

Cities, Culture, & Technology

Research Cluster Framing Paper
March 2025





The AUL is a research center at the African School of Economics-Zanzibar focused on rapid urbanization across Africa.

OUR WORK

RESEARCH

We conduct frontier research on African urbanization, currently focusing on four research clusters: Urban Expansion & the Periphery; Innovative Urban Governance; Urbanization & Industrialization; and Cities, Culture, & Technology.

TRAINING

We provide short trainings and capacity building programs to the current generation of city officials, urban planners, and municipal leaders.

EDUCATION

We provide longer-term educational programs to the next generation of city builders, planners, and urban leaders.

1. Motivation

Cities are innovation hubs. In fact, “it has almost become a research premise, as opposed to a research question, that cities are the font of economic innovation,” (Shearmur, 2012, p. 9). The economic rationale is fairly well understood: cities agglomerate firms, labor, and consumers; the proximity ensures that firms have easy access to high-skilled labor, necessary capital inputs, and knowledge spillovers, while simultaneously immersing them in a high-pressure environment that demands innovation to maintain competitive advantage in the market. This gives rise to a “spontaneous process, whereby knowledge produces growth and growth attracts knowledge, [establishing] the engine by which urban centers sustain their development through unfolding innovation,” (Bettencourt et al., 2007: p. 1).

However, at its core, innovation is a social process, and thus crucially dependent upon the social and cultural environment. Although there is a robust literature on the relationship between culture and economic growth in many social science disciplines, the subject has recently gained renewed attention, especially in economics, due to the emergence of new methods and data sources. For example, Mokyr (1999) uses historical analysis to demonstrate that both the physical and the social environment of particular times and places have been conducive to immense technological progress. He argues that “a culture of growth” enabled Europe to develop and disseminate the technological breakthroughs that contributed to the Industrial Revolution (Mokyr, 2016).

Other major recent contributions emphasize the importance of the “systems approach” to exploring how culture and institutions co-evolve to direct progress (Acemoglu & Robinson, 2021; Ang, 2023). Acemoglu and Robinson (2021) propose a theory in which culture is fluid, yet “inseparable from a broader social equilibrium and closely interacting with political and economic power,” (p. 2). This work underscores the idea that while gradual, cumulative advancements in technological capability allow for greater material progress over time, coevolving cultural norms, social structures, and formal governing institutions ultimately define the environment within which innovation takes place.

While these represent significant contributions to the literature on culture and progress, there remains an apparent disconnect between two strands of literature: one which holds that cities are outsized contributors to economic growth and the other which holds that culture is a crucial determinant of technological progress. There is no clear framework for understanding (1) the culturally nuanced social mechanisms that drive innovation, (2) why these mechanisms are particularly concentrated and effective in urban environments, (3) how these mechanisms evolve within cities over time, and (4) how we might intervene to increase the innovativeness of cities.

Insights from cultural evolution offer strong theoretical foundations for such a framework. Muthukrishna and Henrich (2016) argue that innovation is a property of the “collective brain”—ideas spread through individuals connected through various social structures, including families, firms, networks, and institutions, recombining in innovators’ heads to

create new ideas. They argue that the pace of innovation is therefore primarily affected by three social dynamics: sociality, or the size and interconnectedness of a population; transmission fidelity, or the accuracy of information transmission between individuals; and variance, or the diversity of knowledge and skills within a population. Muthukrishna et al. (2021) build on this argument by arguing that these three levers of innovation increase, but can also harm innovation if the challenges they create around coordination, conformity, and communication are not resolved, with variance or diversity as a particularly difficult challenge.

Cultural attributes within groups and the cultural distance between groups impact each of these three dimensions. Acemoglu and Robinson (2021) offer the following definition of cultural attributes:

“...such things as the type of social hierarchy (patriarchy, gerontocracy, meritocracy); the identity of ‘in-groups’; the meaning, definition, and importance of virtue; the social responsibilities; the role of honor and violence in conflict resolution; respect for ancient customs and traditions; the extent of segregation and mixing between different types of people; family structure; certain rituals; religious precepts; regulation of sexual behavior; the role of higher ideals; etc.” (p. 11).

Alternatively, cultural attributes are social norms and values that are widely accepted and consistently shape patterns of behavior within a certain community. Cultural distance refers to the degree of difference between specific groups with distinct, coherent sets of cultural attributes (Muthukrishna et al., 2020). Greater cultural distance, for example, may decrease the likelihood of interaction or mutual legibility between two groups. Together, cultural attributes and distance not only influence patterns of interaction, but also the content of those interactions. In other words, because they affect sociality, transmission fidelity, and variance, cultural attributes and distance fundamentally shape the social process of innovation.

This framework has clear implications for cities. In addition to being centers of economic activity, cities are cultural colliders, where actors from diverse backgrounds converge within uniquely open, impersonal, and rapidly

shifting social networks (Simmel, 1903). Historically, cities have broken down atavistic, narrow, in-group prejudices, instead encouraging more tolerance of non-kin others (Xu, 2021). As individuals widen their moral circle beyond kinship affiliations, they often become less beholden to ancestral ties, authority, and conformity – key ingredients to innovation. In this way, cities themselves are a cultural evolution that allow for “ever-growing levels of cultural complexity” by increasing levels of sociality, transmission fidelity, and variance to “more effectively [incubate and] share the fruits of rare innovation,” (Muthukrishna et al., 2018: p. 31-32).

Besides the economic and infrastructural forces that are concentrated in cities, it is also the social and cultural environment that makes cities super-charged innovation incubators. Exploring how urban environments impact the functioning of the “collective brain” can provide valuable insights into why cities are particularly effective at fostering innovation. For one, cities aggregate large populations and collapse cultural distance between groups, increasing sociality. Second, cities increase the potential for cross-cultural social learning and access to formal education, improving transmission fidelity. Third, cities, at their best, integrate diverse groups, while simultaneously allowing for deviance and nurturing niche social microclimates, effectively maintaining diversity.

These insights are especially pertinent for African cities, where rapid urbanization has created both opportunities and challenges for diffusing new technologies and fostering innovation. Many African cities are growing at substantially lower levels of income, compared to historical precedent (Henderson et al., 2017). Some estimates show that as much as 25% of the population in African cities is engaged in urban agriculture, giving rise to a phenomenon that Ken Opalo (2024) calls the “ruralization of cities” or “high density ruralization.” This suggests that African cities may not be functioning as innovation hubs to the same degree as cities in other regions during other times.

Furthermore, the pace of urbanization in Africa is beyond all historical precedent. Over the next three decades, two thirds of global urban population growth will be concentrated in sub-Saharan Africa (UNDP, 2018). By 2050, 70 percent of the world will live in cities and Africa will have added almost one billion new urbanites (OECD, 2020). Although a large proportion of this growth will be driven by within-city population growth, rural to urban migration will still occur on a large scale, as millions seek better economic opportunities, access to services, and improved living conditions (Christiaensen & Lozano-Garcia, 2024).

Interestingly, in the United States, the top 100 metropolitan areas are responsible for generating 92% of registered patents (Rothwell et al., 2013). This demonstrates the enormous creative potential of cities.

In 2009, sub-Saharan Africa (SSA) hit 37% urbanization with an average GDP per capita of US\$992 (Freire et al., 2014: p. 5). By comparison, in 1890, the US reached one-third urbanization with a GDP per capita of nearly \$6,000 and 50% urbanization with a GDP per capita closer to \$10,000 (Glaeser, 2013: p. 10)

As African cities expand, there will be immense changes to the social environment. This will be further heightened by the unique diversity of African cities. Gray (2024) points out that “Nigeria alone contains upwards of 300 ethnic groups and languages. In turn, urbanization in Africa has brought together an array of cultures in large, dense cities like Lagos, Addis Ababa, and Kinshasa,” (p. 4). Effectively integrating new arrivals into the urban social and economic fabric is crucial for bolstering social capital and ensuring that sociality and variance lead to positive outcomes, rather than conflict. Understanding how efficiently, or inefficiently, the “collective brain” is functioning in African cities can help inform efforts to build more productive, creative, and innovative urban centers.

By adopting a complex systems and cultural evolution perspective, the Cities, Culture, and Technology (CCT) research cluster aims to understand how culture influences the social processes that foster the generation, diffusion, and adoption of innovative ideas, products, and practices in urban environments. More specifically, this cluster is interested in the logical chain through which cities foster the cultural changes that give rise to innovation. This cluster is broadly guided by investigation into the three social dynamics that Muthukrishna and Heinrich (2016) argue affect the pace of innovation in the collective brain:

1. Sociality and Urban Networks

2. Transmission Fidelity, Social Learning, and Education

3. Variance, Tolerance, and Migration

2. Research Themes

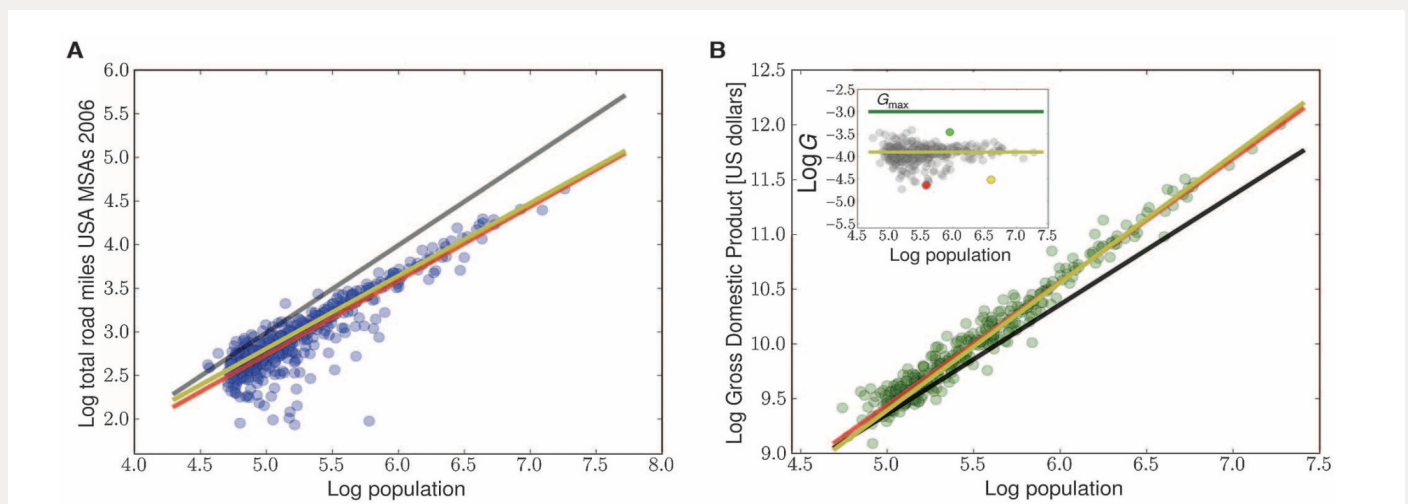
2.1. Sociality and Urban Networks

Sociality refers to the size and interconnectedness of a given population (Muthukrishna & Henrich, 2016). As more people interact more often in various social settings, they expose themselves to a broader range of perspectives, experiences, and expertise, leading to a cross-pollination of ideas and a greater potential for novel solutions to emerge. Cities functionally agglomerate large human populations and concentrate habitation density, thereby facilitating a greater variety and frequency of social interactions, which increases sociality through greater size and interconnectedness.

Size

In fact, evidence suggests that larger cities are generally denser and more efficient, productive, interconnected, and innovative (Bettencourt, 2021). As cities grow in size, they tend to exhibit “power-law scaling relations” on multiple margins: “One generally observes that rates of social quantities (such as wages or new inventions) increase per capita with city size “(super-linear scaling), whereas volume occupied by urban infrastructure per capita (roads, cables, etc) decreases (sub-linear scaling),” (Bettencourt, 2013: p. 1438; see Figure 1).

Figure 1. *Scaling in cities*



Source: Bettencourt (2013). Figure uses data from US metropolitan areas in 2006. Black lines show linear scaling. Red and yellow lines are the best fit to a scaling relation. Infrastructure shows sublinear scaling, while metro-level GDP shows superlinear scaling.

Crucially, larger city size has also been found to increase the frequency of social interactions (Bettencourt, 2013; Schlapfer et al., 2014). For example, using data from Portugal and the UK, Schlapfer et al. (2014) show that contacts and communication both increase with city size. More specifically, they argue that,

“[the] empirically observed network densification under constant clustering substantially facilitates interaction-based spreading processes as cities get bigger, supporting the assumption that increased social connectivity underlies the superlinear scaling of certain socioeconomic quantities with city size,” (p. 2).

In other words, cities with larger populations foster a greater volume of social interactions. This increase in sociality, in turn, hastens the spread of information and ideas, giving rise to greater potential for innovation.

These findings are pertinent to African cities, which are experiencing rapid increases in urban population. By 2100, the largest cities in the world are expected to be located on the continent—megacities whose populations are predicted to exceed any other urban agglomeration in human history. For example, if current trends continue, three African cities are on trajectory to become the largest in the world by 2100: (1) Lagos, Nigeria at an estimated 79.3 million residents; (2) Dar es Salaam, Tanzania at an estimated 62.3 million residents; and (3) Kinshasa, Congo at an estimated 60.3 million residents (Satterthwaite, 2016).

Given the scaling laws observed in cities around the world, African megacities may reasonably be expected to demonstrate similar scaling patterns. However, although empirical evidence is generally lacking due to data constraints, it is not evident that such is the case in African cities to date. Many African cities are experiencing unorganized urban sprawl, undermining infrastructure efficiency and social density (Lall et al., 2021). In this way, the unrealized gains of larger agglomerations may be due to high degrees of physical, social, cultural, and political fragmentation within cities (Bertaud, 2018; Bettencourt, 2013; Gray, 2024). In other words, although the size of the “collective brain” is undoubtedly expanding, it may not be adequately interconnected.

Between 2025-2030, East Africa will lead the world in urban growth, with four out the top five fastest-growing urban populations: Burundi: 5.17%, Niger: 5.11%, Uganda: 5.10%, Malawi: 4.62%, and Tanzania: 4.59% (UNUP, 2018).

Interconnectedness

Interconnectedness determines the frequency and quality of interaction between agents in a given system. Within cities, the magnitude and diversity of social exchange offers both challenges and opportunities for fostering innovation. Simmel (1903) argues that the overstimulation of social life in the metropolis can lead to a detached and intellectualized approach to interaction, allowing for more fast-paced, goal-oriented exchange. The anonymity and transience of urban life can erode social trust, inhibiting the formation of “bonding” social capital, or the deep trust and cohesion typically seen in tightly knit groups (Putnam, 2000).

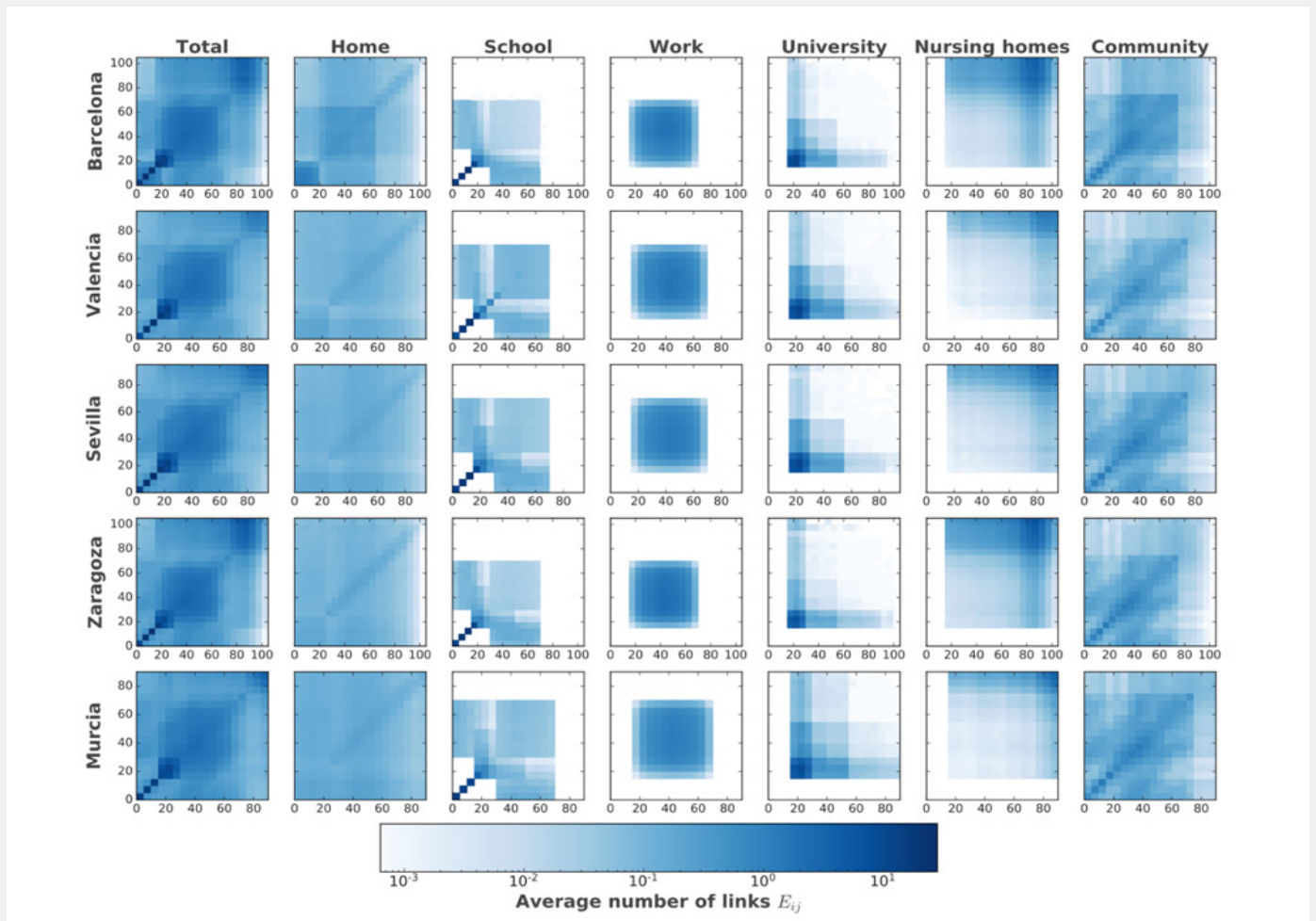
However, at the same time, cities also foster opportunities for the cultivation of greater “bridging” social capital (Putnam, 2000). Urban environments attract diverse populations, often bringing together individuals with contrasting worldviews, attitudes, and risk tolerances. The dense and dynamic social environment within cities can help build higher levels of generalized trust as individuals transcend narrow, tribal affiliations and in-group, kinship ties. This tends to result in the formation of broader moral circles that include fellow urbanites and neighbors regardless of tribe—a phenomenon that Granovetter (1973) refers to as the “strength of weak ties” (p. 1360). In other words, cities can help collapse the cultural distance between diverse groups by bringing them into closer contact through increased proximity.

Formal and informal institutions thus play an important role in balancing these dynamics, facilitating the formation of both types of social capital and helping people navigate complex urban social environments. Interacting agents within cities may be individuals, groups, or firms. Formal interactions occur within structured environments, such as workplaces, academic institutions, and professional networks, where knowledge transfer and innovation are often intentional and goal-driven. Conversely, informal interactions arise spontaneously in shared urban spaces—cafes, parks, public transportation or community events—fostering serendipitous encounters that can spark unexpected ideas and collaborations (Choi et al., 2024; Arzaghi & Henderson, 2008).

In fact, a recent study by Rodriguez et al. (2024) used data from local censuses, school and university records, nursing home files, social security reports, national employment surveys, and firm registrations to create synthetic twins of five cities in Spain to map contacts between individuals.

Cross-country evidence suggests that a 10 percentage point increase in social capital, or trust levels, can boost economic performance by 1.3-1.5% of GDP (Haldane, 2024).

Figure 2. *Sociality in five Spanish cities*



Source: Rodriguez et al., 2024. “Contact matrices in each digital city aggregated (Total) and per layer. Each entry E_{ij} indicates the average number of connections that the individuals of the age represented by row i will have with the individuals in the age group of column j .”

Their analysis reveals that both the volume of interactions a person has and the composition of their social contacts are critically shaped by institutions, such as schools, workplaces, and community organizations (see Figure 2 below). Although their analysis was intended to help inform disease spread, it also has important implications for mapping sociality and idea diffusion. Schools and universities emerge as hubs of dense interaction among peers, while connections at work and in the community are generally more evenly dispersed across age groups.

The types of institutions that help build bridging capital, as well as the stickiness of beliefs and openness to new ideas are all predicated upon cultural attributes and the cultural distance between groups. The interconnectedness of a given urban population, as well as the methods employed to increase interconnectedness, are thus culturally nuanced. For example, the “tightness” or “looseness” of particular cultures as well as whether they are primarily cooperating

on the basis of kin relations, friendships, ethnic groups, institutional trust or more impartially impacts how open individuals may be to engaging with others from culturally distant groups (Muthukrishna & Henrich, 2016; Henrich & Muthukrishna, 2020).

African urbanites come from diverse socio-economic, ethnic, historical, and cultural backgrounds, making African cities among the most diverse in the world. In cultures with strong kinship ties and high in-group loyalty, informal networks may be particularly robust, yet bridging social capital might be more difficult to cultivate due to suspicion of outsiders (Nunn & Wantchekon, 2011). In contrast, groups with more fluid social structures and weaker in-group loyalties may find it easier to forge cross-cultural ties.

Breaking down barriers between such groups is crucial for facilitating collaboration, idea diffusion, and innovation. The marked cultural variability in African cities means that efforts to enhance interconnectedness in cities must recognize the role of trust, social norms, and historical legacies in shaping urban interactions. Within urban environments, efforts to increase “social potential”—such as support for bridging institutions, public spaces, or inclusive governance—must be designed with such cultural dynamics in mind.

Sample Research Question

- **What role does social fragmentation play in deviations from expected scaling patterns? What is the estimated impact on innovation?**
- **What role do informal networks—such as local cooperatives and grassroots organizations—play in shaping knowledge diffusion? How are they influenced by cultural attributes?**
- **Do cultural traits, such as tightness and looseness, endogamous marriage, or scale of trust influence the diffusion of ideas and technologies in cities?**
- **Can cultural differences and interaction patterns be modeled?**
- **Can synthetic models of cities be further developed to simulate cultural dynamics or interventions and measure their impacts on social networks, innovation diffusion, and resilience under different conditions (e.g. Rodriguez et al., 2024)?**

2.2 Transmission Fidelity, Social Learning, & Education

The efficiency and fidelity of cultural transmission mechanisms, such as language, social learning, and formal education, significantly impact the spread and accumulation of knowledge within the collective brain (Muthukrishna & Henrich, 2016). As discussed in Section 2.1, urban centers can help collapse cultural distance and widen circles of generalized trust through increased proximity and exposure to a large number of diverse individuals. Higher rates of sociability can also improve transmission fidelity by creating more opportunities for social and cross-cultural learning. Furthermore, a variety of institutions help facilitate transmission, such as schools, universities, libraries, and museums. These platforms provide formal approaches for transmitting complex skills and ideas while setting norms for social interaction which increase sociality.

Social Learning

Social learning refers to the process through which “new patterns of behavior can be acquired through direct experience or by observing the behavior of others,” (Bandura, 1971, p. 2). Cities create ample opportunities for iterative social learning. As people crowd into urban environments, frequent interactions with one another make it easier for individuals to accumulate new skills, ideas, or ideologies by copying and sharing with others. This has important implications for transmission of technical knowledge, but also cultural knowledge, impacting the efficiency of the collective brain and innovation.

In the economics literature, the relatively rapid transmission of technical know-how within cities is broadly referred to as “human capital spillovers,” (Glaeser, 1997, p. 254). Workers learn from one another through observation, imitation, and collaboration, leading to faster applied skill acquisition. This concept has been widely used to explain how cities generate increasing economies of scale: by facilitating the diffusion of skills, knowledge, and new technologies, particularly within high-skilled industries (Duranton & Puga, 2003). Proximity plays a crucial role in these spillovers, as individuals and firms benefit from face-to-face interactions, labor market pooling, and informal knowledge sharing (Moretti, 2004; Arzaghi & Henderson, 2008).

However, the city also plays an important role in the transmission of cultural values—an underexplored, yet important, dimension of human capital spillovers. Beyond technical expertise, urban environments facilitate the exchange and adaptation of cultural norms, attitudes, and values that shape economic and social outcomes, including innovation. For example, cultural recombination in cities may influence individuals’ work ethic, entrepreneurial attitudes, openness to cooperation, prosocial behavior, and generalized trust (Guiso et al., 2006).

Crucially, cultural transmission often takes place through various social learning strategies, such as conformity, payoff-biased, and prestige-biased social learning—when individuals copy or imitate high-status “elites” (Henrich & Gil-White, 2001; Kendal et al., 2018). In dense, competitive urban environments, exposure to high-achieving individuals in business, academia, government, or the arts can shape aspirations, work ethic, and risk-taking behaviors, contributing to the cultivation of innovation-friendly social norms. Equally, if successful individuals reached their success through rent-seeking, corruption, or illegal activities, these too can be copied and lead to self-sustaining behaviors.

African elites have largely failed to form a coherent, legitimate, and consolidated group (Opalo, 2024). Opalo (2024) argues that one of the key factors underpinning “lack of elite ambition in the region [is]...elites’ failure to establish cultural, material, ideological, and intellectual hegemony over their societies.” Opalo continues by explaining that these legacies are historically produced and that “intra-elite lack of trust inhibits coordination at scale...[so they] rarely make long-term deals founded on ‘open access’ public policy.” Low generalized trust among elites thus becomes a self-reinforcing loop, as the ruling class remains unable to achieve sufficient legitimacy and authority to develop greater state capacity and sustain economic growth.

This also has profound implications for social learning in African cities. In the absence of a cohesive and legitimate elite, there is no clear reference group for social learning or identity, leading to a more fractured diffusion of values and behaviors. Social learning may become more localized, constrained within smaller ethnic, professional, or patronage-based networks, rather than spreading throughout the urban population. In turn, this may further contribute to urban cultural equilibriums that are not especially conducive to innovation. The relationship between cultural fragmentation, elite formation, social learning, and urban development is thus crucial for the long-run growth of African cities.

Formal Learning

High-quality formal education – or high transmission fidelity of basic, technical knowledge – is crucial for technological progress. As Rodrik (2020) argues, “Innovation in the private sector depends crucially on government funding of basic science and research labs. It relies on scientific talent trained in universities supported by public funds.” A well-educated workforce, equipped with fundamental knowledge and skills, forms the foundation for using, diffusing, and advancing new technologies, especially in cities. In addition to imparting technical knowledge, a high-quality education also helps students formulate their own unique perspective and ways of thinking about the world, which contributes to the diversity that drives progress. Government support for educational institutions and basic research is thus essential for fostering innovation.

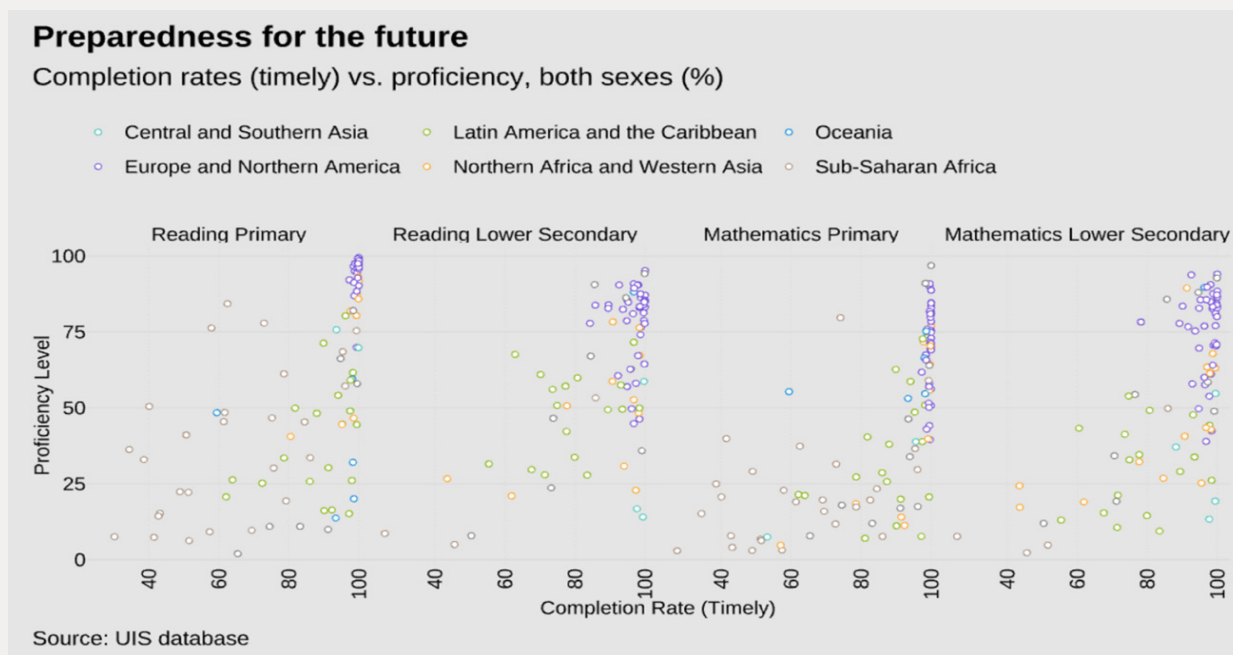
Although urban education is generally better than in rural areas, in many African countries, educational outcomes remain stubbornly low (OECD et al., 2022). Despite increasing participation rates—primary school enrollment now stands at 86% and secondary at 52%—basic testing

Opalo emphasizes that there is a way out of the “low-ambition” trap, but it will require time for elites to consolidate property rights protections for elites, greater policy autonomy, and deliberate efforts to build state capacity (Opalo, 2024).

On average, African nations invest only 0.45% of their GDP in research and development initiatives, far below the global average of 1.7% (Kariuki et al., 2023).

scores have not seen corresponding improvements (AUDA, 2022; UNESCO, 2024). In fact, UNESCO (2024) reports that Sub-Saharan Africa has the lowest rates of preparedness in mathematics and reading at the primary level (see Figure 3; p. 23). In countries such as Tanzania, preparedness rates are actually declining. As Lant Pritchett (2013) argues, for many students, “schooling ain’t learning.” Enrollment cannot drive progress if the quality of education remains stagnant.

Figure 3. *Preparedness for the future*



Source: UNESCO, 2024.

The challenges are multifaceted. First, teacher shortages and low-quality teacher training results in classrooms that struggle to deliver meaningful instruction. Teachers often lack the resources, mentorship, and tools needed to create engaging learning environments that promote understanding rather than rote memorization. Second, inadequate resources for course administration exacerbate the problem. For instance, because materials are mostly prepared in English, many students do not learn in their native tongue, despite evidence which suggests that interventions for mother tongue instruction substantially improve outcomes (Evans & Acosta, 2021). In this way, transmission fidelity is undermined, but so too is the diversity that comes from learning in one’s own language.

New technologies, especially frontier technologies such as artificial intelligence, introduce new possibilities for education and social learning in urban environments. These technologies offer unprecedented opportunities to enhance the efficiency, fidelity, and scalability of technical transmission. For example, AI-powered learning tools can

serve as powerful complements to traditional classroom instruction by providing educational content tailored to individual student needs (DeSimone et al., 2025). Adaptive learning platforms can analyze a student's progress in real-time, offering targeted feedback to improve comprehension and retention. Outside the classroom, frontier technologies can help remove linguistic barriers and open new avenues for collaboration (Juhász et al., 2024). The intersection of cities, education, and these technologies offer an important research direction, especially to avoid the pitfalls that led to past Ed-tech failures, such as One Laptop per Child (West, 2023).

Transmission fidelity in cities is ultimately influenced by a complex array of factors. Dense social networks, elite cohesion, and the accelerated pace of interaction in cities create both opportunities and challenges for cultural transmission and accumulation. While schools and universities also play a crucial role in fostering social learning, systemic challenges in many African cities hinder their effectiveness. Urban environments may also amplify these challenges through overstimulation and social fragmentation, introducing barriers to trust and knowledge exchange. Understanding the mechanisms that enhance and hinder transmission fidelity in urban environments is crucial for designing effective policy and technological solutions that can help improve social learning processes.

Sample Research Question

- **What social, cultural, and structural factors (trust, repetition, etc.) improve social learning and transmission fidelity in informal contexts?**
- **How do elite networks perpetuate or change norms of low interpersonal trust?**
- **How does diversity affect patterns of intra-elite social transmission?**
- **What are the spillover effects and implications for innovation?**
- **What is the university's role in cultural transmission?**
- **If testing scores are low, why are returns to education so high, especially in cities?**
- **What are the social and cultural dimensions of classroom learning?**
- **How can AI be used to enhance educational outcomes, especially in diverse social and cultural contexts?**

2.3 Variance, Tolerance, and Migration

Cities are perhaps the most diverse places on Earth. They offer access to a wide array of values, perspectives, knowledge, and skills that drive the accumulation and recombination of ideas. Moreover, the anonymity of social life within the city can also liberate individuals from the constraints of tight cultural norms and social expectations (Simmel, 1903). Individuals are free to pursue unorthodox solutions, take risks, and engage in “boundary-pushing” behaviors, allowing creativity and innovation to flourish. Although not all cultures will be equally willing to accept and reward deviation, the relative diversity, flexibility, and tolerance within cities are the key ingredients that allow them to be such outsized contributors to innovation.

These attributes of the urban social environment also help foster entrepreneurship (Schimmelfennig et al., 2021). Generating new ideas is difficult, deviating from norms may be socially unacceptable, and starting a business is personally risky. Cities help lower the barriers to entrepreneurship on all of these margins. For one, they expose potential entrepreneurs to a variety of technologies and ideas which can be recombined or incrementally improved to generate novel products. Second, urban diversity and anonymity increases tolerance for deviation and failure. Third, the close proximity of inputs, labor, and consumers can also help lower startup costs. Fourth, the potential rewards to starting a successful business are also greater in cities, increasing the incentives for entrepreneurs to try something new.

Importantly, entrepreneurs also gain exposure to other entrepreneurs, who can help them navigate the trials and tribulations of starting a new venture. This demonstrates something crucial about urban environments: they naturally foster the emergence of specialized networks. The very diversity that fuels entrepreneurial activity also allows other individuals to engage in self-sorting based on their own needs and interests, giving rise to an ecosystem of social micro-climates—restricted social networks based on professions, hobbies, sub-cultures, or values.

These micro-climates function as incubators for specialized knowledge and niche ideas. For instance, technological subcultures, activist circles, and artistic movements often emerge within these bounded social networks, where unique shared norms accelerate the development of new concepts. The combination and layering of these groups within the city fosters bridging social capital and facilitates idea exchange (Putnam, 2000). However, when these micro-climates remain insular, they may reinforce specialized knowledge, but limit broader diffusion.

Migrant communities offer interesting examples of specialized networks that not only adapt to but also drive urban innovation. Cities have traditionally served as in-migration hotspots due to easy access to jobs and amenities, higher standards of living, and openness to strangers. Some groups establish tightly knit networks that provide individuals support, resources, and a sense of identity, while simultaneously exposing them to the broader urban environment (Wellman & Craven, 1973). The resultant enclaves act as both cultural sanctuaries and springboards for economic and social mobility. Migrant groups contribute to urban innovation by introducing new ideas, practices, and businesses which integrate into the broader urban fabric.

As the final wave of urbanization sweeps across sub-Saharan Africa, effectively integrating new urban residents into rapidly growing cities is crucial to promote social cohesion, political stability, and long-run economic growth. Although rapid urbanization can increasingly be attributed to natural increases in urban population, on average, rural to urban migration still contributes a significant amount of urban growth (Christiaensen & Lozano-Garcia, 2024). Many rural to urban migrants are also “younger, have fewer dependents, and are more educated than urban nonmigrants; these gaps are larger for urban-urban migrants and decline as city size increases,” (ibid, p. 7) (see Figure 4). In other words, new urban arrivals have immense potential to contribute to economic activity and innovation in African cities.

However, integrating migrant communities into the urban fabric, especially in booming African cities, presents substantial challenges socially, economically, and politically. Although Christiaensen & Lozano-Garcia (2024) find evidence that migrants to small towns and cities in African countries are generally able to quickly integrate into local labor markets, migrants to large cities tend to have a more difficult time finding jobs. Instead, because they often lack funds, networks, and access to opportunity, these migrants are forced into informal settlements. As Cartwright et al. (2018) point out, “failure to recognize and integrate new urban residents results in conflict with incumbent interests over land, the formal economy, and finance and government, creating tensions that exacerbate ethnic and social fault lines,” (p. 13).

This points to the central “paradox of diversity”: at the same time social and cultural variance within the city can help foster specialization, unique sub-cultures, and deviant ideas that propel innovation, fragmentation can lead to challenges with both “communication and coordination” between individuals and groups (Schimmelfennig et al., 2021). This can erode mutual trust, inhibit idea exchange, and undermine collective action. These issues may bubble into active conflict when some groups are systematically excluded from economic, political, and social opportunity. Balancing this tension is crucial for any human social system, but it is especially important for the highly diverse populations within cities.

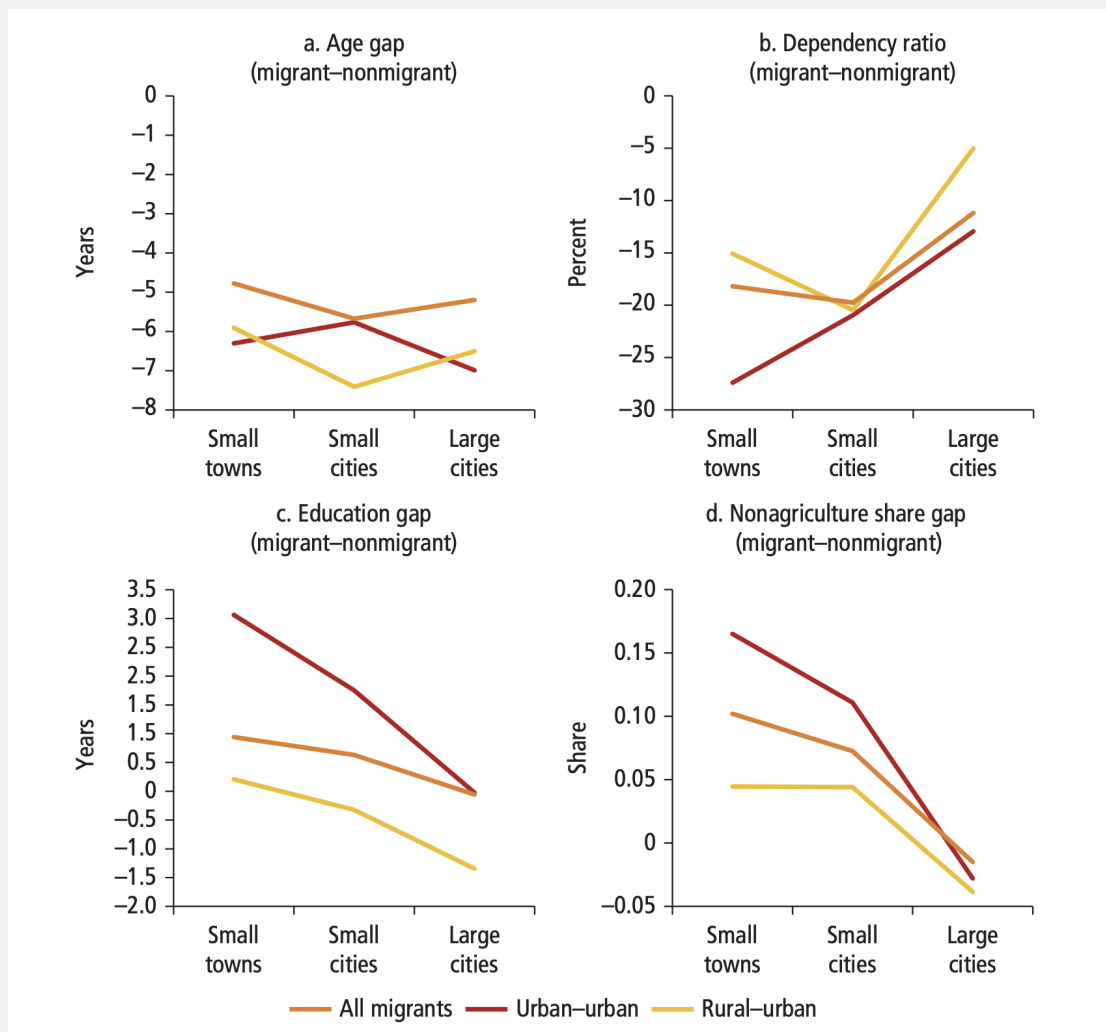
Policymakers have a significant role to play in helping to bridge structural holes within and between specific networks. For example, increasing affordable housing, ensuring equitable access to public services, removing barriers to business and property registration, and public

In African cities with over 1 million residents, migrants make up an average of 39% of the population. In mid-sized cities (100,000 to 1 million people), they account for 31%, while in smaller cities with fewer than 100,000 inhabitants, they represent 25% (Christiaensen & Lozano-Garcia, 2024, p. 7).

The Cities in Motion Index, which evaluates urban performance across various dimensions including social cohesion, ranks Nairobi 173rd, Douala 177nd, Accra 178th, Kampala 179th, and Lagos 183rd in the world, highlighting the need for improvement in fostering cohesive urban environments (Berrone & Ricart, 2024).

schooling can help reduce the risks of exclusion. Crucially, periods of economic growth can help reduce “resource competition and zero-sum perceptions” between groups within the city (Schimmelfennig et al., 2021). Policymakers can also purposefully foster environments where diverse groups interact by creating shared public spaces, actively supporting emergent civil society organizations, or forging

Figure 4. Characteristics of urban migrants in African countries



Source: Christiaensen & Lozano-Garcia, 2024.

These interventions can help catalyze the formation of bridging social capital while also preserving bonding capital, simultaneously addressing inequalities that drive social conflict and increasing the benefits of urban diversity. The policies, approaches, and institutions capable of achieving such a worthwhile goal will inevitably look different from city to city and country to country. Residents’ needs, available resources, and local constraints will also change at various levels of economic activity. As African cities grow at unprecedented rates, resolving the paradox of diversity will be crucial to achieving productive urbanization and building thriving cities.

Efforts to build social capital and reduce inequalities can also hasten the process of “cultural evolvability”, the capacity of groups to change their norms and values over time to adopt more effective strategies (Schimmelfennig et al., 2021). As groups move in and out of the city, policies gain and lose influence, or macro-level conditions change, cities must evolve to maintain vibrancy and generate fresh innovations. Firms, social networks, and cultural norms may be more or less well-suited to accommodate changes to the urban environment, but diversity allows actors to adopt new strategies, and is thus key for enabling adaptation.

It is this “balance between diversity and selection, exploring and exploiting, sampling and specializing, convergent and divergent thinking” which allows for cultural evolvability and urban resilience (Schimmelfennig et al., 2021: p. 5). Urban areas agglomerate diverse individuals, facilitate social learning, build bridging capital, and adapt to changing conditions. The miracle of the city lies in its ability to strike a difficult balance between stability and flexibility: it is capable of hosting millions of diverse individuals while maintaining a social environment that simultaneously connects and protects unique cultures, which are fodder for recombination and innovation. The city’s enduring capacity to evolve is the foundation for the continuous innovation that propels humanity forward.

Sample Research Question

- **What are the cultural and psychological dimensions of migration networks?**
- **How do they evolve? How resilient are they? How tolerant? What types of resources do migration networks provide to new urban arrivals, beyond access to jobs?**
- **How does the exclusion of certain groups from economic and social opportunities exacerbate conflict in the city (Kasara, 2017)?**
- **What are the spatial dimensions of ethnic, socio-economic, or religious fragmentation?**
- **How do urban governments mediate conflict, especially in ethnically diverse, rapidly growing cities?**

3. Conclusion

Cities are the primary incubators of human ingenuity and creativity. Consequently, they are also outsized contributors to innovation, technological change, and long-run economic growth. They provide uniquely dense and dynamic environments where individuals from diverse backgrounds converge, exchange ideas, and collaborate. The core social mechanisms that underpin innovation—sociality, transmission fidelity, and variance—are all heightened in urban settings, shaping the ways in which ideas are created, improved, and recombined.

Yet, these mechanisms do not operate in isolation, rather, they interact and mutually adapt to one another. The interconnectedness of a population, for example, may impact the efficiency of social learning, just as high levels of cultural variance within the population can influence how often different groups interact. Moreover, the unique social, political, and cultural characteristics of cities mediate their effects. Consequently, not all cities, at any given time, may be equally able to realize their full potential as hubs of innovation and economic growth.

In many African cities, rapid urbanization is unfolding at an unprecedented pace, bringing both challenges and opportunities. While expanding urban populations create fertile ground for exchange and recombination, issues such as social fragmentation, infrastructural inefficiencies, inadequate public services, and political constraints can undermine the vitality of cities. Addressing these challenges requires a deep understanding of how formal and informal institutions shape urban life, how trust and social cohesion emerge, and how cities can be governed to enhance the social processes that drive innovation.

The future of cities is the future of human progress. Luis Bettencourt (2021) aptly writes that “cities are [humanity’s] master niche: the primary environments where an open-ended, sustainable future for our kind and for life on earth may be imagined and constructed” (p. 370). Ultimately, understanding the mechanisms and cultural nuances that shape the social processes of innovation can help us design, govern, and empower cities which continue to drive humanity forward.

A Note from the AUL

The Africa Urban Lab endeavors to do more than conduct cutting-edge research on localized innovation within cities. We aim to put these insights into practice, using research to inform our participation in facilitating the emergence of local innovation networks that meaningfully contribute to making cities more efficient, sustainable, and conducive to human flourishing. Through active partnerships with local governments, communities, industries, and research coalitions, AUL strives to develop scalable models that foster robust urban ecosystems, enabling cities across Africa to thrive in an era of rapid change. If you are interested in the ideas and research under this cluster, or if you would like to partner with the AUL, please reach out to us at heba.elhanafy@aul.city or eva.klaus@aul.city.

Sources

- Acemoglu, D., & Robinson, J. A. (2021). Culture, Institutions, and Social Equilibria: A Framework. National Bureau of Economic Research Working Paper 28832. DOI: 10.3386/w28832.
- Acs, Z. J., & Audretsch, D. B. (1988). Innovation in Large and Small Firms: An Empirical Analysis. *The American Economic Review*, 78(4), 678–690. <https://www.jstor.org/stable/1811167>.
- African Union Commission and African Union Development Agency - NEPAD. (2022). AUC & AUDA-NEPAD Second Continental Report on the Implementation of Agenda 2063. AUC & AUDA-NEPAD.
- Aghion, P., Akcigit, U., & Howitt, P. (2015). Lessons from Schumpeterian Growth Theory. *American Economic Review*, 105(5): 94–99. <https://www.jstor.org/stable/43821858>.
- Ang, Y. Y. (2023). Adaptive Political Economy: Toward a New Paradigm. *World Politics*, 75(5), 1–18. DOI: 10.2139/ssrn.4813107.
- Arzaghi, M. & Henderson, J. V. (2008). Networking off Madison Avenue. *Review of Economic Studies*, 75(4), 1011–1038. <https://EconPapers.repec.org/RePEc:oup:restud:v:75:y:2008:i:4:p:1011-1038>.
- Audretsch, D. B., & Feldman, M.P. (1996). R&D Spillover and the Geography of Innovation and Production. *American Economic Review*, 86(3), 630–640. <https://www.jstor.org/stable/2118216/>.
- Bandura, A. (1971). *Social Learning Theory*. General Learning Press.
- Bertaud, A. (2018). *Order without Design : How Markets Shape Cities*. MIT Press.
- Berrone, P., & Ricart, J. E. (2024). IESE Cities in Motion Index. IESE Business School, University of Navarra–IESE Cities in Motion. <https://www.iese.edu/media/research/pdfs/ST-0649-E.pdf>.
- Bettencourt, L. M. A., Lobo, J., & Strumsky, D. Invention in the city: Increasing returns to patenting as a scaling function of metropolitan size. *Research Policy*, 36(1), p. 107–120. <https://doi.org/10.1016/j.respol.2006.09.026>.
- Bettencourt, L. M. A. (2013). The Origins of Scaling in Cities. *Science*, 340, p. 1438–1441. DOI: 10.1126/science.1235823.
- Bettencourt, L. M. A. (2021). *Introduction to Urban Science: Theory and Evidence of Cities as Complex Systems*. The MIT Press.
- Carlino, G. A., Chatterjee, S., & Hunt, R. M. (2007). Urban density and the rate of invention. *Journal of Urban Economics*, 61(3), 389–419. DOI: 10.1016/j.jue.2006.08.003.

- Cartwright, A., Palmer, I., Taylor, A., Pieterse, E., Parnell, S., Colenbrander, S. (2018). Developing Prosperous and Inclusive Cities in Africa – National Urban Policies to the Rescue? Coalition for Urban Transitions. <http://newclimateeconomy.net/content/cities-working-papers>.
- Chetty, R., Hendren, N., & Katz, L. F. (2016). The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment. *American Economic Review*, 106(4), 855–902. DOI: 10.1257/aer.20150572.
- Choi, J., Guzman, J., & Small, M. L. (2024). Third Places and Neighborhood Entrepreneurship: Evidence from Starbucks Cafes. National Bureau of Economic Research Working Paper 32604. DOI: 10.3386/w32604.
- Christiaensen, L., & Lozano-Gracia, N. (Eds). (2024). Migrants, Markets, and Mayors: Rising above the Employment Challenge in Africa’s Secondary Cities. Africa Development Forum. World Bank. DOI: 10.1596/978-1-4648-1903-2.
- Ciccone, A., & Hall, R. E. (1996). Productivity and the Density of Economic Activity. *American Economic Review*, 86(1), 54–70. <https://www.jstor.org/stable/2118255>.
- Craven, P., & Wellman, B. (1973). The Network City. *Sociological Inquiry*, 43(3–4), 57–88. DOI: [10.1111/j.1475-682X.1973.tb00003.x](https://doi.org/10.1111/j.1475-682X.1973.tb00003.x).
- DeSimone, M. E., Tiberti, F., Mosuro, W., Manolio, F., Barron, M., & Dikoru, E. (2025). From chalkboards to chatbots: Transforming learning in Nigeria, one prompt at a time. World Bank Blogs. World Bank. <https://blogs.worldbank.org/en/education/From-chalkboards-to-chatbots-Transforming-learning-in-Nigeria>.
- Duranton, G., & Puga, D. (2003). Micro-Foundations of Urban Agglomeration Economies. National Bureau of Economic Research Working Paper 9931. DOI: 10.3386/w9931.
- Dong, X., Zheng, S., & Kahn, M. E. (2020). The Role of Transportation Speed in Facilitating High Skilled Teamwork Across Cities. *Journal of Urban Economics*, 115(C). DOI: 10.1016/j.jue.2019.103212.
- Glaeser, E. L., Kallal, H. D., Scheinkman, J. A., & Shleifer, A. (1992) Growth in Cities. *Journal of Political Economy*, 100(6), 1126–1153. <http://dx.doi.org/10.1086/261856>.
- Evans, D. K., & Acosta, A. M. (2021). Education in Africa: What Are We Learning? *Journal of African Economies*, 30(1), 13–54. DOI: 10.1093/jae/ejaa009.
- Freire, M.E, Lall, S., & Leipziger, D. (2014.) Africa’s Urbanization: Challenges and Opportunities’, The Growth Dialogue Working Paper No.7, Washington, D.C.
- Glaeser, E.L (2013). A World of Cities: The Causes and Consequences of Urbanization in Poorer Countries. *Journal of the European Economic Association*, 12:5, p1154-1199.
- Glaeser, E. L. (1997). Learning in Cities. National Bureau of Economic Research Working Paper 6271. <https://www.nber.org/papers/w6271>.
- Gollin, D., Jedwab, R., & Vollrath, D. (2016). Urbanization With and Without Industrialization. *Journal of Economic Growth*, 21(1), 35–70. DOI: [10.1007/s10887-015-9121-4](https://doi.org/10.1007/s10887-015-9121-4).

- Granovetter, M. S. (1973). The Strength of Weak Ties. *American Journal of Sociology*, 78(6), p. 1360–1380. <https://www.jstor.org/stable/2776392>.
- Gray, A. (2024). Diversity, Conflict, and Agglomeration in African Cities. Working Draft. <https://priceschool.usc.edu/wp-content/uploads/2024/10/Andre-Gray.pdf>.
- Guiso, L., Sapienza, P., & Zingales, L. (2006). Does Culture Affect Economic Outcomes? National Bureau of Economic Research Working Paper 11999. <https://www.nber.org/papers/w11999>.
- Habyarimana, J., Humphreys, M., Posner, D. N., & Weinstein, J. M. (2007). Why Does Ethnic Diversity Undermind Public Goods Provision? *American Political Science Review*, 101(4), p. 709–725. <https://www.jstor.org/stable/27644480>.
- Hirschman, A. O. (1992). *Rival Views of Market Society and Other Recent Essays*. Harvard University Press.
- Haldane, A. (2024). Counting the cost of bowling alone. Opinion. *Financial Times*. <https://www.ft.com/content/97c1044d-141a-42fb-a47a-672ddb9512c4>.
- Henderson, J. V., Storeygard, A., & Deichmann, U. (2017). Has Climate Change Driven Urbanization in Africa? *Journal of Development Economics*, 124, 60–82. <https://doi.org/10.1016/j.jdeveco.2016.09.001>.
- Henrich, J., & Gil-White, F. J. (2001). The evolution of prestige: Freely conferred deference as a mechanism for enhancing the benefits of cultural transmission. *Evolution and Human Behavior*, 22(3), 165–196. [https://doi.org/10.1016/S1090-5138\(00\)00071-4](https://doi.org/10.1016/S1090-5138(00)00071-4).
- Iacovone, L., Ramachandran, V., & Schmidt, M. (2013). Stunted Growth: Why Don't African Firms Create More Jobs? Policy Research Working Paper. The World Bank.
- Juhász, R., Sakabe, S., & Weinstein, D. (2024). Codification, Technology Absorption, and the Globalization of the Industrial Revolution. National Bureau of Economic Research Working Paper 32667. DOI: 10.3386/w32667.
- Kariuki, T., Mutimura, E., & Kadzamira, G. (2023). Innovative approaches to unlocking R&D funding in Africa. *World Economic Forum*. <https://www.weforum.org/stories/2023/11/innovative-approaches-for-unlocking-research-and-development-funding-in-africa/#:~:text=One%20crucial%20area%20that%20requires,the%20global%20average%20of%201.7%25>.
- Kasara, K. (2017). Does Local Ethnic Segregation Lead to Violence? Evidence from Kenya. *Quarterly Journal of Political Science*, 11(4), 441–470. <http://dx.doi.org/10.1561/100.00014115>.
- Kendal, R. L., Boogert, N. J., Rendell, L., Laland, K. N., Webster, M., & Jones, P. L. (2018.) Social Learning Strategies: Bridge-Building between Fields. *Trends in Cognitive Science*, 22(7), p. 651–665. <https://doi.org/10.1016/j.tics.2018.04.003>.
- Krugman, P. (1979). A Model of Innovation, Technology Transfer, and the World Distribution of Income. *Journal of Political Economy*, 87(2), 253–66. <http://www.jstor.org/stable/1832086>.
- Lall, S. V., Henderson, J. V., & Venables, A. J. (2017). Africa's Cities: Opening Doors to the World. World Bank.

Lall, S. V., Lebrand, M. Park, H., Sturm, D., & Venables, A. J. (2021). Pancakes to Pyramids: City Form to Promote Sustainable Growth. World Bank.

Long, C. X., & Yi, W. (2024). Information effects of high-speed rail: Evidence from patent citations in China. *China Economic Review*, 84. <https://doi.org/10.1016/j.chieco.2024.102115>.

Moretti, E. (2004). Workers' Education, Spillovers, and Productivity: Evidence from Plant-Level Production Functions. *American Economic Review*, 94(3), p. 656–690. <https://www.jstor.org/stable/3592947>.

Mokyr, J. (1999). *The British Industrial Revolution: An Economic Perspective*. Routledge.

Mokyr, J. (2018). *A Culture of Growth*. Princeton University Press.

Muthukrishna, M., & Henrich, J. (2016). Innovation in the Collective Brain. *Philosophical Transactions of the Royal Society B*, 371(1690). <https://doi.org/10.1098/rstb.2015.0192>.

Muthukrishna, M., Doebeli, M., Chudek, M., & Henrich, J. (2018). The Cultural Brain Hypothesis: How culture drives brain expansion, sociality, and life history. *PLoS Computational Biology*, 14(11). <https://doi.org/10.1371/journal.pcbi.1006504>.

Muthukrishna, M., & Henrich, J. (2020.) The Origins and Psychology of Human Cooperation. *Annual Review of Psychology*, 72, p. 207–240.

Muthukrishna, M., Bell, A. V., Henrich, J., Curtin, C. M., Gedranovich, A., McInerney, J., & Thue, B. (2020). Beyond Western, Educated, Industrial, Rich, and Democratic (WEIRD) Psychology: Measuring and Mapping Scales of Cultural and Psychological Distance. *Psychological Science*, 31(6), p. 678–701. <https://doi.org/10.1177/0956797620916782>.

Nathan, N. L. (2024). Do grids demobilize? How street networks, social networks, and political networks intersect. *American Journal of Political Science*, 1–18. <https://doi.org/10.1111/ajps.12912>.

Nunn, N., & Wantchekon, L. (2011). The Slave Trade and the Origins of Mistrust in Africa. *American Economic Review*, 101(7), p. 3221–3252. DOI: 10.1257/aer.101.7.3221.

OECD/SWAC. (2020). *Africa's Urbanisation Dynamics 2020: Africapolis, Mapping a New Urban Geography*. West African Studies, OECD Publishing. <https://doi.org/10.1787/b6bccb81-en>.

OECD/UN ECA/AfDB. (2022). *Africa's Urbanisation Dynamics 2022: The Economic Power of Africa's Cities*. West African Studies, OECD. <https://doi.org/10.1787/3834ed5b-en>.

Opalo, K. (2024). Can better urbanization policies unlock faster economic growth and development in Nigeria? An Africanist Perspective. Substack. <https://www.africanistperspective.com/p/can-better-urbanization-policies>.

Putnam, R. D. (2000). *Bowling Alone: The Collapse and Revival of American Community*. Simon & Schuster.

Rodrick, D. (2020). Democratising Innovation. Project Syndicate. <https://www.project-syndicate.org/commentary/policymakers-should-influence-course-of-technological-innovation-by-dani-rodrik-2020-08/>.

Rodriguez, J. P., Aleta, A., & Moreno, Y. (2024). Multilayer networks describing interactions in urban systems: A digital twin of five cities in Spain. ArXiv. <https://doi.org/10.48550/arXiv.2409.04299>.

Rothwell, J., Lobo, J., Strumsky, D., & Muro, M. (2013). Patenting Prosperity: Invention and Economic Performance in the United States and its Metropolitan Areas. Brookings. <https://www.brookings.edu/wp-content/uploads/2016/06/patenting-prosperity-rothwell.pdf>.

Satterthwaite, D. (2016). Will Africa have the world's largest cities in 2100? International Institute for Environment and Development. <https://www.iied.org/will-africa-have-worlds-largest-cities-2100>.

Schläpfer, M., Bettencourt, L. M. A., Grauwin, S., Raschke, M., Claxton, R., Smoreda, Z., West, G. B., & Ratti, C. (2014). The scaling of human interactions with city size. *Journal of the Royal Society Interface*, 11(98). <http://dx.doi.org/10.1098/rsif.2013.0789>.

Schimmelpfennig, R., Muthukrishna, M., Razek, L., & Schnell, E. (2021). Paradox of diversity in the collective brain. *Philosophical Transactions of the Royal Society B*, 377. <https://doi.org/10.1098/rstb.2020.0316>.

Shearmur, R. (2012). Are cities the font of innovation? A critical review of the literature on cities and innovation. *Cities*, 29, p. S9–S18. <https://doi.org/10.1016/j.cities.2012.06.008>.

Simmel, G. (1903). *The Metropolis and Mental Life*. Stimuli.

Rosenthal, S. S., & Strange, W. C. (2004). Evidence on the nature and sources of agglomeration economies. Henderson, J.V., & Thisse, J. F. (Eds.). *Handbook of Urban and Regional Economics*, 4, 2120–2171. [https://doi.org/10.1016/S1574-0080\(04\)80006-3](https://doi.org/10.1016/S1574-0080(04)80006-3).

UNDP. (2018). *World Urbanization Prospects: The 2018 Revision*. United Nations. <https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf#page=46>.

United Nations Urbanization Prospects 2018 Revision.

UNESCO. (2024). *World Education Statistics: 2024*. UNESCO Institute for Statistics.

West, Mark. (2023.) An ed-tech tragedy? Educational technologies and school closures in the time of COVID-19. Davison, K., & Yaghmour, R. (Eds.). UNESCO. <https://doi.org/10.54675/LYGF2153>.

World Bank. (2022). *Concept Note: Business Enabling Environment*. World Bank.

Xu, C. (2021). Effects of urbanization on trust: Evidence from an experiment in the field. *Journal of Economic Psychology*, 87. <https://doi.org/10.1016/j.joep.2021.102450>.

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