

# **Telecommunications Ownership and Control (TOSCO). A new dataset on ownership of internet infrastructure in Africa, 2000-2016**

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## **--- WORK IN PROGRESS ---**

The internet provides a space for sharing digital information and communication. This space is built on a physical infrastructure owned by a variety of state and private actors, foreign and domestic, that reflect a multitude of interests. This paper presents TOSCO, a new dataset on ownership and control of internet service providers that allows for comparative large- $N$  analysis of the determinants and effects of varying ownership structures and identities in the transforming context of African countries from 2000 to 2016. We provide a detailed discussion of the conceptualization and operationalization of ownership as a variable. Descriptive statistics illustrate varying ownership of ISP since the internet became accessible to a larger population across the continent, and correlational statistics illuminate potential venues for research using our data.

**Keywords:** Internet diffusion; internet service providers; internet control; owner identity; telecommunications

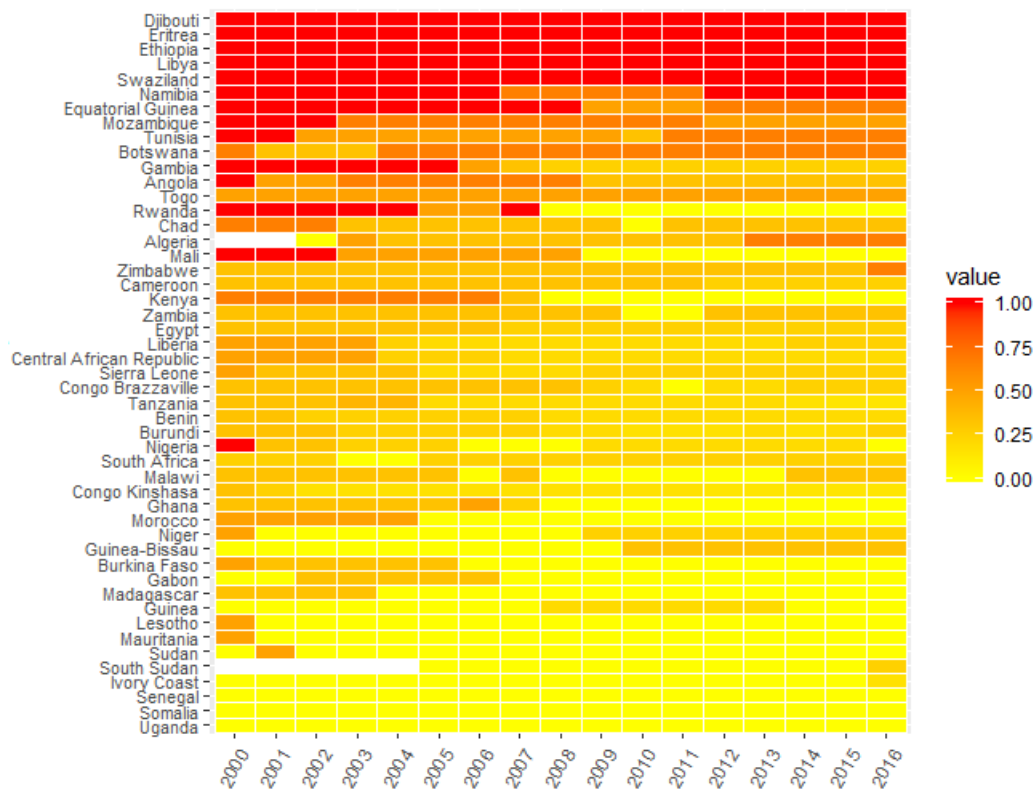
Access to, use of, and also the impact of ‘the internet’—familiar shorthand for information and communication technologies (ICT)—is unevenly distributed within and across countries, raising concerns for a ‘digital divide’ (Norris 2001). Existing research points to a positive relationship between the use of ICT and a country’s performance in terms of economic growth or prospects for democracy (Corrales and Westhoff 2006; Howard and Mazaheri 2009; Vu 2011). At the same time, ICT has been shown to enable repressive regimes to impose further restrictions on political, social and economic liberties (Rød and Weidmann 2015; Gohdes 2015). While the effects of internet diffusion may appear to depend on the political environment and the regime type, there is systematic evidence that the spread of the internet, too, is determined by political factors, notably the preferences of those in power (Milner 2006; Stier 2017).

Most accounts recognize that internet services are no resource that governments have necessarily and automatically control over. Rather, they acknowledge that the incumbent mostly relies on internet-providing telecommunication companies to delay, prevent or manipulate the access to internet services. Milner (2006: 185), for instance, refers to China as an example in which internet service providers (ISPs) are “forced [...] to monitor the Web for“ the government. And Rød and Weidmann (2015: 340) point out that “[c]onveniently for autocrats, online services are often provided by state-run telecommunications agencies”, which they assume to facilitate government control of internet-based communication; they further notice “that even when the suppliers of Internet connections are privately owned, they are often obliged to comply with government requests”. Yet, studies that account for the ownership structure of the telecommunications sector in a systematic and rigorous manner are missing.

The key theoretical problem with existing accounts of the determinants and effects of internet penetration lies in the implicit assumption that the incumbent government can make any internet-providing telecommunication company comply with its requests. However, and as Vendil Pallin’s (2017) case study on Russia discloses, a government’s leverage over ISPs depends on its relationship with the owner of these companies. The challenges and risks a government faces when seeking to extend its repressive control to foreign-owned companies differ from those associated with companies either owned by the state or by someone close to the incumbent (cf. Freyburg and Garbe 2018).

Telecommunications companies control the gateway through which all digital information and communication must pass (DeNardis 2014:11). They can be seen as centralized points of control or “the most important and most obvious gatekeepers to the internet” (Goldsmith and Wu 2006:73). The internet essentially relies on a network of small local physical networks of computers. Interconnected across the globe via copper cables, fiber optic cables, or radio waves, these conglomerate networks belong to different internet service providers that enable ‘last-mile’-connection to end-users. With ISPs there hence exists an industry-wide capacity to grant and to restrict access to manifold internet-based services on which an increasingly digitalized economy and society relies. The potential for using this capacity may depend on the nature of those who actually own ISPs.

**Figure 1.** Patterns of state involvement in the African telecommunications sector



*Note:* The darker the squares are shaded, the higher the degree of domestic state involvement among all ISPs in a country in a given year, e.g. red squares mark 100 percent state-owned telecom sector; empty squares for years with no ISPs.

Figure 1 underlines why it seems worth studying the ownership structure of the telecommunications sector. The figure demonstrates the retreat of the state from the

initially state-dominated sector across the African continent between 2000 and 2016. It maps the share of companies that are majority state-owned (>51 percent) in the total number of companies within a given country. It turns out that in several African countries, the share of majority state-owned companies is still 100 percent. In Djibouti, Eritrea and Ethiopia, the government has always been the majority-owner of the only ISP operating in the country. In most countries, however, the degree to which the state is involved considerably decreased with time. In Senegal and Malawi, for instance, the state has no majority in any ISP anymore. In Tunisia, in turn, the involvement of the state in ISPs operating on its territory first decreased and then—with a change in the political regime—increased again. Overall, Figure 1 suggests that ISP ownership varies considerably across African countries and time.

How can the observed change in ownership structures be explained? For instance, what role do national political and economic factors play in the privatization of the telecommunications sector? How does the international and transnational integration of markets and polities affect a state's capacity to maintain control of the digital flow of information and communication? And, what difference does telecommunications ownership make in terms of political liberalization, economic development, and citizens' ability to use ICT for the purpose of protest? To answer these and other questions about the effects and determinants of ISP ownership, one needs cross-sectional, time-series data at company-level, which to date, is largely missing. The “extremely difficult and tedious” (Schneider, Fink and Tenbücken (2005:706; cf. La Porta *et al.* 1999:474) compilation of such historical and detailed data may be one reason why political scientists tend to treat the internet as a ‘black box,’ largely neglecting its inner working and corresponding conditions of ownership and control.

With this paper, we introduce the first large-scale dataset on Telecommunications Ownership and Control (TOSCO) to help narrowing this gap. TOSCO covers all telecom companies that are members of the Global System for Mobile Communication (GSM) Association and started providing internet with second generation standards. These companies usually cover the majority of a country's population. Additionally, we also include the 14 operators that provide access to the internet through fixed lines. We exclude companies that provide 2G through CDMA, that only provide 3G (UMTS) and/or 4G (LTE/WiMax) services. We exclude these

companies because they only comprise small parts of a country's internet user base; the latter two also usually run on top of the infrastructure of GSM providers. Mobile virtual networks operators (MVNO) are therefore omitted, too. Overall, we only consider ISPs that are telecom companies with a physical presence in the territory on which they operate and that hold official state licenses to operate cables and possess communications infrastructure.

TOSCO allows for cross-sectional, time-series large- $N$  analysis of the determinants and effects of ISP ownership in the African developing context. It makes in particular three contributions to data in this area. First, it provides detailed disaggregated information about ISP ownership at the level of shareholders (providing their exact shares) that allows tailoring the definition of ownership to the needs of the researcher or practitioner (e.g., foreign shareholders; state ownership). The data also lends itself for networked analyses, enabling to follow the development of specific actors or companies across countries and over time. Second, the detailed coding descriptions that document sources and coding choices for every single case allow tracking individual coding decisions and context. Finally, providing the autonomous system (AS) number for each ISP in the dataset, as well as the organization ID provided by the internet registries RIPE and AFRINIC, allows exploring the relationship between ISP ownership and internet activity measured at the level of AS, among other things.

While the dataset is limited to sub-Sahara and North Africa, we conceptualize ownership in a way that is applicable to a variety of questions related to the study of the internet beyond the African continent. The straightforward extension to other parts of the world for comparative research is greatly encouraged. Furthermore, the careful conceptual framework backing this dataset is an essential first step in mapping and understanding the empirical patterns of the politics involved in internet infrastructure. A better understanding of the determinants and effects of ownership in a politically and economically sensitive sector such as telecommunications is not only valuable for better understanding the impact of internet penetration; it is also crucial for the work of practitioners and policy-makers interested in exploiting the development potential of investment in ICT.

In what follows, we first briefly discuss ownership as a variable in political science research. We then describe our conceptualization of ownership in its four dominant types. Section three explains the dataset, our coding decisions and its sources,

before we present potential applications in section four. In so doing, we demonstrate some ways of how our data can be aggregated, demonstrating the flexibility in using the dataset and suggesting avenues for further research. The final section concludes by highlighting the relevance of ISP ownership in explaining the determinants and effects of internet diffusion.

### **Ownership as a variable in political science research**

Although ownership does not necessarily and automatically mean control, it essentially reflects administrative responsibility. In view of the political and economic sensitivities associated with infrastructure ownership, privatized and/or foreign ownership provides a “barometer of states' willingness to share authority with others” (Doh *et al.* 2004:234; cf. Mudambi 2003). Eventually, in all parts of the world, telecommunications has been widely viewed as public infrastructure provided, or at least guaranteed, by the state. The (partial) retreat of the state from public infrastructure, its potential new role, state-investor bargaining, and most importantly the determinants and effects of private (foreign) investments across various cultural, economic, legal and political contexts have been widely discussed by scholars of international business, as a look at the articles published with their flagship outlet, the Journal of International Business Studies reveals.<sup>1</sup>

Our systematic literature review of top political science journals<sup>2</sup> between 1945 and 2019 indicates that ownership as a variable is gaining prominence in political science research, too. Out of the identified 42 articles that deal with ownership as a property of companies, more than 90 percent have been published since the year 2000 and more than 30 percent over the last five years. While four articles study the determinants or effects of privatization of the telecommunications sector (Colli,

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<sup>1</sup> A simple search within the journal yields 240 articles for ‘foreign direct investment’ and 197 results for ‘ownership’ within the last five years only.

<sup>2</sup> We searched the Web of Science during the timespan from 1945 to 2019 using the search term “TS=(owner\* AND (state OR firm OR company)) AND SO=(American Journal of Political Science OR American Political Science Review OR Annual Review of Political Science OR British Journal of Political Science OR European Journal of Political Research OR Political Science and Research Methods OR Journal of Politics OR Political Analysis OR International Organization OR World Politics OR International Studies Quarterly OR Governance OR Comparative Political Studies OR Journal of Peace Research OR Journal of Conflict Resolution OR Conflict Management and Peace Research OR Socio-Economic Review OR Review of International Organizations OR Journal of European Public Policy OR European Union Politics OR West European Politics OR Journal of Public Administration Research and Theory OR Political Geography OR Political Communication)”.

Mariotti and Piscitello 2015; Jho 2007; Schneider, Fink and Tenbrücken 2005; Durant, Legge and Moussios 1998), only one of them, namely Jho's qualitative case study of Korea's "phased liberalization" policy mentions the role of ISPs therein. Existing studies tend to focus on ownership of a country's mass media (Markus and Charnysh 2017; Bailard 2016; Dunaway and Lawrence 2015; Hughes and Lawson 2005; Gilens and Hertzman 2000) or natural resources such as oil, gas and gold (Wegenast and Schneider 2017; Austvik 2012; Emel, Huber and Makene 2011; Luong and Weinthal 2006; Abel 1957).

Distinguishing between basically three arrangements—state-majority ownership as well as private-foreign and private-domestic ownership structures, studies of natural resources highlight the salience of ownership in better understanding the political and economic consequences of natural resources. For instance, Luong and Weinthal (2006: 245) explicitly state that "[t]he neglect of ownership structure as a potential variable has deterred scholars from making explicit connections between the structure of ownership and the negative political and economic outcomes that they attribute to mineral wealth." While Luong and Weinthal's review (2006) provides no systematic test of their argument, the longitudinal study of all major diamond and gold mines as well as onshore oil or gas fields in sub-Saharan Africa by Wegenast and Schneider (2017) supports their argument that ownership matters. Acknowledging the vast variation of ownership arrangements within the same country, Wegenast and Schneider's disaggregated analysis of georeferenced grids reveals that state repression as answer to societal dissent is particularly likely if more than 50 percent of the average total share of oil fields are owned by international companies.

Existing studies of media ownership tend to concentrate on its influence on media content and news coverage. Regardless of whether they focus on the Ukraine (Markus and Charnysh 2017), Latin America (Hughes and Lawson 2005) or the United States of America (Bailard 2016; Gilens and Hertman 2000), studies in this field find substantial differences in how the media reported on specific events depending on the financial interests of their corporate owners. Overall, political science research hence agrees that each form of ownership reflects different forms of business-state relations, and thus, is likely to produce distinct outcomes. In conceptualizing ownership as a variable, we turn to studies of corporate governance that specialize in this matter.

## Conceptualizing ownership

The ownership structure, relating to the number and relative size of shareholders, and the particular identities of these owners is widely seen as having important implications for a company's corporate strategy, managerial decision-making and performance, including its engagement with corporate social responsibility issues (Sur *et al.* 2019; Jamali *et al.* 2008; Thomsen and Pedersen 2000; Shleifer and Vishny 1997). Particularly influential in this regard is Jensen and Meckling's (1976) agency theory, according to which the principal (i.e. the shareholder) should develop mechanisms for exerting control over the agent (i.e. the manager/s). Shareholders may exercise such control through the right to elect the board of directors, to appoint the management team, to approve mergers, or to appropriate a company's residual earnings, among others (Hansmann 2013:897). Since the board of directors (and the chief executive officer) are accountable to the shareholders at all times, it is them that stipulate, albeit indirectly, the strategic direction of a company (Leech 2002:2).

**Table 1.** Properties of owner identities

	<b>State</b>	<b>Individual/ Family</b>	<b>Corporation</b>	<b>Financial Institution</b>
<i>Goals</i>	political objectives	wealth maximation	profit maximation	asset maximation
<i>Attitudes toward risk</i>	willing	averse	neutral	willing
<i>Control over the management</i>	high	high	medium	low

We follow the literature and distinguish between four main types of owner identities in our dataset: the state government, a single individual or family, a corporation, and a financial institution (La Porta *et al.* 1999; Thomsen and Pedersen 2000; Strange 2018:1235; Sur *et al.* 2019). The different groups of shareholders are likely to vary in their goals, risk propensities, and in their relation with the management, as summarized in Table 1.

*State-owned firms* are typically run by bureaucrats equipped with concentrated control rights and objectives dictated by political interests (Tusiime *et al.* 2011:252;



Shleifer and Vishny 1997).<sup>3</sup> The (majority of the) board members are appointed by the government. They are not necessarily interested in maximizing efficiency or profit but may pursue other, socio-political or even ideological goals such as the protection/discrimination of vulnerable minorities or the creation/maintenance of jobs (Hart, Shleifer, and Vishny 1997). In that sense, state ownership may have a regulatory function (Thomsen and Pedersen 2000:694), but can also serve to gain votes (Villalonga 2000). “[N]either exclusively profit driven, nor bound by hard budget constraints” (Cannizzato and Weiner 2018:177), state-owned firms tend to be willing to take more risks as it is the public who ultimately “pays for the losses” (La Porta *et al.* 1999:476; cf., Cuervo-Cazurra *et al.* 2014).

If a *single private individual or family* owns shares of a company, the entrepreneur’s personality and interests typically define its business interests (Miller 1987:693). This is often strengthened by a double role for the individual/family as both owner and manager (Thomsen and Pedersen 2000:693). The resources brought to the company by the investor are linked to individual-specific concerns, including family values and the protection of capital (Sur *et al.* 2010:376; Arregle *et al.* 2007). Individual/family owners are typically considered as being risk-averse and driving firm strategy to be conservative. They aim at ensuring the survival of the company, with the goal to pass direct control on to later generations (Miller *et al.* 2010:203). Viewing “their images and reputations as inextricably connected to the firms they own [, individuals/families tend to be] unwilling to damage those reputations through irresponsible actions in part of their firms” (Dyer and Whetten 2006:797). The distinction between firms that are owned by the state and firms owned by individuals/families is often blurred as in many cases the said individuals occupy powerful positions in the government, have strong ties to influential government officials or are close allies, if not relatives of the incumbent (Arayssi and Jizi 2019; Djankov *et al.* 2003).

*Corporate owners* are conventional business corporations that pursue traditional economic goals, notably profit maximation, and are interested in firm-specific

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<sup>3</sup> State governments can own shares of a company either directly (i.e. by the central government itself) or indirectly (i.e. through other state-owned companies like pension funds, national banks, political parties or other state-owned institutions such as the National Petroleum Corporation in Ghana).

concerns, such as the generation of capability or the “uninterrupted supply of goods and resources” (Sur et al 2013:378). Often investment decisions by corporations are motivated by strategic objectives such as prospective mergers or branding (Dam and Scholtes 2012:236). Telecommunication companies tend to invest in firms related to the telecommunications sector. In consequence, corporate owners commonly have the relevant expertise and know-how that allows them to not only contribute financial resources but to also provide managerial expertise as well as technical and organisational resources (Sur *et al.* 2013:379; Douma *et al.* 2006:643). While corporate owners are portrayed as generally risk-neutral, they are seen as cautious in their investment strategies (Cannizzaro and Weiner 2018). They do not enter and leave a market rapidly but expand activities following long-term business-plans.

Finally, *financial institutions*, such as mutual funds, hedge funds, or insurance companies, invest in potentially profitable companies to arrive at financial returns in the best interest of their ultimate investors. Their main goal is less the monitoring of the company’s strategies, but rather to safeguard and enhance their financial investment (Sur *et al.* 2013:376). As “delegated monitors” (Dam and Scholtens 2012:236), financial-institutional owners hence emphasize financial controls over strategic controls (Yan and Zhang 2009) and rather keep an “arm’s-length relationship” (Thomsen and Pedersen 2000:693) with the management. While the risk propensity of institutional shareholders depends on the type of institution—e.g., hedge funds search for quick profits while pension funds are interested in long-term outcomes (Boss *et al.* 2013), each of them is likely to have well-diversified portfolios. Moreover, if an institutional investor is dissatisfied with a company’s share performance, it can relatively easily just sell its ownership stake (Douma *et al.* 2006:643). This makes institutional investors “effectively risk-neutral and more willing to accept increased risk exposure” (Strange 2018:1234).

While sharing a number of important key features, these four groups of shareholders are no homogeneous units. Their goals and activities are likely to depend on the social, economic and political environments in which they operate, in particular the home country institutions (Strange 2018:1236; Estrin *et al.* 2016). We therefore include the shareholders’ headquarters, which we define as the country in which the company was originally founded and is registered (Birkinshaw *et al.* 2006: 684). In case they are listed, we add the location of the respective stock exchange. We expect

the location of the owner's headquarter to be relevant in several ways: It does not only allow to distinguish between domestic and foreign owners but, relatedly, also to qualify their home environment in terms of the democratic quality of political rule, potential ex-colonial relationships, and the jurisdiction to which a company is subject, among others.

Foreign ownership is not only associated with higher performance (partially due to self-selection of more efficient and capital-intensive into foreign investment)—through the provision of financial capital, knowledge, organizational resources and quality control systems (Douma *et al.* 2006; Heugens *et al.* 2009; Desender *et al.* 2016)—but also expected to affect state-business relations. Existing studies demonstrate that decisions to invest in a foreign market are often influenced by close diplomatic relations between host and home countries. Foreign investors appear less sensitive to political risks when the host country has a similar UN voting record as their home country (Duanmu 2014). We further know that the quality of the host institutions influences investment decisions. Eventually, chances of expropriation increase with only limited legal protection (Blonigen 1997). Softer forms of political interference involve the obligation of accepting a 'local' chairman presiding the board of shareholders as facilitator between a company's owners, the management and the state government (Wanyama *et al.* 2013, Nkundabanyanga *et al.* 2013). Moreover, differences between the preferences and non-economic motivations of state-owned and privately owned companies might vanish if both are listed or come from home countries with similarly high government quality (e.g. Grøgaard *et al.* 2019; Estrin *et al.* 2016).

Accounting for a company's headquarter also allows us to capture that a company can become subject to two potentially conflicting laws: the local law of the country in which it operates and the national laws of the countries in which it is registered. This may matter with regard to corporate responsibility, for instance. A case in point are firms with headquarters in a member state of the European Union (EU), which are subject to the 2012 regulation on jurisdiction in civil matters<sup>4</sup> that allows victims of human rights abuse committed by corporations to bring a tort claim against

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<sup>4</sup> EU Regulation No. 1215/2012 of 12 December 2012 on jurisdiction and the recognition and enforcement of judgments in civil and commercial matters (recast), OJ L 351/1, 20 December 2012, Art. 2.

a company domiciled in the EU, even if the harm that provides basis for the claim occurred outside of the EU (van Dam and Gregor 2017).

We further expect the location of the stock exchange where a company is listed to have implications on its corporate strategy and managerial decisions, notably with regard to legal and regulatory responsibilities.<sup>5</sup> Stock exchanges vary in their accounting and regulatory disclosure requirements. Advanced capital markets tend to require not only clear and precise information that allows for effective monitoring, but often also demand the disclosure of social and environmental impacts along with their financial reporting (Estrin *et al.* 2016:298). This may incentivize a listed company to commit to human rights, to engage in voluntary environmental agreements, or to take measures against corruption and bribery (Siegel 2009).

If a company is listed on local and/or international stock exchanges, a large part of its shares is often held by owners who individually own less than 5 percent of firm equity, which is the common threshold for being classified as blockholder, as defined by the United States Securities and Exchange Commission (cf. Holderness 2009). Together, however, they may represent significant shares of the total ownership. These small investors present a rather dispersed and versatile type of ownership. Typically, they have only limited interest to get involved in the activities and management of a company, but focus mostly on diversifying their investment portfolios (Thomsen and Pedersen 2000; Connelly *et al.* 2010). We do not consider small investors as a separate type of ownership because each of the four types—state; individual/family; corporation; financial institutions—can be at least partially traded on the stock exchange.

## **Measuring telecommunications ownership in Africa, 2000-2016**

TOSCO covers the ownership of commercial ISPs in all 50 independent mainland countries plus Madagascar<sup>6</sup>, i.e. 45 sub-Saharan and the five North African countries, from 2000 until 2016. The total number of companies included is 193, which amounts to 2'622 company-years over the time period covered. The number of companies operating on the African continent has increased from 108 in 2000 to 175 in 2016. It

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<sup>5</sup> It is increasingly common to find partial state ownership among listed firms (Estrin *et al.* 2016).

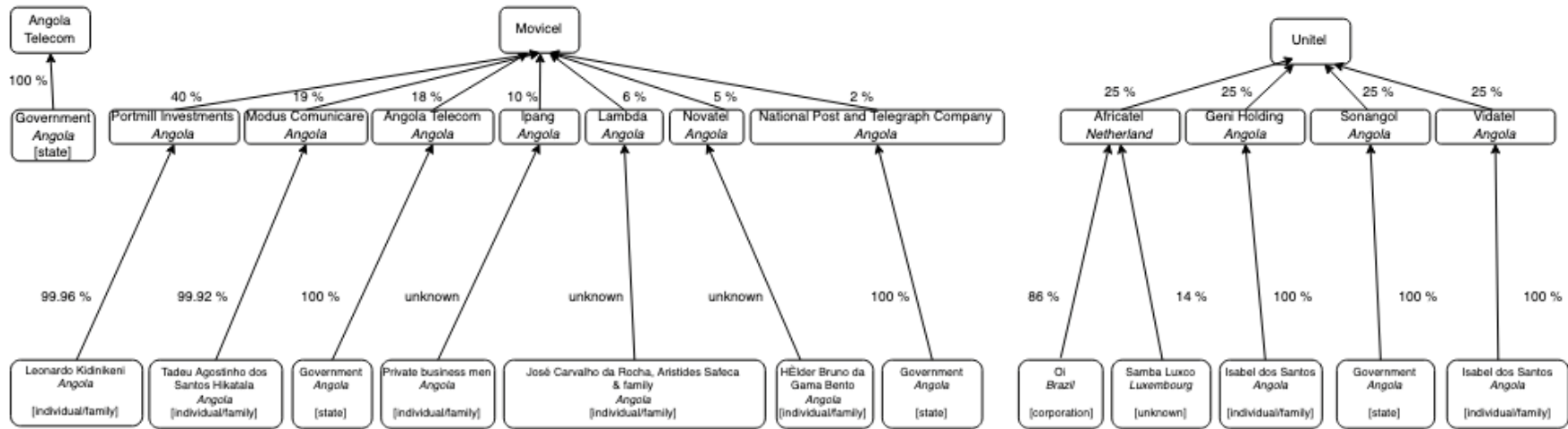
<sup>6</sup> Due to data availability and comparability of connectivity, we exclude the small islands Cape Verde, Comoros, Mauritius, La Reunion, Sao Tome and Principe, and the Seychelles.

varies greatly from one in Djibouti and Eritrea to eight in Ivory Coast and Somalia in 2016. Although the internet is said to have arrived to Africa (precisely South Africa) in 1991, it is not before the early 2000s that it became accessible to a larger population across the whole continent (Aker and Mbiti 2010). Going back in time allows capturing interdependences and hierarchies between IPSs.

We focus on the African continent because this region of the world is especially marked by economic and political transitions that we expect to drive cross-national variation in ISP ownership (Albiman and Sulong 2016; Hadenius and Teorell 2007). Its market is characterized by a booming young and urban population that has quickly adopted ‘smart’ mobile phones through which internet services are accessed (Wavre, 2018:2). The profits of telecommunications companies are usually bolstered by loose regulation and low competition (Schoentgen and Gille 2017). As compared to other sectors, foreign direct investment in the telecommunications sector has relatively high entry barriers, is usually very concentrated and often subject to government involvement. Eventually, many African governments face a typical “dictator’s dilemma” (Boas 2006): How to embrace the economic development potential of ICT and retain the traditional levers of state-monopolistic control over the national information and networking industry? In light of this transforming context, our dataset allows to investigate crucial questions of economic development and authoritarian survival associated with an increasing internet connectivity.

Why these features are particularly pronounced on the African continent, other regions in the global South present similar characteristics. In particular, several countries in Latin America or the Middle East also experienced colonial rule, present thriving markets with young consumers (Howard and Mazaheri 2009; Wavre 2018), experienced extensive privatization efforts in the telecommunications sector by the World Bank and other international organizations (Wallsten 2001), and are often ruled by authoritarian governments, among other similarities. Taking the example of countries in sub-Saharan and North Africa, our data allows addressing key issues in these parts of the world where the internet is increasingly used not only for communication and information dissemination but also for e-business, e-commerce and ICT-based public services such as e-health.

**Figure 2.** Structure of telecommunications ownership in 2016 Angola



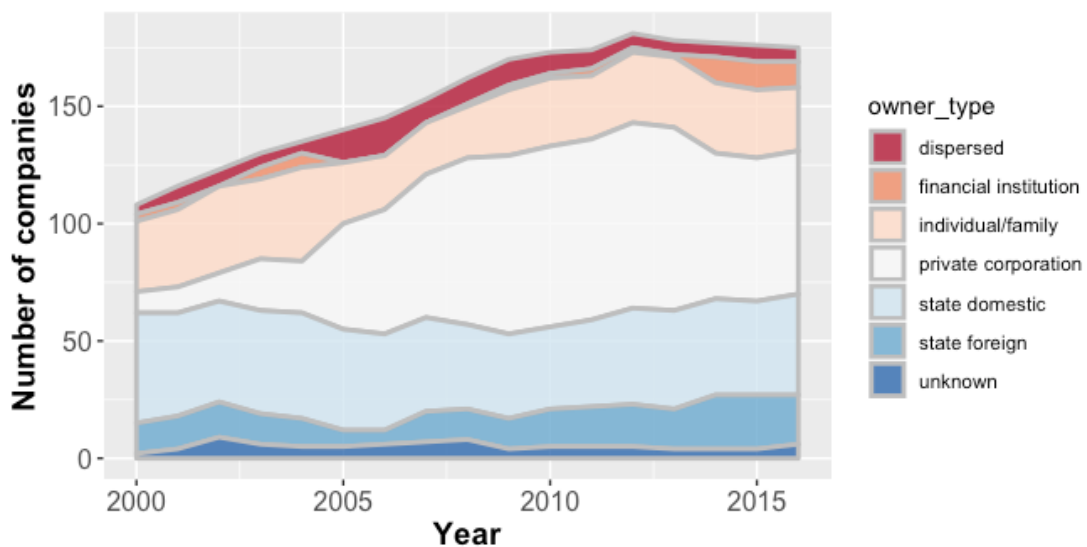
Our unit of analysis is the individual shareholder. For each GSM provider in a country, we consider all shareholders and their exact shares, plus, if applicable, the shareholders owning each of these shareholders and their exact shares. To give an example, in 2016 Angola, access to the internet was provided by three companies (see Figure 2): Unitel (Angola), Movitel (Angola) and Angola Telecom. Angola Telecom is 100 percent state-owned. The country's largest ISP Unitel (Angola), in turn, is owned by four shareholders with each 25 percent of the shares, namely Africatel (Netherlands), Sonangol (Angola), Geni Holding (Angola) and Vidatel (Angola). Looking at their respective shareholders reveals that the state is indeed involved in all three companies operating on Angolan territory. In the case of Unitel, both Geni Holding and Vidatel are owned 100 percent by Isabel dos Santos, the daughter of José Eduardo dos Santos, then president of Angola, and the state oil company Sonangol is 100 percent directly owned by the Angolan state. As concerns Movitel, 20 percent of its shares are owned by two state companies, Angola Telecom and the National Post and Telegraph Company. The remaining 80 percent is split between five ostensibly private Angolan companies; yet, all of them are majority owned by the president's entourage. The majority shareholders of the Angolan investment company Lambda include the Minister of Telecommunications and Information Technologies José Carvalho da Rocha, his deputy, and members of both their families. Portmill Investments and Modus Comunicare are owned by two lieutenants that serve in the presidential guard. This example demonstrates the importance of the second shareholder level to be included if one was interested in the influence of specific actors, such as the state.

TOSCO allows for different ways of how to assess a company's owner identity and ownership concentration (based on the aggregated identity of its shareholders) as well as a country's ownership structure of the telecommunications sector (considering the aggregated identity of the companies). For this purpose, it can be screened on multiple criteria, including identity type (e.g. state government (indirect/direct); private corporation), subsidiaris (e.g., number, country, foreign/domestic) and shareholders' political and economic background (e.g. democratic; ex-colonial; industrialized). While the ownership structure of a company informs about the existence of agency problems, the particular identities of owners play a role as well in influencing a company's strategic decisions. Eventually, in terms of structure, the absence of a dominant shareholder might make it easier for managers to pursue their own goals at the expense

of shareholders' interests and preferences. Providing granulated data at the shareholder level, we allow researchers to define the thresholds according to their research needs and interests.

A company's owner identity is typically determined based on the respective individual ('blockholder') or aggregated percent of shares hold (Sur *et al.* 2019). Next to the single-controlling shareholder that can virtually "dictate corporate policy [...] by managing the firm directly" (Bennedsen and Wolfenzon 2000:114), the majority shareholder has decisive influence in the business operations and strategic direction of the company by virtue of controlling more than half (> 51 percent) of the voting interests in the company (Thomsen and Pedersen 2000). Figure 3 shows the development in the distribution of majority owner types across the African telecommunications sector over time. If no single majority holder exists, we identify the majority owner type based on the totaled shares of the dominant shareholder group, e.g. if the sum of shares of all private-corporate owners collectively exceeds 51 percent, this company would be majority-owned by private corporations. In the absence of any individual or collective majority owner type, we view a company's ownership as being dispersed among a large number of small shareholders.

**Figure 3.** Distribution of majority owner type, 2000-2016



*Note:* If no single majority owner exists, we determine majority owner type based on totaled shares of dominant shareholder group; companies with no single or collective majority owner type have dispersed ownership.



**Table 1.** The 10 shareholders with the largest number of subsidiaries

<b>Shareholder name</b>	<b>No of subsidiaries</b>	<b>Headquarter</b>	<b>Subsidiaries</b>	<b>Majority owner type</b>
MTN	16	South Africa	Benin, Cameroon, Congo Brazzaville, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Liberia, Nigeria, Rwanda, South Africa, Sudan, South Sudan Swaziland, Uganda, Zambia	corporation
Orange	16	France	Botswana, Burkina Faso, Cameroon, Central African Republic, Congo Kinshasa, Egypt, Equatorial Guinea, Guinea, Guinea Bissau, Ivory Coast, Liberia, Madagascar, Mali, Morocco, Niger, Senegal	corporation
Airtel	15	India	Chad, Congo Brazzaville, Congo Kinshasa, Gabon, Ghana, Kenya, Madagascar, Malawi, Niger, Nigeria, Rwanda, Sierra Leone, Tanzania, Uganda, Zambia	corporation
Millicom	5	Luxembourg	Chad, Ghana, Rwanda, Senegal, Tanzania,	corporation
Atlantique Telecom	5	Ivory Coast	Benin, Central African Republic, Ivory Coast, Niger, Togo	state
Vodacom	5	South Africa	Congo Kinshasa, Lesotho, Mozambique, South Africa, Tanzania	corporation
Africell	4	Lebanon	Congo Kinshasa, Gambia, Sierra Leone, Uganda	individual/ family
Smart	4	Kenya/Cyprus	Burundi, Sierra Leone, Tanzania, Uganda	financial institution
Econet	3	South Africa	Lesotho, Central African Republic, Rwanda,	dispersed
Vodafone	3	UK	Ghana, Egypt, Uganda	corporation

*Note:* Entries ordered by number of subsidiaries.

In Africa, as in most other parts in the world, the telecommunications sector was traditionally regulated by state-controlled monopolies. Due to increasing awareness for the inefficiency of monopolist operators and technological changes, many countries started liberalizing their markets in the 1990s (Alemu 2018; Lafont and Tirole 2001: 3). This trend came along with privatization but als internationalization. On the African continent, telecommunications turned into a “booming sector at the heart of economic

development” (Alemu 2018:2), attracting major foreign investments from abroad. The share of companies with a headquarter abroad has increased from 42 percent in 2000 to 58 percent in 2016. Several big companies hold shares in various ISPs across Africa (see Table 1). These big companies have headquarters in Africa (e.g. MTN and Atlantique Telecom), Europe (e.g. Orange and Millicom), and beyond (e.g. Airtel and Africell).

Data comes primarily from company and market analysis software (e.g., Thomson and Reuters’ Eikon [[eikon.thomsonreuters.com](http://eikon.thomsonreuters.com)] and Orbis [[orbis.bvdinfo.com](http://orbis.bvdinfo.com)]), specialized blogs (e.g., Research ICT Africa [[www.researchictafrica.net](http://www.researchictafrica.net)]), news websites like All Africa [[AllAfrica.com](http://AllAfrica.com)] and Quartz Africa [<https://qz.com/Africa>], and Bloomberg Snapshot repositories [[www.bloomberg.com](http://www.bloomberg.com)]. This information is triangulated with the annual reports provided by the telecommunications companies and data from market research and analysis companies, in particular African Telecommunications News (AMETW) [[www.africantelecomsnews.com](http://www.africantelecomsnews.com)] and TeleGeography [[www.telegeography.com](http://www.telegeography.com)], which are limited to the dominant companies. All empirical information we use is publicly available online. For each data entry, the corresponding sources are reported and saved as .pdf-file.

In order to ensure data accuracy, we ran several cross checks, and all cases were independently coded by at least two trained research assistants; any discrepancies or uncertainties were discussed in the team at a weekly basis.<sup>7</sup> Despite greatest care in the compilation of the data, for less than 10 percent of the company-years we miss reliable information. For the concerned countries (reliable) data tend to be generally missing; it is an open secret that data on socio-economic indicators in African countries is sparse (Przeworski *et al.* 2000:117)—that is, cases with opaque ownership structures such as Somalia where a functional state government is absent and part of the public infrastructure, including telecommunications, are allegedly owned by warlords with connections to Al-Shabaab such as Ali Ahmed Nur Jim’ale (Iazzolino 2015). Or, cases in which the state administration lacks the capacity to make all companies register their shareholders, let alone make this information electronically available. In cases, in which it was impossible to rely on any sources to code the shareholders, we report the

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<sup>7</sup> Details of the coding procedure are provided in the codebook.

respective shareholder as ‘unknown’ so that its share can be considered when determining properties such as the ownership concentration in a country.

### **Analyzing telecommunications ownership in Africa, 2000-2016**

TOSCO data on ownership of telecommunications companies offering access to the internet on the African continent can be used to explore a multitude of political and economic relationships. We now present potential applications of our dataset, concentrating on preliminary, descriptive insights rather than exhaustive empirical analyses, which we leave to future research. We focus on two approaches: factors that explain changes in the ownership structure of the telecommunications sector across countries and over time—ownership being the dependent variable—and the effects of ownership on violence, corruption, and censorship—ownership being the independent variable. In so doing, we aggregate data so that it fits best the respective research purpose, demonstrating the flexibility in using the TOSCO dataset.

To explore potential context conditions of ownership structures in African countries, we use data on a range of covariates. We then model the relationship between these covariates and our ownership variable(s) using a series of simple bivariate regression analyses, and plot the regression coefficients with 95 percent confidence intervals. In each of correlation, we control for GDP per capita, colonial ties, internet penetration, region and regime type, unless any of these factors became the key independent or dependent variable. This is an exploratory exercise only; our model merely serves as a concise way to summarize the probabilistic relationship between different covariates and telecommunications ownership. While we explicitly refrain from making causal claims regarding these covariates, such correlations can still point to potentially relevant influences that should be incorporated in dynamic, multivariate models.

#### *Ownership as dependent variable*

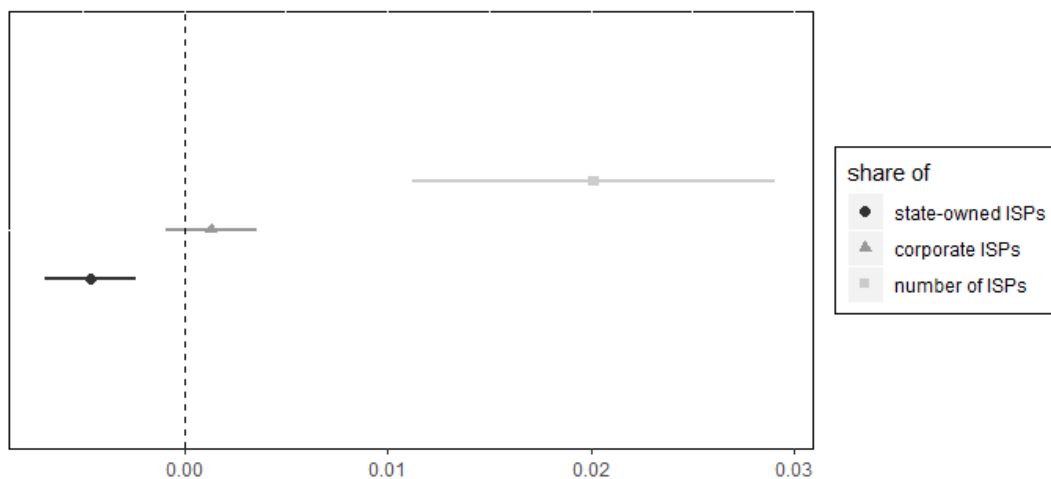
We first look at ownership as a dependent variable and provide insights about its relationship with a couple of variables commonly used in political science research.

**Internet penetration.** A large number of studies argue that private companies are more efficient than state-owned enterprises (Dewenter and Malatesta 2001). Private companies are said to be more successful in minimizing production costs and, at the

same time, optimizing profit and return on investment than companies owned by the state (Peng *et al.* 2016:299). In fact, state-owned companies are often characterized by their inefficient working conditions and over-staffing; they are criticized for taking decisions dictated by political goals rather than economic and financial objectives (Tusiime *et al.* 2011; Shleifer and Vishny 1997). However, some argue that, influenced by the ideological socialism/capitalism divide (Peng *et al.* 2016), existing studies might often take the inefficiency of state-owned companies for granted and therefore oversee potentially positive effects of state-ownership.

Our correlations indicate a significant negative relationship between the share of state-owned companies and internet penetration according to estimates provided by the International Telecommunications Union (ITU 2018). As Figure 5 further indicates, the relationship between the share of corporate-owned companies and internet penetration is insignificant. While state ownership might slow down the diffusion of internet, private ownership appears to have no accelerating effect across African countries. Unsurprisingly, however, the number of telecommunications companies providing internet services is positively associated with higher levels of internet penetration.

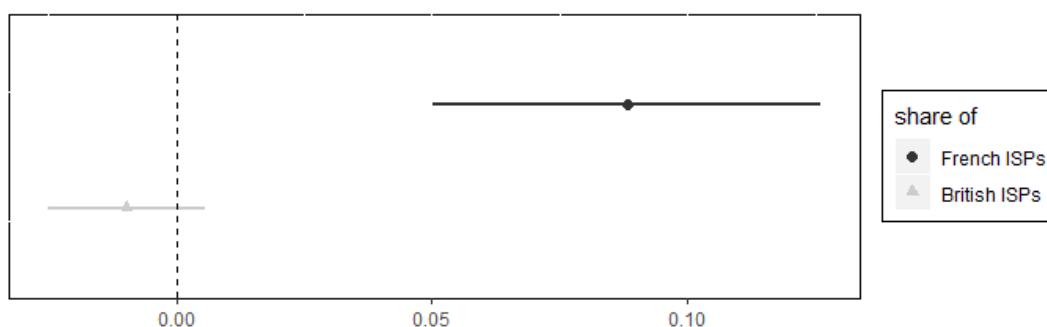
**Figure 5.** Internet penetration and state versus private-corporate ownership



**Colonial legacy.** Since the early 1980s, privatization started to be advocated as a means of establishing clear property rights, providing economic incentives, and stimulating superior economic performance of firms and economies at large. Bonardi

(2004) and Pogrebnyakov (2008) find, for instance, that language plays an important role in the international expansion of multinational enterprises. Colonial ties lead to similarities in legal systems and generally offer the potential to ease the investing firm's navigation of the regulatory environment in the host country (Dike and Rose 2015). We therefore expect the share of ISPs with shareholders from the ex-colonizer to be higher in former colonies. We measure colonial ties as the share of ISPs headquartered in France or Great Britain, respectively. To this end, we use a dummy variable that distinguishes between countries with or without France or Great Britain, respectively, as former colonizer. Correlations demonstrate that this is particularly pronounced for French-owned ISPs, but does not affect the number of ISPs headquartered in Great Britain (see Figure 6).

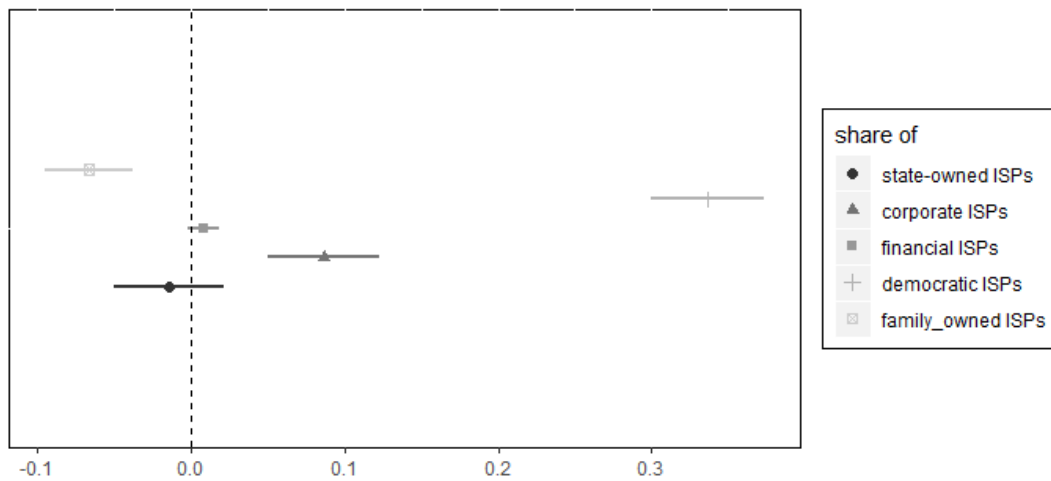
**Figure 6.** Ex-colonized host countries and ex-colonizing home countries



**Regime Type.** Several scholars have argued that multinational corporations are more likely to invest in democratic countries as democratic institutions provide more credibility to investors (Jensen 2003). Yet, this effect should diminish after controlling for property rights protection (Li and Resnick 2003). As shown in Figure 7, the share of ISPs with headquarters in democratically constituted countries is significantly higher in African democracies. The literature is more ambiguous when it comes to private versus state ownership across different regime types. Specially looking at Russia and other Post-Soviet countries, scholars have argued that state ownership has remained an important feature of authoritarian countries (Chernykh 2008). Pond (2018), however, argues that autocrats use financial liberalization to stabilize their rule when repression becomes too costly. We regress the shares of state versus privately-owned ISPs on the regime type in a country-year. To measure regime type, we use the `v2x_regime` variable

by the Varieties of Democracy project (Coppedge 2018). This variable ranges from zero to three, with zero indicating that a country is a closed autocracy and three indicating that country is a liberal democracy. Corporate ISPs appear to be more prevalent in democratic regimes; there is no clear correlation between state ownership and ISPs. Interestingly, ISPs privately-owned by families or individuals appear to be more prevalent in non-democratic regimes. Overall, the regime type alone appears to be insufficient to explain different types of ownership.

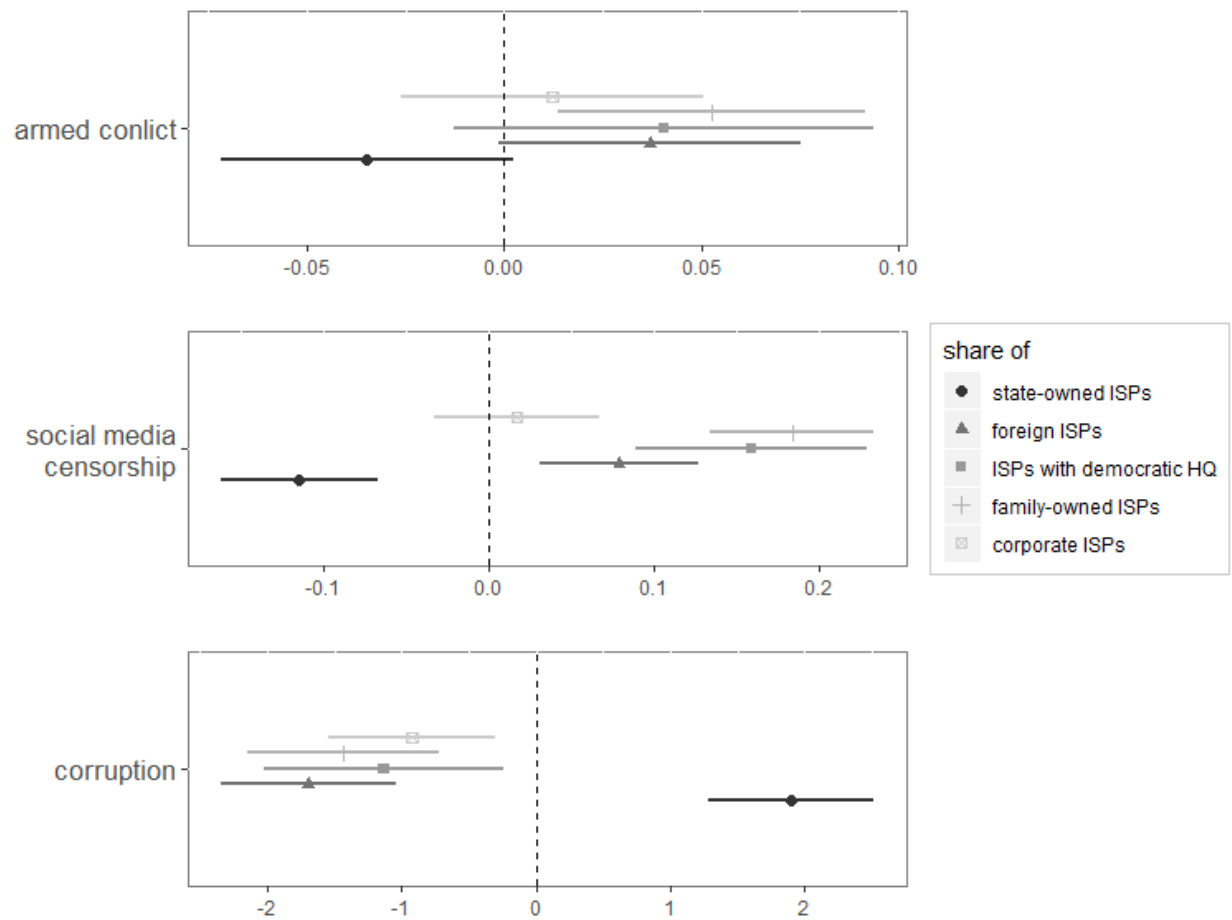
**Figure 7.** Regime type and owner identities



### *Ownership as an independent variable*

The TOSCO dataset can also help address research questions that treat ownership as the independent variable. We demonstrate the significance of owner identity in explaining relations between ownership structures and politico-economic developments across the African continent. In particular, we look at the relationship between ownership and armed conflict, corruption, and social media censorship. We assess these relationships by using different aggregated measures of ownership at the country-year level. We aggregate the ownership variable by calculating the share of state-owned companies, foreign companies, companies owned by families or individuals, companies owned corporations, and companies headquartered in a democracy in a given country-year.

**Figure 8.** Regression coefficients for ownership as an independent variable



**Protest & violence.** In recent years, scholars emphasized the importance that new forms of ICT can play for collective action, protest, and violent conflict. Several studies demonstrate that in Africa, the availability of mobile phones significantly increases the probability of violent conflict by facilitating coordination among anti-government groups (Bailard 2015; Pierskalla and Hollenbach 2013). Others, in turn, have argued that ICT might also decrease the likelihood of protest depending on governments' Signals Intelligence (SIGINT) capacity as well as rebels' capacity to use ICT for violent insurgency (Shapiro and Siegel 2015).

Given that the availability of and potentials to use mobile phones depends on the companies providing access to the internet, violent conflict can be affected by different owner types and hence different interests of those companies that provide internet access. If the state owns substantial parts of the telecom infrastructure, for

instance, it has higher technological capacity to establish surveillance mechanisms (Hogan and Shepherd 2015). Once substantial parts of the internet infrastructure is not in the hand of the incumbent themselves or close allies from the (business) elite, it should become more difficult for an incumbent to control communication flows. In turn, citizens will be less constrained in communicating with each other and therefore protest and conflict should be more pronounced. This should be more salient when companies are owned by shareholders from abroad and, in particular, if they are headquartered in democratic countries (see above).

To estimate armed conflict, we use the UCDP/PRIO armed conflict data set (Gleditsch *et al.* 2002). We only consider conflicts that are internal and always include the domestic government among the involved actors. We then use the intensity of the conflict as a dependent variable, distinguishing between minor conflicts resulting in between 25 and 999 battle deaths (= 1) and major conflicts resulting in at least 1000 battle deaths per year (= 2). If there is no conflict according to UCDP/PRIO, we code it as peaceful period (= 0).

**Corruption.** Shleifer (1998) argues that state ownership paves the way for corruption as governments can use their control over these firms for political purposes. Several sector-specific studies support this mechanism by looking at state ownership of the media (Houston *et al.* 2011) or forests (Koyuncu and Zilmaz 2013). The link between private ownership and corruption is less clear. Case studies of privatization dynamics in Africa show that they were often accompanied by corruption and cronyism because governments favour specific clients (Tangri *et al.* 2010). Rose and Dike 2019 find that major African multi-national enterprises invest significantly more in countries with low levels of corruption. Conversely, countries with more local enterprises should display higher levels of corruption. Overall, the headquarter of a company, and hence its (geographic and legal) proximity to the incumbent government should shed light on the relationship between ownership and levels of corruption. To assess levels of corruption, we use data from the corruption perceptions index (CPI) (Transparency International 2019). CPI is a composite indicator of the perception of corruption in the public sector.

**Internet censorship.** State (majority) ownership of ISP presents the most immediate, physical form of state control (Howard 2011:171). It does not only “function as an institutional alternative to regulation” (Thomsen and Pedersen



2000:694), it also renders technical control over the traffic transiting the physical lines obsolete, if (at least considerable parts of) the physical infrastructure is in the hands of the state. To measure the extent to which a state government attempts to implement censorship, we use the variable ‘v2smgovsmcenprc\*\_ord’ by the Varieties of Democracy project (Coppedge 2018).

## **Discussion and conclusion**

Internet services are no resource that governments or any other political or economic actor have necessarily and automatically at their free disposal. Despite its decentralization, the internet relies on some fairly significant hierarchical structures, mostly for the sake of efficiency. It is specifically the physical infrastructure that, connecting the individual customer to the internet, is key to controlling the flow of digital information and communication. Internet service providers (ISPs) with control over the physical infrastructure can extend that control into applications and content. Therefore, a state government’s ability to control the diffusion of the internet and its use or its interruption depends on the extent to which it controls the ISPs that grant internet access to customers on its territory. To better understand how technology, government, and economy are interacted, we suggest taking into account the role of ISP who provide the last-mile connection to end-users. We therefore propose that the ownership structure of ISPs is key to explaining the determinants and the effects of internet penetration. Yet, existing studies commonly miss to consider this factor in a systematic manner.

In this paper, we presented TOSCO, a dataset that maps the owner identity of all internet service providers on the whole African continent from 2000 to 2016. In Africa, the number of people with access to internet has grown tremendously over the last decade. New opportunities in communicating and accessing information are expected to challenge Africa’s long-lived autocrats. The higher number of recent internet shutdowns indicates that incumbent rulers may indeed attribute some danger to this new technology. TOSCO allows for considering the variance in ownership at the level of companies or shareholders, across countries and over time.

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