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The Chinese Supply of Surveillance Technology to Africa

Going Beyond the Authoritarian Bias

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Abstract

A notable trend in the global surveillance technology landscape is the increasing importation of Chinese surveillance systems by a wide range of nations. Several scholars have attributed the increased Chinese presence in the African surveillance technology market to an "authoritarian bias," positing that states with authoritarian tendencies naturally turn to China, a nation that reflects their model of governance and provides technology conducive to their control mechanisms. However, this perspective seems overly simplistic and may overlook a variety of factors that influence the decision-making processes of these countries. This study uses a QCA methodology to identify what combination of factors can explain countries' decisions to import control technologies from China. Our results show that countries with reasonable economic power, primary trade relations with Beijing, and a good level of digital maturity are key aspects of a country's decision to import these technologies. Moreover, the results suggest that having a political-institutional affinity with China is not a determining condition (in terms of either necessity or sufficiency) for importing Chinese surveillance technologies when a strategic relationship with China exists. This implies that the choice is not solely determined by financial and commercial factors but also by strategic ones.

Keywords: China – Africa – Safe City – Surveillance Technologies

1. Introduction

For years now, the African continent has been filled with biometric technologies, infrastructures of hardware and software that link biometric data such as fingerprints, iris scans, facial scans or DNA data with demographic data such as name, gender, age, address and marital status. The widespread adoption of biometric technologies is relevant throughout the Global South. In India, for example, the introduction of the Aadhaar biometric identification system has created the world's largest biometric identification system.

The latest report from the Collaboration on International ICT Policy for East and Southern Africa on the State of Internet Freedom in Africa focuses specifically on the rise of biometric surveillance as one of the most pressing issues on the continent. Biometric technologies have been introduced in almost all African countries[1]. The biometrics market is forecast to grow at a CAGR of 21%, with the global biometrics industry expected to reach US$82 billion by 2027[2]. Such a steady increase in the adoption of biometric technologies in Africa signals an enduring belief that these technologies can solve complex political problems. Biometric technologies are indeed sold in the name of ensuring “free and fair” elections,[3] more efficient policing through forensic science biometric databases (Pauwels, 2020), or more appropriate border controls against the ever-greater terrorist fright.[4]

This paper addresses this issue from a geopolitical perspective, particularly looking at China as a provider of biometric technologies to African countries. Currently, the market sector that sees the most intense Chinese involvement as a supplier of biometric technologies to Africa is the one of smart cities.

In some cases, Chinese firms have provided African governments with digital ID systems that use biometric data, such as fingerprints, eye scans, and facial recognition. Across Africa, these systems are increasingly integrated with personal mobile devices and financial services, including banking and mobile financial transactions and are mandatory for acquiring essential documents and services like passports, driver's licenses, medical services, social welfare benefits, and other public services and rights.[5]

[1] Pauwels, Eleonore, The anatomy of information disorders in Africa: Geostrategic Positioning & Multipolar Competition Over Converging Technologies, Konrad Adenauer Stiftung, September (2020).
[2] Toesland, F., African countries embracing biometrics, digital IDs, Africa Renewal, February 5th. Available at: https://www.un.org/africarenewal/magazine/february-2021/african-countries-embracing-biometrics-digital-ids (2021).
[3] Jacobsen, Katja Lindskov. "Biometric voter registration: A new modality of democracy assistance?." Cooperation and Conflict 55.1 (2020): 127-148.
[4] Polito, Carolina; Alaimo, Cristina. "THE POLITICS OF BIOMETRIC TECHNOLOGIES: Borders control and the making of data citizens in Africa." (2023).
[5] Roberts, T. "Mapping the supply of surveillance technologies to Africa: case studies from Nigeria, Ghana, Morocco, Malawi, and Zambia." The Institute of Development Studies (IDS) Brighton, UK (2023).

However, with a few exceptions, the supply of biometric technologies in other market segments, such as voter registration or border control, is largely dominated by European, US or Japanese companies. Conversely, the global smart city market is increasingly becoming a focus for Chinese leaders and companies. Various official Chinese documents present China as a smart city provider to a variety of regions, including the Maghreb and sub-Saharan Africa.[6]

The primary vector for transferring digital surveillance technology from Chinese firms to the African government is the Digital Silk and Road Initiative, an offshoot of the Belt and Road Initiative (BRI), which specifically focuses on investments in the digital sector for improving ICT infrastructure abroad. Noteworthy among its numerous projects is the Pakistan East Africa Cable Express (PAGE), an ambitious 15,000-kilometer underwater cable originating from Pakistan's Gwadar port. This cable traverses several regions, connecting Asia, Europe, and Africa, and notably makes landfall along the coasts of Somalia and South Africa.[7]

When it comes to the supply of biometric technologies, key ventures under this initiative include the "Safe City Project" by Huawei and the "Smart City" by the company ZTE.[8] In recent years China has provided an increasing number of training programs to officials and engineers of developing countries alongside the supply of the hardware and software components.[9]

Chinese package often includes a command-and-control room in a 'data centre' from which police and security forces can survey citizens moving around public space in real-time.[10] Thus interior ministries and police authorities of various African countries have been developing their surveillance capabilities with the help of leading Chinese firms. For instance, in 2019, Kampala police in Uganda procured surveillance technology from Huawei worth $126 million to tackle the city's crime problems. However, there have been concerns that this technology, particularly facial recognition systems, has been used to monitor and suppress government critics.[11] These developments have been observed across multiple African nations, including Algeria, Botswana, Côte d'Ivoire, Egypt, Ghana, Malawi, Nigeria, Rwanda, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe.

The spread of these technologies in Africa is facilitated by sales of foreign technology backed by soft loans, predominantly from China. Chinese firms have been instrumental in building about 70% of the 4G network infrastructure on the continent. Moreover, the "Safe City" projects by Huawei have been financed by loans from China Exim Bank and implemented in over 16 African countries.

These projects integrate a range of surveillance technologies, including interconnected tracking devices, video cameras, software, and cloud storage systems, ostensibly to support public safety and administrative services.

As mentioned by Elkman, "while many African cities are still far from becoming ***smart***, given major lack of basic infrastructure, local government deficiencies in some instances and uneven use of technologies

[6] Ekman, Alice. "CHINA'S SMART CITIES." The new geopolitical battleground (2019).
[7] Colarizi, Alessandra. "Africa rossa: il modello cinese e il continente del futuro." Africa rossa (2022): 1-223.
[8] Sheombar, Anand, and Sebastian Klovig Skelton. "Follow the Surveillance: A Breadcrumb Trail of Surveillance Technology Exports to Africa." IFIP Joint Working Conference on the Future of Digital Work: The Challenge of Inequality. Cham: Springer Nature Switzerland, (2023).
[9] Ekman, Alice. "CHINA'S SMART CITIES." The new geopolitical battleground (2019).
[10] Roberts, T. "Mapping the supply of surveillance technologies to Africa: case studies from Nigeria, Ghana, Morocco, Malawi, and Zambia." The Institute of Development Studies (IDS) Brighton, UK (2023).
[11] Human Rights Watch, Uganda: Rights Concerns Over License Plate Tracking Surveillance System Jeopardizes Right to Privacy (2019).

by the population, China's growing telecommunication and technological dominance in Africa poses a solid basis for the development of smart cities in the future."[12]

In this paper, we analyse and identify the conditions common to African countries that decide to import Chinese surveillance technologies. We start from the puzzle that countries' decisions to import China's surveillance technologies can be explained by several factors in combination rather than single ones, such as the authoritarian bias. This analysis is carried out through a QCA methodology that examines conditions in terms of necessity and sufficiency individually and in combination. The QCA results are presented and discussed in the last section by drawing connections with the existing literature and theories.

[12] Ekman, Alice. "CHINA'S SMART CITIES." The new geopolitical battleground (2019).

2. Beyond the authoritarian bias

The global landscape of surveillance technology is witnessing a notable trend where a diverse array of nations is increasingly importing Chinese surveillance systems. Surveillance technologies such as facial recognition cameras or spyware software are regarded as key enablers for the government to track a target's physical location or monitor their digital activity.[13]

Several scholars attribute the growing Chinese presence in the African surveillance technology market to an 'authoritarian bias', suggesting that states with authoritarian tendencies will naturally turn to China, a nation that mirrors their model of governance and provides technology conducive to their control mechanisms. However, this perspective seems overly simplistic and potentially overlooks a variety of factors that influence the decision-making processes of these countries.

By challenging the reductionist view of 'authoritarian bias', this study attempts to analyse the multiple reasons behind the import of Chinese surveillance technologies, addressing the following questions: What conditions do African countries importing Chinese surveillance technologies have in common? Is the decision to import such technologies from China based solely on a political-institutional affinity, or are there additional, less explored dimensions at play? What combination of factors influences a country's decision?

In addressing these questions, this study assesses various factors, including international partnerships, economic incentives, and domestic factors that may be behind the import of surveillance technology from China. In this context, African countries are categorised as either having adopted Chinese surveillance technology or not. This dichotomous framework allows for a clear assessment of technology transfer and facilitates a straightforward comparison between cases. It recognises that while there are nuances and degrees of implementation, the primary concern is whether or not there has been a formal adoption of the technology in question.

2.1 Identifying Factors Associated with African Countries' Imports of Chinese Surveillance Technologies

According to the existing literature, countries' decisions to import surveillance technologies from China may depend on several factors, both international and domestic. In examining the African continent, this

[13] Woodhams, Samuel. "China, Africa, and the private surveillance industry." Geo. J. Int'l Aff. 21 (2020): 158.

study examines several factors that together provide a multidimensional analysis of why these countries may choose to import such technologies from China.

As argued earlier, some studies suggest that political institutional affinity with China may determine why countries formally engage with Chinese investments in surveillance technologies. This suggestion is based on the argument that authoritarian governments, characterised by centralised control and limited political pluralism, often seek to enhance their surveillance capabilities in order to maintain social order and control over their populations. In this context, surveillance technologies serve a dual purpose: ostensibly enhancing security and public safety, while also providing a means to monitor dissent and manage political stability.

Moreover, Chinese surveillance technologies, developed in a similar political context, are likely to be designed with features that meet the needs of regimes that prioritise state security and authority over individual privacy rights. For authoritarian leaders, the appeal of these systems may be enhanced by the perception that they can be adopted without the political and ethical scrutiny that might accompany technologies from more liberal democratic sources. In this context, an institutional political affinity with China is expected to be associated with the import of Chinese surveillance technologies.

However, it is important to recognise that the relationship between governance style and technology importation is not deterministic and that the decision-making process is likely to be influenced by a constellation of factors. Therefore, the level of the Democracy Index for each African country is assessed to test for 'authoritarian bias', but it needs to be tested in conjunction with a number of other factors.

One such factor looks at the relationship between financial power and the import of surveillance technologies, assuming that wealthier countries have more resources to spend on importing advanced technologies, including surveillance systems. In particular, wealthier countries with higher GDPs tend to have more financial flexibility, allowing for greater investment in advanced technologies in various sectors, including public safety and national security. This financial capacity enables these countries to procure, deploy and maintain sophisticated surveillance systems, which may include the latest advances in facial recognition technology. Indeed, surveillance technologies require significant investment, not only for initial purchase and installation, but also for ongoing maintenance, software updates and personnel training. As wealthier nations are more likely to have the budgetary resources to cover these costs, it is expected that a reasonable level of financial power may be associated with the import of surveillance technologies.

In addition, some studies argue that countries' decisions to import surveillance technologies are driven by geopolitical considerations. Countries are more likely to import from a (major) power with which they share fundamental geopolitical interests. Since a 'comprehensive strategic' agreement suggests a deep level of cooperation that may extend to security and surveillance, countries that import surveillance technologies from China are expected to have a comprehensive strategic partnership with China on geopolitical issues.

The existing literature also assesses the volume of a country's general imports from China. The trade relationship between an African country and China, in particular the volume of imported goods, can be an indicator of the likelihood of adopting additional technologies, including surveillance technologies[14]. On

[14] Titiloye Ademola, O., Bankole, A. S., & Adewuyi, A. O, China–Africa trade relations: Insights from AERC scoping studies. The European Journal of Development Research, 21, 485-505, (2009).

this basis, countries that are significant importers from China are expected to import surveillance technologies as part of a broader trade relationship.

The perceived level of crime is also taken into account. The hypothesis that countries with high crime rates may strengthen their surveillance infrastructure, including through acquisitions from China, to enhance public safety is based on a pragmatic approach to crime prevention and control. Advanced surveillance technologies are said to be instrumental in monitoring criminal activity, helping to identify and apprehend perpetrators, and ultimately reducing crime rates by acting as a deterrent. The integration of high-tech surveillance tools, such as CCTV systems equipped with facial recognition capabilities, is usually justified in this context with rhetoric relating to the allegedly enhanced effectiveness of law enforcement agencies.[15] In light of this, countries with high crime rates are expected to import Chinese surveillance technologies.

The final expectation concerns the normative protection of data and posits a positive correlation between the adoption of a country's data protection laws and its likelihood of importing biometric technologies. The adoption of biometric technologies in countries with data protection legislation can be attributed to their overall higher levels of digital maturity. Countries with more advanced physical and normative digital infrastructures are often better equipped to integrate and use complex technologies in line with their broader digitalization and security strategies.[16] States may prioritise the adoption of such technologies to address specific policy challenges, while using privacy regulations as a general legal basis for their use. Therefore, countries with mature legal frameworks are expected to import Chinese surveillance technologies.

By combining all these factors, this study builds a multidimensional framework that looks at the intersection of economic, strategic, financial, political, security, and normative conditions to explain African countries' decisions to import surveillance technologies from China. This framework is tested through a QCA analysis, which is explained in the next section.

[15] Pauwels, E. "The Anatomy of information disorders in Africa: geostrategic positioning & multipolar competition over converging technologies." Konrad Adenauer Stiftung (2020).
[16] Hoekman, M. Bernard, Maskus, E. Keith, Saggi Kamal, Transfer of technology to developing countries: unilateral and multilateral policy options, World Bank Policy Research Working Paper 3332, June (2004).

3. Methodology

QCA is a set-theoretical approach that draws on qualitative and quantitative methods,[17] by combining "the in-depth knowledge of case studies with the inferential power of large/medium number of cases."[18] More precisely, QCA conceives social phenomena as sets in which cases have different levels of memberships; it analyses social phenomena as complex combinations of different sets; and, more importantly, it identifies the necessity and sufficiency of conditions for a specific outcome through set relations.[19]

This study adopts a QCA method for two main reasons: first, it provides a useful analytical framework for assessing social phenomena that are extremely complex and mostly the result of a combination of factors (conjunctural causation). Secondly, is it a very appropriate tool when the focus of the research can be explained by multiple sets of combinations (equifinality).[20]

The cases under scrutiny comprise 50 African countries, except Cabo Verde, Comoros, Mauritius, Sao Tome Principe and Seychelle, whose geographical isolation and size influence the impact on continental trends in surveillance technology usage and importation.

Throughout the QCA analysis, two similar sets of parameters of fit are used to evaluate the empirical relevance of necessary and sufficient conditions respectively. More precisely, these sets of parameters indicate the extent to which set relations deviate from a perfect set relation either in terms of necessity or sufficiency. For necessary conditions, the set of parameters includes necessity consistency (Cons.Nec), necessity coverage (Cov.Nec), and relevance of consistency (RoN). The consistency parameter measures the extent to which the empirical evidence is in line with a set relation. As a rule of thumb, the consistency rate above which a condition can be considered necessary or sufficient is respectively 9.0 or 8.0. If the consistency rate is met, coverage and relevance of consistency (RoN) are considered to assess the extent to which the condition is empirically important. Coverage expresses the difference in size between the condition and the outcome sets, whereas the RoN parameter assesses the degree of trivialness by controlling that a condition is not highly present for the negation of the outcome. Both parameters should be greater than 0.5 to be empirically relevant. Sufficient conditions are evaluated to a similar set of parameters that include consistency sufficiency (incluS), proportional reduction in inconsistency (PRI), coverage sufficiency (CovS), and unique coverage CovU). Unique coverage considers the cases that are

[17] Ragin, Charles C. The comparative method: Moving beyond qualitative and quantitative strategies. Univ of California Press, 2014; Ragin, Charles C. "What is Qualitative Comparative Analysis?" (2008); Rihoux, Benoît, and Charles C. Ragin. Configurational comparative methods: Qualitative comparative analysis (QCA) and related techniques. Sage Publications, 2008.
[18] Chatterley, Christie, et al. "A qualitative comparative analysis of well-managed school sanitation in Bangladesh." BMC Public Health 14 (2014): 1-14.
[19] Oana, Ioana-Elena, Carsten Q. Schneider, and Eva Thomann. Qualitative comparative analysis using R: A beginner's guide. Cambridge University Press, (2021):9
[20] Mello, Patrick A. "Qualitative comparative analysis." Routledge Handbook of Foreign Policy Analysis Methods. Routledge, (2022):28-30.

covered only by one set of conditions. The same thresholds are applied to the parameters of sufficient conditions.[21]

3.1 Calibration: conceptualization and measurement

This study considered six plausible explanatory factors to explain under what conditions countries import surveillance technology from China. The first condition focuses on the financial/economic power of countries, with the expectation that such a condition might affect the ability of countries to import China's surveillance technologies. The financial/economic power of countries varies across the continent, which includes regional emerging powers such as Nigeria, relatively consolidated economies such as South Africa and Egypt, and very small (poor) economies such as Malawi and Sudan. This study focuses on countries with reasonable economic power, which would give them the financial power to import from China. This concept is measured by a country's GDP. More specifically, countries with a GDP of more than 100 billion are considered fully in, while those with a GDP of less than 1 are considered fully out. The threshold is set at $10 billion to determine which case is more in than out, or vice versa. These thresholds are set relative to the differences in GDP between African countries rather than the world as a whole. For example, Nigeria, South Africa, and Ethiopia, each with a GDP of over 100 billion, are considered fully in, while Mali and Tanzania are considered fully out. The other countries are considered more in than out, or vice versa, depending on their GDP. 10 billion is set as a qualitative threshold, as there is a clear gap in the raw numerical data and closer analysis of the cases reasonably confirms such differences in African countries' GDP.

The second condition looks at the nature of the bilateral partnership between African countries and China, with the expectation of a link to Chinese imported surveillance technologies. As noted above, China has numerous partnerships that are difficult to distinguish from each other because of the small differences between them. Following Li and Ye's conceptualisation,[22] this study distinguishes China's partnerships into three broad areas: comprehensive strategic partnership, strategic partnership, and regular partnership. A comprehensive strategic partnership with China is the highest level of cooperation. It implies stable and long-term cooperation in various fields, from economy to technology, through bilateral and multilateral channels, across different levels of authority, government-to-government, and people-to-people. A strategic partnership is the lower level of cooperation and involves cooperation in some areas and at some levels of government. Finally, a regular partnership refers to the lowest level of cooperation, which is limited to mutual respect and trust.[23] Based on this, countries with comprehensive strategic partnerships are coded as fully in (1), countries with strategic partnerships are coded as more in than out (0.67), and countries with regular partnerships are coded as more out than in (0.33). Finally, countries with no partnership are coded as fully out (0). For example, countries such as South Africa, Kenya and Namibia are coded as fully in because they cooperate in all areas of cooperation. Angola, Nigeria, and Morocco are coded as partly in the set as they maintain stable cooperation but in only a few areas and levels of governance. Finally, Tunisia, Libya and Ghana are coded as more out than in as they limit themselves to

[21] Oana, Ioana-Elena, Carsten Q. Schneider, and Eva Thomann. Qualitative comparative analysis using R: A beginner's guide. Cambridge University Press, (2021).
[22] Li, Quan, and Min Ye. "China's emerging partnership network: what, who, where when and why." International Trade, Politics and Development 3.2 (2019): 66-81.
[23] Ibid.

mutual recognition and trust. No countries were coded as fully out of the set since there is no country with any basic cooperation. The data are taken from the works of Yi and Ye,[24] Feng Zhongping Huang Jing,[25] and verified on the government website.

The third condition, China as a top importer, assesses countries' imports from China. In particular, it indicates whether China is the first trading partner for countries' imported goods within the timeframe of importing or not China's surveillance technologies. Imports cover all categories of imported goods. A specific focus on technology products would have been better, but no organic data could be found. Countries with China as their first importer are coded as full in (1). Subsequently, countries with China as their second or third most important importer are coded as partly in (0.67). Countries with China as their fourth or fifth top importer or more are coded as more out than in (0.33) and completely out (0) respectively. For example, Algeria is coded as a full member, the Central African Republic as a partial full member, Gambia as a partial full non-member and Chad as a full non-member. Data are taken from the WITS TradeStat database, which provides an overview of countries' import and export levels.

The fourth condition focuses on the level of democracy in countries, with the expectation that countries with low levels of democracy may import Chinese surveillance technologies. This condition is measured by a democracy index that captures the extent to which political leaders are chosen through free and fair elections with full suffrage, including freedom of association and expression. This index ranges from 0 to 1, with 0 representing the least democratic country and 1 representing the most democratic country. In this case, by calibrating the condition of the low level of democracy, countries that have a score equal to or below 0.4 are considered fully in, while countries with a score equal to or above 0.8 are considered fully out. The qualitative threshold is set at 0.6 so that countries with a score equal to or less than 0.6 are considered more in than out; conversely, countries with a score above 0.6 are considered more out than in. These thresholds are set taking into account the overall score of African countries and more detailed empirical observations and differentiate between nations like Algeria, Egypt, and Rwanda, which are relatively part of the condition and score lower, versus Tunisia, South Africa, and Ghana, which score higher on the Democracy Index. The data are taken from the electoral democratic index of the University of Oxford's data repository.[26]

The fifth condition assesses the possible relationship between criminality and the import of surveillance technologies by expecting that countries with high criminality will import such technologies from China. This condition is measured by a democracy index that takes into account the level of criminality within countries on a scale from 0 to 10, with 10 representing the most criminally inclined countries. In this specific case, countries with a score equal to or above 0.80 are considered fully in; conversely, countries with a score equal to or below 30 are deemed fully out. The qualitative threshold is set at a value of 6, above which countries are considered more in than out for the high criminality condition. This value is chosen by taking into account the thresholds proposed by the index and by comparing the values of African countries. According to this threshold, countries such as the Central African Republic, Congo and Chad are considered to be more in than out with respect to the high criminality condition, whereas, conversely, countries such as Rwanda, Ghana and South Africa with a score below 6 are considered to be more out

[24] Ibid.
[25] Zhongping, Feng, and Huang Jing. "China's Strategic Partnership Diplomacy." (2014).
[26] V-Dem – with major processing by Our World in Data. "Central estimate" [dataset]. V-Dem, "Democracy and Human rights, OWID based on Varieties of Democracy (v13) and Regimes of the World v13" [original data], 2023.

than in with respect to the high criminality condition. Data are retrieved from the Numbeo Criminality Index.[27]

The sixth condition examines the relationship between having a normative framework for technology governance and importing biometric surveillance technologies. This condition is measured by simply examining countries with or without a normative framework, arguing that those with a normative framework may be more inclined to import surveillance technologies from China. Therefore, countries with a normative framework are coded as fully in, while countries with a specific normative framework are coded as fully out. For example, South Africa and Morocco were coded fully in, while Libya and Mali were coded fully out. These data are taken from the UNCTAD Index on Data Protection and Privacy Legislation Worldwide.[28]

[27] The crime Index provided by Numbeo is based on user-contributed data and perceptions. Numbeo, Crime Index (2023). Available: https://www.numbeo.com/crime/rankings_by_country.jsp

[28] UNCTAD, Data Protection and Privacy Legislation Worldwide (2023). Available: https://unctad.org/page/data-protection-and-privacy-legislation-worldwide

4. QCA Analysis: Under What Conditions Do Countries Import Chinese Biometric Surveillance Technologies?

The QCA analysis typically starts with an analysis of whether conditions are individually necessary or sufficient based on three fit parameters: consistency, coverage and relevance of necessity.[29]

Starting with necessity, the QCA results show that there is no single condition that can be considered necessary. The only condition that comes close to being considered necessary is a normative framework with a consistency rate close to 0.90, above which it would have been considered necessary. The other conditions, except those for countries with China as a first importer and countries with low democratic values, have a relatively low consistency value (Table 1). In addition, no combinations of conditions were found to be necessary.

These results offer some initial interpretations. The fact that none of the conditions is necessary for the outcome to occur contradicts some of the literature considered. The most striking aspect is that political institutional affinity with China, which according to some scholars could determine why countries import Chinese surveillance technologies, is not a determining factor per se. In fact, several countries that are considered democratic still import technology from China, such as South Africa.

It is also remarkable that perceived levels of crime are not a necessary condition for countries to import surveillance technologies. This challenges the expectation that higher levels of crime automatically lead to more surveillance technology imports. Instead, the analysis suggests that the decision to import such technologies is influenced by broader factors, not just crime levels.

This insight challenges the mainstream political narratives that these technologies are primarily implemented for security. As an example of these mainstream political narratives, the South African SafeCity Initiative description argues that “the SafeCity initiative was formed to tackle South Africa’s dramatically increasing crime rate. Powered by ground-breaking surveillance technology, in collaboration with private security and public law enforcement, we aim to bring safety to the doorstep of every South African.”[30]

Rather, this insight suggests a need to scrutinize the broader, perhaps more complex, motivations driving the deployment of surveillance technologies, beyond the simplistic objective of crime reduction.

[29] Oana, Ioana-Elena, Carsten Q. Schneider, and Eva Thomann. Qualitative comparative analysis using R: A beginner's guide. Cambridge University Press, (2021); Mello, Patrick A. "Qualitative comparative analysis." Routledge Handbook of Foreign Policy Analysis Methods. Routledge, (2022):28-30.

[30] VumaCam, SafeCity. Available: https://safecity.community/about/#:~:text=The%20SafeCity%20initiative%20was%20formed,doorstep%20of%20every%20South%20African.

Finally, it is interesting to examine the normative condition. This is the only hypothesis that comes close to being necessary, and it confirms our hypothesis that the adoption of biometric technologies in countries with privacy regulations is due to their overall higher level of digital maturity.

Condition	Consistency	Coverage	RoN
GDP	0.560	0.663	0.808
STRAT	0.624	0.495	0.551
IMP	0.750	0.551	0.527
DEM	0.780	0.481	0.333
CRIM	0.506	0.479	0.642
NORM	0.833	0.606	0.552

Table 1. Single Necessity

Similar to the necessity analysis, no single condition can be considered sufficient on its own to explain the conditions under which African countries import surveillance technologies from China. As shown in Table 2, the consistency parameters are far from the recommended threshold of 0.8, above which conditions can be considered sufficient.

This aspect is in line with our expectations because it confirms what we initially expected, namely that countries' imports from China cannot be explained without looking at a combination of different factors.

Condition	Consistency	Coverage	RoN
GDP	0.663	0.560	0.663
STRAT	0.494	0.624	0.495
IMP	0.551	0.750	0.551
DEM	0.481	0.780	0.481
CRIM	0.479	0.506	0.479
NORM	0.606	0.833	0.606

Table 2. Single Sufficiency

When analysing these conditions in combination in terms of sufficiency, two paths of sufficiency can be identified.

The first path combines four conditions (see Figure 2. in the Annex), namely, countries with reasonable financial power, countries with a strategic partnership with China, countries with China as the first importer, and countries with a normative framework.

The second path (see Figure 3. in the Annex) instead includes countries with reasonable economic and financial power, countries with low levels of democracy, countries with high levels of criminality, and countries with a normative framework. While the first set of sufficiency paths includes 7 countries, the second includes 10 countries.

Sufficiency Paths	InclS	PRI	CovS	CovU	Cases Covered
GDP*STRAT*IMP*NORM	0.732	0.732	0.338	0.060	Senegal; South Africa; Algeria, Egypt; Angola, Democratic Republic of the Congo, Nigeria
GDP*IMP*DEM*NORM	0.716	0.716	0.342	0.037	Guinea, Uganda, Zambia; Cameroon, Niger; Algeria, Egypt; Angola, Democratic Republic of the Congo, Nigeria

Table 3. Combination of Conditions

These two sets of conditions were identified by setting the inclusion rate at 0.7 (see Methodology), which is slightly below the recommended threshold, as no sufficiency paths were found above the recommended threshold of 0.8. In addition, the sufficiency coverage rate is not that high. Therefore, although empirically relevant, these sufficient paths must be treated with caution.

These results lend themselves to a number of interpretations. First, the results suggest that having adequate financial/economic power, having China as a first trading partner, and having a certain level of digital maturity are key aspects of a country's decision to import these technologies. Since they are present in both sufficiency paths, we could argue that these conditions are relatively more important (but not sufficient) in explaining why countries import surveillance technologies from China.

Most importantly, these results show that a political-institutional affinity with China is not a determining condition – in terms of necessity and sufficiency – for importing Chinese surveillance technologies when a strategic relationship with China exists anyway. This confirms our initial assumption that the decision of countries to import surveillance technology from China cannot be solely attributed to their authoritarian nature.

In addition, scatterplots showing the position of cases in relation to single or combined sufficiency paths can provide additional interpretations. Figure 1. shows the position of countries in relation to all sufficiency paths explaining countries importing biometric technologies from China. More specifically, countries in the upper right quadrant are considered to be the most similar cases for all sufficiency paths (solution formula); countries in the lower right quadrant are considered to be deviant cases; while countries in the lower left quadrant are irrelevant and those in the upper left quadrant are countries that are not explained

by any sufficiency paths. The latter cases suggest that there may be other important conditions that can provide additional explanations for the result. While this shows some limitations of the study, it also opens up possibilities for new research.

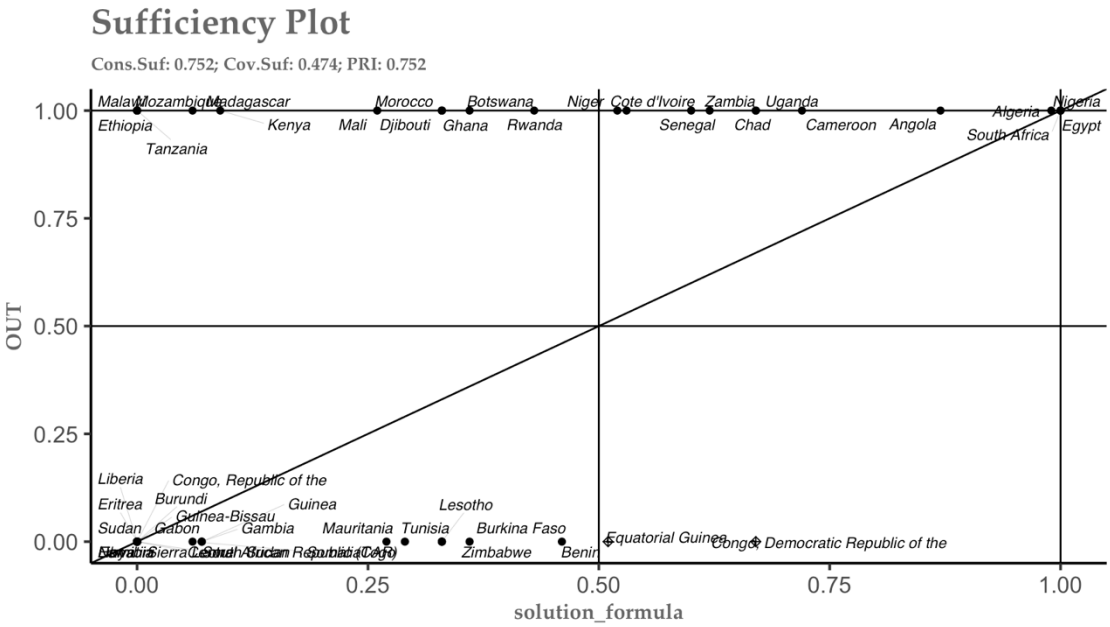

Figure 1. Scatterplot with the position of countries in relation to all sufficiency paths

5. Conclusions

In conclusion, our research has contributed to a deeper understanding of the dynamics underlying the acquisition of Chinese surveillance technology by African states. Going beyond the reductionist view that attributes these decisions to an 'authoritarian bias', we have uncovered a tapestry of factors that are both complex and influential. Using qualitative comparative analysis (QCA), our findings show that a combination of economic power, primary trade relations with China, and digital maturity significantly influence these decisions, rather than mere political institutional affinity or ideological alignment.

On the contrary, our study shows that a lack of political/institutional alignment with China does not necessarily prevent a country from importing Chinese surveillance technologies, provided that a strategic relationship with China exists. Interestingly, the study also shows that the perceived threat of crime is not a main driver behind the adoption of surveillance technology.

This nuanced understanding challenges prevailing assumptions and suggests the need for a broader perspective on the motivations behind the adoption of foreign surveillance technologies in Africa.

Future research should aim to unravel the complex interdependencies and contextual specificities that influence technology adoption processes.

For policymakers and practitioners, these findings also argue for the importance of developing both commercial and strategic relationships with African countries. Financial relationships, through investment and aid, provide the necessary resources to acquire and implement new technologies. However, these financial engagements must be coupled with strategic relationships. Strategic relationships help build trust, align interests, and facilitate knowledge sharing, which are essential for successful technology transfer and adoption.

As we move forward, this holistic perspective could be useful in guiding both academic research and policy-making to ensure that the future trajectory of technology transfer in Africa is both beneficial and sustainable.

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6. Annexes

PIL	STRAT	IMP	DEM	CRIM	NORM	OUT	incl	PRI	Cases
1	0	0	1	0	1	1	0.733	0.733	Cote d'Ivoire
0	0	0	1	1	1	1	0.705	0.705	Chad
1	1	1	0	1	1	1	0.683	0.683	South Africa
1	1	1	1	0	1	1	0.679	0.679	Algeria,Egypt
1	0	1	1	1	1	1	0.679	0.679	Cameroon,Niger
1	1	1	1	1	1	1	0.656	0.656	Angola,Congo (DR), Nigeria
1	0	1	1	0	1	1	0.617	0.617	Equatorial Guinea, Uganda, Zambia,
1	1	1	0	0	1	1	0.605	0.605	Senegal
0	0	0	1	0	1	0	0.585	0.585	Mauritania
1	1	0	1	0	1	0	0.573	0.573	Morocco
0	0	1	1	1	1	0	0.517	0.517	Lesotho,Madagascar,Somalia
1	1	0	1	1	1	0	0.503	0.503	Zimbabwe
0	1	1	1	0	1	0	0.491	0.491	Kenya
0	0	1	1	0	1	0	0.491	0.491	Rwanda,Togo
0	1	0	1	0	1	0	0.488	0.488	Djibouti
1	0	0	0	0	1	0	0.481	0.481	Botswana,Tunisia
0	1	1	1	1	1	0	0.479	0.479	Guinea
0	0	1	0	0	1	0	0.470	0.470	Mali
0	1	0	1	1	1	0	0.459	0.459	Gambia
1	0	1	0	0	1	0	0.451	0.451	Benin,Burkina Faso
1	1	1	1	0	0	0	0.396	0.396	Congo (Republic), Ethiopia
1	1	1	1	1	0	0	0.388	0.388	Mozambique
0	1	1	1	0	0	0	0.327	0.327	Burundi,Tanzania
0	1	1	1	1	0	0	0.255	0.255	Sierra Leone
0	0	0	0	1	0	0	0.239	0.239	Liberia
0	0	1	1	0	0	0	0.230	0.230	Eswatini, Malawi, Sudan

0	1	0	1	0	0	0	0.212	0.212	Eritrea
0	0	1	1	1	0	0	0.194	0.194	Central African Republic
0	1	0	1	1	0	0	0.171	0.171	South Sudan
0	0	0	1	0	0	0	0.153	0.153	Guinea-Bissau
1	1	0	0	1	0	0	0.131	0.131	Namibia
0	0	0	1	1	0	0	0.129	0.129	Libya

Table 4. Truth Table

Cases	PIL	STRAT	IMP	DEM	CRIM	NORM	OUT
Algeria	0.99	1	1	0.99	0.40	1	1
Angola	0.87	0.67	1	0.97	0.70	1	1
Benin	0.52	0.33	0.67	0.46	0.23	1	0
Botswana	0.55	0.33	0	0.36	0.41	1	1
Burkina Faso	0.53	0.33	1	0.36	0.37	1	0
Burundi	0.11	1	0.67	1.00	0.46	0	0
Cameroon	0.72	0.33	1	0.99	0.65	1	1
Central African Republic (CAR)	0.11	0.33	0.67	0.94	0.97	0	0
Chad	0.09	0.33	0	0.99	0.85	1	1
Congo, Democratic Republic of the	0.77	1	0.67	0.98	0.97	1	0
Congo, Republic of the	0.51	1	1	0.99	0.39	0	0
Cote d'Ivoire	0.69	0.33	0.33	0.64	0.47	1	1
Djibouti	0.07	0.67	0	0.99	0.37	1	1
Egypt	1.00	1	1	1.00	0.35	1	1
Equatorial Guinea	0.51	0.33	1	1.00	0.29	1	0
Eritrea	0.09	0.67	0	1.00	0.21	0	0
Eswatini	0.15	0.33	0.67	1.00	0.33	0	0
Ethiopia	0.91	1	1	0.99	0.40	0	1
Gabon	0.29	1	0	0.96	0.50	1	0
Gambia	0.07	1	0.33	0.68	0.53	1	0
Ghana	0.84	0.33	1	0.26	0.31	1	1
Guinea	0.07	1	1	0.97	0.54	1	0
Guinea-Bissau	0.07	0.33	0	0.79	0.40	0	0
Kenya	0.09	1	1	0.89	0.49	1	1
Lesotho	0.07	0.33	0.67	0.51	0.78	1	0
Liberia	0.07	0.33	0.33	0.45	0.96	0	0
Libya	0.24	0.33	0.33	0.99	0.51	0	0

Madagascar	0.06	0.33	1	0.83	0.60	1	1
Malawi	0.06	0.33	0.67	0.74	0.48	0	1
Mali	0.07	0.33	0.67	0.26	0.42	1	1
Mauritania	0.09	0.33	0.33	0.95	0.27	1	0
Morocco	0.98	0.67	0.33	0.99	0.35	1	1
Mozambique	0.54	1	0.67	0.95	0.63	0	1
Namibia	0.52	1	0.33	0.34	0.66	0	0
Niger	0.52	0.33	1	0.71	0.89	1	1
Nigeria	1.00	1	1	0.64	0.70	1	1
Rwanda	0.43	0.33	1	1.00	0.17	1	1
Senegal	0.60	1	1	0.32	0.35	1	1
Sierra Leone	0.15	1	1	0.68	0.67	0	0
Somalia	0.06	0.33	1	1.00	0.73	1	0
South Africa	1.00	1	1	0.28	0.91	1	1
South Sudan	0.07	1	0.33	1.00	0.95	0	0
Sudan	0.07	0.33	1	0.99	0.33	0	0
Tanzania	0.07	1	1	0.95	0.43	0	1
Togo	0.29	0.33	1	0.89	0.31	1	0
Tunisia	0.74	0.33	0.33	0.28	0.32	1	0
Uganda	0.67	0.33	0.67	0.99	0.45	1	1
Zambia	0.62	0.33	0.67	0.98	0.36	1	1
Zimbabwe	0.66	1	0.33	0.99	0.52	1	0

Table 5 Calibration

Cases	Condition 1	Condition 2	Condition 3	Condition 4	Condition 5	condition 6	outcome		
African Countries	GDP (billion)	STRATEGIC PARTNER	IMPORT PARTNER	DEMOCRATIC LEVEL	CRIME INDEX	NORMATIVE FRAMEWORK	SURVEILLANCE PROJECTS	Implementation	Type
Algeria	170	Comprehensive strategic	1	0.31	51.5	1	1	2018	Smart City-Public Security project
Angola	68	strategic	1	0.37	65.8	1	1	2018	Smart City-Public Security project
Benin	12	Regular	2	0.62	35.3	1	0		
Botswana	16	Regular	6	0.68	52.6	1	1	2017	Smart City-Public Security project
Burkina Faso	14	Regular	1	0.68	49.4	1	0		
Burundi	3	Comprehensive strategic	2	0.16	56.6	0	0		
Cameroon	39	Regular	1	0.29	64.2	1	1	2018	Smart City-Public Security project
Central African Republic (CAR)	3	Regular	2	0.41	83.5	0	0		
Chad	2	Regular	6	0.27	71.7	1	1	2012	Smart City-Public Security project
Congo, Democratic Republic of the	47	Comprehensive strategic	2	0.34	82.8	1	0		
Congo, Republic of the	11	Comprehensive strategic	1	0.25	50.5	0	0		
Cote d'Ivoire	35	Regular	4	0.56	57.5	1	1	2009	e-government
Djibouti	1	strategic	6	0.26	49.2	1	1	NA	Smart City-Public Security project
Egypt	300	Comprehensive strategic	1	0.18	47	1	1	2019	Smart City-Public Security project
Equatorial Guinea	11	Regular	1	0.18	41.9	1	0		
Eritrea	2	strategic	6	0.07	32.8	0	0		
Eswatini	4	Regular	2	0.13	45.8	0	0		
Ethiopia	80	Comprehensive strategic	1	0.27	51.4	0	1	2018	Smart City-Public Security project
Gabon	7	Comprehensive strategic	5	0.39	60.1	1	0		
Gambia	1	Comprehensive strategic	4	0.55	60.7	1	0		
Ghana	60	Regular	1	0.74	44.1	1	1		
Guinea	1	Comprehensive strategic	1	0.37	61.2	1	0		
Guinea-Bissau	1	Regular	6	0.51	51.8	0	0		
Kenya	2	Comprehensive strategic	1	0.46	58.8	1	1	2016	Smart City-Public Security project

Lesotho	1	Regular	2	0.60	68.5	1	0		
Liberia	1	Regular	3	0.63	80.9	0	0		
Libya	6	Regular	2	0.27	60.4	0	0		
Madagascar	0,5	Regular	1	0.49	62.7	1	1	2018	Smart City-Public Security project
Malawi	0,5	Regular	2	0.53	58.6	0	1	2015	E-government & National Identity
Mali	1	Regular	2	0.74	53.5	1	1	NA	Smart City-Public Security project
Mauritania	2	Regular	4	0.40	40	1	0		
Morocco	130	strategic	3	0.26	47.1	1	1	2019	Smart City-Public Security project
Mozambique	15	Comprehensive strategic	2	0.40	63.7	0	1	2018	Smart City-Public Security project
Namibia	13	Comprehensive strategic	3	0.69	64.6	0	0		
Niger	12	Regular	1	0.54	74	1	1	2019	Surveillance equipment (Cameras)
Nigeria	420	strategic	1	0.56	65.8	1	1	2017	Smart City-Public Security project
Rwanda	9	Regular	1	0.23	27.3	1	1	2016	Smart Kigali initiative
Senegal	23	Comprehensive strategic	0	0.70	47.1	1	1	NA	Smart City-Public Security project
Sierra Leone	4	Comprehensive strategic	1	0.55	64.7	0	0		
Somalia	0,5	Regular	1	0.16	66.7	1	0		
South Africa	400	Comprehensive strategic	1	0.73	75.5	1	1	2018	Smart City-Public Security project
South Sudan	1	Comprehensive strategic	4	0.16	80	0	0		
Sudan	1	Regular	1	0.27	45.5	0	0		
Tanzania	1	Comprehensive strategic	1	0.40	54.4	0	1	NA	Smart City-Public Security project
Togo	7	Regular	1	0.46	43.5	1	0		
Tunisia	42	Regular	3	0.73	44.7	1	0		
Uganda	32	Regular	2	0.30	55.9	1	1	2014	Smart City-Public Security project
Zambia	25	Regular	2	0.35	47.9	1	1	2015	Smart City-Public Security project
Zimbabwe	30	Comprehensive strategic	3	0.30	60.6	1	0		

Table 6 Raw Data

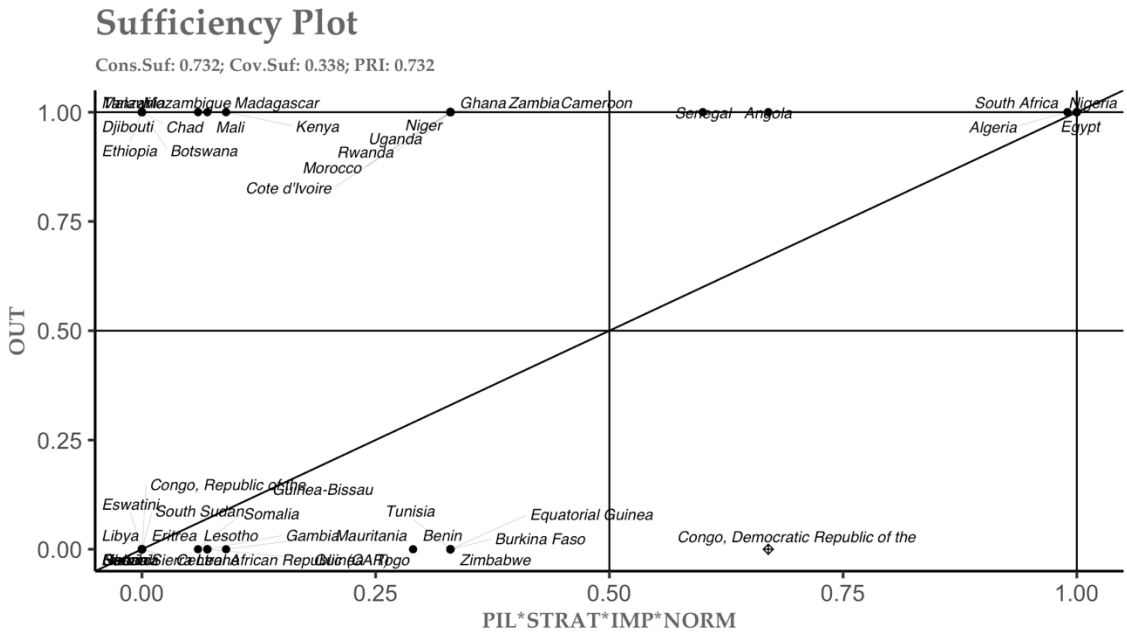

Figure 2. Scatterplot with the position of countries in relation to the first sufficiency paths

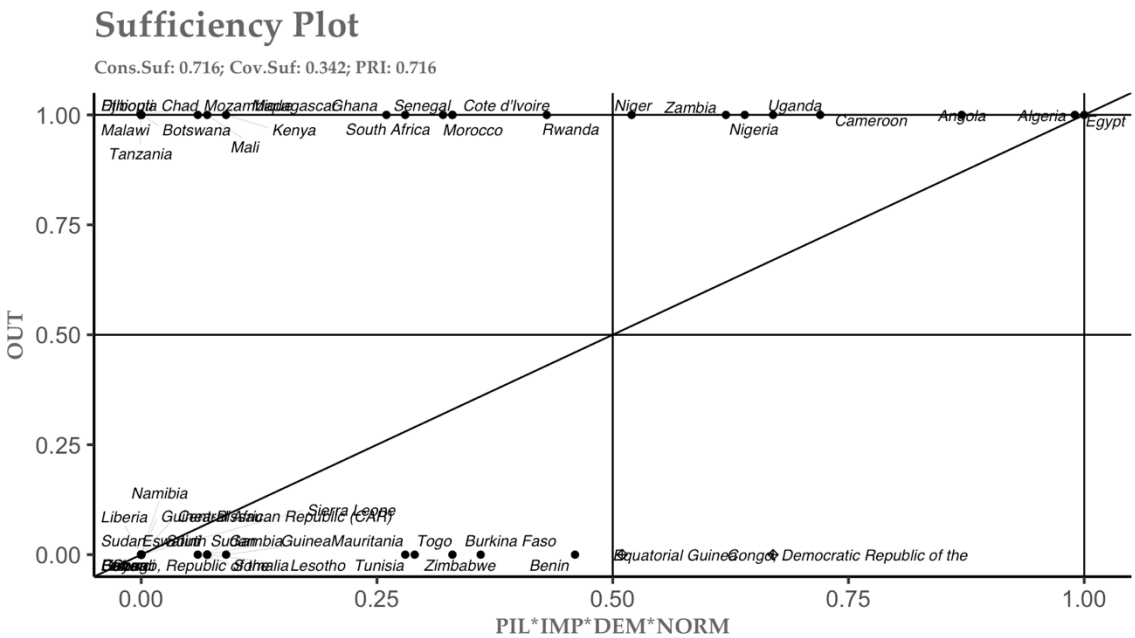

Figure 3 Scatterplot with the position of countries in relation to the second sufficiency paths

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The Luiss School of Government (SoG) is a graduate school training high-level public and private officials to handle political and government decision-making processes. It is committed to provide theoretical and hands-on skills of good government to the future heads of the legislative, governmental and administrative institutions, industry, special-interest associations, non-governmental groups, political parties, consultancy firms, public policy research institutions, foundations and public affairs institutions. The SoG provides its students with the skills needed to respond to current and future public policy challenges. While public policy was enclosed within the state throughout most of the last century, the same thing cannot be said for the new century. Public policy is now actively conducted outside and beyond the state. Not only in Europe but also around the world, states do not have total control over those public political processes that influence their decisions. While markets are Europeanised and globalised, the same cannot be said for the state.

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