

The image shows the back of a man's head and neck. The hair is dark and short. The text is overlaid on the hair and neck area. The word 'WIRED' is in white, 'FOR' is in red, and 'SURVIVAL' is in white. Below this, there is a subtitle in white, and at the bottom, the author's name and a foreword credit are also in white.

WIRED  
FOR  
SURVIVAL

THE RATIONAL  
(AND IRRATIONAL)  
CHOICES WE MAKE,  
FROM THE GAS PUMP  
TO TERRORISM

MARGARET M. POLSKI

With a Foreword by **James Woolsey**, former head of the CIA

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# Foreword

When Margaret Polski and I were colleagues in the consulting business I came to regard very highly her extraordinarily informed, creative, and indeed frequently iconoclastic, approach toward understanding how decisions are really made. If you think human beings generally weigh important choices carefully and logically, that we can approximate the key elements of our decisions by using economic models or game theory, that we are basically “dispassionate optimization machines with stable preferences and an objective knowledge base” be prepared for a shock.

Using examples as down-home as deciding whether to help a neighbor by shoveling snow off his sidewalk and as consequential as designing a strategy for counter-insurgency, Polski takes us on a witty and informative trip through the ideas of a number of innovative thinkers about how we make decisions: mind-body interaction, poly-centric sensory systems, and strengthening and weakening of synaptic connections. It is quite a ride. My particular favorite (in the context of the author both admiring and critiquing a Monty Python sketch) is her suggestion that neuroscience research is leading us toward a view that our thoughts are “playing around in our brains like jazz musicians in search of a good groove: They may synchronize around a line that is right-on, venture off on some disconnected tangents, or they may just plain get it wrong.”

This small book will discomfit more sacred cows and their herds-men in the field of decision-making than any work written for the general reader in many years.

Brava.

**Jim Woolsey**

**Former Director, Central Intelligence Agency; Venture Partner, Vantage Point, Silicon Valley; Senior Executive Advisor, Booz Allen Hamilton**

# Introduction

“This is the way the world ends  
not with a bang but a whimper.”

*T.S. Eliot, The Hollow Men (1925)*

T.S. Eliot was a young American immigrant living in England in the aftermath of World War I when he wrote *The Hollow Men*, a haunting expression of the anxiety and despair that blanketed the inter-war period. Seduced by the sirens’ song of global adventurism, the European empires lie strangled by decades of enmity, the near annihilation of a generation of bright young men, economic depression, and the rise of fascism. Across the ocean, the ebulliently prosperous America was too distracted by the roaring twenties to provide solace.

Like many of his generation, Eliot worried that humans would not survive the challenges of modern life. But in this poem, he went even further, contending that in the ways that matter—our ability to think and make good choices—human nature is not fit to survive. We are not only hollow, Eliot bemoans, with “headpieces filled with straw,” but senseless. In fact, he concludes, we have already ceased to exist in any way that matters.

Nearly a century later, hurtling into the twenty-first century like some cabbies drive, the sirens sing once more. Shaken by 9/11 and now mired in conflict in the Middle East, insecurity and despair is proliferating faster than weapons of mass destruction. The media and its pundits, old and new, portend demise pointing ominously to signs of global strain: unchecked nuclear proliferation, terrorism, political conflicts, financial volatility, resource pressures, famines, tainted food, and potential pandemics.

Alternately Quixotic or shrewish, citizens are deeply divided. Leaders consistently disappoint. Politicians and business executives spin so fast, they risk vertigo. Analysts and activists dream up vague prescriptions that can't be filled. Policy makers who bother to struggle to negotiate workable compromises find themselves tilting at windmills, dead-locked, or hoisted on their own petards.

Lunching with an artificial intelligence researcher who aims to develop the next generation of security tools, I wondered out loud if we are wired for survival. "It is just a hypothesis—I don't have any evidence," he replied, "but I don't think so." As he sees it, we are hard-wired to respond to each other in kind so that if one of us threatens the other, the other sees the threat and ups the ante, leading to increasing escalation and near certain mutual destruction. From his perspective, the world is more likely to end not with a whimper, but a very loud bang.

Thomas Schelling, who shared the 2005 Nobel Prize in economics for his work on conflict and deterrence, sees the problem differently. He wonders at the legacy of our choice to develop and use the atomic bomb in World War II. Without doubting the risks associated with the proliferation of weapons of mass destruction, he observes that we have nevertheless managed to avoid using these weapons in anger for over sixty years. He attributes this result to the emergence of a universal taboo against deployment. But whether self restraint arises from "stunning achievement" or "stunning good fortune," he argues that, "This attitude or convention or tradition that took root and grew over these past five decades is an asset to be treasured," and something we must seek to understand and preserve.<sup>1</sup>

Perhaps we are wired for survival after all. As Schelling reminds us, the story of human civilization so far is a tale of survival. Often harrowing, sometimes ridiculous, occasionally inspiring, and at times, downright incredible, enough of our ancestors have made good enough choices that the human species has adapted. To be sure, our

story includes plenty of violence and whimpering, but perhaps our choices and actions need not be as hollow as Eliot feared.

## Such Deliberate Disguises

One of my generation's most evocative reflections on survival, choice, and change is the 1972 film, *The Godfather*, which portrays the competitive struggles of two generations of the Corleones, a fictional New York crime family. A classic story of the struggle to reconcile the tension between doing what one wants and doing what one must, the film is part morality tale and part cautionary guide for how to survive intense competition when an old order is crumbling.

The first lesson the younger Corleone generation learns is that survival depends upon picking one's battles and setting priorities. As a grab for control by a rival organization threatens to decapitate the family, their choices sharpen. A trusted executive is charged with eliminating a member of the inner circle who is believed to have betrayed them. Setting off to work, the executive's wife, who knows only that he is driving to the city, reminds him to pick up canollis. Later, after verifying that the hit met its mark, he calmly moves to his next priority, instructing the assassin: "Leave the gun. Take the canollis."

Whether it is with respect to weapons or canollis, intentional choice is what we like to think separates us not only from each other but from the other animals. My cat and I share an instinct for survival. We jump when startled, attend to threats, seek to satisfy our hunger, and respond predictably to cues we have been trained to value. But this is pretty much where the similarities between us end.

Left to her own devices, my cat, who spends most of the day sleeping or watching, rouses herself reflexively in pursuit of prey, the rattling of kitchen equipment, or running water. Although I too have my reflexive moments, I am uniquely able to rouse myself thoughtfully as

part of a plan that I imagine will either preserve or improve my current state of affairs.

And unlike my cat, I can, at least theoretically, think about a situation, create alternative courses of action, and put change in motion. When, having abandoned sleep or watchfulness, she runs into the path of an oncoming car and lives to see another day, she does not (as far as we know) wonder at her good fortune, resolve to move to the country, or stop and look both ways before she darts into the road. I, on the other hand, whether in haste, animated conversation, or reverie can (but alas, may not—my companions often remove me from harm's way) reflect on my habits in traffic, seek advice, and make some changes.

Observing my cat and me, you may not conclude that my cat makes bad choices or question her adaptability—she is just being a cat, you may say—whereas you may very well question mine. But should we draw this distinction? After all, despite our differences, my cat and I belong to species that have adapted and survived over a very long time without markedly changing our natures. Devout evolutionists (and hard-boiled economists) argue that competition selects the fittest among us and dispenses with the rest, improving the overall survivability of the species. Like the Corleone's business associates, ill-fitting individuals are sacrificed to sustain the group.

Yet doubt lingers. Those of us who have lived through a few political and economic cycles know the wisdom of the old saw that “it takes all kinds.” Someone who is fit in one environment may not be in another. But wait a bit, things change, and this same person may be fit once more. Moreover, the experienced among us know that selection is an imperfect process and mistakes are common. Perhaps you too have railed in disbelief as chance or wrong-headed choices have eliminated someone who is eminently fit.

We have come to understand that diversity is important for survival. But selection reduces diversity, and a prolonged period of bad choices can destroy survivability. Is it possible that we have made such

a mess of things that we are reaching the limits of our adaptability, as Eliot despaired and contemporary Cassandras forewarn?

This is where this book comes in. I am a political economist who is interested in developing practical, but sound, approaches to the kinds of choices that global growth is throwing our way—competing in highly competitive global markets; trading energy and the other non-renewable resources that fuel growth; investing in and securing critical trade-related infrastructure such as sea lanes, ports, and airports; addressing the structural impact of global trade; responding to terrorism; or dealing with large-scale natural disasters and health pandemics that can have profound impacts on survivability.

This book is my attempt to come to grips with what we are learning about the brain, choice, and change, and to figure out how we can use this new knowledge to make the kind of choices that will help us survive and prosper in the challenging years ahead. But *nota bene*: These sciences are in their infancy. We are entering a long period of discovery that will yield contradictory results. We must take the evidence with a healthy dose of skepticism while climbing out on a few limbs to experiment. Like any good adventure, this effort will challenge our preconceptions, introduce us to some fascinating characters, and encourage us to learn more.

Here is a preview of the rest of the book. The choices and changes we face today are no less compelling than they were at the dawn of the twentieth century and the differences among us no less severe. Chapter 1, “Under the Twinkle of a Fading Star,” describes some of these changes and the challenges they present for how we make choices and govern compared to how we think we ought to. The next three chapters explore how our thinking and choice processes are built and how they function: Although there is still a great deal to be learned, one thing we can say for sure is that we do not think and choose the way we think we do. Remember Monty Python’s *Flying Circus*? Well, here is your chance to brush up. Chapter 2, “Bits and Pieces,” covers the basic anatomy of thinking and choice. Chapter 3,



“Mind Matter,” focuses on the mysteries of conscious and unconscious thinking and choice—and you thought you had something on Pavlov’s dog. Chapter 4, “Thinking in the Wild,” lays a framework for thinking about thinking and choice that provides an alternative to conventional approaches. Our inventive information handling powers are the subject of Chapter 5, “Feeling Our Way.” After reading this chapter, you may never trust your memory or anyone else’s ever again, and you may have a different perspective on education policy. Things get even more interesting in Chapter 6, “Mind to Mind,” which tackles mind reading—how we understand the intentions of others and the impact of social interaction on thinking and choice. Chapter 7, “Brightening the Twinkle of Our Faded Star,” introduces renegade perspectives on security policy that challenge standard approaches, and concludes with some thoughts on how we can use our brains to govern ourselves more effectively in the years ahead.

# 1

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## Under the Twinkle of a Fading Star

“There is nothing in the world but change. Our life is only perception.”

—*Marchus Aurelius*, *Meditations* (170s AD)

It is cliché to observe that we have entered a new period of global growth and change or that we face innumerable threats to our current way of life. The global order we have known for several generations has profoundly changed, and there is no going back: To survive and prosper, we must think differently and make different choices than we have made in the past.

The most telling indication of this change is the trend in global per capita gross domestic product (GDP), which is the value of all goods and services produced in the world, divided by population. Since 2000, global per capita GDP has been rising at the rate of 3.2% per year. At first glance, this may not seem like such a big number. But as economic historian Angus Maddison points out, these changes are remarkable when compared with previous growth spurts.

In the first modern high-growth cycle, which occurred over the period 1870–1913, world per capita GDP grew at an average annual rate of 1.3%.<sup>1</sup> In the next big spurt, which occurred over the period 1950–1973, annual per capita GDP increased 2.9% on average—a jump over the prior period, but still below today’s rate of 3.2%. Where nineteenth-century industrialization doubled real per capita GDP in 50 years in the United Kingdom and the United States, China has doubled its real per capita GDP in just nine years.

Current growth trends are particularly interesting because they are the result of changes in the emerging economies, which have been growing at an average annual rate of 5.6% compared to 1.9% for the developed countries.<sup>2</sup> The combined output of these countries, which in recent history have been the least developed and poorest countries in the world, now accounts for more than half of world GDP and nearly half of all world trade. Moreover, together they hold over 70% of global foreign exchange reserves, which is the cash in the global economy cash register.

What does all this mean? History teaches us that rapid, sustained growth and lots of money sloshing around in the global financial system has important implications for resource allocation, geo-politics, and human development. Using Angus Maddison's estimates, until 1820, today's emerging economies dominated the global political economy for 18 centuries, producing 80% of world GDP. But the old world was labor intensive with limited technology or productive investment. Growth was slow and inconsistent, and human development faltered as the vast majority of the world's population struggled just to survive.

Although growth took off with the industrial revolution, the structure of the global economy has been quite skewed. Most of the world's GDP has been produced and consumed by 20% of the world's population, who have resided for the most part in the advanced economies in Western Europe, North America, and East Asia. Life is a persistent struggle to survive for the majority of the world's population, who are ill-educated, often sick, short-lived, and struggling to live on less than \$1 per day.

However, old patterns are changing. A leading indicator is the demand for energy resources, particularly oil, which fuels commerce and trade. The emerging economies now consume over half of the world's energy and account for four-fifths of the growth in demand for oil.

Global growth trends raise concerns about the ability to produce adequate energy to meet demand because historically, growth is

energy intensive. Maddison estimates that per capita energy use rose eight times from 1820–2001.<sup>3</sup> On the surface, there appears to be little cause for alarm: The geological evidence suggests that world supplies are adequate to manage a transition from non-renewable to renewable fuels. And prices are rising, which theoretically provides both an incentive to invest in production and the means to do so. For most of the two decades prior to 2000, the world price of crude oil hovered around \$20 per barrel. Since 2000, prices have steadily but noisily increased to over \$100 per barrel.

Yet rising prices have not closed the gap between demand and supply. The International Energy Agency predicts that the world is facing a supply crunch that will push oil and gas prices up to record levels over the next five years. Production is constrained by persistent underinvestment in technology, field maintenance, refining capacity, development of renewable substitutes, regulatory obstacles, geological challenges, and disruptions in supply chains created by shortages in inputs such as equipment and skilled labor, or conflict, piracy, and terrorism.

Although higher prices may be necessary for investing in improving the energy security value chain, they are not sufficient—and they may be a double-edged sword. In the past, high prices have led to rises in inflation and interest rates that have dampened growth. Some estimate that expensive oil may retard growth by 1.5% of GDP. Moreover, prices may not reflect economic fundamentals, in which case they are not a good signal for investment. Energy analysts estimate that as much as a third of the increase in oil prices can be attributed to “political factors.”

The “political factors” that affect oil prices create considerable consternation for investors and policy makers. Analysts typically assume that markets form and operate unfettered by government interference. However, the emerging economies and the developed economies are not playing by the same rules.

For starters, few of the countries and firms that control energy production are committed to liberal political and economic ideals. The institutions that are most closely associated with secure participation and property rights, enforceable contracts, and sound financial intermediation reliably function in just three of the top oil-producing countries and in only one of the top net-exporting countries. In the remaining countries, which account for about 77% of world production and about 93% of net exports, exchange is based on personal relations with limited recourse to the rule of law. Moreover, entire regions in the global energy system are wracked by ethnic and political conflict that frequently disrupts investment and trade, and imposes significant costs on transacting.

**TABLE 1.1 Top World Oil-Producing Countries in 2006**

Country	Production* Thousand Barrels/Day
Saudi Arabia (OPEC)	10,655
Russia	9,677
United States	8,330
Iran (OPEC)	4,148
China	3,845
Mexico	3,707
Canada	3,288
United Arab Emirates (OPEC)	2,945
Venezuela (OPEC)	2,803
Norway	2,786
Kuwait (OPEC)	2,675
Nigeria (OPEC)	2,443
Brazil	2,166
Algeria (OPEC)	2,122
Iraq	2,008

\*Production includes crude oil, natural gas liquids, condensate, refinery gain, and other liquids.  
Source: Energy Information Administration.

**TABLE 1.2 Top World Oil Net Exporters in 2006**

<b>Country</b>	<b>Net Exports Thousand Barrels/Day</b>
Saudi Arabia (OPEC)	8,525
Russia	6,816
United Arab Emirates (OPEC)	2,564
Norway	2,551
Iran (OPEC)	2,462
Kuwait (OPEC)	2,342
Venezuela (OPEC)	2,183
Nigeria (OPEC)	2,131
Algeria (OPEC)	1,842
Mexico	1,710
Libya (OPEC)	1,530
Iraq (OPEC)	1,438
Angola	1,379
Kazakhstan	1,145
Qatar (OPEC)	1,032

Source: Energy Information Administration.

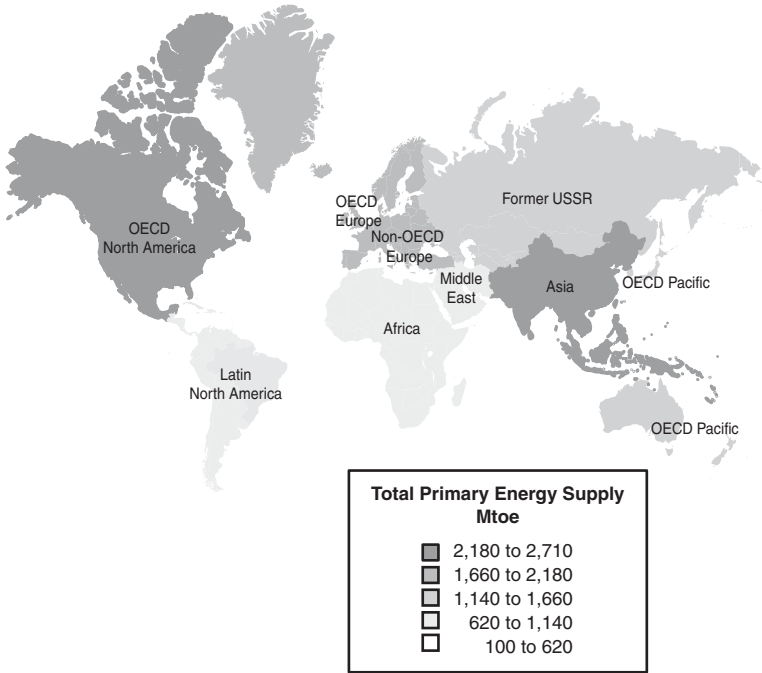
At the industry level, over 90% of the world's oil and gas resources are effectively owned or controlled by the governments of producing countries rather than by private sector firms. Only two of the top 15 firms are privately held: Lukoil, a Russian firm, and Exxon Mobil, an American firm. Of these two private firms, only Exxon Mobil, which controls just 3% of global reserves, is located in a country that consistently favors open markets and the rule of law.

**TABLE 1.3 The World's Largest Oil and Gas Firms**

<b>Firm</b>	<b>Country</b>	<b>Rank</b>	<b>Reserves*</b>
Saudi Aramco	Saudi Arabia	1	300
National Iranian Oil Co.	Iran	2	300
Gazprom	Russia	3	>200
INOC	Iraq	4	>100
Qatar Petroleum	Qatar	5	>100
PDVSA	Venezuela	6	100
Kuwait Petroleum Corp.	Kuwait	7	100
ADNOC	United Arab Emirates	8	>50
Nigerian National Petroleum Co.	Nigeria	9	<50
Sonatrach	Algeria	10	<50
Libya NOC	Libya	11	<50
Rosneft	Russia	12	<50
Petronas	Malaysia	13	<50
Exxon Mobil**	USA	14	<50
Lukoil**	Russia	15	<50

\*Proven oil and gas reserves in billion barrels of oil equivalent.  
 Not state controlled (2). All other firms are state controlled (13).  
 Source: *The Economist* (2006b).

Every continent and every region of the world has energy deposits. However, primary energy supplies are concentrated in Asia, Europe, the Middle East, and North America (Figure 1.1). Promising new supplies have been located in Africa, central Europe, and North America. However, new supplies include unconventional sources located in deep water or in oil sands, and considerable technical expertise and investment is required to make these sources economically viable. Exxon Mobil reports that over the period 2001–2005, it invested \$74 billion on six continents to search for new supplies, build new production facilities, expand refining capacity, and deploy new technologies. They expect to augment these investments at the rate of \$20 billion per year over the next decade.



**Figure 1.1 World energy resources**

Source: Organization for Economic Cooperation and Development/International Energy Administration.

Although most of the world's oil supply is controlled by emerging economies, most of the current demand for energy resources originates in developed countries, which account for 78% of world net oil imports. The technical expertise needed to discover and develop energy resources is also concentrated in developed countries.

There is a mismatch in how exporters and importers think and choose that creates conflict in energy trade relations. Leaders in most of the countries with extensive energy supplies limit who can participate in developing and producing resources, make choices about who will participate based on personal relationships, and are selective—even capricious—about honoring and enforcing contracts with investors and producers. On the other hand, governments in many of the consuming countries require their investors, technical experts,



and buyers to promote fair and open competition, make impersonal choices based on merit rather than personal relationships, and consistently honor and enforce contracts. When sellers, technical experts, and buyers have starkly different approaches to the terms of investment and trade, it is the balance of power between the parties that decides how business will be conducted.

**TABLE 1.4 Top World Oil Net Importers in 2006**

<b>Country</b>	<b>Net Imports Thousand Barrels/Day</b>
United States	12,357
Japan	5,031
China	3,428
Germany	2,514
South Korea	2,156
France	1,890
India	1,733
Italy	1,568
Spain	1,562
Taiwan	940
Netherlands	935
Singapore	825
Turkey	625
Thailand	594
Belgium	583

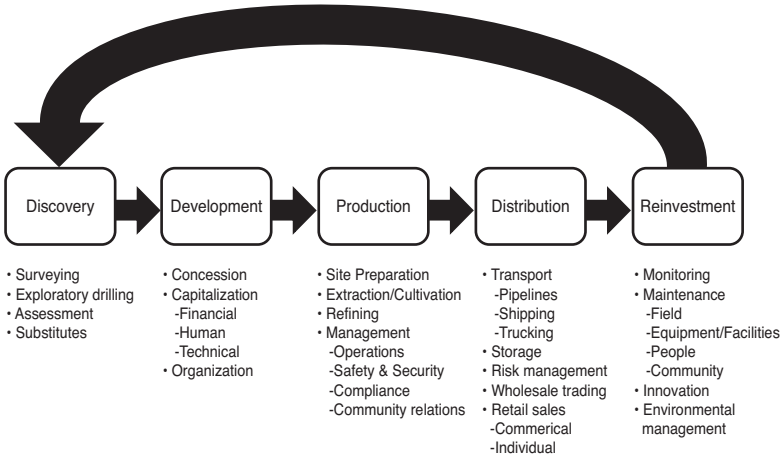
Source: Energy Information Administration.

Until recently, the balance of power to set the terms of investment and trade has not allowed any of the participants in the energy trading system to strictly dominate the other. Instead, they have been forced to find middle ground. However, as the emerging economies grow and their demand for energy outstrips that of the developed countries, the balance of power favors the emerging economies and their political and economic habits and preferences. This means that resource

conflicts among countries with very different political and economic values will emerge, and developed countries will find it increasingly difficult to influence the terms of trade. Because conflict imposes costs on all countries in the global political economy, energy security is a strategic concern for every country, not just those that are dependent upon imports. We can run, but we cannot hide from the effects of changes in the structure of the global political economy.

Harbingers of a shift in the geo-political balance of power are already evident. Leaders in oil-exporting countries have demonstrated that they will use oil supplies to achieve political objectives. Seven of the major oil-producing countries and ten of the top net oil-exporting countries are members of the international producer cartel, the Organization of Petroleum Exporting Countries (OPEC), which was formed to exert supplier power in energy markets. Political leaders in Iran, Russia, and Venezuela have recently nationalized production, reneged on long-term development and production contracts, and strategically interrupted supplies. And China, eager to assure its own access to energy and other strategic commodities, has adopted a “no strings” approach to bilateral engagement that makes it difficult to enforce compliance with multilateral agreements that are designed to open access and level political and economic playing fields.<sup>4</sup>

The recent actions of major oil-producing countries may have a chilling effect on investment in discovering and developing energy resources, which could further constrain supply. This is because discovery and development requires very large upfront investments in the short and medium term. However, returns on investment do not begin to flow until the resource is extracted and delivered to market, which because of the nature of the resource development and production process, occurs over the long-term. If there is a high risk that producing countries will renege on contracts with investors, the costs of discovery and development increase. In the worst case, it becomes too risky for private investors to invest at all (Figure 1.2).



**Figure 1.2 Energy security value chain**

Disputes over energy are symptomatic of broader differences in the global political economy that are not easily resolved. Just three of the countries in the world are inclined to limit government involvement in economic matters: Australia, the United Kingdom, and the United States. Most countries are either “nanny states,” where citizens expect government to play a strong role in the economy, or authoritarian states, which sharply limit political and economic participation rights. Each of these types of states have different approaches to investment and trade relations.

For example, economic decision making in Canada and the Western European social democracies is fairly concentrated, and policy makers take a corporatist approach, which balances government, business, and labor concerns. The Eastern European countries and India have long-standing socialist traditions and are granting participation rights and opening to markets in fits and starts with frequent reversals. There are several devoutly communist countries in the system including China, Cuba, and Vietnam, which aspire to forge a “third way.”

But authoritarianism is perhaps the most common tradition in the global political economy, covering the vast majority of the world’s population. Some authoritarian countries are ruled by strong individuals,

families, or theocracies, while other putatively democratic or socialist countries cycle between military and civilian control. Authoritarian countries tend to maintain relatively closed economies and restrict interaction with other countries.

Different approaches to governing political and economic affairs, uneven patterns of growth, and disparate resources make it difficult to coordinate and cooperate over a host of global security issues that go beyond access to energy. How, for example, can countries with very different values, beliefs, and capabilities address the physical security of territories, critical infrastructure, natural resources, and other common property like the high seas and airspace? How can we protect the personal security of individuals, animal and human health, food supplies, and sanitation, or the security of financial flows and transactions? More generally, as the emerging economies rise, do the developed countries fall, or can we, for the first time in history, find ways to survive and prosper together despite our differences?

## **Life Is Very Long**

Human history is long, spanning more than 10,000 years. However, as the Nobel Prize-winning economic historian Douglass North argues, in all recorded time, only a handful of countries—those we refer to today as the developed countries—have achieved sustained rates of growth and human development. And this accomplishment is very recent, beginning about 300 years ago. Writing with colleagues John Wallis and Barry Weingast, North argues that this experience demonstrates that the key to explaining human development is the transition from a social order that limits access to political and economic participation to one that encourages open access.<sup>5</sup>

Coinciding with the advent of liberalism and modernization, growth has been exceptionally high over the past 300 years. Angus Maddison estimates that world per capital GDP has increased eight times over the past 300 years. This growth has been led by the developed countries, which have slowly opened access to participation in

political and economic affairs while coping with any number of changes in the global political economy. Maddison thinks about this progressive opening, or “liberalization,” as having two distinct epochs: 1700–1820 and 1820–Present.<sup>6</sup>

Growth in the first epoch, which was dominated by the Dutch, was built on trade and the scientific approach to thinking and choice that emerged from the Renaissance. The nation-state was born. In return for a share of the profits, monarchs granted monopoly rights to private companies. Gains from trade and commerce provided an incentive for elite groups in sovereign territories to improve their terms of trade and the means to develop internal transportation, communication, and navigation. These investments produced some modest technical progress. Political and economic decision making was centralized, hierarchical, and largely authoritarian.

Mercantilism, as this system was called, was nevertheless labor intensive with minimal technology or productive investment, which limited growth and development and created destabilizing social tensions. By Maddison’s estimate, average annual growth in per capita GDP in Europe over the period 1700–1820 was just .2%, about the same as the period 1500–1700, which was agrarian rather than trade-oriented. Only a few people could obtain the funds or take the risks required to finance activities that would produce more than a subsistence wage. Wealth accrued to the few at the expense of the many. To participate in the economy, one had to have the right social status, cultivate close personal relationships with rulers, and satisfy their often capricious demands. Even a slight misstep could land a person in dire straits. Labor had very little value and few alternative uses: People could be bought and sold along with the other commodities that filled the holds of merchant ships. Violent political, religious, and social conflicts were common. As best we can tell, life was, in the words of eighteenth century philosopher Thomas Hobbes, “solitary, poor, nasty, brutish, and short” for the vast majority of world population.<sup>7</sup>

Repressive rule and miserable conditions stimulated thinking about political and economic organization.<sup>8</sup> Enlightenment philosophers argued that scientific thinking could be applied to addressing a wide range of human activity to create better societies. They promoted the development of organizations and systems based on reason rather than tradition or superstition. Newton's "natural philosophy," which combined the mathematics of axiomatic proof with physical observation, captured the imagination of intellectuals, producing a new philosophy of science that emphasized skepticism, reason, and the pursuit of new knowledge.

Philosophers and social activists were particularly interested in the nature of government and the limits of state power. The theory of natural right emerged to challenge the traditional theory of divine right. Those who explained social order in terms of divine right believed that monarchs were the representative of God on earth, God granted them the right to rule, and they ruled with divine powers. God was, in effect, an authoritarian social planner who dictated instructions to representatives and maintained order through a centralized hierarchy of command. But those who explained social order in terms of natural right believed that God ruled through natural laws that govern all forms of life. Rulers had the right to rule, subject to these laws. God was, in effect, an inventor who operated through the rule of law, leaving it to divine creations to discover these rules, and to organize and govern themselves.

If one believed in divine right, then human choice should be based on an understanding of God's intentions on earth. Given their special relationship with God, the people who were best positioned to develop and interpret this understanding were monarchs and religious leaders. But if one believed in natural right, then human choice should be based on discovering the natural laws that operate in the universe and using this understanding to develop systems that were compatible with these laws. The pursuit of reason and the development of science and technology were not alternatives to divine inspiration but served and

augmented it. Pushing the notion even further, some argued that natural rights included the universal right to participate in thinking about and making choices about social issues. Radical insurgents argued that choices could be made by interested parties reasoning together as equals rather than by authorities: Commoners could challenge the authority of monarchs, and laypeople could challenge the authority of religious leaders.

Challenges to traditional authority, whether in theory or practice, are rarely well-received. The Enlightenment era proved to be no exception. Scientific thinking, the proliferation of Protestant sects, secularism, and the growth of an independently wealthy commercial class posed a distinct threat to the old order, which generated new conflicts and created pressure for new choices.

## **We Grope Together**

The exception to pure authoritarian control through most of the eighteenth century was the English system, which was evolving into a decentralized political economy governed by a marginally representative government. Economic and political matters were governed by a monarchy, a parliament that included representatives of the aristocracy and commoners, law, and a far-flung civil service managed by expatriates and local loyalists. Decision makers increasingly relied on rule by law rather than royal degree.

With England setting the course for the second epoch of liberalization, competition among countries for geo-political dominance fired interest in more extensive change. Public and private discourse thickened with liberal ideas, and laws were passed that created the potential for broader political and economic participation.<sup>9</sup> This opening provided the opportunity to experiment with a historically novel approach to political economy proposed by Adam Smith in 1776. A moralist by training, Smith took exception to mercantilism, arguing

that sustained growth would only be achieved if governments allowed individuals the freedom to act in their own best interest.

Resting on a detailed analysis of the vagaries and necessities of human nature, Smith's model of political economy has five features that are the mainstays of liberal political economy: a commitment to reason, private ownership of property and the returns on investment, free and open trade, self-regulation, and limited government that protects private rights, provides goods and services that facilitate trade, and enforces contracts.<sup>10</sup>

Smith's intuition about how his system of political economy would work was simple but powerful. He reasoned that if individuals had the right to pursue their own economic interests through trade and could keep their profits, they would invest in producing things that others want, creating new opportunities for trade. People would specialize in areas of comparative advantage, economies of scale would emerge, and the "invisible hand" of trading activity would guide resources to their most productive use. Increases in productivity would produce growth, which would expand opportunities for individuals, stimulate further innovation, and lead to a virtuous circle of human progress and development.

Taking liberal ideas to heart, the American insurgents constructed an exceptionally daring experiment in economic and political participation. Brashly declaring independence from England in 1776, Americans committed themselves to three ideals: life, liberty, and the pursuit of happiness. They hoped to achieve these ideals by designing rules of the game that protected individual liberty, granted extensive human rights based on natural law, and created many centers of self-governing authority subject to the will of citizens and the rule of law. Central controls were quite limited both by necessity and design, and any attempt to assert authority was deeply suspect. Eschewing colonialism and other forms of imperial prerogative, the newly United States focused on protecting its interests and building mutually agreeable relations abroad, reducing the necessity for trade by meeting



more of its needs at home, and improving its competitiveness in tradable goods and services.

Western countries on the European continent made more modest commitments to liberalism, clinging to hierarchical forms of economic and political organization. Monarchies, social class, paternal authority and other centralized forms of government continued to reign; however, they encouraged policies that favored individual effort, technical progress, and financial and organizational innovations that made it possible to use technology, accumulate physical and human capital, and more efficiently allocate resources. Sources of wealth expanded and diversified—gains from trade and real property were leveraged to create new engines of growth in manufacturing, industry, and related goods and services such as equipment, materials, information, engineering and construction, financial services, and transport.

Gradually opening participation in political economies was associated with increased growth. Maddison estimates that per capita GDP increased four times faster in the period 1820–1870 than it did in the entire eighteenth century, increasing average income 15 times.<sup>11</sup> Annual growth in GDP averaged 1.7% in Europe and 4.2% in the United States, which translated into per capita growth of .9% in Europe and 1.3% in the United States.

But things really began to take off in the late nineteenth century, as accumulated technical progress pushed the western countries ahead of the rest of the world, making them the largest contributors to world GDP. A massive and systematic research and development effort in the United States helped it operate more productively and nearer the technical frontier than other countries. By 1890, the U.S. economy was larger and growing faster than any economy in the world. Over the period 1870–1913, GDP grew at an average annual rate of 2.2% in Europe and 3.9% in the United States, which translated into annual per capita growth of 1.3% and 1.8%, respectively.

However, the course of liberalization was not smooth. The second epoch of change presented a number of challenges. Maddison describes the period extending from 1870–1913 as a stable period of expanding but relatively subdued participation. Suffrage was limited, there were no major international or social conflicts, trade unions and other democratic political activists were weak, labor and capital were flexible, taxes were low, social spending was confined to elementary education and public health, and governments pursued relatively sound fiscal and monetary policies.

Competing for access to resources, investment opportunities, and trade, the European countries expanded internationally by colonizing populations in every region of the world. With lesser means and a deep commitment to the principle of self-determination, the U.S. government adopted a *laissez-faire* approach to foreign policy, even if some of its citizens did not. Where Europeans expressed their imperial beliefs through statecraft, Americans who held the same beliefs expressed them through privately funded “missions” abroad that were intended to return African slaves to Africa, convert others to particular forms of Christianity, implement religious doctrines such as Restorationism and Zionism, and save or persuade others through health care or education.

But imperial American citizens who ventured abroad were counter-balanced by others who were pragmatic rather than messianic. These Americans believed that they had something to learn from others and hoped that they could benefit from developing mutually beneficial relationships. Internationalists pursued scientific and technical exchanges, joint ventures involving commercial and social entrepreneurship, investment rights, and access to resources, trade prerogatives, jobs, artistic and literary inspiration, and adventure. A timely illustration of how individual Americans’ forays abroad influence and often contradict American foreign policy is Michael Oren’s fascinating account of the history of American involvement in the Middle East.<sup>12</sup>

But let's get back to our story. Growth and liberalization created structural changes in domestic economies that created numerous dislocations and inequalities. Wealth, incomes, and political decision making were concentrated among those with property and social connections. Participation rights were controlled by small cliques of insiders. For those who were not in the club, poverty was rampant, services were limited, health pandemics were frequent, the environment was squalid, and violence and rude behavior were common. Social safety nets were non-existent so that economic downturns produced ruin from which it was often impossible to recover.

## **Headpieces Filled with Straw**

Hyper-competitiveness, imperialism, and domestic social tensions created immiseration in many countries in the global economy. Global growth slowed over the period 1913–1950, producing average annual growth of 1.8% in Europe and 2.8% in the United States. Growth was dampened by a wide range of poor choices including economic and political conflicts, two “world” wars, economic depressions, protectionism, and other beggar-thy-neighbor policies that emphasized domestic priorities at the expense of common concerns and international order. Ill-considered fiscal and monetary policies and a Cold War with the communist countries contributed to the litany of unfortunate events. Although these developments were very costly for the western countries that were now dominating the global economy, they were even more costly for those countries that had not found a way to consistently grow. These countries, which today are the emerging economies, fell further behind.

The early twentieth century gave rise to increasingly belligerent demands for redistribution and wholesale attacks on liberal political and economic ideas. European and American political economies addressed these tensions quite differently, reflecting the relative differences in their competitive positions in the global economy. Like small

ships in a great sea, the European economies were more exposed to changes in the global economy. Following the authoritarian vision of fascism, the socialist ideals articulated by Karl Marx, or the nanny-state prescriptions of John Maynard Keynes, they relied on centralization, government intervention, and social transfers to stabilize their ships of state. The protests of classical liberals like Friedrich Hayek and Michael Polanyi were lost in the howling winds of change.

Protected by a larger and more self-sufficient economy, the goodwill engendered by their hands-off approach to international affairs, and competitive policy-making, Americans took a more laissez-faire approach to social change. Progressive changes in tax, regulatory, and suffrage policies were traded off against preserving private sector control over resource allocation, authorizing few direct social transfers, and creating incentives to encourage the development of local government, philanthropy, and self-help societies. Hayek and Polanyi were well-received, Lord Keynes was rebuffed, and Marxists and socialists were forces to be reckoned with.

Over the period 1950–1973, Maddison estimates that global growth again took off, increasing on average 4.6% per year in Europe, 3.9% in the United States, and 9.2% in Japan, the new member of the developed country club. Chastened by the disasters of the past and heightened demands for independence, the European countries ended colonialism. U.S. partnerships in Europe and Japan stimulated widespread recovery from the devastation of World War II. Extensive multilateral cooperation enlivened liberalism. A host of international institutions and organizations were born to manage crises, international trade, investment flows, and exchange rates. Intensive investments in science, technology, and education stimulated innovation, entrepreneurship, and human development. As productivity soared in Europe and Japan, for the first time since 1890, the dominant position of the United States in the global economy was under challenge.

Growth again slowed over the period 1973–1996. According to Maddison's estimates, average annual GDP increased 2.1% in

Europe, 2.5% in the U.S., and 3.2% in Japan. The period was marked by a breakdown in monetary cooperation and an erosion of many of the factors that helped mitigate price increases in the developed countries. The rise of the Organization of Petroleum Producing Countries (OPEC) forced up energy prices, which contributed to inflation, changes in balances of payment, and structural adjustment. The rise of the East Asian economies in the 1980s contributed to restructuring the world economy and created new impetus for liberal reforms in Europe and the United States.

**TABLE 1.5 Average Annual Growth Rates**

<b>GDP Growth in Constant Prices</b>					
<i>(Average Annual Compound Growth Rates)</i>					
<b>Region</b>	<b>1820–1870</b>	<b>1870–1913</b>	<b>1913–1950</b>	<b>1950–1973</b>	<b>1973–1996</b>
Europe	1.7	2.2	1.8	4.6	2.1
USA	4.2	3.9	2.8	3.9	2.5
Japan	0.3	2.3	2.2	9.2	3.2
<b>Per Capita GDP Growth in Constant Prices</b>					
<i>(Average Annual Compound Growth Rates)</i>					
<b>Region</b>	<b>1820–1870</b>	<b>1870–1913</b>	<b>1913–1950</b>	<b>1950–1973</b>	<b>1973–1996</b>
Europe	0.9	1.3	1.1	4.1	1.7
USA	1.3	1.8	1.6	2.4	1.5
Japan	0.1	1.4	0.9	8.0	2.5

Source: Compiled from Maddison (1997b) Tables 9 and 10.

The breakdown of the former Soviet Union and liberalization in the developed as well as the emerging economies eased many fears about global tensions. However, conflict in the Middle East, the rise of religious fundamentalism, the development of global terrorist networks, resource pressures, and climate change fuel concerns about collective survival. These developments also pose new challenges for how we organize and govern ourselves and our economies. With fewer than 10% of the world's population committed to classical political and economic liberalism, and the emerging economies producing better

than 50% of world GDP, one must wonder whether liberalism as we have come to know it will survive.

Writing to persuade his fellow Americans to adopt the U.S. constitution, James Madison argued that “government itself is the greatest of all reflections on human nature.”<sup>13</sup> But if government reflects human nature, and we observe different forms of government in the world, why has human nature produced different types of government, and why hasn’t there been more convergence as our interaction with each other has increased? What does this suggest about similarities and differences in human nature across the world, how we think and make choices, our ability to understand each other, and our capacity to cooperate for mutual survival?

## **Here We Go Round the Prickly Pear**

Those of us who have been raised and educated in liberal political economies have been trained to believe that it is human nature to make formally rational choices and transact with each other on an impersonal basis in political and financial markets. Price sensitivity rather than adaptation guides our choices, and technical efficiency is our primary goal. The costs of transacting are irrelevant. Providing that governments or bandits do not interfere too much, we believe that if we follow these principles, we will achieve socially beneficial equilibrium in any situation. These beliefs allow us to tell a sensible story about complicated questions—and sensible stories help us make difficult choices. (Some of my colleagues like to refer to this compunction as “faith-based” political economy.) Alas. Although these simplifications may work well in some situations, they are failing to provide reliable predications about global security issues: Energy security is just one example. Instead of making sense, we are making nonsense, weak predictions, and poor policies.

Our understanding of how we make choices and change turns out to be as important as the substance of these choices. Vernon Smith, a

Nobel Prize-winning pioneer in experimental economics, argues that prevailing assumptions and models are grossly misguided. Since the mid-twentieth century, experimental and behavioral economists have been using laboratory experiments to test the predictions of standard models of human behavior. Although their results tend to confirm the predictions of these models in many (but not all) impersonal exchange situations, such as electronic auctions, they are mixed in predicting outcomes in personal exchange. But many of our most important interactions in the global political economy (and elsewhere for that matter) involve personal exchange. These results suggest that we are systematically misunderstanding a great deal of human interaction.

We simply do not behave the way we think we behave. And we most certainly do not behave the way we think we ought to behave. For example, standard models cannot account for the following behaviors that we routinely observe in both the field and in the laboratory:

- Choosing a cooperative solution even if there is a risk that the person on the other side of the bargain may take advantage.
- Cooperating with strangers, and with machines.
- Failing to cooperate or punishing the person on the other side of a bargain when it hurts us to do so.
- Exerting effort or making a contribution without any prospect for monetary reward.
- Achieving worse outcomes when we have complete and common information.
- Forming different expectations and knowledge, even when we have common information and training.

Similarly, standard models—the ones we continue to use and to teach in school, despite their predictive frailties—cannot explain the dilemma Tom Schelling examines, in which intensely competitive and ideologically opposed countries have had weapons of mass destruction for over 60 years but have yet to unleash them. And they cannot explain why some groups are able to protect their natural resources,

avert resource conflicts, and avoid the “tragedy of the commons.”<sup>14</sup> Nor can they explain why Cuban soldiers protected Chevron’s oil operations during the Angolan civil war; why, despite religious convictions to the contrary, some young men and women kill themselves in order to kill others for religious reasons; why on 9/11, an able-bodied man working in one of the twin towers decided to stay with his handicapped co-worker, even though there was no reason to believe that they would survive; or, why many economists—perhaps most—refused to travel after 9/11.

Not only do we not behave the way we think we behave or ought to behave, we apparently do not think the way we think we think. Eliot chides that we are “hollow men ... stuffed men leaning together head-pieces filled with straw.” But we are far better equipped to understand ourselves and the intentions of others than we were in Eliot’s day. Our existing models of human nature, government, and the relationship between them rest on rather thin empirical foundations. This is due in part because until fairly recently, we have had limited tools to investigate human nature. But with advances in the neurosciences and analytical technologies, it may be possible to discover the biological basis of human nature, thinking, and choice.

Wrestling with decades of contradictory research results, it occurred to Vernon Smith and his colleague Kevin McCabe that developments in the neurosciences could be fruitfully applied to developing a better understanding of economic behavior. And so in the late 1990s, with the aid of a creative extension to a research grant from the National Science Foundation, they launched a new program of experimental research that McCabe dubbed “neuroeconomics.” Today, this effort has morphed into a challenging interdisciplinary research program that uses experimental and brain-imaging techniques to examine decision making with the aim of building a biological model of economic choice.<sup>15</sup>

As Smith and McCabe were rethinking their approach to investigating behavior, Douglass North was wrestling with a new theoretical



approach to understanding growth and change. Steeped in years of research on how people in the western political economies have organized exchange, North concluded that adaptive change requires that our minds evolve.<sup>16</sup> Our ability to form beliefs, develop solutions, and choose among them begins in our minds, which, regardless of how one approaches philosophy of mind, requires at least a nodding acquaintance with the brain. It is human minds working together (or not) that create and enforce the rules that govern exchange, choose among these rules, organize production and exchange, adapt to changing conditions, and suffer or enjoy the consequences.

However, changing our minds and our choices may require changing our brains. Many neuroscientists argue that we cannot change our mental state without changing our brain state. But before we can change our brains, we must first understand them and how they are involved in thinking and choice. Then we must apply this knowledge to developing a better understanding of our own intentions, the intentions of others, and how we govern ourselves and our transactions. Finally, we must translate this knowledge into policy making.

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