AFRICA URBAN LAB

AFRICAN SCHOOL OF ECONOMICS | ZANZIBAR

An African Sky Un-Scraped

Building Skyscrapers as a Solution to Dysfunctional Urbanization in Africa

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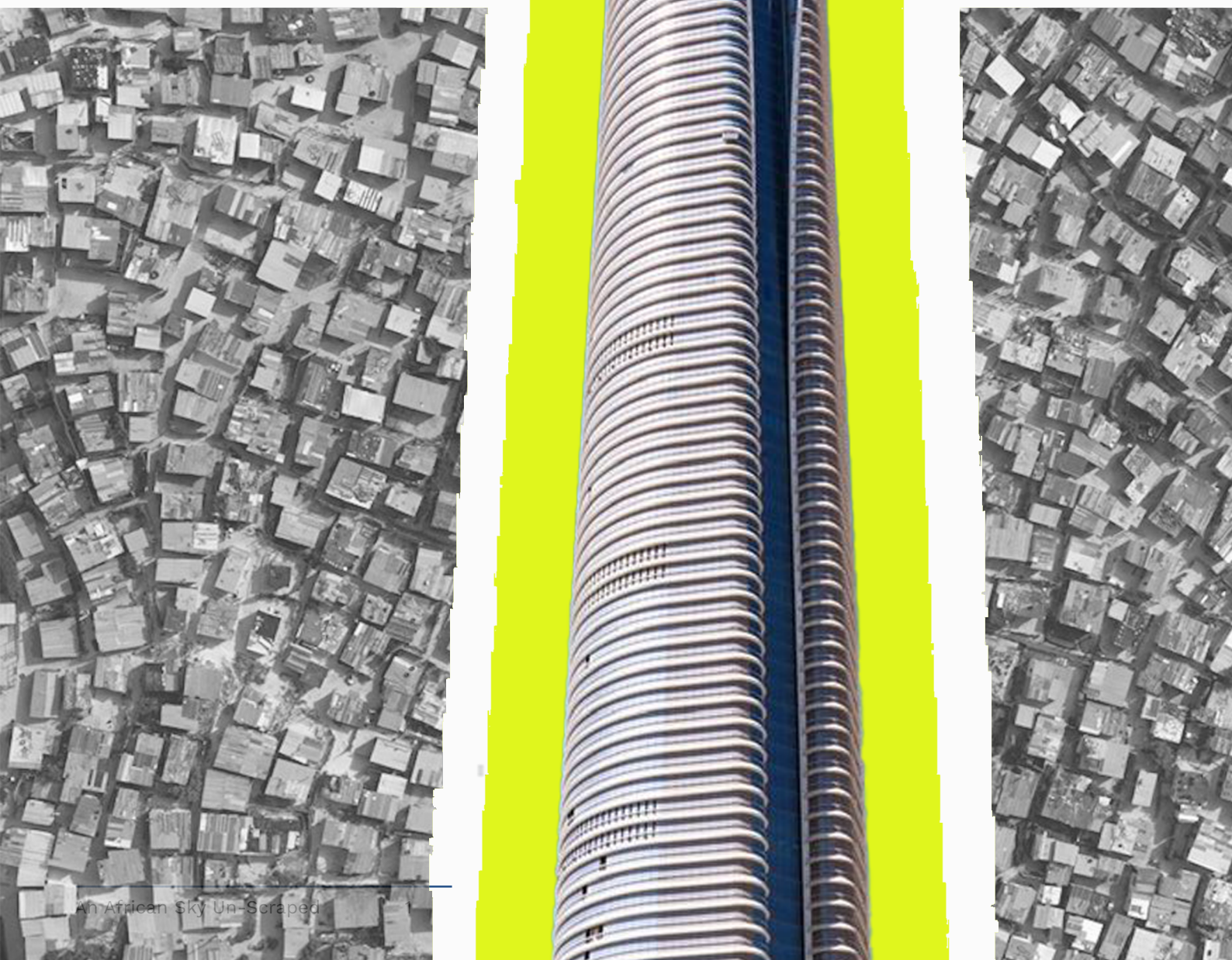

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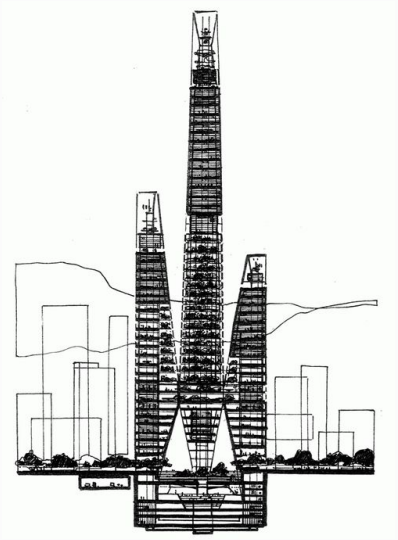

"And they said, go to, let us build us a city and a tower, whose top may reach unto heaven; and let us make us a name, lest we be scattered abroad upon the face of the whole earth." (The Bible, Genesis 11:4)

1. Introduction

In 1800, 4% of the global population lived in cities. This rose to 30% in 1950, then to 43% in 1990, and to 56% by 2019 (Hirschl, 2020:1). While urbanization has historically been an indicator of the location of global wealth, this is no longer so evident. In the years to 2050, 96% of urban population growth is forecast to occur in the Global South (Hirsch, 2020:4). Between 2018 and 2050, the urban population of Africa is forecast to increase from 548 million (almost identical to the total population of Europe) to 1.34 billion (more than double Europe). The urban population of Nigeria alone is forecast to rise by 200 million people (Hirschl, 2020:3). It will take a single generation (30 years) for many countries in Sub-Saharan Africa (SSA) to transition from being lightly urbanized (10-20% of the population) to being predominantly urbanized (60-85%). It took today's developed countries 100 or 150 years to achieve the same transition (Henderson, 2010).

We can and should be optimistic about the development implications of rapid urbanization across the Global South. There is a close and positive association globally and historically between national incomes and the level of urbanization (Henderson, 2010). Over time, income per capita and urbanization increase together. Countries that experience an acceleration of economic growth, such as China after 1980, also experience accelerated urbanization (Pritchett, 2014). However, the link between urbanization and economic growth is not automatic. Since the 1970s, urbanization has failed to boost per capita incomes in Sub-Saharan Africa (SSA) (Gollin et al, 2016). Instead of driving accelerated economic growth, SSA cities are experiencing the downsides of density (crime, contagion, and congestion) that undermine prospective economic and social benefits.

One example of congestion is in respect to housing. The population of many cities in SSA is growing at 4% per year (Lall et al, 2017:32). Because this growth is so rapid, SSA governments cannot expand infrastructure and public services at the same pace. One consequence of this is the growth of congested informal housing, known variously as 'favelas', 'shanty towns', or 'slums.' One billion people currently live in slums, which are generally poorly served by public services such as sanitation, schooling, and electricity

(Hirschl, 2020; Berrisford and McAuslan, 2017:7). Partly because of this, cities in SSA have become cities of 'consumption' rather than 'production,' with a large share of their workforce in non-tradable services such as retail rather than manufacturing and tradable services. This process is what this paper refers to as 'dysfunctional urbanization'.

Cities in SSA are expanding rapidly and this paper asks, can skyscrapers can help alleviate the downsides of density and create the employment, incomes, and exports needed to sustain rapid and inclusive economic growth?

The Council on Tall Buildings and Urban Habitat (CTBUH), based in Chicago, has developed the definitive database on tall buildings, becoming the acknowledged umpire to designate the "world's tallest building." CTBUH offer three categories: 'tall' with 14 or more story's (165 feet), 'super-tall' (984 feet), and 'mega-tall' (1,968 feet). As of today (2024) there are 173 super-tall and three mega-tall buildings globally. CTBUH also acknowledge that 'tall' is a subjective definition. Considered against various categories–such as height relative to context, a 14-story building would not be considered tall in central Chicago but would in most African cities–'tall' can also be judged in terms of a building being slim enough to give the appearance of height or whether its height necessitates the use of "sustaining technologies", such as high-speed elevators or structural wind bracing to manage height (CTBUH, 2024). This paper takes the more subjective definition and asks whether relatively tall, even down to five to ten story buildings, can help African urbanization work better.

This paper is timely because SSA is currently undertaking massive investments in big infrastructure**.** The choices made today about big infrastructure, such as skyscrapers, will influence the pattern of urbanization in SSA for decades, if not centuries, to come. In Europe, areas better connected by the construction of Roman roads (2,000 years ago) are still more urbanized today (Wahl 2016:6; Dalgaard et al, 2018). Making the right choices about big infrastructure in SSA today is crucial: "Given the high sunk costs and enduring nature of infrastructure, any approach to urban development that lacks early planning and coordination will burden future generations with cleaning up the mess – a terribly inefficient strategy," (Lall et al 2017:157).

Even building skyscrapers alone would not be enough because they also require significant supporting infrastructure. China for example, managed this process successfully. Between 1980 and 2011. China's capital investment (infrastructure, housing, and office buildings) rose from 35% of GDP to 48% of GDP as the urban share of its population increased from 18 to 52% (Lall et al, 2017:43). By contrast, in Warsaw, Poland, 23 skyscrapers of 100 meters plus were constructed between 1989 and 2022, 74% of which were used as offices. There was much less attention to building supportive infrastructure. The Varso Tower, for example, used by around 10,000 people daily, offered only 116 parking spaces for cars, leaving 99% of the workers to use bicycles or public transport. The construction boom was not matched by complementary investments in bike lanes or public transport (Goncikowski, 2022:13). Sewage, drainage, clean water, and electricity are less expensive to install at scale on clear sites, rather than retrofitted beneath (or over or around) existing structures on previously developed land (Lall et al, 2021:84).

The choice to build skyscrapers is also constrained by financial practicalities. SSA is urbanizing at strikingly lower levels of GDP per capita (hence tax capacity), when compared to other developing regions with similar urbanization levels. Countries in East Asia and the Pacific (EAP) surpassed urbanization rates of 50% in 2009 with an average GDP per capita of $5,300. The Middle East and North Africa (MENA) became 50% urban in 1981 with an average GDP per capita of $3,700, and Latin America and the Caribbean (LAC) crossed the same threshold in 1961 at GDP per capita of $2,300. SSA reached 37% urbanization with an average GDP per capita of $992 (Freire et al, 2013:5). This places severe constraints on domestic financing of urban infrastructure in SSA, increasing the need for domestic, regional, and international support.

There is a global recognition of the need for better infrastructure in Africa. The New Partnership for Africa's (NEPA) Development was established under the African Union (AU) in 2001. NEPA has promoted the Program for Infrastructure Development in Africa (PIDA) (2012-2040) as one of its flagship initiatives (African Union, 2015). The African Development Bank (AfDB) has recognized an infrastructure need, estimating an annual infrastructure financing gap of around $100 billion per year (Phiri and Mungomba, 2019; Graff, 2019:2). The African vision is rooted in the practical realities of available international funding. These have included the Infrastructure Consortium for Africa (ICA) (formed by the G8 in 2005), the Africa50 Infrastructure Fund (AfDB, 2013), and the Global Infrastructure Fund (World Bank, 2014) (Wethal, 2019). The overall financing of infrastructure in SSA more than tripled between 2004 and 2012 (Wethal 2019).

In 2013, China also launched the Belt and Road Initiative (BRI). The BRI is planned as a vast network of road and rail connections, seaports, energy, and manufacturing investments across Africa and Eurasia (Asia, Europe, Central Asia and the Middle East). Since 2013, BRI has become an integral aspect of Chinese foreign policy; working towards its success was made a constitutional obligation (Boyce, 2017). The BRI is scheduled to cost between $1 and $8 trillion, depending on the source of estimates (Dawn, 2018). Much of the infrastructure financing is done by Chinese lenders, in particular the China Export-Import (Exim) Bank (Wethal, 2019). Currently, 138 countries have signed up to the BRI, including at least 38 African countries (Phiri and Mungomba, 2019). Chinese lending to Africa peaked at about $28 billion in 2016, declined rapidly to near zero during the Covid-19 years (2020 to 2022), then revived to around $5 billion in 2023 (Global Development Policy Center, 2024).

This paper is organized as follows. Section 2 gives a brief history of skyscraper construction, the global boom in construction after c. 2000, and the relative absence of skyscrapers from SSA. Section 3 demonstrates that this absence is an empirical puzzle given the key drivers of skyscraper construction, including economic growth, population growth, globalization, and skyscrapers as a vanity project. Section 4 asks whether skyscrapers can promote good density and so better urbanization in Africa. Section 5 examines the resulting policy implications, and Section 6 concludes.

2. Skyscrapers for Africa?

This section opens with a brief history of skyscraper construction, passing from the Biblical Tower of Babel to the iconic skyscrapers of New York and beyond. Skyscraper construction both accelerated and globalized after the 2001 attacks on the Twin Towers in New York, USA. However, SSA did not share in this construction boom. There are many active efforts to solve the problem of dysfunctional urbanization in SSA, but skyscrapers have not been, nor are planned to be, part of the solution.

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2.1 skyscrapers: A Short History

For some, the Biblical construction of the Tower of Babel provides evidence for the early construction of skyscrapers. The ancient world - Phoenicia, Mycaenae, Minoa, Egypt and Mesopotamia - used lime as a binding element in mortar, a basic technology that could have permitted them to build tall (Ali, 2001:2). Archaeologists of ancient Rome have struggled to find ‘concrete’ evidence of the eight-story ‘skyscrapers’ that were described by some classical authors (Storey, 2003:8). Although there is one building in Rome, at the foot of the Capitoline Hill, that shows traces of a sixth story, Rome was more likely a city of one to four story houses (Storey, 2008). After the collapse of the Roman Empire in the fifth century CE, the knowledge of concrete was lost for centuries, and only re-discovered again in the nineteenth century (Ali, 2001:3).

For 3,800 years, the Great Pyramid of Pharoah Khufu Khufu was the tallest building in the world. It was surpassed by Lincoln Cathedral, in the UK, when it was rebuilt in 1311CE with the addition of a 160-meter tower, it lasted until 1548CE when the tower was destroyed in a storm (Parker and Wynne, 2020).The pyramids illustrate to dramatic effect, the limits of masonry construction. Given the building technology of the ancient period, the lower levels had to be very large in order to support the higher levels, which in turn needed to become narrower to retain stability (Helsley and Strange, 2008:51). The key innovation that facilitated the transition from ‘fat base and tapered tall’ to ‘slim and skyscraper’ was iron. The use of iron as a structural material went back to classical antiquity, but it did not appear wholly emancipated from masonry until the construction of Darby and Pritchard’s cast iron arch bridge over the River Severn at Coalbrookdale, England, in 1775-79.

The first building with interior columns and beams of iron was William Strutt's Calico Mill at Derby, England (1793) (Conduit, 1959:81). Also important was the Ditherington Flax Mill in England, built between 1796 and 1800, which was built around column and beam metalwork, a forerunner of the steel-frame structures of modern skyscraper. The Flax Mill has been labelled the "grandfather of the skyscraper" (Denison and Beech, 2019:36). Elsewhere, cast iron was used in the structure for the construction of the gallery of St Anne's Church in Liverpool (1772), the Marble Palace in St Petersburg (1772), and the Theatre Paris (1790) (Landau and Conduit, 1996:20). Iron in construction first appeared in American buildings in the 1820s and complete iron construction was established by 1850. Skyscrapers emerged in the 1880s in New York for four reasons: economic, geology, policy and technology.

Economic: New York only emerged as the principal city of the US in the 1850s, due variously to railway construction in the 1830s and 1840s; the National Bank Act of 1863 which made New York the national financial capital; the construction of the Erie Canal in the 1820s linking the Great Lakes region to the New York port after which New York emerged as the country's premier port; and the flourishing of university, cultural and musical life. After the 1850s, tall buildings consequently became economically desirable (Landau and Conduit, 1996:1).

Geology: Manhattan Island is built atop sunken, glaciated bedrock. In parts of New York, this rock can be easily seen from the surface, such as in Central Park. There is some evidence that skyscrapers were often built on top of this rock, which provided a naturally stable foundation. However, it is difficult to generalize this argument. Chicago, another early adopter of the skyscraper, was built on swampy soil (Barr, 2010:11; Ahlfeldt and Barr, 2020:42).

Policy: In 1811, in an effort to rationalize its street pattern, Manhattan implemented a grid-plan, which standardized lot sizes into 25 ft by 100 ft parcels. These small lot sizes were deemed, at the time, suitable for individual homes or shops. Because lot sizes were relatively small, as the city became built up, acquiring larger lots for buildings became more difficult. By the late-19th century, this created an incentive for developers to use each lot more intensely by building upwards (Barr, 2010:10).

Technology: By the 1830s, power operated elevators were used in English factories and warehouses. The safety break was invented in 1851 by Elisha Graves Otis (Landau and Conduit, 1996). The first safe passenger elevator, with automatic safety breaks, was installed in the Haughwout Department Store, New York City in 1857. With the advent of the elevator, buildings of four or more stories became practical for retail or residence (Vijayasree, 2019:372). The fireproof floor was patented by Frederick Peterson in 1855 (Landau and Conduit, 1996:27). These technologies made skyscrapers much safer. For example, in 1945 when a bomber aircraft crashed into the Empire State building, between the 78th and 80th floors, the crash caused only 14 deaths. The resulting fire was quickly tamed and extinguished, and though the elevator cab fell 75 stories, the elevator operator survived. In less than a month, everything was repaired (Bonechi, 2004:39; Ascher, 2013:100).

The refinement of the steel Bessemer process, first used in the United States in the 1860s, allowed for another major advance in skyscraper construction. Steel is stronger and lighter than iron.

The Bessemer process allowed for the mass production of steel, which reduced the price of steel from $167 per ton in 1867 to $24 per ton in 1895 (Ascher, 2013:11), and so contributed to making skyscrapers viable. In the 1880s the US Weather Service and UK Royal Meteorological Society had completed much of the scientific work to measure and compensate for wind velocity on high structures (Landau and Condit, 1996:159). The development of the telephone by Alexander Graham Bell in 1876 allowed people to communicate within and between skyscrapers (Ascher, 2013).

Among architectural historians, there is an ongoing debate about what constituted the first true skyscraper. The term 'skyscraper' was first used in 1883 in an article published in the *American Architect and Building News* (Landau and Conduit, 1996:x). The common newspaper usage of the word "skyscraper" was to describe those relatively tall (eight to ten floors) commercial buildings being built in New York and Chicago in the early 1880s (Ahlfeldt and Barr, 2020:5). The popular belief is that the Home Insurance Building in Chicago, designed by William Le Baron Jenney, and completed in 1885, was the world's first true skyscraper. Legend has it that Jenney first realized that an iron skeleton could hold up a building when he saw his wife place a heavy book on top of a small birdcage, which easily supported its weight (Vijayasree, 2019:373).

New York utilized this innovation soon after, with the construction of the 22-story Flat Iron building (Denison and Beech, 2019:74; Ahlfeldt and Barr, 2020:6). The use of a steel skeleton increased the amount of usable floor space, increasing the commercial viability of building upwards. Technology continued to refine skyscrapers. The first reinforced concrete building was the McGraw Building (1908) (Landau and Condit, 1996:331). As a corporate statement, the ALCOA building (1953) in Pittsburgh, (the HQ of the Aluminum Corporation of America) built the electrical system, wiring, cooling tower, plumbing, and every exterior and interior finish out of aluminum (Dupre, 1996:47). In the late 1960s, structural engineer Fazlur Khan (of Skidmore, Owings & Merrill, SOM) developed the concept of tubed support structure. Here the external perimeter walls would consist of a series of load-bearing tubes instead of simple steel columns. This resisted wind and gravity more successfully and allowed for greater weight and greater height. The World Trade Center in New York (1972) was the first tube-based skyscraper (Ascher, 2013:16). Into the twenty-first century new materials such as graphene, laminated timber, and bamboo are being used as construction materials in skyscrapers (Parker and Wynne, 2020L176).

Skyscraper construction fueled the accumulation of vast wealth. Jacob Astor made a fortune from buying land and building tenements for rental around New York in the 1830s. By the 1930s, a large share (50) of the richest 400 people in the US had made their fortunes in Manhattan real estate. Joseph Kennedy made a fortune in the 1920s in bootlegging and the stock market, but tripled it in the 1940s through real estate speculation. After the 1939 construction of the Rockefeller Center, the Rockefellers made as much from Manhattan real estate as they did from oil (Shachtman, 2000:9). The building process was incredibly dynamic. For example, the tenements of Astor gave way to mansions for the rich in the 1860s, and in turn to skyscrapers in the 1880s. 21,000 buildings were demolished in Manhattan between 1898 and 1908 and most plots had been built on three times (Shachtman, 2000:93). 350 Fifth Avenue, for example, has sequentially been the

mansion home of Caroline Astor, the site of the Waldorf Astoria hotel, and finally the site of the Empire State Building (Bonechi, 2004).

After 1890, the first twelve sequential holders of the world's tallest building were in the US. These included many New York skyscrapers, including the 348-foot Manhattan Life Insurance Building (1895), the 612-foot Singer Building (1909), and the 1,250-foot Empire State Building, which held the record for 41 years (1931-1972), before being replaced by the 1,368 foot World Trade Centre (1974). The label of 'tallest' was a prestigious one. To keep people guessing, the spire of the Chrysler Building (1930) was secretly assembled in the fire shaft and hoisted into place weeks after the Bank of Manhattan (1930) had been completed (Dupre, 1996:37). The Chrysler Building was then the world's tallest building for eleven months, until it was deposed by the Empire State Building.

In 1930, 99% of the world's tallest buildings were in North America. The principal exception was the Predio Martinelli building in Sao Paulo (1929) (Ascher, 2013:16). New York long dominated this list before losing the title once to Milwaukee, and then to Chicago in the 1970s (Weiss, 1992:206). In the run up to near bankruptcy in the mid-1970s, GTE, Union Carbide, General Foods, and other giant companies fled Manhattan in response to concerns about poor quality schooling, overcrowding, housing shortages, and rising taxes. New York revived soon after, and by 1978 more than thirty new skyscrapers were under construction (Shachtman, 2000:2600). The US was knocked off this perch by the 1,483-foot Petronas Towers in Kuala Lumpur, Malaysia (1998), by the 1,671-foot Taipei 101 in Taiwan (2004), and finally by Dubai, United Arab Emirates with the Burj Khalifa (2009).

After the 9/11 terror attacks on the Twin Towers in New York in 2001, it was thought by some that the era of skyscrapers was over. As obvious terror targets, would cities allow new skyscrapers to be built? Would people want to continue to live and work and firms to rent office space in skyscrapers? However, skyscraper construction continued, especially in the urban world outside the West (Smith, 2021:2). Recent history had shown that terrorism would not act as a break on building upwards. An earlier terrorist attack, the April 1992 IRA truck bomb in London, destroyed the Baltic Exchange building, but the outcome in practice was to replace it with the iconic Gherkin skyscraper (Parker and Wynee, 2020).

2.2 Africa: Where the sky isn't scraped

During the first two decades of the twenty-first century, global cities were estimated to have added 8,827 tall buildings (165 feet) to the 7,513 already constructed (Al-Kodmany, 2018:2). It was still possible for one author to declare in the mid-1990s, that "skyscrapers are a uniquely American art form," (Dupre, 1996:6). By 2020 this expression was lost to history, then the top ten tallest skyscrapers in the world were in Asia and the Middle East. Saudi Arabia had two (including what will be the new global tallest, the Jedah Tower at 2,020 feet), the Arab Emirates one, South Korea one, Malaysia one, and dominating the list, China, with five (Al-Kodmany, 2018:4). In the second edition of his book, that same author now declared, "once a uniquely American art form, the skyscraper has been exported to the earth's four corners....today, the emerging

cities of the Far and Middle East are the new blank slates," (Dupre, 2013:7). About two-fifths of the skyscrapers presented and discussed in the second edition were built after 2000, and mainly in the Middle East, China, and London, with only a few from the US.

One university professor writes about how she showed her university students slides of tall buildings in African capital cities and asked the students to guess where they were located. Not a single student recognized any of the buildings, nor suggested an African city, believing the cities portrayed looked 'too modern' and 'too clean' to be located in Africa. The scholar ascribed this to a bias in perceptions about and teaching of Africa (Malaolu, 2014:25). While the extreme reaction among the students may be faulted, it does capture a reality about Africa. Africa has built and is building far fewer skyscrapers than other regions of the world.

Across the twentieth century, North America led the list of skyscraper constructions (3,867), while Asia (1,593), Europe (968), Oceania (473), and South America (286), were all far ahead of Africa (132) (Al-Kodmany, 2018:4). The relative position of Africa fell further behind in the first two decades of the twentieth century where the global boom in skyscraper building was led by Asia (3,962), followed by North America (1,710), and Europe (1,426). In contrast to the twentieth century, the Middle East has transformed from laggard into dynamic constructor (647), while Oceania (473), and South America (350) also stepped-up skyscraper construction. By contrast Africa (50) didn't participate in the global skyscraper building boom (Al-Kodmany, 2018:4).

The list of super-tall buildings in the twentieth century is even more striking, with Asia (48) and the Middle East (27) leading, and North America (6), Europe (5), and Oceania (1) lagging a long way behind. South America, Central America, and Africa did not build any super-tall buildings (Al-Kodmany, 2018:5). The tallest skyscraper in Africa remains the Carlton Center in Johannesburg, at 723 feet, which was built in 1973. More recent constructions, including the Britam Tower in Nairobi (660 feet), built in 2017, and the Commercial Bank of Ethiopia, Addis Ababa (660 feet), built in 2018, remain some way behind (Al-Kodmany, 2018:11). Earlier examples, such as the 18-story FINDECO House (1979) in Lusaka, Zambia built by Yugoslavian architects and the 25-story Hotel Ivoire (1963) built by Israeli architects, which were both long seen as under-utilized white-elephants (Denison and Beech, 2019). An informal list of the current (2024) ten tallest buildings in Africa, includes six in North Africa (Egypt, Algeria, and Morocco) and two of those are minarets of mosques (Ayemba, 2023).

3. Skyscrapers in Africa: The Empirical Puzzle

This section discusses the key drivers of skyscraper construction–economic growth, population increase and migration, globalization, and vanity–showing that there is an empirical African puzzle. Africa should be building more skyscrapers.

3.1 Economic Growth

One writer declared that “towers are for power” and that there “is no economic need to build skyscrapers, anywhere,” (Dupre, 1996:7). This is wrong. There is ample evidence that economic factors drive skyscraper construction. In low and lower-middle-income countries, 90% of urban built-up area expansion occurs as horizontal spread (Lall et al, 2021a). Cities in upper-middle and high-income countries build upwards, including skyscrapers (Barr and Luo, 2021:213). For Latin America, GDP growth is a good predictor of building heights (Garza and Lizieri, 2016:287). Another study shows that across almost 400 cities, building heights increase, non-linearly, with economic development (Lall et al, 2021b:11). Using a sample of 9,468 cities (defined as urban centers with at least 50,000 inhabitants in 2015), Lall et al. (2021b) show that as city income doubles average height increases by 18%.

There are various reasons why economic growth is linked to building height. One is that housing and commercial floor space are normal goods: demand for them increases with income. A study of more than 90 countries found that housing investment follows an S-shaped trajectory, taking off at a per capita GDP of around $3,500, then tapering down at a per capita GDP around $36,000 (Lall et al, 2021b:11). Another rationale for the link is that because building tall is expensive, capital intensive, and technologically demanding, it can only be managed and afforded by wealthier cities (Lall et al, 2021). Richer cities also tend to produce more tradeable services (accounting, marketing, and research) which are intensive in knowledge workers and gain the most from the agglomeration of workers, increasing the demand for higher buildings (Lall et al, 2021).

One study uses a database of global tall (80 meter plus) buildings to give a rigorous answer to this question of whether there are missing skyscrapers given a country's level of GDP per capita between 1950 and 2020. The number of skyscrapers in the US and Japan is close to what would be predicted given the high incomes and large urban populations of both countries (Jedwab et al, 2022:5). More widely, the global stock of tall buildings is estimated to fall short by the equivalent of 6,000 Empire State Buildings. The gaps in tall building stocks are larger for richer countries, especially European countries. In developed and developing countries, there is a relative shortage of residential and commercial tall buildings respectively (Jedwab et al, 2022:2). There are specific puzzles, such as cities in Brazil and Mexico (Garza and Lizieri, 2016:287). South Asia and SSA also have missing skyscrapers when controlling for city income and population (Barr and Jedwab, 2003:1; Lall et al, 2021b:21).

In 2022, 20 African countries were defined as low-income (or less than $1,036 GDP per capita) and 21 as lower-middle-income (between $1,036 and $4,045). This left eight countries that were classified as upper-middle-income, and one, the Seychelles, as high-income. This list included countries like Botswana ($6,657) and South Africa ($6,019) in SSA and Egypt ($4,089) in North Africa that may be considered good candidates for skyscraper building (Trading Economies, 2023).

The wealth-height relationship has also changed over time. Skyscrapers can be built at lower incomes today than in the past. In the mid-1980s, the story of the construction of the Worldwide Plaza showed how the project involved a complicated working relationship between Skidmore, Owings, and Merrill (SOM), the Zeckendorf Co (ZCWK), and Hymovitz, Ravitch, and Horowitz (HRH) (Sabbagh, 1989:3). It was crucial to the success of the project that New York had a dense mass of such experienced professional expertise. Today, global shipping of the goods and services and people necessary to build skyscrapers has become "routine, fast and affordable," at least up to the borders of African countries (Al-Kodmany et al, 2013:25). Skyscraper-friendly service output is also increasing its share of national output at lower levels of GDP per capita than in the historical past (Dasgupta and Singh, 2006). The income level at which we could reasonably expect SSA to build skyscrapers is declining over time.

3.2 Population Increase and Migration

Between 1880 and 1890, the population of Chicago doubled, which helped push real estate prices up from $130,000 per quarter acre to $900,000 (Dupre, 1996:15). This increased the incentive to save land and build upwards. In the US across the 20th century, for each additional million people living in New York and the surrounding counties, average building height increased by about one to one and a half floors (Barr, 2012:22). In China, there has been a U-shaped cross-sectional relationship between a city's population and the number and heights of its buildings, suggesting small cities are most eagerly building skyscrapers (Barr and Luo, 2021:213). Across a global sample of 400 cities, as city population doubles, the average height increases by 25% when keeping income constant (Lall et al (2021b:20). The share of the world's population living in urban areas will increase from 33% in 2000, to 60% by

2030, and 75% by 2050, when the total urban population is forecast to reach 9 billion people (Al-Kodmany (2018:12).

Recall from the introduction to this paper that between 2018 and 2050 the urban population of Africa is forecast to increase from 548 million to 1.34 billion people. The urban population of Nigeria alone is forecast to rise by 200 million people (Hirschl, 2020:3). Based on current patterns of urbanization, the population of Lagos and Kinshasa could reach 85 million by 2011 and Dar Es Salaam could reach 75 million (Hirschl, 2020:8). Population increase should have long generated a turn to skyscraper construction in SSA cities.

3.3 Globalization, Global Cities, and Urban Competition

The Eiffel Tower was opened in 1889 and 32 million people visited the Exposition Universelle of which it was a part. For the first time, abstract engineering was the goal and attraction, not religious or military purposes (Dupre, 1996:17). The tall building as a secular icon was born. The Empire State Building has spent its near century-long life as an advertising icon, everything from pancakes to ocean liners, and continues to attract several million visitors a year (Dupre, 1996:39). The Empire State Building had no corporate logo and was a speculative venture to rent out space (Ascher, 2013). Over time skyscrapers have become a form of competitive advertising for entire cities. If one city builds a skyscraper to draw attention to itself, another city may build a taller skyscraper to attract attention back to itself – a form of conspicuous architectural competition. This would indicate that skyscrapers are 'strategic complements' in that cities build more or taller skyscrapers in response to the actions of other cities. Cities can also be 'strategic substitutes,' especially if they are economically or geographically proximate. This implies that one city can absorb the demand for office buildings and so reduce the incentive of other cities to build skyscrapers (Barr and Luo, 2021:212).

By 2010, of the 10 tallest buildings in the United States, four were in Chicago and four were in New York (six would have been in New York, had the Twin Towers been included) (Barr, 2013:369). Based on time series data for New York and Chicago from 1885 to 2007, there is evidence that the two cities experienced 'strategic complementarity' as building skyscrapers in one city increased the likelihood of skyscraper construction in the other (Barr, 2013:370). A panel data set on skyscraper construction in 74 cities throughout China from 1978 to 2015 shows that China's skyscrapers are strategic substitutes nationally, but regional strategic complementarities also exist. Cities will build fewer or shorter skyscrapers in the face of rapid construction nationally, but similar cities (in terms of size and economic and social development) compete by building more and taller skyscrapers (Barr and Luo, 2021:214).

Today, cities, as well as nations, compete to attract global investment and global tourism, through brand differentiation and symbolic modernity. There has been an enduring tradition of doing this through architecture, with notable examples including the Eiffel Tower (1889), the Sydney Opera House (1973), the Guggenheim Bilbao (1997), and the London Eye (2000). Recent decades have seen a wave of efforts to do this through skyscraper construction (Dyckhoff, 2017). Since the 1990s, Shanghai, for example, has responded to the global wave of

skyscraper construction by building even taller – strategic complementarity. The Jin Mao Tower was ranked the third tallest building in the world in 1998; the Shanghai World Financial Center the second tallest in 2008; and the Shanghai Tower the second tallest in 2015 (Barr and Luo, 2021:215). The plan worked; during the 1990s, more than half of the world's 500 top transnational corporations opened branches in Shanghai (Al-Kodmany et al, 2013:31).

The commissioning of iconic public buildings by global architects has become an established marketing technique. There is a familiar litany of star names, including Frank Gehry, Daniel Libeskind, Jean Nouvel, Rem Koolhaus, Norman Foster, Santiago Calatrava, Renzo Piano, and Adrian Smith (Al-Kodmany et al, 2013:24). The Petronas Towers in Kuala Lumpur were designed by Cesar Pelli. Pelli was born in Argentina in 1926 and moved to the US in the 1950s, he designed Canary Wharf in 1986 and the World Financial Center in New York in 1981. Pelli won an international competition for the Petronas Towers in 1991. The Towers have since become a marketing symbol for both Kuala Lumpur and Malaysia (Sklair, 2017). There is an economic rationale to icon-seeking. One study of almost 17,000 office buildings with rental observations across 682 locations in the US finds that those designed by architects that have been recipients of the Pritzker Prize and/or AIA Gold Medal command rents that are 5%-7% higher and sell for 12-17% more than other buildings (Fuerst et al, 2011:180).

Cities in SSA are not yet part of this global competition. SSA cities are neither global strategic complements nor substitutes to other global cities. Conventional lists of 'global cities,' such as the Schroders top-thirty global cities, don't include any SSA cities (Schroders, 2023). Using a database of the height, use and location of buildings more than 330 feettall shows that the height of skyscrapers in Latin America is strongly and positively correlated with the Global Cities variable from an index (based on global connectivity in advanced producer services such as accountancy, advertising, banking/finance, and law) produced by the Globalization and World Cities Research Network (GaWC) (Garza and Lizieri, 2016:289). International architectural firms cluster into those same global cities, outside SSA. Among the top ten architecture firms listed at different times between 2005 and 2013, 11 were from the USA, five from UK, and one each from Australia, Canada, Japan, Singapore, and South Korea. The list was relatively stable and only 21 firms ever attained a position in the top ten (by architects employed) (Sklair, 2017:87). Skidmore, Owings & Merrill (SOM) are the most successful global architecture firm. In the 1950s, about 10% of their projects were outside the US, 20% in the 1970s, and almost half by the 1990s (Sklair, 2017:24). It is telling that the Jin Mao Tower in Shanghai, built in a traditional Chinese pagoda style and as an advert for rising China, was designed by SOM (Sethi, 2021:14). As Asia joined the skyscraper race after 2000, there has been an increase in the global presence of Asian architects, but who typically are educated in the West, such as Ken Yeang (Malaysia), William Lim and Tay Kheng Soon (Singapore), and Sumet Jumsai (Thailand) (McNeil, 2005:45).

3.4 Skyscrapers as a Vanity Project

Height has long been a symbol of power. The Seven Wonders of the ancient world were all characterized by height and visibility (Al-Kodmany, 2018:16). The Egyptians buried various Pharaohs in the Pyramids, which were the tallest structures of their time and for centuries afterwards (Sethi, 2021:5). The tendency to be able to instantly identify a city through an image or silhouette of a tall building has increased in recent decades, obvious examples including Big Ben and the Gherkin in London, the Eiffel Tower in Paris, the Petronas Towers in Kuala Lumpur, the Space Needle in Seattle, the Willis Tower in Chicago, and the Burj Khalifa in Dubai (Al-Kodmany, 2018:16).

Since the late nineteenth century, it is not just height, but also the relative height of buildings that has become important. Woolworth revised the plans for his New York skyscraper (1913) to ensure that it would be taller than the Metropolitan Life Building (1909) and so become the tallest occupied building in the world (Helsley and Strange, 2008:49). Afterwards, the opening the Woolworth building, by virtue of its design and relative height, became a global news story and local tourist attraction (Helsley and Strange, 2008:52). The builders of the Manhattan Company Building (1930) added four stories to their design to overtake the Chrysler Building (1930) as the world's tallest. In response, a dome planned for the Chrysler building was replaced with a 'tapered vortex,' that allowed the building to re-claim the title of world's tallest building (even taller now than the unoccupied Eifel Tower) (Helsley and Strange, 2008:53). After being deposed by the World Trade Center project (1972), the Empire States Building (1931) undertook an analysis of adding another eleven stories to reclaim the top spot (held since 1930) (Helsley and Strange, 2008:53).

The clash between communism and capitalism in the twentieth century was also manifest in skyscraper construction. Moscow launched a mission in 1947 (as part of the 800th anniversary celebrations of Moscow) to build eight skyscrapers, seven of which were completed in the 1950s. These comprised elite apartments, luxury hotels, the headquarters of Moscow State University, the Ministry of Railways, and the Ministry of Foreign Affairs. The buildings were intended to serve as monuments to Soviet victory in World War II and to the rise of the USSR as a world communist power. The socialist concessions were the propaganda that the workers who built them could one day become students at Moscow State University and that good construction performance could lead to membership of the Communist Party (Zubovich, 2021:152). Less socialist were the thousands of residents who were displaced to make way for luxury accommodation. Identical buildings were given as gifts to Warsaw, Riga, Prague, Bucharest, and Kyiv in 1951 and 1952. The scale was 'monumental,' implying that the scale exceeded the function the building was intended for – a form of vanity architecture (Zubovich, 2021). On completion, the buildings were viewed by the new Soviet Premier Kruschev, as symbols of the excesses of Stalinism. The USSR thereafter switched to the construction of mass housing and built 38 million houses and apartments between 1953 and 1970 (Zubovich, 2021:203). Perhaps not surprisingly, in 2001, at the start of Putin's first term as president, Russia began work on the 57-story Triumph Palace skyscraper in Moscow, briefly the tallest building in Europe.

Historically, autocrats have funded the construction of vanity projects such as skyscrapers, but also pyramids, high-speed trains, religious buildings, enormous dams, major sporting events, and even entire cities. Many leaders want to be famous and talked about and viewed as "powerful, capable, and affluent" (Gjerlow and Knutsen, 2017:5). The Kingdom Tower in Jeddah (estimated cost $1.2 billion) is closely associated with the Saudi Royal Family. Prince Alwaleed bin Talal is the Chairman of the company building the tower and the nephew of the recently deceased King Abdullah (who himself began construction of the King Abdullah Economic City (KAEC) on the Red Sea. The tower is seen as a personal bid to out-build the Burj Khalifa in Dubai, closely associated with Sheikh Mohamed bin Rashid al Maktoum (Graham, 2016:756). In China, skyscraper construction is bound up with career politics in the ruling Communist Party. Local economic performance is one of the most important criteria when higher-level officials evaluate lower-level officials for reward or promotion. Skyscraper construction can visibly signal the skill of local officials and help them be promoted within the Communist Party. There is empirical evidence for this connection. There is a negative correlation between the ages of municipal leaders and skyscraper construction suggesting that younger leaders promote skyscrapers in order to advance their careers (Barr and Luo, 2021:213). The rise to economic power of Asia and the Middle East from the 1990s, and especially after the slowdown of economic growth in the West after the 2008 Global Financial Crisis, has been reflected in a competitive struggle for the title of 'world's tallest building,' from the Petronas Towers in Malaysia (1998), the Taipei 101 in Taiwan, China (2004), and then the Burj Khalifa in Dubai (2009) (Helsley and Strange, 2008:54). A more telling indicator of skyscrapers as a vanity project is that of 'vanity height'.

'Vanity height' is defined as the distance between the highest floor that can be occupied and the architectural top of the structure. The vanity height of the Burj Khalifa for example is 29%, Zifeng Towers is 40%, and the Bank of America Tower is 36% (Gjerlow and Knutsen, 2017:14). In some instances, entire skyscrapers have been built without any economic rationale. The Ryugyong Hotel in Pyongyang, a 330m towering pyramid, on which construction started in 1987 (under dictator Kim Il Sung), still remains unoccupied 35 years later. Others, such as the Eiffel Tower have generated unplanned and unexpected, but prodigious tourist revenues (Gjerlow and Knutsen, 2017:7). There is nothing new about vanity. In Bologna, Italy a forest of 100 towers were constructed in the twelfth and thirteenth centuries, some up to 100 meters tall. There was no obvious rationale for this flurry, other than competitive vanity (Parker and Wynne, 2020). By contrast, in the (democratic) US, the famous competitions for the title of the world's tallest building are not reflective of skyscraper construction more generally. Instead, the average height of skyscrapers overall can best be explained by economic factors that affect the costs and benefits of construction (Barr, 2010:570). If builders were systematically aiming to stand out, then the height of the skyline itself or the height of recent completions would be positively related to current average heights and completions, for which there is no systematic evidence (Barr, 2010:570).

Empirical evidence shows that when countries become more autocratic, they subsequently build more new skyscrapers, controlling for other relevant factors, such as level of income and urbanization. This is neither due to skyscrapers being more popular in

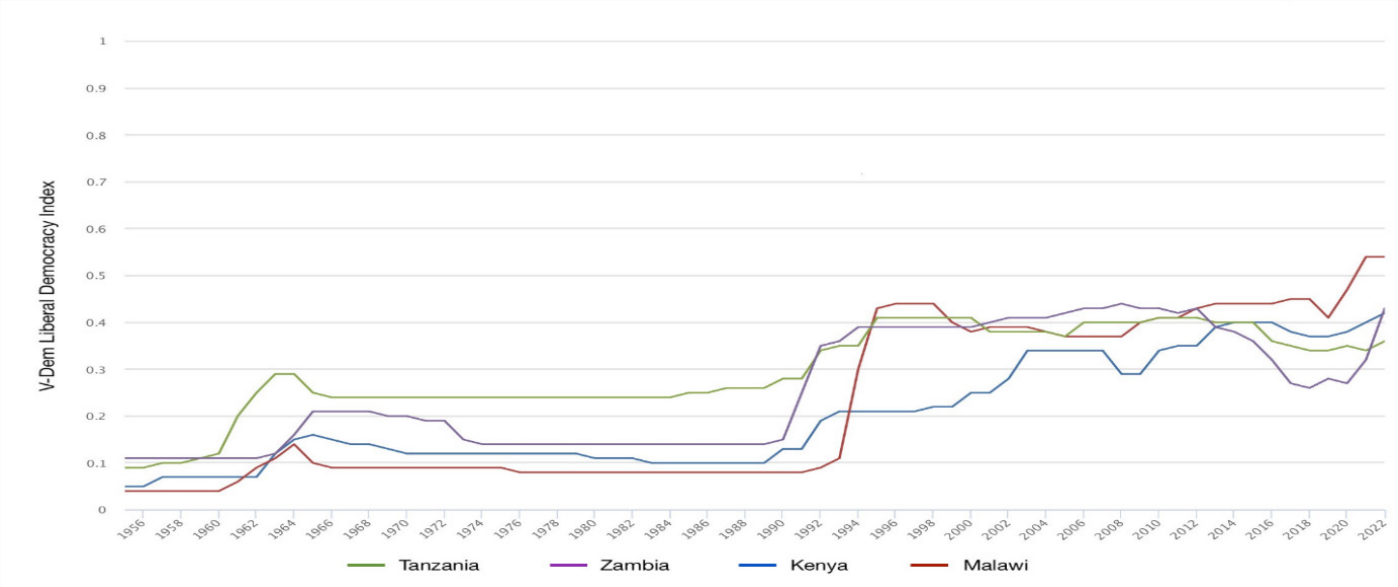
autocratic countries such as Kuwait or China, nor to skyscrapers being built with greater frequency in certain time periods where autocracies proliferate (Gjerlow and Knutsen, 2017:2). The link between regime type and skyscraper construction is influenced by mechanisms of vertical accountability, that create or suppress opportunities for vanity in construction, such as well-informed democratic voters disciplining politicians into not pursuing skyscraper projects (Gjerlow and Knutsen, 2017:4). In (democratic) India construction work began on a 2,300-foot skyscraper in Mumbai, initially known as the 'Park Hyatt Tower,' and later 'India Tower' as it acquired enormous national attention and popularity. In 2015, the project was cancelled by the local government who cited corruption issues (Sethi, 2021:5).

There is good evidence that politicians in SSA like to build non-skyscraper big-infrastructure, whether for reasons of personal vanity or more carefully calculated personal politics, and more limited evidence of the skyscraper-moderating impacts of democracy. In Africa, the home regions of 117 national leaders have significantly more infrastructure than is nationally efficient (Graff 2019). In Kenya, between 1963 and 2011, districts where the majority of people had the same ethnicity as the president received twice as much expenditure on roads—translating to almost five times the length of paved roads built—relative to their share of the overall population (Burgess et al, 2015). During non-democratic interludes in Kenya, districts that shared the ethnicity of the President received three times the average expenditure in roads and over five times the length of paved roads; both these biases disappeared during periods of democracy (Burgess et al. 2015). One study, looking at 38,427 subnational regions across 126 countries, showed that being the home region of a nation's political leader increased local GDP by an average of 1%. Regional favoritism increases in scale the longer said leader is in office, but vanishes after a regime change (Hodler and Raschky, 2014).

In Africa, as in much of the Global South, there was a shift towards democracy in the late 1980s and early 1990s. This was linked to the collapse of the USSR and the associated decline of external Cold War support for authoritarian regimes by the USSR and the USA. However, since the early 1990s, empirical measures of democracy have stagnated or declined across much of SSA. An October 2023, a front-page editorial in the Economist magazine concluded that support for democracy was declining across Africa (Economist, 2023). In many African countries, democracy is "phony" and while the opposition participate in elections, rulers tamper with voter rolls, control the media, and ensure they cannot lose (Economist, 2023). The poll findings demonstrated that the dysfunctional urbanization (contagion, congestion, and crime) associated with SSA (see Section 4) was a key factor behind the decline in democratization. The Democracy Index by V-Dem, based at the University of Gothenburg, Sweden, uses more than 470 indicators across more than 200 countries to measure the evolution of democracy since 1789. The data cover the quality of democracy, inclusivity, participation, and civil liberties, among others. The index ranges from 0 to 1, with 1 being defined as a liberal democracy with "electoral democracy" where "citizens enjoy individual and minority rights, are equal before the law, and the actions of the executive are constrained by the legislature and the courts." (V-Dem, 2023). Using a sample of four countries, Figure 1 shows a steady rise from a low level in Kenya, and recent rise after long stagnation in Malawi, and enduring stagnation in Zambia and Tanzania. The

long-running tendency of SSA leaders to build big-vanity infrastructure combined with the continent-wide weakening of democracy increases the likelihood that SSA leaders will build skyscrapers.

Figure 1: The Evolution of Democracy in Tanzania, Zambia, Kenya, and Malawi, 1956-2022



Source: V-Dem (2023)[1]

1. Thanks to Oliver Baker for compiling figure one from the data.

4. Can Skyscrapers Promote Good Urban Density in Africa?

More than 50% of global income is produced on 3% of the global land mass in cities. Rather than being concerned about geographical inequalities, there is widespread agreement among economists and urban planners that even higher densities would have economic and social benefits (Ahlfeldt and Pietrostefani, 2019:2). The global population have long voted with their feet in support of this contention and continue to migrate to cities (Duranton, 2014:50). This paper opened with data showing how the urban population of SSA is forecast to triple between 2018 and 2050, which implies that migrants are voting in favor of cities and access to economic opportunity, despite dysfunctional urbanization, rather than the rural or small-town alternatives. This section explores the meaning, experience, and benefits of density, then discusses the question of whether skyscrapers can promote good density in SSA.

4.1 Measuring the Benefits from Density

There is clear empirical evidence that wages being paid for otherwise identical jobs are higher in cities. Those higher urban wages may be evidence that workers benefit from the productivity gains of urban density or that better workers and more productive firms re-locate to urban areas (Puga, 2010). Higher productivity (measured using firm-level output data) for firms based in cities may be evidence of the benefits of urbanization or of the benefits of the locational attribute of cities, such as access to a harbor or a mine (Glaeser and Xiong, 2017) or that cities offer a more competitive market so that only the most productive firms are able to survive (Puga, 2010:207). One method to measure

the impact of density is to examine the impact of a statistical measure of density on wages while accounting for these other factors. Such statistical efforts show that as population density per square kilometer doubles, wages increase by about 5% in the US, 7.5% in India (Glaeser and Xiong, 2017:9) and 6% in China (Glaeser and Xiong, 2017:14). Similar tests on firm productivity show that as population density doubles, firm productivity increases by between 2% and 10% (Duranton, 2014:42).

A wide-ranging review of 347 estimates of the effects of density from 180 studies found that there are "sizeable benefits and costs of density," (Ahlfeldt and Pietrostefani, 2019:4). An increase in density "is associated with higher wages, patent activity, consumption variety value, preservation of green spaces, lower case use, as well as lower average vehicle mileage, energy consumption, crime, and costs of providing local public services. Density, however is also associated with higher rents, construction costs, pollution concentration, skill wage gaps, mortality risk, as well as lower average traffic speed, and self-reported well-being" and in general, an increase in density has larger effects in developing than developed countries (Ahlfeldt and Pietrostefani, 2019:4).

As the introduction to this paper noted, the link between urbanization and economic growth is not automatic. Since the 1970s, urbanization has failed to boost per capita incomes in Sub-Saharan Africa (SSA) (Gollin et al, 2016). Instead, SSA cities are experiencing the downsides of density–crime, contagion, and congestion–that undermine prospective economic and social benefits.

First, crime has the capacity to yield direct welfare losses, but also to negatively impact investment activity, tourism, and urban street life. The evidence linking density to crime is not clear. Some argue that crime should be lower in low-density, single-use environments with restricted access and easier visibility of strangers. Some scholars have not found a relationship between crime and density, and others found the opposite effect (Boyko and Cooper, 2011:22).

Second, crowding increases exposure to communicable diseases (contagion). Inadequate drainage increases the risk of malaria and lack of access to clean water is a leading cause of diarrhea, which is responsible for an estimated 21% of deaths among children under five in developing countries or 2.5 million deaths per year (Lall et al, 2017:43). An estimated 10% of the global disease burden would be prevented by improvements to water, sanitation, and hygiene, and better water resource management worldwide (Glaeser and Sims, 2015). With the population of many cities in SSA growing at 4% per year, many SSA governments are unable to provide extensions of infrastructure and public services (Lall et al, 2017:32).

Third, crowding can be characterized by the growth of informal housing (*housing congestion*), known variously as 'favelas,' 'shanty towns,' or 'slums.' One billion people currently live in slums, which are generally poorly served by public services such as sanitation, schooling, and electricity (Hirschl, 2020; Berrisford and McAuslan, 2017:7). On average 60% of Africa's urban population is packed into slums (Lall et al, 2017:38). Without proper management, traffic problems can easily get worse as incomes rise and a greater fraction of the population is able to afford motor vehicles (*traffic congestion*). Transportation infrastructure normally begins with a street plan, and the setting aside of some space as public

thoroughfares[2]. A key planning function of government is to enforce a separation between construction of buildings and public streets, but this is beyond the enforcement capacity of many developing country governments. Even so, there may be trade-offs. For example, the US highway program after 1945 reduced housing congestion by allowing people to move from the central city to the suburbs, but also increased traffic congestion as those same people then commuted back to the center by car for work (Baum-Snow, 2007).

There is clear evidence of the economic benefits of density but also evidence of the downsides that emerge when density becomes crowding. Can skyscrapers help SSA leverage the benefits of good density?

4.2 Markets for labor, inputs, and outputs

Poor SSA countries should, in theory, have access to an abundance of cheap labor and cheap labor should subsequently attract investment in labor-intensive manufacturing. In reality, labor in SSA is expensive. A study using the World Bank Enterprise Surveys to compare labor costs and productivity across 5,467 firms and 25 countries found that industrial labor costs are far higher in SSA than one might expect, given low levels of GDP per capita. Annual labor cost estimates (2013) were relatively high: Bangladesh, $835.31; Kenya, $2,118.01; Tanzania, $1,776.65; Senegal, $1,561.64; and Ethiopia, $909.28 (Gelb et al, 2017:10). Unit labor costs are three-times higher in Djiboutiville, Djibouti, than in Mumbai, India and 20% higher in Dar Es Salaam, Tanzania than in Dhaka, Bangladesh (Lall et al, 2017:25). Firms pay high wages because the cost of living in SSA cities are high. Data from the Economist Intelligence Unit (EIU) shows that in 2015, after controlling for income levels, SSA cities are about 30% more expensive than comparable cities elsewhere (Lall et al, 2017:91).

These high costs of SSA cities are closely related to the disconnected and fragmented form of SSA cities. The size and efficiency of a labor market depends on how short, cheap, and comfortable the commute is. For a worker, the number of jobs that can be reached within a travel time of less than one hour defines the size of their labor market. “Mobility” is the ability to reach any area of a city in as short a travel time as possible. “Affordability” is the ability of households and firms to locate in whichever area they think will maximize their welfare (Bertaud, 2014).

In terms of mobility, in SSA, the largest and fastest growing cities, such as Lagos, Kinshasa, Nairobi, Accra, and Dar Es Salaam, experience gridlock despite their relatively low levels of car ownership. Congestion impedes human and economic interactions, adds to business costs and erodes agglomeration benefits (Turok, 2016:37). Outside the central business district, SSA cities are disconnected and buildings are scattered in small neighborhoods without adequate connective roads or other transport. As noted in the introduction to this paper, , this is, in part, due to the fact that SSA has urbanized at much lower levels of income than did other parts of the world, constraining funds available for infrastructure financing. This makes commuting slow and costly, denying workers access to jobs throughout the entire city (Lall et al, 2017:19).

2. The Africa Urban Lab (AUL) has a research cluster ‘Urban Expansion and the Periphery’ focused on this topic, see www.aul.city/research

Fragmentation means that population density varies widely, with areas of dense population scattered, instead of clustered in a way that can promote scale economies (Lall et al, 2017:19). In 2013, a resident of London could reach 54% of all jobs in Greater London within 45 minutes of the city center using the public transit network. By comparison, in Nairobi ,matatu (minibus) users had access to less than 6% of all jobs within 45 minutes (Lall et al, 2017:81). SSA cities are fragmented and poor transport mobility means they are disconnected.

These challenges are compounded by unaffordability. A study in the mid-2000s found that the cost of travel by informal minibuses was high relative to household budgets in major SSA cities, rendering it largely unaffordable on a daily basis, especially for the poorest households. In eight out of eleven cities studied, *the average* household could not afford one round-trip a day using the mini-bus network. For the poorest quintile, the cost was 53% of the daily budget in Dar Es Salaam and more than 100% in Lagos (Lall et al, 2017:77). Consequently, 30-45% of trips are made by walking in Nairobi, Lagos, and Addis Ababa and nearly 70% in Dar Es Salaam. This implies that these cities are actually operating as a series of urban villages with extremely local labor markets (Avner and Lall, 2016:9; Lall et al, 2017:77). Fragmented cities and expensive transport also increase the cost of consumption goods. Food is about 35% more expensive in SSA than other cities of the Global South. Data from international price comparisons show that relative to their income levels, urban residents pay 55% more for housing in SSA than they do in other regions (Lall et al, 2017:88). The high costs of housing mean that many residents must make a choice between cheap housing often on the periphery with little access to jobs or more expensive centrally located (often slum) accommodation located close to jobs.

In Nairobi, slum residents often have better jobs and higher levels of education relative to those living in formal housing (Lall et al, 2017).

Skyscrapers can help bring suppliers closer to their customers, leading to a reduction in transportation costs. This effect works more strongly for the service sector than for manufacturing. The rise of the skyscrapers paralleled the rise of the corporate office. Skyscrapers were required in the late nineteenth century by the growing mass of white-collar professionals to undertake the bureaucratic procedures of the newly emerging modern corporation (Parker, 2015:227). There are parallels here with the contemporary rapid growth of the African urban middle and professional classes (Nathan, 2019). The skyscraper became the critical administrative hub of the new economy emanating from the US, where “decisions are made and transmitted throughout the capitalist system and where traders communicate and exchange information and goods, interconnecting with the telecommunications network,” (Thornton, 2012:60). At the end of the nineteenth century, 80% of Chicago’s jobs were found within four miles of State and Madison Streets (Lall et al, 2017:14), skyscrapers and high-rise tenements were built to house workers close by. Over time, the historical advantages of cities from reducing transport costs for manufactured goods became less important, but cities have retained the function of matching both employers and employees and buyers and sellers (Puga, 2010:214). A 1.3 million square foot mixed-use skyscraper with a floor-area ratio (FAR) of 15 will cover 60% of a typical New York city block. A suburban strip mall with equivalent office, retail, and residential areas with one-quarter-acre (0.1 hectare) building lots, and open parking will require 21 city blocks. The World Trade Center contained 430 companies and 50,000 people (Asher,

2013:33). Building upwards can help concentrate employer and employees closer together in clusters, while density can improve access through better mobility and affordability.

4.3 Transport on Free Land

Skyscrapers may help bring firms and workers together and improve the mobility and affordability of the city as a labor market, but why build skyscrapers? Why not follow the US suburban model and build roads so people can live at greater distance (in low-rise housing) and commute quickly at low cost? There are constraints to building affordable housing in the city center – the rising demand for land, office and housing space over time is likely to increase real estate prices. This means that regardless of skyscraper construction, better urban transport to improve the mobility and affordability of commuting will be part of any solution to dysfunctional urbanization in Africa.

It is true that African cities have a lot of scope to increase population density outside their city centers. Average population densities in African cities are approximately 21,000 people per square mile, which is comparable to densities of cities in East Asia and the Pacific (19,223 people per square mile) and Latin America and the Caribbean (18,190 people per square mile) (Freire et al, 2013:6). The distribution of this density is unusual. In most SSA cities, population and economic densities are high near the city center and one kilometer away from the city center, but average density falls more rapidly than in cities elsewhere (Lall et al, 2017:41).

The governments of post-1994 South Africa and post-1991 Ethiopia have been more successful at building new residential blocks for urban slum dwellers outside the city center. In South Africa, the government aspired to building a new, fully-serviced house for everyone occupying slum housing. The government have committed $30 billion to mass housing since 1994 (Visagie and Turok, 2020). Roughly three million new housing units have been constructed, which now house about 20% of the country's citizens (Turok and Borel-Saladin, 2018:775). In Ethiopia, the government has planned and built more than 200,000 apartments in four to six story blocks. The construction is outsourced to private firms and the government builds the connective infrastructure, such as roads, sewage, and water. Ownership is transferred to households via a lottery. Most of the housing is built on the city periphery where land and local wages are cheaper, helping to reduce program costs. This has allowed the program to be self-financed without any assistance from foreign donors (Dercon et al, 2019:22).

In South Africa, the periphery's housing program has neglected the need for flexible, low-cost (rental) accommodation for mobile households seeking to escape rural poverty and access urban labor markets (Turok and Borel-Saladin, 2018:775). In Ethiopia, research shows that the beneficiaries see dramatic improvements in their housing quality as well as a much greater willingness to invest in their properties (Dercon et al, 2019:22). However, some never take up residence because transport investment has not matched that in housing and the apartments are too far away from city jobs. Instead, they prefer to rent out the accommodation (Dercon et al, 2019:22). A peripheral housing policy needs to be combined with transport investment, such as road access and affordable minibuses or

railways, to ensure the newly relocated people can continue to access jobs elsewhere in the city. Latin America invested heavily in Bus Rapid Transport (BRT) systems in the early 2000s and inspired many African cities to emulate them to improve the ability to commute; including Lagos (2008), Johannesburg (2009), Cape Town (2011), and Dar Es Salaam (2016) (Lall et al, 2017:144).

However, even a focus on urban transport needs to be accompanied by a policy of building upwards – to make space for those new roads and bus lanes. Existing slums in African cities allocate a bare minimum amount of land for access lanes and walkways to connect new settlements to the existing city (Turok, 2016:37). While Kigali, Rwanda and Nairobi, Kenya have good road access in the city center, roads quickly disappear outside the center (Lall et al, 2017:71). Various African countries are making a significant effort to increase road density within cities. Between 2003 and 2013, road area increased by 400% in Addis Ababa, 100% in Dar Es Salaam, 300% in Kigali, and 54% in Nairobi (Lall et al, 2017:149). Making the city center more accessible to the rest of the city will widen the functional city labor market and make it more desirable to locate business and retail in the city center, increasing further the demand for floor space. The urban road building strategy noted above was associated with an increase in both population density and economic activity (Lall et al, 2017:149).

In recent years 41 from 54 countries in Africa have also announced large affordable housing construction programs, often led by state-owned agencies. The scale of need in most cities is formidable (and much greater than 1990s South Africa or Ethiopia) considering levels of poverty, the scale of projected population growth, limited state resources, and required transport investment (Visagie and Turok, 2020). The result is likely to be a re-emergence of poverty as the inhabitants of peripheral housing cannot access jobs and their urban environment decays into a poverty-sink, leading to a gradual reversion to the previous status quo as households move back to slums nearer the city center to access employment opportunities.

4.4 Housing Density

Another question is the assumption that skyscrapers are synonymous with density. It may seem obvious and it is true in many examples. Manhattan and Mumbai both have similar density, around 60,000 people per km^2, but midtown Manhattan (average household income $137,130) has about 8 times more floor space per person than Dharavi (average household income $812) (Lall et al, 2021:6). This is because Manhattan builds upwards, housing more people spaciously on a given volume of land. Kinshasa, Mumbai, and Karachi are four to five times more densely populated that Shanghai, Tokyo, or London (Lall et al, 2021b:14). In Abidjan, Cote D'Ivoire, 50% of residents live three people to a room (Lall et al, 2017:38). The data shows that density as measured by housing space declines rapidly between low and middle incomes and then stabilizes as cities reach $20,000 per capita (Lall et al, 2021b:19).

Intuitively, building upwards should be a means to increase average per capita floor space, and this was the result of skyscraper construction in New York compared to low-rise Mumbai. This is not just a product of rising disposable incomes. In Singapore, skyscrapers are built to house low-income residents. However, in other instances, new skyscrapers make little impact on increasing average housing space. New

skyscrapers often focus on hotels, restaurants, leisure attractions, viewing platforms and expensive super-luxury apartments. In 2000, only five of the world's 20 tallest skyscrapers were mixed use; by 2020, only five won't be (Graham, 2016:763). It is also the case that a growing portion of the height of super-tall skyscrapers is so narrow that it is actually 'vanity height,' little wider than the lift shafts and therefore completely unlettable. For example, 85 floors of Jeddah's 1 km Kingdom Tower are too narrow to be lettable in any way (Graham, 2016:762).

Additionally, increasing housing space is not just about supply. The 18-story FINDECO House (1979) in Lusaka (Zambia) and the 25-story Hotel Ivoire in Abidjan (1963) (Cote D'Ivoire) were both seen as white-elephants as they ran at low rates of occupancy for decades (Denison and Beech, 2019). Urban planners should also focus on increasing the demand for more housing space by planning to maximize the potential for economic productivity: "The best-laid urban plans, the most thoughtful zoning and height regulations, even costly investments in mass transit: none of these will create livable, sustainable densities without well-functioning markets, economic growth, and increasing demand for floor space near the urban core. To this extent, economy is destiny," (Lall et al, 2021:8).

Urban densities are often higher in densely built streets than in cities dotted with clusters of huge towers. Paris is the densest city in Europe, with 54,415 persons per square mile and is structured around a medium-high skyline of six to eight story buildings, set compactly together at a walkable scale, with small shops and a vibrant street life (Gallagher, 2021:xxi). The population density in Paris's 13th arrondissement, for example—a neighborhood of nineteenth century ix- or seven-story apartment buildings—is significantly higher than that in Les Olympiades, a nearby district made up of recently constructed 100-meter towers (Graham, 2016:762). Jane Jacobs, in her classic 1961 book, *The Death and Life of Great American Cities*, argued that dense, mixed-use neighborhoods with medium-rise buildings were the best for fostering local economic opportunity, social interactions, and personal well-being (Barr and Johnson, 2020:348). Building tall is not a matter of "creating a distinctive skyline with notable skyscrapers. Much more than a vanity project, enabling the construction of taller buildings – say, five to ten stories high – is a matter of livability," (Lall et al, 2021:i).

4.5 Learning and ideas

Many city centers in the United States that suffered from the migration of their population to the suburbs in the 1970s and 1980s have witnessed a major return to their centers in recent decades. In the 2000s, New York City witnessed its greatest period of skyscraper construction. In Pittsburgh, despite the loss of traditional manufacturing to the suburbs and sunbelt cities, there was a building boom in the city center to accommodate new service-oriented activities (Plotnicov, 2008:38). New products, such as computers, electronic components, and medical equipment, and high-fashion textiles, upper-end publishing and business services were locating in those large metro areas that offered a diversified skill base (Henderson et al, 1995; Puga, 2010).

Many skyscrapers became centers for specialized business services, such as producer, commercial, or corporate services, financial markets, and the production and consumption of financial innovations. These activities require the agglomeration of lawyers, accountants, bankers, financiers, consultants, and other specialist corporate service workers (Smith, 2021:6). An accounting firm can service clients online, but its services require the input of other specialists, such as lawyers and programmers (Smith, 2021:6). Confidentiality requires face-to-face meetings, as telephone or online conversations can be overheard and even recorded surreptitiously. That is why many meetings take place informally in a neutral setting, like a restaurant or coffee shop (Plotnoicov, 2021:42). Firms may collaborate, compete, share ideas and learn from each other, which encourages innovation and boosts productivity (Turok, 2016). In New York, for example, there were 1,000 different advertising agencies in the southern half of Manhattan in the mid-2000s. One study found that productivity benefits existed for firms that were located within 750 meters of each other (Arzaghi and Henderson, 2008:1035). More mature manufacturing that requires purpose-built factories, such as primary metals, machinery, electrical machinery, transport equipment, and instruments tended to relocate to smaller, more specialized urban areas, with lower wages and land costs (Puga, 2010). The fact that skyscraper-friendly service output is increasing its share of national output at lower levels of GDP per capita than in the historical past has contributed to the spread of skyscraper construction to the Global South (Dasgupta and Singh, 2006). This was highlighted as a puzzle in section 3.1., why is SSA not building skyscrapers.

Workers migrate to big cities because interactions with experienced workers help them acquire skills, become more productive, and earn more (Turok, 2016). Workers may be more productive when face-to-face contact is important and skyscrapers facilitate knowledge spillovers between workers. Within-building interactions are more likely than between-building interactions, because water coolers, photocopy machines, restaurants, coffee shops, and gym facilities are shared among workers of the same building (Koster et al, 2014:124).

By allowing higher density of residential accommodation, the construction of skyscrapers can promote a parallel investment in retail and leisure, activities that bring people together and so facilitate positive agglomeration effects. The completion of the Rockefeller Center in New York in 1939 was marked by significant investment in public spaces, including the Radio City Music Hall, and 200 shops and services (Dupre, 1996:43). The construction of the Docklands high rise accommodation and offices in London during the 1980s was accompanied by the landscaping of 17 acres, and the construction of shops, a marina, a light railway, and the extension of the London underground railway (Dupre, 1996:107). A story of the 1986 construction of the Worldwide Plaza in New York showed how the local government made the granting of permission to build ten stories conditional on improvements to the nearby subway and to build a plaza around the building. In order to attract professional firms as tenants, the developer bought out an adjacent sex cinema and repurposed it as something more fitting (Sabbagh, 1989:39).

Those public portions of mixed-use

skyscrapers, where people interact and socialize, can combine the best of indoors and outdoors (Ascher, 2013). Such communal gathering places fill some of the criteria for the diverse, lively, and 24-hour mixed use neighborhoods praised by Jane Jacobs (Jacobs, 2011). A problem here, and distinction with Jacobs, is that the residents and workers in a skyscraper are likely to be relatively homogenous in terms of economic status. We may view this as good in terms of the economics of the knowledge economy, arguing that it is by bringing together the most educated and skilled that service-oriented cities boost productivity and innovation. Evidence shows that a doubling in the urban population share of adults with a college degree leads to a 1% increase in earnings in the US, 2% in India, 4.7% in Brazil, and 5.2% in China (Glaeser and Xiong, 2017:21). However, this may also have wider social costs. Drawing from a related literature on gated communities suggests that everyday exposure to difference has been argued to be a key aspect of socialization (Atkinson and Flint, 2004). Public spaces can be centers of integration where individuals of widely divergent social factors—such as age, race, ethnicity, and income—work, live, and create in close proximity. The public space contributes to cosmopolitanism and liberalism by fostering unplanned social interactions between individuals who would not otherwise associate with one another (Vesselinov et al, 2007).

There can be no presumption that density and interaction is good for learning and productivity. The experience of density and so the implications for economic and social outcomes is influenced by choice. Some people enjoy the experience of anonymity, chaos, the unexpected, strangers, and vitality of a large and crowded city. An example would be the flaneur, “that aimless stroller who loses himself in the crowd, who has no destination and goes wherever caprice or curiosity directs his or her steps,” (White, 2001:16). For another person, unwanted interactions with strangers rather than family may lead to a subjective feeling of loss of control and privacy, of anxiety and of being crowded for any given level of density (Boyko and Cooper, 2011:17). Either a strong community spirit or having a private outdoor garden can help alleviate those feelings of being crowded (Boyko and Cooper, 2011:19). Noise, heat, cars, and the number of street signs, lights, and pollution will increase the stress associated with a given level of density (Churchman, 1999:392).

5. Policy Issues: The Debate

This paper has shown that SSA has not shared in the global skyscraper boom which is a puzzle given the evolution of the key drivers of skyscraper construction in SSA, including economic growth, population growth, globalization, and skyscrapers as a vanity project. This paper then showed that skyscrapers could promote good density and so better urbanization in Africa. This section draws together the discussion in the paper into some general ideas for policy in the context of SSA, focusing on property rights, access to land, and slums and affordable housing.

5.1 Better Protecting Property Rights

There are three components to functioning land markets: “Effective use of urban land requires rights that are secure, marketable, and legally enforceable,” (Collier et al, 2018:2). In many SSA cities, tenure security comes from private actions (such as hiring private security firms) rather than the formal legal system (Collier et al, 2018:2). In SSA, the rules and protection of tenure is often conducted by landlords, chiefs, bureaucrats, and gangs (Lall et al, 2021:122). These negotiated property rights are not secure.
In Nairobi, unclear property rights in the Kibera slum area allowed well-connected bureaucrats to claim ownership over much of this land (Collier et al, 2018:2). Formal property registration in Africa takes, on average, almost 60 days and costs 9% of the property value. For example, registration can take almost 300 days in Togo and can cost more than 20% of the property value in Republic of Congo (Lall et al, 2017).

As a result of these burdens, most land in SSA is not formally registered (Lall et al, 2021:121). Across SSA, the absence of formal records of ownership and previous sales means that it is difficult to buy and sell land. A functioning land market is needed to ensure that land is transferred, over time, to its most productive uses – from farmland to industrial and residential land and from low-level housing to skyscrapers (Lall et al, 2021:121). Land rights related to security and ownership require legal protection, working through the police and courts. Legal protection in SSA is often undermined by overlapping and contradictory property rights systems based on layers of formal, customary, and informal rights (Dercon et al, 2019:12).

There is a clear steer from economists and donor policy papers, who collectively argue that it is land use policy that "determines whether a city becomes an engine or an obstacle for national economic growth," (Collier et al, 2018:1). Urban leaders should thus "formalize land markets, clarify property rights, and institute effective urban planning," (Lall et al, 2017:32). Accordingly, many SSA countries have announced or are implementing bold land reform plans. Between 2005 and 2012 for example, Rwanda pursued a nationwide program to issue land titles by demarcating plot boundaries in the presence of the whole community and recording plots using satellite and aerial photographs. Eleven million plots of land were formally registered over five years at a cost of only $6 per plot (Collier et al, 2018:3; Dercon et al, 2019:13). Before the implementation of the program, Rwanda was ranked 137th in the world for ease of property registration by the World Bank Doing Business Report but rose to 4th upon completion (Dercon et al, 2019:13). In Tanzania, complex surveying processes inflated titling costs to over $3,000 per land plot, well above average annual per capita income. As a result, many low-income residents chose not to follow this process.

Some countries and cities have developed hybrid regimes to make formal and customary administration more compatible. Zambia passed a new law in 2015 extending planning controls across state and customary land and designating all local authorities as planning authorities. In Nigerian states with largely Muslim populations, representatives of the ruling Emir can subdivide and allocate land with the help of volunteer professionals from the government. A similar pattern is evident in Ghana, where local authority professionals survey the land for the chiefs, who then are then responsible for allocating it (Lall et al, 2021:128). Namibia recognizes traditional leaders as part of the formal land system; they are designated by the national president, and their details are recorded in the government gazette (Lall et al, 2021).

Better protection of property rights may help boost both the supply and demand for skyscrapers.

Supply of skyscrapers will increase as well-protected property rights increases incentives to undertake long-term investment. Skyscrapers, like most big infrastructure projects, require investors to put in huge up-front sunk capital in hope for future economic gain. The Empire State Building in the US, for example, was completed in 1931, but took until the early 1950s to fill with tenants and start generating a profit for its owners. Skyscraper construction, especially by the private sector, requires land markets that offer property that is secure (skyscrapers may exist for a century or more), marketable (land needs to be purchased to build and there is a thriving market in renting or buying space in a skyscraper and even transferring ownership of the whole building), and legally enforceable (tenants need to pay rent and the owners need to be secure in the returns from their investment).

However, in many African cities, land markets are poorly functioning and associated property rights not well-protected. While skyscrapers do economize on the need to acquire land, their durable nature as a very long-term investment accentuates the need for the protection of property rights. The result of dysfunctional land markets is the construction of informal, low-rise shacks (Turok, 2016). Evidence for this can be seen in the Prindex survey across 140 countries. Table One shows that SSA has

high levels of tenure insecurity (defined as believing it very or somewhat likely that one will lose the right to all or part of one's property, against one's will in the next five years) and those with no formal or informal documents asserting their right to live in or use their property.

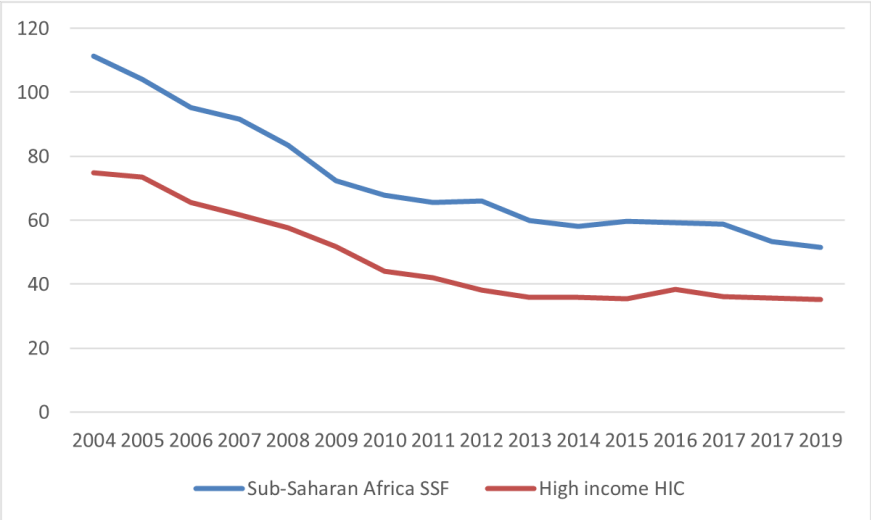
Table One: Tenure Security in nine African countries and in Singapore

Name	Tenure insecurity	No documents
Burkina Faso	44	56
Ethiopia	26	17
Ghana	27	39
Kenya	28	42
Malawi	21	58
Nigeria	23	42
Rwanda	8	17
Tanzania	22	48
Zambia	27	62
Singapore	4	6

Source: Prindex (2024)

Figure Two, however, offers some reasons for optimism. Even though land markets are poorly functioning in SSA, there has been steady improvement, even relative to high-income countries, over the last two decades. Figure Two shows that the time required to register property in days has fallen steadily in SSA

Figure Two: Time required to register property (days)



Source: World Bank (2024)

Demand for skyscrapers will also increase as secure property rights boost firm-level productivity in the city and urban agglomeration. As productivity increases, the morphology of the city evolves. Lall et al. (2021) explain that urban growth starts as a pancake:

> "*Cities with low productivity and income levels generally grow as pancakes – flat and spreading slowly. Low economic demand for land and floor space keeps land prices low and structures close to the ground, especially at the urban edge. Given slow expansion, growth in population density is often accommodated by crowding, starkly visible in the slums of developing country cities,*" (4).

Urban growth evolves from pancakes into pyramids, as horizontal expansion is accompanied by more infill development and vertical layering (Lall et al, 2021:4). The protection of property rights for investors will stimulate investment, firm growth, and output expansion. This will increase the demand for floor space, especially in the central business district, and so drive economic agglomeration and in turn increase the incentive to build upwards. For example, if good property rights induce investment in a textile factory, this will require inputs from marketing, accounting, and input

suppliers (raw cotton, capital equipment, chemicals and dyes). The increased output and employment in related firms will create the necessary conditions for agglomeration externalities. The success of incipient pyramid development in a city, "hinges on its success at nurturing highly productive economic activities that benefit from urban scale and agglomeration potential," (Lall et al, 2021:4). Agglomeration externalities will create the demand – the economic rationale – to build a skyscraper to house all the interactive workers and firms. A city that evolves into a pyramid city will set up a virtuous circle:

> "*Pyramids are generally better than pancakes at meeting three key urban planning objectives: driving prosperity, ensuring livability, and respecting planetary boundaries. Compared with a pancake city, a pyramid city will drive more growth in urban productivity and incomes because it is more economically dense and efficient – its inward and vertical expansion reduces the distance between firms, jobs, and workers*." (Lall et al, 2021b:73).

Policy should focus on enabling investment and productivity growth through stimulating better functioning markets for land. Building upwards should not be the targeted focus of policy. City leaders should never, "*try to force a neighborhood's vertical expansion through legal and regulatory incentives alone – without sufficient market demand for floor space, or without functioning factor markets and adequate private investment – [this] will yield only ghost districts, their tall structures disused or underused*," (Lall et al, 2021b:73).

5.2 Using Empty Land, Acquiring New Land and Building Upwards

Near the city center, the government should focus on building upwards to house middle- and upper-class workers, to enable them to be near the high-wage, high productivity jobs typically located in the city center. In many SSA cities there is ample existing land to accomplish this goal. SSA cities tend to have patches of either undeveloped or under-developed land that could be used to build skyscrapers (Lall et al, 2017:64). In Harare, Zimbabwe, more than 30% of the land within 5km of the city center has not been built upon (Lall et al, 2017:66).

In crowded slums, it is difficult to widen or construct new roads and install infrastructure such as sewage. A process of participatory mapping can assist communities to understand the inadequacies of the current layout and envision a more efficient arrangement. Residents may then be asked to give up small pieces of land in return for a plot elsewhere or a small housing unit in a new development. The model followed in Japan and some other East Asian countries involved participating owners pooling and selling their fragmented land parcels to the government to fund formal property development (Visagie and Turok, 2020). In Japan, 40% of the total annual supply of urban building plots from 1977 to 2000 was secured through land re-adjustment; in South Korea, readjustment contributed 95% of land between 1962 and 1981 (Lall et al, 2021:78).

Once the land in the area had been assembled and public infrastructure installed, households generally benefitted from slightly smaller but better serviced and more valuable plots (Visagie and Turok, 2020). The government can also retain strategic land parcels to sell on to commercial developers to recover the cost of infrastructure investment. This process sometimes takes decades of intensive planning and negotiation to implement. In SSA, the scope for something similar in populous informal settlements is complicated by the vast number of stakeholders, the very small plot sizes in many places, and also issues of trust – will developers eventually return land once a parcel of land is given up? (Visagie and Turok, 2020). The sequencing of tenure rights is an important issue to promote meaningful bargaining with communities over the priorities and process of improvement (Visagie and Turok, 2020). Granting property rights to the mass of small-scale slum owners may hinder the long-term process of transitioning from pancake to pyramid.

Skyscrapers generally require large plots to make the economics work. A developer of a tall building needs to assemble many pieces of land. During this process, owners of one or two strategically located lots may refuse to sell in an effort to derive extra monopoly rents. This is known as the 'holdout problem' (Ahlfeldt and Barr, 2020:40). To avoid this problem, developers typically buy lots in secret. If a block has many small lots with different owners, it may take years or decades even to assemble a sufficiently large parcel for the development of a skyscraper (Ahlfeldt and Barr, 2020:41).

One study constructed a 100m^2 cell-level dataset of the old city area of Tokyo, Japan spanning 150 years data (Yamasaki et al, 2021:10). During the feudal era before 1868, 20% of the land in Tokyo was occupied by the samurai (warrior or daimyo) class. These estates were much larger than the lots in the other areas of the city. After the Meiji Restoration in 1868, the samurai lords were forced by the government to release their estates into the private market. These large lots were persistent in size over time; the presence of samurai estates before 1868 still showed up as larger lots in 2011, demonstrating that lot size persistence did not dissipate even after 150 years.

Before WWII, the presence of these large plots had *negative* effects on land prices; they were too large to be usefully used. This gradually changed over time. The effect on land prices became zero in 1972 and turned positive in 1983. By the 1980s, these large plots facilitated benefits from technological change (such as the emergence of skyscrapers and the transition to the knowledge economy) and lower assembly costs for builders who needed a large land plot. The study found that these larger lots facilitated contemporary urbanization and the samurai areas today have taller and fewer buildings, more floor space, and higher land prices. The larger lots also show up as a positive effect on revenue per worker, which is a proxy for firm-level productivity (Yamasaki et al, 2021:3). The results imply that titling property rights may have unintended consequences for productivity through lot fragmentation in rapidly growing cities when such areas need to be transformed into business zones with high-rise buildings.

5.3 Slums near the city center

Technology-intense, productive, and high value-add firms located in the expensive city center, often in finance, research, marketing, design or IT, generally create well- paid jobs. They require accessible residential accommodation for those workers (see Section 5.2). These firms also require less-skilled, less well-paid jobs, including security, clerks, retail, catering, and cleaning, and the city needs general service occupations needed to function, such as teachers, nurses, and police. One study using a nationally representative sample of 30,000 slum dwellers of working age Surveys in South Africa found that slum workers were low-paid, but much better paid than similar workers in rural areas (Turok and Borel-Saladin, 2018:782). They also achieved high rates of employment: 39% had attained permanent jobs, with 14% in senior managerial, professional, technical, or clerical occupations.

To function successfully, a city needs affordable housing near its expensive well-connected city core. In the cities of SSA, people often live in slums close to the city center, the only accommodation available that is cheap enough and provides accessibility to places of employment. Here the government is best advised to enable slum upgrading to proceed organically alongside rising household incomes. The alternative, based on re-location, may leave the labor force stranded by unaffordable and inaccessible commutes and thus unable to access jobs. However, comprehensive slum improvement programs also risk raising living costs and driving out those same workers (Turok and Borel-Saladin, 2018:772). Over time, rising incomes encourage households, landowners, and property developers to start investing in what were slums. They “renovate and rehabilitate rudimentary dwellings, consolidate fragmented sites, and redevelop single-story structures into multi-story units” (Turok and Borel-Saladin, 2018:772).

6. Conclusion

This paper opened by outlining the empirics of rapid urbanization in SSA. Urbanization in SSA over the last few decades has turned dysfunctional, characterized by crime, congestion, and contagion that together are choking off the potential benefits of urbanization. Since the 1970s, urbanization has failed to boost per capita incomes in Sub-Saharan Africa (SSA) (Gollin et al, 2016). Then, this paper gave a brief history of skyscraper construction, passing from the Biblical Tower of Babel to the iconic skyscrapers of New York and beyond. Skyscraper construction both accelerated and globalized after the 2001 attacks on the Twin Towers in New York, into the twenty-first century. SSA did not share in this construction boom. There are many active efforts to solve the problem of dysfunctional urbanization in SSA, but skyscrapers have not been, nor are planned to be, part of the solution. This paper demonstrated that the absence of skyscrapers in SSA is an empirical puzzle. The key drivers of skyscraper construction – economic growth, population increase and migration, globalization, and vanity-driven competition – should all be pushing SSA into building upwards.

This paper explored the meaning, experience, and benefits of density, and discussed the question of whether skyscrapers can promote good density in SSA. Any policy focus or target to build skyscrapers won't work

> "*While pyramidal development with peaked skylines may be the outcome of strong agglomeration forces and complementary institutions, steepening a city's skyline should not be the focus of policy, nor the key metric by which urban success is judged. Improving living standards and sustainability should be*" (Lall et al, 2021:5).

While skyscrapers can make a city work more efficiently by strengthening markets for labor, inputs, and outputs, by freeing up land to improve the transport system, by increasing housing density, and by facilitating the exchange of learning and ideas. It is always important to remember that every point here has a caveat: freeing up space also requires heavy investment in roads and transport; skyscrapers may not have much impact on housing density if they are full of vanity space; for some, constant interactions with others may create stress and feelings of overcrowding rather than any exchange of ideas.

Nonetheless, skyscrapers can help contribute to transforming crowding in SSA cities to good density. The key to resolving the empirical puzzle of why SSA doesn't build skyscrapers lies in land markets: better functioning land markets would directly increase the supply and indirectly increase the demand for skyscrapers. But an emphasis on improving land markets is not enough. While SSA cities do have a lot of unused land

near the city center that could be used for skyscraper construction, it is still likely the government will need to oversee a slow process of land amalgamation full of market failures (the hold-out problem in particular) and also an organic process of slum upgrading to permit the emergence of affordable housing near the city center.

This paper has focused on general trends, making sweeping comparisons across broadly defined regions. The analysis linking skyscrapers and good density and the resulting policy conclusions need to contextualized for specific cities, or even neighborhoods with those cities. At a more micro level, skyscraper construction can be characterized by more complexity and diversity than suggested by the general conclusions presented in this paper. Within one kilometer of the central business district (CBD) of Chicago and New York, the standard deviation in building heights is about as large as the average height. It is difficult to explain this degree of variation in heights within such a small area (Ahlfeldt and Barr, 2020:39). Density has been treated with all the crudity associated with large-scale averages in this paper. Such averages can conceal enormous city-level variations. For example, in San Francisco, population density in the mid-1990s averaged 183 persons per hectare but ranged from 83 and 1,838 persons per hectare across different neighborhoods (Churchman, 1999:391).

This paper focused on the internal deficiencies of skyscrapers, whether they would offer large amounts of affordable housing or a few luxury apartments and whether they were productive economic assets or merely vanity projects. A more detailed study would need to step outside those skyscrapers and gauge their spillover effects. In 1887, the US journal *Sanitary Engineer* was the first engineering journal to attack high buildings, blaming them for the lack of sunlight at lower levels, the shadows cast on nearby properties, the danger of wind tunnels, and the increased fire hazard (Landau and Condit, 1996). The Equitable Building in New York, at 538 feet, was one such solid mass of building which cast shadows and expelled sunlight from streets. It was completed in 1915, subsequently leading to the 1916 New York Zoning Laws which set restrictions on height (Denison and Beech, 2019). In Paris, height restrictions in place between 1860 and 1960 were suspended by President Pompidou to build the Tour Montparnasse. It became the most hated building in Paris, and after its construction height restrictions were imposed again. In 2008 the ban was again over-turned and four skyscraper projects received building permits (Gallgher, 2007).

This paper has also neglected to focus on the environmental aspects of skyscraper construction. High population density for example can make public transport (rather than private car use) more viable (Boyko and Cooper, 2011:8). Japan's urban population is five times as dense as that of Canada and partly as a consequence of this, Japan consumes 40% less electricity per person (Boyko and Cooper, 2011:24). Green retrofitting of skyscrapers has become a significant activity. The Empire State Building managed to save $410,000 a year by upgrading window insulation (Al-Kodmany, 2014:689).

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