

Debate

**From Development State to Corporate Leviathan:
Historicizing the Infrastructural Performativity of
Digital Platforms within Kenyan Agriculture****Laura Mann and Gianluca Iazzolino**

ABSTRACT

While there is growing literature on the role of platforms in concentrating market power, this article centres on their role in ‘performing’ economic theory. As infrastructures that measure, monitor and ultimately compel human behaviour, the authors argue that digital platforms should be understood as ‘performative infrastructures’ that seek to incorporate informal populations by compelling behaviour in line with certain theoretical and commercial models. The article draws on secondary historical literature and primary research with Kenyan and international agritech developers, farmers, and representatives from international organizations, regulators and farmer organizations, to historicize contemporary ‘platformization’ within a longer history of infrastructural performativity in rural Kenya, in order to tease out both continuities and departures from the past. While contemporary technologists evoke similar justifications for top-down control over markets as did their analogue predecessors, they nonetheless seek to vest such power within the private sector and to use it to perform neoclassical theory. The authors argue that this particular orientation is not an intrinsic feature of the technology itself but is rather shaped by a longer history of shifting policy paradigms.

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INTRODUCTION

In the aftermath of World War II and facing pressure from the Mau Mau uprisings, British officials began transferring land to Kenyan farmers in 1960. The prime architect of this plan, Roger Swynnerton, wrote (1954: 13): ‘the African farmer must be provided with such security of land tenure through an indefeasible title as will encourage him to invest his labour and profits into the development of his farm and as will enable him to offer it as a security against such financial credits’. Clearly, Swynnerton viewed property rights as providing the skeletal infrastructure upon which rural markets might develop, and yet in order to guarantee the loan from the British government and to attract subsequent investment into agro-processing, colonial officials sought additional extra-market control over these crops (Chege, 1987; Tignor, 2015; Wanyande, 2001).

Policy makers thus assembled an institutional infrastructure that would monitor and control these farmers for the purposes of investment attraction. It included extensive farm plans, which specified which crops they could grow and which methods they should use, as well as marketing boards and selected agro-processors that were empowered to act as monopsonies, automatically deducting the costs of inputs and loan repayments from sales transactions (Bates, 1989/2005; Ochieng, 2009; Wanyande, 2001). Such top-down control was justified as ‘the most reliable way of securing the repayment of debts’ (Gibbon, 1992: 194). In effect, this institutional infrastructure sought to lock farmers into performative closed-loop systems through which their behaviour could be predicted and better aligned with the colonial state’s centralized investment planning. Kenya retained such integrated financial and marketing infrastructures up until the 1970s when a series of economic shocks and intellectual challenges precipitated the rise of the neoliberal paradigm and the removal of such infrastructure from the rural economy.

In recent years, digital developers have begun to construct similar systems for coordinated investment planning. Frustrated by the limitations of stand-alone apps and mindful that the application of behavioural economics necessitates the creation of more complete datasets, tech developers have begun to move away from stand-alone digital applications based on information provision and market access towards ‘platformization’ — a digital infrastructure based on centralization and integration. This shift reflects both their doubts about the fundamental rationality of farmers as well as their desire to scale up multiple applications over a single shared network. Like their analogue predecessors, developers hope to lock farmers into closed-loop systems through which they can be disciplined, and through which outside investors can be assured of the return on their investments.

Our contribution asks how we should interpret this return to centralized investment planning. Should platformization be viewed as rupturing

the neoclassical policy paradigm that has dominated development since the 1980s? Or should we instead view it as a kind of performative reinforcement of the paradigm, strengthening the control of non-state actors over market governance and providing a new compulsive architecture through which neoclassical growth theory can be coerced and finally performed? In order to answer this question, we historicize digital applications and infrastructures within a longer history of ‘performative infrastructures’, in order to tease out both continuities and departures over time. We demonstrate how the collapse of the post-war development paradigm precipitated a shift in authority away from the Kenyan state towards donors and private companies. This shift also firmly situated neoclassical economics as the dominant theoretical growth model.

Digital technology firms emerged within this historical context and were implicated in two attempts to make neoclassical models ‘work’ on the ground in rural Kenya. First, they were positioned as tools that could strengthen markets ‘from the bottom up’. More recently, they have been implicated in moves to make markets work ‘from above’. We base our analysis on secondary historical literature and on over 50 interviews with Kenyan and international agritech developers, farmers, and representatives from international organizations, regulators and farmer organizations conducted between 2012 and 2019.

The following section introduces the concept of infrastructural performativity as a way of tracking the rise and fall of policy paradigms in development over time. We then return to the colonial and independence eras to understand how early planners sought to build performative infrastructures in order to ‘perform’ post-war development theory. We explain how a series of financial shocks and intellectual challenges precipitated the breakdown of these performative infrastructures and the rise of neoliberalism in their place. The subsequent section then situates the emergence of Kenya’s Silicon Savannah within this political and intellectual history. We argue that early digital innovators were influenced by ICT for development (ICT4D) scholarship within New Institutional Economics (NIE), which framed digital technologies as devices that could strengthen decentralized market institutions such as property rights and price signals. However, as farmers failed to respond to market signals, developers shifted away from stand-alone applications towards platformization and more top-down control. In some senses, ideas about markets and investment have come full circle, and yet we observe the resilience of the neoclassical policy paradigm; for this new socio-technical infrastructure is being used to perform micro-economic theories of development rather than the *structural* development economics of the 1950s–1970s. The final section discusses the developmental implications of this shifting locus and orientation of performative infrastructural power.

PARADIGM SHIFTS, PERFORMATIVITY AND PLATFORMIZATION

Development policy has been subject to various paradigm shifts over time. Two broad perspectives are often deployed to interpret these shifts: one frames policy making as a process of cumulative learning through which paradigms rise and fall according to how well they actually reflect, explain and predict human behaviour; the other depicts these shifts in terms of competing political interests. Peter Hall (1993) developed the concept of a ‘policy paradigm’ as a way of fusing the two perspectives, describing how policy paradigms are subject to punctuated equilibria: while actors within the dominant policy paradigm constantly modify their models to account for challenges over time, larger anomalies emerge which undermine a paradigm’s overall coherence and precipitate a shift in authority away from one and towards others. This process is not just driven by the weight of evidence or by substantive arguments but also by the relative power, positional advantages and financial resources of the actors involved (see also Dafe, 2020; Mkandawire, 2014; Ouma and Adesina, 2019).

Our article draws attention to the financial and marketing infrastructure that competing policy paradigms have assembled (or disassembled) to make their models of development ‘work’ in rural Kenya. We introduce the concept of ‘infrastructural performativity’, which we define as the use of infrastructural arrangements to compel human behaviour in line with a given theoretical model or paradigm. This concept builds on the idea of ‘performativity’ within economic sociology and science and technology studies, which captures how economic theory does not just describe the economy passively from the outside, but rather helps to ‘perform’ and constitute it from within. In order to measure the economy and align the day-to-day functioning of economies with theoretical models, actors construct systems of measurement, monitoring and compulsion that allow them to nudge and coerce human behaviour in line with their theories and predictive models (Breckenridge, 2014; Donovan, 2015; MacKenzie et al, 2007; Mitchell, 2008; Pardo-Guerra, 2010; Young, 2018). Seen in this way, inclusion into a ‘formal’ economy is premised on the success of actors in a given policy paradigm to make new entrants fit within their theoretical models of development. As socio-technical infrastructures that measure, monitor and ultimately compel human behaviour, we argue that digital platforms and the associated process of platformization should be understood through this lens.

A platform is a digital arrangement that allows different separate pieces of software to interact through a set of communication protocols called application programming interfaces (APIs). This architecture has often been described positively as facilitating ‘openness’ and ‘interoperability’ among third parties and allowing smaller software developers to scale up and avoid replication (van Dijck, 2013: 45–50). At the same time, this architecture strengthens the power of the central administrator — or operator — via network effects. The word ‘platformization’ captures this tendency; as more

and more users and third-party developers join and integrate onto the platform, its operator can capitalize on the innovation of others while strengthening its own market share in the process.

Scholars such as Srnicek (2017) and Andersson Schwartz (2017) have argued that while technology companies portray their platforms as neutral apolitical marketplaces, platforms ‘embody a politics’ as their operators control the terms of market entry and participation, and are thus well positioned to reshape economic relationships and rationalities. This ‘curation’ of the market (van Dijck, 2013) is what allows the operator to create value beyond mere economies of scale. By reconfiguring relationships and flows of value, the operator is able to assemble and extract value from the accumulated data and relationships that form between third party developers, partners and users on the network (see also Fourcade and Klutzz, 2020; Zuboff, 2019). However, this power to curate is not all-powerful. Particularly within a development context, platforms do not operate in a political or historical void. They depend on other actors to fund, facilitate and frame their activities. Thus, our article situates platforms within a wider discussion of policy paradigms. Other powerful actors, such as large donors, government bodies, or large corporate partners in the case of agriculture, can pressure the platform operator to curate the market in ways that accommodate and reflect their own requirements, interests and theories of development.

While there is a growing literature on the role of platforms in concentrating market and political power and in shaping market subjectivities in line with private commercial interests (Fourcade and Klutzz, 2020; Langley and Leyshon, 2020; Sadowski, 2020; Zuboff, 2019), we centre our analysis on their role in shaping intellectual and ideological debates within development. In fact, we argue that platformization itself can be understood in terms of the performativity of policy paradigms. As more and more actors integrate and use a platform, the operator not only strengthens its market power but also deepens the predictive power and theoretical legitimacy of the paradigm to which it belongs. Indeed, the strength of its performativity depends precisely on whether it is able to embed its users within a fully encompassing ‘closed-loop system’ through which all their activities, transactions and relationships are captured. The more complete this picture, the more accurate and authoritative the paradigm’s model becomes. Thus, while regulators should be aware of the potential for market concentration and private regulatory capture, they should also be aware of how platform operators — and the wider policy paradigms within which they sit — are also building up the performative power to create, shape and produce knowledge and theory.

We historicize platformization within a longer history of infrastructural performativity in rural Kenya in order to make three inter-connected arguments. First, rather than platformization representing something wholly new or innovative, we show strong continuities with the past. In

particular, the architects of performative infrastructures in the post-war period and the performative socio-technical infrastructures in the contemporary period share similar aspirations: regulatory control for the purposes of coordinated investment planning. However, we also identify interesting discontinuities. While the performative infrastructures of the past were principally controlled by state actors for collective and strategic financial mobilization according to post-war development economics, today's platforms are primarily controlled by private and donor actors seeking to perform micro-economics and, increasingly, behavioural economics. Finally, our analysis demonstrates how these contemporary orientations (private and behavioural) are not intrinsic features of the technology itself, but rather reflect this longer history of shifting power over governance. Overall, we argue that while platforms are transforming production systems and changing flows of economic value, they are also changing the way knowledge and theory are produced and validated.

THE RISE AND FALL OF THE PERFORMATIVITY OF DEVELOPMENT ECONOMICS

In the post-war period, Keynesian economic policy prevailed in high-income countries (Burgin, 2012) but almost everywhere else, a distinct branch of *development economics* was emerging to guide economic development. Development economists understood low-income countries as being structurally disadvantaged within the global economy as their workforces were concentrated in low-productivity agriculture, rather than in more knowledge-intensive manufacturing (Prebisch, 1950; Singer, 1950). This *structural* difference left them vulnerable to price volatility and declining terms of trade (ibid.). Development was thus understood as a process of 'introducing large-scale fundamental changes into the economic structure' rather than one of 'inducing marginal shifts' (UN, 1960: 7).

These economists further believed that such 'structural transformation' required state interventions in order to stimulate investments and shift production into more lucrative activities. For example, Paul Rosenstein-Rodan (1943) and Tibor Scitovsky (1954) described how developing economies were stuck in a low-level equilibrium investment 'trap': first, individual investors were hesitant because they lacked data to calculate risk and, second, there was a coordination problem; no individual firm would want to shoulder the costs of external economies (that is, the spill-over benefits that would accrue to others). Thus, policy makers proposed that states reduce this uncertainty by providing preferential contracting and licensing arrangements to investors. Such state activism was justified in relation to the perceived weakness of the price signal in stimulating investment in new areas. As Scitovsky wrote:

In the market economy, prices are the signalling device that informs each person of other people's economic decisions; and the merit of perfect competition is that it would cause prices to transmit information reliably and people to respond to this information properly. Market prices, however, reflect the economic situation as it is and not as it will be The proper co-ordination of investment decisions, therefore, would require a signalling device to transmit information about present plans and future conditions as they are determined by present plans; and the pricing system fails to provide this Hence the belief that there is need either for centralized investment planning or for some additional communication system. (Scitovsky, 1954: 150)

Most development planners of this era opted for centralized investment planning. For example, in Kenya, colonial policy makers sought European investment through a range of policies that included land alienation and the prohibition of cash crops among African producers, and a taxation policy that drove African labourers onto white settler farms. They further set up parastatal monopsonies and cooperatives to organize the marketing of important crops, hoping to achieve economies of scale while avoiding what they saw as the monopsonist dangers of private monopolies (Mosley, 1983; van Zwaneberg and King, 1975). In contrast to Nigeria or Ghana, where such pricing infrastructures were used to extract the agricultural surplus for industrial investment, Kenya's powerful white settlers ensured that these economies of scale were re-invested back into their own sectors; the development of agro-processing and industry would therefore come to rely more on foreign capital (Tignor, 2015). Accordingly, officials offered investors preferential scheduling and protective tariffs, and gave them monopsonistic powers over producers.

Upon independence, the basic outline of these arrangements remained intact, but the targeted beneficiaries changed. Jomo Kenyatta's government continued policies of state-financed land transfers, farm mortgages and closed-loop marketing infrastructures (Boone, 2012; Tignor, 2015). It used cooperatives and marketing boards to integrate ever-larger numbers of smallholder farmers into the formal economy and continued to use these infrastructures to assert control over their growing and marketing activities (Alila and Atieno, 2006; Jabara, 1985; Ochieng, 2009). Its objectives were also similar to those of the post-war colonial state; it sought to boost and stabilize agricultural prices, to finance public goods such as domestic research and extension, to compel the adoption of modern inputs and, particularly under Moi, to cross-subsidize between more and less prosperous regions (Grosh, 1992). This domestic policy strategy was also greatly shaped by the 'Green Revolution', a series of donor-led programmes that sought to increase the uptake of modern agricultural inputs among farmers in low- and middle-income countries. Importantly, however, such international programmes had divergent commercial interests in promoting the science and technology of donor countries, rather than domestic research outputs (Brooks, 2021; Cullather, 2004; Scott, 1998).

Kenyatta also used these infrastructures *politically*, prioritizing certain crops in an effort to de-racialize the apartheid economy, appease existing political constituents and undercut potential opposition (Boone, 2012; Grosh 1992; Ochieng, 2009). While this politicization was later viewed with suspicion by political scientists on both the left and right, politically interventionist forms of economic planning were widely accepted at the time. In Europe and the United States, for example, Keynesianism was seen as an appropriate tool to re-engineer industrial society away from class conflict (Burgin, 2012) and planning was also used to target and protect specific racial groups (Fox, 2012).

Throughout the 1960s and 1970s, the post-war development paradigm generated strong growth and comparatively high savings, and helped to break up the colonial apartheid economy (Killick, 1981). However, criticism began building among scholars concerned about its potential urban, elite and capital-intensive biases (Singer and Jolly, 1972). In relation to agriculture, critique centred on pricing structures that turned the terms of trade against agriculture in favour of industry and which biased larger cash crop producers over smallholder subsistence farmers (Chambers et al., 1989; Sen, 1966; Stryker, 1979). In Kenya specifically, levels of direct and indirect taxation of agriculture for industry were comparatively low, and yet policies certainly favoured cash crop producers over subsistence farmers (Lele et al., 1989). A long-running debate about the relative productivity of small and larger farms opened up at this time, under the term ‘the inverse productivity theorem’ (Chambers et al., 1989; Sen, 1966), with some believing that smallholder farms were naturally more productive and others viewing the large commercial farms favoured by current policies as more productive. Critics of the large-scale model viewed public support of large farms as both slowing development and creating greater rural inequality. Accordingly, World Bank lending increasingly shifted towards smallholder farmers throughout the 1970s and 1980s (Bernards, 2021).

The post-war policy paradigm also faced logistical challenges. The power of its performative development infrastructures depended on the ability of state administrators to accurately calculate yields, set prices and compel compliance and, in practice, they often got things wrong. In some years, Kenya imported or exported at loss. Differences between domestic and global prices incentivized farmers to evade formal channels and undermined the closed-loop systems that made the paradigm’s models work. Further, if prices were set too high, marketing boards would struggle to cover costs and farmers would face long queues, delayed payments and discriminatory treatment by local agents. Finally, the whole performative balancing act was vulnerable to declining terms of trade. Thus, while Kenya was able to recoup investment on its first sugar-processing facility in 1970, when prices fell, it was forced to maintain artificially high prices. These difficulties resulted in lost export earnings and created opportunities for political corruption and informal evasion (Alila and Atieno, 2006; Grosh, 1992).

A series of external shocks began to severely undermine the performative power of the statist agricultural development infrastructure. First, the 1973 oil price hike destabilized Kenya's current account balance and caused food prices to rise. In 1975, an unprecedented coffee boom temporarily released pressure (Killick, 1981) but when export prices fell back again in 1982, Kenya once again faced a widening balance of payments crisis and fiscal deficit (Killick, 1981; Ndung'u, 1999). To further compound matters, the 1980 drought caused food shortages, increasing the import bill (Hasan and Karanja, 1997). Finally, the spike in oil prices and the rise in US interest rates depressed global demand for Kenya's crops and prices fell. These conditions shook the state's institutional infrastructures to the very core and undermined the performative power of the post-war development paradigm.

By now, governments in high-income countries had also shifted away from Keynesianism towards neoliberalism, and economists such as Krueger and Berg gained influence within international organizations including the World Bank. They rejected the core principles of development economics: first, that lower-income economies were *structurally* different and, second, that the price signal was incapable of stimulating investment alone. Instead, they argued that developing economies just needed to 'get prices right' and conform to the neoclassical theory of comparative advantage (Gibbon, 1992). They collected data from across sub-Saharan Africa to make a comprehensive argument against state planning (World Bank, 1981). Drawing attention to the weaknesses of the intrusive 'closed-loop' systems discussed above, they argued that state intervention interfered with the natural communication of markets, artificially depressed producer incomes, and caused countries to lose out from trade by turning away from their 'natural' comparative advantages.

In addition, political scientists from both the left and right attacked the record of 'the African state' on moral and political grounds, positioning the peasant farmer as a victim of class exploitation, whose incomes were being used as patronage by more politically powerful urban groups (Bates, 1989/2005; Lipton, 1977; for a critical review, see Mkandawire, 2015). The influential American political scientist Robert Bates led the charge, conceding that while '[t]hese institutions were put in place to attract capital ... and to bind it to land and labour in rural Kenya ... these institutions now generate the resources employed in the factional politics that have largely replaced ideological confrontation' (Bates, 1989/2005: 148). In Kenya, the ethnicized character of state intervention was particularly emphasized, with political scientists drawing attention to the alternating fortunes of tea producers (mostly in Kikuyu areas, the ruling party's stronghold) and sugar producers (mostly in Luo areas, an opposition area) (Ochieng, 2009).

At heart, this new neoliberal paradigm aimed to replace the state's performative infrastructures with the diffuse and 'natural' coordination of the price mechanism (Mirowski, 2009). Attempts to gather, monitor and control information and incentives were represented by

neoliberal economists as a ‘fatal conceit’ (Hayek, 1988). Instead, neoliberal economists favoured models that assumed individuals made rational decisions based on market signals (Gibbon, 1992). Thus, in contrast with the post-war development economists, whose paradigm had required a whole system of coercive institutional infrastructures to make their models work, neoliberal economists asserted that their theories could work naturally, without compulsion. Individuals were to be trusted to make decisions, and market prices — and prices alone — should shape their behaviour.

Under the condition of debt, policy makers were forced to dismantle the performative infrastructures that had performed the post-war development policy paradigm. Single-channel marketing boards were shuttered, and policy makers were forced to float exchange rates and liberalize commodity and factor prices and input distribution. Public investment in agricultural extension was likewise withdrawn. However, neoliberal economic theory did not seem to ‘work naturally’ as anticipated. Private actors appeared hesitant to invest in remote areas due to the absence of transport infrastructures and credit provision (Richardson, 1996). Most commercial banks closed their rural branches and farmers became dependent on informal banking arrangements such as rotating credit and ‘table banking’ (Njuguna and Nyairo, 2015). In many cases, informal middlemen filled the void, exploiting farmers’ lack of alternatives (Gow and Parton, 1995; Kinyanjui, 2013). Research and extension also became more decentralized and patchier, as coordination shifted away from domestic research bodies and Ministry of Agriculture extension workers towards efforts by NGOs, multinational companies, local agro-dealers and researchers embedded within the World Bank-funded Consultative Group on International Agricultural Research (CGIAR) (Brooks, 2021; Cramer et al., 2020; Stryker, 1979). This shift towards private and donor-controlled efforts also shifted the balance of power over paradigmatic contestation in favour of international actors. Lack of public funding effectively privatized extension as officers became reliant on farmers to make contributions towards their transport and accommodation costs. As a result, the uptake of certified seeds faltered, depressing yields.

Overall, structural adjustment resulted in a fragmentation of governance and low levels of private investment (Richardson, 1996). As Ahmed and Lipton summarized (1997: 1): ‘By concentrating almost exclusively on the issues of pricing, the reform policies ignored the other critical factors, in particular, the technological development needed to translate improved incentives into more sustainable and productive farming systems’. At first, this lack of investment was interpreted as a paradox, as the experience seemed to run counter to neoclassical economic theory (Lucas, 1990) but economists quickly started to make modifications within the neoclassical paradigm to reconcile these unsatisfactory outcomes (Peck and Tickell, 2002). Just as Rosenstein-Rodan and Scitovsky had theorized, property rights and prices appeared insufficient to mobilize investment without some form of centralized investment planning or communication system. As Bernards (2021: 3)

has written, towards the end of the 1980s and early 1990s, economists within the neoclassical policy paradigm therefore began to embrace the idea that markets ‘needed to be produced and engineered into being’ (see also Nik-Khah and Mirowski, 2019).

The next section situates Silicon Savannah within this history. While media commentators evoke technological deterministic views of technology embodying some intrinsic qualities, we argue that this longer history shaped how contemporary digital platforms first emerged and subsequently developed. Their location within the private sector and their association with neo-classical economic theories are not intrinsic features of the technology itself, but rather reflect the policy context in which they emerged. Set against the dual failures of the ‘developmental state’ to perform its theories and then the inadequacy of price signals to perform neoliberal theory, developers first hoped their technologies could strengthen market institutions from the bottom up. When this decentralized vision failed to materialize, they began re-imagining digital technologies as tools for centralized investment planning. However, in the wake of neoliberal state retrenchment, this centralized control took the form of a corporate leviathan. The following section charts this evolution by drawing on material from interviews conducted between 2012 and 2019.

SILICON SAVANNAH SHIFT: FROM COMPETITION TO PLATFORMIZATION

By the 2000s, a new generation of economists were attempting to reconcile the unsatisfactory impacts of structural adjustment within the neoclassical policy paradigm. These economists maintained their core assumptions about market signals and individual rationality, and yet they proposed that low- and middle-income economies were beset with a series of institutional failures that prevented price signals from working properly. These New Institutional Economists identified three key institutional weaknesses that inhibited markets: weak property rights, information asymmetries and high transaction costs. In essence, NIE represented a modification within the neo-classical policy paradigm rather than a true rupture, for growth was still envisioned to be market-led and development was ultimately still a process of cumulative productivity gains among rational producers; it was just that market institutions needed to be strengthened from the bottom up.

Some turned to digital technologies as potential tools that could strengthen market institutions. Three seminal pieces shaped this early ICT4D scholarship within economics: Jensen’s 2007 piece on Keralan fishermen in India, Aker and Mbiti’s 2010 piece on mobile phones in Africa, and Jack and Suri’s 2011 study on M-Pesa in Kenya. While their findings were subsequently challenged (Bateman et al., 2019; Srinivasan and Burrell, 2015; Steyn, 2016), these canonical texts became widely cited (1,955,

2,078 and 632 times respectively, at the time of writing), and have helped promulgate a belief among many economists and commentators that digital technologies could help strengthen market institutions and allow individual producers and traders to better access information, make decisions and transact more freely.

In Kenya, this intellectual moment coincided with Mwai Kibaki's election as president and with the rise of microcredit within the donor community. President Kibaki's 2003 Strategy to Revitalize Agriculture programme sought to rebuild Kenya's rural markets and to boost smallholder finance through partnerships with the private sector and through philanthropic organizations such as the Bill and Melinda Gates Foundation and Syngenta Foundation. This first wave of innovation was also influenced by the launch of the mobile money system, M-Pesa in 2008.

M-Pesa was first developed as a microcredit programme by the UK's Department for International Development in partnership with Vodafone UK, but was later launched as a commercial platform by Vodafone's Kenyan subsidiary, Safaricom. It scaled rapidly partly due to market demand driven by rural-urban remittances (Morawczynski, 2009), but also due to Safaricom's decision to invest heavily into an agent network (Omwansa and Sullivan, 2012). Its expansion further benefited from the support of politically connected shareholders who helped shield it from banking and competition regulation (Tyce, 2020). Safaricom was able to position M-Pesa as a backbone payment infrastructure, branching out from individual payments into business payments, and later developing a payment gateway for government services.

Despite this substantial corporate investment and political support, commentators explained M-Pesa's rise in terms of market demand and thus framed it as an example of bottom-up innovation (Graham et al., 2015). This narrative encouraged graduates to embrace digital entrepreneurship, and also attracted foreign developers and MBA graduates who perceived Kenya as having lower entry barriers compared to Silicon Valley (Friederici et al., 2020). Entrepreneurs could apply for grants offered by development agencies as well as benefit from new Social Impact Investments, which had been established by private equity firms seeking to recast investment in emerging markets as social investments after the 2008 financial crisis (Watts and Scales, 2020). Donors and private foundations such as the Omidyar Network also provided funding for incubators like iHub and MLab and accelerator programmes such as GrowthAfrica, Pangea and TUMI. Nairobi became host to myriad entrepreneurship training programmes and start-up competitions such as Apps4Africa and PivotEast.

The ICT4D literature within NIE provided the first intellectual frame for this wave of developers. Developers identified weak markets and exploitative middlemen as the key barriers to higher levels of investment and productivity; middlemen were understood to control credit and value chains and to distort market signals from working properly (Friederici et al., 2020;

Mann et al., 2015). One Safaricom executive estimated that middlemen returned only a third of profits to farmers: ‘In the case of milk’, he explained, ‘if the price is 100 KSh per litre, the farmer gets between 28 and 32 KSh. The rest goes to middlemen and to the other actors’.¹ Another interviewee explained, ‘farmers are willing to sell to one buyer, irrespective of the price as long as it’s consistent and it’s someone they can trust’.² In the view of agritech executives, these middlemen derived their power from the geographic and informational isolation of farmers, who relied on them for credit, inputs, haulage and market access. Another fintech executive explained, ‘the key issue for farmers is the lack of access to reliable sources of information through which they can better cope with unforeseen events and become more productive’. Due to this lack of information, he continued, ‘farming is based on guesswork. You plant, you expect something, and so you end up always living below the poverty line’.³ Agritech developers felt that this guesswork could be ameliorated through the supply of better information and saw their role as providing farmers with independent sources of information, credit and market access.

Many entrepreneurs settled on digital extension and informational services as prime market opportunities (Mann et al., 2015). Safaricom estimated that in 2019, only 1,300 extension workers operated across Kenya’s 1,450 wards; as farmers needed a minimum of 10 visits per season, Kenya required 26,000 extension workers, which would cost 47 billion Ksh in public finance (around US\$ 460 million at the time of the interview).⁴ In place of this costly human and publicly funded infrastructure, tech developers first sought to build independent, low-cost private mobile applications that would provide farmers with advice and market information. Some developers also built virtual marketplaces, hoping to facilitate autonomous transactions between farmers and buyers and thereby cut out middlemen and ‘disintermediate’ rural markets. In some cases, facilitation was simply provided through forums and message-boards where agents could freely organize transactions using cash or M-Pesa. In other cases, agritech firms integrated payment technologies but still left it up to buyers and sellers to register themselves on the platform. Finally, some applications sought to provide insurance, such as Syngenta Foundation’s Kilimo Salama, which initially tried to use government rainfall data to design index insurance contracts.

Developers hoped their applications would strengthen the bargaining power of individual farmers and allow them to better respond to price signals, thereby strengthening markets from the bottom up. Much like their counterparts of the 1980s, they saw themselves as empowering

1. Interview, Digifarm executive, Nairobi, 7 June 2019.

2. Interview, Digifarm product specialist, Nairobi, 27 September 2018.

3. Interview, Digifarm executive, Nairobi, 7 June 2019.

4. Personal communication Nairobi, September 2018.

entrepreneurial farmers who'd just been given 'the wrong end of the stick'.⁵ They theorized that, once afforded better information and communication, farmers would naturally adopt superior inputs and seeds, boost their productivity and find better markets for their goods. Developers were encouraged to find 'financially sustainable' ways of scaling their applications and tended to focus their business models on cost recovery and advertising (Friederici et al., 2020; Mann et al., 2015). However, in practice, many continued to depend on grants, venture capital and proceeds from competitions to continue their experiments and scale-up efforts. Furthermore, as numerous applications came and went, developers began to concede their applications were not scaling as hoped. While there was clear demand for traditional extension, farmers were slow to embrace digital applications and there was growing evidence that initiatives based solely on mobile advice were not effective in driving the adoption of improved techniques or inputs (Cramer et al., 2020: 232). A common explanation was that farmers rely on the trusted advice of neighbours and friends and were unlikely to trust new applications without intensive training and familiarization. Interviewees also expressed doubts about the core rationality and responsiveness of farmers to information and price signals. As one Safaricom executive explained, 'Some farmers just plant rice or maize because this is what they have always done We want to stop a widespread attitude among farmers to plant something just because they feel like it'.⁶

In an effort to better engage farmers and scale their applications, developers pivoted towards working with organizations already on the ground such as farmer cooperatives, saving groups, NGOs, extension officers and private actors such as large multinational input companies, whom farmers could trust or with whom they at least had some familiarity. Over time, some of these partners became clients in their own right, for it was far easier for developers to build an application for a single institutional client who could then roll it out to all its users, rather than to try to market and scale an application on their own to disparate new users (Mann et al., 2015). These partnerships increasingly encouraged developers to construct business models that were compatible with the wider policy environment within which they were emerging.

Developers also came to recognize that their systems were generating valuable data, and thought about how they might monetize or use it more strategically (Mann, 2018). Some reconceptualized their business models as two- or three-sided, experimenting with charging farmers for services while also monetizing data analysis through partnerships.⁷ Some even began to envision the resurrection of closed-loop systems through which various pools of information could be shared and used to construct a fuller picture of

5. Interview, agritech executive, Nairobi, 10 August 2018.

6. Interview, Digifarm product specialist, Nairobi, 27 September 2018.

7. Interview, 11 October 2012.

the whole agricultural value chain. One of Kilimo Salama's executives, and now managing director of Acre Africa, recalled that 'the availability of reliable historical rainfall data was very patchy'.⁸ This patchiness hindered the business model, which was based on the development of predictive weather models. In place of a whole host of individual applications accumulating siloed databases, tech developers began to think about how they could work with others to share data and achieve cross-intelligibility across different applications.

These changing sentiments were also reflected in the wider funding environment. While funders and accelerator programmes had enabled many firms to access seed funding and roll out projects, the entrepreneurial environment had encouraged competition rather than cooperation, and as a result, tech developers were prone to replication and failure. One interviewee revealed how this environment had begun to frustrate donors who were eagerly awaiting the emergence of a single, dominant platform that could achieve scalability and serve as a backbone infrastructure for multiple rural development projects.⁹

Donors were also experimenting with new theories and technologies of aid. In particular, donors had begun pushing conditional cash transfer programmes in place of direct support to governments, as they could use these systems to target aid towards individuals they deemed 'deserving' and use conditionality to compel certain developmental behaviours (Ouma and Adesina, 2019). This shift also reflected their desire for great quantitative monitoring and evaluation of projects as well as increasing emphasis on randomized control trials (RCTs) as a reference standard for development research. Kenya became a key RCT research hub, hosting the second-highest number of studies (74) after India within MIT's Abdul Latif Jameel Poverty Action Lab (J-PAL) portfolio. Finally, international actors had begun to experiment and embrace behavioural economics, as evidenced by the focus of the World Bank's *World Development Report* in 2015 (World Bank, 2015). Nairobi had already become a hub for behavioural economics when the Busara Centre for Behavioural Economics was established in 2012.

Behavioural economics can be seen as a further modification within the neoclassical policy paradigm, as behavioural economists still hold to the neoclassical focuses on comparative advantage and efficiency and productivity gains, yet no longer assume individual market actors are rational (Brooks, 2021). Rather, they theorize that 'people tend to "think automatically", rather than deliberately; to "think socially", under the influence of social norms and pressures; and to think within the bounds of "mental models" that reflect prevailing "worldviews, ideology and culture"' (Brooks, 2021: 4, citing Klein, 2017). Therefore, behavioural economists have shifted the paradigm away from a focus on strengthening market institutions from

8. Interview, Acre Africa executive, Nairobi, 2 August 2018.

9. Interview, Fintech CEO, Nairobi, 16 July 2018.

the bottom up towards finding ways to nudge — or compel — market actors directly, perceiving their mindsets and behavioural choices as being ‘barriers’ that prevent neoclassical economics from working effectively. This new theorization has great appeal for digital developers who have been grappling with slow adoption and who have doubts about the ability of farmers to respond to price signals. The development community therefore finds itself growing closer to the behavioural economics community.

A behavioural economist underlined the benefits of using platforms to explore trust within self-help groups, explaining:

You could take a more ethnographic, observatory, type of approach to these groups, but I don’t think that this is as effective as if you could randomize. If we could use data to look at the transactions among the group members, we would understand how inter-group trust is created and reproduced, and ... use this to disseminate best practices, or the knowledge of best inputs, among the members.¹⁰

In order to render farmers more amenable to these new approaches, developers acknowledged the need for more granular data, believing that their models’ predictive power could be correlated to the volume and dimensionality of data, or the number of attributes within a dataset.¹¹ This aspiration for greater precision reflected a ‘craving for intelligibility’ that Hayek (1944/2001: 204) had associated with the allure of planning and which he — and other neoliberals — felt should be resisted. Contemporary cravings were driven both by growing interests in behavioural economics and by the use of data for precision agriculture within the wider agribusiness community (Sabarina and Priya, 2015).

In order to create a more all-encompassing environment for this kind of approach, the most well-resourced tech firms are currently investing heavily in physical infrastructure and human workforces, which are, in a sense, reconstructing some of the functionalities of earlier analogue systems such as those performed by the extension services and marketing boards dismantled by structural adjustment. Syngenta Foundation, for instance, has invested in a network of 77 automated weather stations, mostly concentrated in the so-called maize belt between the Rift Valley and Western Kenya. Acre Africa, supported by Syngenta Foundation, is using this network to build risk-management models for its insurance products.¹² In turn, it has established its own network of marketing agents, forging partnerships with agro-dealers and input providers to try to build new closed loops around whole value chains. Within this system, farmers will purchase bags of seed and inputs from partners and find a code on scratch cards. This code will activate insurance contracts. Acre Africa will then use the farmer’s phone number and GPS location, the input’s serial number, and the date and location to monitor rainfall using satellite data. In the event of poor rainfall, the farmer

10. Interview, behavioural economist, Nairobi, 9 October 2018.

11. Interview, agritech platform executive, Nairobi, 7 August 2018.

12. Interview, Acre Africa executive, Nairobi, 2 August 2018.

will receive additional bags of inputs. The construction of such closed-loop systems requires developers to work with proprietary input providers, but it also requires a common network upon which to scale.

Safaricom is best positioned to act as a backbone as it has a near-monopoly over mobile money, a widely spread agent network, a telecom market share of over 60 per cent and a well-trusted brand. It turned its existing corporate social responsibility initiative, M-Agri, into a commercial operation in 2017, launching Digifarm, a platform that the company hopes will integrate a whole suite of applications. Accessible to any citizen with a Safaricom SIM card upon registration of her or his national ID number, the platform embeds many other firms such as Arifu, an agronomic advice platform; Farmdrive, a fintech that uses M-Pesa activity to derive credit scores and eligibility for loans in the form of vouchers for agricultural inputs; and iProcure, an input supplier that redeems those vouchers.

Rather than rely on farmers to make better decisions, these systems, in effect, aim to make better decisions for farmers. An executive of Tulaa, a California-based fintech operating in Kenya and India that provides loans and advice to Kenyan potato farmers, comments:

If we know the farmers, we know the farmers' location, we know the land size that they have, we know the crop that they're growing, we can push the right inputs to them to improve their productivity. Based on their planting date, we can continually send them agronomy tips over a period of time We plan to work with external partners who may have remote sensing data and they will tell us 'look, there's a drought coming'. Therefore, we can tell the farmer 'please double up on your fertilizers because there's a drought coming, so you can improve your produce now because the prices will go up'.¹³

Another executive from Agriwallet, a Dutch agritech that provides earmarked credit (that is, credit that can only be used for specified inputs), echoes this idea: 'by giving them tokens that they can spend with large distributors like Amiran, Syngenta ... we are also guaranteeing that they purchase high quality inputs'.¹⁴ By tying credit and insurance to specific inputs, platformization hopes to compel desirable behaviours and yet it also seeks to embed farmers within closed, proprietary research systems.

In Safaricom's view, the Digifarm platform will make 'the market fairer and more efficient for farmers'.¹⁵ However, Digifarm is curating the market in particular ways, both to favour Safaricom business interests as well as to reflect the preferences of its partners within the wider neoclassical policy environment. It is trying to do so through a mix of remote services via mobile phones and through a physical network of Digifarm Village Advisors (DVAs) and Digisoko (digital marketing) points. The latter are aggregation hubs that provide inputs and recruit labourers in key farming areas. Digifarm aspires to build as many Digisoko spots as M-Pesa outlets and, eventually,

13. Interview, Tulaa executive, Nairobi, 10 August 2018.

14. Interview, Agriwallet executive, Nairobi, 16 July 2019.

15. Interview, Digifarm executive, Nairobi, 27 September 2019.

‘make Digifarm bigger than M-Pesa’. DVAs are ‘last mile’ agents, typically recruited among M-Pesa mobile money agents or more commercially oriented farmers, who are paid on commission, and who advise other farmers about Digifarm services, replacing patchy public services and providing, in the words of Digifarm’s executive, ‘an extension service that people can see’.¹⁶

Safaricom seeks to curate total transparency across the value chain by trying as far as possible to embed farmers within closed loops and thus activate ‘trust’ among producers, third-party partners and investors. In this way, the proposed model is similar to its post-war analogue predecessors; by controlling behaviours and choices, platform developers seek to increase repayment rates, reduce investment risk and provide stable and predictable demand and supply for input providers and aggregators. Other firms are embracing similar visions of total transparency, addressing what they see as key obstacles to investment: volatile price signals; lack of digital footprints; and excessive fragmentation. For instance, Farmshine, a company co-founded by a former UN official, hopes to roll out a platform and last-mile agent network that will link farmers with large buyers and allow them to agree on prices and sign digital contracts using distributed ledger technology. Their contribution to transparency involves reducing price volatility ahead of the planting season. As one of its founders explains, ‘these forward pricing mechanisms allow the farmer to predict and decide beforehand what they want to plant’.¹⁷

Tulaa’s executive likewise explained how Tulaa will ‘create visibility’ by digitizing the KYC (know-your-customer) process and thus allow farmers to acquire digital footprints for loan applications with financial institutions. As these loans are provided as ‘tokens’ to purchase seeds and fertilizers from specific distributors, input providers will know where their products are being sold and used.¹⁸ Finally, some agritech firms view the fragmented land tenure system as a major reason for high transaction costs and have designed technologies to lump together suppliers to meet the needs of larger buyers. For instance, the American founder of Twiga Foods, a major agritech connecting middle-sized farmers to large urban buyers, explains how Twiga built a platform to ‘control for all these tiny drop sizes [small transactions], because it’s impossible to manage dollar transactions on paper’.¹⁹ Twiga has developed a customer relationship management system that manages the collection of fruit and vegetables across the country and organizes payments to almost 9,000 farmers. Another platform, developed by the Nigerian-American agritech Hello Tractor, likewise hopes to match tractor owners

16. Ibid.

17. Interview, Farmshine executive, Nairobi 4 October 2018.

18. Interview, Tulaa executive, Nairobi, 10 August 2018.

19. Interview, Twiga CEO, Nairobi, 10 September 2018.

with farmers in need, aiming to achieve efficiency by aggregating farmers on the basis of geography, size and crop type.

While competitors to Safaricom's Digifarm do exist, M-Pesa's domination in the mobile payment sector makes all actors reliant on the Safaricom network. Safaricom aims to replicate M-Pesa's success as the main — and most Kenyans would say only — digital payment option for customers and small and medium businesses alike. If it succeeds in this vision (which is by no means certain),²⁰ this hegemonic position will allow Safaricom to set the terms of market entry participation and thus shape the market according to its business interests and in line with the broader policy paradigm within which it sits.

Importantly, this performative infrastructure differs markedly from traditional extension services as DVAs and Digisoko agents are not public employees whose qualifications provide bargaining power within an industrial relationship and who accumulate knowledge and expertise through their work. Rather, they function primarily as social and commercial infrastructures that connect farmers to the proprietary knowledge embedded within the platform itself (Mann and Nzayisenga, 2015; Meagher, 2018). In this way, by transferring mental processes away from people onto centralized proprietary technical systems, the Digifarm platform is helping to restructure agricultural production in ways that benefit capital investors at the expense of Kenyan-based workers and professionals (Isakson, 2014; Kleibert and Mann, 2020). In the context of rural Kenya, developers hope this restructuring will obviate the need for distributed investment into training and thus reduce the risks of industrial action and/or the politicization of extension by politicians. This quality makes platformization attractive to the donor community which may perceive government programmes as inefficient and prone to mismanagement, and which is keen to find ways of delivering services such as agricultural extension and healthcare to remote communities more cheaply.²¹

Indeed, when it comes to the role of the Kenyan state in these new systems, almost all of our interviewees shared the view that, given what they perceived as the Kenyan state's poor historical record in managing extension services, the private sector should now take the mantle in restructuring the rural economy.²² Some held that the state should help facilitate the digitization of agriculture through tax rebates and subsidies for tech firms. Others emphasized the need for public–private partnerships through which proprietary data could be shared with local governments for a fee or used to shape policies in ways that would further accommodate the expansion of

20. Indeed, interviewees relayed stories of implementation channels that mirror those of state planners!

21. Interestingly, our wider study uncovered similar desires by US technologists to digitize University of California extension amidst similar budgetary constraints.

22. Interview, 10 September 2018.

private platforms, echoing trends observed elsewhere (Gurumurthy et al., 2019). Many drew the line at more state-directed intervention. For example, Farmshine's executive drew a distinction between 'heavy' and 'light' government structures, explaining: 'These guys in the county governments are good friends of ours. I'm not a big fan of market control by government, normally they don't work very well. What I'm a big fan of is a government which helps increase transparency so that everyone can make the right decision on what is best'.²³ In this way, while software developers may acknowledge their ambition to coordinate centralized investment planning, they maintain that such coordination will be 'safer' in private hands as their firms are more immune to shifting partisan politics and predation by politicians. The next section discusses what this shifting locus of performative power might mean for development.

DISCUSSION: BACK TO THE FUTURE?

We have documented growing interest among software developers and donors in top-down performative control over markets. Much like their counterparts in the colonial and independence eras, these developers have justified this control as a means of increasing efficiency, attracting investment, and making markets more predictable to suppliers and aggregators. However, while the return to coordinated investment planning appears to be sending rural Kenya 'back to the future', there are a number of very important discontinuities relevant to scholars of development.

First, developers and platform operators seek to consolidate non-state governance over markets. Although many of these schemes are still in the pilot stage, there is a clear tendency towards regulatory capture in the interests of private actors, shareholders and donors, and away from domestic public interest concerns (Mazzucato, 2013; Mkandawire, 1999; Peck and Tickell, 2002). However, platformization should not simply be understood as a privatizing force; Safaricom's 'curation' of the market is also shaped by donors and experts within its policy paradigm. If we think about policy paradigm shifts not just in terms of transitions from one set of ideas to another, but as shifts between the actors who have the power to validate ideas and knowledge (Mkandawire, 1999, 2014), platformization, at least in rural Kenya, appears to be re-enforcing the private and foreign-driven regulatory control first established in the wake of neoliberal state retrenchment.

Second, platform operators are embedded within a scholarly community that seeks to perform — and effectively coerce — behaviour according to neoclassical theories of development and, increasingly, behavioural economics. In their view, financial resources are not to be mobilized

23. Interview, 21 August 2018.

collectively or strategically towards structural transformations; rather, gains should flow directly to the farmers who produce them. Meanwhile, governance of the market should be used to promote efficiency and pursue natural comparative advantages. Indeed, many interviewees quietly acknowledged that platformization would likely lead to more pronounced rural differentiation through which the most productive farmers would drive out less productive farmers, and thus create larger, more commercially viable farms and farmers. In this way, platformization appears to be performing neoclassical growth theory but shorn of any liberal commitment to individual autonomy and market signals.²⁴ In the process, however, this intervention may generate both greater rural inequality and the identification of farmers who do not fit in their models as a kind of ‘dysfunctional’ category.

Finally, if foreign input providers and donors are able to embed themselves as the dominant input suppliers within a privately run platform, there is a danger that these systems could be reinforcing the technological advantages of high-income countries relative to middle-income countries, and thus ignoring one of the key concerns of post-war development economists: namely, the growing divergence between knowledge-intensive production systems and those based on primary production (Prebisch, 1950; Singer, 1950). There is also a danger of marginalizing domestic public sector initiatives emerging from bodies such as the National Pototo Council and the Kenya Agricultural and Livestock Research Organization (KALRO) who have launched their own free applications, which may be able to ‘curate’ the market according to broader public policy goals. Yet these public sector institutions have neither the financial clout nor the business infrastructure to scale and compete with their counterparts in the private sector. In the process, proprietary knowledge and input providers could become the only reference points for Kenyan farmers. As the business model of digital extension is premised on transferring the knowledge and skill requirements away from both farmers and paid extension officers and onto the technical infrastructure, platformization may end up deepening the international division of labour between agricultural producing regions such as Kenya and those regions where expertise and innovation for agriculture are being developed and commercialized (Isakson, 2014; Kleibert and Mann, 2020; Mann and Iazzolino, 2019). Policy makers should pay close attention to how platform curation may shift the political economy of research and input choices. Perhaps such curation should not be left to purely commercial interests.

24. Indeed, if developers are successful in creating fully closed systems (which should not be assumed), it is possible they may even be able to coercively weigh in on the ‘inverse productivity’ theory by effectively making certain farmers more productive (Barrett, 1996; Sen, 1966). Robert Chambers made a similar critique of the large farm bias contained within the Green Revolution (Chambers et al., 1989).

CONCLUSION

A technologically deterministic view might deem private control over digital platforms to be an inevitable feature of the technology itself, just as Friedrich Hayek's contemporaries viewed the inevitability of state planning in the era of industrial manufacturing (Hayek, 1944/2001). Yet by historicizing platforms within a longer history, we have shown that innovations do not take place in a historical and political vacuum. Software developers are shaped by historical legacies and by the community of partners and intellectuals with whom they associate. Our article has argued that contemporary digital platforms have emerged within a very particular historical context. The era of state-led planning depended on a particular performative infrastructure to coordinate agricultural production and markets around theories and policy paradigms of state-led development. After the failure of neoliberal structural adjustment new institutionalist economists developed digital agricultural infrastructures to try to make market signals work on the ground in developing country contexts. However, far from creating decentralized frameworks of economic coordination, agritech systems have become increasingly centralized in their efforts to include poor farmers in market-led agricultural development. Techniques from behavioural economics have also been drawn into these efforts to perform agricultural markets according to neoclassical economics.

Future research is needed to delve deeper into the politics of platform 'curation' within development policy paradigms: how much bargaining power do non-tech actors such as governments, donors and powerful third-party partners have in shaping the 'curation' of the market in line with their ideas and interests? More research is also needed into the comparative contexts in which digital platforms are emerging within the global economy. For example, in other parts of the world, where state retrenchment during the neoliberal era was less severe, can we observe platform infrastructures being used to perform alternative forms of development theory focused on public rather than private-sector led paradigms of inclusion? What is clear is that these systems are shaping the policy as well as the economic infrastructures through which debates over development theory will unfold in the coming years.

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