Overview

This document is meant to be a primer on Lustick Consulting’s model of Syria & Iraq (we call it “Syraq” for short). It is a spatio-temporal network model of both countries, designed to help explain and forecast political instability. This document will not be an introduction to how our model works, what kinds of past validation we’ve done, or the broader goals of the project under which this model has been funded.\(^1\) Instead, it will be about the Syraq model specifically, and how it can and cannot help us make sense of how that complex system operates. Also included is a brief report on general patterns appearing in our output data.

What’s the model like?

Syraq is an agent-based model that represents the political topography of the geographic area of both Syria and Iraq. The model includes over 50 identity-groups, including various ethnic, religious, political, tribal, and military groups in the region.\(^2\) Networks of “elite” agents or “influentials” are featured amidst thousands of “basic” agents. Elite networks are operationalized to capture communication, organizational ties, and support mechanisms among these more influential leaders of different groups.

This model does not explicitly include macroeconomic indicators (GDP, price of oil), external strategic actors (leaders in other countries), or indicators of individual death counts or troop movements. Instead, this model is meant to represent the political system at a more abstract level where we can discuss group identification, coalition-building, and levels of violence. Nevertheless, in addition to the presence of a business identity and criminality/corruption, the model also uses exogenous randomized perturbations to simulate different combinations of resource availability levels to different groups.

What are our data sources?

The data is all unclassified, mostly from the internet, but supplemented with monographic and other specialist produced material as well as input from SMEs, some via questionnaires designed by Lustick Consulting. Of particular importance here have been resources created and gathered by Hriar Cabayan’s Strategic Multi-layer Assessment team that attempt to analyze the political, military, economic, and social realities in Syria and Iraq. We have also gone to other open source materials on the web, including journals, newspapers, reports from NGOs, governments, think tanks, sites that specialize in data collection, and Wikipedia. And lastly, we have exploited resources available from Jane’s Terrorism and Insurgency Center (JTIC). We are

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1. For more on this, see our “V-SAFT Final Technical Report” (available upon request to U.S. Government Agencies and their contractors.)
2. For details on which groups, see the document “Some Notes on Identities in LC’s Syraq Model.”
actively using the JTIC data to estimate the number of foreign airstrikes occurring within Syria and Iraq that would not otherwise be an expected part of the model’s endogenous creation of violence.

Why should I trust the model?

We have carried out extensive validation tests on other countries as part of the Office of Naval Research’s V-SAFT project, which can be found in our final technical report for that project. This validation study attempted to forecast in- and out-of-sample events such as insurgency, rebellion, and domestic crisis in 17 countries (including Syria & Iraq) in all five combatant commands. This was the first attempt in computational social science to build, run, and update such a large sample of ABMs for a fifteen-year in-sample period, and then validate the results using real-world empirics. We found that our model results held their own against state-of-the-art statistical models attempting to forecast the same dependent variables, with an overall accuracy of about 85% of correctly classified events.

Besides our empirical validation results, it is important to keep in mind that the level of granularity over time, in space, and by identity-group that our model can capture is unparalleled by other modeling approaches. The accomplishments of our model are primarily rivaled by Subject Matter Experts (SMEs). On the other hand, although SMEs can provide explanations and forecasts at similar levels of analysis, their assumptions are often imprecisely and incompletely specified, Nor can SME’s “replicate” (for verification and validation purposes) the mental models and processes that produce their conclusions. LC ABM’s are also incomplete, but they are exact in their incompleteness, meaning that all inputs and model operationalizations are available for analysts to probe.

One difficulty with ABMs that virtualize the problems they simulate is also associated with SMEs. Reality is complex and so are the explanations for outcomes of interest that ABMs and SMEs offer. The Syraq model is of course, and necessarily, less complicated than the actual real-world target. Its dynamics thus produce clouds of possibilities, not a single thread of “what will happen” or “what did happen.” Therefore we use small random shocks to produce hundreds of possible futures, each incorporating elements of chance and the consequences of unobservable factors that operate in the real world. Because LC models explore the world of the possible, and not the actual, experimentation with them produces data that is richer and more complex than what can even in theory be collected via observation of the “one run” of the real world we have at our disposal. Although we can provide details to every input and model dynamic, what emerges in the output are distributions of probabilities containing stimulating mixes of recognizable and surprising patterns. This means that analysis of experimental results is key to harnessing the complexity of the model for building a more complete picture of the real world.
Running the Model

For each combination of variables we wish to study we standardly produce dozens to hundreds of runs with different random seeds, yielding distributions across various dimensions that sample the state-space of the model. This allows us to use a “treatment and control” approach to Syraq, exploring via rigorous experimentation what causal effect different conditions of interest, different loadings of different variables, or different assumptions about the way the world works, have on model performance and patterns exhibited in model output.

What are the model’s key dynamics and outputs?

There are two key model functions that have important theoretical roots in political science and also drive the most important outcomes and trends in model results. Those are identity and authority. It is particularly important to understand the basic meaning and operation of the model component known as the “Dynamic Political Hierarchy” (DPH).

An identity is an affiliation that animates the political behavior of agents. Identities can be ethnicities, religions, political parties, military organizations, tribes, economic classes, or any other affiliation that can drive political behavior. The Syraq model has about 50 identity-groups, including common cleavages like Sunni/Shia, Kurd/Arab, and ISIS/Iraq/Syria. It’s also important to note that identities are “constructed,” meaning that they are relatively fluid and that agents can hold multiple at once in their repertoire, choosing to activate on one over another depending on salience. In our Syraq model, for example, there are times when the ISIS identity weakens (due to external attacks or internal fragmentation) which allows agents to activate on other identities like Sunni, or tribal affiliations in central Syraq.

In our model, authority is measured by tracking which agents have joined (or been captured by) a particular state or statelet. There are five of these territorial zones of authority in our model, namely Shia Iraq, Kurdistan, ISISLand, Assad’s Syria, and Syrian rebel-held territory. This political authority is locally defined, fluid, and in constant competition with other zones. This operationalization reflects Paul Staniland’s insight that "states and insurgents are not simple-minded maximizers of monopoly but instead are optimizers of authority in complex, often counterintuitive, interaction with other armed actors.”

Agents determine their place within each zone of authority by using the Dynamic Political Hierarchy (DPH) module, which classifies identities and agents into five categories: Dominant, Incumbent, Regime, System, and Non-system. The largest identity within a zone is first labeled as dominant, and next incumbents are identified as those groups comprised predominantly of agents aligned with the dominant group via overlapping subscribed identities (affiliations

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3 For more information on how particular algorithms and triggers work in our models, see Lustick’s “Agent-based modelling of collective identity: testing constructivist theory” in the Journal of Artificial Societies and Social Simulation (Paper) or Lustick, et.al. "Secessionism in Multicultural States: Does sharing power prevent or encourage it?" in the American Political Science Review. (Paper)

included in their repertoire of identities). Put more simply, the incumbent level are those groups that are most closely aligned with the dominant group. *Regime* groups are those aligned with incumbent groups, *system* groups are those aligned with regime groups, and *non-system* groups are not aligned with any groups within their zone of authority. Once the DPH calculation is complete, all agents are able to politically mobilize in different ways via either *lobby* (dominant/incumbent groups), *protest* (regime groups), and *violence* (dominant/system/non-system groups).5

For example, lobbying occurs within uncontested pillars of authority within each zone, when for example an ISIS supporter is angry about the lack of available services. Protests are common in Iraq where there are disenfranchised Sunni tribes that consider themselves the “loyal opposition.” Protest is less common outside of Iraq’s core where “loyal opposition.” In most other portions of Syria, “loyal opposition” is seldom tolerated and violence is the most common form of political mobilization. This violence is perpetrated both by groups looking to maintain dominance within their own region and against other militaries looking to expand into their territory.

### Three DPH Configuration Examples in Shia Iraq

Figure 1 - Three examples of political hierarchies in Shia Iraq. The red band is dominant, green is incumbent, blue is regime, yellow is system, and grey is non-system. In the left-most graphic, we have a sectarian Iraq dominated by the State of Law - all other identities except for Globalizing are in Non-System. The middle chart shows a much more stable Iraq with far less opportunity for violence, despite the State of Law identity still being dominant. The right-most describes an intermediate situation dominated by the Iraqi State, with identities distributed throughout the hierarchy.

The three displays in Figure 1 depict the DPH status of different groups in the Iraqi Shia State DPH zone during one timestep in three different trajectories. Each registers which group is dominant, which incumbent, which regime, which system, and which non-system by the color of the strata where it is located. The size of each group’s circle represents its relative political clout at that point in time, in that particular trajectory. The display on the left shows a highly sectarian version of the Iraqi state, one in which a “Maliki-type” State of Law party dominates, alienating all other groups within the country and driving them into severe opposition. This even includes

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Shia groups. The center display is better interpreted as more of an “Abadi” version of a less-sectarian Shia Iraqi state—the sort that most American analysts are recommending as an important way to break ISIS’s influence among Sunni Iraqis. Interestingly, we do see that many groups are in an alliance with State of Law and others are in opposition—but a non-violent sort of opposition. How stable this configuration is and how effective it is in blocking ISIS advances are interesting questions for the model. The display on the right shows the “Iraqi State” identity as dominant—meaning the bureaucracy, civil service, judiciary, etc. supported by citizens who identify as patriots of the country. This is a promising configuration, if it can be achieved and sustained in Iraq. We do see ISIS appearing in the Iraq zone in this display, which may reflect the risk that is associated with the dominant force in that state not having a Shia coloration with which to mobilize against ISIS. Note also that the Dulaym tribe is sometimes featured as in serious opposition to the Shia state, and sometimes not. In the real world that crucial tribe is split between subgroups close to ISIS and subgroups who fight ISIS.

How do we update the model over time?

Our models begin as a semi-randomized set of agents and identities that match, as closely as possible, the political and demographic data of the target region. That being said, data availability is a particularly acute problem in the ongoing war zone of Syraq. To obtain results with greater relevance to the real world, we steer the model, using punctuations to tune the model toward the part of the state space of the future that the “thread of the actual” appears to be in.

For Syraq, the best steering data available is that of territory control in Syraq between the five major political groups – Assad’s Syria, Rebel Territory, ISIS-land, Iraqi State, and Kurdistan. Wikipedia has a large collection of mostly-standardized, reasonably well-sourced maps covering most of the history of the conflict. Using these maps, we have developed automated scripts to determine the modal control of every district in the two countries, and use that data to bias agents towards particular ownership. Other data not used for steering can (when available) still be used for verification purposes.

Situational Awareness for Syraq

The first question asked about the state of Syraq is about territory. Unfortunately for the optimists, ISIS rarely collapses in our model results. The most typical result is a slight shrinkage, costing ISIS only a few outlying territories (Fig. 2).

The extent of Assad’s state is another relatively stable aspect of the trajectories produced by the Syraq model. While its extent varies, it is as likely to increase as it is to decrease. The highly fragmented opposition within that domain—both at the elite and mass level—combined with the isolation of opposition factions from larger groups in other parts Syraq explains why the Assad regime has sustained itself as long as it has and why it is likely to persist. Model results also suggest that what gains the Kurds have made at the expense of ISIS or the Assad state are not
well consolidated. Furthermore, if Kurdistan does shrink, the most likely process is ISIS zone expansion, exploiting the tension along the Kurdistan/Iraqi border toward Iran.

Figure 2 - Left: The most likely outcome in our results, which shows that barring any large external interventions, Syria is likely to remain in a very similar status to the present. Right: One run where ISIS is nearly defeated. Although rare, this was and is a possible outcome in Syria.

There is also a relatively normally-distributed likelihood of violence (Fig. 3). In other words, there is a very low-likelihood of violence dropping to low levels with a higher likelihood of “medium” levels of violence. This is a bit surprising, since most of our country models tend to exhibit a “fat-tailed” distribution of violence. This finding is not only consistent with the fact of the survival over the last two years of all the major players in Syria—Assad State, ISIS, Shia dominated Iraqi State, Kurdistan(s), and the Syrian opposition—but also with the expectation, absent a radical change in the amount or concentration of violence, that Syria features “ultra-stability” of endemic but non-decisive patterns of civil war, warlordism, and sectarian strife.

Figure 3 - Histogram of the number of attacks in one year of runtime. There is variation here, but there is a low likelihood of a relatively peaceful region.

But since there is some likelihood of low levels of violence, we can ask what makes those runs different than those that display high levels of violence. The “Low Violence” map on the left has...
lower fragmentation - note the more uniform rebel zone, dominated by the Free Syrian Army in the North West of Syria. Note also that ISIS is somewhat smaller, losing two territories outside of Mosul to a tribal group, distancing the group from one of it’s most important population centers.

Figure 4 - The two graphs above compare the most common identity by district between the lowest violence trajectories and the highest violence trajectories.

Now that we understand which groups are most likely to be active during different types of trajectories, we might also wonder which external, cross-zone attacks are most common. Most of the attacks in our model feature an attacker and victim in the same zone, but there are also many attacks where the attacker and victim are in different territorial zones. Below (Fig. 5) we can see the most common external attacks originate from the two large state zones and target the peripheral zones (Assad attacks Rebels and ISIS, and Iraq attacks Kurds and ISIS.) Part of the reason for this is the overwhelming resources available to the two state zones, in the form of a consistent tactical advantage. We can also see that due to the highly central location of the ISIS territory, it has a near-equal likelihood of attacking one of the other four zones. Given the ISIS zone’s large size and long border with Assad, relative to the quite small Rebel zone, one would expect that more of Assad’s external attacks would hit ISIS than the rebels. However, it’s quite clear that the opposite is true, which is some evidence for a form of accommodation between ISIS and Assad.
Figure 5 - External zone to zone attacks. Most attacks originate from the Assad and Iraq zones due to their access to resources.

We can also ask about the geographic distribution of attacks in the region. We found that most attacks originate from Iraq, specifically Baghdad, and that Syrian attacks originate from a more uniform distribution of governorates. There are several explanations for the predominance of Baghdad sourced attacks, including the district’s extremely high population (20% of Iraq’s total population) and a rather cosmopolitan society that can often make mobilization more likely. Baghdad is also the center of Iraq, almost always controlled by the dominant identity of the zone (Fig. 6 below). This uniform connection to large identities in combination with the strong elite network centered on the capital gives Baghdad agents more range, better tactics, and easy access to expertise. Furthermore, ISIS is often practically on Baghdad’s doorstep, which means there is no shortage of potential targets.
The darker districts are those that are tightly controlled by the zone and lighter districts represent more peripheral zones that are unlikely to experience high levels of central control. Baghdad, Damascus, Raqqa, Idlib, and Erbil are all show high levels of authority within their zone. On average, the Assad zone tends to maintain the tightest control.

Some analysts see Syria through a lens of militarism or tribalism, so below we created maps of the region that identify those military and tribal groups that are most likely to dominate particular districts (Fig. 7). The military identities match up with the major zones of control, although the Kurdistan region tends to be more fragmented between key armed militias. The tribal identities are scattered, and there are some regions - east of Damascus and in Southern Iraq - where no tribal identity rises to the top (transparent districts). Several of these tribal identities can play key roles in the working of the model, often leading counter-intuitive results from punctuations.

Figure 6 - Left: Average number of attacks per governorate in Syria. Right: Likelihood of control by district.

Figure 7 - Maps of the most prevalent military and tribal identities, respectively.
What about this key group/variable not in the model?

There are many more groups and affiliations in the real-world Syraq, including foreign political players such as Iran, Saudi Arabia, Turkey, Russia, and the United States. Some do have influence in the model via favored identities or proxy groups - for example, the ethnic Turkmen for Turkey, the Sunni religious identity and Islamic Front for Saudi Arabia, and Hezbollah for Iran. As part of the steering method described above, we also implement airstrikes representing the efforts of military forces (the United States and its allies) that are external to complex political systems of Syraq itself.

There are also many identities that can be discovered the social demography of Syraq that are simply not politically important or large enough to be individually included in the model. There are innumerable small tribes and clans that have simply been left out of the model. Some small identities were not left out, but aggregated - for example, the Christian identity which is actually comprised of several different minority ethnic groups.

In political science, there are also dozens of sub-fields that tend to coalesce around sets of variables treated as the most crucial at explaining or predicting specific parts of the world. These include variables measuring the economy, regime types, the existence of failed states, voting behavior, psychological states, climate, etc. Although we find much of this research compelling, it is simply out of scope for what is already a very complex model.

Conclusion

Our model is a digital realization of the real world Syraq that is close enough in its key elements to provide a thinking tool about its complex dynamics that is unprecedented in its richness and flexibility. A key take-away is not only that the conflicts in Syraq are highly resistant to change in their basic patterns, but that the medium term intractability of the situation can be captured by focusing on three key elements: entrenched and antagonistic affiliative commitments, imbalances in the density and effectiveness of organizational ties among elites, and the overall level of violence—high enough to prevent political development but too low to afford opportunities for decisive changes in the political landscape.

Experimentation with steering, punctuations, and alternative conceptualizations of ISIS shows that questions and debates among experts can be translated into computational realities that can then respond in interesting ways to those debates and the questions asked by experts. Thus the Syraq model shows promise as a scalable platform capable of incorporating considerable nuance and granularity in its application to specific questions. At minimum, the model can speak to side-effects that policy-makers should be aware of or perhaps be prepared to mitigate and can provide opportunities to search the space of the possible more rigorously than can be accomplished with any other technique for plausible paths to a better future. Of particular interest is the potential for applying this technology with more granularity to both lower levels of conflict in individual parts of Syraq and of broadening its application to exploration of questions about the “new,” messy, but not order-less Middle East that is emerging.