EDITORS' INTRODUCTION

Timothy W. Guinnane, William A. Sundstrom, and Warren Whatley

Economic history today, especially as practiced in North America, reflects an ongoing process of borrowing and integrating from economics, history, and other social sciences. Compared with economic history even thirty years ago the field is now more technical, drawing on advances in economic theory and econometrics, but also more reliant on the historian's techniques of archival research and close source scrutiny. At the same time, the discipline of economics has become more open to taking explicit account of the influence of the past. This fruitful interchange between economics and history reflects an increased awareness, then, that history matters.

No scholar has done more over this period to define the approaches, themes, and standards of economic history than Paul A. David. Furthermore, no scholar has more forcefully and influentially argued the case for making economics a truly historical social science—one that, like evolutionary biology, gives past events a central explanatory role in understanding the present. Like most productive scholars he has a long list of publications, including some classic papers that are read by thousands and will continue to be read for many years to come. Like most productive scholars his influence is also felt through the work of his students, both those who worked formally with him as Ph.D. students and those who collaborated with him in other ways. What sets Paul David apart from most scholars, however, is that certain fundamental ideas and methods are distinctly associated with his work within the economics

profession. It is the deepest sort of influence when a scholar alters the way others do research even when the topic has nothing to do with the scholar's own specific interests. The essays in this volume all deal in some way with one or more of the issues or methods that David has helped to define.

Although the essays assembled here cover a considerable range of topics and approaches, three broad themes emerge, themes that might be summarized in three phrases: history matters, context matters, and the facts matter. The authors would no doubt agree that an appreciation of these themes is a principal lesson they have taken away from their interactions with Paul David and his work.

The notion that history matters through strong "path dependence" is an idea closely associated with Paul David. Path dependence means different things to different people and in the hands of some has become little more than a buzzword, straw man, or vague conception that draws together disparate ideas. In David's work the term has specific meaning: namely, path dependence describes processes in which the long-run character of the system depends critically on the history of the system—that is, on the specific sequence of events, some of which may be random in nature. Historical events or accidents are not merely short-term "perturbations" to the system, but may alter the evolution of the system in a fundamental way. As David has written, "In such circumstances 'historical accidents' can neither be ignored, nor neatly quarantined for the purpose of economic analysis; the dynamic process itself takes on an essentially historical character" (David 1985, p. 332). Fundamentally, to take path dependence seriously is to demand a "historical economics." And as some of the essays included here make clear, thinking about path dependence may lead to some startling welfare and policy conclusions, which play no little role in the controversy surrounding the idea.

A second perspective that Paul David has championed is the idea that context matters—that the deep "fundamentals" of economic and social structure, institutions, and even culture, can have strong effects on purely economic matters, and that economic modeling must take explicit account of these fundamentals. The economist who takes this idea seriously will occupy an uncomfortable perch between economists who often sweep such concerns under a rug and those who fully appreciate the complexity of human society

and react to it with the intellectually nihilist position that attempts to model the complexity are fruitless. The first generation of new economic historians, epitomized by the Nobel laureates Douglass North and Robert Fogel, reinvigorated the field of economic history by applying rigorous price theory to the past and downplaying the importance of historical and cultural context. Indeed, in his early work, North tried to show that institutions were mere epiphenomena of underlying relative factor prices (North and Thomas 1973). But the work of Paul David and others has shown that what Eugene Hammel in another context called "culturally smart microeconomics" pays enormous dividends.

A third hallmark of David's work pertains to the matter of facts and evidence: an insistence on careful and creative use of the tools of economic theory and econometrics in the task of measuring social and economic phenomena of the past. This approach has not been a worship of technique for its own sake; sometimes the theory is simple and the statistical tools no more sophisticated than weighted means. But this insistence on careful modeling and measurement has paid off in many of David's contributions, and by example has raised the standards for modeling and measurement in many other works.

1. HISTORY MATTERS: PATH DEPENDENCE

An important implication of the standard assumptions of neoclassical economics is that the dynamic evolution of the economy is described by movement toward a unique equilibrium path that can be predicted from certain underlying fundamentals, including tastes, technologies, and endowments. The equilibrium may be a moving target because the underlying tastes and technologies may change, and endowments can be altered by random shocks, but the relationship between those changes and the long-run equilibrium is a continuous one. For this reason, even in the neoclassical world "history matters," but in a circumscribed manner: small changes in fundamentals have small effects on long-run outcomes.

The neoclassical approach often implies that the economy can eventually "shake free" of its history, in the sense that deviations from the equilibrium path will diminish in impact over time. A well-known illustration of such a

process in economics comes from the standard Solow growth model. Consider an economy in which half the physical capital has been destroyed by war or natural disaster. The resultant reduction in per capita product would be transitory in the sense that capital deepening would eventually cause the economy to converge back toward the equilibrium per capita product implied by its underlying technology, population growth, and savings behavior.

In systems typified by path dependence, history matters in a more fundamental way. As David has recently defined it, "A path dependent stochastic process is one whose asymptotic distribution evolves as a consequence (function) of the process's own history" (David 2000, p. 5). This is a precise way of saying that the process cannot shake free of its history. Because path dependence implies multiple dynamic equilibria, relatively small historical events, if they lead to the selection of an alternative equilibrium path, can have large and persistent long-run implications. Furthermore, as David (1985) suggests for the case of the QWERTY typewriter keyboard, society might not be indifferent between the alternatives. The possibility of lock-in on an inferior technology cannot be ruled out. Path-dependent growth, *pace* Solow, may exhibit divergence rather than convergence.

It is one thing to assert that path dependence exists and therefore that history matters in this far-reaching way. But economics cannot be satisfied with mere assertion, both on general methodological grounds and because neoclassical economics, as the dominant paradigm, tends to receive the benefit of the doubt among practicing economists (see the essay by Reder in this volume). Hence, a convincing theoretical and empirical case must be made that the assumption of path dependence is appropriate in a given case. A particular virtue of Paul David's work in this area has been his careful specification of the theoretical conditions that are likely to give rise to path dependence. It is then the task of the economic historian or empirical economist to determine for each specific case whether the conditions have plausibly been met. These two strands in the literature on path dependence—its theoretical underpinnings and its empirical applications—are both represented in this volume.

The Theory of Path Dependence

Kenneth Arrow's essay is a good place to start because it presents a lucid overview of the theoretical underpinnings of the literature to date and argues

that the idea of path dependence is more general than is often appreciated. Much of the literature on path dependence has stressed the causal role of increasing returns. Network effects are a widely cited example. Suppose, for example, that agents can choose between two competing technologies and that the net benefit of a technology is an increasing function of the number of adopters. Then the sequence of early adoptions can have a powerful impact on the ultimate equilibrium choice of technology (Arthur 1989; David 1985). Adoption of one of the alternatives has a positive feedback effect, encouraging further adoptions. In this case increasing returns take the form of a positive network externality.

But is path dependence always, or even usually, a consequence of increasing returns? Arrow argues that the fundamental source of path dependence is not increasing returns but irreversibility of investment. In his dynamic equilibrium model path dependence arises even with constant returns to scale when capital is infinitely durable (and therefore investments are irreversible). Early investment decisions become a sunk cost, and during subsequent periods agents may find it optimal to continue to use installed capital rather than scrap it, even if it is less productive than an alternative capital good would be. Arrow cites a number of illustrative cases of path dependence, including Thorstein Veblen's classic account of German industrialization and the purported advantages of being a follower. In each case, he argues, irreversibility of investment plays a crucial role.

Paul Stoneman takes another theoretical approach to path dependence and once again shows that it is more general than has been appreciated. Most models of path dependence are built, as Arrow noted, on network externalities or feedback. In his chapter Stoneman constructs a simple intuitive model that has no network features but exhibits path dependence nonetheless. The key feature of his model is what Stoneman calls "legacy" effects. There are two technologies, and the benefits of installing one depend on whether the other has already been installed. If the two technologies exist side by side then the situation is much like a standard production function with positive but declining marginal productivity of capital. A more novel situation arises when one technology is in place and another is new. Then, as Stoneman shows, the pattern of diffusion depends critically on (among other things) which is the new technology. Thus the decision to adopt a new technology at a given time depends

not just on prices at that time, but on the path of adoption up to that point. This is the central feature of path dependence, and Stoneman generates this result without externalities of any kind.

Arrow's and Stoneman's chapters share a common feature, which is the demonstration that path dependence, which was originally associated with network externalities and thus thought to be of limited importance in the real economy, can arise in far more general circumstances. Both chapters focus on the nature of investments. Arrow isolates the irreversibility of the investment as the central point. Stoneman's chapter, which uses a different kind of model, can be thought of as deriving a set of conditions under which the cost of reversing an earlier adoption decision might affect the probability of adopting a given technology today. Together these chapters suggest a more expansive view of the role of path dependence in the economy.

To increasing returns and irreversibilities, Douglas Puffert's chapter adds a third factor contributing to path-dependent processes: limited foresight. Puffert notes that, given perfect foresight and complete future markets, increasing returns need not imply path dependence because agents could in principle select the single globally optimal dynamic path from the alternatives. In a sense, the multiple dynamic equilibria of increasing returns would collapse into a single rational-expectations equilibrium. But the real world is characterized by imperfect information and limited foresight, and in such a world path dependence becomes possible as agents make decisions sequentially and myopically. Puffert finds unconvincing the critiques frequently leveled at Paul David and Brian Arthur that fault them for assuming imperfect foresight.

Puffert's essay goes on to examine the implications of *network form* for path dependence. By network form he has in mind the structure of interconnections among users in the network. Puffert notes that many networks have a lumpy structure, in which local subnetworks use common standards, but subnetworks may then be linked in various ways with varying degrees of compatibility. The network effects operate to different degrees within or between these subnetworks. Puffert examines a number of case studies, including railroad gauges, electrical power distribution, telecommunications, and computers. His overview of these cases points to the importance not only of

network form, but also of so-called gateway technologies, which help overcome compatibility problems across standards.

Arrow, Stoneman, and Puffert all provide strong theoretical grounds for thinking that path dependence can occur. But how significant is the challenge of path dependence to conventional economic theory and methodology? The view that path dependence plays an important role in the real world is what Melvin Reder terms "strong history" in his contribution to this volume. Using Thomas Kuhn's framework, Reder argues that strong history and strong (neoclassical) economics constitute competing paradigms for economics. The neoclassical paradigm, however, is the incumbent, and "with that goes the default position in allocating the burden of proof." Strong history, as a challenger to orthodoxy, will necessarily be held to a higher standard of empirical support than strong economics.

Reder chooses not to take sides on the empirical debate. But he does identify an additional factor favoring the neoclassical paradigm in the battle for the hearts and minds of economists and economic historians. Namely, the neoclassical model is a powerful tool in empirical work, even of a purely descriptive nature. The neoclassical equilibrium conditions imply relationships among prices, quantities, and underlying technical parameters that permit the researcher to draw broad inferences from limited information. In Reder's view, most economists would be loath to relinquish these tools without overwhelming evidence of their falsity.

Case Studies of Path Dependence

Some of the most interesting discussions of path-dependence literature are found in case studies of specific historical phenomena. Here the challenge is to uncover and document the role of history in the evolution of a specific economic structure without lapsing into generalities about how the past must of course matter. A good example is Charles Calomiris's discussion of post–World War II international monetary institutions. Calomiris argues that the "second thirty-years' war" (the period extending from World War I through World War II) can be thought of as a shock that gave rise to institutions of a specific historical nature: the decline of the gold standard and the spread of regulation. The absence of the gold standard and the new regulations

increased the expectation of bailout, trade volatility, and inflation and gave rise to the International Monetary Fund and the World Bank. These institutions continue to evolve and to influence policy today. Given that these institutions emerged in response to historically specific shocks (the world wars and the Great Depression) and continue to influence policy, they can be thought of as path dependent in nature.

Phillip Lim, like Calomiris, applies the concept of path dependence to the evolution of institutions, an application that has been encouraged by David (1994) in his own work. Lim argues that the role of the state in South Korea's economy emerged as a path-dependent adjustment to historical accidents during the postwar period, resulting in a set of institutions that have recently contributed to the country's financial difficulties. In pre-1961 South Korea the United States backed a conservative anticommunist regime that used cronyism to build its political base. After 1961 the anticommunist regime was bent on economic development as a response and counterweight to perceived North Korean communistic success. Lim characterizes the post-1961 policy regime as a risk-guarantee system that was adopted after Korea was forced to acquiesce to IMF and U.S. pressures. These choices had lasting consequences. Under the risk-guarantee regime, the state guaranteed loans to select firms based on their success in the export sector. State action in times of crisis revealed that the state would bail out these companies. As firms came to expect this, moral hazard became institutionalized. The resulting inefficiencies gave rise to financial crises, and the state's bailout during these crises only reinforced the expectation that the state would bail out the private sector the next time. The April 1996 collapse of the semiconductor market is but the most recent cycle in the risk-guarantee regime.

The persistence of an apparently suboptimal economic policy regime is also a central theme of Peter Temin's account of the evolution of federal regulation in the U.S. telecommunications industry. Recounting the debates between the Federal Communications Commission and the firms in the industry beginning in 1959, Temin argues that the FCC has never been able to treat costs consistently in regulating pricing. The reason is that the FCC has consistently favored entrants over the entire forty-plus years of its existence, arguing that the incumbent firm (AT&T through much of the period) should charge

high prices when it extends into competitive markets, but should charge low prices to entrants who want access to its network. Although the ostensible regulatory policy is that prices should cover costs, the proper definition of the relevant costs has been repeatedly contested by the FCC and the phone company, with the FCC persistently advocating the definition of cost that most favored entry. Although Temin does not attempt to explain the hysteresis in FCC thinking, what is clear is that the regulator has failed to adapt its regulatory approach to changes in the competitive structure of the industry.

The recent literature on economic growth and economic geography has seen an increased interest in models that are explicitly historical. One important source of path dependence in these models is external economies of scale. The role of external economies in regional and urban economic development is one of the oldest themes in economics, dating back to Adam Smith's *Wealth of Nations* and elaborated upon by subsequent economists, most notably Alfred Marshall. In his work on Chicago, Paul David (1987) demonstrated the importance of such agglomeration economies. These ideas have received renewed interest among economists in the so-called new economic geography (see, for example, Krugman 1993). In his chapter, Paul Rhode applies the related concept of home market effects to understanding the U.S. Pacific Coast economy after World War II.

Home market effects occur when expanding local or regional demand for products facilitates increased productivity locally through external economies or learning. Rhode hypothesizes that the booming wartime home market may have pushed the West Coast economy from a low-level to a high-level equilibrium, defying wartime expectations that the region would suffer serious and potentially long-lasting economic dislocations after the war. To demonstrate the importance of home market effects, Rhode uses a panel of California manufacturing industries to estimate a reduced-form model of industry value added. The key finding is that the size of the California economy, as measured by the (log) ratio of California to national income, affects individual industry manufacturing activity with an elasticity in excess of 1, suggesting powerful positive feedback. Rhode's chapter weds historical description and data analysis to make the case that California's postwar economic growth was indeed a path-dependent process.

The implications of path dependence for decision makers, including government policymakers, continue to be a source of contention. As Geoffrey Rothwell shows in his chapter, policy decisions can offset lock-in effects in path-dependent regimes, but not without cost. Rothwell examines the optimality of China's nuclear power program, applying a model developed jointly with Paul David. In the model there are two generations of nuclear power plants. Choosing a standardized design in generation one offers the opportunity to learn by doing in both generations, reducing operating costs substantially. Alternatively, in generation one planners could choose a diverse menu of plant designs, forgoing learning gains but retaining flexibility in the future and gaining from experimentation with alternative designs. Using plausible parameter values for the Chinese case, Rothwell simulates total power generation costs for different degrees of diversity. He finds that Chinese decision makers, for a variety of reasons, chose greater technological diversity than would have been optimal.

2. CONTEXT MATTERS

Path dependence or strong history is one route to a more historical economics. Another is to make use of historical description to contextualize and enrich the explanatory models of economic theory. A good example of this attention to what we refer to above as deep fundamentals is the chapter by Timothy Besley, Stephen Coate, and Timothy Guinnane on the English Poor Law reform of 1834. The implicit contrast here is to a type of institutional economic history pioneered by Douglass North and his students. North, especially in his earlier work, emphasized the explanatory power of very simple economic models. Given his goals and the nature of the debates in which he was engaged, this simplicity might have been warranted, but more recent institutional economic history has shown that more careful attention to the social and economic context pays ample dividends through a better appreciation of the constraints facing the historical actors in question.[1] Besley, Coate, and Guinnane stress the social and political circumstances that determined the availability of information on the poor to those administering the Poor Law.

Central to the New Poor Law, as implemented under the Poor Law Act of 1834, was the reduction of the power of local authorities and the elimination of outdoor relief for the able-bodied through the use of the workhouse test. The workhouse test was a simple administrative device: when individuals applied for poor relief, officials could make relief conditional on entering the workhouse, and nothing more. By setting a standard for economic relief and psychological stress in the workhouses, self-selection into the poorhouses revealed the true opportunity utility of potential entrants. If the relief standard was set low and the psychological stress level set high, then only the neediest (deserving) poor would enter the poorhouse.

While much of the literature on the New Poor Law emphasizes the low relief level set by the workhouses, Besley, Coate, and Guinnane emphasize how the workhouse test economized on information that had become increasingly unreliable during this time. The workhouse test screened the deserving from the undeserving poor and deterred the kind of behavior that would lead to poverty. The dramatic social and economic change that took place in England starting in the late eighteenth century also broke down the local nature of social ties that had verified information on the poor. The New Poor Law took the form it did, the authors argue, because its architects wanted to reduce the information needed to administer poor relief.

Susan Carter, Roger Ransom, and Richard Sutch's chapter is in many ways the summary of a long and fruitful dialogue with Paul David on the topics of U.S. fertility decline and its relation to broader themes of growth and savings in the nineteenth-century economy. Carter, Ransom, and Sutch disagree with some aspects of David's own contributions on these subjects, but the spirit of their work is very much in keeping with the notion of paying close attention to the cultural and historical trends that shape economic and demographic behavior.

Historians have long appreciated that fertility declined earlier and more rapidly in the United States than it did in much of Western Europe. Estimates that Carter, Ransom, and Sutch discuss show that total fertility rates of whites fell by about half between 1800 and 1900. A long succession of scholars have sought to explain this precocious decline in fertility, usually tying it into other great themes in American economic history such as migration and the

availability of cheap land on the frontier. In a well-known contribution to the literature, Richard Easterlin (1976) linked fertility decline to the closing of the frontier by arguing that declining land availability made it increasingly costly for farmers to endow their children with adequate farmland. Unable to meet their target bequests to a large number of children, they reduced their fertility. In contrast, both David (Sundstrom and David 1988) and Carter, Ransom, and Sutch stress the role of children in the provision of old-age support for their parents. Using a bargaining model, Sundstrom and David argued that the key and hitherto underappreciated force was the increase in off-farm opportunities for children. As economic development improved children's off-farm opportunities, the terms of the bargain between the generations tilted in favor of the children; parents responded by reducing the number of children they had and provided for old age in other ways.

Carter, Ransom, and Sutch also see the rise of off-farm opportunities as a key causal factor, although they emphasize the problem of "child default" (children simply leaving) rather than the changes in bargaining power. They make two important contributions to this discussion. The first is a masterful overview and analysis of the available data, improving on previous work by disaggregating to the county level and incorporating a variety of variables and alternative measures. The second is to provide a different twist on the David-Sundstrom argument. Carter, Ransom, and Sutch argue that a major driving force in the decline of fertility was in fact a *cultural* change: the decline of patriarchal family relations and the rise of what they call life-cycle behavior, under which children were increasingly viewed as a consumption good rather than an investment in old-age security. This change in turn had far-reaching implications for such macroeconomic phenomena as savings behavior.

In his chapter, David Weiman explores another dimension of the historical context of economic activity: namely, the spatial and industrial structure of markets and its subtle influence on the development of the organizational structure of business firms. Specifically, he argues that the spatial pattern of wholesale trade influenced the design of the early Bell telephone system. Weiman's method is an analytical rendition of the strategies and insights of key managers and engineers of the newly formed AT&T Company between 1887 and 1914. Weiman reviews the basic technology of early telephone

service and Bell's traffic studies, which suggest the affinity between long-distance telephone service and wholesale trade. The essay focuses on the hierarchical organizational structure of long-distance telephone networks and how this is explained by the natural flow of long-distance telephone traffic and ultimately increasing returns to long-distance telephone service.

Another legacy of history that shapes economic action is the structure of political institutions, both national and international. Whether jurisdictions cooperate or compete in setting taxes and other economic policies may have important welfare consequences. In his chapter, Trond Olsen develops a model of competition between national governments for technology investments by large multinational enterprises. Olsen shows that in a setting with asymmetric information, competition between countries to lure direct investment may lead to over- or underinvestment relative to the efficient level, depending in part on the ownership structure of the multinational firm. The analysis suggests a reason that national governments might take an active interest in patterns of equity ownership of investing firms, for reasons not only of distribution but also of efficiency.

3. FACTUAL MATTERS: ECONOMICS AND HISTORICAL MEASUREMENT

Economic history is the field of economics that has perhaps been most concerned with questions of data quality. The limitations of historical data have inspired historians to seek out unusual new data sources and to tease the most information possible out of the available numbers. Careful attention to economic theory is required in order to combine limited data and plausible assumptions to yield useful inferences. Several chapters in this volume apply methods pioneered or inspired by Paul David to do just that.

Estimating economic growth before the advent of modern economic or demographic statistics is a central task of economic history. An important tool in this endeavor is the conjectural estimation methodology championed by David (1967) in his study of U.S. economic growth during the early nineteenth century. Making use of basic growth accounting equations, snippets of historical data, and plausible assumptions about production parameters and the

growth of various components of the economy, the researcher arrives at "controlled conjectures" about income and growth.

The chapter by Peter Mancall, Joshua Rosenbloom, and Thomas Weiss employs the conjectural methodology to estimate rates of economic growth in the American Lower South during the eighteenth century. The authors present a "reality check" for those who have asserted that colonial growth rates of per capita product were in the range of 0.3 to 0.5 percent per year. Using plausible assumptions, the authors suggest that the true figures were likely much smaller, closer to 0.1 percent for the period before the American Revolution. An important innovation of Mancall, Rosenbloom, and Weiss's contribution is to offer estimates that include the Native American population. These conjectures are based on scanty evidence, but even so they show how the picture of economic growth must look quite different when Indians are included. Indeed, inclusion of the native population considerably increases the estimates of per capita growth rates. This result arises because by all accounts the per capita income of Native Americans was considerably below that of the colonists, and the dramatic shift in the composition of the population away from the Indians therefore drove overall per capita incomes up.

Economic historians who attempt to estimate economic growth in more modern industrialized economies often have better data to work with, but confront new challenges. Estimating national product and economic growth based on output data for specific industries or sectors of the economy requires estimating the value added of each sector and using appropriate weights to aggregate the components into the national total. Estimating real growth by sector raises the difficult question of how to adjust value added for price changes in both the inputs and the outputs (David 1962, 1966). In their chapter, Mark Thomas and Charles Feinstein provide a careful analytical discussion of the biases inherent in alternative deflation procedures, given incomplete data. They show that the choice of a second-best index to measure real growth in value added involves tradeoffs: which index is least biased may depend on the values of several parameters, such as the share of materials in value added and rates of technological change and relative price changes. Using ranges of values for these parameters appropriate to the nineteenth-century British economy, Thomas and Feinstein provide estimates of the likely magnitudes of

the biases. Importantly, they are able to show that some simple and commonly used indicators of real growth, such as the growth of real inputs or of real outputs, may give seriously misleading estimates of growth in value added. But their findings are hardly nihilistic. They show that even with infrequent observations on prices and quantities, one can do much better deflating with an easily calculated Fisher index.

When historical data are not up to modern standards, a fruitful approach can be to devise entirely novel methodologies and measures that can take advantage of whatever data are available. Paul David and Warren Sanderson took this approach to the measurement of fertility decline in historical populations. In some circumstances one has access to tabulations of the number of children ever born to married women, the age at which these women married, and the duration of their marriages. This is very crude information by the standards of modern surveys but in some ways is more detailed than what is usually available historically. David and Sanderson devised a method (CPA, for cohort parity analysis) that amounts to comparing the fertility behavior of two populations and interpreting the differences (see David and Sanderson 1988). The "model" population is one in which there is little or no fertility control, and the "target" population is the one thought to be exhibiting some fertility control. With a few judicious assumptions CPA can yield estimates of the fraction of the population controlling fertility and the number of children born to women who are doing so.

Sanderson's chapter in this volume explores the strengths and limitations of CPA. In part the chapter responds to an earlier critique by Barbara Okun and coauthors, who argued that CPA was not a reliable tool because it was very sensitive to some determinants of fertility that often cannot be measured, given the limitations of historical data. Sanderson defines and discusses three types of bias that might invalidate CPA results and then uses simulations to show how such problems can be identified in specific cases. His "user's guide" suggests some simple tests that can help practitioners avoid the pitfalls of misusing CPA. Based on an application of these techniques to the case of Irish fertility in 1911, Sanderson concludes that earlier findings based on CPA were largely reliable, and that CPA remains a robust and powerful tool for historical demography.

Thomas Mroz and David Weir's chapter represents a different way to use a powerful modeling tool in a concrete historical application. Their chapter focuses on ways to make practical use of explicit economic modeling in a circumstance where full-blown structural models quickly become computationally intractable. In any life-cycle decision (such as fertility) there will arise two fundamental modeling issues. One is unobserved heterogeneity, which if ignored can bias estimates. The other is the complicated dynamics of any forward-looking decision. Most decisions have consequences for both the present and the future. Econometric models that attempt to incorporate the future implications of current decisions must somehow model the agent's decision-making process throughout all relevant future periods. Here the problem is not so much that the data are lacking as that any model that tries to deal with these two fundamental econometric problems will be both impossible to estimate and difficult to interpret. Even a very parsimonious model, one incorporating only three or four choice variables, can imply many thousands of future "states" for each set of decisions. These modeling difficulties have impeded the application of structural approaches in situations such as life-cycle fertility.

Mroz and Weir focus on ways to simplify the model while still capturing the essentials of the problem at hand. Their approach is based on a combination of judicious simplifications. On the one hand, they rely on discrete factor approximations to model unobserved heterogeneity. On the other, they reduce the dimensions of the dynamics by treating each couple's decision problem as a series of two-period optimization problems; rather than model the next twenty periods, Mroz and Weir model "this period" and "everything after." Their two approximations are related in that the simplified dynamics means some intercouple variation will appear as unobserved heterogeneity when it is more formally the consequence of the simplified treatment of consequences. Their model, unlike fully structural models, can be estimated without tying up a supercomputer, and because of its relative simplicity allows the research to incorporate a larger and more complicated set of choice variables. This chapter outlines a remarkable compromise between reduced-form models and full structural models and should help advance econometric modeling of dynamic decision-making processes.

It is our hope and expectation that the reader will bring away from this diverse collection of essays an increased appreciation of the many ways in which history and economics may inform and enrich one another. And if, as we would insist, scholarship is itself subject to path dependence, much like the social and economic phenomena considered here, this volume will also serve to demonstrate the profound and enduring influence of Paul A. David on these disciplines and the scholars who engage in them.

Note

1. In fairness, in his later work North himself has embraced a more nuanced view of the role of institutions and culture (see, e.g., North 1990).

References

Abramovitz, Moses, and Paul A. David. 2000. "American Macroeconomic Growth in the Era of Knowledge-Based Progress: The Long-Run Perspective." In Stanley L. Engerman and Robert E. Gallman, eds., *The Cambridge Economic History of The United States.* Vol. 3. Cambridge, England: Cambridge University Press.

Arthur, W. Brian. 1989. "Competing Technologies, Increasing Returns, and Lock-in by Historical Events." *Economic Journal* 99: 116–31.

David, Paul A. 1962. "The Deflation of Value Added." *Review of Economics and Statistics* 44: 148–55.

———. 1966. "Measuring Real Net Output: A Proposed Index." *Review of Economics and Statistics* 48: 419–25.

———. 1967. "The Growth of Real Product in the United States before 1840: New Evidence, Controlled Conjectures." *Journal of Economic History* 27: 151–97.

———. 1985. "Clio and the Economics of QWERTY." *American Economic Review Papers and Proceedings* 75: 332–37.

———. 1987. "Industrial Labor Market Adjustments in a Region of Recent Settlement: Chicago, 1848–1868." In Peter Kilby, ed., *Quantity and Quiddity: Essays in U.S. Economic History,* pp. 47–97. Middletown, Conn.: Wesleyan University Press.

———. 1994. "Why Are Institutions the 'Carriers of History'? Path Dependence and the Evolution of Conventions, Organizations, and Institutions." *Structural Change and Economic Dynamics* 5: 205–20.

———. 2000. "Path Dependence, Its Critics, and the Quest for 'Historical Economics.'" Working paper subsequently published in Pierre Garrouste and

Stavros Ioannides, eds., *Evolution and Path Dependence in Economic Ideas: Past and Present.* Cheltenham, England: Edward Elgar, 2001.

David, Paul A., and Warren Sanderson. 1988. "Measuring Marital Fertility Control with CPA." *Population Index* 54: 691–713.

Easterlin, Richard A. 1976. "Population Change and Farm Settlement in the Northern United States." *Journal of Economic History* 36: 45–75.

Eichengreen, Barry. 1992. *Golden Fetters: The Gold Standard and the Great Depression, 1919–1939.* New York: Oxford University Press.

Krugman, Paul. 1993. *Geography and Trade.* Cambridge, Mass.: MIT Press.

North, Douglass C. 1990. *Institutions, Institutional Change, and Economic Performance.* Cambridge, England: Cambridge University Press.

North, Douglass C., and Robert Paul Thomas. 1973. *The Rise of the Western World: A New Economic History.* Cambridge, England: Cambridge University Press.

Sundstrom, William A., and Paul A. David. 1988. "Old-Age Security Motives, Labor Markets, and Farm-Family Fertility in Antebellum America," *Explorations in Economic History* 25: 164–97.