



Why is the Global Trade in Integrated Circuits a Development Question?

Introduction

Integrated circuits represents an unprecedented convergence of scientific advancements in materials, efficiency in production processing and market demand. In this essay, it is argued that due to this explosive convergence in science and trade, whether or not African policy makers recognize the fact, the global trade in ICs is and will continue to be a development question. The division of labour and specialization and comparative advantage has seen a handful of firms and a selection of countries principally in East Asia and North America appropriate the most important share of the consumer surplus in IC production. Lacking the comparative advantage to produce ICs, African households, firms and governments as a net consumer of the product remain beneficiaries of significant consumer surplus windfalls. Without the IC, Africans would be considerably poorer. Overall, African households, firms and governments are consumers of ICs both in the direct and indirect markets.

The Observatory Economic Complexity reports that in the year 2020, the US\$669 billion value of the trade in integrated circuits surpassed the value of both the trades in motor vehicles and petroleum, separately . In that year, the value of global trade was \$US 16.7 trillion. These trends could have been driven by the COVID19 lockdowns which included a negative shock to the demand for petroleum and motor vehicles and a positive shock to the consumption of digital devices. Many across the world worked from home. On the supply side, the global value and supply chains for integrated circuits experienced negative shocks from the trade war between the United States and China, lockdown related supply chain crunches. Cars, crude petroleum and integrated circuits have complexity indices of -0.88, -2.32 and 1.42 respectively. The integrated circuit demands a higher intensity of knowledge to produce than do cars and petroleum. This means that the integrated circuit is the most valuable and most sophisticated product ever traded so widely in human history.

What is the profile of African Countries in the Global Trade in Integrated Circuits?

As they took about 80% share of the export and import trades in the year 2021, the export and import markets for integrated circuits are dominated by Asian countries. The East Asian region in particular enjoys significant comparative advantage in IC production and IC based manufacturing. The African continents' IC exports of US\$401 million and imports of \$1.19 billion, the African continent is a net importer of ICs and a beneficiary of IC consumer surplus.

The economic profile of a specific African country can be used to further contextualize poor countries in Africa within the global IC market. The World Bank reports that between the years 2009 and 2019, Chinese per capita incomes grew by 164% from \$3,832 . Kenyan per capita incomes grew by a more modest 87% from \$1,049. Today, while Chinese per capita incomes are US\$ 10,143, Kenyan per capita incomes are US\$1,970. On average, global per capita incomes rose by 28% in that same period from a baseline of \$8,830. Kenyan per capita incomes have grown much slower pace than those of China, but a little faster than the global average. The Chinese and global averages serve as examples to contextualize Kenya's economic relatively sub par growth in per capita incomes.

Why is the Semiconductor Trade a Development Question?

In the year 2023, with an annual income of less than \$2000, the average Kenyan smartphone user has more computing power at his disposal than the National Aerospace Agency's (NASA) annual US\$50 billion budget could secure in the 1960s when that American institution was placing rockets on the moon . In the year 1960, the number of transistors on an IC was 50. By the year 2017, the number of transistors on an Exynos 8895 was just above 20 billion .

Scientific advancements in semiconductor materials and IC production processes facilitated the miniaturization of electronics and electronic computing, advancements in computing power and a fall in the price of computing so precipitous as to increase market choice and competition in manufactures and an expansion of disposable incomes. Science has converged with the division of labour, specialization, and entrepreneurship to provide a product whose demand on the global market continues to grow. Furthermore, the evolution in efficiency in cost, performance, is so dramatic as to render Kenyans, Africans and citizens of the poorer world wealthier despite policy failures in these states. Where science meets economies of scale, the integrated circuit has changed the lives of the poorest of the world.

The global trade in ICs will not abate. For poor African nations that are net consumers of ICs, their households, firms and governments will drive demand primarily through indirect markets for ICs. African households will not consume ICs directly but will drive demand indirectly through the consumption of IC based products. As they continue to provide digitized public goods and services, African governments will also be significant drivers of demand in the indirect market. Purchases of IC based devices will demand it. The African firms that consume ICs and that drive

demand for ICs as inputs will be a small handful. Net consumers of ICs could to implement trade policies that liberalize the trade in ICs as attempts to subsidize domestic production of the product will be impeded by the magnitude of comparative advantage that East Asian and North American producers enjoy.

The political competition engulfing IC supply and production chains in East Asia and North America constitutes a zero sum race to claim ever larger producer surpluses. African countries must take a stance on the matter as any disruptions to global value and supply chains will strip away important shares of the consumer surplus they enjoy. African consumer welfare will continue to be increasingly dependent on the free flow of ICs. Africa's trade policy posture must be calibrated to the twin facts of growing IC demand, and an imperilled IC consumer surplus.

References

1. CH1. NASA. <https://history.nasa.gov/SP-4012/vol4/ch1.htm#:~:text=NASA's%20annual%20budget%2C%20which%20had,considerable%20impact%20on%20the%20agency>. Accessed April 12, 2023.
2. Exynos 8895: Mobile Processor. Samsung Semiconductor Global. <https://semiconductor.samsung.com/processor/mobile-processor/exynos-9-series-8895/>. Accessed April 12, 2023.
3. Fu H, Baffes J, Andree BPJ, Baah SKT. World Bank Open Data. Data. <https://data.worldbank.org/>. Published April 10, 2023. Accessed April 12, 2023.
4. Integrated Circuits. Observatory Economic Complexity. <https://oec.world/en/profile/hs/integrated-circuits>. Accessed April 12, 2023.

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