

REVOLT ON THE NILE: ECONOMIC SHOCKS, RELIGION, AND POLITICAL POWER

BY ERIC CHANEY¹

Using centuries of Nile flood data, I document that during deviant Nile floods, Egypt's highest-ranking religious authority was less likely to be replaced and relative allocations to religious structures increased. These findings are consistent with historical evidence that Nile shocks increased this authority's political influence by raising the probability he could coordinate a revolt. I find that the available data provide support for this interpretation and weigh against some of the most plausible alternatives. For example, I show that while Nile shocks increased historical references to social unrest, deviant floods did not increase a proxy for popular religiosity. Together, the results suggest an increase in the political power of religious leaders during periods of economic downturn.

KEYWORDS: Political economy, religion, economic shocks, social conflict, political power.

RECENT RESEARCH HAS SHOWN that economic downturns increase the probability of democratic change (Acemoglu and Robinson (2006), Burke and Leigh (2010), Brückner and Ciccone (2011)). For much of history, however, democratization did not follow economic shocks. At least since the Enlightenment, scholars have attributed the historic resilience of autocratic regimes to the actions of religious leaders working in “alliance with social hierarchy and oppressive government” (Israel (2006, p. 103)). Although thinkers including Smith (1776 [2009]), Marx (1844 [1982]), and, more recently, North, Wallis, and Weingast (2009, p. 39) have stressed the importance of religious authorities in determining institutional equilibria, we lack empirical investigations of the extent to which religious leaders wield political power.²

This paper documents a negative relationship between arguably exogenous Nile shocks and the probability of change in Islamic Egypt's highest-ranking religious authority—known as the head judge—using centuries of Nile flood data. In other words, I find that the head judge was less likely to be dismissed by the sovereign or to resign his post when the annual Nile flood was abnormally high or low. In addition, I show that during such floods, the construction of religious structures relative to secular structures increased.

¹I thank CREI and IAS, Princeton for hosting me while part of this project was carried out, and I thank numerous individuals and seminar participants for helpful suggestions. I particularly thank a co-editor and four anonymous referees for detailed suggestions and comments that significantly improved the paper. The library staff at the Bibliothèque Nationale de France, Manuscripts Orientaux greatly facilitated the Nile data transcription. An appendix that provides a detailed description of the data, additional results, and sensitivity checks is available in the Supplemental Material (Chaney (2013)). I am responsible for any remaining errors.

²Throughout this paper, I follow Acemoglu and Robinson (2006, p. 173) and define political power as “a measure of how influential a particular group (or individual) is in the political arena when there is conflict over which policy should be implemented.”

These empirical patterns are interesting because they are consistent with historical evidence that Nile shocks increased the political power of religious leaders. Scholars suggest that the head judge enjoyed widespread popular influence and that his political power stemmed from this influence. During periods of social unrest—such as those created by deviant Nile floods—the judge’s political influence is believed to have increased. Social unrest is thought to have strengthened the judge’s bargaining position by rendering the probability of success of a judge-coordinated revolt (which generally remained “off the equilibrium path”) abnormally high.

I gather additional data to further investigate the empirical relevance of this conceptual framework. For example, I provide evidence that during Nile shocks, the prices of foodstuffs were higher and the incidence of social conflict was greater than during other periods. These results are consistent with the claim that Nile shocks increased the propensity for social unrest.

Additional results weigh against some of the most plausible alternative explanations. For example, I show that historical references to religious practices did not increase during Nile shocks. This result casts doubt on explanations that stress the importance of Nile-induced increases in religiosity or the provision of religious services. I also show that Nile shocks did not affect the replacement probability of judges without sizeable followings. This result is not consistent with explanations that suggest that Nile shocks decreased the replacement probabilities of all bureaucratic or religious officials.

While this evidence is consistent with a Nile-induced increase in the judge’s political power, data limitations make it impossible to rule out completely all alternative interpretations. For example, Nile-induced unrest might have led the political leader who appointed the head judge to defer judge replacement and to increase relative allocations to religious structures to channel aid to the population.

My interpretation of the results is closely related to growing evidence that economic crises increase the probability of the collapse of autocratic regimes by temporarily altering the balance of political power (Acemoglu and Robinson (2001), Berger and Spoerer (2001), Acemoglu, Johnson, Robinson, and Yared (2005), Acemoglu and Robinson (2006), Burke and Leigh (2010), Brückner and Ciccone (2011)). This paper suggests the relevance of this literature in the pre-modern era by providing evidence that Nile shocks altered the balance of political power in favor of Egypt’s highest-ranking religious authority. To the best of my knowledge, this is the first empirical evidence that religious leaders historically wielded political power.

None of the shocks documented in this paper led to the collapse of pre-modern Egypt’s autocratic institutional arrangements. Some historians have suggested that religious leaders contributed to this institutional resilience by using their popular influence to mitigate the threat of “revolutionary devel-

opments” during periods of crisis (Lapidus (1984, p. 153)).³ Evidence that the political power of Egypt’s highest-ranking religious leader increased during periods of economic downturn is both consistent with this view and suggests that future research investigating the political role of religious leaders may enhance our understanding of the historic resilience of autocratic institutions.⁴

The remainder of the paper proceeds as follows. The first section provides an account of the institutional framework in pre-modern Egypt and the effects of deviant Nile floods on the balance of political power within this framework. The second section describes the data, documents the negative relationship between head judge replacement and Nile shocks, and investigates the effects of Nile shocks on the construction of religious structures. The third section empirically investigates potential causal channels. A fourth section concludes.

1. HISTORICAL BACKGROUND

1.1. *Institutions and Political Power in Islamic Egypt*

A unique institutional framework characterized by the introduction of foreign-born military slaves emerged in the areas conquered by Arab armies during the centuries after the death of the prophet Muhammad (Chaney (2012), Blaydes and Chaney (2013)).⁵ As pre-Islamic elites disappeared, Islamic religious associations became the basis for communal organization and religious leaders emerged as the primary check on the power of the sovereign backed by his army of slaves (Lapidus (2002, p. 189)).

Although military slaves were introduced across the region from an early date, the transformation of pre-Islamic social structures took centuries (Lapidus (2002, pp. 183, 189)). Many of these institutional transformations are thought to have been related to the process of popular conversion to Islam and the concomitant increase in the political power of Muslim religious leaders (e.g., Makdisi (1962, p. 45)). While these developments occurred at different dates across the region, it is generally agreed that the rise of the Ayyubid dynasty in 1169 CE marks the completion of this process in Egypt (Lapidus (1972, p. 279)). After this date, the balance of political power between religious and military leaders—and the accompanying institutional equilibrium—is believed to have remained broadly constant into the modern era (Chamberlain (1998, pp. 211–212)).⁶

³Political scientists including Huntington (1991, p. 46) have also suggested that in the past, religion was used to support nondemocratic rule.

⁴For an investigation of why some modern authoritarian regimes are more resilient to economic shocks than others, see Geddes (1999). For work suggesting a link between religion and political structure, see Lipset (1994) or Barro (1999).

⁵Islam emerged in the Arabian Peninsula in the seventh century and Arab Muslims by the middle of the eighth century controlled territories stretching from the Iberian Peninsula to the Indus Valley.

⁶Consequently, throughout the paper, I draw on evidence from Egypt’s Islamic history following the rise of the Ayyubid dynasty in 1169 and prior to 1805 unless otherwise noted. In addition,

Consistent with the premise underlying the above hypothesis, scholarship suggests that the political power of religious leaders flowed from their control over popular support. For example, Al-Sayyid Marsot (1973, pp. 133–134) noted that “[i]t was through using the threat of rousing the mob that [religious leaders] could restrain the authorities, who recognized the dangers behind the threat.” Napoleon noted this during his short-lived conquest of Egypt in 1798. He remarked that religious leaders were the “natural leaders” of native Egyptians and appointed them to high-ranking positions in his ruling council (Crececius (1972, p. 173)).

After the Ayyubid conquest in 1169 and prior to the Ottoman conquest of Egypt in the early sixteenth century, the head judge was Egypt’s most influential religious leader (Petry (1981, p. 231)). This leader is believed to have enjoyed “vast personal authority” and is thought to have been able to provide “massive popular backing” (Lapidus (1984, pp. 134, 136)). The sovereign generally appointed head judges from a list of candidates presented by a council of religious leaders or sought out leaders with substantial popular followings.⁷ Rulers did not generally appoint servile candidates because they were unlikely to retain popular influence.⁸

Religious leaders such as the head judge enjoyed popular influence because they acted as intermediaries between the populace and the sovereign. In return for popular support, religious leaders extracted resources from the sovereign that they then distributed to both themselves and their “constituencies” (Lapidus (1984, p. 189)). In addition to such patronage, it is also undoubtedly true that ideology (i.e., religious beliefs) contributed to their influence.

Given this intermediary role, it is not surprising that the head judge often conflicted with the sovereign over policy implementation. Judges advocated for the implementation of Islamic law (the Sharia), which was interpreted in each period with the interests of both the populace and religious leaders in mind. In particular, the head judge “resisted, haggled and defended against abuse” and “stood against confiscations without consent and proper compensation” (Lapidus (1984, p. 140)). This religious leader also favored prohibitions of “deviant” behavior (such as wine drinking and prostitution) and advocated for the construction of religious structures. The sovereign generally aimed to minimize such concessions since they reduced the amount of resources available to himself and the military. For example, resources allocated to religious structures were held in religious endowments (*waqfs*) that the military could not tax. Similarly, taverns, prostitution, and hashish consumption all yielded sizeable tax revenues. These tax revenues sharply declined if such activities were prohibited (Lapidus (1984, p. 172)).

at times I substitute sovereign for military/*mamluks* and head judge for *ulama* (religious scholars) for expositional ease.

⁷See Petry (1981, p. 315) and Maqrizi (1441 [1997], II, p. 228; III, pp. 238–239; IV, p. 101). See Maqrizi (1441 [1997], III, pp. 353, 383, 384) for the importance of a judge’s popular following.

⁸See Maqrizi (1441 [1997], VII, p. 450) and Petry (1981, p. 320).

When the head judge and sovereign conflicted over policy implementation, the head judge was more likely to resign his post or to be dismissed by the sovereign.⁹ Why did the head judge often choose to resign or be dismissed rather than endorse confiscations and other violations of Islamic law? As an intermediary between the sovereign and the populace, the head judge's influence was rooted in his control over popular support. Since a head judge who regularly sanctioned violations of the Sharia was likely to see his popular influence decline, judges often preferred to be replaced when they were unable to prevent the sovereign from implementing policies that went against the interests of their "constituencies." Such judges seem to have retained or even increased their popular standing and were sometimes reappointed to the head judgeship at a later date.¹⁰

1.2. *Nile Shocks and the Balance of Political Power*

It is well known that pre-modern Egypt's economic activity depended heavily on the Nile's annual flood. A complex system of dikes and irrigation networks helped harness the flood's agricultural potential, making Egyptian agricultural yields some of the highest in the pre-modern world. However, when the Nile's annual flood significantly deviated above or below its optimal level (these episodes are referred to throughout the text as deviant Nile floods, Nile shocks, or Nile failures), agricultural output dropped sharply when crops were harvested the following spring.

Since sharp Nile deviations could lead to widespread famine, Egyptians closely monitored the Nile's rate of rise during the summer. A slow or excessively rapid rise led to abrupt increases in the prices of foodstuffs as individuals hoarded supplies in preparation for shortages the following year. This sharp rise in the price of foodstuffs resulted in localized riots in which people sacked bakeries and looted stores (Shoshan (1980, p. 473)).

Historical evidence suggests two channels through which Nile shocks may have increased the political power of the head judge.¹¹ First, without the aid of the head judge, coordination of localized riots into a widespread uprising is thought to have been "impossible" (Lapidus (1984, p. 191)). Since Nile shocks increased the likelihood of a popular revolt, they made the head judge's ability to control and channel such riots into actions that did not threaten the sovereign more valuable. Second, it is possible that Nile shocks increased conflicts between factions in the Egyptian military.¹² It is believed that during such

⁹For a few illustrative examples, see Ibn Hajar (1449 [1998], pp. 231, 246, 392).

¹⁰See Ibn Hajar (1449 [1998], pp. 29, 231) for examples of such judges.

¹¹This evidence suggests the pre-modern relevance of the insight that "poor economic performance reduces the bargaining power of authoritarian incumbents and increases the strength of oppositions" (Haggard and Kaufman (1997, p. 267)).

¹²For evidence of such Nile-induced conflict during the Fatimid dynasty (969–1169), see Lev (1991, pp. 14, 76).

periods of military conflict, the head judge's support "and with it massive popular backing, was often of decisive importance" in determining the fate of the sovereign (Lapidus (1984, p. 134)).

During periods of social unrest such as those induced by deviant Nile floods, scholars have noted that it "was not unusual for the [sovereign] to beg the [head judge] to help [him] preserve the peace and keep the population tractable" (Al-Sayyid Marsot (1972, p. 153)). This evidence suggests that Nile shocks increased the head judge's leverage over the sovereign because these shocks made the probability of success of a judge-coordinated revolt (which generally remained off the equilibrium path) abnormally high.¹³

Additional qualitative evidence is consistent with the claim that Nile shocks led to an increase in the head judge's political power. For example, sovereigns seem to have increased the implementation of the head judges' preferred policies during Nile failures. One historian summed up this policy shift by noting that during periods of Nile failure, "the sultan would bow to [...] pressure [from the head judge] and enforce decrees against [...] prostitution, hashish eating, beer drinking, the wearing of immodest or over-luxurious dress [or] Christian and Jewish functionaries lording it over Muslims" (Irwin (1986, p. 50)). The historical record also provides evidence that the sovereign increased payments and perquisites to religious leaders during Nile failures.¹⁴

Importantly for the empirical analysis below, the historical record includes examples of the sovereign increasing allocations to religious structures during Nile shocks. One such example occurred in 1420 when the Nile rose at an abnormally slow rate. In response, the sovereign ordered the construction of a mosque and the repair of another religious structure (Taghri Birdi (1468 [1976], III, pp. 77–79)). Similarly, during the deviant flood spanning the Nile year 1415–1416 the sovereign gave "the treasurer a large sum and ordered him to go down to Cairo and distribute it among the mosques" (Taghri Birdi (1468 [1976], III, p. 38)). Such allocations particularly benefitted the head judge and other religious authorities, since they received stipends in return for overseeing and staffing these structures.¹⁵

¹³How did the head judge control the coordination of popular support? The head judge could issue judicial opinions that justified rebellions. Such rulings would be publicly announced from the pulpit of mosques and could result in a coordinated popular uprising. The head judge's influence with lower-ranking religious leaders was also important. These leaders had both local knowledge and influence, and could help organize the populace.

¹⁴For an example of increased payments to religious leaders following a Nile shock, see Maqrizi (1441 [1997], IV, p. 269). For an example of increased perquisites, see the effect of Nile failure on the ability of religious leaders to ride horses in Taghri Birdi (1468 [1990], pp. 220, 238).

¹⁵For evidence that religious structures disproportionately benefitted the head judge and other religious leaders, see Amin (1980, pp. 113, 181). For evidence that they decreased resources available to the military, see Amin (1980, p. 279).

2. NILE FLOODS, JUDGE REPLACEMENT, AND RELIGIOUS STRUCTURES

The evidence presented in the previous section suggests that during periods of social unrest, the political power of the head judge increased, leading to an increase in the implementation of his preferred policies. This increase, in turn, lessened conflict between the sovereign and the head judge, resulting in an equilibrium decrease in the judge replacement probability. In this section, I investigate the extent to which the data are consistent with these predictions.

2.1. Nile Flood and Judge Replacement Data

Egyptians have measured the height of the annual Nile flood since very early times. The “nilometer” on the island of Rauda in Cairo consisted of a rectangular well that was connected to the Nile by three conduits. A vertical column in the middle of the well served as a gauge and was used to measure the height of the Nile. The Nile flood data provided by Ibn al-Hijazi (1470) cover the interval [622, 1469] CE and come from a copy of the measurements taken at this nilometer (Popper (1951, p. 91)). Scholars agree that these data provide credible estimates of the Nile’s annual flood level and have been used extensively in the climatology literature.

The month and year of the head judge changes used in this paper are taken from Ibn Hajar (1449 [1998]) and cover the interval [641, 1438] CE. I use the Nile year (which runs from July to July) as the unit of observation and omit Nile years that are incompletely covered by the judge data. When merged, the flood data and head judge data cover the Nile years [641, 1437].

In the baseline sample, I drop all observations prior to the start of the Ayyubid dynasty in 1169 and all observations after 1425. I drop the early observations because, in general, the Egyptian head judge had an insignificant popular following before 1169. The earliest such judges have been described as government-appointed administrators and as “an integral part of the ruling class” (Hallaq (2009, p. 39)). Although Egyptian head judges increasingly developed an independent power base as local populations converted to Islam, these developments were interrupted by the Fatimid conquest of Egypt (Lapidus (1972, p. 279)). During the Fatimid period (969–1169), the Shia head judge reverted to the role of government-appointed administrator and had a negligible popular following among the mainly Sunni Muslim population.¹⁶ Thus, it is only after the rise of the Ayyubids in 1169 that the head judge is believed to have regularly commanded significant popular support.¹⁷ I omit

¹⁶Although the Fatimid dynasty was Shia and appointed a Shia head judge, it is likely that the Fatimids provided patronage to influential Sunni religious leaders (see Lapidus (1972, p. 281)).

¹⁷This remark refers primarily to the Shafii head judge, since the majority of Egypt’s Muslim population in this period belonged to the Shafii school. When four head judges from different schools were simultaneously appointed after 1265, it seems likely that those who had insignificant followings were more government-appointed administrators than intermediaries between the ruler and the populace.

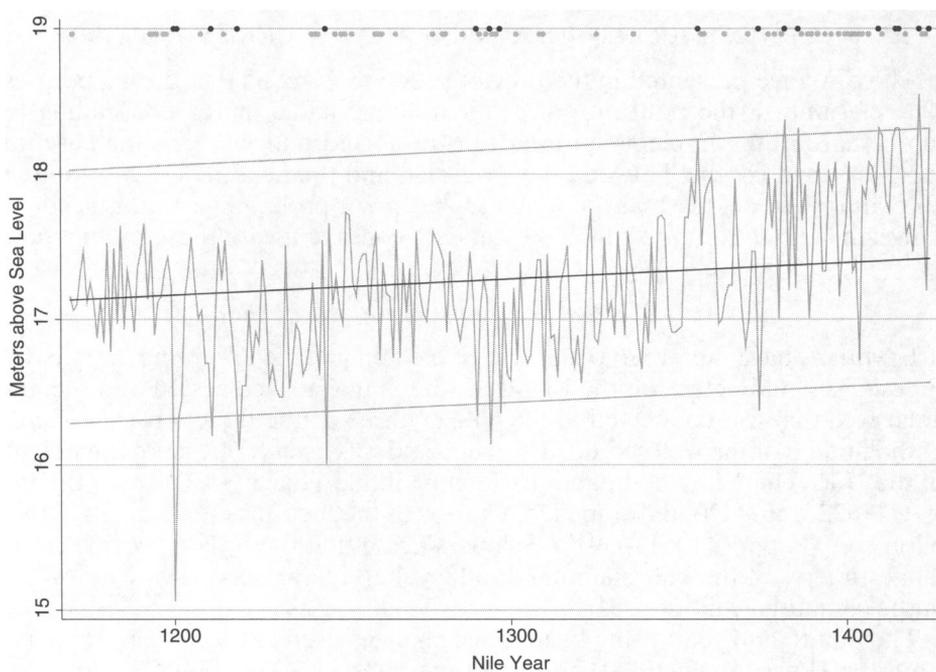


FIGURE 1.—Nile shocks and judge replacement on the baseline sample. Gray dots at the top of the graph denote years with judge replacement; black dots denote Nile shocks. The time series plot of the Nile’s annual maximum on the baseline sample is also provided for comparison.

years after 1425 because there was an abnormally intense concentration of Nile shocks after this date.

Figure 1 graphically presents the judge replacement results in the baseline sample. The black dots at the top of the graph denote Nile shocks, whereas the gray dots denote years with at least one judge replacement. The vertical axis details the flood level in meters above sea level. The Nile time trend is plotted in black and shows that the Nile flood level slowly trended upward over time. This upward trend was caused by sediment accumulation that led to an increase in both the level of the Nile bed and the surrounding land (Popper (1951, pp. 241–247), Borsch (2000)). Given this fact, I use a linear trend as a proxy for the optimal Nile flood level or the level that maximized agricultural production during the harvest the following spring. I then set the Nile shock variable equal to 1 for Nile flood deviations that are in the bottom or top 5% of the deviation distribution (these calculations were made using the entire sample to facilitate comparisons between subsamples). The cutoffs that define Nile shocks are marked by the two gray trend lines in Figure 1.

The shock variable used throughout the paper includes both a predictable (in a statistical sense) nonlinear trend and “surprise” changes in the Nile level.

TABLE I
PROBABILITY OF JUDGE REPLACEMENT: SUMMARY STATISTICS^a

	All	Shock	Nonshock
	(1)	(2)	(3)
<i>Panel A: Baseline</i>			
Probability	22.18 (41.63)	0.00 (0.00)	23.75 (42.64)
<i>N</i>	257	17	240
<i>Panel B: Before 1169</i>			
Probability	19.89 (39.95)	16.67 (37.62)	20.25 (40.23)
<i>N</i>	528	54	474

^aColumns 1–3 present 100 times the probability of judge replacement in all years, years of Nile shock, and nonshock years, respectively. Standard deviations are presented below the relevant probabilities in parentheses.

Although it is plausible that more predictable Nile shocks had different effects than those that were more of a surprise (perhaps because elites and/or populace could better prepare for more predictable shocks), empirical limitations make it impossible to investigate this hypothesis with any reasonable degree of certainty. However, close inspection of Figure 1 suggests that Nile shocks were primarily driven by high-frequency or surprise variation in the flood level. This can be demonstrated in a more formal manner by decomposing Nile shocks into the part attributable to deviations of the Hodrick–Prescott (HP) trend from the linear trend and the part attributable to deviations from the HP trend. The latter source accounts for over half the Nile’s deviations from the linear trend during shock years.

In Table I, I present summary statistics. In the baseline sample, the probability of a judge replacement is 22% in all years, 0% in years of Nile shocks, and 24% in nonshock years. Prior to 1169 CE, Nile shocks appear to have had a smaller effect on the probability of judge replacement.

2.2. Judge Replacement

To formally estimate the relationship between judge replacement and Nile shocks, I estimate a specification of the form

$$(1) \quad ch_t = \beta_0 + \beta_1 shock_t + \gamma'x + \varepsilon_t,$$

where ch_t is a dummy equal to 1 if the incumbent judge at the start of Nile year t was no longer in office at the end of that year, $shock_t$ is an indicator variable equal to 1 if the Nile flood deviation is in the top or bottom 5% of the deviation distribution, and x is a vector of controls. Note that this specification is closely linked to binary response models for grouped duration data (e.g.,

Sueyoshi (1995)). To account for possible serial correlation, the error structure is assumed to be autocorrelated up to 10 lags and heteroscedastic (Newey and West (1987)). For expositional ease, in the tables I report 100 times β_1 .

The estimated β_1 obtained omitting the vector of controls is presented in column 1 of Table II and provides the standard error for the difference between columns 3 and 2 of panel A in Table I. The second and third columns show that these results do not qualitatively change when dynasty and decade dummies are included. In the row labelled AR(10), I provide the p -value from the Breusch–Godfrey test with the null hypothesis of no autocorrelation in the error term up to 10 lags. In columns 1–3, this test rejects the null hypothesis that the errors are not autocorrelated at varying levels of statistical significance.¹⁸

To further examine the extent to which Nile shocks caused judge changes, in column 4, I add five lags and leads of the shock variable. In addition, I include two lags of the dependent variable to address autocorrelation in the error term. The data do not reject the null hypothesis that the coefficients on the lags and leads are, respectively, jointly equal to zero. In addition, when these controls are added, the Breusch–Godfrey test does not reject the null hypothesis of no autocorrelation in the error term.¹⁹ This result suggests that the effects of Nile shocks were concentrated in the “impact” year.

In column 5, I perform the same exercise including 10 leads and lags. The results are, in general, similar, with the exception that the data reject the null hypothesis that the lags are jointly equal to zero. This robust result is driven by a positive correlation between the eighth shock lag and judge replacements. One interpretation of this result is that it indicates an “unwinding” of concessions given to the head judge during Nile floods after the threat of Nile-induced unrest had subsided.²⁰ Alternatively, it is possible that this result is a false positive.

2.3. Religious Structures

The historical evidence presented in the first section suggests that the Nile-induced decrease in the head judge’s replacement probability may be indicative of an increase in the implementation of his preferred policies. In this section, I investigate the effects of Nile shocks on relative allocations to religious structures. The relevance of this exercise is stressed by studies that suggest that such allocations are “the most significant indicator of the relative positions of the religious and military establishments” (Nielsen (1985, p. 120)) and

¹⁸For the results presented in Table II, the coefficients on Nile droughts and floods (i.e., abnormally low and high floods) are generally similar in magnitude.

¹⁹Consequently, in these regressions, I report heteroscedasticity-robust standard errors.

²⁰For example, the theoretical framework in Acemoglu and Robinson (2006) suggests the sovereign would have been likely to renege on Nile-induced concessions once the threat of revolt had passed. Why the head judge did not find it optimal to overthrow the sovereign and establish a rule of judges to address this commitment problem was discussed by Lapidus (1984, p. 153).

TABLE II
NILE SHOCKS, JUDGE REPLACEMENT AND MONUMENT CONSTRUCTION^a

	Dependent Variable: Judge Replaced on $[t, t + 1]$									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Shock	-23.75*** (3.95)	-24.00*** (4.13)	-33.50*** (6.78)	-30.00*** (5.85)	-34.33*** (6.97)	87.88** (43.29)	86.21** (41.39)	95.49* (54.40)	70.32* (39.71)	81.31* (42.19)
AR(10)	[0.05]	[0.09]	[0.00]	[0.93]	[0.72]	[0.01]	[0.02]	[0.00]	[0.64]	[0.45]
<i>p</i> -Value (5 leads)				[0.20]	[0.47]				[0.91]	[0.88]
<i>p</i> -Value (5 lags)				[0.45]	[0.00]				[0.66]	[0.87]
<i>p</i> -Value (10 leads)										
<i>p</i> -Value (10 lags)										
Dynasty dummies?	No	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes
Decade dummies?	No	No	Yes	No	No	No	No	Yes	No	No
<i>N</i>	257	257	257	257	257	257	257	257	257	257

^aThe dependent variable in columns 1-5 is a dummy equal to 1 if the incumbent judge at start of Nile year t is replaced in the following year, whereas the dependent variable in columns 6-10 is a standardized measure of the relative allocation of new constructions to religious structures as explained in the text. In columns 1-5, I report 100 times the estimated coefficient. Shock is an indicator variable equal to 1 if the flood residual is in the upper 5% or lower 5% of the flood distribution. The row labeled AR(10) provides the *p*-value for the Breusch-Godfrey test with the null hypothesis of no autocorrelation up to 10 lags. The rows *p*-Value provide the *p*-value for the test of the null hypothesis that the coefficients on the stated number of leads and lags of Nile shocks are jointly equal to 0. Standard errors, assuming the error structure is autocorrelated up to 10 lags and heteroscedastic, are presented in parentheses, aside from those in columns 4, 5, 9, and 10, which are robust to heteroscedasticity. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

stems from the fact that resources allocated to religious structures benefitted the head judge while detracting from the resources available to the sovereign.

I use Creswell (1919) to compile a data set of the construction dates of major secular and religious structures, and create a variable that measures the total number of secular and religious structures on which construction began in each lunar year. These structures include Cairo's most important religious monuments (e.g., mosques or madrasas) as well as secular structures (e.g., palaces or city walls). The sovereign and other military elites funded almost all the structures provided by Creswell and this data set likely provides a reasonable approximation to the total number of important structures built over the period covered by the data.

To investigate the effect of Nile flood deviations on the rate of construction of religious structures, I construct a measure of the number of religious structures built in each Nile year. Since the construction dates are given by lunar year, I take the weighted average of the total number of religious and secular buildings begun in the lunar years that overlapped with at least part of a given Nile year (where the weights are the percentage of the Nile year occupied by the respective lunar year). I then take the difference between the standardized number of religious and secular buildings and multiply this difference by 100.

I present regression results of the investigation of the effect of Nile shocks on relative allocations to religious structures in columns 6–10 of Table II. Results in column 6 omit controls and show that allocations to religious structures increased by roughly 0.88 standard deviations during Nile shocks. In columns 7 and 8, I show that this result remains robust to the introduction of dynasty and decade dummies. In columns 9 and 10, I include two lags of the dependent variable, and lags and leads of Nile shocks. These results suggest that increases in relative allocations to religious structures were limited to the “impact” year.

3. POSSIBLE CAUSAL CHANNELS

In the previous section, I presented results consistent with historical evidence that Nile shocks increased the political power of the head judge. In this section, I investigate the extent to which some of the most plausible interpretations of the results are consistent with the available empirical evidence.

3.1. *Increases in Religiosity*

It is possible that the empirical results are driven by a Nile-induced increase in the populace's religiosity. To meet the increased demand for religious services, the sovereign may have been more likely to both retain the head judge and divert resources to religious structures.

To investigate the extent to which an increase in religiosity can explain the results, I construct a measure of religiosity using the chronicle *al-Sulūk li-Ma'arifat Duwal al-Mulūk* composed by the Egyptian historian al-Maqrizi

(1364–1442). In this chronicle, al-Maqrizi—one of the most trusted sources for the period covered by his writings—provides a yearly description of events in Egypt. The metric is in the spirit of Baker, Bloom, and Davis (2011) and is 100 times the standardized measure of the number of times the word “prayer” occurs in the description of each year’s events. All the metrics using this source in the subsequent analysis are constructed in a similar manner.

I present the estimates of regression (1) using this metric as the dependent variable in column 1 of Table III. The results show that al-Maqrizi mentions the word prayer significantly less in his chronicle during years of Nile shock. One would not expect this result if deviant Nile floods led to important increases in religiosity or in the demand for religious services, since an increase in both individual and collective prayers seems a likely manifestation of increased religiosity. While it is clearly possible that other Nile-induced events “crowded out” references to average levels of religiosity (and thus the results should not necessarily be interpreted as evidence of a Nile-induced decrease in religiosity), presumably al-Maqrizi would have recorded events related to important increases in religiosity. Thus, this result provides some evidence that Nile-induced increases in religiosity are not driving the results.

3.2. *Decrease in Replacement Probabilities*

Did Nile failures lead to a decrease in the replacement probabilities of all appointed officials? I empirically investigate this possibility in two steps.

First, I examine the effects of Nile shocks on the replacement of the head judge prior to 1169. If Nile-induced decreases in the replacement probabilities of all officials are driving the results, I would not expect to find systematic differences in the effects of Nile shocks on judge replacement over time. To empirically investigate the extent to which the data are consistent with this prediction, I report results obtained by running regression (1) on the entire pre-1425 sample and allowing the effect of Nile shocks to be different before and after 1169 in column 2 of Table III. The null hypothesis that these coefficient are equal is rejected, which is not consistent with the “uniform decrease in probabilities” hypothesis.

Since it is possible that this result is a product of the fact that the data are measured with greater error prior to 1169 or to other time-varying factors, in column 3 of Table III, I limit the sample to after 1265 and report results from running equation (1) for the four head judges who were appointed in Egypt after this date. These judges represented the main Sunni law schools and had different levels of adherence among Egyptian Muslims. As above, if the uniform decrease in probabilities hypothesis were true, I would expect Nile shocks to result in similar probability decreases across the four schools. Results in column 3 show that the data reject the null hypothesis that Nile shocks had similar effects on the replacement probabilities of all the head judges. In particular,

TABLE III
POSSIBLE CAUSAL CHANNELS^a

	Prayer (1)	Judge (2)	Judge (3)	Crusade (4)	Judge (5)	High Prices (6)	Unrest (7)	Sultan (8)	Sultan (9)	Judge (10)
Shock	-31.34*** (11.06)									
Shock * Baseline		-33.50*** (6.76)	-39.93*** (8.45)	-14.96 (27.58)		111.20*** (36.21)	85.25* (49.69)	1.59 (7.53)		
Shock * Early		-7.61 (7.28)								
MalikiShock			-13.43** (5.70)							
HanafiShock			13.06 (14.58)							
HanbaliShock			0.37 (7.33)							

(Continues)

TABLE III—Continued

	Prayer	Judge	Judge	Crusade	Judge	High Prices	Unrest	Sultan	Sultan	Judge
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(Crusade)/100					-3.97*					
					(2.05)					
Shock5									28.42*	
									(15.87)	
(High Prices)/100										-30.13**
										(12.55)
										[-56.80, -10.51]
<i>p</i> -Value		[0.01]	[0.00]							
Estimation	OLS	OLS	SUR	OLS	OLS	OLS	OLS	OLS	OLS	IV
<i>N</i>	254	785	160	254	254	254	254	528	528	254
Sample	Maq.	≤ 1425	(1265, 1425]	Maq.	Maq.	Maq.	Maq.	Ind.	Ind.	Maq.

^aThe dependent variable in the columns marked Judge (Sultan) is a dummy equal to 1 if the incumbent judge (sovereign) at the start of Nile year *t* is replaced in the following year. In these columns, I report 100 times the estimated coefficient. The columns Prayer, Crusade, High Prices, and Unrest denote the use of standardized measures of the extent to which prayer, Crusaders, high prices, and unrest are mentioned in Maqrizi's chronicle as described in the text and the Supplemental Material. Shock is an indicator variable equal to 1 if the flood residual is in the upper 5% or lower 5% of the flood distribution. Shock5 is an indicator variable equal to 1 if the flood residual is in the upper 2.5% or lower 2.5% of the flood distribution. The entries MalikShock, HanafiShock, and HanbaliShock provide the coefficient on the variable Shock in regression (1) estimated using seemingly unrelated regression (SUR) when head judge replacements from the Maliki, Hanafi, and Hanbali schools are used as the dependent variable (the coefficient on the Shafi head judge is provided in the first row of column 3). The row *p*-Value provides the *p*-value corresponding to the test that all the provided coefficients in the column are equal. In the row sample, Maq. denotes the years in the baseline sample in which the variables constructed using Maqrizi's chronicle are available ([1172, 1425]), and Ind. denotes years in both the early and baseline samples in which Egypt was not part of a larger empire. Standard errors assuming the error structure is autocorrelated up to 10 lags and heteroscedastic are presented in parentheses aside from those in column 3, where they are robust to heteroscedasticity. All regressions include decade dummies. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

the effect of Nile shocks is only statistically significant for the judges with sizeable popular followings (the Shafii and Maliki) in this period (Nielsen (1984, p. 172)).

Taken in unison, these results cast doubt on the uniform decrease in probabilities interpretation, since Nile shocks did not decrease the replacement probabilities of all judges. Moreover, these results provide suggestive evidence that the decrease in replacement probability was rooted in a judge's control over popular support, because only judges with sizeable "constituencies" witnessed declines in their replacement probabilities.

3.3. *External Wars*

It is possible that Nile shocks increased the probability of conflict with neighboring powers (perhaps because Nile shocks induced such powers to invade) and affected judge replacements through this channel. To examine whether Nile shocks affected the probability of military conflict with neighboring powers, I use Maqrizi's chronicle to construct a metric of the times he mentions the word "Crusader" (*faranj*) in each year. Presumably, the word Crusader should appear more often during periods of conflict between Egypt and the Crusaders. Since the Crusaders were the foreign power that was most likely to attack (or be attacked by) Egypt for much of the baseline sample, the fact that the point estimate presented in column 4 of Table III is not statistically significant provides some evidence against the importance of Nile-induced external wars in generating the results.

In column 5 of Table III, I show that Crusader references are negatively correlated with judge replacements.²¹ While this result should be treated with caution given that the activities of the Egyptian and Crusader armies may be endogenous, the sign of this coefficient is consistent with the hypothesis that rulers engaged in wars needed increased judge support to help prevent social unrest, to maintain order, and/or to mobilize the populace as military auxiliaries (e.g., Lapidus (1984, p. 164)).²²

3.4. *Increased Political Power of Religious Leaders*

Are the results indicative of a Nile-induced increase in the judge's political power rooted in his control over popular support? In the ideal world, I would observe the probability of a successful revolt, both with and without judge support in each period. Although the data necessary to construct these metrics do

²¹Interestingly, this result is driven by a negative relationship between replacements and Crusader references prior to the battle of Acre in 1291, which marked the fall of the last major Crusader stronghold in the mainland Middle East.

²²For a related result in early modern Spain, see Vidal-Robert (2011). For a theory that links democratization to military conflict over the past two centuries, see Ticchi and Vindigni (2008).

not exist, in this section, I investigate the extent to which Nile shocks increased the propensity for social unrest.²³

Perhaps the cleanest test of the extent to which Nile shocks increased the propensity for unrest comes from a measure of periods of high prices constructed using Maqrizi's chronicle. I use this source to construct a metric that measures the extent to which Maqrizi refers to high food prices in each year. Estimates using this variable as the dependent variable in equation (1) are presented in column 6 of Table III and show that references to high prices increased by a little over 1 standard deviation during Nile shocks. This result provides direct evidence that Nile shocks led to increases in the price of foodstuffs and provides support for the claim that elites were unable to systematically implement policies to prevent such increases. Given the large literature that links increases in the propensity for popular unrest to high food prices, this result also provides indirect evidence that Nile shocks increased social unrest.

Maqrizi's chronicle can also be used to provide direct evidence that Nile shocks increased social unrest. I construct a metric to measure the extent to which Maqrizi references combat, riots, and looting in each year.²⁴ Regression output using this metric as the dependent variable is presented in column 7 and shows that during Nile shocks, Maqrizi increased references to unrest by approximately 0.9 standard deviations.

To further investigate the extent to which Nile shocks increased unrest, I investigate the effect of Nile failures on ruler changes for all years in which Egypt was not a province of larger empires prior to 1425. Although this metric is at best an imperfect proxy for unrest, since increases in unrest often did not lead to ruler changes, the results in columns 8 and 9 show a positive correlation between Nile shocks and ruler changes. The point estimate is very close to zero in column 8, however, and is only statistically significant in column 9 when Nile shocks are defined using the top and bottom 2.5% of flood deviations. Thus, this result provides some additional evidence that Nile shocks increased unrest, although only the most severe shocks appear to have resulted in ruler changes.²⁵

Finally, to the extent that Nile shocks only affected judge replacement by increasing the probability he could organize a revolt, Nile shocks should be a

²³One implication of the conceptual framework is that *ceteris paribus* there should be more unrest when the sovereign replaces the head judge than when he does not during Nile shocks. Unfortunately this prediction cannot be taken to the data, since in the baseline sample the judge is never replaced during shocks. In addition, conditioning on judge replacement (which is affected by Nile shocks) introduces a form of selection bias (see, for example, Angrist and Pischke (2009)).

²⁴For evidence of a positive relationship between social unrest and democratizations over the past two centuries, see Przeworski (2009). For evidence that economic crises increase such unrest in modern autocratic environments, see Przeworski, Alvarez, Cheibub, and Limongi (2000).

²⁵Given the fact that there are few examples of judges endorsing rebellions *ex ante*, it is possible that this relationship is a product of the actions of rival military factions.

valid instrument for judge changes in a regression of judge changes on unrest. I present the instrumental variable (IV) relationship between judge replacement and the potential for unrest proxied by the high prices metric in column 10 of Table III (the first stage is given in column 6). Below the standard error, I provide a 95% confidence interval for the IV coefficient that is robust to both weak instruments and arbitrary within-decade correlation.²⁶ The IV point estimate is negative and statistically significant, suggesting that a standard deviation increase in references to high prices led to a 30 percentage point decrease in the judge replacement probability.

4. CONCLUSION

During arguably exogenous Nile shocks, Egypt's highest-ranking religious authority was less likely to be replaced and relative allocations of resources to religious structures increased. Using history as a guide, I note that these findings are consistent with the hypothesis that Nile shocks increased the religious leader's political influence by raising the probability he could coordinate a revolt. I provide results consistent with this conceptual framework and additional evidence weighing against some of the most plausible alternative explanations for these empirical patterns.

My overall interpretation of the results is closely related to the theoretical framework developed in Acemoglu and Robinson (2001, 2006), who emphasized that economic crises increase the probability of the collapse of autocratic regimes by temporarily altering the balance of political power. On the one hand, the results in this paper suggest the relevance of this literature in the pre-modern era by providing evidence that Nile shocks altered the balance of political power in favor of Egypt's highest-ranking religious authority. On the other hand, none of the documented shocks led to the collapse of pre-modern Egypt's autocratic arrangements.

At least since the Enlightenment, scholars have argued that religious leaders historically used their popular influence to help perpetuate authoritarian institutions. Although the extent to which religious leaders have historically worked to stifle democratic change remains an area for future research, it is interesting that the Enlightenment thinkers credited with laying the ideological underpinnings of modern democratic institutions (Acemoglu and Robinson (2006, p. 69), Israel (2011)) believed that democracy was "impossible" without first "dismantling priestly power" (Israel (2006, p. 103)). These and subsequent scholars maintained that religious leaders historically used their popular influence to mitigate pressures for institutional change. Consistent with this view, this paper provides evidence that the political power of Egypt's highest-ranking religious leader increased during periods of economic downturn when

²⁶This confidence interval is derived from the Anderson–Rubin (AR) test statistic as described in Finlay and Magnusson (2009).

the pressures for institutional changes are thought to have been particularly acute.

REFERENCES

- ACEMOGLU, D., AND J. A. ROBINSON (2001): "A Theory of Political Transitions," *American Economic Review*, 91 (4), 938–963. [2034,2050]
- (2006): *Economic Origins of Dictatorship and Democracy*. Cambridge: Cambridge University Press. [2033,2034,2042,2050]
- ACEMOGLU, D., S. JOHNSON, J. A. ROBINSON, AND P. YARED (2005): "Income and Democracy," Working Paper 11205, NBER. [2034]
- AL-SAYYID MARSOT, A. (1972): "The Ulama of Cairo in the Eighteenth and Nineteenth Centuries," in *Scholars, Saints, and Sufis*, ed. by N. Keddie. Berkeley: University of California Press. [2038]
- (1973): "The Political and Economic Functions of the 'Ulamā'," *Journal of the Economic and Social History of the Orient*, 16 (2/3), 130–154. [2036]
- AMIN, M. (1980): *Al-Awqāf wa al-Ḥayāt al-Ijtimā'īya fī Miṣr*. Cairo: Dār al-Nahda al-'Arabiyya. [2038]
- ANGRIST, J., AND J.-S. PISCHKE (2009): *Mostly Harmless Econometrics, An Empiricist's Companion*. Princeton: Princeton University Press. [2049]
- BAKER, S. R., N. BLOOM, AND S. J. DAVIS (2011): "Measuring Economic Policy Uncertainty," Report. [2045]
- BARRO, R. (1999): "Determinants of Democracy," *Journal of Political Economy*, 107 (56), S158–S183. [2035]
- BERGER, H., AND M. SPOERER (2001): "Economic Crises and the European Revolutions of 1848," *The Journal of Economic History*, 61 (2), 293–326. [2034]
- BLAYDES, L., AND E. CHANEY (2013): "The Feudal Revolution and Europe's Rise: Political Divergence of the Christian West and the Muslim World Before 1500 CE," *American Political Science Review*, 107 (1), 16–34. [2035]
- BORSCH, S. (2000): "Nile Floods and the Irrigation System in Fifteenth-Century Egypt," *Mamlūk Studies Review*, 4, 131–145. [2040]
- BRÜCKNER, M., AND A. CICCONE (2011): "Rain and the Democratic Window of Opportunity," *Econometrica*, 79 (3), 923–947. [2033,2034]
- BURKE, P., AND A. LEIGH (2010): "Do Output Contractions Trigger Democratic Change?" *American Economic Journal: Macroeconomics*, 2, 124–157. [2033,2034]
- CHAMBERLAIN, M. (1998): "The Crusader Era and the Ayyubid Dynasty," in *The Cambridge History of Egypt*, Vol. 1. New York: Cambridge University Press, 211–241. [2035]
- CHANEY, E. (2012): "Democratic Change in the Arab World, Past and Present," *Brookings Papers on Economic Activity*, 42 (1), 363–414. [2035]
- (2013): "Supplement to 'Revolt on the Nile: Economic Shocks, Religion, and Political Power'," *Econometrica Supplemental Material*, 81, http://www.econometricsociety.org/ecta/supmat/10233_extensions.pdf; http://www.econometricsociety.org/ecta/supmat/10233_data_and_programs.zip. [2033]
- CRECELIUS, D. (1972): "Nonideological Responses of the Egyptian Ulama to Modernization," in *Scholars, Saints, and Sufis*, ed. by N. Keddie. Berkeley: University of California Press, 167–210. [2036]
- CRESWELL, K. (1919): "A Brief Chronology of the Muhammadan Monuments of Egypt to A.D. 1517," *Bulletin de l'Institut Français d'Archéologie Orientale*, 16, 39–164. [2044]
- FINLAY, K., AND L. M. MAGNUSSON (2009): "Implementing Weak-Instrument Robust Tests for a General Class of Instrumental-Variables Models," *The Stata Journal*, 9 (3), 398–421. [2050]
- GEDDES, B. (1999): "What Do We Know About Democratizations After Twenty Years," *Annual Review of Political Science*, 2, 115–144. [2035]

- HAGGARD, S., AND R. R. KAUFMAN (1997): "The Political Economy of Democratic Transitions," *Comparative Politics*, 29 (3), 263–283. [2037]
- HALLAQ, W. (2009): *An Introduction to Islamic Law*. New York: Cambridge University Press. [2039]
- HUNTINGTON, S. (1991): *The Third Wave: Democratization in the Late Twentieth Century*. Norman: University of Oklahoma Press. [2035]
- IBN AL-HIJAZI, S. (1470): "Nail al-Rā'id min al-Nīl al-Zā'id," Manuscript 2261, Bibliothèque Nationale de France, Manuscripts Orientaux. [2039]
- IBN HAJAR, S. (1449 [1998]): *Raf'u al-Iṣr 'an Qudāt Miṣr*. Cairo: Maktaba al-Khānjī. [2037,2039]
- IRWIN, R. (1986): *The Middle East in the Middle Ages: The Early Mamluk Sultanate*. Carbondale: Southern Illinois University Press. [2038]
- ISRAEL, J. (2006): *Enlightenment Contested*. New York: Oxford University Press. [2033,2050]
- (2011): *Democratic Enlightenment: Philosophy, Revolution, and Human Rights 1750–1790*. New York: Oxford University Press. [2050]
- LAPIDUS, I. (1972): "Ayyūbid Religious Policy and the Development of the Schools of Law in Cairo," in *Colloque International sur l'Histoire du Caire, 27 Mars–5 Avril 1969*. Cairo: Ministry of Culture of the Arab Republic of Egypt, General Egyptian Book Organization, 279–286. [2035,2039]
- (1984): *Muslim Cities in the Later Middle Ages*. New York: Cambridge University Press. [2035-2038,2042,2048]
- (2002): *A History of Islamic Societies*. New York: Cambridge University Press. [2035]
- LEV, Y. (1991): *State and Society in Fatimid Egypt*. Leiden: E.J. Brill. [2037]
- LIPSET, S. M. (1994): "The Social Requisites of Democracy Revisited," *American Sociological Review*, 59 (1), 1–22. [2035]
- MAKDISI, G. (1962): "Ash'arī and the Ash'arites in Islamic Religious History," *Studia Islamica*, 17, 37–80. [2035]
- MAQRIZI, T. (1441 [1997]): *Al-Sulūk li-Ma'arifat Duwal al-Mulūk*. Beirut: Dār al-Kutub al-'Ilmiyya. [2036,2038]
- MARX, K. (1844 [1982]): "Contribution to the Critique of Hegel's Philosophy of Right," in *On Religion*. Chico: Scholars Press. [2033]
- NEWBY, W., AND K. WEST (1987): "A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix," *Econometrica*, 55 (3), 703–708. [2042]
- NIELSEN, J. (1984): "Sultan al-Zāhir Baybars and the Appointment of Four Chief Qāḍis 663/1265," *Studia Islamica*, 60, 167–176. [2048]
- (1985): *Secular Justice in an Islamic State*. Leiden: Nederlands Instituut voor het Nabije Oosten. [2042]
- NORTH, D., J. WALLIS, AND B. WEINGAST (2009): *Violence and Social Orders*. New York: Cambridge University Press. [2033]
- PETRY, C. (1981): *The Civilian Elite of Cairo in the Later Middle Ages*. Princeton: Princeton University Press. [2036]
- POPPER, W. (1951): *The Cairo Nilometer*. Berkeley: University of California Press. [2039,2040]
- PRZEWORSKI, A. (2009): "Conquered or Granted? A History of Suffrage Extensions," *British Journal of Political Science*, 39 (2), 291–321. [2049]
- PRZEWORSKI, A., M. ALVAREZ, J. CHEIBUB, AND F. LIMONGI (2000): *Democracy and Development*. New York: Cambridge University Press. [2049]
- SHOSHAN, B. (1980): "Grain Riots and the 'Moral Economy': Cairo, 1350–1517," *Journal of Interdisciplinary History*, 10 (3), 459–478. [2037]
- SMITH, A. (1776 [2009]): *The Wealth of Nations: Books IV–V*. New York: Classic House Books. [2033]
- SUEYOSHI, G. (1995): "A Class of Binary Response Models for Grouped Duration Data," *Journal of Applied Econometrics*, 10, 411–431. [2042]
- TAGHRI BIRDI, A. (1468 [1976]): *Al-Nujūm al-Zāhira fī Mulūk Miṣr wa al-Qāhira, Vols. 1–7, tr. W. Popper*. New York: AMS Press. [2038]

- (1468 [1990]): *Hawādith al-Duhūr fī Mada al-Ayyām wa al-Shuhūr*. Cairo: Wizāra al-Awqāf. [2038]
- TICCHI, D., AND A. VINDIGNI (2008): “War and Endogenous Democracy,” Report. [2048]
- VIDAL-ROBERT, J. (2011): “An Economic Analysis of the Spanish Inquisition’s Motivations and Consequences,” Report. [2048]

Dept. of Economics, Harvard University, Littauer Center, Cambridge, MA 02138, U.S.A.; echaney@fas.harvard.edu.

Manuscript received August, 2011; final revision received March, 2013.