Time Will Tell? Temporality and the Analysis of Causal Mechanisms and Processes
Anna Grzymala-Busse
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What is This?
Time Will Tell? 
Temporality and the Analysis of Causal Mechanisms and Processes 

Anna Grzymala-Busse¹

Abstract
Causal inference and the logic of historical explanation are grounded in temporality. Yet the relationship between causal analysis and aspects of temporality, such as duration, tempo, acceleration, and timing, is often less clear. Using examples from analyses of institutional change and postcommunist regime transitions, the author argues that aspects of temporality allow us to predict which causal mechanisms can unfold and to differentiate causal sequences. Explicitly specifying the role of temporality can thus improve scholars’ understanding of political mechanisms, sequences, and the processes they constitute.

Keywords
temporality, causation, mechanisms, duration, tempo, timing, sequence

What, then, is time? If no one ask of me, I know; if I wish to explain to him who asks, I know not.

Augustine (Confessions, Book XI)

¹University of Michigan, Ann Arbor, MI, USA

Corresponding Author:
Anna Grzymala-Busse, University of Michigan, Department of Political Science, 5700 Haven Hall, 505 S. State Street, Ann Arbor, MI 48109
Email: abusse@umich.edu
Temporality is central to causal inference and to the logic of historical explanation. Politics unfold in time, as a landmark study reminded us (Pierson, 2004), and a burgeoning literature agrees. Yet we can further our existing understanding of temporality and its impact in three ways: First, we can be more sensitive to using time as an unwarranted proxy for causal mechanisms or factors. Second, we can generate predictions about the kind of causal mechanisms that can unfold given specific temporal parameters. Third, we can better specify and differentiate the temporal sequences that underlie much of our understanding of causation. The fundamental analytical building blocks that allow us to do so are aspects of temporality: how long events take (duration), how quickly they change (tempo), whether they speed up or slow down (acceleration), and when they occur (timing). This article seeks to give greater structure to our understanding of temporality by differentiating these building blocks and suggesting how they matter in the analysis of causal mechanisms, sequences, and processes.

Recent historical institutionalist and sociological analyses are especially sensitive to the role of temporality in the analysis of causal mechanisms and processes. Rather than add to the panoply of definitions, I rely on the most common definition of mechanisms as recurrent causal links between specified initial conditions and outcomes. Specific sequences (orderings) of mechanisms and events then constitute processes. The analysis of mechanisms and processes invokes temporality since mechanisms specify change: how and why shifts, trends, and developments occur. Whether belief formation, policy transformation, or the reproduction of power, mechanisms take place in time (Mayntz, 2004).

Since aspects of temporality define both the ordering of the events and the dynamics of the mechanisms that constitute processes, considerable attention has been paid to “eventful” analysis, stipulating the right analytical length of causal chains and critical antecedents, the temporal demands of processes such as institutionalization and functional conversion, and the significance of timing and sequencing (Abbott, 1992, 2001; Aminzade, 1992; Büthe, 2002; Ekiert & Hanson, 2003; Griffin, 1992; Kitschelt, 2003; Mahoney, 2000, 2007; Pierson, 2000, 2004; Slater & Simmons, 2010; Thelen, 2003). Advances in the study of path dependence further suggest a careful consideration of temporality (Capoccia & Kelemen, 2007; Page, 2006).

Less clear is the relationship between specific aspects of temporality and their role in causal analysis. First, mechanisms and processes are distinct from aspects of temporality: (a) duration, or the temporal length of an event, (b) tempo, or the amount of change per a given unit of time, (c) acceleration, or the rate at which this tempo increases, and (d) timing, or when an event occurs relative to a specified timeline. Table 1 summarizes these definitions.
<table>
<thead>
<tr>
<th>Aspect</th>
<th>Definition</th>
<th>Impact on mechanisms and processes</th>
<th>Analytical requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>Temporal length of an event (t = \text{time interval})</td>
<td>Tipping, threshold, consolidation, generational, feedback effects can play out and/or become visible</td>
<td>Periodize: baseline, boundaries</td>
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<td></td>
<td></td>
<td>Short- and long-term outcomes may differ</td>
<td>Ensure theory and empirics refer to same event</td>
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<td></td>
<td></td>
<td>Affects time horizons and discount rates</td>
<td>Demonstrate how effects reproduced and sustained: transmission mechanisms</td>
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<td>Tempo</td>
<td>Amount of change per unit of time (\frac{d}{t}), where (d = \text{distance or change and }t = \text{time interval})</td>
<td>Limits learning, deliberation, consultation effects</td>
<td>Specify the units of change and time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Actors more likely to rely on existing strategic templates</td>
<td>Distinguish tempo from type and magnitude of change</td>
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<td></td>
<td></td>
<td>Privileges existing decision makers</td>
<td>Distinguish tempo of processes from their duration</td>
</tr>
<tr>
<td>Acceleration</td>
<td>Derivative of velocity with respect to time (\frac{dv}{dt}), where (v = \text{vector of direction and tempo and }t = \text{time interval})</td>
<td>Generates discontinuities and break points in processes</td>
<td>Specify tempo, and the nonlinear functional forms</td>
</tr>
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*(continued)*
and describes the impact and analytical requirements that are elaborated further below.

When dynamics are conflated with causes, aspects of temporality such as duration, tempo, and timing are invoked as misleading proxies for mechanisms and assumed, rather than shown, to have a causal role (Thelen, 1999). For example, proponents of slow postcommunist economic transformations argued that gradualism “provides an option for early reversal if prospects look bad after the introduction of first reforms” (Roland, 2004, p. 126). Yet reversibility is not a function of tempo but a function of the type of introduced change—after boiling an egg, it is impossible to revert it to an earlier state, no matter how gradual the rise in temperature. Similarly, Paul Pierson (2004) calls our attention to “temporal processes such as path dependence, critical junctures, sequencing, events, duration, timing, and unintended consequences” (p. 6). Yet “duration” and “timing” do not imply a process at all, even

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</thead>
<tbody>
<tr>
<td>Timing</td>
<td>Position on a temporal timeline</td>
<td>Indicates change in causal mechanisms/actors</td>
<td>Eliminate structure-induced discontinuities and nonlinear effects that occur without underlying acceleration</td>
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<td></td>
<td></td>
<td>Characterizes several causal mechanisms: cascades, tipping, panics</td>
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<td></td>
<td>Availability and costs/benefit of strategies: early mover and late adopter advantages</td>
<td>Establish relevant context as source of change exogenous to actors</td>
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<td></td>
<td></td>
<td>Affects which sequences can unfold</td>
<td>State dependence indicates sequence rather than timing effects</td>
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as “unintended consequences” explicitly invokes a causal relation. Unless we distinguish these concepts, we may conclude that we have demonstrated a mechanism or a process when we have identified only its temporal characteristics.

Distinguishing mechanisms from temporality is also critical because it allows us to differentiate among potential causal mechanisms. Certain causal mechanisms take place under specific temporal configurations, whereas others are very unlikely given a particular tempo or duration. For example, rapid institution building is unlikely to involve deliberation, consensus building among wide constituencies, or multiple veto players. Furthermore, some mechanisms can be observed only under specific temporal conditions: To see the effects of slow accumulation, for example, we need a lengthy duration of analysis.

Finally, since sequence underpins our understanding of causation, we need to better specify the constituent temporal aspects of sequences and how they produce historical processes. Even the thinnest notions of causality place sequence as a necessary condition: X has to precede Y to be able to cause Y. Yet the dynamics of sequences often remain underspecified. For example, James Mahoney’s (2000) magisterial review of path dependence argues that “efficacious mechanisms of reproduction enable an institution to take advantage quickly of contingent events” (p. 515). But we cannot measure the efficacy of these mechanisms without first specifying the baseline for measuring tempo, which events we ought to measure, or how we would compare rates of change. Similarly, Pierson affirms that timing and sequence arguments rely on path dependence (Pierson, 2004, pp. 55, 64), whereas others argue timing and sequence can matter a great deal without producing path-dependent effects (Page, 2006). As we will see, changes in the tempo of transformation and changes in the duration of the critical period of initial change are two ways in which we can isolate path-dependent sequences and the events that set them into motion.

Taking seriously politics in time thus explicitly demands the specification of the temporal aspects of both causal mechanisms and processes. This article seeks to contribute to our understanding of temporality and its role in the analysis of causal mechanisms and processes, using examples from the analyses of institutional change and postcommunist regime transitions. The first section shows that dynamics and causes are distinct, but aspects of temporality allow us to examine and differentiate causal mechanisms. The second section demonstrates that aspects of temporality can differentiate and constitute the sequences underlying political processes. The third section identifies and disaggregates the relevant aspects of temporality: duration, tempo, acceleration, and timing.
Temporality and Causal Mechanisms

The analysis of temporality advances our understanding of causal mechanisms in three ways: First, it warns against the use of time as a proxy for unknown processes and mechanisms. Second, it shows how specific causal mechanisms are more likely given certain temporal configurations, making some hypothesized causal mechanisms more plausible than others. Third, it pinpoints the causal role of time: Specifically, “objective,” “clock” time has no independent causal role—but its subjective perceptions and experiences do.

First, when aspects of time are used as placeholders for underspecified mechanisms and processes, we label rather than explain. Much as geographic distance is used as a measure of cultural influence or access to trade (see Gallup, Sachs, & Mellinger, 1998), duration is frequently employed as a proxy for institutionalization, consolidation, inertia, and so on (Thelen, 1999). Here, time stands in for mechanisms and processes we do not yet fully understand. Such assumptions lead to underspecification: For example, a prominent work defines a democracy as consolidated “if the set of institutions that characterize it endure through time” (Acemoglu & Robinson, 2006, p. 30). Such a definition is not only recursive, but it conflates duration with stability and efficacy and fails to provide a temporal threshold for “long enough.”

Second, aspects of temporality can help to identify which causal mechanisms are unfolding: Some causal mechanisms are less likely given the temporal conditions characterizing the broader processes or outcomes. For example, rapid institutional building is unlikely to involve popular deliberation or consultation and is much more likely the product of elite bargaining and imposition, as argued below. Similarly, the development of institutional stickiness is characterized by a decreasing rate of change rather than by a constant rate of transformation. Thus, the dynamics of the broader processes suggest potential constituent mechanisms.

That said, we should be careful about inferring the temporal characteristics of mechanisms themselves. For example, accumulation or threshold effects can unfold slowly. Indeed, Paul Pierson argues these are “slow moving” causes (Pierson, 2004, pp. 82-83, 164). Yet we should not infer the tempo of these mechanisms from the duration required for observing them. Events and causes can accumulate quickly and thresholds can be reached rapidly, as the tipping and cascade effects of the communist collapse in 1989 show (Kuran, 1992). These threshold effects depend on a given behavior or stressor reaching critical levels that tip the system into a different equilibrium, not on the tempo of the buildup. We should measure, rather than presume, the temporal dynamics of causal mechanisms.
Third, the causal impact of temporal phenomena cannot be simply assumed. “Time” is not simply an independent and self-evident causal force, much as “space” is not an independent causal factor (but distance, terrain, and altitude do influence causal processes). “Objective” or clock time is the medium through which processes unfold, the environment in which processes take place. Much as some environments privilege the flourishing of specific species or evolutionary paths, so do some tempos, sequences, or durations favor the unfolding of particular causal mechanisms and processes. For example, processes such as medieval fortress building, cultural change, and rules becoming “taken for granted” need decades and centuries to come to completion. They are characterized and demarcated, but not caused, by the passage of time.

Subjective understandings of time, in contrast, have a clearer causal impact. Human actors experience time differently as individuals, and they can deliberately speed up or sequence events. Perceptions of how fast events are unfolding, or how much time is left, are crucial because the actors’ anticipated time horizons can lead them to pursue different strategies. For example, if discount rates vary widely among political leaders, some may limit their rate of extraction (as “stationary bandits”) and others will prey at higher rates. Similarly, opposition may not mobilize if it believes an objectionable policy episode to be brief. Conversely, if an authoritarian government perceives that the length of conflict is an indication of opposition strength, it may become more willing to negotiate with the opposition as the conflict wears on (Swaminathan, 1999). Thus, actors’ perceptions of time, their self-conscious identification with particular eras, and the “shadow of the future” that such understandings generate affect their strategies and thus the design, function, and transformation of policies and institutions.

Finally, temporal parameters do not simply arise out of inexorable structures or inherent qualities. Instead, they are often intentionally made, endogenous to politicians, bureaucrats, constituencies, supporters and opponents of given policies, and so on. These actors can time, sequence, and speed up or slow down certain processes. For example, some postcommunist reformers deliberately decided to simultaneously and rapidly engage in liberalization, privatization, and restructuring, whereas other policy makers chose to sequence reforms, greatly delaying some. Actors can also transform or disrupt the experience of time: deliberately reorganizing daily routines and the measurement of time (Hanson, 1997; Scott, 1998; Tilly, 1984). Maoist and Stalinist mobilization campaigns intensified the tempo of production through a mixture of coercion and glorification of “shock” workers. Thus, in addition to “scientific time” (e.g., nuclear clocks), we also have “institutional time”
(e.g., cultural and political calendars that measure out religious holidays and elections). Multiple actors can construct time: Electoral cycles coexist with Jewish and Islamic lunar religious calendars, Christian liturgical years, academic years, and so on. These different calendars interact with political consequences: In Poland, for example, September 15 was a Catholic holy day, which coincided with the anniversary of a Polish victory over Soviet forces in 1921. The communist government, in allowing the religious observation, had to tolerate huge celebrations of Polish nationalism and anti-Sovietism. The political significance of these celebrations is inexplicable without attending to the coincidence of political anniversaries and liturgical calendars.

As a result, in measuring or comparing temporal dynamics, we have no “objective” standards for judging a process to be slow or fast, or early rather than late. Instead, we can rely on three different sources of baselines for comparison. First, we can rely on actor perceptions, where the actors themselves determine the relevant time frame (e.g., policy makers who agree that a particular institutional collapse took place unusually slowly or who view an institution as peculiarly long-lived). These take most seriously the subjective understandings of time. A second baseline consists of theoretical expectations. For example, in war of attrition models, the costs of remaining in the fight and the utility of the prize determine how long a given fight lasts (Alesina & Drazen, 1991). Third, we can use empirical comparisons, such as the time it took to write a constitution in other new democracies or how institution-building episodes were timed and sequenced in other settings. In delineating these temporal baselines and boundaries, we can thus take the viewpoint of the actors involved or of the observers (Emirbayer, 1997). The implications for specific aspects of temporality are discussed in the third section.

Sequences and Mechanisms

Aspects of temporality also constitute and differentiate sequences, or the orderings of events in time. These are central to the understanding of political processes and comparative historical analysis, which “could not—and cannot—be analyzed without recognizing the importance of temporal sequences and the unfolding of events over time” (Mahoney & Rueschemeyer, 2003, p. 7). Sequence specification consists of (a) tracing how states are dependent on each other, (b) specifying the mechanisms that link the states, and (c) delineating sequence dynamics: how close together the events occur, when they occur (relative to each other and to an underlying timeline), and how long they last. All these analytical steps involve temporality.
Causal sequences are characterized by state dependence: States in the ordering are dependent on previous states. This aspect distinguishes sequence from timing, as argued below. State dependence can vary from the simple, where a state depends on the immediately preceding state, to path dependent, where successive states are dependent on all previous states, and increasingly so. In some sequences, temporality is invoked only by the simple ordering of causes and outcomes, whereas the order of events prior to the outcome is immaterial. Thus, in additive causal relations \((A + B = C)\), a combination of events produces the outcome of interest. In conditional, or interactive causes, \(A\) produces \(C\) only in the presence of \(B\) \((A|B \rightarrow C, \text{ or } A \ast B = C)\). \(A\) and \(B\) follow without each affecting each other and together produce \(C\). For example, in modernization theory, participation followed contestation and both were held responsible for democratic development—but contestation did not cause participation (Dahl, 1971; Rustow, 1967).

Temporality becomes more critical in single-state dependence, as in simple Markov chains. Causal relations take the form of \(A \rightarrow B \rightarrow C\), where each state is dependent on its immediate predecessor. In many game- and decision-theoretic models, such ordering is critical. The sequence in which the actors move, the information they possess, and their choice set accounts for both equilibrium outcomes and the underlying processes. The order in which the moves or events unfold can determine even which actors survive. Player 2 can respond to Player 1’s initial decision, but Player 2 can also cease to exist as a result of Player 1’s initial move. In postcommunist Russia, for example, sequencing economic transformation before democratic reforms resulted in the pillaging of the economy by various insiders—and starving potential democrats of resources. Tempo and timing can significantly influence sequence outcomes: For example, a rapid response \(B\) to event \(A\) may prevent \(D\) from happening and instead generate \(C\), as when repression prevents protest from turning into a full-fledged revolution.

In path-dependent sequences, the order of events matters, and increasingly so (Arthur, 1994). Initially contingent events take on increasingly deterministic properties, to the point of presenting irreversible choices (as one post-communist reformer put it, “you can make fish soup out of an aquarium, but not vice versa”), in either (a) self-reinforcing sequences that reproduce a given pattern and/or (b) reactive sequences, where each event is a tightly coupled reaction to previous steps (Mahoney, 2000). In path-dependent sequences, tempo determines how quickly a given trajectory congeals, making it more impervious to change. Timing can set in motion different trajectories, and acceleration often indicates self-reinforcing trajectories. The irreversibility or “stickiness” of the trajectory, however, is a function of the
negative externalities that increase the cost and difficulty of adopting alternative options,\textsuperscript{10} not of its tempo or timing.

Aspects of temporality also characterize the mechanisms that link states within all sequences. If only certain mechanisms unfold given event duration, tempo, acceleration, and timing, we can eliminate some alternatives, and more precisely specify how states are linked. Different temporal dynamics often indicate that different mechanisms trigger and reproduce the sequence across time. Key attributes include the clustering of activity (as opposed to its even distribution across time), acceleration or deceleration of the events in the sequence, and the intensity of the activity or magnitude of the events (Stovel, 2001). For example, deceleration is characteristic of learning mechanisms, whereas imitation is characterized by short, discrete bursts of activity (Stovel, 2001, p. 857).

As a result, aspects of temporality also differentiate among sequences. Distinct sequence dynamics (how long the events took, how densely they were packed together, in what context the sequence began and ended) distinguish one sequence from another. A careful tracing of the distribution of events in time, their duration and tempo, can thus help us to identify similar sequences across different contexts, or vice versa. Duration, tempo, acceleration, and timing further affect possible sequence outcomes. For example, events can be deliberately compressed or expanded in time: The decision to pursue rapid and immediate postcommunist privatization prevented communist managers, bureaucrats, and unions from offering real resistance. Duration and timing can also interact, so that processes converge, or events occur simultaneously. Finally, timing itself can make different types of sequences possible: 19th-century democratizations tended to gradually extend the franchise, but a very different international and technological context prompted rulers to expand suffrage immediately and universally in the postcommunist transitions after 1989.

Aspects of temporality thus both constitute and distinguish sequences. Yet even macro-historical developmental accounts (Acemoglu & Robinson, 2006; Boix, 2003) rely on atemporal configurations of variables, even though developmental explanations necessitate an account of sequencing and a clear specification of which events and mechanisms gave rise to which following states. By attending carefully to temporality, we gain a clearer understanding of how sequences unfold, why they take the form they do, and how they produce their outcomes. Only some historical processes are sequential, in that the unfolding of events in a specific order determines future options. Fewer still are consequential.
Aspects of Temporality

If the analysis of political processes is to gain from attention to temporality, we need to clearly demarcate temporal aspects, how they relate to each other, and how they interact. Otherwise, distinctions blur and confusion arises over attribution. Timing becomes shorthand for initial conditions, whereas rapid tempo is conflated with the magnitude of change, as in some initial accounts of postcommunist privatization, for example. Relatively simple temporal parameters are substituted for ones that gain us greater explanatory leverage, but also make far greater analytical demands. For example, when duration is used as evidence for sequence, we conclude a process was causally dependent on ordering, when all we have demonstrated is its temporal length (Büthe, 2002). Finally, relevant aspects of temporality are ignored in research design: For example, the interaction of slow-moving institutions (such as culture, knowledge) is said to influence fast-moving ones (technology, political institutions; Roland, 2004). However, to test this proposition, enough time must elapse for the interactions among cultures and knowledge to play themselves out. No matter how dense these interactions, slow accumulation cannot be demonstrated in the short term.

A clearer set of analytical distinctions could thus allow us to use temporality more effectively in the analysis of causal sequences and political processes, even if (and precisely because) the empirical manifestations of these aspects of temporality are complex and difficult to disentangle. Below, I differentiate constituent aspects of temporality, examine their role in determining causal mechanisms and agents, and delineate the analytical requirements for their study.

Duration

Duration measures how much time elapses between the start and end of an action or event: It is the interval between X and Z in Figure 1. Examples include the time elapsed between the announcement that a new agency is founded and its demise, or the period between the takeoff of popular literacy and its full attainment. The analysis of start and end points of events and processes allows us to isolate the states in a sequence (and their potential impact). For example, identifying event duration is useful both in delineating “critical junctures” and in determining their causal impact: If the duration of a critical juncture is lengthy, relative to the subsequent period it is said to affect, its impact is low (Capoccia & Kelemen, 2007).
Duration demarcates the unfolding of mechanisms and processes. We can reach very different conclusions about important phenomena depending on the specified duration. Some mechanisms can be observed only given enough time elapsed. For example, a study of electoral volatility in postcommunist democracies concluded that it takes over a decade for electoral loyalties to stabilize (Tavits, 2005, p. 293). Earlier studies, which necessarily relied on a shorter time frame of analysis, had emphasized high levels of volatility but could not observe the stabilization.

Other mechanisms have their effect only given enough time. Slow-moving processes, such as demographic and cultural transformations, need extensive time to unfold and come to completion. For example, at least 18 years elapses between one generational effect and another in modern voting or decision making. Time has to pass for institutions to become widely recognized and taken for granted by societal actors, through education, socialization, and generational effects. Moreover, to consolidate, formal rules also require time to establish mechanisms of enforcement and resolution of the inner contradictions they may generate, processes that also require time. Long-standing institutions such as the British Parliament or the U.S. Congress have evolved not only a set of formal institutions that distribute authority and include a variety of actors (vesting them in the continued existence of the institution), such as Question Time or the committee system, but also informal solutions to informational and logistical problems, such as constituency offices and seniority rules.

Figure 1. Tempo versus duration

![Diagram showing tempo and duration](image-url)
Longer duration makes it possible for diffusion, accumulation, saturation, and tipping effects to unfold. If a tipping process is cut short, it cannot reach its threshold. (This is distinct from assuming that tipping processes are necessarily slow.) More fundamentally, political life is rife with nonlinear processes that result in different outcomes in the short and long term. For example, institutional features that reinforce rules in the short term may weaken them in the long term, as with “quasi-parameters” (Greif & Laitin, 2004). The perceived duration of events or episodes also leads actors to develop distinct time horizons: expectations of how much longer current strategies are likely to work and the expected utility of these choices. For example, a prominent thread in the literature on regime transitions claims that when the group of people whose support keeps the leader in power is large enough, leaders will invest in public goods to prevent their supporters from defecting (Bueno de Mesquita et al., 2003). Yet this argument ignores that many investments in public goods, such as the provision of health care, education, or infrastructure, are likely to pay off in decades—whereas the decision to defect or to remain loyal is made over a much shorter time frame, even days or months. It is not clear why far-off benefits should keep current supporters loyal—and without attending to the duration of the time horizons, the question never arises.

Duration is further distinct from durability. Durability is the vector of duration (temporal length) and stability (constant outcome). Not surprisingly, long-term turmoil would generate very different expectations for political actors than long-term stability. We expect lengthy and stable processes to continue, creating lengthier time horizons and lower discount rates. For example, if conservative opponents perceive that democracy poses few risks during potential transitions to democracy, they will support democratization (Alexander, 2002). However, more time elapsed alone does not lower their perceptions of risk. Lengthy stability does. Thus, duration alone is not the best measure of regime durability since it tells us little about the stability of the regime, or its ability to meet and overcome potential crises.

Even as it is associated with specific causal mechanisms, duration should not be mistaken for sequence. The temporal length of phenomenon says nothing about its ordering. Since sequence is necessary to establishing causality but duration is not, such substitution imports notions of causality where none are demonstrated. For example, Tim Büthe argues for greater sensitivity to historical sequence: He cites Abram de Swaan’s 1998 landmark study of the rise of public good provision as arguing that education led to the growth of elites who then pushed for more education (Büthe, 2002, p. 486). Yet this example points to the importance of duration: de Swaan himself argues that
elite preferences changed because elites gradually recognized the interdependence of individual fates in society, for a variety of cultural and economic reasons (de Swaan, 1998). Time had to elapse for elite preferences to change, but that alone does not constitute a sequence with specific, state-dependent, stages. More generally, such substitution can impute causation to a trivial ordering (trivial in the sense that one factor follows another without causing it). If we want to know how a causal process played out, simply assuming the state dependence associated with sequence is misleading.

How, then, do we analyze duration? The analysis of duration requires periodization, or the demarcation of the analytically relevant time periods, with specific starting and ending points. We can count tree rings to find that a tree lived for 10 years, without needing to find out when exactly it began to grow and when it died. Politics, however, rarely affords such neat measurements and forces analysts to discover “start” and “end” points. Periodization is specified by the theory driving the analysis but is not always easily achieved: Delineating start and end times, the passage of time, and the “before and after” is as central as it is difficult (see Büthe, 2002). Yet “only when we can provide a beginning and an end to a sequence of interrelated events can we understand the meaning of an event within the sequence, and by extension, the meaning of an event sequence” (Bearman, Faris, & Moody, 1999, p. 502).

The first consideration is common to all temporal analyses: choosing and theoretically defending the temporal baseline. Duration can be measured either in absolute terms, of “objective” time (how many years elapsed after a regime collapse before a new constitution), or relative to other episodes (how long constitutional creation took across new democracies). For example, do we measure antigovernment protests annually or by electoral cycles or government administrations? The baseline can dramatically alter the interpretation. In the analysis of postcommunist protests, acceleration and changes in the intensity of antigovernment protests emerged only when the temporal unit of analysis was the government administration—annual analyses obscured the clustering of protests by administration (Ekiert & Kubik, 1999).

Second, we need to determine the boundaries of the event whose duration we analyze. To avoid charges of post hoc cherry-picking, the rules used in delineating duration need to be both explicit and replicable. Discontinuities are one key clue to periodization. Lieberman (2001) deftly analyzes four different kinds of starting points: the rise of a new institution, a transformation in an existing institution, exogenous shocks or “break points,” and changes in rival causal variables. Thus, scholars of postcommunist institutions in East-Central Europe can begin their analysis with the post–World War II rise of communist regimes and trace which communist developments continued to
exert an influence after the collapse of such regimes, and for how long (Ekiert & Hanson, 2003). Alternatively, if they are explaining communist regime variation, they turn to the interwar period and its administrative, political, and economic legacies (Kitschelt et al., 1999).

Periodization is complicated by the fractal-like nature of events, which themselves are made up of smaller events (which in turn comprise sub-events, etc.). For example, “the communist collapse” comprised multiple events: popular upsurges, government-opposition negotiations, handovers of power, informal carrying away of resources from the state, and so on. Larger processes may contain mechanisms or events that have different durations themselves, making both analyses and policy making more difficult (Falleti & Lynch, 2009; Orren & Skowronek, 1994). These subprocesses frequently overlap and interact with each other, simultaneously conditioning a given moment (Kersh, 2005).

Yet for all the difficulties these complexities pose, matching periodization with the level of analysis is critical. For example, in examining postcommunist institutional design and change, a foundational debate pitted advocates of an institutional “tabula rasa” against those who saw the “communist legacy” as a key influence on postcommunist institutional development (Elster, Offe, & Preuss, 1998; Hanson, 1997; Jowitt, 1992). This debate could have considerably advanced our understanding of the influence of authoritarian legacies had it made two critical moves: (a) considered distinct legacies, rather than the communist legacy, and (b) theorized and examined the half-lives, or duration, of their influence, and why some were so much more durable than others. Without doing so, neither side could recognize that (much less explain why) the formal trappings of the planned economy could evaporate overnight—but the suspicion of state regulation of markets persisted for years, for example.

The complexity of the potential interactions among subevents and subprocesses may mean that the most viable periodization strategy is inductive. Working with an explicitly stated and replicable set of decision rules, we may discover discontinuities and demarcation lines that emerge from the data itself (Mayhew, 2005). Once we find these discontinuities, however, we need to return to the theory that informs the analysis, and ask whether the periodization can be reconciled with both theory and the level of analysis it implies.

**Tempo**

Tempo is *change over time* or speed (\( s = \frac{d}{t}, \) where \( s = \) average speed in an interval, \( d = \) distance traveled, and \( t = \) duration of the time interval). *Tempo*
is thus related to, but distinct from, duration. In discrete terms, tempo is the frequency of the “subevents” in a larger event, or between events in a process. Examples include how much time elapses before each new state institution is established, between each new person gaining literacy, and so on. If Y’s are events in a process, the distances between them in Figure 1 measure the tempo. We may thus think of tempo both as continuous (directional movement through space) and as discrete (distance between subevents). Phenomena where the “subevents” are fungible and infinitesimal may be thought of as continuous: For example, in population growth, the death or birth of any one human being slows down or speeds up the growth rate marginally. Moreover, a death is “cancelled” out by a birth: If an equal number of people die and are born over a period of time, the growth rate is 0. In contrast, in many political processes, changes in different directions are not fungible. For example, the implementation of market reforms is not “cancelled out” by an episode of political repression—instead, we examine both events and measure the time between them to assess the tempo of a regime transition.

For tempo to measure the amount of political change per unit of time, analyses of tempo and its effects need to precisely spell out the change in measurable units: the number of bills issued by the legislature per session or the dollars of foreign direct investment per month, the expansion of an institutional domain over the course of its existence, the number of deaths per year of civil war or epidemic, the number of people becoming literate per decade, and so on. This is all the more important since, as noted below, change is often nonlinear and accelerates or slows down at particular points in time. Complicating matters, institutional crises and their responses often occur at multiple speeds within broader episodes of institutional transformation. For example, regimes can collapse very quickly, but the institutional changes they prompt unfold at various rates. Similarly, different institutions (and aspects of institutions) rely on distinct mechanisms of reproduction: growing constituencies, demographic change, and so on. If the means of support or reproduction unfold too slowly, nascent institutions may not survive policy challenges or exogenous shocks. Those institutions that can create their own networks of support and legitimacy stand a better chance of survival. If the tempos of creating support and of institutional reproduction correspond, institutions are more likely to survive. For example, Daniel Carpenter (2001) finds that the key to bureaucratic autonomy and agency survival was the forging of direct links with citizens, establishing a reputation for technological know-how, and developing organizational capacity as the
regulatory domain expanded. Had the tempo of constituency building not kept up with the domain expansion, the nascent agency would have failed.

When institutional development is rapid, it is almost always more opaque to both observers and participants, with events quickly unfolding, overlapping each other, and obscuring the links between strategies and outcomes. The complexity of transformation grows since rapid change in one institutional domain is rarely isolated from other changes and pressures. It becomes increasingly difficult to gather accurate information, disentangle causes, or gauge the impact of earlier decisions. What learning or diffusion could occur among decision makers is limited since they do not have the time to deliberate, to learn new skills, or to gain new experiences (Roland, 2004). There is less time to co-opt adversaries or convert functions over time (Selznick, 1949/1978; Thelen, 2003). Since there is less time between events and responses, related institutional components, such as constituencies, operating procedures, and regulatory mechanisms, have little time to become more aligned before the next challenge hits.

As a result, actors are more likely to rely on existing skills, templates and resources, and personal networks (Powell & DiMaggio, 1991; Stark & Bruszt, 1997). Rather than learning or developing new sources of information, they take “off the shelf” examples. For example, postcommunist economic entrepreneurs relied first and foremost on their existing personal alliances to insure themselves during the transition to the market economy (Stark & Vedres, 2006; Róna-Tas, 1997). Similarly, the authors of many postcommunist constitutions turned to pre–World War II templates, adopting extant institutional solutions. (For an exception that proves the rule, the Polish constitution was largely novel and involved enormous deliberation—but it was not adopted until 1997.)

Evidence from postcommunist transitions suggests that rapid transformation tends to privilege not only the use of extant templates and connections but also a particular set of actors: the few elites institutionally capable of decision making. Decisions over economic reforms or new political institutions were all made by a narrow set of elites from the top echelons of the communist party and its opposition (where it existed), embodied in the Round Table negotiations between the two camps that took place in several countries. The rapid tempo of change (itself the result of the crumbling of communist state power and international pressure) inhibited consultation or challenges from society. Diffuse lower level actors such as party members or voters need to organize, mobilize, and reach consensus first and so face the dilemmas of collective action and costs of extensive mobilization. Faster change also gives fewer opportunities for mass resistance to mobilize and to
challenge earlier decisions. For example, to reinvent the communist parties as democratic competitors after their fall from power in 1989, new leaders in Poland and Hungary rapidly centralized party organizations, dissolved local party units, and forced members to reenlist. Party members were powerless to stop the reorganization: By the time they mobilized to stop the elites, the parties no longer existed (Grzymala-Busse, 2002).

In rapid processes of building or transforming institutions, therefore, small elite cohorts are the likely agents. This is not to say that slower change necessarily involves greater participation or deliberation (e.g., a slow but coercive change would not involve deliberation), but that rapid change precludes it. By the same token, rapid institutional destruction and the triggers for institutional transformation are frequently mass based, as countless revolutions and rebellions testify. Institutions and regimes can be brought down in a variety of ways by diverse actors: Constructing any specific institution is far more likely to require consensus on a particular strategy.

Since the measurement of tempo invokes duration (the denominator), it is easy to conflate the two. Yet the two are analytically distinct. First, tempo does not necessarily correlate with duration. Slow-moving processes can be short lived, and rapid processes can take a long time to unfold completely. Slow but short change includes a slow-moving demographic change cut short by an external shock, or the gradual building of an institution that comes to a halt. Table 2 gives examples: The slow development of clientelist networks may be interrupted by exit from office or by the failure to develop the requisite organizational channels, as was the case in postcommunist democracies. Chaos and instability, on the other hand, from the raging inflation of Weimar Germany to the murderous transformation of Pol Pot’s Cambodia to the

### Table 2. Tempo Versus Duration: Examples

<table>
<thead>
<tr>
<th>Faster</th>
<th>Slower</th>
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<tbody>
<tr>
<td><strong>Shorter</strong></td>
<td>Radical processes: coups, revolutions, shock therapy, regime replacement, and some institutional creation (free elections)</td>
</tr>
<tr>
<td><strong>Longer</strong></td>
<td>Lengthy instability: revolutions and wars, cascades, predation, postcommunist civil society growth, political party fission</td>
</tr>
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Hundred Years’ War, can last years and decades, unfolding rapidly and even gaining momentum before eventually petering out. Such lengthy turmoil, such as the wars of early modern Europe, means that actors and institutions are constantly and rapidly shifting, generating expectations chiefly of further disorder. The lack of predictability and stability means shorter time horizons and higher discount rates. The low average duration (high volatility) of tenure in office in Africa, for example, leads rulers to adopt high and hyperbolic discount rates from the start of their tenure in office, promoting high rates of revenue extraction immediately (Goldsmith, 2005, pp. 95-96). Conflict does not continue indefinitely: The longer a civil war, for example, the more likely it is to end (Fearon, 2004). Nonetheless, low institutionalization or instability can be long lasting: An equilibrium may be very short lived, and the processes that establish new equilibria may be lengthy and unstable.

More broadly, we should not focus on duration at the expense of tempo (or vice versa). Paul Pierson argues that a cross-sectional snapshot will not capture processes that require considerable amount of time to unfold: Fifty annual “slices” do not reveal a process that unfolds over 50 years. This is an important reminder to take duration seriously, but extending the period of analysis may not be enough, even if that period is properly specified. A longer periodization may not be enough to distinguish the mechanisms at work. Thus, several sources of institutional resilience over time, such as veto points or actor investments follow a different functional form: Veto players increase the costs of revision very quickly and then slow down, whereas investments are considerably slower but more constant (Pierson, 2004, pp. 150-151). Yet at the end of a long enough time period, these processes all achieve the same outcome: high costs of institutional revision. Extending the period of analysis alone does not allow us to discern which mechanisms obtained or how they might interact. To do so, we need to trace other temporal dynamics, such as tempo and acceleration, which characterize the different mechanisms at work.

Second, if we conflate duration and tempo, we cannot examine how they interact. Within sequences, duration can expand or limit the impact of tempo or of acceleration: For example, when “critical junctures” or “windows of opportunity” open up for an extended period of time, much more transformation is possible and the set of options may actually increase over time. The faster events unfold, and the greater the time period elapsed, the bigger their cumulative effect, a point that may clear up the confusion introduced when we assume cumulative processes are “slow-moving” (Pierson, 2004). If such windows of opportunity are short lived, even rapid change may not lead to much transformation—a point we miss if we look at the tempo of change alone. An example is nascent democratization cut short by a coup. Where
democratization has already consolidated, the coup is more likely to fail because it faces robust institutions armed with vested interests and authority, which can withstand the defection of one set of participants. The sequence remains the same (regime collapse–democratization–coup), but the outcome differs.

Furthermore, tempo should not be confused with the type of change, or how transformations occur. For example, the debates over “shock therapy” or “gradualism” as strategies for building free markets out of planned economies frequently conflated type of change and its tempo. This led to mistaken analytical and policy conclusions: for example, that slower privatization was more carefully implemented or more successful (see Hellman, 1998). It was the sequencing and regulation of such reforms—ensuring democratic accountability in place and building oversight institutions before privatization—that turned out to be critical for free market and governance outcomes (Herrera, 1999). The conflation of type with tempo obscured these dynamics and led analysts to falsely infer the structure of the economic reforms that took place.

Tempo is also distinct from the magnitude of change: whether it is small, enormous, or in between. Many existing analyses assume an exhaustive dichotomy between radical change, which occurs rapidly and decisively, and gradual transformations that are slow, continuous, and incremental (Roland, 2004, p. 116). Yet the rate of change is distinct from the size of its impact. For example, slowly unfolding “quasi-parameters” can alter actor behavior over centuries—or over the course of 10 years, as they did in the collapse of Genoa’s political order from 1154 to 1164 (Greif & Laitin, 2004). We cannot infer the magnitude or type of change from tempo alone—the rate of change may be very rapid, but that says little about the “size” of the transformations we observe, or whether they accumulate to produce larger change. In short, tempo arguments require that we specify the rate of change—the frequency of events over time—without inferring either their type or their magnitude from the rate at which they occur.

**Acceleration**

Precisely because tempo may be nonlinear, or inconsistent, acceleration (and deceleration) is an important consideration. Acceleration is the derivative of velocity with respect to time (a = dv/dt, where a is the acceleration vector, v is the velocity [the vector of direction and tempo], and t is time), or a measure of the change in the rate of change. The conditions for such nonlinearity are omnipresent: temporal differences in policy implementation capacity,
rising and falling support, uneven resistance, exogenous shocks, efficiency gains and losses. Many political processes exhibit changing tempos: They speed up and slow down at given points. For example, postcommunist privatization started to unfold very quickly, with a great deal of entrepreneurial activity and privatization auctions at the outset. In several countries, it then slowed down after the plums were picked and then sped up again in the mid-1990s as newly restructured offerings were brought to market.

Acceleration and deceleration characterize distinct causal mechanisms. Nonlinear change is often self-reinforcing, so that the rate of loss or gain (or change) feeds on itself (McCloskey, 1991). Mass panics, armament escalation, and sorting and tipping effects (Schelling, 1978) exhibit such positive feedback. Therefore, acceleration may indicate self-reinforcing processes beyond the control of the actors involved. Modeling contagion and diffusion also calls for examining potential acceleration and deceleration since these indicate different susceptibility or resistance.

Acceleration and deceleration are symptomatic of critical junctures: abrupt and “diversionary” moments (Abbott, 2001, pp. 250-252). Identifying acceleration thus allows us to identify break points or turning points in sequential development. In another postcommunist example, the European Union mandated several administrative reforms in the postcommunist accession candidate countries after 1997, suddenly forcing the laggards among them to quickly introduce a spate of state institutions. The result was that all candidates had similar state institutions by 2004, but thanks to two different processes: domestic efforts first begun in 1990 and responses to formal demands of the EU after 1997. And the institutions differed as a result: the EU-mandated ones were “Potemkin institutions” in several cases, devoid of regulatory authority (Jacoby, 2004). Here, examining the sudden acceleration in the tempo of institutional development signaled the possibility of a change in the causal agents and mechanisms responsible and allowed the analyst to disentangle the different paths toward the same formal outcome.

The collapse of communism in 1989 further illustrates the ways in which acceleration can indicate different underlying mechanisms of change. The sequence of regime collapses accelerated, so that it took 7 years in Poland, 7 months in Hungary, 7 weeks in East Germany, 7 days in the former Czechoslovakia, and 7 hours in Romania, perhaps the most repressive of these regimes. The underlying mechanisms changed accordingly: Although the initial Polish and Hungarian transitions began with negotiations between the government and the opposition, preceded by considerable preparation, the subsequent episodes featured spontaneous mass mobilizations that unexpectedly tipped the balance of power against the government. These latter transitions
were also affected by spillover and demonstration effects from the earlier mobilizations. As this example shows, periodization is critical to specifying acceleration: Examining the “communist collapse” of 1989 as a whole would obscure the acceleration and the different mechanisms of collapse—but examining the rapidly increasing frequency of regime collapses in successive countries makes it clear. Breaking down the “communist collapse” into constituent episodes thus allows us to examine how this increasingly rapid cascade snowballed and the distinct underlying mechanisms.

**Timing**

Timing differs from the temporal dynamics discussed so far. Duration, tempo, and acceleration are explicitly about trends or change across units of time. In contrast, timing consists of the placement of a given event on a timeline (itself composed of some units of time, such as electoral cycles or years). Timing can be stated in “objective” terms: An 18th-century revolution occurred earlier than one in the 20th century. Its critical analytical role is in establishing context for comparison: As one analysis notes, “Historical arguments in comparative politics are fundamentally arguments about when divergence took place. Hence disagreements on causal timing are legion” (Slater & Simmons, 2010, p. 903).

Timing arguments are not about the placement of events relative to each other—but to an exogenous context (also see Falleti & Lynch, 2009). In timing arguments, changes in these temporal contexts are responsible for the different outcomes we observe. Thus, 18th-century revolutions had pamphlets and word of mouth as their mobilizing techniques; 20th-century revolutions had television, radio, email, and cell phones at their disposal. If an emphasis on timing implies distinct causal contexts, the theory tested specifies which aspects of these contexts are of interest to the researcher. Furthermore, we still need to specify the mechanisms: Timing does not specify how the phenomenon unfolded.

Sensitivity to timing reveals a set of contextual effects: It changes the set of options available, privileges those who arrive early or late, and alters which sequences unfold. Timing may also be a proxy for initial conditions; but as with other temporal proxies, that relationship has to be spelled out. First, timing can determine the choices available (Swaminathan, 1999). Costs and benefits of given technologies or strategies change over time. For example, repression may be relatively cheap early on in a conflict between the government and the opposition but prohibitively costly later on, when international attention to the conflict may lead to economic or military sanctions. Some
options disappear entirely while new ones arise. Thus, the French Catholic Church squandered its chance to organize a mass electorate in response to anticlerical attacks in the 1870s; 30 years later, other parties had claimed these voters, and no Christian Democratic party arose in France as a result (Kalyvas, 1996).

Second, timing conditions early-mover and late-adopter advantages. Where negative externalities exist, early movers are advantaged (recall that the accumulation of negative externalities indicates path-dependent processes; Franzese & Hays, 2007). Those first arrivals with power, for example, are likely to generate more of it (Pierson, 2000). Conversely, where free riding on existing solutions is possible, late entrants or adopters accrue greater advantages. For example, nascent states in medieval Europe facing geopolitical competition had to buy the support of the few available elites who could make up the state administration, allowing them to sell offices and entrench a patrimonial system. Late state makers (after 1450) no longer had to rely on such elites and built states with better bureaucracies—educated and trained elites became available, thanks to the intervening rise of universities, growth of markets, and changes in military technology (Ertman, 1997).

Third, timing can also profoundly affect which sequence can unfold: For example, when Napoleon and Hitler began their campaigns to invade Russia determined whether they could have returned before winter set in. The sequence of return–winter versus winter–return was critical for their success, and the beginning of their ventures in autumn ensured that both the French and the German armies embarked on the unfavorable (for them) sequence.

Timing is thus distinct from sequencing. Timing exhibits dependence on the changes in the external context; sequencing exhibits dependence among its constituent states. In other words, sequencing endogenizes what timing arguments leave exogenous. Therefore, timing arguments rely on specifying the broader context, and which aspects of it change over time. The analysis of timing relies on identifying those contextual factors that have changed to affect the unfolding of events and the levels of variables, or have a different causal impact at distinct points in time. The characteristics of the agents (whether individual actors or institutions) stay relatively constant: The same actor entering at time $t$ and at time $t+1$ faces a very different context, and that context determines the outcome. For example, colonies freed themselves from imperial control more easily before 1850 and the advent of the telegraph (which passed on news of rebellions) and the steamship (which allowed quick troop transport; Wilkinson & Onorato, 2008).

If arguments about early entrance or late adoption involve change endogenous to the actors (e.g., early competitors deliberately preclude future entrants),
then the argument is in effect about ordering, not timing (see Falleti, 2005). Fundamental “early events” in path-dependent analyses refer to their order in a sequence, not their timing, and they matter because they condition future events, not because they unfold differently. If the actions of earlier actors explicitly affect later ones, or if actors with different endowments enter at different times, the impact of timing is attenuated (at most, it is conditional). In the analysis of “modular” revolutions in the former Soviet Union, both opposition and government actors “were heavily influenced by preceding revolutions and took previous cases as a model for their actions” (Beissinger, 2007, p. 262). Here, sequencing mattered, with earlier actors facing higher barriers to success and later actors benefiting from these experiences, as a result of endogenous learning processes.

The prevailing emphasis on path dependence has tended to obscure the analytical importance of timing. Analyses of path dependence have focused on ordering, since “the same event . . . may have a different effect depending on when in a sequence of events it occurs” (Pierson, 2000, p. 264). However, the same event may have a different impact because of timing and the different context it implies rather than because of its ordering in a sequence of events. For example, International Monetary Fund (IMF) programs adopted in the 1990s differed from those in the 1980s because of specific timing-dependent differences in the international economic and ideological context, not because of learning from earlier events or changes within the IMF (Pop-Eleches, 2009). Conversely, using evidence of timing (when an event occurs, relative to a theoretically relevant context) to make arguments about sequence results in treating as exogenous factors that ought to be endogenized. The result is assigning too much causal importance to a factor that ought to be “shared” with another (i.e., biased regression estimates). The significance of timing is overstated, and the importance of order ignored.

Keeping timing and sequencing distinct allows us to uncover their independent effects. For example, in the adoption of formal state institutions of monitoring and oversight in postcommunist democracies, timing explains the international variation in regulatory performance. The earlier these institutions were adopted, the better the country’s performance on measures such as regulation, control of corruption, and so on. Within countries, however, sequencing was more important: Institutions adopted before the rise of their regulatory domains were far more powerful regulators than those adopted post hoc (Grzymala-Busse, 2007). Thus, the Polish Stock Exchange Commission was established simultaneously with the stock market, in 1991, and gained a reputation for stringent regulation and transparency. Its Czech counterpart arose only in 1998-1999, 8 years after the stock market arose, and struggled with
opaque property rights and asset-stripping scandals. Examining timing alone would not explain variation in performance across institutions; analyzing sequencing would not explain variation across countries.

These aspects of temporality—duration, tempo, acceleration, and timing—play critical roles in our understanding of political processes. Yet, as this section illustrates, they impose analytical requirements that often go unmet. By clearly delineating aspects of temporality and what it takes to analyze them, we can distinguish (and show how they are distinct from) causal mechanisms and see how they constitute and differentiate historical or developmental sequences.

**Conclusion**

The analysis of political processes is grounded in temporality: establishing the dynamics of causal mechanisms, constituting and differentiating sequences, and specifying the length, tempo, and temporal placement of critical events. The more complex causal chains common in social scientific analyses, with multiple events predicated on previous states via a series of mechanisms, call for more nuanced understandings of how temporality defines and relates these orderings. Historical explanations need to examine how temporality characterizes and constrains the unfolding of events and mechanisms over time.

Building on recent innovations in the analysis and specification of periodization, causal context, measuring critical junctures, and the mechanisms of path dependence (Bennett & Elman, 2006; Capoccia & Kelemen, 2007; Falleti & Lynch, 2009; Lieberman, 2001; Page, 2006; Pierson, 2004; Thelen, 2000), this article aimed to make three contributions to our understanding of temporality. First, we need to keep causal mechanisms and temporal dynamics distinct. Second, some causal mechanisms are more likely than others given particular temporal configurations. Third, aspects of temporality constitute and distinguish sequences and characterize how they unfold. We thus need to both differentiate aspects of temporality and see how they fit together—how tempo differs from acceleration, and why a sequence is a different-order analytical concept than timing. Such temporal analysis allows us to better ascertain how political processes unfold and differ.

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**Notes**

1. Mahoney (2001, pp. 579-580) counts more than 24 definitions of mechanisms. Since mechanisms establish the direction of causation, they are distinct from intervening variables, which increase the variance explained without moving beyond correlation. Mechanisms may vary in generalizability, level of abstraction, and observability. Also see Falleti and Lynch (2009).

2. Events are discrete and temporally specific “happenings that significantly transform structures” (Sewell, 1996).

3. Temporal aspects of a process may be endogenous to the same causal force that determines the outcome, and this is often difficult to distinguish empirically. However, the strong association between specific causal mechanisms and temporal aspects still lets us eliminate some causal mechanisms from consideration as far less plausible than others.

4. Kant, among others, spells this out explicitly. Even Hume’s argument about constant conjunction is about consistently sequenced conjunction.

5. Schelling’s (1978) canonical analysis of tipping and thresholds effects remains agnostic on their tempo.

6. Actors may be forced to act by time: For example, chess clocks force players to make decisions. But these derive their power from the rules of the game (institutions).

7. The analogy is imperfect: Time is irreversible and unidirectional, whereas space allows movement in many directions.

8. Hyperbolic discounting interacts with duration through subadditive temporal choice (measured discount rates depend on the length of interval being evaluated) and reference points (discount rates can change dramatically if the outcome is perceived as an acceleration or a delay from some temporal reference point; Loewenstein, 1988; Loewenstein, Read, & Baumeister, 2003).

9. To capture the notion of dependence among entities in a sequence, I use state as a shorthand for both events and variable levels, despite their distinct ontological status. Events are discrete and temporally specific, whereas variables are ahistorical
conventions representing quantities with no fixed values. For example, the assassination of Lincoln is an event: The murder rate is a variable.

10. Mechanisms that reinforce sequences and lower the likelihood of deviation from an initial path include increasing returns, self-reinforcement, positive feedback, and lock in. In increasing returns processes, the more a choice is made, the greater its benefits, and these benefits rise smoothly as more people make a particular choice. Self-reinforcement means an action generates complementary institutions or behaviors that sustain the action. Positive feedback creates positive externalities when the same choice is made by other people—and the benefits accrue to those who make the choice. Finally, lock in means a choice becomes more attractive because enough people have made that choice. “Increasing returns” are neither necessary nor sufficient for path dependence. Conversely, path dependence occurs without increasing returns when negative externalities constrain the possible outcomes (Page, 2006).

11. Here, we need to distinguish between the types of discounting taking place. Under exponential discounting, actors perceive ever-increasing returns, and there are enormous gains from lengthening time horizons. In contrast, in hyperbolic discounting, benefits quickly reach an asymptote and little is gained beyond a certain period.

12. To measure acceleration, we need continuous, rather than discrete, measures of tempo. “Frequency” is therefore less a formal definition than an analogy.

13. Velocity thus indicates the rate of change away from a point. We may want to know not only the tempo but also the direction of change: whether public debt is increasing or decreasing, whether regime support is falling or rising, and so on.

References


**Bio**

Anna Grzymala-Busse is a professor of political science, the Ronald and Eileen Weiser Chair in European and Eurasian Studies, and the director of the Weiser Center for Emerging Democracies at the University of Michigan.