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FROM SOCIAL CONTRACT TO ARAB SPRING: MACROECONOMIC ADJUSTMENT UNDER REGIME CHANGE

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From Social Contract to Arab Spring: Macroeconomic Adjustment under Regime Change

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Abstract

Following the Arab-Spring protests, we examine macroeconomic interactions between a productive firm and a rent-seeking government characterized by a continuous probability of regime shift. The model is able to rationalize the early growth leaps witnessed in many Arab economies (the "Social Contract"), as well as their subsequent stagnation. Although post-Spring outcomes are judged benevolent, the macroeconomic inheritance is dependent on the earlier transition characteristics. The model thus sheds light on Arab economic evolutions, the shifting preferences and technologies of authorities and the likely success of economic reforms.
(*JEL*: E24,F5,N17)

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1 Introduction

In the post-war period many countries underwent radical regime shifts: consider the transition from dictatorships to democracies in Southern Europe, Latin America and Eastern Europe in the 1970s, 80s, and 90s, respectively. Such transitions were rarely smooth. Latin America, for example, experienced hyperinflation in the 1970s and 80s alongside historically high unemployment. In the last decade, though, in all three economic areas, stabilization patterns are converging to G7 averages.

With the uprising against autocratic governments in the Middle East and North Africa (MENA)[1] from late 2010, we are again faced with the question of how economies, undergoing dramatic regime shift, can manage the transition. The transition represents a profound source of uncertainty that may impact negatively on macroeconomic stability (IMF (2012).

On one hand, the MENA block have arguably a better macroeconomic starting point than Latin America faced, in terms of inflation and unemployment. They also possess many under-exploited advantages – proximity to Europe; educated, young labor force; natural resources. On the other hand, their economies have, after early promise, stagnated markedly in recent decades compared to world averages (e.g., Arbache and Page (2010), IMF (2011), Malik and Awadallah (2013)).

Despite these failures and the pressing need for reform, Arab institutions have tended to be conservative and repressive. One wonders therefore if those "Arab Spring" countries that have changed (or may yet change) their regimes will experience a similar transition to that witnessed elsewhere, or whether they will remain "exceptional" in some sense?[2,3]

[1]This block, as defined by the IMF, comprises 20 countries: Algeria, Bahrain, Djibouti, (Arab Republic of) Egypt, (Islamic Republic of) Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, Yemen.

[2]The term Arab Exceptionalism refers to the apparent resistance of the Arab world to make the transition to democracy, as occurred elsewhere in formerly authoritarian regimes (and as broadly predicted by Modernization theory, Lipset (1959)). Several reasons for this have been given – the supposed irreconcilability between political Islam and secular democracy, the colonial legacy of imperialism and foreign domination, the power and institutional structures of current ruling elites.

[3]It is interesting also to compare the Arab Spring with the political events in the spring of 1848 in Europe. There are many of similarities, see (Zamoyski (2001) Chp. 17): (1) The revolutions in 1848 started from manifestations over simple issues (e.g., in France it

Understanding stabilization policy and economic development phases in the Arab-Spring context is the subject of our paper. This is a complex topic, made more difficult by limited and often poor-quality data. As far as we aware, ours is the first to address it. More generally, analytical studies on the Arab developmental model have been surprisingly few.[4] The MENA region amounts to almost 420 million (2012) in population,[5] dominates world resource reserves and is of strategic political importance, with a pronounced and unpredictable "youth bulge".[6] Thus, despite all the uncertainty involved, the topic is too important to ignore.

Moreover, the expression "Arab Spring" suggests a uniformity underlying recent Arab experiences. But MENA states are far from homogeneous. There are differences in geography, resource endowments[7], fiscal capacity, institutions, human capital etc. Likewise, there were quite distinct reactions to the protests: in countries like Saudi Arabia, despite their limited democratic credentials and high unemployment, revolutionary forces were thin. In other countries, like Egypt – poorer but with similar unemployment and democratic failings – pressures were greater. Algeria, which compared to Egypt is richer, less democratic but with a worse inflation-unemployment record, escaped the Spring with relatively minimal concessions.

Notwithstanding, we believe it is still possible to posit a common Arab model which accounts for the many similarities (autocratic regimes, corruption, statism, economic stagnation etc.) but can still give rise to and rationalize the distinct experiences witnessed.

Our model comprises two agents (government and representative firm)

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was sparked by the prohibition of a public banquet by radicals); (2) The countries involved were heterogeneous, from Italy to Denmark, from Hungary to France. All of them bound together by the Metternich system of political repression; (3) The two most important underlying causes in Germany were the step rise in food prices (from potato blight) and unemployed educated people (the "intellectual proletariat"); (4) Among the most frequent political requests were a constitution, and a representative parliament.

[4]This contrasts somewhat with the treatment of China and India, e.g., Brandt and Benjamin (1999), Prasad and Rajan (2006), Bosworth and Collins (2008).

[5]This is 6% of world population. Again we use the IMF's MENA definition to calculate population. Data source: World Bank.

[6]Around 60-70% of the region's population is under 30. Such a youth bulge has often been associated with severe social unrest, Heinsohn (2006); the idea being that sons born late in the family, often excluded from economic and social life, compete for social capital through (possibly radical) religion or political ideology.

[7]For example, from the oil rich (Qatar, Kuwait, UAE, Saudia Arabia) to the oil scarce (Syria, Tunisia, Morocco, Jordan).

and two political-economy regimes (before and after the "Spring"). We assume that the government has preferences over inflation and employment.[8] These are standard in the macro stabilization literature. But they carry particular significance here. On *employment*, given their limited democratic legitimacy, Arab Governments use public-sector sinecures to maintain consent. Regarding *inflation*, Arab countries have traditionally operated price controls for staples and other strategic goods to sustain the regime. Moreover, the fragmented markets that characterize many Arab states generate their own price pressures and distortions.

In addition to policy management, the government is assumed to extract rents from the profit-maximizing firm. Moreover, Arab authorities are assumed in our model (and more generally often in the literature) to have no long-run developmental objectives. Indeed, they erect barriers to growth through low technology access, rigid labor markets, corruption and rent seeking. Given this extractive nature we assume the regime faces a continuous probability of removal.

In addition we assume that the transition between regimes (pre and post-Spring) is determined by a hazard rate. This can be formulated in different ways. For instance, regime change might happen dramatically and with no apparent forewarning, or it may be an endogenous reaction to some underlying polity failure. One consequence of the latter is that a policy maker, mindful his actions could trigger (unwanted) regime shift, may tailor policy to contain revolutionary pressures.

The contribution of this paper is therefore to provide a unified framework for analysing the economic and policy evolution of Arab economies over time. To that end, we consider the MENA block as having passed through three broadly-conceived phases. Phase one, the rapid expansion of their economy and welfare state after colonial independent (the so-called Arab "Social Contract"). Phase two, their protracted slump in the 1980s, and attempted structural reforms. Finally, the current post-Spring phase of economic uncertainty and regime shift.

In doing so, we make a very distinct series of contribution to the literature. For instance, we merge hazard analysis with the literature on macroeconomic stabilization. We also corroborate the importance of institutions, although

[8]For background on policy stabilization in emerging and/or politically strained economies, see Blanchard (2004), Hachicha and Bates (2009), Aktas et al. (2010), IMF (2012).

here our focus is from a macro-stabilization viewpoint than a growth one. We are able to relate the regime's survival prospects with unemployment and rent seeking activities.

The paper is organized as follows. Section 2 provides some empirical and narrative background to the Arab development model (the "Arab Social Contract") and the Arab-Spring protests. Section 3 presents a stylized model in which the policy authority, stabilizes the macro economy subject to unemployment dynamics. Section 4 discusses the incorporation into the model of the regime change through a hazard rate. Section 5 shows the explicit solution of the model in each regime (before, and after the Spring). The section following that illustrates the working of the model and compares economic outcomes when the transition between regimes is governed by a state dependent and non state dependent hazard. Finally, section 7 concludes.

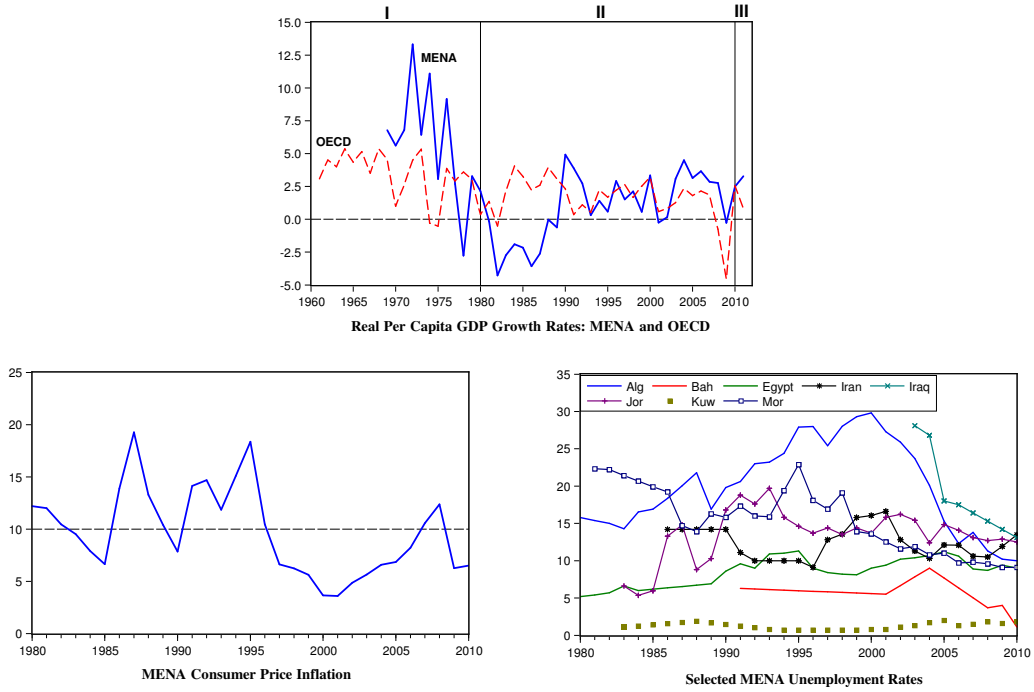
2 Some Empirical Background

Figure 1 plots the growth rates of real per-capita GDP (MENA and OECD) from the 1960s, and then selected MENA unemployment rates and MENA inflation from the 1980s. Following World Bank (2004) and others, we suggest that the MENA economies can be viewed through *three* broad phases, which are indicated by vertical lines in the top panel (although one of our insights is to see these "phases" as actually a continuum).[9]

The *first phase* in the Arab development story was their great early expansion; in the 1960s and 1970s the MENA countries were, alongside the East-Asian tigers, among the fastest growing economies in the world (see Amin (2012)). Following colonial independence, many Arab states engaged in large-scale state planning, nationalization, import substitution, and significant welfare outreach. The accompanying political system was centralized and repressive.

[9] A wider related discussion of the weaknesses of the Arab developmental model can be found in Yousef (2004), World Bank (2004), Abdih (2011), IMF (2011), Foreign-Affairs (2011), Malik and Awadallah (2013).

Figure 1: Growth, Unemployment and Inflation rates: MENA and OECD



Sources: World Bank, OECD, ILO, and IMF WEO.

Thus was born, in effect, the Arab "Social Contract": the toleration of autocracy in return for economic security, Amin (2012), World Bank (2004).[10] Though initially successful in delivering high growth and enhancing development, fundamentally, the social contract emphasized stability and risk aversion. The outcome was a dominant, patronage-based public sector (as characteristic of "rentier states", Schwarz (2013)). And – given weak property rights, corruption and limited openness[11] – an under-developed, dependent

[10]Hydrocarbon windfalls, lessening the need for general taxation, further weakened citizens' stake in making governments accountable and inclusive, see Nabli (2004), Schwarz (2013). In our model there are no taxes; for an examination of the evolution of fiscal capacity see Besley et al. (2013).

[11]Malik and Awadallah (2013) make a particularly effective case that trade fragmentation has set back Arab economic development and entrenched insider power.

and technologically-backward private sector[12] as well as a large informal one.

These early developmental leaps substantiate what we later rationalize as a "stability premium". Buoyed by oil windfalls, authorities expanded demand through state planning. This enhanced employment and development.[13] It also partly compensated the democratic deficit and promoted stability. However, such expansions did not lay the foundations for self-sustaining growth (World Bank (2004)). Political choices (repression, rent-seeking, patronage etc.) did the opposite: they maintained the regime's stronghold but retarded long-run economic development and increased economic vulnerabilities.

The *second* phase of Arab development was their deep, protracted slump in the 1980s. During this phase, commodity prices fell markedly. This, exposing the region's over-reliance on hydrocarbons, cut growth and the (shock-absorbing) flow of remittances in the region. It also strained (oil-dependent) fiscal balances; this was crucial since all social structures and expectations were predicated on the state providing jobs and security.c

In response, many Arab governments engaged in pro-market policies typically advocated by the World Bank and IMF (fiscal consolidation, privatization, trade/financial liberalization etc.).[14] In practise, though, many reforms were implemented piecemeal and reluctantly (e.g., Amin (2012)). This, alongside a largely unchanged governance structure, provided little foundation for their success.

Moreover, pro-education and family-friendly welfare policies helped produce a remarkable demographic youth bulge which, given the inability of the economy to absorb these extra resources, effectively disenfranchised educated labor.

The stagnant performance of the Arab economies, compared to the rest of the world, over this (Phase II) period can also be gauged from **Figures 2**. This shows that the output shares of the G7 have almost halved in recent decades (see lhs panel). Much of that loss stems from the concomitant expansion of the "Emerging Markets"[15] and "Developing Asia" blocks which

[12]To illustrate using World Bank data, high-technology exports (as a % of total manufactured exports) averaged 4% in the MENA (all incomes level) region over 1992-2009, as against 31% in the US.

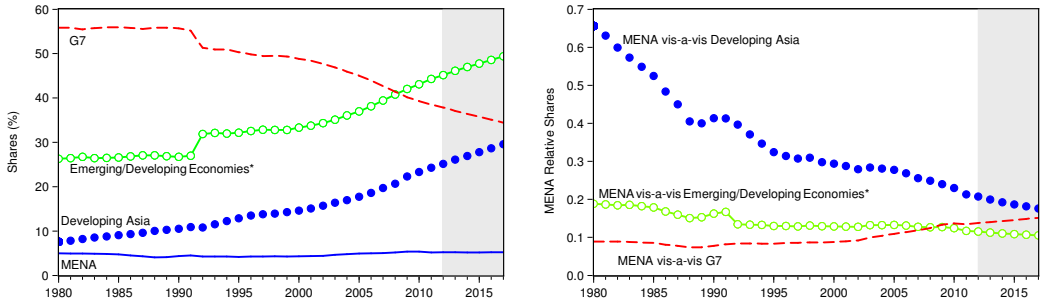
[13]Although it is only from 1980 that MENA unemployment statistics start becoming available, such expansions should have markedly boosted employment opportunities, see Nabli (2004) (as per Okun's Law).

[14]See for a discussion of these policy packages.

[15]Note, the IMF's definition of Emerging and Developing Markets has some overlaps

increased from around 25%-50% and around 8%-30%, respectively.[16] The latter comparison is striking because Developing Asia's initial share roughly matched that of the MENA block. Indeed, Developing Asia bears other similarities with the MENA block: the "demographic dividend" of youth and (the struggle with and emergence from) autocratic regimes.

Figure 2: World PPP GDP Shares (%), and Relative MENA Shares



Notes: Shaded Area denotes forecast period.
*: MENA countries excluded from IMF's Emerging Market and Developing Economies definition to avoid double counting.
Source: Derived from IMF WEO Oct 2012.

The MENA block itself, by contrast, stayed at around a 4%-5% share of world PPP GDP for these three decades. Indeed, the comparison can be put in an even starker light if defined in relative terms (see rhs panel).

These developments, moreover, cover a period of considerable expansion of world trade, growth and technology – developments which remarkably seem to have by-passed the Arab world. Relative to much of the rest of the world, therefore, the Arab world has experienced a complex, downward trend in economic fundamentals begetting higher unemployment, lower and more volatile growth and declining economic importance.

Towards the end of that second phase (see again Figure 1), growth was more aligned with OECD averages but insufficient to make up for past losses.

with countries in the defined MENA region. Accordingly, in calculating trade shares for Figures 2 we stripped the MENA region out of their definition, and recalculated accordingly.

[16]In the former block, the biggest increases in shares being China (12ppt), India and Russia (both 3ppt) over 1980-2011.

Unemployment, started to rise sharply (spectacularly so in some countries, e.g., Algeria) and has only started to converge to OECD averages at the end of the sample. Inflation has tended to be less volatile: varying around a 10% mean.

The final phase for Arab economies, for which outcomes are unfolding, is the period after the Arab Spring. The term "Arab Spring" refers to protest movements that swept across the MENA from late 2010 onwards. The catalyst for the movement is often attributed to protests in Tunisia following the self-immolation of Mohamed Bouazizi (an unlicensed fruit trader).[17] Events in Tunisia were soon followed by protests elsewhere in the region.

In some countries – Egypt, Libya, Tunisia and Yemen – protests led to the overthrow of the existing political elite and fledgling steps towards a more politically inclusive society. In others – Syria and to a lesser extent Bahrain – civil war followed. Elsewhere, there has either been combinations of constitutional changes (Jordan, Morocco), formal governmental changes (Bahrain, Kuwait), and fiscal "fire fighting".[18]

How can we begin to understand these phases of Arab development – from the early boom of the social contract, to the slump and uneven recovery from the 1980s onwards, to the Arab Spring? The model we now sketch aims to capture these elements.

3 The Model

We analyze an extension of a simple dynamic model with a representative firm and a Government. The Government has the general role of stabilizing the economy via its setting of inflation. It also pursues its own specific role of extracting rents from activity. Given the threat of regime change, the government may condition policy to contain revolutionary pressures.

The model is a Stackelberg game. The Government plays the leader. The Firm is the follower. Given the Government's overwhelming dominance in all aspects of Arab life, this strategic choice is straightforward to motivate. The government sets the optimal inflation rate to which the firm reacts (given by its reaction function for labor demand). The government then takes this

[17] Although pressures for reform have a long heritage in the Arab world (e.g., Foreign-Affairs (2011)).

[18] These have tended to include increase in food and energy subsidies, increases in transfers and public-sector pay (e.g., Table 1 in Breisinger et al. (2011)).

reaction function as a dynamic constraint in its optimization program.

3.1 The Firm

The representative firm uses labor, L_t, to produce output, Y_t, and generate revenue. It makes hiring decisions to maximize its expected present value,

$$\underset{L}{Max}\ \mathbf{E}_t \int_t^{\infty} \left(\Omega \cdot AL_t - \omega_t L_t - \frac{\varphi}{2} \dot{L}_t^{\,2} \right) e^{-\theta t} dt \tag{1}$$

where $\dot{L}_t = L_t - L_{t-1}$, $\theta > 0$ is the firm's time preference and $\mathbf{E}_t$ is the expectations operator.

The product $\omega_t L_t$ is the firm's wage costs and $\frac{\varphi}{2}\dot{L}_t^{\,2}$, $\varphi > 0$, represents adjustment costs to labor and thus activity. Given the mathematical complexity of regime change we keep the model as simple as possible; as a consequence the quadratic adjustment costs are related to adjustments in labor employment following Machin et al. (1993). Note that the adjustment costs are determined in terms of the output price, so ω_t is the real wage. Production is defined by the linear technology,

$$Y_t = AL_t \tag{2}$$

where parameter $A > 0$ is the level of technology.[19]

The first term in the maximand of (1), namely ΩAL_t, is the *realized* revenue of the firm where $\Omega \in (0, 1)$ is an index of generic rent extraction. This might include costs associated to excessive bureaucracy and bribery, to those associated with acquiring monopoly rights, direct state confiscation of firm revenue etc.

If $\Omega \to 1$ there is no rent-seeking aspect to the economy. Otherwise $1 - \Omega$ is captured in various ways by the political elite. For simplicity we assume that any revenues from rent seeking are not returned to the economy as investment or consumption.[20,21]

[19] Term A can be thought of as Harrod-neutral or labor-augmenting technical progress. See León-Ledesma et al. (2010) for discussions on different forms of technical progress and their implications.

[20] We might think of elites diverting accounts into safe havens, foreign properties, central-bank vaults etc. (e.g., Barros et al. (2011)), or using them to fund unproductive public-sector sinecures.

[21] To allow positive profits in the long run requires $\Omega AL < AL - \omega L - \frac{\varphi}{2}\dot{L}^{\,2}$; the represen-

The rate of rent extraction, moreover, may be constant or time varying. A constant rate might be interpreted as a condition whereby the state is sufficiently organized to extract a given proportion of activity. Another possibility is that rent size reflects time preference, $\Omega(\theta')$, $\Omega' < 0$, where θ' is the authority's time preference.

Such an interpretation is consistent with the seminal work of Olson (2000) distinguishing "roving" and "stationary" bandits. The former plunders economic assets and extracts rents widely and expeditiously. Accordingly, time preference will be high and rent extraction pervasive, $\Omega(\theta') \to 0$. Stationary bandits, by contrast, seek political longevity and partly encourage activity to generate a stable source of rents. Thus, their time preference, though above zero, will be below the roving bandit's.

In our framework, though, this aspect (or this distinction) becomes important not because we assume that time preference and rent size are explicitly related, as per Olson. It is important because, as we shall see, time preference effectively becomes endogenous in the presence of a state-dependent hazard function (see section V.B). This means that over time Olson's distinction fades in importance.

The first order condition with respect to labor from (1) yields the following differential equation for employment,

$$\dot{L}_t = \gamma \left(\Omega A - \frac{W_t}{P_{t-1}} \frac{1}{1+\pi_t} \right) \tag{3}$$

where $\gamma = 1/\varphi$ represents inverse adjustment costs and where we exploit the real wage decomposition,

$$\omega_t = \frac{W_t}{P_t} \frac{P_{t-1}}{P_{t-1}} = \frac{W_t}{P_{t-1}} \frac{1}{1+\pi_t} \tag{4}$$

where $1+\pi_t$ is gross inflation, and W and P are, respectively, the nominal wage and price level.

Note a simple interpretation of equation (3). Labor demand grows only if the rent-adjusted marginal product of labor, ΩA, exceeds the real wage.[22]

tative sector of the Arab economies is assumed not open or competitive; being populated by few firms protected because they are aligned with the government. So this alignment explains the rent extraction by government officials because of prevalent rent seeking by firms.

[22]Labor is supplied inelastically.

Otherwise, employment growth may decline or stagnate. We see therefore a simple mechanism whereby the presence of extractive rents contracts activity.[23]

Finally, we assume parameters, Ω, A, and γ are given (i.e., chosen at a prior stage by the state). We label their product as indicating the "quality" of the regime: $\mathbb{Q} = A \cdot \Omega \cdot \gamma$.

3.2 The Government

The government, through its choice of inflation, minimizes loss function, $\mathcal{L}$, in inflation and unemployment, subject to the dynamics of unemployment:[24]

$$\underset{\pi}{Min}\ \mathrm{E_t} \int_t^{\infty} \mathcal{L}\left(\pi, u\right) e^{-\theta' t} dt \quad \text{s.t.} \tag{5}$$

$$\dot{u}_t = \gamma \left(\frac{W_t}{P_{t-1}} \frac{1}{1+\pi_t} - \Omega A \right) \tag{6}$$

Normalizing the labor force to unity, $L + u = 1$, equation (6) can be seen to be the unemployment analogue of (3). To make matters tractable, we assume that the government's time preference is the same as the firm's, $\theta' = \theta$; if the policy maker is myopic, it seems unlikely that firms are any less so.[25]

We assume the loss function is quadratic,

$$\mathcal{L} = \pi^2 + \lambda u^2 \tag{7}$$

This corresponds to flexible inflation targeting, where $\lambda \in (0, \infty)$ captures the weight on unemployment relative to inflation.[26]

That the government chooses inflation as an instrument is both convenient and realistic in this framework. Convenient because it aligns our

[23]For a historical perspective on growth under "extractive" states, see Acemoglu and Robinson (2012).

[24]One can extend this model by including public debt as an additional source of political instability, see Persson and Tabellini (2002).

[25]One indication of this can be seen in the limited FDI flows into Arab economies, and the consequent difficulty of them diversifying their (often resource-dependent) economic base, see Gourdon (2010). Surveys of firms conducted by international agencies often cite uncertainty over property rights as concerns.

[26]Implicitly, we can also think of this rule as targeting zero inflation and a natural rate of unemployment which has been normalized to zero.

analysis with the classic studies of stabilization policy (e.g., Barro and Gordon (1983)). It is realistic because price controls and implicit price subsidies play a fundamental role in the Arab world (plagued as it is by chronic issues in energy, food and water security). For example, pre-tax energy subsidies amounted to 8.5% of MENA GDP in 2011, or 22% percent of government revenue (and this estimate likely represents a lower bound since domestic fuel prices are often held below international levels). Food subsidies are estimated to have amounted to just under 1% of MENA GDP (2011).[27]

Moreover, lifting these subsidies represents a non-trivial policy problem. Consider Egypt's *Infitah* economic liberalization program in the 1970s after the Yom Kippur War. The World Bank and the IMF, from whom President Sadat sought a loan, criticized the country's extensive food and fuel subsidies. Their lifting in early January 1977 was followed by intense, violent unrest, and the rapid reversal of the initiative. These subsidies have largely persisted, for example in 2012, food and fuel subsidies accounted for 10% of Egypt's GDP.

4 Regime Change

Assume that in some future date, $\tau > t$, there is a regime shift. The regime may transform completely – from, say, dictatorship to democracy. It might happen dramatically and with no apparent forewarning or it may be a steady reaction to some underlying political-economy failure. In any case, the envisaged change is assumed to be permanent and irreversible.

Given this irreversibility, the policy problem in the second regime is quite standard; the policy maker minimizes his loss function subject to his parametric constraints and assumed sequencing. However, in the first regime, there is a non-zero probability of regime shift.

The issue at hand therefore is whether the regime shift, by changing the "quality" of the regime, $\mathbb{Q}_1 \to \mathbb{Q}_2$, may change the system dynamics as well as yield different steady-state equilibria for inflation and unemployment. To analyze this we use dynamic programming techniques which, when supplemented by a hazard function, allow us to study the first regime before the shift occurred.[28]

[27]Source: Energy Subsidies in the Middle East and North Africa: Lessons for Reform, IMF Policy Note, May 2013.

[28]Kiefer (1988) discusses the uses of hazard functions in economics. Moreover, for

4.1 Hazard Function Analysis

We denote the hazard rate by $h(z) \geq 0$[29] where $z > 0$ is a continuous random variable with probability density function $\Lambda(z|h)$. Such a function represents the risk that an "event" will occur in a small time interval $[t, t + \Delta]$ given that it has not so far occurred. In our context, it represents the likelihood that the (first) regime will shift given that it has been in place until that point.

Allied to the hazard rate is the "survival rate", $S(z) \in [0, 1]$, where $S'(z) < 0$, with $S(0) = 1$ (i.e., the regime is initially in place), and $S(\infty) = 0$ (i.e., the regime shifts; ceases to "survive"). The survival rate, which unlike the hazard is a probability, is the ratio of the probability density function to the hazard function.

Whilst the survival rate is always monotonically decreasing, the hazard may be constant, increasing, decreasing, or take a more complex shape. If constant, the time until the event occurs is drawn from an exponential (equivalently, restricted Weibull) distribution. This implies that the probability of an event occurring (i.e., regime shift) in $t+\Delta$ does not depend on the starting point, t. Nor will it depend on policy actions either.

The case for constant hazard rates in its many traditional uses (medicine, engineering) is usually considered unconvincing. However, since the Arab Spring protests appeared to take the world by surprise, for completeness we consider both constant and state dependent hazard rates.

4.2 Determinants of the Hazard

If the Arab-Spring hazard rate *were* state dependent, what might it depend on? Campante and Chor (2012) make a compelling case that the size and persistence of educated, youth unemployment is fundamental to explain the protests and uprisings. Our framework does not contain unemployment strata per se, but given the pronounced youth bulge in both population and unemployment in many Arab states, a defensible short cut is to make the hazard a function of aggregate unemployment, with the implication that the higher is the unemployment rate, the lower is the survival rate of the regime.

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dynamic programming references see, e.g., Sargent (1987), Kamien and Schwartz (1991), Stokey et al. (1989).

[29]The hazard rate must be non-negative. Moreover, its integral must sum to infinity otherwise there would never be regime change.

However, though lack of productive employment opportunities is a recognized failure of the Arab model, it is far from being the only one. There are, and were, profound political and economic failures throughout the region. Though many social indicators[30] have improved over time, economic fundamentals remain weak. The Social Contract offered jobs, welfare and security in return for political compliance. It was thus arguably more a redistributive than growth model (see World Bank (2004)). And it precisely this neglect of the supply-side of the economy that likely consigned the Arab world to trail its peers (recall Figure 2).

But it also goes with saying that, politically, the culture of repression, human rights abuses, and political exclusivity, underpinned by a heavily-resourced military, similarly led to chronic tensions in the Arab polity long before Bouazizi's actions.

It is unrealistic to assume that all such factors (e.g., economic ones holding back productive supply; political ones impeding pluralism) can be tractably captured. But they do affect the policy problem considered here. For simplicity, we aggregate these issues into composite vector $\mathbb{Z}$, whilst continuing to isolate unemployment. Supplementing the hazard in this way, $h(u, \mathbb{Z})$, though reduced form, captures the continuing economic and political weakness over time of the Arab experience and accords with the Social Contract interpretation: namely that authorities were primarily concerned with redistribution and demand stabilization (through u, π) whilst neglecting the longer-run developmental and governance aspects encapsulated by $\mathbb{Z}$.[31]

[30]For example on education, mortality and poverty as measured by the Human Development Indicator of the United Nations Development Program, http://hdr.undp.org/en/statistics.

[31]It is also possible that $\mathbb{Z}$ is a function of unemployment: prolonged unemployment and an under-diversified human-capital base retards growth and economic prospects through the discouraged worker effect, low skill incentives, etc., e.g., León-Ledesma and Thirlwall (2002). Likewise high unemployment and inflation contribute to social unrest and might lead to the mis-allocation of resources towards the military, further crowding out productive civilian activities.

5 Solving the Model

5.1 The Second Regime

We solve the model backwards, starting with the second regime. The dynamic programming approach to solving the model is fruitfully applied to both discrete and continuous time problems. The Hamilton-Jacobi-Bellman (HJB) equation is the fundamental partial differential equation obeyed by the optimal value function, which is the best value that can be obtained at the stating time in the initial state u.

Taking into account the dynamic constraint given by,

$$\dot{u}_t = \gamma \left(\frac{W_t}{P_{t-1}} \frac{1}{1+\pi_t} - \Omega A \right) \tag{8}$$

the HJB equation for the optimal value function $\mathbb{M}_2(u)$ is then given by,

$$\theta \mathbb{M}(u) = \underset{\pi}{Min} \left\{ \pi_t^2 + \lambda u_t^2 + \mathbb{M}'(u) \underbrace{\gamma \left(\frac{W_t}{P_{t-1}} \frac{1}{1+\pi_t} - \Omega_2 A_2 \right)}_{\dot{u}_t} \right\} \tag{9}$$

The first order condition is,

$$\mathbb{M}'(u) = \frac{P_{t-1}}{W_t} \frac{2\pi_t \left(1+\pi_t\right)^2}{\gamma} \tag{10}$$

And the Benveniste-Scheinkman condition is given by,

$$\dot{u_t} \mathbb{M}''(u) = \theta \mathbb{M}'(u) - 2\lambda u_t \tag{11}$$

Equations (8), (10) and (11) yield the equilibrium conditions (now formally indexing by regime):

$$1 + \pi_2^* = \frac{W_{2t}}{\Omega_2 A_2 P_{2t-1}} \tag{12}$$

$$u_2^* = \left(\frac{W_{2t}}{\Omega_2 A_2 P_{2t-1}} - 1 \right) \frac{\theta_2}{\lambda \gamma_2 A_2 \Omega_2} \equiv \frac{\pi_2^* \theta_2}{\lambda \mathbb{Q}_2} \tag{13}$$

Equation (13) also demonstrates that, in terms of parameter comparative statics, the reaction of the firm's (un)employment decision is declining in the weight policy makers attach to unemployment, in the level value of labor adjustment costs, and in the technology level. Moreover, the less myopic is the policy maker, the more success is achieved on unemployment.[32]

5.2 The First Regime

Next, consider the regime *prior* to the shift. The policy problem is now,

$$\underset{\pi}{Min}\ \mathrm{E_t}\left\{\int_0^{\tau}\mathcal{L}(u,\pi)e^{-\theta_1 t}dt\ +e^{-\theta_1\tau}\mathbb{M}_2\left(u\left(\tau\right)\right)\right\}\quad\text{s.t.} \tag{14}$$

$$\dot{u}\ =\gamma_1\left(\frac{W_t}{P_{t-1}}\frac{1}{1+\pi_t}-\Omega_1 A_1\right) \tag{15}$$

The HJB equation for this type of problem (see Polasky et al. (2011)) becomes,

$$\theta_1\mathbb{M}_1(u)=\underset{\pi}{Min}\left\{\pi_t^2+\lambda u_t^2+\mathbb{M}_1'(u)\underbrace{\gamma_1\left(\frac{W_t}{P_{t-1}}\frac{1}{1+\pi_t}-\Omega_1 A_1\right)}_{\dot{u_t}}+h(u,\mathbb{Z})\mathbb{M}_{2-1}(u)\right\} \tag{16}$$

where $\mathbb{M}_{2-1}(u)=\mathbb{M}_2(u)-\mathbb{M}_1(u)$.

Regarding the interpretation of (16), the HJB equation (compare (9)) is augmented to accommodate the regime shift given by the product of the hazard and the difference between optimal value functions across the regimes, $h(u,\mathbb{Z})\mathbb{M}_{2-1}(u)$. Thus, dissent and expected post-regime value functions condition *current*-regime policy choices and outcomes.

The first order condition for (16) is,

$$\mathbb{M}_1'(u)=\frac{P_{t-1}}{W_t}\frac{2\pi_t(1+\pi_t)^2}{\gamma_1} \tag{17}$$

and the Benveniste-Scheinkman condition is given by,[33]

$$\dot{u_t}\mathbb{M}_1''(u)=\theta_1\mathbb{M}_1^{'}(u)-2\lambda u_t-h_u\mathbb{M}_{2-1}(u)-h\mathbb{M}_{2-1}'(u) \tag{18}$$

[32]This recalls Olson's "bandits" classification.

[33]In the following we replace $h(u,\mathbb{Z})$ and $h_u(u,\mathbb{Z})$ by h and h_u, respectively, for notational compactness.

where $\mathbb{M}'_{2-1}(u) = \mathbb{M}'_2(u) - \mathbb{M}'_1(u)$. We have from (15), (17) and (18), the equilibrium conditions:[34]

$$1 + \pi_1^* = \frac{W_{1t}}{\Omega_1 A_1 P_{1t-1}} \tag{19}$$

$$\theta_1 \mathbb{M}'_1(u) - 2\lambda u_t - h_u \mathbb{M}_{2-1}(u) - h\mathbb{M}'_{2-1}(u) = 0 \tag{20}$$

Let us substitute equations (10) and (17) (and their integrals with respect to u) into (20), and exploit the small-valued approximation $\pi \approx \pi\,(1+\pi)$. Thereafter, since it is an arbitrary constant, we can set $\mathbb{Q}_1 = 1/\lambda$ and define $\widetilde{\mathbb{Q}} = \mathbb{Q}_1/\mathbb{Q}_2$ as the relative quality term. Solving for first-regime unemployment then yields:

$$u_1 = \Phi\left\{\pi_1\left[\,\theta_1 + h\right] - \pi_2\left[h + h_u u_2\right]\widetilde{\mathbb{Q}}\right\} \tag{21}$$

where $\Phi\,(u_1, \pi_1) = \left[1 - h_u \pi_1\right]^{-1}$. Further we expect $h_u > 0$: the higher the unemployment the higher the hazard associated with regime shift.

Expression (21) does not uniquely solve for u_1^* since unemployment is on both sides through h and h_u. It is therefore problematic to generate comparative statics. Broadly though, the condition reveals first-regime unemployment to be a weighted average of the inflation performance over both regimes. The "weights" involve the policy parameter, λ; regime quality, $\mathbb{Q}$;[35] preferences, θ; the hazard, $h + h_u$; and future unemployment, u_2.

Moreover, the term in square brackets in the numerator has an interesting interpretation:

$$\Theta_t = \theta_1 + h(u, \mathbb{Z}) \tag{22}$$

We can think of Θ_t as a *regime-adjusted* time preference which exceeds primitive time preference and is time varying (compare with (13) where there is no such adjustment).[36] To illustrate the point, we know that if h is "high",

[34] Equation (19) yields an interesting implication: if the regime is completely extractive, $\Omega_1 \to 0$, there will be the conditions for hyperinflation: if the regime takes all (or almost all) the goods available, whatever remains will necessarily be insufficient to satisfy demand, thereby generating runaway inflation.

[35] Where, to recall, $\mathbb{Q}_i = A_i \cdot \Omega_i \cdot \gamma_i$. Note $\widetilde{\mathbb{Q}} < 1$ indicates a quality improvement in the second regime relative to the first, e.g., better technology access, lower rent seeking, lower labor adjustment costs.

[36] Compare also our later equation (given in footnote (44)) which merely has a constant addition to time preference, $\theta + \bar{h}$, given the lack of state dependence in the hazard.

the survival of the regime is low.[37] It is reasonable to suppose that this impending loss of economic rents would make authorities inherently more impatient.

This echoes a common theme in the literature: oppressed citizens will challenge their rulers if the payoff outweighs the costs in expectation, see Acemoglu and Robinson (2009). In this case, though, we have the *ruler's perspective*: the more fragile the current regime becomes, the more likely will the ruler cut-and-run and engage in inferior stabilization.[38] To put it more concretely: in the limit even a stationary bandit ends up a roving one.

This has a bearing on how good governance may be promoted among politically-fragile nations. For example, the lucrative Mo Ibrahim Foundation, which rewards African leaders for the quality of their governance, is only available to those who have left office. Our Arab-Spring analysis suggests leaders heading towards regime change have little incentive to engage in good governance.

In effect, the certainty of eventual regime change endogenizes and shifts the rate of time preference; as opposition to the regime escalates, the incentive to run the regime well diminishes. However since h_u also appears on the numerator and denominator of (21), the overall impact of a rise in the determinants of h is ambiguous (in the absence of simulation evidence).[39] We now therefore proceed to specify the hazard.

6 Some Illustrations with a Hazard Function

As noted, expression (21) does not uniquely solve for u_1^*. To proceed let us assume a hazard of the simple Weibull class:

$$h\left(u, \mathbb{Z}\right) = \overline{h}\alpha\left(u \cdot \mathbb{Z}\right)^{\alpha-1} \tag{23}$$

[37] For example, for the survivor probability from a simple exponential hazard, $S(t) = e^{-ht}$, we have $S(t \mid h_+) > S(t \mid h),\ h_+ > h$.

[38] If the hazard is constant, the ruler can and does ignore economic failure and dissent. As Tullock (1987) suggested, his main task is to maximize regime duration given the costs that will (presumably) have to be faced when stripped of power.

[39] The upshot is that the differential impact of the ratio $\frac{h}{h_u}$ is now therefore apparent; even a "low" unemployment rate could beget rapid regime shift if the hazard is sufficiently sensitive. This parallels quite well the analysis of Campante and Chor (2012) analysis: namely, that the compositional aspects of Arab unemployment (e.g., its concentration on the young and well educated) and the reaction to it matter just as much as its aggregate level.

where, in hazard terminology, $\alpha > 0$ is the "shape" parameter and $\bar{h} > 0$, is the "scale" parameter. Note that $h_u > 0$ requires $\alpha > 1$ which implies that the hazard associated with regime shift is increasing in its determinants.

This form nests the exponential case, $h = \overline{h}$ and $S(\mathbb{Z}) = e^{-\bar{h}\mathbb{Z}}$. We call this the non state dependent case since it is not affected by unemployment, although the survival rate, S, remains affected by the exogenous elements captured by $\mathbb{Z}$.

To sum up, hazard (23) captures *two* aspects of our subject matter. First, the likelihood that unemployment pressures impact regime survival. Second, the continuing economic weakness *over time* of the Arab Social Contract, see World Bank (2004). This will similarly impact regime survival. We now use this hazard and the model to understand the various phases of Arab development.

6.0.1 From *Phase 1* to *Phase 2* of Economic Development

6.0.2 Calibration

Using a simple calibration we can show the trajectory for unemployment for a given inflation strategy of the authority. Since performance in the first regime is impacted by the expected performance in the second, we must calibrate across regimes.

Specifically, we assume the government stabilizes the economy around an average inflation rate of 10%; the MENA average consumer-price inflation (using the IMF definition and weights) over 1980-2010 being 9.7% (recall Figure 1). We assume a hazard function in the neighborhood of the benchmark exponential case $\alpha = 1, 2$. Regarding preferences, we assume that authorities are unemployment averse, $\lambda = 1.5$, and that time preference is close to but above zero, $\theta_1 = 0.05$.

Moreover, using the familiar hazard metric of median survival time,

$$t_{0.5} = \frac{\log 2}{\bar{h}}$$

allows us to calibrate $\bar{h}$ in the exponential case. Marshall et al. (2010) provide international data on regime duration. Using their data from 1980 to 2008, for Algeria, Egypt, Iran, Jordan, Kuwait, Morocco, Saudi Arabia, Sudan, Syria and Tunisia,[40] we found the median regime duration to be 26 years.

[40]The other MENA countries had either missing or highly discontinuous entries.

Thus, $\bar{h} = 0.0258$.

To maximize the comparability of the exercise, the median regime duration is set so as to be common to the non-state and state dependent cases.[41] This seems consistent with the Arab Spring experience whereby Arab states, with distinct characteristics, experienced common tensions. Finally, as is common to hazard analysis, the time-to-failure $\mathbb{Z}$ element is interpreted in terms of calender time.

Regarding the *second* regime, it is an open question as to whether post-Spring outcomes deliver improvements. But how such improvements may come about is clear. In the model, improvements in the "quality" of governance happen through better technology access, $dA > 0$,[42] less encumbered labor markets,[43] $d\varphi < 0$, lower rent extraction, $d\Omega > 0$. Likewise, we might add more patient policy makers, e.g., $\theta_2 = 0.01$ and an inflation rate closer to OECD averages.

By contrast, much of the literature instead how difficult it may be to implement structural reforms in politically-fragile state. Typical themes being the blocking of reform to protect elite rents and reputation; the difficulty of compensating "losers" in a time consistent manner; the impact of fractionalization pressures within society (e.g., ethnic, religious, language, demographic) etc (e.g., Drazen (2000), Jain and Mukand (2003), Acemoglu and Robinson (2008), Menaldo (2012), Rodrik (2013)).

We take an agnostic viewpoint. The relative "quality" of the second regime is set to a medium-sized value of 5 in the central scenario (i.e., $\widetilde{\mathbb{Q}} = 0.2$). But it is thereafter varied in such a way that the quality of the second

[41] In the latter case, given the Weibull hazard, the $\bar{h}$ set to enforce the same $t_{0.5}$ date was 0.0686.

[42] We can infer technological backwardness from several Arab-world features: muted external and regional openness, fragmented capital markets, insufficiently-diversified economies, widespread state intervention, bureaucratic barriers for start-ups, weak property rights (see Gourdon (2010), Amin (2012)). These tend to curtail investment, expansion, scale economies and exposure to frontier technologies. Moreover, they represent deliberate political choices (often rationalized in the literature as to constrain the rise of a rival, entrepreneurial class, Acemoglu and Robinson (2000)).

[43] The new regime may bring about labor market deregulation: reducing patronage/insider power, improving search-and-matching, incorporating the (typically unregulated) informal economy into the formal one etc. (the informal sector is typically judged to be large in Arab states relative to similarly developed nations, see Schneider (2002). See also Arbache et al. (2004) discusses wage dynamics in pro-trade regimes) Such effects, by lowering φ, promote employment (see World Bank (2004) for such arguments.)

Table 1: Central Parameter Values Across Regimes

Parameter		Value	Target	Source
Time Preference	$\theta_1 > \theta_2$	$0.05, 0.01$	Lower in Regime 2	–
Relative Reg. Quality	$\widetilde{\mathbb{Q}}$	0.20	Higher in Regime 2	–
Hazard Components	α	$1, 2$	Non/State Dependent	–
	$t_{0.5}$	26 years	Median Duration	Marshall et al. 2010
	$\overline{h}$	$t_{0.5}^{-1}\log(2)$	$S(t_{0.5}) = 0.5$	–
	$\mathbb{Z}$	$[0, \infty)$	Calender Time	–
Policy Weight	λ	1.50	Unemployment Averse	–
Inflation	π_1^*	0.10	MENA Average	IMF
	π_2^*	0.05	Half MENA Average	–
Unempl. in Reg. 2	u_2^*	–	$\frac{\pi_2^*\theta_2}{\lambda\mathbb{Q}_2}$	Model

regime may exceed or fall behind that of the first regime.

Table 1 summarizes the calibration pertaining to the regimes. These are assumed known by the authority and the representative firm.

Note, finally, our analysis does not aim to provide quantitative policy prescriptions. Section 4, however, provides robustness around these central values.

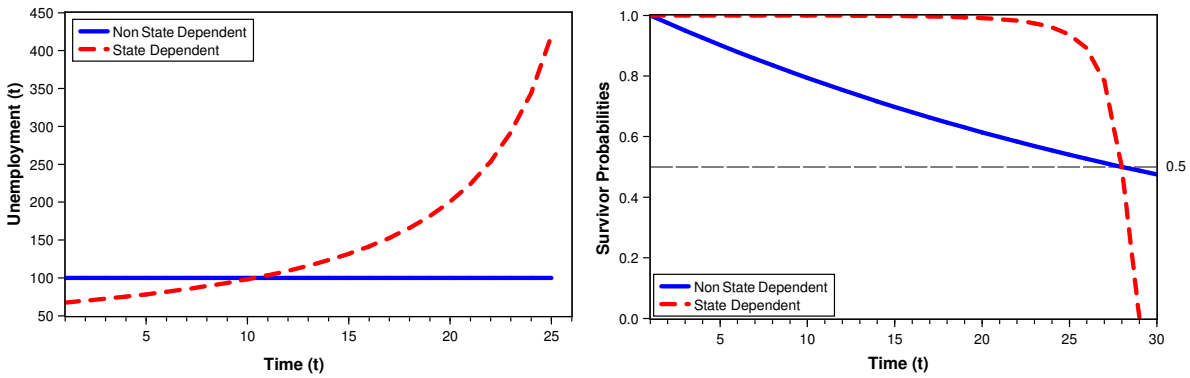
6.0.3 Results

Figure 3 plots the unemployment (see lhs panel) and survival rates (rhs panel) for the state and non-state dependent cases. The latter is naturally characterized by constant unemployment (normalized to 100 for scaling purposes).[44] The constant hazard case is equivalent to exponentially distributed regime survival probabilities; thus, barring any stochastic or extraordinary events, the longevity of such a regime is clear.

Where there is an *endogenous* hazard, i.e., $\alpha = 2$ (see broken line in Figure 3), unemployment approaches the constant-hazard case from below, and exceeds it just after a decade on this calibration. Thereafter it rises in a highly non-linear manner. Interestingly, despite this mounting unemployment, the survival probability barely budges from unity over a wide range (see

[44] Given equation (21), the non state dependent case reduces to $u_1^* = \pi_1 \left[\theta_1 + \overline{h} \right] - \pi_2 \left[\overline{h}\widetilde{\mathbb{Q}} \right]$.

Figure 3: Unemployment and Survival Probabilities for Different Hazard Rates.



rhs panel). It is only when unemployment becomes sufficiently high and the non-linearity of the h_u term dominates, that survival rates fall dramatically.

By construction, both survival rates cross at the empirically-predicated median date but their local characteristics differ. For instance, the non-state dependent case, although then still operating at low survival rates, has a far gentler decline towards zero, compared to the collapsing state-dependent regime.

6.1 Robustness and Policy

So far, however, these results say little about policy characteristics. The state and non state dependent regimes behave as they would by construction. The more germane question is what features extend or shorten regime duration in the state-dependent case. Accordingly, **Figure 4** examines robustness – varying the relative quality parameter, time preference rates, unemployment aversion, and expected second-regime inflation. The dashed lines represents the state-dependent trajectory of the previous graph. The "+" symbols trace out unemployment rates associated to the indicated case ordering in the legends above.

Regarding time preferences (Panel E), the effect is asymmetric over regimes. If the first regime planner can commit to the same (baseline) preferences of

the second (namely, 0.01), regime shift can manifestly be staved off. On the other hand, highly impatient preferences ($\theta_1 = 0.1, 0.2$) generate no stability premium and, accordingly, beget rapid regime change. Variations in second-regime preferences θ_2 (panel B) however – given the way in which they enter the unemployment condition – have limited differential impact (except perhaps at very long horizons).[45]

Preferences for unemployment, however, generate strong differences and in logical patterns; thus, unless the authority *over* weights unemployment, $\lambda > 1$, there can be no stability premia and minimal regime duration (panel C).

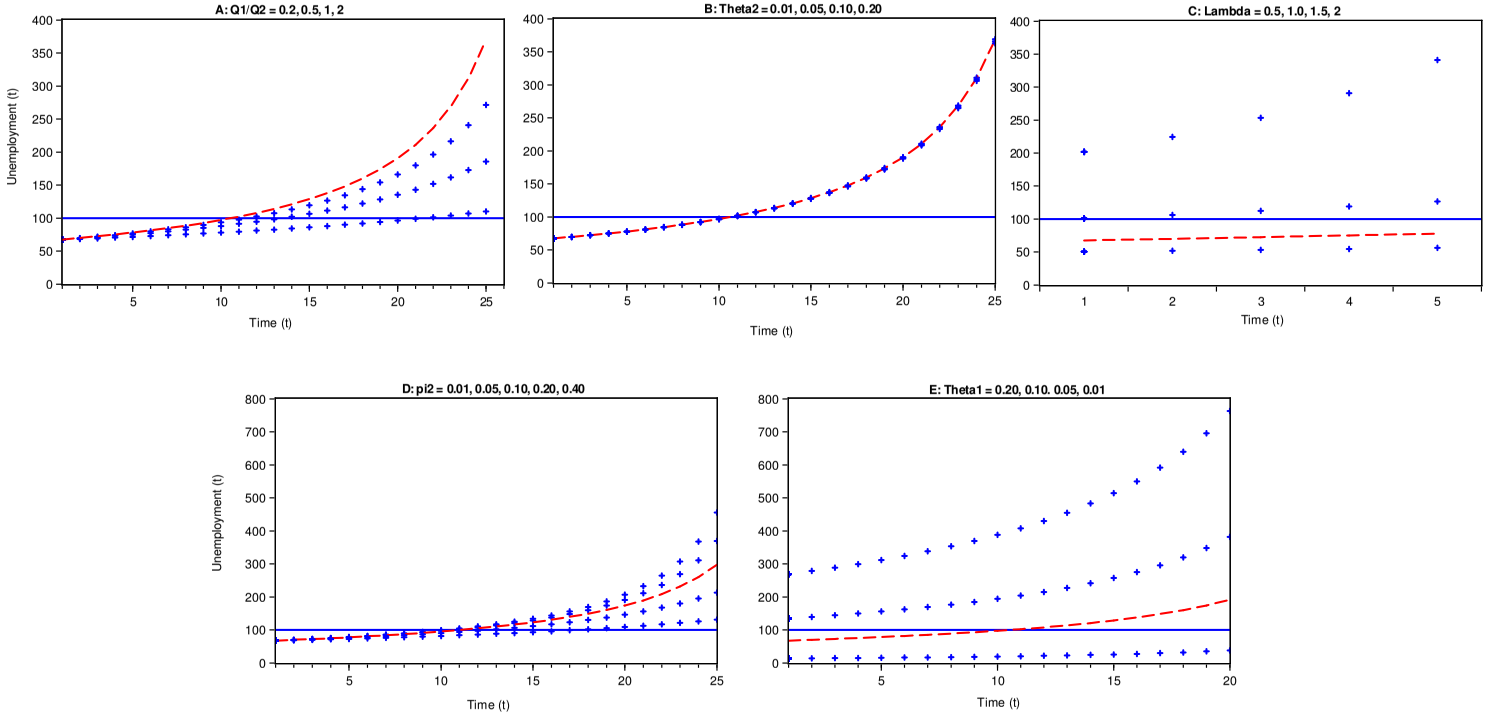
Finally (see panels A and D), the effect of varying relative quality and post-Spring inflation, tell a similar story. If the first-regime authority can increase its own quality it will enjoy a longer duration.[46] For example, if $\mathbb{Q}_1 = 2\mathbb{Q}_2$, then unemployment exceeds the non state dependent value after 20 rather than 10 years (as before). The same outcome arises if agents can be convinced that the quality of post-Spring governance will be poor, or if the second regime somehow inherits lower quality (e.g., a ruined capital stock following civil war).

This conclusion is interesting since some new political economy models (e.g., Leith and Wren-Lewis (2009)) suggest that exiting governments try to "tie the hands" of incoming ones – e.g., to disadvantage their successors, advance their preferred agenda, increase their own re-election probabilities etc. In our framework, however, the "re-election" probabilities of the first-regime authority are zero by construction; ostensibly therefore they should be indifferent to second-regime outcomes. However the recursive nature of the problem means that one means by which they may stave off regime shift is by altering later payoffs.

[45] On these questions see also Drazen (2000), Chp. 10.

[46] One politically expedient way of doing so might be through expanding technology access whilst retaining strong controls on civil society, see International Telecommunication Union (2010).

Figure 4: Robustness



6.2 Stalled Economic Reforms: Phase 2

As we know, from the mid-1980s onwards oil revenues fell. This cut growth and strained fiscal balances. In response, many Arab governments engaged in the pro-market policies typically advocated by international policy organizations.

Even controlling for the prevailing downturn the outcomes were far from successful. Arguably this reflected three main features. First, consistent with our hazard framework, the likely backlash against – and economic fallout of – the reforms. Second, that the "private sector" was ill-equipped to raise supply consistent with the reforms. Finally, that these reforms mostly neglected good governance issues.[47]

Can our framework shed similar light on why these reform apparently stalled? Fundamentally, all such reforms are intended to make the economy more productive. We model this as an outward shift of the technology level. One reason why growth-enhancing reforms are blocked by the political elite (or rather why growth-suppressing policies are maintained) is that growth dissipates economic activity and leads to the erosion of rent (e.g., see the discussions in Rodrik (2013)). Accordingly, it is not unreasonable in our context to match possible technology improvements with offsetting increase in rent seeking, either directly, or indirectly via enhanced policy myopia.

Figures 5 and **6** show 3D plots of the effect of changes in unemployment for such presumed technology expansions, $A = \{1 : 5\}$ when (i) time preference becomes more impatient $\theta \to 0.2^{+}$ and (ii) when rent extraction changes, $1-\Omega \to 1$. Varying the support of the parameters in this way allows us to gauge the dependency of reforms on polity types.[48]

Consider Figure 5. As the level of technology rises, production expands and unemployment falls, via equations (2) and (6). However, the extent of that fall is highly preference dependent. At extremes, unemployment under *high* technology reform ($A^{High} = \{3 : 5\}$) can be well above the *low* or no-reform scenario ($A^{Low} = \{1 : 3\}$) if the authority's time preference is

[47] For example, see Walton (2013) on Egypt's privatization program in the 1990s.

[48] To implement these plots, we wrote the unemployment expression (21) into its equivalent in terms of wage rates and the individual quality components. Again we assume $\widetilde{\mathbb{Q}} = 5$. To match that, assume the technology level in regime 2 is 10% above that of the first (itself normalized to unity). Thereafter assume that rent-seeking costs amount to 25% of firm revenues, $1 - \Omega_1 = 0.25$, but is absent in the second regime, $1 - \Omega_2 = 0$. Accordingly, we back out $\gamma_2/\gamma_1 \approx 6$. All graphs and simulations were performed in *Mathematica* version 9.0.

sufficiently high, e.g.:

$$u_1\left(A^{High}, \theta \to 0\right) > u_1\left(A^{Low}, \theta \to 0.2\right)$$

The same can be said for technological improvements alongside variations in rent extraction, Figure 6. Even small technical improvements can generate large unemployment reductions. However, they rapidly flatten out and can go into reverse if the government becomes increasingly extractive, $\Omega \to 0$ (alternatively, $1 - \Omega \to 1$)

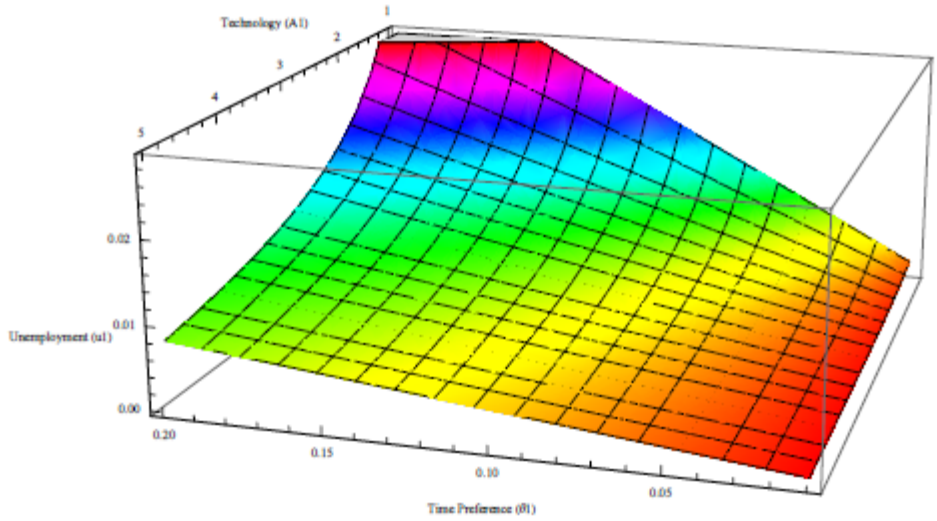
6.3 Phase 3. After the Regime Shift: Poisoned Chalice or Virtuous Circle?

In *Phase 3* – after the Spring – does macroeconomic stabilization improve or deteriorate? We do not pretend to know the answer. But our model sheds light on key mechanisms.

As we know from equation (12), in so far as the new regime has no extractive elements, opens itself to trade and better technologies, the prospects for lower inflation is manifest.

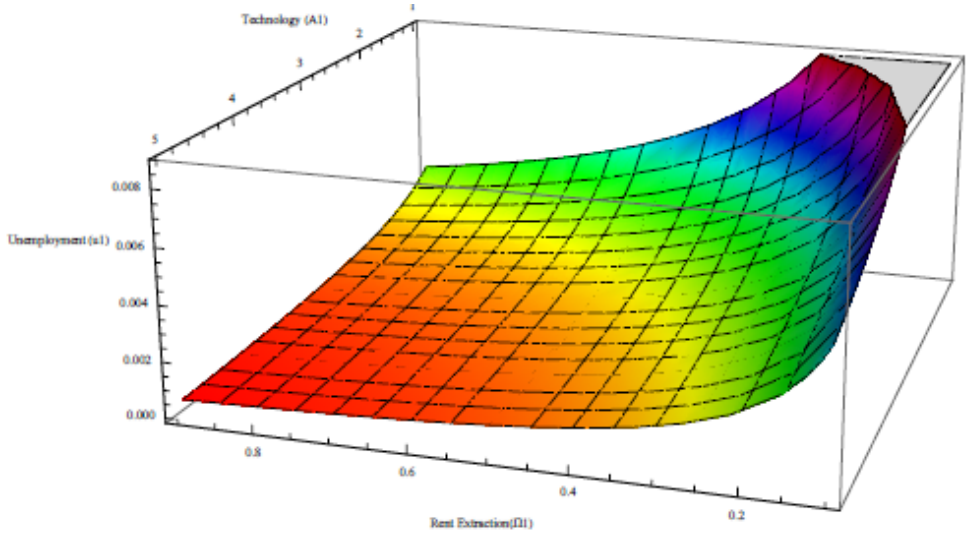
To make specific comparisons, comparing (19) with the second regime expression, (12), equilibrium inflation is higher in the first regime if rent extraction operates, $0 < \Omega_1 < 1$ and if technology is relatively lower. Put simply, corruption raises costs and the costs of doing business: it imposes technical backwardness and siphons off labor productivity (see World Bank (2004) for such arguments).

Figure 5. : Unemployment & Technology Improvements, varying Time Preference.



Note: Unemployment rates in ppts.

Figure 6. : Unemployment & Technology Improvements, varying Rent Extraction.



However, the possibility that 'revolutions' merely substitute one dominant group for another (e.g., competing religious factions or age cohorts), allied to the time-consistent problem of compensating losers, makes the substantial removal of rent seeking (the third pillar of regime quality) and elite privileges an issue on which we may arguably be less optimistic than the possibility that revolutions may enhance technology and functioning labor markets.

Regarding unemployment, comparison across regimes is less clear. On one hand, if labor adjustment costs are lower and technology is higher in the second regime, this would tend to boost activity and employment. On the other, the first-regime authority may have an incentive to keep unemployment low to maintain consent (and it may achieve this over some time frame).

A more immediate concern is the macroeconomic *inheritance* of the new regime. We know that the regime shift characteristic can take several forms. Re-examining Figure 3, we see that when the survival probability passes the median, the regime can be collapsing or still exhibiting a substantially long time to fail. If the regime fell at that point, the *second* regime would then inherit unemployment rates which were, respectively, either exploding or relatively benign.

As modelled here, there is therefore something of a contradiction in the Arab polity. Political institutions are repressive, extractive and lack democratic legitimacy. To counter revolutionary elements thrown up by this arrangement, authorities boost demand creating jobs, growth, and development. Modernization theory (Lipset (1959)) would suggest that such growth begets democracy. However, by effectively blocking those elements conducive to growth and inclusion, the economy tends towards stagnation. Even when technological progress is possible and economic reforms embarked upon, the outcomes are ambiguous. Indeed, we suggested that authorities (even if initially well intentioned) will face progressively weaker incentives to operate policy (and implicitly, may be progressively more likely to harden their autocratic tendencies).

Moreover, our analysis demonstrates that even if Arab regimes are ultimately judged on job creation, one may not necessarily extrapolate from *current* unemployment conditions to survival prospects. For example, the exogenous hazard case produces an unemployment rate which is for many periods above that of the state dependent case. And yet it is the most stable of all regimes.

6.4 Lessons for the Arab Spring [or] Why Dictators prevail and Revolutions happen

Our exercises, though stylized, attempt to give a flavor of the evolution of the Arab economies. They do so in three main dimensions.

First, rapid state-led expansion allowed Arab states to progress on employment and social objectives. Much of that expansion was in practice financed by oil windfalls, aid, remittances and sovereign borrowing (rather than supply expansion from, say, enhanced trade, investment, innovation). Accordingly, we rationalize this early phase as a demand-based stability premium needed to build political support;[49] the stronger the forces of internal rebellion and the weaker the dynamism of the economy, the greater the required premium.

Moreover, Figure 3 suggests that the trajectory of unemployment may be non-linear (e.g., quadratic) when the regime exhibits state dependency in its hazard rate. That is to say unemployment would be initially low (as the regime seeks short-run economic legitimacy) but would then rapidly rise as the Arab developmental model comes under inevitable strain.

In addition, as we saw from condition (22), the certainty of regime shift endogenizes and shifts the rate of time preference; as opposition to the regime escalates, the incentive to stabilize the macro-economy well diminishes. Equally, if economic advantages would be markedly superior after the shift, then (regime-adjusted) time preference similarly shifts up and stabilization objectives also deteriorate. Moreover, if economic hardship falls predominantly on new labor cohorts (Campante and Chor (2012)) who arguably have most to benefit from reform (and least to lose), then the hazard may be highly sensitive. Actual unemployment may thus matter less than the strength of feeling associated with its distributional consequences.

We uncover empirical evidence for quadratic curvature when we regress the unemployment rate on two measures likely to be relevant in our context: (1) regime durability and (2) how prone the authorities may be to condition policy on competing intra-national claims. For the former we use the already-mentioned *DURABLE* variable from the Polity IV database, Marshall et al. (2010).[50] For the latter we use measures of religious fractionalization, Re-

[49]This result is predicated on the logic of the model. It is not intended to dispute that following colonial rule, Arab leaders were sincerely motivated to promote jobs and welfare among their people.

[50]From the Polity IV manual: *Regime Durability: The number of years since the most*

ligFrac.

Table 2 shows a fixed-effect panel regression for the following MENA countries over the annual sample 1980-2010: Algeria, Egypt, Iran, Jordan, Kuwait, Morocco, Saudi Arabia, Sudan, Syria and Tunisia.[51] Columns 1 and 2, show that DURABLE regimes are strongly associated with reductions in unemployment (with a coefficient of -0.132), with a positive, statistically significant quadratic component. These results accord with our model in the sense that regimes with state-dependent hazard have a strong need to stabilize unemployment to maintain consent but will, unless the hazard is exogenous, face increasing pressures for regime change through time as economic weakness prevail and unemployment increases.

Columns 3 and 4 show an analogous and somewhat more promising regression of unemployment on religious fractionalization (and its square). We chose this indicator as a long-term structural measure of dissent and competing intra-national claims (e.g., Esteban and Ray (2008)). Again, we would expect that the greater the pressures of internal dissent, the more likely are authorities to advance employment measures. In this case, we see a significantly negative effect for the linear case (-18.7), and a significant positive term in the quadratic (20.8). This final regression also dominates the other three in terms of explanatory fit, $R^2_{adj} \approx 0.5$.

The second way in which our exercises give a flavor of events is the following. The Arab model (resource dependent, economically sheltered) depressed long-term growth prospects. Attempts at economic reform risked creating influential losers. And as we demonstrated in section 6.2, governments at the more extractive or repressive end of the political spectrum can ensure that reforms generate worse outcomes than non-reforms. This again speaks to the important of institutional reform as a complement to economic reform.

Finally, the results provide some pointers as to why dictators prevail, and revolutions happen. Long-lived dictators are (or were) a key feature of the Arab world: Muammar al-Gaddafi ruled Libya for over 40 years (1969-2011), Ali Abdullah Saleh was President of North then unified Yemen for

recent regime change (defined by a three-point change in the POLITY score over a period of three years or less) or the end of transition period defined by the lack of stable political institutions (denoted by a standardized authority score). POLITY is an aggregated polity scale over a number of relevant indicators going from +10 (strongly democratic government) to -10 (strongly autocratic).

[51]The other MENA countries had either no or highly discontinuous unemployment records.

Table 2: Unemployment, Policy Durability and Religious Divisions

	1.	2.	c....	4.
const.	13.961^{***}	15.745^{***}	13.815^{***}	14.600^{***}
$DURABLE$	-0.132^{***}	-0.258^{***}		
$DURABLE^2$		0.002^{*}		
$ReligFrac$			-18.692^{***}	-31.741^{***}
$ReligFrac^2$				20.815^{**}
R^2_{adj}	0.123	0.133	0.460	0.476

Notes: Number of Observations = 126. ***,** and * denote significance at the 1%, 5% and 10% level respectively.

Source: *Religious fractionalization*: Alesina et al. (2003) and Encyclopedia Britannica Book of the Year 2010. *Unemployment*: World Bank. *Durable*: Polity IV database.

over 30 years (1978-2012), Hosni Mubarak served a similar term as Egyptian President (1981-2011),[52] the al-Assad family have ruled Syria since 1971, and the House of Saud represent a long-standing, ruling dynasty.

On reason why dictators prevail is because they contain revolutionary pressures, by turns negatively (through a military apparatus, engaging in sporadic regional conflicts) or "positively" (suitably well-targeted redistribution, sheltering the domestic economy). In so doing they seek to manage the hazard associated with regime change. There are therefore large returns to presiding over a "stable" economy for which there is no state dependence in the hazard.[53] The survival rate of the regime is given by long-term rather than short-term factors. Thus the most stable regimes can extract the highest rent. This is both as a fraction and as a physical amount. The former arises because regime survival is orthogonal to Ω. The latter because the amount of unemployment tends to be on average lower for all Ω (relative to the state-dependent case), and thus the level of activity to be appropriated is higher.

[52] And before Mubarak, Nasser (18 years) and Sadat (11 years).

[53] Although, judging by MENA defense expenditures, the monetary costs of such stability are not negligible; 15 out of the world's top 40 "Global on the Militarization Index" in 2010 were MENA states, with Syria being the 3rd top ranked (behind Israel and Singapore), BICC (2012).

On the other side, a state dependent regime has an incentive to keep regime quality high and to keep rent extraction in ranges which do not compromise survival. Otherwise, unemployment starts to accelerate, leading to rapid declines in survival rates and a diminishing pool of extractable revenues. This is interesting since it is precisely state-dependent hazard regimes which may have most need of rents in order to maintain order, redistribute and fund social objectives.

7 Conclusions

Against the backdrop of the Arab-Spring protests, we examined macroeconomic stabilization under regime shift. The model is shown to be able to rationalize the various phases of Arab economic development: the early growth and developmental gains as well as the difficulty of structural reforms, and the key channels underlying the post-Spring regime. We modeled these developments as a dynamic interaction between a (follower) Firm and a (leader) Government. The latter sets the inflation rate, for a given state of technology, rent extraction and time preference. The firm, conditional on these, sets labor demand. Given its extractive nature, there is a continuous probability of regime shift, as reflected by a hazard function. Consistent with the analysis of Campante and Chor (2012), we consider the case where unemployment plays a key role in progressively undermining the regime. Our framework was kept simple. It might be extended in several fruitful directions. For example, by adding a government budget constraint tied to natural resource revenues. This may shed light on how increasing resource scarcity and variable demand might further condition policy and regime survival. Also our assumption that first-regime agents possess full information could be relaxed to study uncertainty (see Gilli (2012)) and the rebuilding of public trust after regime shift Growiec and Growiec (2013)).

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