GAMES IN ECONOMIC DEVELOPMENT

Games in Economic Development examines the roots of poverty and prosperity through the lens of elementary game theory, illustrating how patterns of human interaction can lead to vicious cycles of poverty as well as virtuous cycles of prosperity. The book shows how both social norms and carefully designed institutions can help shape the "rules of the game," making better outcomes in a game possible for everyone involved. The book is entertaining to read, intended for a broad audience, and can be accessed with little background in development economics or game theory. Its chapters explore games in natural resource use, migration, education, coping with risk, borrowing and lending, technology adoption, governance and corruption, civil conflict, international trade, and the importance of networks, religion, and identity to economic development. It illustrates concepts with numerous anecdotes from recent world events. An appendix explaining basic ideas in game theory used in the book is provided for interested readers.

Bruce Wydick is Professor of Economics at the University of San Francisco, where he has taught since 1996 after completing his Ph.D. at the University of California at Berkeley. His research focuses on applications of game theory, empirical and experimental methods to address poverty and development issues, especially microfinance. Professor Wydick has published more than a dozen articles in academic journals such as the *Journal of Development Economics*, *Economic Development and Cultural Change*, *World Development*, and the *Economic Journal*, and received grants and awards for his research from USAID, the Jesuit Foundation, the McCarthy Foundation, and the Pew Charitable Trust. He is codirector of the masters program in International and Development Economics at the University of San Francisco, has served as a consultant on a number of research projects of the World Bank, and is actively involved in both field research and development work in the highlands of Western Guatemala.

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For Dad

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Preface

WHAT ACCOUNTS FOR the wide spectrum of poverty and prosperity in the world today? This is arguably the most important question in the social sciences, but it has also proven to be one of the most difficult. Many books written about economic development contain a plethora of macroeconomic statistics that document the widening span of the economic chasm between rich and poor. This is not one of those books. There are relatively few statistics in it. You will not find many references here to GDP, macroeconomic growth rates, inequality coefficients, or statistics about hyperinflation. This book addresses this question not by reexamining the statistics on world poverty or looking at the successes, failures, or potential of grand development schemes. Instead, it examines how patterns of human interaction form the basis for poverty and prosperity.

Game theory is a formal structure used to understand human interaction. Because human interaction is both frequent and desirable for most of us, game theory covers a lot of ground: Games occur in social relationships, during market exchange, in the fulfillment of contracts, in the use of environmental resources, in educational and technology choices, in politics, and myriad other aspects of everyday life. By analyzing human interaction in a formal structure, game theory can make predictions about how people will behave and the consequences of their behavior. This makes game theory a powerful tool. It can also give us insight into difficult questions, such as why some countries have become rich and others remain poor.

Traditional economics typically assumes that markets arrive at a single, efficient outcome. In contrast, game theory shows that many outcomes are often possible in human interaction, including economics. The study of economic development is essentially the study of how multiple outcomes in economies may arise, some better than others. In this book, I try to show how changing the incentives and rules of the game by which society operates can dramatically affect the outcome of the game and the resulting welfare of its players, creating a basis for either poverty or prosperity.

Institutions and social norms of a society establish the formal and informal rules of the game. Functioning properly, they make the good outcomes more likely and the bad outcomes less likely. Rich countries have become rich, not principally because they have abundant natural resources, or because they have exploited poor

countries, or because they have been lucky. Rich countries have become rich because institutions, social norms, and patterns of behavior have emerged within them that have fostered widespread accumulation of capital, technology, and education. If you are browsing this book, trying to find its main idea before picking up something else, this is it. You have found it. You can now move on to another book.

But if you continue to read this book, you will find that it is aimed at a broad audience. I have written it for economists, undergraduate students in economics, other social scientists interested in development issues, development practitioners, and even graduate students and development economists wanting an up-to-date review of current ideas in the field. By aiming at a large audience, I have chosen to make this book fairly self-contained. This means that different readers may find parts of the book to be either too rudimentary or too challenging. Although I sympathize, I also believe that current ideas in a field should be accessible to a broad audience – one of my goals for the book.

One of the features that attracted me to development economics was that it seemed more humble than other fields in economics, less insular, and more eager to draw from other disciplines. Since then, I have become increasingly convinced that it is impossible to understand poverty issues strictly through the lens of economics. In addition, development economics has increasingly devoted itself to understanding political, social, and even psychological phenomena in poor countries as a way of trying to understand poverty. But the traditional tools of economics, which assume a set of well-functioning (and often market-based) institutions, are often not the right tools for this job. Game theory, with its more general analytical apparatus, functions more comfortably in this terrain. One of the laudable attributes of game theory is its ability to be "a uniter and not a divider," a methodology that spans academic disciplines, and it has done so increasingly in recent years. Through its use of game theory throughout, this book is fervently interdisciplinary, drawing from political science, sociology, psychology, and even animal biology and theology.

Some common themes run throughout the book. One relates to the tension between human competition and cooperation and how this affects economic development. A regrettable legacy of Darwinian theory is that academics have misapplied it in seeking to understand the development of human societies. Whatever success human beings have achieved over other species has come about not mainly through *competition* with one another but rather through *cooperation*. A large degree of altruism exists biologically at the level of the nuclear family, just as it does between bees in a common hive. But early human societies learned the advantages of broader altruism and cooperation. They adopted internal systems of reciprocity within groups that rewarded cooperators and punished cheaters. By repeated interaction with one's biologically unrelated neighbors or "clan," early societies were able to develop cooperative behavior within a larger local network. The promise of future interaction helped encourage honesty in market exchange. Reciprocal aid by neighbors in times of distress allowed households to smooth over the effects of unavoidable mishap such as illness, injury, and bad weather. These systems evolved into social norms, which came to act as guidelines for appropriate behavior.

However, the materially advanced societies have been able to construct institutions that have fostered cooperation on an even broader level. In the most economically developed societies, formal institutions provide incentives for widespread economic creativity, freedom, and exchange while simultaneously mitigating opportunism. Economic and social cooperation based on repeated face-to-face interaction has been replaced by institutions that allow for exchange between individuals who have no history (and often no future) with one another. Yet, despite their anonymity, mutual exchange benefits both.

One example I will discuss more fully in Chapter 7 involves credit markets. In developing countries, the credit contract is typically enforced through a borrower's personalized relationship with a local moneylender. The moneylender is able to curtail opportunism by the borrower (say, absconding with a loan) by virtue of his monopolistic control over the borrower, which is based on inside knowledge of his trustworthiness. Unfamiliar lenders cannot ascertain the borrower's trustworthiness, and so the borrower has few alternative options. Thus, if the borrower does not repay his personal moneylender, he loses access to credit. This keeps the borrower repaying and the moneylender lending, albeit often at usurious interest rates. In economically developed countries, however, institutions share credit information about borrowers broadly among lenders. That so many lenders have access to a borrower's credit rating lowers interest rates for borrowers via increased competition (and in the process creates a lot of credit card junk mail).

Property rights, judicial systems, bureaucracies, police, commercial law, and even international bodies such as the World Trade Organization are other examples of institutions that foster cooperation and mutually beneficial exchange on a widespread level. What remains common to all of these institutions is that their broad-based support and their perceived legitimacy are keys to their success.

A related theme in this book is the importance to economic development of institutions that act as a check on human self-interest. Economic development is fostered, and perhaps even *defined*, by the creation of institutions that allow for exchange on an impersonal, public level, rather than simply on a clan or communal level. Solving the problem of self-interest on a large scale allows an economy to realize the greater benefits of increased specialization. Some academics (especially those who are not economists) are troubled by the assumption common to game theory that players formulate strategies based on their own selfish interests, rather than the interests of others or the common good. I teach at a Catholic university, the University of San Francisco, where my students have sometimes shared this concern. My answer to them is that, unfortunately, we live and interact in a fallen world. Furthermore, in such a world, the Judeo-Christian view of human nature may offer a more useful picture of human behavior than some of the more optimistic perspectives. Although we must uphold altruism as a standard, in such a world it is unwise to assume systemic altruism, to understand the world by it, or to formulate policy based on it. As will be seen in many of these chapters, even some behavior that may appear on its face to be altruistic, when studied more carefully, may be understood ultimately to be self-interest. We are not like the angels.

Good institutions not only check our self-interest, they harness this self-interest for the benefit of the common good. Ironically, advocates of both socialism and unbridled capitalism similarly underestimate the human predilection toward self-interest. Both extremes create a set of incentives that elicit undesirable qualities in human beings: Socialism fails because it gives workers the incentive to be lazy. Unbridled capitalism fails because it gives entrepreneurs the incentive to cheat. This is because markets, which rely on "greed," require sets of formal and informal rules to curtail opportunism; otherwise, they break down. Well-functioning markets with a clear and enforceable set of rules, however, provide unparalleled welfare benefits.

A good society has formal and informal rules that induce people to do good things. Properly designed institutions establish rules of the game that foster incentives for people to act in the long-term interest of the community rather than in short-term self-interest. Yet it is crucial that individuals also *perceive* that the way to advance is through playing by these institutional rules rather than outside them. The most successful societies are ones in which the payoffs to cooperative behavior are almost universally perceived as higher than the payoffs for opportunistic behavior.

It is not necessary for readers to have studied game theory to read this book. If you are unfamiliar with game theory, you will learn the basic ideas of game theory while reading the examples in the book like someone learns about electricity while learning how to install a light switch. Although mathematically sophisticated explorations in game theory are needed to expand the frontier of the field and prove the generality of important results, most of the basic ideas of game theory can be communicated using little more than high-school algebra. Therefore, if you remember your high-school algebra, this book will not be too technically difficult for you, for it relies on nothing past this level.

Moreover, I have tried to array the chapters in an order that makes sense as a way of both presenting economic development issues and gradually introducing new concepts in game theory. Consequently, I develop the basic ideas of the Nash equilibrium and Pareto efficiency in the context of introducing a handful of well-known games in Chapter 2. Coordination games are used as a way of understanding poverty traps in Chapter 3. I introduce repeated games, especially of the Prisoners' Dilemma in discussing the relationship between natural resources and economic development in Chapter 4. Chapter 5 presents the basic principal-agent model in the context of day-labor markets, sharecropping, and traditional agricultural institutions. Chapter 6 introduces expected utility in an analysis of risk, insurance, and peasant solidarity networks. In Chapter 7, I examine credit markets through an expansion of a repeated Trust game. Chapter 8, which looks at technology adoption, uses slightly more advanced applications of Coordination games. I look at the emergence of property rights using Hawk-Dove games in Chapter 9. In this chapter, I also make use of backward induction in dynamic games more extensively and give an example that uses mixed strategies in a game in which potentially corrupt public officials must be monitored. In Chapter 10, on civil conflict in developing countries, I introduce evolutionary game theory, which is a helpful framework for understanding the underlying motives for conflict. Chapters 11 and 12 employ a

variety of game theoretic concepts in examining social capital and the political economy of international trade. For interested readers, I have included an overview of some key game theoretic concepts in an appendix along with some exercises.

Many have helped me write this book. First, I am grateful to God for the opportunity to learn, teach, and write about something as important as world poverty. I can't imagine anything else that is more challenging or more rewarding, and not many people can say that about their work. I am also greatly indebted to many wonderful people who helped me directly and indirectly in writing this book. The initial chapters of this book were taken from lectures given at the University of Costa Rica and the National University of Costa Rica. I wish to thank David Solano for organizing these and the faculty and students who participated. The final chapters of the book were completed while I was on sabbatical leave at the University of California at Santa Barbara, and I wish to thank my colleagues there for hosting my stay and for the many stimulating and fruitful discussions about development issues we enjoyed throughout the year.

I owe a great intellectual debt to a number of people who have been particularly influential in my way of thinking about development economics and whose work has formed the background for this book. I owe an enormous intellectual debt to many, especially George Akerlof, Pranab Bardhan, Tim Besley, Javier Birchenall, Alessandra Cassar, Gary Charness, Alain de Janvry, Marcel Fafchamps, Hartmut Fischer, Karla Hoff, Dean Karlan, Elizabeth Katz, Michael Kevane, Tee Kilenthong, Rachel Kranton, David Levine, Craig McIntosh, Ted Miguel, Jeff Nugent, Jeff Perloff, Jean-Philippe Platteau, Jim Porter, Robert Powell, Matthew Rabin, Paul Ruud, Elizabeth Sadoulet, John Strauss, Chris Udry, and Romain Wacziarg, who through their work and conversation have helped me to better understand development economics generally, and in many cases, how game-theoretic, experimental, and empirical research methods can be used to understand poverty issues. Many of these people also took the time to look over drafts of chapters for this book, some of them took up far too much of their valuable time looking over the entire work. Much praise to my wonderful research assistants, Kim Singer and Lea Prince. I am grateful to the late John McMillan for his inspiration and for encouraging me to write this book. Economics has lost a beautiful mind.

I would also like to thank my editor at Cambridge University Press, Scott Parris. A more encouraging editor would be impossible to find. Thanks to him for shepherding this book through the many stages of publication and through offering innumerable points of advice about how to make this a better book that could be enjoyed by a broad audience. I also thank my production manager Mary Paden and her associates at Aptara Inc. for their tireless efforts in poring over my manuscript and correcting my silly mistakes and oversights.

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and is now ready for preschool. She provided many happy and healthy distractions the whole way through. As a former English teacher, my mother, Judy Wydick, has been engaged in an unflagging battle for me to communicate properly in my native language, a steadfast effort that began at a very early age and continues unabated. I am truly thankful for her support. My father, Richard Wydick, professor emeritus at the University of California at Davis, was with me at every step in the writing of this book, patiently and carefully reviewing every chapter and sending it back through the mail with marks on every page. He has been an unwavering support to me in my career, and especially in my writing, and I would like to dedicate this book to him.