Internews

The Price of Disruption:
Evaluating the Economic Impact of Senegal's 2023 Internet Shutdowns

Authors: Anirudh Tagat and Skyler Sallick

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Executive Summary

The main objective of this report is to assess the economic impact of Senegal's 2023 internet shutdowns using publicly available data and a tailored econometric approach. This report leverages a comprehensive methodology that utilizes a range of economic indicators, encompassing a variety of economic activities. These indicators include Gross Domestic Product (GDP), financial sector output, stock market performance, industrial turnover indices, unemployment figures, inflation rates, and trade inflows and outflows. The Appendix (Table A.1) provides detailed information on the specific indicators, their sources, definitions, and data frequencies. Additionally, innovative satellite data on nighttime economic activity provides supplementary evidence, highlighting a substantial decline in activity during the shutdown period. This multi-faceted approach helps to provide a more robust understanding of the economic consequences of the 2023 Senegalese internet shutdowns.

Key Findings

- This report found a staggering **1.3 percentage point**[1] **decline in the overall Gross Domestic Product (GDP)** associated with the internet shutdowns in June 2023. This translates roughly to **a loss of $76.8 million USD (46.86 billion XOF).**[2]

- This loss mainly affected the services sector, which alone experienced a **loss of $5.26 million USD (3.23 billion XOF).**

- Financial markets bore a large brunt of the shutdowns' impacts, with findings suggesting that **nearly $1.43 billion USD (871.5 billion XOF) were lost in market capitalization** during the period of internet shutdowns, which represents **nearly 12% of the total value of the BRVM at the time**.

- The most significant decline, however, appears to be driven by the exports sector, with a substantial loss of trade value and volumes that appear linked to the internet shutdowns.

  - Though we cannot establish direct causality, the analysis of comprehensive economic indicators suggests that the **overall value of exports declined by 0.6 percentage points**, translating to a substantial **loss of nearly $2.46 billion USD (1.505 trillion XOF)**.

  - Additionally, **the volume of exports from the port of Dakar decreased by 3.93 percentage points**, resulting in a **loss of roughly 42,350 tons of exported goods** as a result of the internet shutdowns.

These findings suggest that the impacts of shutdowns are far-reaching and affect specific sectors more than others. Survey evidence indicates that the disruption to payments presents a significant challenge to an economy amidst an internet shutdown. Estimates of the economic impact of internet shutdowns on the financial sector support this argument. It is crucial for the global community to better understand these economic consequences to effectively pressure governments to stop the use of shutdowns and establish safeguards to protect local economies against potential future disruptions.

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[1] Please note that this report utilizes percentage points rather than percentages of the whole to illustrate the amount of change in economic indicators before and after internet shutdowns.
[2] All exchange rates assume 1 USD = 610.12 XOF, the prevailing exchange rate on June 1, 2023. (XE Currency Tables, 2023)

About This Report

This report was developed as a component of Internews' Jappandal Senegal project, a year-long initiative to equip civil society, digital rights activists, and everyday citizens with the information, skills, and connections to push back against the rising tide of internet disruptions. The report, in conjunction with another research study published under this project that investigates the broader societal impact of the 2023 shutdowns in Senegal, aims to galvanize advocacy communities in Senegal by highlighting not just what happened during the shutdown, but what can be done to more effectively prepare for, respond to, and advocate against network disruptions in the country. This project and the accompanying reports would not be possible without the support of Dakar-based Computech Institute who, together with a growing network of activists from around the country, have ignited a conversation about the importance of a democratic internet and taken action to hold leaders accountable for their actions in the digital space.

Introduction and Context

It is no secret that governments across the globe increasingly employ internet shutdowns to suppress dissent. While the political motivations behind these actions are clear, their economic implications remain underreported. This trend is particularly concerning as economies like Senegal have increasingly embraced digital technologies. The internet has become an essential driver of economic growth, facilitating trade, innovation, and job creation. By restricting internet access, governments not only undermine fundamental freedoms but also risk stifling their own economies. While the precise economic impact of an internet shutdown is challenging to quantify, its potential consequences for local economic activity can be significant and far-reaching. This report seeks to explore potential correlations between internet shutdowns in Senegal and changes in local economic activity as a means to infer impact.

The lack of transparency and prolonged uncertainty surrounding Former President Macky Sall's candidacy for a third term followed by the subsequent suppression of opposition voices triggered a period of social unrest in Senegal. Tensions escalated on June 1, 2023, when Ousmane Sonko, leader of the opposition, was sentenced to two years in prison. As violent protests broke out in Dakar and other parts of the country, Senegal's Ministry of Communication, Telecommunications and the Digital Economy ordered Internet Service Providers (ISPs) to block access to social media platforms, messaging services, and mobile internet. Data also points to mobile network disruptions connected to all ISPs in the country. The shutdowns lasted until June 7, 2023 with intermittent network disruptions continuing throughout the next few months as events continued to evolve. Authorities justified these blockages as necessary actions to prevent the spread of hate speech and violence. This report attempts to estimate the economic impact of the internet shutdowns that took place in Senegal specifically during the period of June 1, 2023 to June 7, 2023 and July 31, 2023 to August 1, 2023.

To understand the potential impact of shutdowns on the local economy, it is essential to first examine the demographic user base in Senegal. Senegal has among the youngest populations in the world, with a median age of 19.2 years old, and nearly 60% of the population is under 25 years old. The country has a high rate of internet penetration relative to its closest neighbours (Mauritania, The Gambia, Mali), rapidly increasing from 43% in 2019 to 60% in 2023. Internet use is more widespread in urban areas, relative to rural areas, and with nearly 50% of the population residing in urban areas, digitization is taking place rapidly in Senegal. Approximately 34% of all internet users in Senegal use some form of social media, with Facebook making up the largest subset of users. There are also approximately 108 active mobile-broadband subscriptions per 100 persons. Mobile money has also played a large role in the country, with nearly 437.27 active mobile money accounts per 1000 people, resulting in mobile money transactions making up 33.7% of GDP. Thus, a disruption to social media and mobile networks in the country can have widespread impact on the country's population.

Historically, the difficulty in determining whether a network disruption was intentionally implemented by the government or simply an issue with infrastructure has complicated researchers' ability to determine the economic impact of an internet shutdown. In the case of this series of shutdowns in Senegal, explicit technical evidence supports statements made by government officials to confirm the presence of government-sponsored network interference. These shutdowns have been documented in technical analysis by the Open Observatory Network Initiative, and also in previous reports prepared by Internews. Findings from Internews' After-Action Report on the 2023 shutdowns in Senegal suggest that the public experienced diverse impacts immediately following the blockages. Surveys with stakeholders identified a broad pattern of immediate impacts, including the inability to make payments using apps/protocol that rely on the internet, an overall loss of efficiency related to work and professional commitments, as well as negative impacts on social and emotional well-being.

Such adverse impacts are aligned with larger studies on the economic consequences of internet shutdowns globally. However, a key challenge is the accurate identification and attribution of a shutdown's short-term impacts on local economic activity. Multiple factors can concurrently influence economic output, as measured by macroeconomic indicators such as Gross Domestic Product (GDP).

This complexity makes it challenging to isolate the precise impact of specific events, such as those observed in Senegal, on the Senegalese economy.

However, this does not preclude a careful analysis of various economic indicators and an attempt to correlate them with internet shutdowns in Senegal. In this report, we employ a well-documented econometric methodology, utilizing publicly available data and a framework tailored to Senegal. In line with similar work for other shutdown-prone countries like Iran, we combine this econometric approach with real-time satellite data on night-time economic activity to demonstrate the significant economic ramifications of internet disruptions on the local economy. Furthermore, this report incorporates testimonials from Senegalese citizens to connect data points to personal experiences.

The remainder of this report is organized as follows. After providing an overview of the data, methodology, and limitations of the analysis, this report provides an outcome-level examination of the impacts of Senegal's 2023 internet shutdowns on a range of economic indicators related to Gross Domestic Product (GDP), financial market fluctuations, industrial turnover, trade, and business activity more broadly.

Data and Methods

Data for this report comes from various statistical databases that collate information for Senegal. While detailed individual-level data, such as income, consumption expenditures, savings, mobile payments, and social media use, could provide a more comprehensive understanding of the impacts, such data was unavailable for this research. Additionally, such data is often not collected to track impact, but rather used to monitor economic stability and growth at monthly, quarterly, or annual intervals by government entities. This makes it particularly challenging to isolate the specific impacts of an internet shutdown, as numerous other factors can influence economic conditions during the same period. In the absence of causal data, official statistics on economic activity before and after the internet shutdowns served as a valuable resource for understanding the broader economic consequences and in suggesting correlatory impacts.

Although previous studies have attempted to determine the economic impact and additional methodologies have been created, many under or overestimate the economic cost. Tagat et al., (2023) developed the first of its kind methodology to measure the economic impact of internet shutdowns on a range of economic outcomes that provide a clearer picture than broader traditional measures such as GDP alone. This report adapts the global methodology reported in Tagat et al. (2023) to the Senegalese context. To do so required modifying the econometric framework to reflect the duration, frequency, and intensity of the specific internet shutdowns in Senegal. The appendix (Table A.1) documents the various indicators, their data sources, the definitions of the variables, and the frequency at which they enter the dataset.

Moreover, the methodology utilized for this report incorporates key factors known to precipitate internet shutdowns, both globally and in the specific context of Senegal. In line with prior findings from the community, these factors primarily involve civil unrest (protests, riots, violent demonstrations) and political events (such as elections). As previously discussed, in the case of Senegal, the arrest of a key opposition leader and subsequent protests appear to have, in part, motivated the shutdown. Evidence also suggests that the frequency of internet shutdowns may depend on a government's capacity to implement techniques, which may depend on conditions such as the percent of State ownership of internet service and telecommunications providers. Accurately identifying (and accounting for) the triggers of internet shutdowns is important to be able to map their impacts on economic outcomes. This methodology is able to consider various other factors that simultaneously affect economic outcomes, and isolate the potential links of these outcomes with internet shutdowns.

As a result, this methodology constructs a measure of internet shutdown risk and benchmarks it against actual internet shutdowns in 2023 in Senegal. Past data on protests, previous shutdowns, elections, and other factors statistically associated with internet shutdowns are collated to calculate the probability that a shutdown would take place in 2023. The model accurately reports

a high shutdown probability in June and July 2023, months where shutdowns actually took place. The overall data for the model spans from January 2022 to December 2023, accounting both for days on which there may or may not have been violent conflicts or protests. Details of how the shutdown risk is captured can be found in the Appendix (A.2). In this way, the findings in this report utilize both descriptive evidence based on trends and estimations based on regression analyses.

Limitations

This study on the economic impact of internet shutdowns in Senegal aims to provide preliminary insights into the links between economic indicators and the employment of internet shutdowns. Drawing from earlier work in this area (Tagat et al., 2023; Kathuria et al., 2018; West, 2016), the approach used in this report comes with important caveats and limitations regarding the interpretation of impacts as causal. This subsection highlights key factors to consider when interpreting the results and drawing conclusions on the basis of this work.

First, while the internet shutdowns in Senegal were unanticipated, they were not entirely random. Most work examining causal economic impacts relies on this kind of random timing to illustrate differences in various indicators before and after the random event occurs (much like a natural disaster). However, to be able to tie changes in the economy to shutdowns, we would need to adequately control for all other factors that could be affecting economic outcomes at the same time. Since shutdowns are government-imposed, it is difficult to disentangle these other factors from shutdown-related impacts in a clear way. Therefore, we cannot definitively infer causal relationships from our estimates. As such, our findings should be interpreted as suggestive of strong correlations and associations rather than causal impacts.

Second, much of the shortcomings of the method reflect the type of data that is available in the public domain. The limited availability of granular, daily economic data makes it difficult to accurately assess the economic impact of an internet shutdown. This constraint necessitates reliance on monthly and/or quarterly data, which can provide aggregate estimates but may obscure the immediate and nuanced effects of the disruption.

Third, the findings in this report largely rely on data collected and released by statistical agencies at a monthly or quarterly frequency. However, the impacts of shutdowns are more likely to be felt immediately, and as evidence from the stock market shows, may be temporary in certain cases. Observing impacts on monthly or quarterly data means that any short-term negative impacts may quickly be compensated by changes in the economy once the shutdown ends, and ultimately may not appear in the data itself. The impacts of internet shutdowns on stock market performance is helpful as it is one of the few economic indicators that uses daily data. Although, stock market data only reflects performance of the formal financial sector, and may not be helpful in capturing the effects felt in other parts of the economy that are not closely connected to financial markets. For example, small-scale economic activity in the informal sector (which makes up nearly 94% of all businesses in Senegal) may not be captured in a composite index of the stock market. To overcome this, a more holistic real-time indicator of economic activity is needed.

Finally, the aforementioned issues regarding data availability also means that this report offers some educated assumptions and inferences about certain sectors that may be affected by shutdowns. For example, although this report explores the potential economic impacts associated with disrupted access to mobile payment systems, data on payment platforms is not publicly available, and despite efforts to obtain such data from payment services providers, it could not be included in this report. Furthermore, the study relies on publicly available data that is typically tracked and managed by government or government-related entities. This has both advantages and disadvantages: a clear advantage is that, in the interest of transparency, a government may regularly be held accountable to release data on the economy. This would also necessitate robust statistical systems to ensure reporting is largely accurate. However, it also means that researchers using such data must rely on it as accurate and use it "as is", with little means to corroborate the data provided by government entities. One way to overcome this limitation is to supplement publicly available government data with external data that proxies for economic indicators (such as night-time lights) that are discussed and utilized in this report.

Findings

The internet shutdowns that began on June 1, 2023 were intended to block access to social media and disrupt mobile connectivity, limiting the ability of millions of users to gain access to information. Given that such disruptions were put in place amid civil unrest, these shutdowns increased uncertainty and fear amongst the population. These impacts go beyond any one individual and affect how firms, markets, and households function to ensure economic productivity. For example, according to Internews' 2023 After-Action report, the shutdowns severely disrupted online financial transactions and e-commerce activities. Survey participants noted that companies that use the internet, particularly those that utilize money transfer services on mobile devices, were not able to carry out business. Participants also noted that businesses struggled to sell their products, noting that online retailers were particularly vulnerable to economic impacts. Thus, with a population that has increasingly adopted the internet as more than just a means of communication but as a vehicle of commerce, internet shutdowns will have far-reaching adverse effects on the economy.

The targeted nature of the 2023 shutdowns meant that activities not reliant on social media platforms or mobile internet access (directly or indirectly), such as construction or core manufacturing activities, may not have experienced the same level of disruption as those sectors that heavily depend on them, including financial services and small business operations (which make up more than 94% of all firms in Senegal).

In the chart below, we summarize the key findings from the regression analyses of key economic indicators on the timing of internet shutdowns (Figure 1) as well as immediate or short-term impacts (illustrated in terms of changes in percentage points) that can be observed in common economic indicators in Senegal. It is important to note that the estimations based on our regression analyses cannot be interpreted as causal, but are indicative of the potential impacts that the shutdowns may have had in the immediate aftermath. As displayed in Figure 1, the estimated cost of an additional day of an internet shutdown is likely to be largest on export volumes and overall GDP. In the subsequent sections, we examine the impacts of Senegal's 2023 internet shutdowns on each category separately, discussing how these disruptions may have affected each sector.

Note: This graph shows the degree of the impacts (in percentage points) associated with Senegal's 2023 internet shutdowns across different sectors and outcomes. Longer bars indicate a greater adverse impact.
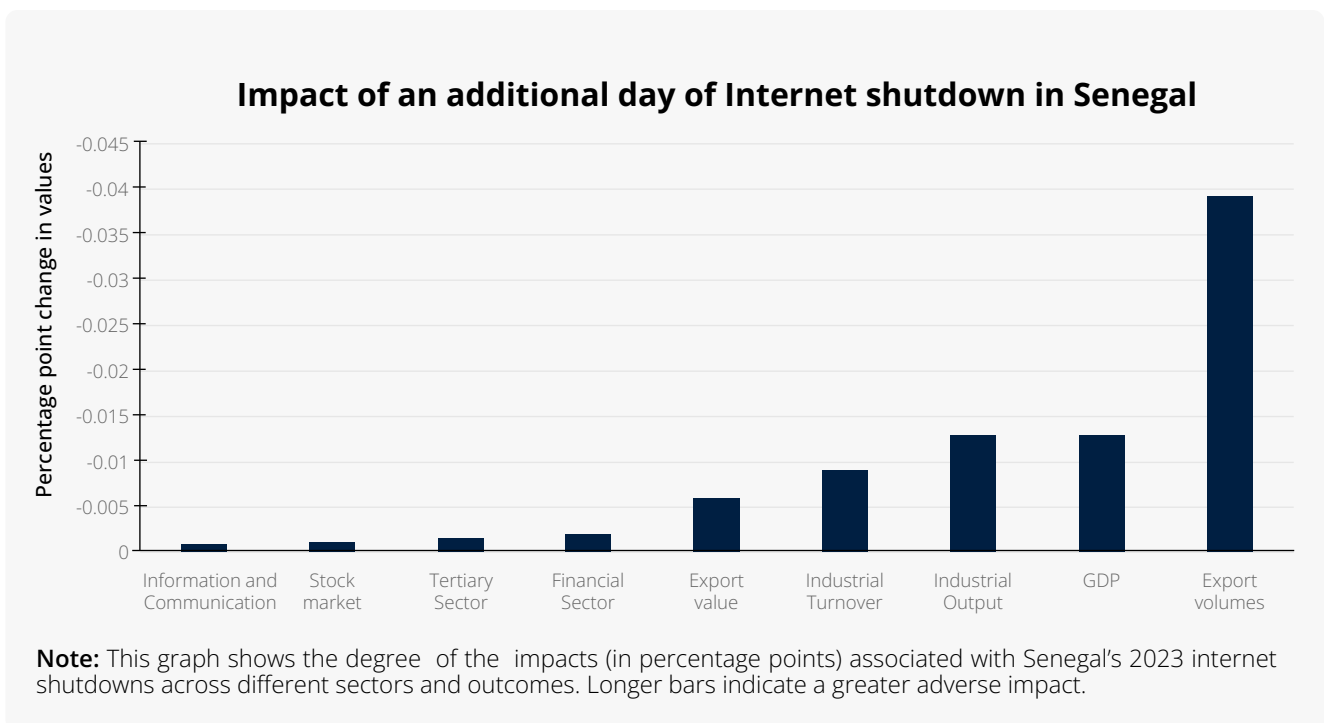
Figure 1: Summary of impacts of internet shutdowns

Gross Domestic Product (GDP)

One of the strongest impacts of the internet shutdowns observed in Senegal was on overall GDP. Although GDP is an aggregate measure of economic activity, it is likely to reflect the immediate losses in economic productivity associated with the internet shutdowns. Since data on GDP (unlike the stock market) is not available on a daily or monthly basis, we present quarterly data, which does not appear to fluctuate significantly in the quarter after the internet shutdowns. Figure 2 provides descriptive evidence on the change in GDP observed during the quarter in which the shutdowns took place. However, when broken down by sector, we observe that the information and communication sector (reflecting the economic output of companies in this sector), and the financial sector dip slightly. This implies that households and firms that provide financial services (like insurance or banking) or primarily provide goods or services related to communications (mobile devices, or telecom companies) experienced a decline in output. Probing further, our regression analysis (which attempts to predict the relationship between two variables), of GDP on the timing of internet shutdowns finds that an additional day of the Senegalese internet shutdowns was associated with a nearly 1.3 percentage point decline in overall GDP. Using data on GDP from 2023 Q2, this translates to an approximate loss of $76.8 million (46.9 billion XOF) overall. The decrease in GDP could be attributed to a reduction in consumption expenditures, trade, access to financial services, and/or loss in business income as a result of the internet disruptions. As described below, the impacts of the shutdowns on various sectors contribute to this overall impact on the economy. This report unpacks the impact

Note: This graph presents quarterly data on economic output (GDP, sector-wise GDP). The red dashed line here refers to Q2 2022 (exactly one year prior to the shutdown), and the black dashed line refers to Q2 2023 (the period in which the shutdown took place). For descriptions of activities that make up each sector, see Footnote 3.
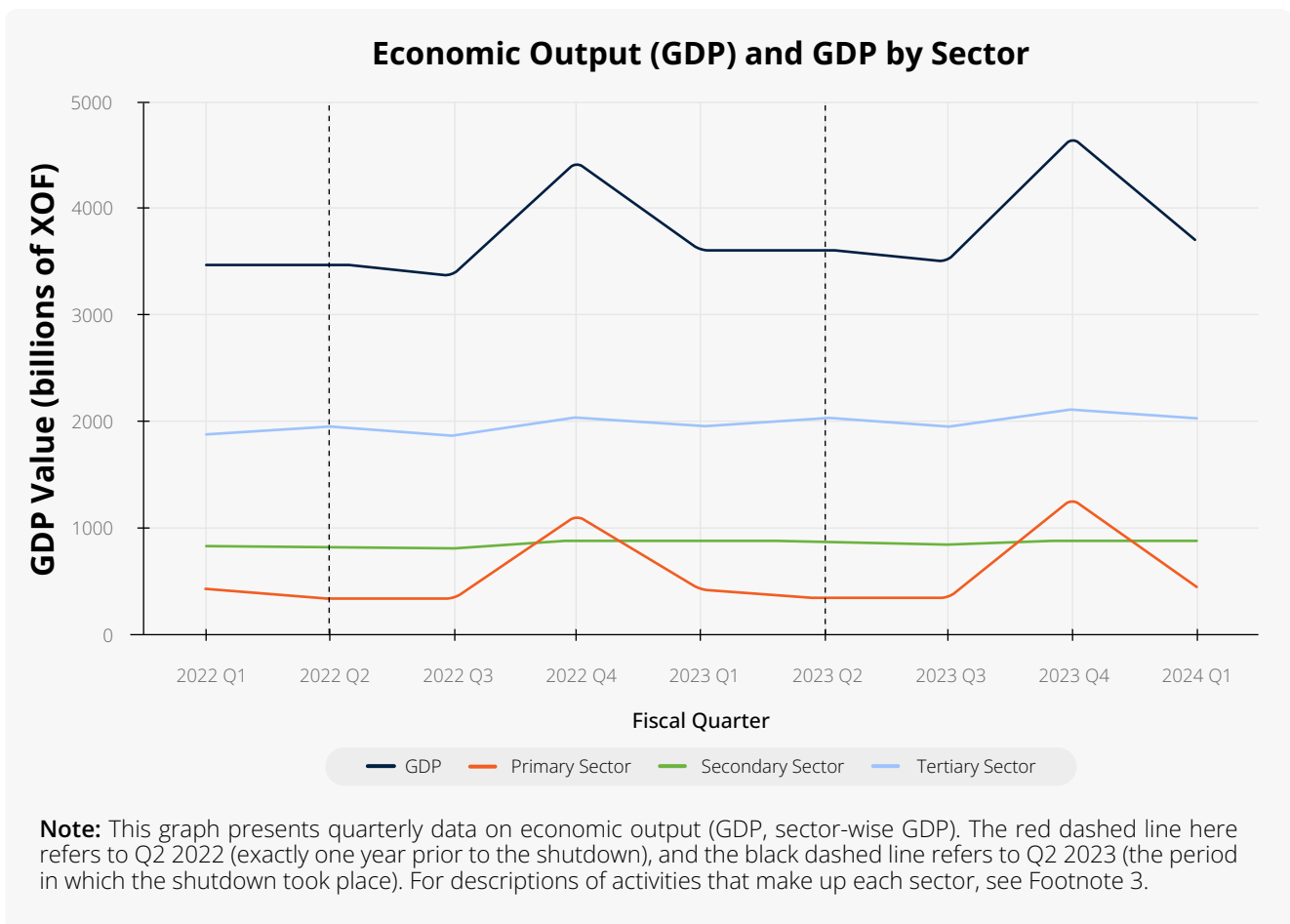
Figure 2: GDP and Sector-based GDP over time[3]

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[3] In Senegal, the <u>primary sector</u> comprises of agriculture, livestock/hunting, forestry/logging, and fishing/aquaculture; the <u>secondary sector</u> comprises of mining/quarrying, manufacture of food products, mineral products, chemicals, and chemical products, electricity, gas, steam, water supply, sewerage, waste management and remediation activities, and construction; and the <u>tertiary sector</u> comprises of wholesale and retail trade, transportation, accommodation and food service, information and communication, financial and insurance activities, real estate, professional, scientific and technical activities, public administration, education, health, and household production.

of Senegal's 2023 internet shutdowns on each of these sectors below.

In contrast to the communications and financial services industries, the natural resource and industrial sectors were not significantly affected by the internet shutdowns. However, the service sector, which might depend more substantially on access to internet services, was significantly affected. Similar to the overall GDP estimate, the regression analysis of the service sector's share of the GDP on the timing of internet shutdowns (which attempts to predict the relationship between the sector's share of GDP and the timing of the internet shutdowns) shows that the service sector experienced a loss of $5.26 million (3.23 billion XOF) associated with the shutdowns. This means that the shutdowns significantly crippled the ability of businesses to sell their services, and for people to access these services. This also implies that this particular set of economic activities are most vulnerable to the adverse impacts of

shutdowns in Senegal since they disrupt the ability of businesses to operate smoothly. As described by survey participants during the development of the corresponding Internews report, this decline in the economic output of the service sector is likely related to the disruption of services such as the provision of financial services (such as the use of mobile payment platforms), access to retail services (such as food or grocery stores), or even the sale of real estate.

Within the service sector, the information and communication sector ($0.31 million or 0.2 billion XOF) and the financial sector ($0.33 million, or 0.21 billion XOF) appear to have lower losses in terms of percentage points. The changes in the sectoral shares of GDP might also indicate the impact of shutdowns on financial payments conducted through digital channels, although more specific data is needed to estimate the precise loss in these payments.[4] Figure 3 illustrates the description trends of these industries during the period of

Economic Output by Industry

Note: This graph presents quarterly data for specific activities within the tertiary sector of the GDP of Senegal. The red dashed line here refers to Q2 2022 (exactly one year prior to the shutdown), and the black dashed line refers to Q2 2023 (the period in which the shutdown took place).
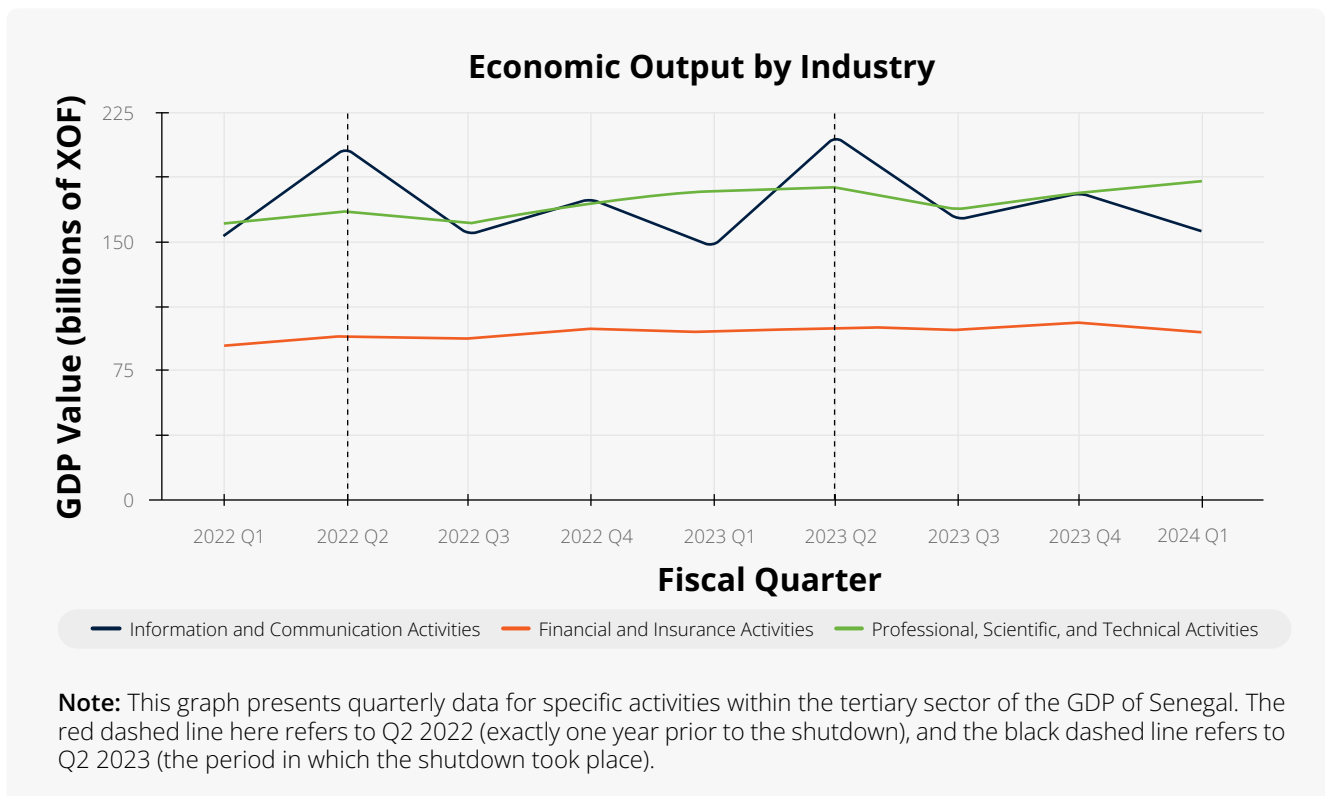
Figure 3: Industry-specific output over time

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[4] Data on payment platforms are not publicly available. However, secondary information suggests that the potential adverse impact was cushioned by payment platforms' quick response. An expert from a large mobile money app in Senegal told this report's authors that: "The impact of the internet outages on our business could indeed have been significant and reached a few tens of thousands of dollars per hour of disconnection, however, a backup plan was put in place from the first disruptions and was improved as other disruptions occurred, in particular by activating USSD for agents and by setting up whitelisting which allows users to contact [company name] free of charge. This backup plan made it possible to reduce the impact to the more reasonable threshold of a few tens of thousands of dollars per day, which represents 4% of the impact without a backup plan."

internet shutdowns. Data from surveys conducted alongside these analyses indeed suggest that participants reported a loss in the ability to make financial transactions as a result of the shutdowns (nearly 41.1%).

Finally, to benchmark the estimate obtained in our analysis, we can look at the estimated economic cost of internet shutdowns as determined by other tools using different methodologies. The Internet Society Pulse Net Loss calculator, determines the economic impact of the Senegalese shutdown to be $3.7 million USD, which is significantly lower than our estimate. The lower estimate might be due to the global nature of their model, and the fact that it is estimated typically using monthly or annual data, which may not capture more granular variations in the economy. The Net Blocks COST of Shutdown tool, in contrast, though not specific to the days of these internet shutdowns, provides an estimate of $55.86 million USD for any 7-day internet shutdown in Senegal. The COST tool presents larger estimates since it does not specifically account for the circumstances around each shutdown, but rather provides an economy-wide estimate of any shutdown based on the number of internet or social media users in that country at that time. Thus, our estimate is less likely to be under-reporting the true impact of internet shutdowns relative to other currently available methodologies.

Financial Markets

After the internet shutdowns in June and July 2023, the overall stock market price of the Bourse Régionale des Valeurs Mobilières (BVRM) composite index experienced slight, but noticeable, declines (Figure 4). The BRVM Composite Index includes the top 10 West African companies listed on the Bourse Régionale des Valeurs Mobilières exchange. While the market showed signs of recovery after the first, longer shutdown, the value index remained low after the second shutdown. Our regression analysis

Note: This graph presents daily data on the value of the BRVM Composite stock market index over time. The dashed lines mark the timing of two internet shutdowns in Senegal (June 1 2023 and July 31 2023).
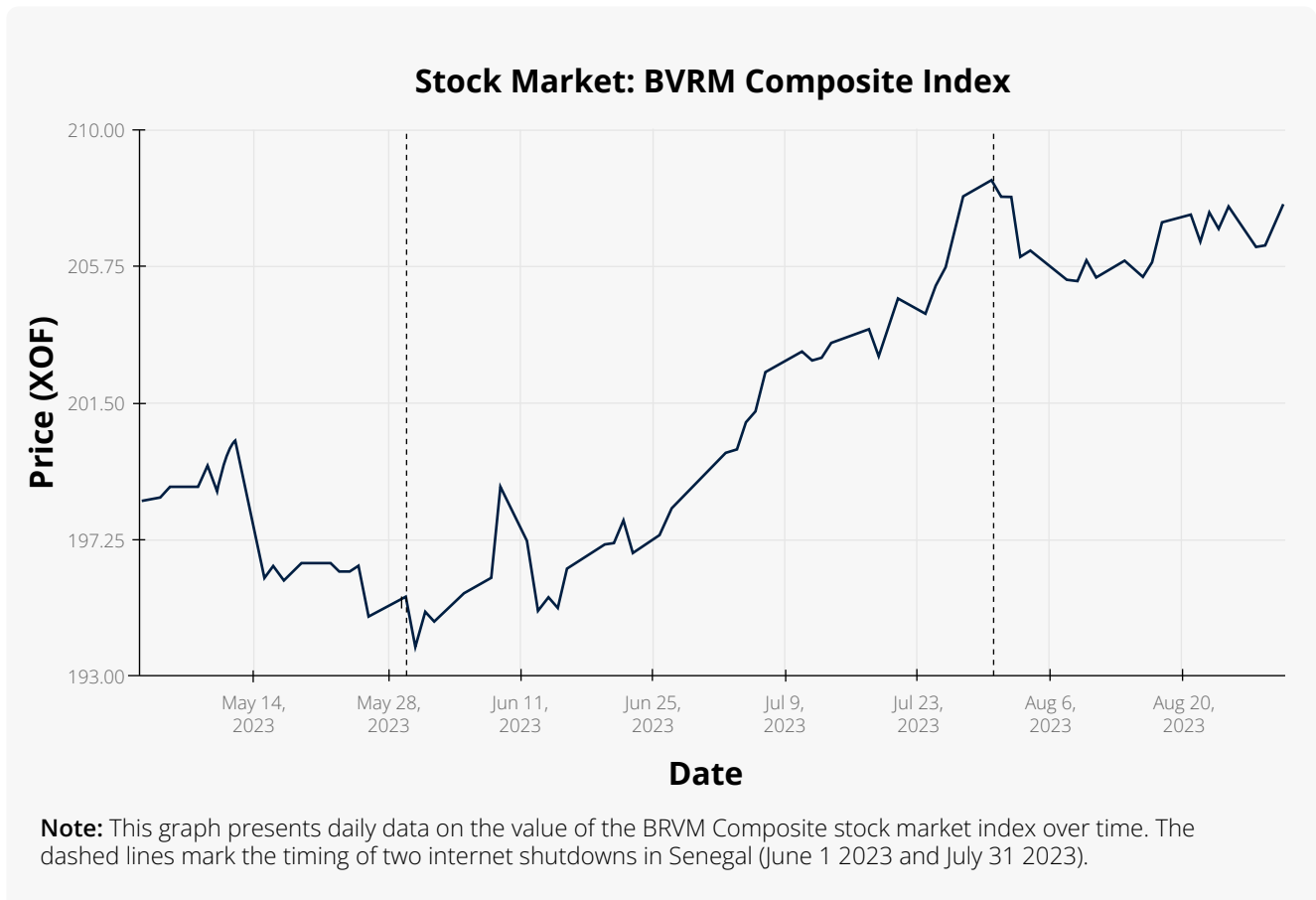
Figure 4: Change in stock market performance

of the stock market index value on the timing of internet shutdowns suggests that these network disruptions had a significant financial impact on the BRVM. Findings indicate that the shutdown resulted in a loss of approximately $1.43 billion USD (871.5 billion XOF) in market capitalization, which represents nearly 12% of the total value of the BRVM at the time. Research in finance [suggests](link) that internet access is positively linked with stock market participation, implying that a weakened internet can affect who participates in the stock market. Furthermore, having stable access to the

internet also gives investors access to information in a timely manner, which results in far more efficient (i.e., profitable) participation. Such declines in market capitalization suggest that companies may have experienced weaker than expected earnings during the shutdowns due to internet disruptions. As consumers were often unable to access internet-based financial services and many forms of transactions require connectivity, the correlation between a decline in the value of the BRVM composite index and the effects of an internet shutdown is a reasonable assertion.

Industrial Turnover

Within the overall impacts on GDP, it is possible that Senegal's industrial sector may have also been impacted by the internet disruptions. The descriptive evidence suggests that the trends in Industrial Turnover Index, which measures changes in sales and revenues across various industries (such as extractive industries, manufacturing, and

power production) in Senegal, dipped marginally in the quarter following the internet shutdowns (Figure 5). Findings from the regression analysis of the Industrial Turnover Index on the timing of the internet shutdowns is more direct, showing that the internet shutdowns were associated with a 0.91 percentage point decline in the overall

Note: This graph presents daily data on the value of the BRVM Composite stock market index over time. The dashed lines mark the timing of two internet shutdowns in Senegal (June 1 2023 and July 31 2023).
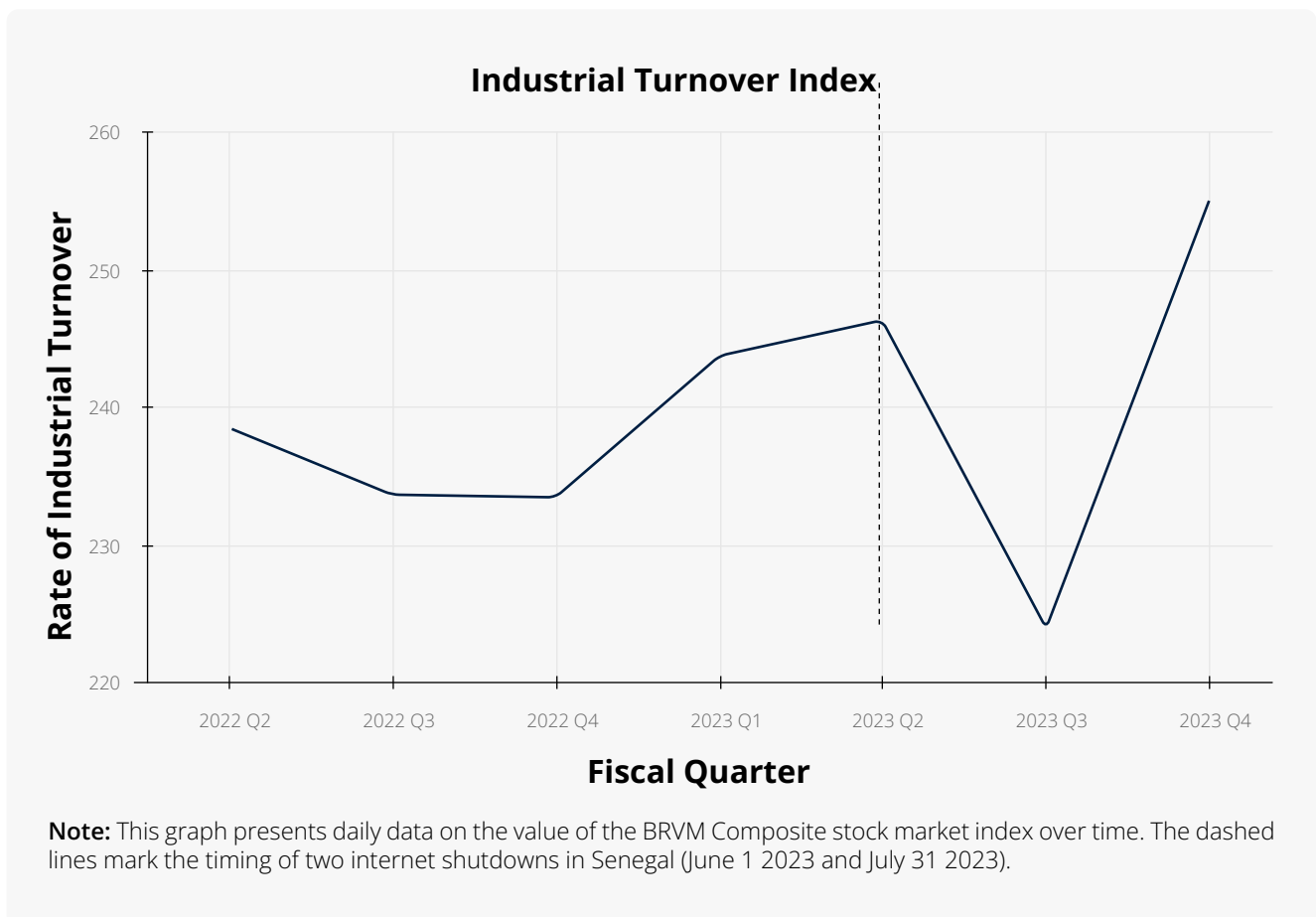
Figure 5: Industrial Turnover Index over time[6]

Industrial Turnover Index.[5] When we look at the associated impacts on industrial output measure, we find a similar decline of 0.95 percentage points from each additional day of internet shutdowns.

Overall, industries in Senegal may be using the internet or social media to facilitate transactions, maintain logistics and distribution networks, as well as plan shipments of material. These are likely to be critically dependent on the availability of a stable and resilient internet connection in the country.

Amidst an internet shutdown, companies located in the affected area would likely face challenges in tracking their inventory and/or supply chain, no longer have access to data-driven decision making and other digital tools or automation that increase productivity and production, and, as mentioned above, lose access to e-commerce capabilities and digital/online payment systems.[6] These challenges would directly contribute to decreased production and efficiency, leading to significant economic losses for vulnerable companies.

As a decline in the Industrial Turnover Index indicates a decrease in additional factors such as production capacity, such implications would likely have rippling effects throughout the economy: particularly on trade.

Trade: Imports & Exports

Trade is another substantial indicator that recorded declines following the internet shutdowns in 2023. Descriptive evidence, as shown in Figure 6, suggests a slight decrease in import volumes during June 2023, a disaggregated look at the descriptive evidence from imports and exports does not confirm a direct link between internet shutdowns and these fluctuations (Figure 7 and Figure 8). However, the same analysis reveals a clear and statistically significant connection between internet shutdowns and the value and volume of exports. In practical terms, this suggests that while the shutdowns may not have had a noticeable impact on the amount of goods entering Senegal, the shutdown hindered the ability of Senegalese companies to sell products abroad.

Further descriptive analysis found that the internet shutdowns in Senegal had a significant negative impact on the country's export sector (Figure 7). Results from the regression analysis of exports and imports on the timing of internet shutdowns show that the overall value of exports declined by 0.6 percentage points, translating to a substantial loss of nearly $2.46 billion USD (1.505 trillion XOF). Additionally, the volume of exports from the port of Dakar decreased by 3.93 percentage points, resulting in a loss of roughly 42,350 tons of exported goods as a result of the internet shutdowns. These findings highlight the tangible consequences of network disruptions on local economies. Such a decline in export value has the potential to result in reduced government revenue, fewer jobs, and a weakened economy overall. Similarly, such a decrease in export volume could disrupt supply chains and harm businesses across the global economy.

This decline amidst the shutdowns could have been for a number of reasons such as disrupted communications, decreased marketing due to social media blockages, and/or operational challenges. Such factors have the ability to reduce the overall value and quantity of exports, potentially contributing to an impact on the country's economic growth and trade balance. Indeed, data from surveys indicates that money transfer services were slowed down or halted, which could have prevented cross-border payments. Furthermore, the findings from the survey indicate business communication difficulties, leading to the cancellation of contracts, the inability to manage projects remotely, and delays in the delivery of services, suggesting direct impacts of the shutdowns on logistics and trade, which could be linked to lower exports in our findings.

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[5] Please note that this number cannot be directly expressed in monetary terms, but suggests that overall industrial output might be declining during internet shutdowns.

[6] The Industrial Turnover Index is also meant to capture data on "Electronic, Computer, and other Machinery" which may be affected by internet shutdowns. However, this data is not available for the time period. Understanding whether manufacture of these devices might be affected by shutdowns could help show potential longer-term impacts on the economy that extend beyond the service sector. If manufacturers reduce their production of electronic devices, it could drive down production in the company, affecting the supply of locally produced (and cheap) electronic devices which could be further damaging to the economy.

Trade Volumes (Imports and Exports)

Note: This graph presents monthly data on the volume of imports and exports in thousands of tonnes over time. The dashed vertical lines represent two internet shutdowns in June 2023 and July 2023 in Senegal.
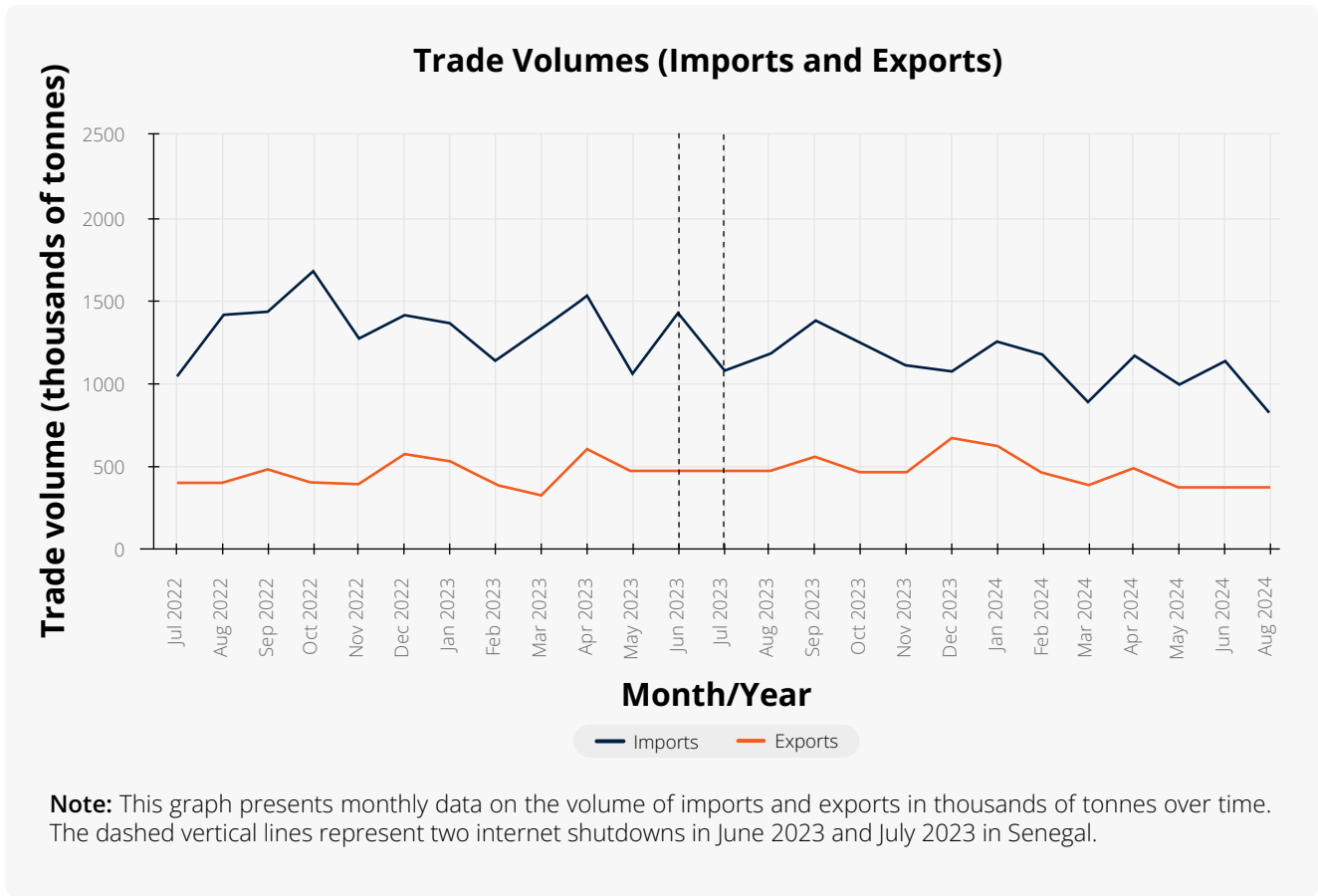
Figure 6: Volume of trade (Imports and Exports)

Net Trading Volumes (Imports)

Note: Figure 7 presents monthly data on net trade volumes (net exports and imports in thousands of tonnes). The two black vertical dashed lines represent the internet shutdowns that were imposed June and July 2023.
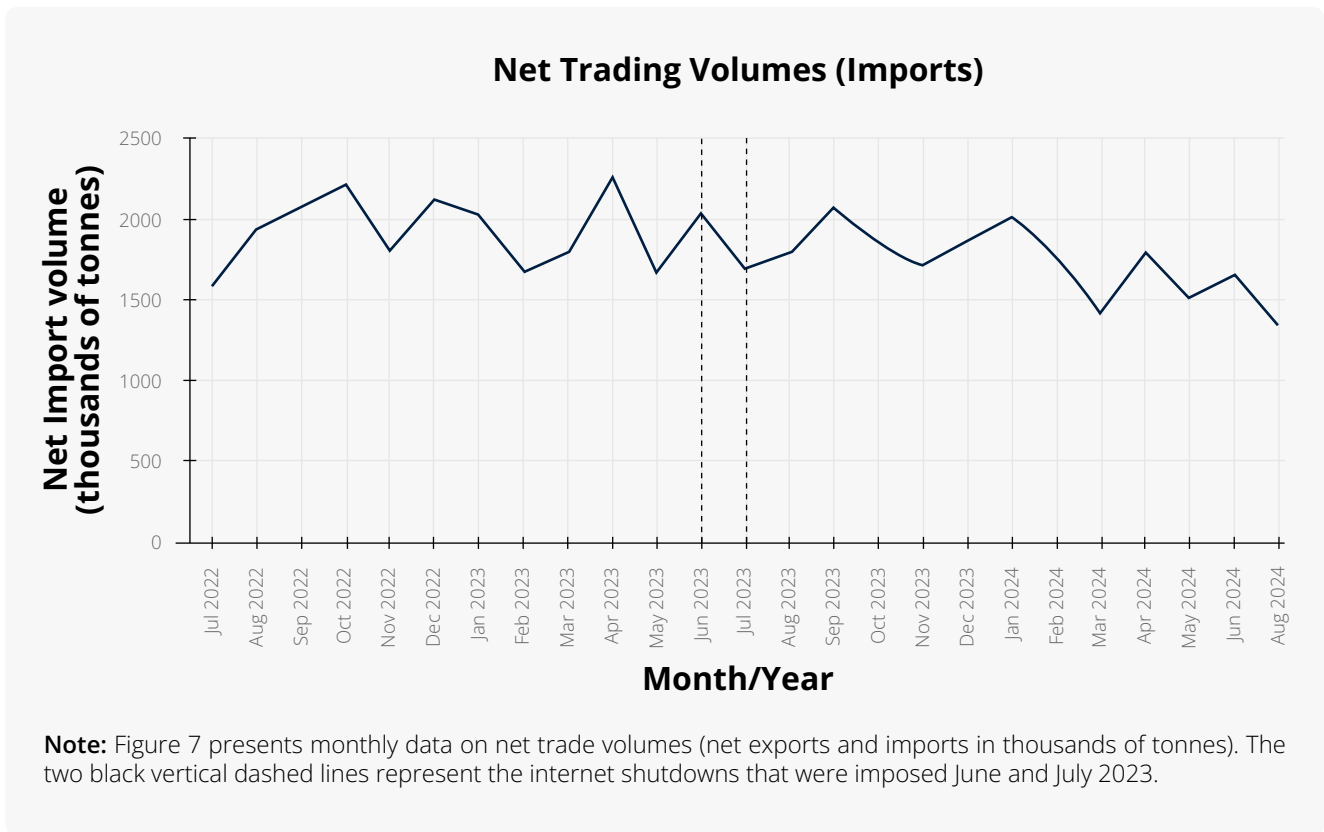
Figure 7: Trade volumes at the Port of Dakar

Trade Values (Imports and Exports)

Note: Figure 8 presents monthly data on total value traded (imports and exports, separately in millions of XOF). The two black vertical dashed lines represent the internet shutdowns that were imposed June and July 2023.
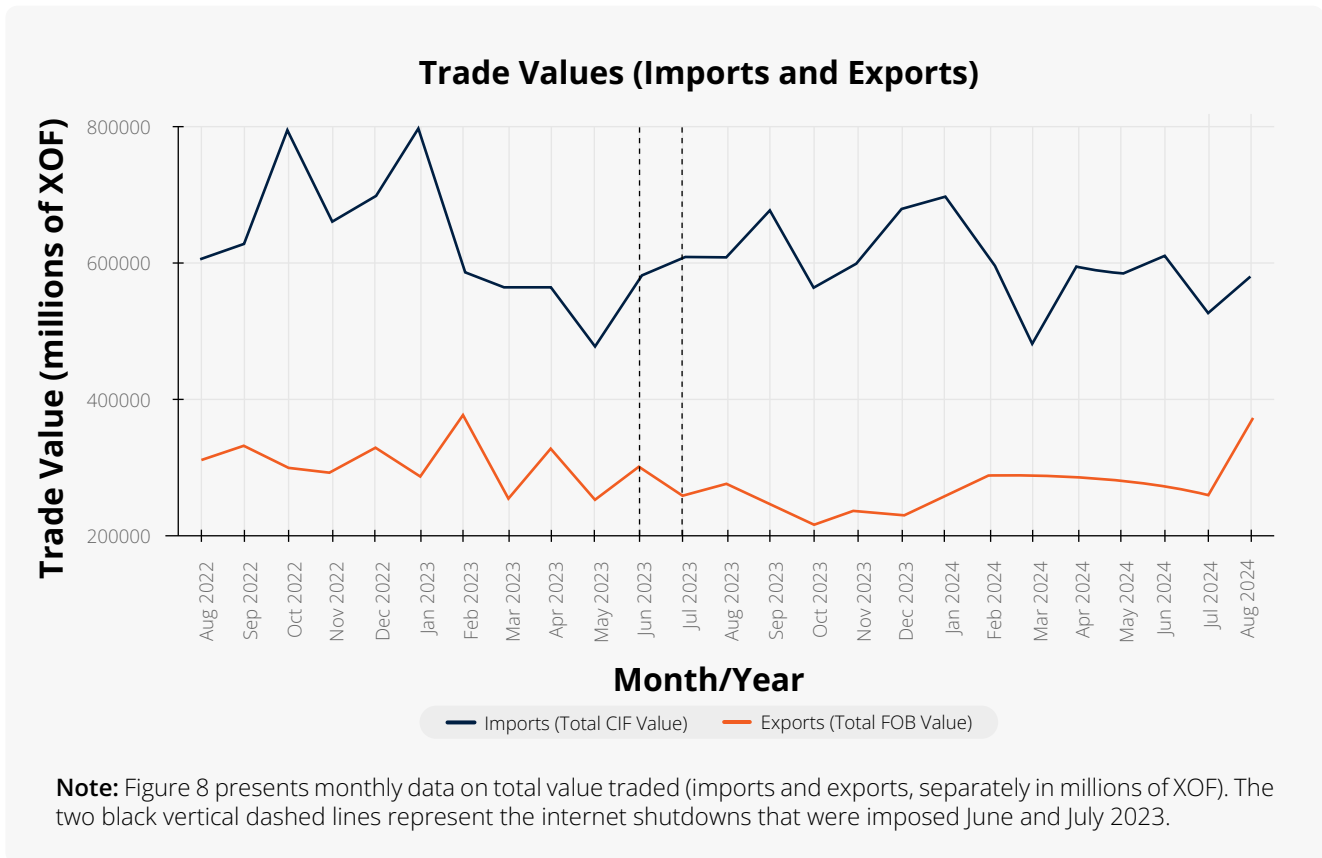
Figure 8: Trade values

Business Activity & Employment

Additionally, the descriptive evidence suggests that there was a small uptick in unemployment in urban areas following the internet shutdowns, especially among men (Figure 9). Given that men comprise a majority of the working population, this is not a surprising insight. In regression analyses, however, we do not find statistically significant effects of the internet shutdowns on different measures of unemployment.

Even where days during which shutdowns occurred are not directly correlated with a downturn in business activity, businesses (especially small businesses) operate under high uncertainty. Their sales, operations, revenues, and profits ultimately rely heavily on a stable economic environment. In this context, the shutdown risk captures aspects of uncertainty associated with a future shutdown. Thus, a higher shutdown risk might drive down confidence of business owners and entrepreneurs about future profits. If businesses and citizens expect a shutdown in the future, it might affect how they plan their future economic activity (new purchases, asset allocation, hiring, and/or employment decisions).

To some extent, in an already uncertain environment of civil unrest, imposing a shutdown could amplify the adverse economic impacts by creating more uncertainty and economic instability. The regression analysis of unemployment rates on the probability of an internet shutdown shows that a small increase in the risk of an internet shutdown (i.e., the probability of a future internet outage) was associated with a nearly 9.9 percentage point increase in the urban unemployment rates and a 9.5 percentage point increase in the male unemployment rates between 2022 and 2023. Although a regression analysis such as this is not the same as measuring the specific impacts of the current shutdowns, it indeed suggests that future shutdowns could put the urban workforce (that predominantly uses the internet and social media for employment opportunities) at risk of short-term unemployment. When individuals become unsure of their ability to use the internet or social media to access information about jobs or to run their small businesses, it has an overall negative impact on their employment and/or business prospects. This, in turn, could have downstream effects on overall economic productivity and output.
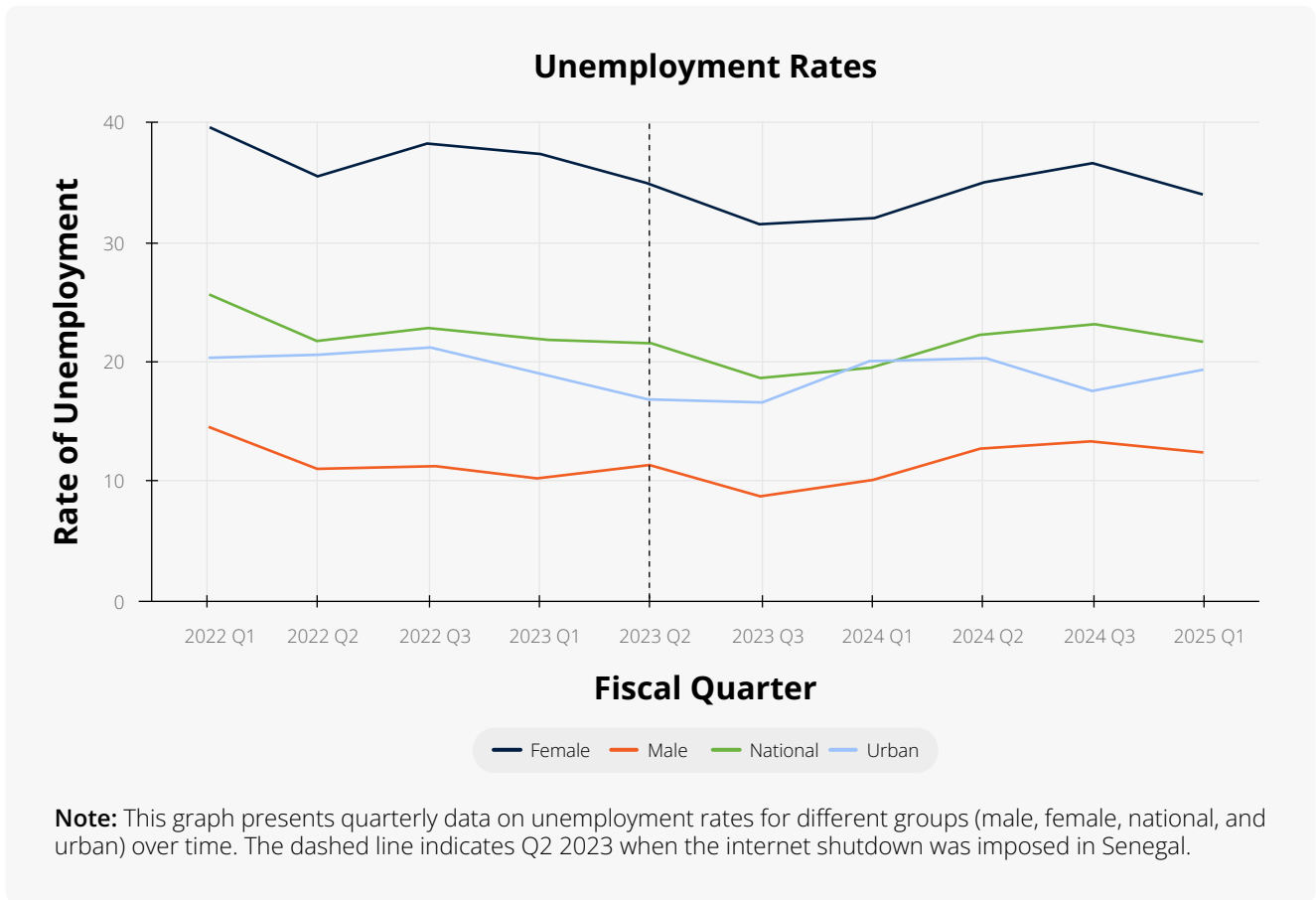
Unemployment Rates

Note: This graph presents quarterly data on unemployment rates for different groups (male, female, national, and urban) over time. The dashed line indicates Q2 2023 when the internet shutdown was imposed in Senegal.

Figure 9: Unemployment Rates over time

Similar to those seeking employment, the regression analysis of small businesses (which make up more than 94% of the firms in Senegal, and account for nearly 50% of the employment by firms) on the probability of internet shutdowns found that the economic uncertainty that results from shutdowns cripples their economic activity. Descriptive evidence from the time period in which the shutdowns took place suggests a small dip in the new enterprises registered during the months of the internet shutdowns (Figure 10). On average, new firm registrations dropped from 6,088 to 5,876 (a decline of 3.5%). The regression analysis exploring the links between new firms registered and the timing of internet shutdowns was not statistically significant, but the regression analysis of new firms registered on the probability of internet shutdowns showed some significant results. The mere risk of internet shutdowns was linked with an 8 percentage point decrease in new firm registrations, further suggesting that future shutdowns may negatively impact business activity in Senegal.

Small businesses and those working in the informal sector heavily rely on internet access for their economic livelihoods. An Internews report examining the broader consequences of internet shutdowns in Senegal during the same period revealed that 56.7% of survey participants deemed the internet as entirely indispensable for their work. Moreover, 54.6% of respondents indicated that internet shutdowns severely hindered their ability to conduct business. Survey respondents reported a range of individual economic losses from 60,000 XOF (roughly $95 USD) to 7 million XOF (roughly $11,200 USD). "Abdou" and "Fatima" explained that as their businesses rely heavily on the internet for selling goods and for communication, the shutdown left them feeling helpless.

To further compound factors, the researchers also found that the shutdowns and resulting lack of information during the period of civil unrest led many to isolate themselves within their homes, not participating in the local economy as they typically would, as both consumers and as employees. Such fear and instability can contribute to further economic uncertainty, compounding the findings identified throughout this report.
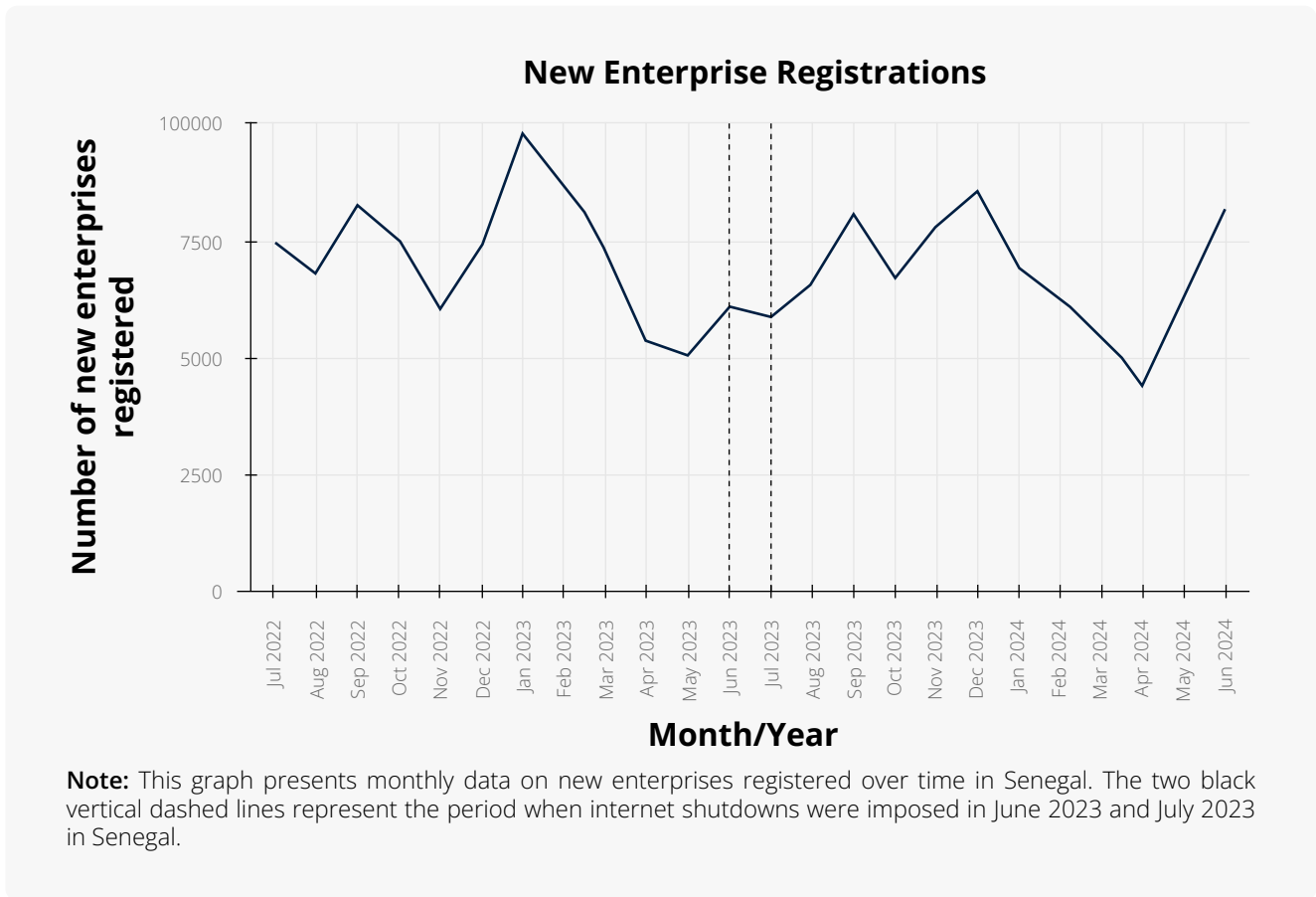
New Enterprise Registrations

Note: This graph presents monthly data on new enterprises registered over time in Senegal. The two black vertical dashed lines represent the period when internet shutdowns were imposed in June 2023 and July 2023 in Senegal.

Figure 10: New enterprises registered over time

Visualizing Impact: Night-Time Economic Activity

One of the key challenges in identifying the economic impacts of internet shutdowns is due to the fact that data on economic activity is often not available in real time. For events such as internet shutdowns, the impacts are likely to be experienced in the short term (within the week or month). Traditional aggregate economic data may not fully capture the impacts of shutdowns, or worse, may over-or-underestimate the impacts of the shutdowns.

To mitigate these concerns, we also examine night-time economic activity using data from NOAA's JSTAR Mapper tool using Suomi NPP - VIIRS Imagery as Layer 1 (Day/Night Band) data. The generated images (Figure 11) show the intensity of variation in night-time economic activity: brighter lights are indicative of more economic activity and dimmer (or no) lights may indicate lack of activity in a particular region at that time. This is descriptive evidence, and does not involve the use of a regression model to examine associations between nightlights and the timing of internet shutdowns. Images from Figure

11 (and the associated video) show that compared to the baseline (i.e., at the same time in the previous year - May 31, 2022), there are changes in night-time lights around the time that the internet shutdowns were imposed (June 1, 2023). The stark difference in the night-time lights between May 31, 2023 and June 1, 2023 (Figure 11) indicates that the shutdown in Senegal may have dampened (night-time) economic activity. Furthermore, from the video, there were some impacts that were also felt around the second, much shorter shutdown (July 31-Aug 1, 2023). Although night-time activity may not be a major indicator of overall economic activity in Senegal, this data suggests that night-time economic activity was severely impacted by the disruptions imposed by the government. These figures are meant to supplement the results discussed throughout this section and provide a visual representation of the shutdown's impacts.

Before and After: June 1, 2023 Internet Shutdown
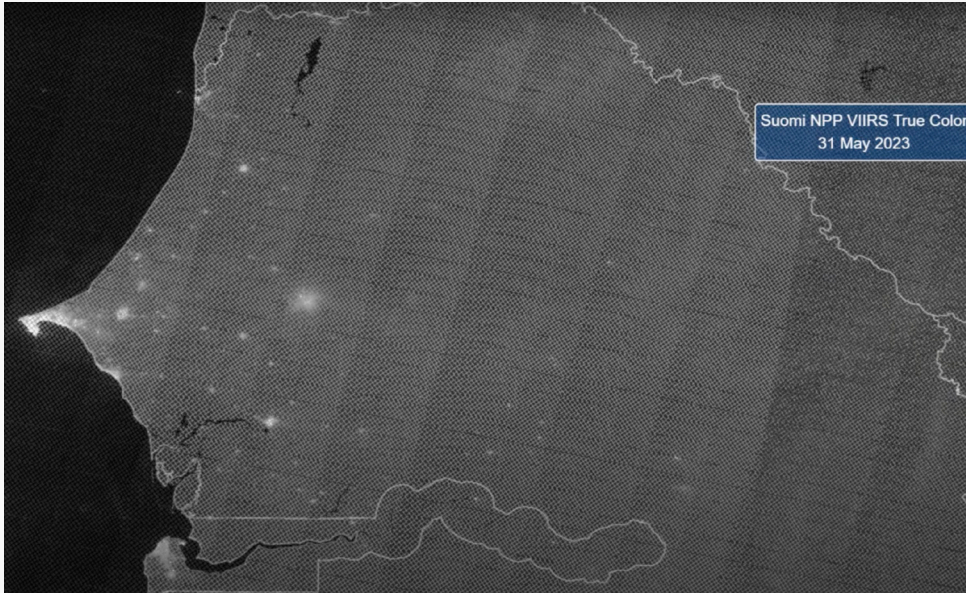
May 31, 2023
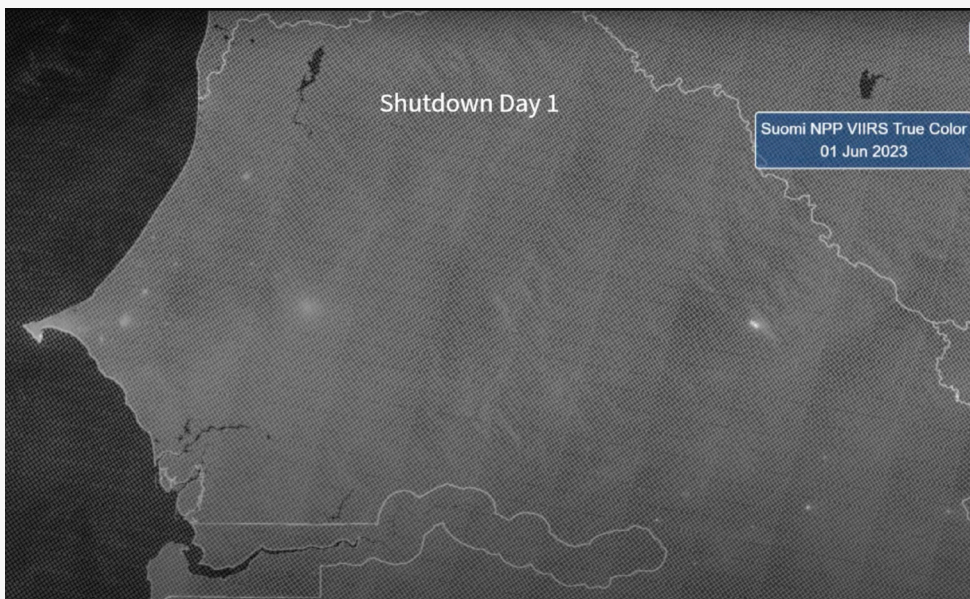
June 1, 2023

Note: This figure presents two images of night-time activity using satellite data from NOAA's JSTAR Mapper for May 31 2023 (the day before the internet shutdown was imposed), and June 1 2023 (the day the shutdown was imposed) in Senegal.

Figure 11: Change in night-time economic activity

Conclusion

This report has demonstrated the potential far-reaching and detrimental effects of internet shutdowns on local economies, particularly in the context of Senegal's 2023 shutdowns. While the absence of definitive causal data limits the scope of our analysis, a strong correlation between shutdowns and negative economic impacts is evident.

The economic repercussions of the internet shutdowns examined in this report are significant and multifaceted. From a macroeconomic perspective, they lead to statistically significant decreases in GDP, reduced industrial output, and a decline in export volume and value. These impacts are not merely statistical abstractions but have real-world consequences for individuals and communities. The personal stories interwoven throughout this report, and highlighted in detail in the corresponding Internews report, provide a human dimension to these economic indicators, revealing the challenges faced by Senegalese citizens to maintain their economic livelihoods in the absence of internet connectivity. These narratives underscore the importance of considering the human cost of internet shutdowns, beyond mere economic metrics.

Given the deeply studied economic implications of social unrest and political destabilization, governments that meet unrest with internet shutdowns only further exacerbate these economic consequences. IMF economists found that social unrest leads to a reduction in GDP driven by contractions in manufacturing and service sectors on the supply side as well as consumption on the demand side due to lowering confidence and increased uncertainty. This is pivotal within the context of this report's findings, especially considering the findings of the corresponding Internews report on the shutdowns' broader societal impacts in Senegal. The report found that, separate from the unrest that initially caused the internet shutdowns, the shutdowns themselves lowered confidence in the Senegalese government and the country's economic future. Additionally, the shutdowns raised uncertainty due to a lack of information and the inability to communicate effectively. In this case, both social unrest and internet shutdowns independently contributed to conditions that created an environment ripe for economic consequences, thus amplifying the negative economic impacts.

Such analyses can provide further insight into the compounding nature of the economic impacts of unrest met by internet shutdowns.

In a modern, interconnected, and global economy such as Senegal, where internet usage is growing rapidly, governments should strongly reconsider disrupting the internet. The criticality of the internet for businesses (especially small businesses) in the service sector as well as across the economy means that shutting down the internet is counter to the interests of their country's economy, and warrants that policy stakeholders think carefully about the impacts before taking such actions.

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Appendix

Appendix A.1: Results from the Econometric Model on Shutdown Risk

The graph below shows the various factors that are associated with the implementation of an internet shutdown in Senegal. Each dot on the graph represents the point estimate of the coefficient of the variable on the left axis on the probability of an internet shutdown. The length of the horizontal lines running through the point represent 95% confidence intervals (CIs). The vertical dashed line represents zero (or no) association. Where the CIs overlap with the dashed line, we cannot infer any link between the variable on the left and internet shutdown risk.

The strongest factor overall is if there was a shutdown implemented in the previous month, then the likelihood of an internet shutdown increases by more than 50 percentage points. In general, any conflict event exacerbates the likelihood of an internet shutdown, and increases the chance that it will be imposed. The strongest of these was if there was a riot that took place in the same month, it was associated with a 41 percentage point increase in the shutdown risk.
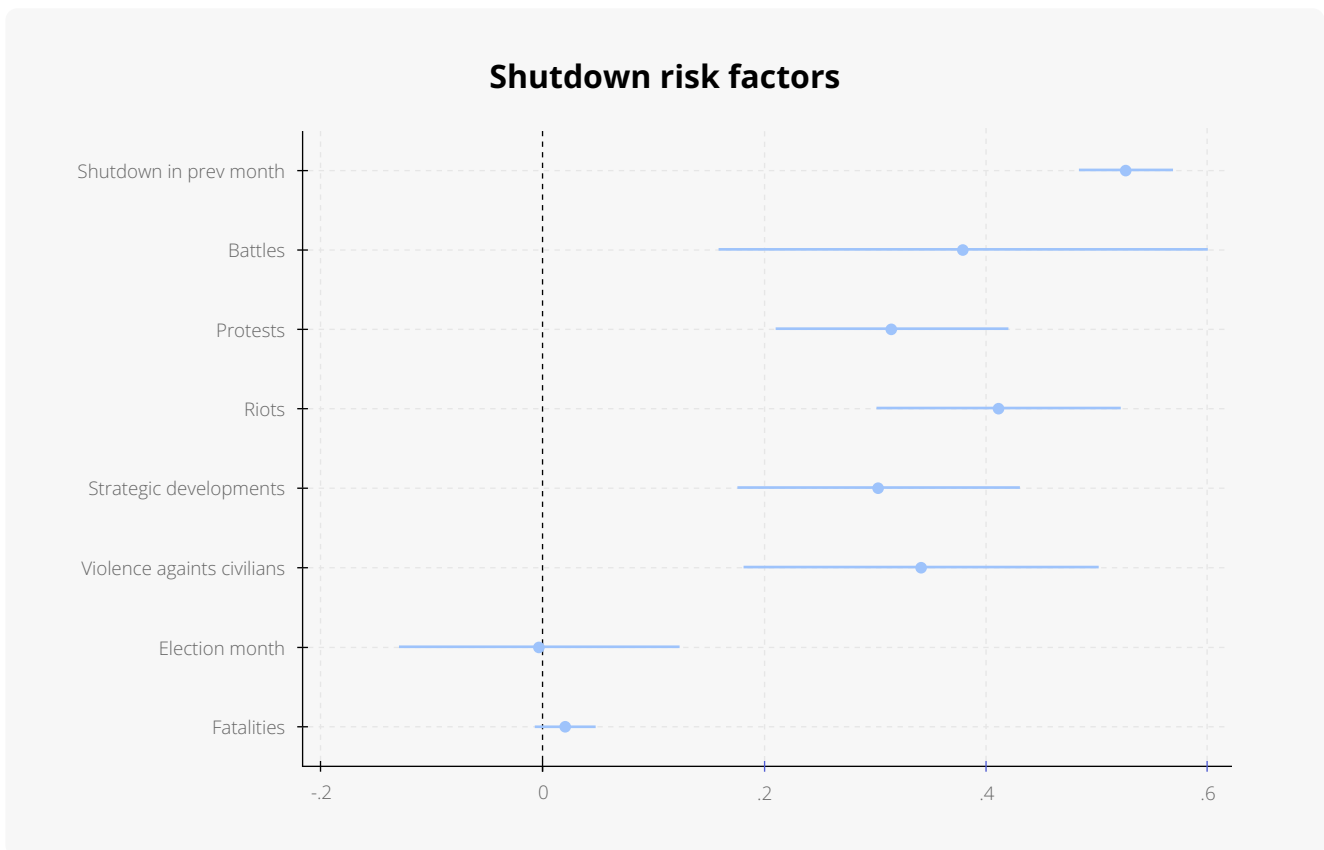

Shutdown risk factors

Figure A.1: Factors associated with internet shutdowns in Senegal

Table A.1: Variable Definitions and Sources

Sr. No	Variable	Definition	Source	Link	Frequency
1	Shutdown event	A binary variable that takes a value 1 if there was a recorded internet shutdown or social media block on that day, and 0 otherwise	AccessNow #KeepItOn Global Tracker and internet Society (ISOC) Pulse Shutdowns Tracker	https://www.accessnow.org/campaign/keepiton/#global-tracker	Daily
2	Shutdown duration	Calculated using the start and end date of the shutdown and specified in days	AccessNow #KeepItOn Global Tracker and internet Society (ISOC) Pulse Shutdowns Tracker	https://pulse.internetsociety.org/shutdowns	Daily
3	Capacity to implement internet shutdowns	Government internet shut down in practice (smgovshut) mean	Mechkova et al. (2023)	Mechkova et al. https://digitalsocietyproject.org/data/	Yearly
4	Capacity to implement internet shutdowns	Government social media monitoring (smgovsmmon) mean	Mechkova et al. (2023)	Mechkova et al. https://digitalsocietyproject.org/data/	Yearly
5	Conflict events	Categorial variable that records a value of 0 for No event; 1 for Battles; 2 for Protests; 3 for Riots; 4 for Strategic Developments; 5 for Violence against civilians, and 6 for Explosions/remote violence	Armed Conflict Location and Event Data (ACLED)	https://acleddata.com/	Daily
6	Fatalities	Number of fatalities recorded for each conflict event	Armed Conflict Location and Event Data (ACLED)	https://acleddata.com/	Daily
7	Election	A binary variable that takes a value 1 if there was an election (Presidential or Prime Ministerial) in that month, and 0 otherwise	Constituency-Level Elections Archive (CLEA)	https://electiondataarchive.org/data-and-documentation/clea-lower-chamber-elections-archive/countries-and-elections/	Monthly
8	Economic output	Natural log of the Gross Domestic Product (GDP) in billions of FXOF	Open Data for Africa	https://nso-senegal.opendataforafrica.org/iogsnwg	Quarterly
9	Primary, Secondary, and Tertiary sector output	Natural log of the Primary, Secondary, Tertiary sector Gross Domestic Product (GDP) in billions of FXOF, separately	Open Data for Africa	https://nso-senegal.opendataforafrica.org/iogsnwg	Quarterly

Sr. No	Variable	Definition	Source	Link	Frequency
10	Information and communication sector	Natural log of the information and communication sector Gross Domestic Product (GDP) in billions of FXOF	Open Data for Africa	https://nso-senegal.opendataforafrica.org/iogsnwg	Quarterly
11	Financial and insurance activities	Natural log of the financial and insurance activities sector Gross Domestic Product (GDP) in billions of FXOF, separately	Open Data for Africa	https://nso-senegal.opendataforafrica.org/iogsnwg	Quarterly
12	Unemployment rates	Male, Female, Urban, Rural, and Total Unemployment Rates (%)	L'Agence nationale de la Statistique et de la Démographie (ANSD)	https://www.ansd.sn/Indicateur/enquete-emploi	Quarterly
13	Stock market performance	Closing price of the Bourse Rgionale des Valeurs Mobilires (BRVM) index, composite	Investing India	https://in.investing.com/indices/brvm-composite-historical-data	Daily
14	Trade volumes	Natural log of the total embarkment (import) and disembarkment (export) (Traffic entering and leaving the Autonomous Port of Dakar, millions of tonnes)	Open Data for Africa	https://senegal.opendataforafrica.org/tmpwpyf	Monthly
15	Trade values	Natural log of the total value of trade in goods for exports (in FOB value) and imports (in CIF value), measured in millions of XOFs	Open Data for Africa	https://nso-senegal.opendataforafrica.org/pikdvrf	Monthly
16	Industrial production index	Value of the overall industrial production index	Open Data for Africa	https://nso-senegal.opendataforafrica.org/jaiwltf	Monthly
17	Industrial turnover index	Value of the industrial turnover index (excluding cotton ginning activities)	Open Data for Africa	https://senegal.opendataforafrica.org/nxefvxc/indice-du-chiffre-d-affaires-dans-l-industrie-icai	Quarterly
18	Inflation rate	General - Individual consumption expenditure of households National consumer price index (CPI)	International Labor Organization (ILO)	https://data.as-rcp.org/Datacatalog/Dataset/un-agencies%2Filo%2FNational%20consumer%20price%20index%20CPI%20annual%20rate%20of%20change%20discontinued%20Monthly_08022023202828	Monthly
19	New enterprises registered	Number of newly registred companies and associations (NINEA)	Open Data for Africa	https://senegal.opendataforafrica.org/gjezjr	Monthly

Appendix A.2: Econometric methodology for estimating impact of Internet shutdowns

This section describes the technical details of the estimation framework for the economic impact of internet shutdowns in Senegal. We use varied time-series data for Senegal at daily, monthly, quarterly, and annual data as described in Table A.1. The framework here follows the methodology laid out in Tagat et al. (2023), and the estimating equation is as below:

$$\text{Shutdown}_t = \alpha + \beta_1 \text{Shutdown}_{t-1} + \beta_2 \text{ShutdownCap}_t + \beta_3 \text{SocialMediaCensor}_t + \beta_4 \text{Election}_t$$
$$+ \sum \beta_c \text{Conflict}_{ct} + \beta_5 \text{Fatalities}_t + \epsilon_{ct} \quad\text{..} \quad (1)$$

$$Y_t = \omega + \delta_1 \text{Shutdown}_t + \sum \delta_s X_{st} + \gamma_t + \eta_{st} \quad\text{..} \quad (2)$$

Where, **Shutdown$_t$** is a dummy variable that takes a value of 1 if there was any shutdown observed at time period t (typically date t), and 0 otherwise. **Shutdown$_{(t-1)}$** is, therefore if there was a shutdown in the previous time period (in this case, we take the previous month). **ShutdownCap$_t$** is the government capacity to implement internet shutdowns and SocialMediaCensor_t is the government capacity to monitor political content in social media by the from the DSP data, both measured annually. They are measured as continuous variables from the V-DEM model (see DSP codebook for more details). **Election$_t$** is a dummy variable that takes a value of 1 if there was an election in that month-year, and 0 otherwise. **Conflict$_{ct}$** is a categorical variable that takes values as described in Table A.1. **Fatalities$_t$** is a continuous variable that captures associated fatalities for each conflict-related event. This model is estimated as the first stage, in a two-stage least squares model assuming that exclusion restrictions hold (i..e, shutdown and social media censorship capabilities as instrumental variables, or IVs, are not directly related to economic outcomes).

In equation 2, **Y_t** is the outcome of interest (detailed economic outcomes are available in Table A.1); **Shutdown$_t$** is the shutdown risk at time t, which is measured as a probability. In the tobit specification (estimated using conditional mixed-process, or CMP, models; Roodman, 2011), Shutdown is measured as the duration of internet shutdowns. In this alternative model, the model is conditioned on a shutdown being observed. X is a vector of country and time-level controls (total population, the rate of inflation, and unemployment rate are used as controls in most of the models, and in the case of sectoral models, GDP is also controlled for). γ indicates time fixed effects. All estimations use heteroskedastic-robust standard errors.

Diagnostic tests for instrument validity and robustness of exclusion restriction all indicate that the IVs are valid across model specifications, and are not weak instruments.

Internews