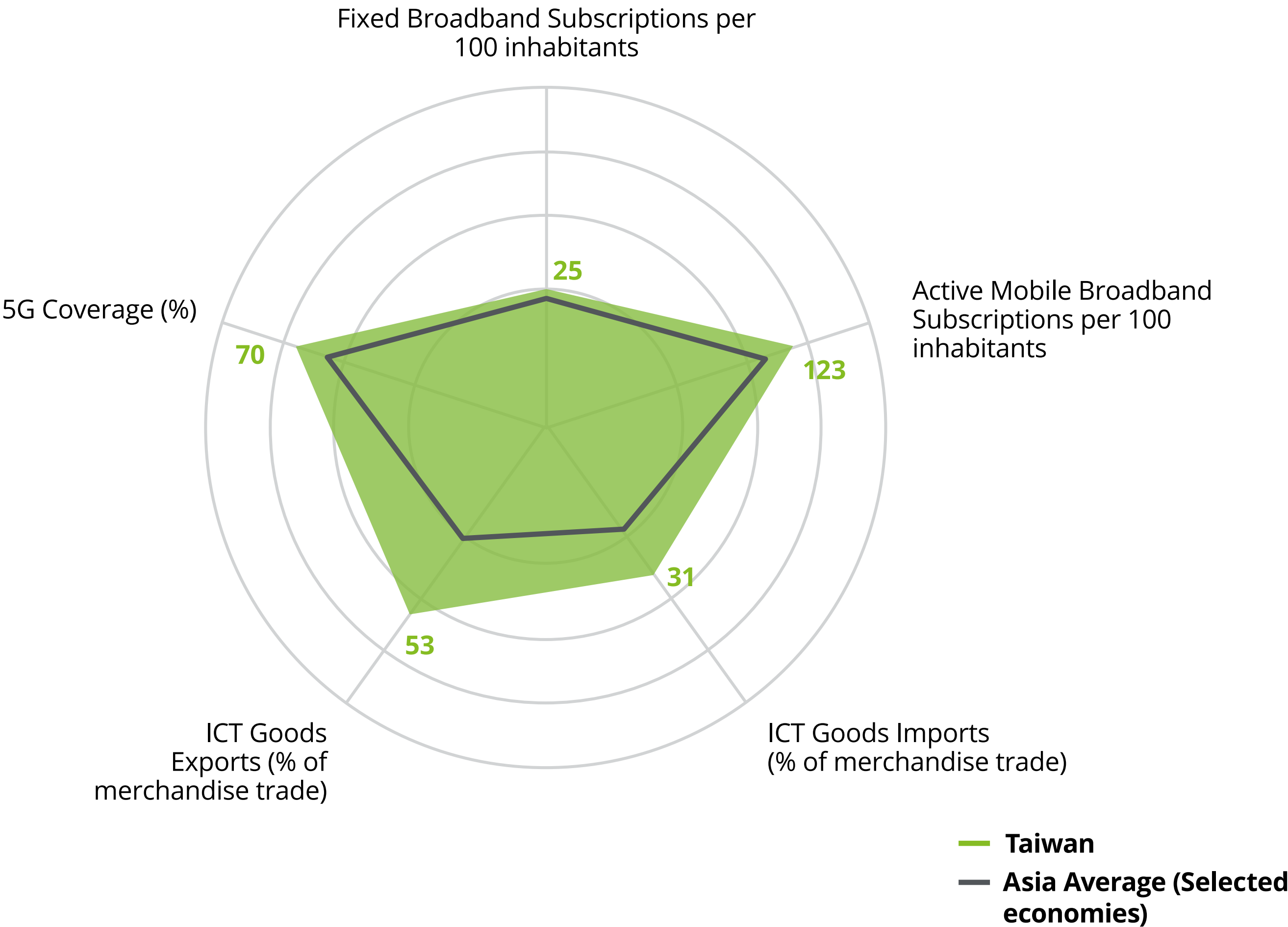
6. ING Group, "Taiwan Economic Update: Inseparable From Semiconductors," accessed October 3, 2022.  
7. Department of Investment Services, Invest Taiwan, Key Innovative Industries in Taiwan: Service Industry, 2020.  
8. Betty Hou and Cindy Wang, "Taiwan's 2021 Exports Soar to Record \$446b on Tech Demand," Bloomberg, January 7, 2022.  
9. Sarah Zheng, "China Reliance on Taiwan would Make Trade Retaliation Costly," Bloomberg, August 17, 2022.  
10. Evelyn Cheng, "Taiwan's Trade with China is Far Bigger than its Trade With the US," CNBC, August 4, 2022.

Note: Taiwan is not ranked on the Global Innovation Index, EIU Business Environment Ranking, and Digital Readiness Index  
Sources: Our World in Data 2017, ITU Digital Development Dataset 2019, World Bank Global Findex, Official Government Statistics

# Technology Fundamentals

- Meta choosing to set-up its first Asian Extended Reality (XR) Research Hub in Taiwan<sup>11</sup> is a testament to its strong technology fundamentals
- Its semiconductor foundries account for over 60% of the global market share in production, and 92% of leading-edge semiconductor production.<sup>12</sup>
- The government aims to increase accessibility to high-speed internet to eliminate the urban-rural gap through 1Gbps internet access in 90% of the economy and the setting up of responsive digital government services in rural areas.<sup>13</sup>
- The newly set-up Ministry of Digital Affairs, overseen by Audrey Tang, will further develop digital governance and cybersecurity preparedness, and promote cooperation in digital services and data democratization.<sup>14</sup>
- The ministry has shown a willingness to utilize emerging digital technologies, such as the Web 3.0 InterPlanetary File System (IPFS), to guard its government websites against cyberattacks through a more robust decentralized file network.<sup>15</sup>
- Taiwan's digital skills training is hardware-inclined. The government has set-up semiconductor R&D centers to cultivate industrial talent, with an additional 10,000 semiconductor professionals per year.<sup>16</sup> After the launch of its cybersecurity strategy in May 2021, Taiwan has trained around 2,600 IT security professionals.<sup>17</sup>

11. Taipei Times, "[Meta Launches Asia's First XR Hub in Taipei](#)," accessed October 3, 2022.  
12. Yen Nee Lee, "[2 charts show how much the world depends on Taiwan for semiconductors](#)," CNBC, March 15, 2021.  
13. Comms Update, "[Asia Pacific Telecom aims to reach 90% of population with 5G by end-2021](#)," accessed October 19, 2022.  
14. Liu Tzu-Hsuan, "[Digital Affairs Ministry to be Launched on Aug 27](#)," Taipei Times, August 6, 2022.  
15. Matt Haldane and Xinmei Shen, "[Taiwan's Digital Affairs Ministry Turns to Web3 to Guard Against Mainland China Cyberattacks following Pelosi's Visit](#)," South China Morning Post, August 11, 2022.  
16. Department of Investment Services, Invest Taiwan, [Key Innovative Industries in Taiwan: Semiconductor Industry](#), 2021, p. 3.  
17. Department of Investment Services, Invest Taiwan, [Key Innovative Industries in Taiwan: Information Security](#), 2021, p. 3.



Sources: GSMA Mobile Connectivity Index 2021, ITU Digital Development Dashboard 2020, UNCTADStat 2019  
Note: Data on International Bandwidth per Internet User is not available for this economy

# Ecosystem Enablers

## Competition within the metaverse

Domestic hardware firms like Foxconn, ASUS, TSMC and HTC are global players in their respective fields with deep manufacturing capabilities. Growth in their areas of expertise will be further supported by the administration, with Taiwan’s National Development Council identifying digital technology as a core strategic industry to power economic growth.<sup>18</sup>

Nurturing more software-centric firms could help Taiwan bridge the value chain between hardware and content companies in the metaverse. Audrey Tang, Taiwan’s digital minister, has commented that the digital ecosystem will benefit from the shorter iteration cycles and service-oriented perspective that software-centric firms can bring to the table.<sup>19</sup>

Although a new wave of software-centric firms have emerged, strengthening the pool of software firms will require a greater diversity of financing options<sup>20</sup> and retention of software talents.

Strengthening the pool of software firms can also bridge Taiwan’s deep hardware capabilities with its content producers. With a deep network of artistes that started the Taiwanese Mandopop boom, the first metaverse music label, 0x0, has emerged in the territory.<sup>21</sup> Taiwan is also emerging as a global leader in VR content production, and its VR films have become a regular feature in international film festivals.<sup>22</sup> La Camera Insabbiata, a Taiwan-US co-production, also won the best VR experience award at the Venice Film Festival’s 1st VR competition. The documentary “FORMOSA 3D” directed by Charlie Chu, looks at forgotten craftsmanship through augmented reality.<sup>23</sup>

## Accessibility

When it comes to ensuring equal access to the metaverse, Taiwan starts from a position of strength. Today, Taiwan ranks the 5th most free on the internet globally in 2021 by the Freedom House,<sup>24</sup> and the freest in Asia. Thanks to President Tsai Ing-Wen administration's commitment to increase internet accessibility as a leading national concern,<sup>25</sup> there are no significant digital divides, except with slight geographical and age disparities.<sup>26</sup>

Taiwan has also implemented the Web Content Accessibility Guidelines 2.0 in 2017 that allow people with disabilities to access web content more easily.<sup>27</sup> By pressing on with this commitment to ensure access for all to the next version of the internet, Taiwan will be a leading example in the region on how this can be achieved and the social benefits of doing so.

18. Executive Yuan, “[President's Six Core Strategic Industries to Power Economic Growth](#),” press release, December 10, 2020.  
19. Public Digital Innovation Space, “[Audrey Tang Interview with Cindy Sui](#),” interview transcript, September 22, 2017.  
20. Khamila Mulia, “[Taiwan Sets Sights to Become AI Hub, with Southeast Asia as Primary Market](#),” KrAsia, February 25, 2021.  
21. Ryan Huang, Violet C Lo and Xin-Wu Lo, “[Taiwan Startup Ecosystem Survey](#),” PwC and Taiwan Institute of Economic Research, 2021, p. 26.  
22. Franchesca Judine Basbas, “[Taiwan Launches First Metaverse Music Label '0x0', Debuts New Supergroup Medicine Man and A-Pop](#),” Bandwagon Asia, May 20, 2022.  
23. Taipei Times, “[Taiwanese VR film wins grand prize in Venice](#),” September 13, 2022.  
24. Freedom House, [Freedom on the Net](#), 2021, p. 38.  
25. Nicolas Rapold, “[‘The Shape of Water’ Takes Top Venice Film Festival Prize](#),” New York Times, September 9, 2017.  
26. Chris Wang, “[2012 Elections: Tsai Pledges to Upgrade ICT on a par with Seoul](#),” Taipei Times, December 23, 2011.  
27. Web Accessibility Initiative, “[Taiwan](#),” accessed on October 19, 2022.<sup>25</sup>



# Sectors to Watch

## Technology and Manufacturing

Taiwanese technology and manufacturing giants are poised to capitalize on the upcoming opportunities in the metaverse. Having established themselves within the global technology ecosystem, companies like TSMC, MediaTek and HTC have hinted at their metaverse plans. Mark Liu, Chairman of TSMC, believes that AR and VR devices could replace smartphones and personal computers, respectively, and TSMC has been developing the technologies needed for metaverse applications.<sup>28</sup>

HTC similarly has the metaverse firmly in its sight, with recent product launches compatible with the metaverse - HTC Vive, a VR headset, and Desire 22 Pro, which comes with a digital asset wallet and VR headset pairing.<sup>29</sup> The explosive demand for increasing compute power met by the growing clusters of data centers across the globes are also quietly powered by Taiwanese original design manufacturers (ODM), like Quanta Computer, Wiyynn, Inventec and Foxconn, all based in Taiwan.<sup>30</sup>

## Government

Immersive environments in the metaverse could facilitate the government in achieving various policy aims – from increasing foreign direct investments to more forms of participation methods in democratic processes. In collaboration with Smart City Taiwan Program, iStaging, an AR/VR solution provider, has experimented with providing investors with AR/VR tours during the planning stage of industrial park developments. Taiwan Creative Content Agency (TAICCA), a government agency, is actively promoting the integration of technology and creative content. Its Immersive Content Grant funds creative projects that can be interactive, multiplayer, AR, VR, MR, haptic, sound, or location-based.<sup>31</sup>

The Taiwanese government currently utilizes digital platforms, like join.gov.tw, as local town halls. Access to the metaverse could provide administrators with more tools to run townhalls more smoothly, while increasing the variety of participation methods.

28. Coinspeaker, "[The New HTC Desire 22 Pro Comes with Crypto and NFT Wallet Features](#)," accessed October 19, 2022.

29. Taipei Times, "[“Metaverse” Concept Likely to Create Huge Opportunities, TSMC and MediaTek Say](#)," accessed October 3, 2022.

30. Patrick Moorhead, "[Lenovo's Secret Recipe for Hyperscale Success is Called ODM+](#)," Forbes, October 22, 2018.

31. Taiwan Creative Content Agency, "[TAICCA Brochure](#)," accessed October 14, 2022.

