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Economic Doctrines and Innovation Policy

Policymakers and economic scholars around the world agree that the primary source of economic growth, competitiveness, and increases in standards of living in a globalized economy is innovation in the form of new products and services, more efficient production processes, and new business models.[1] Moreover, as oil and food prices escalate, the need for innovation across the economy becomes even more pressing. Yet even in the aftermath of a serious, lengthy recession with lingering high unemployment, the current U.S. political dialogue is giving scant attention to innovation and policies to promote innovative activity.

Innovation policy has gotten short shrift in the U.S. political dialogue largely because the three dominant economic policy models advocated by most economic advisors—and implicitly held by most Washington policymakers—ignore the role of innovation and technology in achieving economic growth in the global, knowledge-based economy of the 21st century. Unfortunately, while the U.S. economy has been transformed by the forces of technology, globalization, and entrepreneurship, the doctrines guiding economic policymakers have not kept pace and continue to be informed by 20th-century conceptualizations, models, and theories.

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As described in this essay, the three competing 20th-century economic doctrines embraced by most Washington policymakers today are conservative neoclassical, liberal neoclassical, and neo-Keynesian economic doctrines. One of the most important principles of neoclassical economics is that it is the accumulation of capital that spurs economic growth. On this point, people in both the conservative and liberal neoclassical economic camps agree, but they diverge in the ways they seek to spur capital formation. Conservative neoclassicalists (often called supply-siders) advocate spurring capital formation in the private sector by cutting taxes on income and wealth, whereas liberal neoclassicalists recommend spurring capital formation by having the government run budget surpluses (or reduce deficits) and/or by helping low-income people save. Adherents of the third prevailing economic doctrine, neo-Keynesianism, stress the importance of both having the federal government ensure aggregate economic demand by increasing government spending, and ensuring that the fruits of economic growth are fairly distributed.

In *An Inquiry into the Nature and Causes of the Wealth of Nations*, Adam Smith argued that there were three major inputs to the production process: land, labor, and capital. In today's New Economy, a fourth input now significantly outweighs these other three—knowledge. The fall of the Berlin Wall in 1989 triggered more than just "a flat earth," in Tom Friedman's terms; the ensuing globalization accompanied and spurred a shift from the mass production, corporate managed economy to a knowledge-based entrepreneurial economy. A leading Stanford economist, Ed Lazear, observed, "The entrepreneur is the single most important player in a modern economy."[2]

To be sure, such entrepreneurship does not have to be reflected in individuals starting new companies; it can be reflected in larger organizations acting more nimbly. But in either case, it is innovation and organizations doing new things that now spurs growth. As innovation and entrepreneurship replace mass production and large capital-intensive factories as the engine of growth, jobs, and competitiveness, economic policy must also shift from its old-economy concern of stimulating consumer demand while restraining the market power of oligopolies to the new economy concern of boosting innovation and productivity. In what has become widely known and accepted as the "new growth theory," knowledge has been explicitly recognized as a crucial factor, generating economic growth.[3] In the new knowledge economy, knowledgeable people, including creative entrepreneurs, skilled shop-floor workers, cutting-edge researchers, innovative managers, and digital-savvy "prosumers" are the drivers of growth.

The keys to growth are in some ways profoundly simple. Nobel Prize-winning economist Douglass North summed it up as follows: "We must create incentives for people to invest in more efficient technology, increase their skills, and organize efficient markets."[4] As Paul Romer, former Stanford University economist and a leader in the field of innovation economics, states, the conservative "save-more" and liberal "spend-more" approaches are not the answer:

> [Such] policy prescriptions miss the crux of the matter. Neither adjustments to monetary and fiscal policy, nor increases in the rate of savings and capital accumulation can by themselves generate persistent increases in standards of living. . . the most important job for economic policy is to create an institutional environment that supports technological change.[5]

The new realities of a global, knowledge-based economy in the 21st century require a new approach to national economic policy, one that is based more on smart support for the building blocks of innovation and entrepreneurship and less on capital accumulation, budget surpluses, or social spending. Without an economic theory and doctrine that match the new realities ,it will be very hard for policymakers to take the steps needed to foster economic growth.

Fortunately, as described in this policy brief, a new theory and narrative of economic growth based on an explicit effort to understand and model how innovation occurs has emerged in the last decade. This new economic doctrine on the block—called "innovation economics"—reformulates the traditional model of economic growth so that knowledge, technology, entrepreneurship, and innovation are positioned at the center of the model, rather than being seen as independent forces that are largely unaffected by policy. Innovation economics—also called "new institutional economics," "new growth economics," "endogenous growth theory," "evolutionary economics," and "neo-Schumpertarian economics"—is based on two fundamental tenets. One is that the central goal of economic policy should be to spur higher productivity and greater innovation. Second, markets relying on price signals alone will not always be as effective as smart public-private partnerships in spurring higher productivity and greater innovation.

The United States needs an economic framework that supports the new economy—and innovation economics is it. Leading economists increasingly acknowledge that without change, the U.S. economy cannot grow; that increases in knowledge and competition drive growth and change; and that the government has a key role to play in that process. In short, they are saying that the best macroeconomic policies are institutional policies—support for research, innovation, skill building, and digital transformation, all within an environment of competitive markets.[6]

This policy brief article explains the three prevailing economic doctrines, as well as the newer doctrine of innovation economics, that are competing for the attention and allegiance of U.S. policymakers. In addition to discussing each doctrine's principles, goals, and what each believes about the economy, it discusses the advantages and limitations of each economic doctrine. Finally, it examines how each doctrine views particular real-world economic challenges and explains the different types of policy prescriptions that result from each.

ECONOMICS: A SCIENCE OR AN ART?

Economics prides itself on being a science, one closer to physics than to sociology. As David Colander notes, the art of economics has been lost.[7] Yet although supply and demand curves and other aspects of economics do approach being a science, much of economics is actually based on frameworks, paradigms, and doctrines. Thus, asnoted tax economist Joel Slemrod observes, "It is a troubling fact for the aspirations of economics to be a hard science that our values about equity end up being so correlated with our beliefs about what kind of fiscal, or tax, policy works best for the economy." Larry Lindsey, former head of President Bush's National Economic Council, agrees, noting, "In part, the continuing argument [among economists] is a product of philosophical disagreements about human nature and the role of government and cannot be fully resolved by economists no matter how sound their data."[8]

People's beliefs about what policy works best for the economy are not simply random thoughts; rather, such beliefs make up coherent worldviews or doctrines, which, in turn, profoundly shape how they view the economy, what they see as important and not important, and, most importantly, what they believe is the correct public policy and what is not. Moreover, it's not just PhD economists working at the Federal Reserve, with Congressional committees, or in think tanks that subscribe to particular economic doctrines. Virtually all policymakers involved in economic policy subscribe to a particular economic doctrine, even if they may not be aware of which camp they are in. The economic doctrine guides their thinking and deliberations and helps them make sense of an incredibly complex economy that is changing rapidly. Indeed, as John Maynard Keynes himself once stated, "Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist."[9]

As noted, there are three main economic doctrines and a fourth, new, economic doctrine competing for the attention and allegiance of Washington policymakers (See Table 1). It is important for these policymakers and others to understand these economic doctrines so they can more self-consciously choose the doctrine they believe is most effective in producing the kinds of economic outcomes they support—and, ultimately, so that they can be liberated from being the slaves of some defunct, or in some cases, some current, economist.[10]

Economic doctrines don't emerge and become adopted on the basis of intellectual arguments alone. The economic and social structures of an era profoundly shape not only what economic doctrines emerge as dominant but also which policies stemming from economic doctrines are effective. Thus, for example, the dominant economic doctrine before World War II was classical economics, which supported the primacy of markets and a limited role for government. In the 1940s, following the Great Depression and the emergence of large corporations and large government after World War II, Keynesian economics emerged as the dominant paradigm. Keynesianism emphasizes using federal government spending and other policies to spur economic demand and manage the business cycle. Its dominance

through the early 1970s was confirmed in 1971, when Republican President Richard Nixon proclaimed, "We are all Keynesians now."

Keynesian economic doctrine held center stage in the United States until the "stagflation" of the 1970s led to neoclassical economics—a modification of classical economics—which took center stage as a reaction against it. The reaction against Keynesian economics was especially notable among conservatives, who crafted a neoclassical alternative to Keynesian economics known as "supply-side economics," which remains the dominant economic paradigm for many conservatives to this day.[11] At the macroeconomic level, monetarism, a close cousin of supply-side economics, held that rather then applying fiscal policy to respond to business cycle troughs as Keynesianism proposed, the government should manipulate the money supply. More politically-moderate neoclassical economists embraced many of the same principles as supply-siders, but developed a neoclassical economic doctrine that incorporated their own values including a belief in a stronger role of government and greater economic equity. Meanwhile, a group of neo-Keynesian economists on the left developed ideas that they hoped could better explain current economic events than the original Keynesian doctrine.

In sum, since the 1980s, three prevailing economic doctrines have been competing for dominance in the United States: (1) conservative neoclassical (often called "supply-side") economic doctrine; (2) liberal neoclassical economic doctrine (sometimes called "Rubinomics," referring to the policies of President Bill Clinton's Secretary of the Treasury Robert Rubin); and (3) neo-Keynesian economic doctrine. Each of the three prevailing economic doctrines today provides important insights into the economy and offers important guides to policymakers.

Unfortunately, however, none of the prevailing economic doctrines offer the kind of economic policy framework that fits the new economic realities of the 21st century. All three focus in an almost Newtonian way on adjusting the demand or supply of capital and labor to keep the economy in equilibrium. All three focus on macroeconomic factors, particularly prices, rather than on the institutional factors and technological change that really drive growth, albeit in different ways in different countries and times.[12] And none of the three prevailing doctrines has much to say about the complex process by which technological innovation occurs, preferring instead to dwell largely in the world of mathematical models, not in the messy and complicated world of firms, industries, and national innovation systems.[13]

Fortunately, a new theory and narrative of economic growth—innovation economics—has emerged in the last decade through the work of a wide range of scholars.[14] Understanding innovation economics is particularly important for Washington policymakers because the playbooks (economic doctrines) most of them are using today—conservative or liberal neoclassical, or Keynesian—severely limit the plays they can call. Calling a play not in the official playbook is a particularly risky thing to do, unless perhaps the team is down by 40 going into the fourth quarter, so it is very important for Washington policymakers to have the right playbook. Unlike the United States, the policymaking communities in many other countries around the globe have already recognized the primacy of innova-

tion and developed a rich and nuanced set of institutions and policies to make their economies innovation based. Thus, policymakers in many other countries have the advantage of operating from the right playbook—innovation economics.[15]

THE DOMINANT DOCTRINE: NEOCLASSICAL ECONOMICS

Each economic doctrine has its bible, and the bible for neoclassical economics is Adam Smith's classic 1776 book, *An Inquiry into the Nature and Causes of the Wealth of Nations*. Although the neoclassical economic doctrine embraced by most economists in Washington today has evolved significantly since Smith wrote his book, both the conservative and liberal versions of the doctrine are based on many of the same insights and principles he outlined.

Conservative neoclassicalists—supply-siders—find their institutional home in places like the American Enterprise Institute, the Heritage Foundation, the Cato Institute, the Competitive Enterprise Institute, and a host of other conservative think tanks. Liberal neoclassicalists—proponents of Rubinomics—find their homes at a host of politically moderate think tanks, like the Brookings Institution, the Peterson Institute, the Center for American Progress, and the Council on Foreign Relations.[16]

Principles Guiding the Neoclassical Economic Doctrine

Neoclassical economic doctrine is guided by at least five key principles, outlined below.

The accumulation of capital drives economic growth. Perhaps the most important principle of neoclassical economics is that the accumulation of capital is what drives growth. Massachusetts Institute of Technology (MIT) economist Robert Solow was awarded the Nobel Prize for empirically linking two explicit factors—labor and capital—to growth.[17] While Solow is noted for acknowledging the importance of technology in growth, he did so by calling the unexplained residual in the model "technical change," and seeing it as still exogenous, that is, lying outside of the model, and therefore outside of economic inquiry. In other words, in the neo-classical model, capital is at the center.

The belief that capital drives economic growth leads neoclassical economists to recommend a set of policies designed to spur private savings (for supply-siders) or public and private savings (for liberal neoclassicalists). The policy implication that flows naturally from the neoclassical model is clear and unambiguous: focus public policy on ensuring high levels of saving (public and/or private) because high levels of savings (mechanically) create the capital pools to support investment, which in turn drives economic growth.

Although the accumulation of capital is at the center of the neoclassical model, technology is outside the model. Indeed, as *Business Week* chief economist Mike Mandel notes, neoclassical economists are "capital fundamentalists who believe that savings and investment in physical capital and (sometimes) human capital are

the only forces driving growth. [They] generally ignore or minimize the role of technology." For the most part, therefore, neoclassical economists "remain profoundly ambivalent or even hostile toward most areas of technology. . . They grudgingly acknowledge the importance of technological change, but they don't understand it or trust it."[18]

Economic growth is achieved by maximizing allocative efficiency. Neoclassical economists have one overarching principle that guides their thinking and shapes their advice: maximize "allocative efficiency." Allocative efficiency is the market condition whereby resources are allocated in a way that maximizes the net benefit attained through their use, and the quantity of goods produced is that which is most beneficial to society. An allocatively efficient market is one in which scarce goods and services are consumed on the basis of the prices consumers are willing to pay for them, and scarce goods and services are produced on the basis of marginal costs equaling the prices charged for them.

From the standpoint of a neoclassical economist, it would be a cardinal sin to propose a policy that would alter the "natural" allocation of factors—that is, capital, labor, and goods and services—produced by market price signals determined by individuals and firms making free choices not distorted by regulations, taxes, market power, or other "distortions." Both supply-siders and liberal neoclassicalists believe that any policy that distorts allocative efficiency harms growth.

Nevertheless, liberal neoclassicalists will sometimes accept policies that harm allocative efficiency (and, by extension, growth) if they lead to greater economic fairness. As liberal neoclassical economist Alan Blinder states, "We need not summarily reject a substantial redistributive program just because it inflicts some minor harm to economic efficiency. . . Policy changes that promoted equity (such as making the tax code more progressive or raising welfare benefits) would often harm efficiency."[19] Liberal neoclassicalists are particularly strong in their opposition to policies that distort the economy and potentially hurt equity, even if they lead to higher growth. Gene Sperling, former head of President Clinton's National Economic Council, argues, "New technology will always make it more efficient to replace workers with machines or computers but decisions should be based on relative economic costs, not a tax code that tips the balance against workers."[20] But overall, their view is consistent with supply-side economics, in that it holds that markets acting on price signals alone get most things right, with the exception of things like public goods and equity.

Neoclassical economists believe that any violation of this principle of maximizing allocative efficiency leads to what economists call "deadweight loss"—a loss of economic efficiency that occurs when people buy too much of one product (if it is priced lower than it costs) or buy too little of a product (if it is priced higher than cost and a market clearing profit.) Taxes, neoclassical economists argue, by their very nature, distort allocative efficiency, and taxes that favor or burden particular activities distort it even more. For that reason, neoclassical economists—whether conservative or liberal—see their ideal tax code as one with low rates and few distortions. Such a tax code, they claim, allows decisions by economic actors to

be driven by the market and not by the tax code. Similarly, most neoclassical economists assert that proactive policies to spur firms' productivity or innovation are inappropriate because they "distort" the market.

The focus is on markets and prices. If there is one defining factor that determines whether someone is a neoclassical economist, it is a predominant focus on the economy as a market determined by price signals. Indeed, allocative efficiency revolves around the responsiveness of economic agents—firms and consumers—to price signals.[21] Consequently, neoclassical economists tend to rely on mathematical models rather than on actual studies of how businesses, industries, and national economies work. Furthermore, their emphasis is more on factors like interest rates, currency values, inflation, and other monetary factors than on factors such as the rate by which firms are developing and adopting new technologies, or the effect of culture on entrepreneurship.

Neoclassical economists see few differences between economies, whether over space or over time, because they view all economies as operating largely according to the same principles: individuals and firms responding to price signals. It is for this reason that neoclassical economics largely overlooks factors such as economic history, culture, norms, and institutions, preferring instead to dwell in the more universal world of prices, costs, and mathematical models. It is also for this reason that most neoclassical economists reject the notion of a new economy emerging in the last decade, because for them, the economy is still based on price signals and supply and demand.

The economy tends towards equilibrium. Related to neoclassical economists' focus on allocative efficiency is the notion that the economy is simply a large market of goods and services that is generally in equilibrium and usually best left to itself. Equilibrium occurs when a market price is established through competition, such that the amount of goods or services sought by buyers is equal to the amount of goods or services produced by sellers. Because the economy tends toward equilibrium in the neoclassical view, the main task of economic policy is simply to reduce artificial barriers and impediments to market equilibrium, particularly by ensuring that prices are aligned with costs.

Individuals and firms are rational maximizers and respond to incentives. Neoclassical economics holds that individuals act in response to incentives to rationally maximize their own self-interest and that individuals' pursuit of their own self-interest generates the public interest. Indeed, according to Adam Smith, the individual who "intends only his own gain" will, in the course of maximizing his needs, be "led by an invisible hand to promote. . . the public interest."[22] As supply-side guru Arthur Laffer notes, supply-side economics "is a recognition that people change their behavior when marginal incentives change."[23] One of the biggest incentives, supply-siders claim, is taxes—particularly top marginal tax rates on individual earnings, savings, and investment, which limit work and investment. Thus, supply-siders' recipe for boosting productivity is to cut tax rates on individuals, especially high earners. Similarly, as liberal neoclassical economist Alan Blinder argues, "[E]very tax influences incentives, as supply-siders correctly

emphasize. . . Unless the market is malfunctioning, such tax-induced redirections of resources reduce economic efficiency. They are therefore to be minimized."[24] And the hurdle for establishing that a market is malfunctioning is quite high for neoclassical economists.

Conservative Neoclassicalists vs. Liberal Neoclassicalists

Although conservative and liberal neoclassicalists agree on many key economic principles, they also differ in some important ways. Thus, for example, although both camps of neoclassicalists hold that capital accumulation is the key to growth, the two have a different focus on where that capital should come from.[25] Supply-siders argue that the accumulation of private capital is the key to economic growth; hence lower taxes on income and wealth are the keys to spurring more capital accumulation. Supply-side economist Larry Kudlow states, "Tax-cut incentives will promote capital formation, productivity, jobs, and growth." The logic of supply-siders is rather straightforward. In the neoclassical model, if you want more of anything, you lower its price. If you want more savings, you lower the price—in this case, tax rates on capital. But supply-siders' focus on private capital accumulation is naturally oriented to wealthier individuals, the reason being, according to them, that the disincentive effect of taxes on savings is greatest for those with the highest marginal tax rates. Even though cutting taxes on higher earners leads to a less progressive tax code, supply-siders are willing to make that tradeoff, because for them economic growth is more important than fairness. Some supply-siders in fact believe that greater equity actually limits the incentives for growth.

Liberal neoclassicalists also believe in the primacy of capital and savings to growth, but they differ from supply-siders in that they are strong supporters of greater income equality. Consequently, liberal neoclassicalists advocate increasing capital accumulation either by having the government run budget surpluses (or reduce its deficits), and/or by helping low-income people save more, in part by giving low-income citizens tax incentives.[26] The liberal neoclassicalists' approach aims to spur capital accumulation in ways that are more fair than tax cuts on high earners. Perhaps the best summary of liberal neoclassicalists' belief comes from Peter Orszag, formally at the Brookings Institution and now head of the Congressional Budget Office:

> The fundamental benefit of higher national savings—achieved by preserving a substantial portion of the projected budget surplus—is that it will expand economic output in the future. Higher national saving leads to higher investment, which means that future workers have more capital with which to work and are more productive as a result.[27]

Government spending policy is another area where supply-siders and liberal neoclassicalists differ. Supply-siders view lower taxes as the key to growth but also see reduced government spending, even if taxes remain the same, as a stimulus to growth. They believe that many government expenditures, including both direct spending and tax expenditures, have a host of pernicious effects.[28] In contrast, lib-

eral neoclassicalists worry about government spending not because they believe it is harmful but because of its supposed effects on fiscal discipline and public savings. Liberal neoclassicalists are also more willing to support public spending if it is focused on helping economically disadvantaged individuals, but they would usually see decisions about such spending as involving a tradeoff between growth and fairness.

The extent to which economic policy can influence long-run growth is yet another area where the two camps of neoclassicalists differ. Like innovation economists, supply-siders believe that economic policies can influence the long-run rate of economic growth. For example, supply-sider Greg Mankiw, who headed the Council of Economic Advisors in the administration of President George W. Bush says, "In the long run, lower tax rates expand the supply side of the economy by enhancing the incentives for work, saving, and investment."[29]

Liberal neoclassicalists, in contrast, believe that at some point, it will become impossible to spur further growth because capital will be exhausted and there will be, in the words of economists, diminishing returns. Adding the first machine tool to the economy will contribute to economic growth, but adding the billionth will contribute eventually nothing to such growth. In fact, the original (Robert) Solow growth models predicted that we would reach a steady state where capital intensity could not grow and productivity would stagnate. As economic journalist David Warsh describes it, in the neo-classical Solow model "there was little or no room for policy to affect growth rates."[30] It is for this reason that most liberal neoclassical economists are profoundly pessimistic about long-term growth—and perhaps one reason why economics is known as "the dismal science." For even among those who believe that economic growth and improved productivity are important, many liberal neoclassical economists believe that there is nothing economic policy can do to positively influence growth, except perhaps to influence short-term growth on the consumer demand side, as Keynesian economics suggests, or to reduce allocative inefficiency to let the economy operate a little closer to its growth frontier, as neoclassical economics suggests.

As Liberal neoclassical economist Alan Blinder argues, "Although economics can tell the government much about how to influence aggregate demand, they can tell it precious little about how to influence aggregate supply. Let no supply-sider tell you differently."[31] Blinder goes on to claim, "Nothing—repeat, nothing—that economists know about growth gives us a recipe for adding a percentage point or more to the nation's growth rate on a sustained basis. Much as we might wish otherwise, it just isn't so."[32] Paul Krugman, another liberal neoclassical economist, offers the same refrain, pronouncing, "Productivity growth is the single most important factor affecting our economic wellbeing. But it is not a policy issue, because we are not going to do anything about it."[33] These views aren't outliers. The dominant economic thinking embodied in the liberal neoclassical economics doctrine minimizes the role of innovation in growth and government's capability to spur innovation, and largely counsels policymakers to manage the business cycle, reduce allocation inefficiencies, and support greater fairness.

Areas Where Neoclassical Economic Doctrine Is Useful and Generally Accurate

The neoclassical economic doctrine would not have obtained such a large following and dominant position in the United States if it were not accurate and useful in at least some circumstances. And, indeed, both conservative and liberal versions of the doctrine contain key insights. Markets are important, especially at the microeconomic level (e.g., markets for electricity, for gasoline, for "widgets" generally). Helping to ensure that prices usually match costs can be important to promoting allocative efficiency, especially when there are little or no compensating benefits to productivity or innovation. It's possible that tax rates at too high a level can limit incentives (the key question is what that level is). Budget deficits at too high a level can limit capital availability (again, the key question is what the level is at which this becomes a problem). The evidence suggests that modest increases in personal tax rates or budget deficits have no negative effect on economic growth.[34] Individuals and organizations are rational and respond appropriately to incentives (but not necessarily all the time). Certain markets, especially those characterized by stability and slow rates of change, do tend toward equilibrium (but many other markets do not).

Areas Where the Neoclassical Economic Doctrine Is a Flawed Guide to Policy

Notwithstanding its positive contributions, the neoclassical economic doctrine is a flawed guide to economic policy in the global, knowledge-based economy of the 21st century. The neoclassical economic doctrine gets it wrong on a number of key points.

Innovation is a much larger driver of growth than capital. In the old economy, where large amounts of capital were needed to construct an embryonic factory economy, and before the emergence of the kinds of sophisticated global capital markets of today, neoclassicalists' overriding focus on capital accumulation may have made some sense. But in today's economy, trying to stimulate the supply of an item that the economy has plenty of—investment capital—does not make much sense. The problem in the new economy is not a lack of investment capital but a lack of good investment opportunities. Supply-side tax cuts for individuals do not make much difference in the availability of capital; and even if they did, the supply of capital is not the key factor driving economic growth in today's knowledge-based economy.

The liberal neoclassical focus on government savings is equally misplaced. In an era of global capital mobility, the relationship between higher budget deficits and an increase in interest rates is less strong than it once was. Moreover, as we have seen so clearly in recent years, lower interest rates don't necessarily spur more capital investment. Indeed, even with the very low interest rates of the first half of this decade, capital investment rates fell, and people used the low interest rates to increase capitalized spending, particularly on housing, which does nothing to increase innovation or productivity. Yet many liberal neoclassical advocates of fis-

cal discipline would oppose measures such as more liberal expensing of machinery and equipment on the grounds that this would increase the budget deficit, thereby increasing interest rates and in turn reducing investments. But lower interest rates are a very blunt tool—possibly boosting investmen, but also boosting capitalized spending, whereas expensing of machinery and equipment or investment tax credits or research and development (R&D) tax credits are much more targeted tools that directly spur innovation. It is in this sense that MIT professor Lester Thurow argued, "Like having a better CFO in a company, having a better minister of finance is not going to yield a future competitive advantage. Having a national chief knowledge officer who understands where the knowledge-based economy is headed is where the future is to be found."[35]

Productive efficiency and adaptive efficiency are much more important to economic growth than maximizing allocative efficiency. Neoclassicalists also get it wrong by stressing the importance of maximizing one factor—allocative efficiency—to spur economic growth and giving short shrift to two other key factors: productive efficiency and adaptive efficiency. Productive efficiency is the ability of organizations to produce in ways that lead to the most amount of output with the fewest inputs, including labor inputs. Adaptive efficiency is the ability of economies and institutions to change over time to respond to successive new situations, in part by developing and adopting technological innovations.

One can easily envision a host of policies that, while distorting allocative efficiency, would boost productive efficiency and adaptive efficiency. The R&D tax credit, for example, undoubtedly "distorts" allocative efficiency. Without the tax credit, though, firms would conduct less R&D and produce fewer innovations, and the economy would grow more slowly.[36] The key point is that the gains in innovation and productivity spurred by the increased R&D that the tax credit produces vastly exceed any minor losses from "misallocation" of economic resources.

As discussed in detail below, innovation economics has found that the lion's share of growth is achieved not by simply allocating existing goods and services in the most efficient way, but by increasing productive and adaptive efficiency.[37] With their focus on getting prices right, neoclassical economists assume that markets get prices right most of the time, and that even when markets don't get prices right, government intervention in response will be wrong. But, as innovation economists Philippe Aghion, Paul David, and Dominique Foray note, "The empirical foundations for such sweeping statements remain remarkably fragile."[38]

Neoclassicalists also assume that the pretax marketplace is efficient and that taxes, regulation, and spending distort the "invisible hand" envisioned by Adam Smith. But the neoclassical model, as innovation economist F.M. Scherer explains, "assumes perfect competition, constant returns to scale, and the absence of externalities. All three assumptions have been questioned, often convincingly, by new growth theorists."[39]

Finally, with its focus on allocating existing scarce resources, the neoclassical economics framework gives short shrift to innovation. The neoclassical model assumes that firms have static production functions that respond to changes in

input prices. If prices of one input go up, firms will use less of it and more of another. Indeed, a textbook by Paul Samuelson and William Nordhaus, two leading neoclassical economists, defines economics as "the study of how societies use scarce resources to produce valuable commodities and distribute them among different people."[40] But as noted innovation economist Joseph Schumpeter stated, "Add successively as many mail coaches as you please, you never get a railway thereby."[41] In short, simple and minimal polices are nice and provide a certain amount of intellectual comfort, but they are means, not ends, and if they come at the expense of economic growth, such policies are not pro-growth.

The economy increasingly doesn't tend to one equilibrium. The neoclassical economic doctrine holds that the economy is a large market of goods and services that is generally in equilibrium. But in a world of rapid technological change where innovation drives change, market equilibrium is almost never achieved. The reason is that some new product, service, business model, or new market is always emerging, disrupting existing products, services, business models and markets. As Eric Beinhocker, author of *The Origin of Wealth,* states, "Equilibrium systems by definition are in a state of rest, while growth implies change and dynamism."[42]

Some economists, disputing the neoclassical view that the economy tends toward one equilibrium, have argued that economic systems can have multiple equilibria, with significant consequences for economic welfare, and that government policy that moves an economy to the more productive equilibrium can spur growth[43] A number of trade scholars, for example, have argued that in the new world economy, more industries are characterized by increasing returns to scale; hence, nations that start to produce first in such industries can acquire comparative advantage. This means that there exist multiple possible equilibria.[44] Moreover, it means that government policy that moves an economy to a higher output equilibrium can spur growth.[45] Innovation economists believe that the market is characterized not by equilibrium or multiple equilibria, but instead is roiled by constant change. Consequently, a quest to ensure that prices align with costs and drive towards equilibrium is a quest that can never be achieved.

Individuals and firms are not necessarily rational actors. Neoclassical economic doctrine holds not only that the economy is an equilibrium system, but that individuals operating within that system have full information and act rationally to maximize their own self-interest. Without this basic assumption of rationality, modeling economic behavior mathematically would be much harder. Recently, however, the emerging fields of behavioral economics and complexity theory have called this and other assumptions that underlie neoclassical economics into question. [46]

Complexity theory and the mathematical modeling related to it show that many systems act less like well-structured equilibrium systems and more like chaotic complex systems. The new behavioral economics is finding out that, in real life, people consistently make what are—at least from the perspective of economics—irrational decisions all the time. In *The Origin of Wealth,* Eric Beinhocker explain that people's decisions are affected by a host of "problems," including fram-

ing biases, difficulties judging risk, superstitious reasoning, and other "human" biases.[47] For example, people often tend to overestimate the likelihood of low probability events. Finally, research on the process of organizational change and innovation increasingly shows that the process is path dependent, locationally specific, and institutionally shaped. New discoveries, such as these, in the realms of behavioral economics and complexity theory are calling into question the "Newtonian" simplicity of the neoclassical worldview.

THE NEO-KEYNESIAN ECONOMIC DOCTRINE

As noted earlier, the dominant economic doctrine before World War II was classical economics, which supported the primacy of markets and a limited role for government. Keynesian economics first emerged during the Great Depression, when British economist John Maynard Keynes published his theories in *The General Theory of Employment, Interest, and Money* in 1936. Keynes maintained that the government could help maintain economic growth by instituting counter-cyclical fiscal policies, especially through government spending. Keynesian economic doctrine gained wide acceptance after World War II and was the dominant economic paradigm in the United States until the 1970s.

In the economic doldrums of the mid-1970s, when conservatives and many moderates moved to replace Keynesian economic thinking with what subsequently became the dominant neoclassical economic doctrine of today, many liberals remained firmly committed to the Keynesian economic doctrine. Even today, as the economy has become more global, dynamic, and technology-driven, a large group of liberal "neo-Keynesians"—so called because they have attempted to revise Keynes's ideas in response to new economic conditions and new research—continue to base their policy recommendations on Keynesian ideas. Most neo-Keynesians are on the left side of the political spectrum, with institutional homes in places like Demos, the Economic Policy Institute, the Center for Economic and Policy Research, the Levy Economic Institute, the AFL-CIO, the Center on Budget and Policy Priorities, and the Center for American Progress (also home to some liberal neoclassicalists).

Principles Guiding Neo-Keynesian Economic Doctrine

Neo-Keynesian economic thinking is guided by at least three key principles, outlined below.

Demand drives economic growth. Neo-Keynesians have long held that it is the demand for goods and services—coming from business investment, government spending, and consumer spending—that drives growth.[48] In recent years, though, neo-Keynesians have tried to update the liberal demand-side story for the new economy. Thus, some neo-Keynesians now acknowledge that investment is the key to productivity, but claim that consumer spending drives investment.[49] Instead of claiming that aggregate consumer spending leads to more jobs, they now tell a more nuanced, and what they hope is a more compelling, story about how con-

sumer demand is the fuel that induces companies to invest in new machinery and equipment. According to neo-Keynesians, if companies think consumer demand is increasing, they will have an incentive to invest more. There are many adherents to this neo-Keynesian story. The Christian Weller of the Center for American Progress, for example, explains the modest slowdown in productivity growth between 2004 and early 2007 as stemming from slow consumer income growth that, "provides business with fewer incentives to invest at an accelerated rate."[50]

Because of the neo-Keynesians' focus on aggregate demand, many neo-Keynesian economic policies revolve around increased government spending to keep the economy growing. As former Economic Policy Institute President Jeff Faux writes, a core tenet of Keynesian economics is that a key role of the federal government is "to jump-start consumer demand and through its spending keep it up."[51] Similarly, neo-Keynesian economist James Galbraith argues:

> Consumption is also an important and much maligned policy objective. People should have the incomes they need to be well fed, housed, and clothed—and also to enjoy life. Public services can help: day care, education, public health, culture, and the arts all deserve far more support than they are getting.[52]

Former Democratic House leader Dick Gephardt echoes the neo-Keynesian view:

> [R]aising wages does more than help someone buy food or pay for shelter. Remember the Republican nostrum of the 1980s, supply-side economics? I'm a believer in demandside economics. Raising wages increases the buying power of American workers and that's good for the entire country.[53]

Equitable distribution of wealth is critical. Neo-Keynesians see most economic issues as boiling down to a question of who gets the benefits: working people, or rich people and corporations. Consequently, neo-Keynesians—even more than liberal neoclassicalists—focus on ensuring that the fruits of economic growth are distributed fairly. MIT neo-Keynesian economist Frank Levy argues, "We cannot legislate the rate of productivity growth. . . That is why equalizing institutions are so important." Since there is not much that can be done to increase productivity growth, neo-Keynesians argue there is no reason for tax policies to spur productivity and innovation, such as accelerated depreciation or R&D credits. Moreover, because neo-Keynesians view increased spending (as opposed to savings) as the key economic growth, they generally want tax cuts to go to lower income individuals and households, arguing that they are more likely to spend the money from tax cuts than wealthier individuals and households.

Managing the short-term business cycle is the primary objective. In part because Keynesianism was largely a response to the Great Depression, neo-Keynesians focus predominantly on the short-term business cycle, usually at the expense of a focus on long-term growth. In *The General Theory*, Keynes reflected this view when he wrote:

> If the Treasury were to fill old bottles with banknotes, bury them at suitable depths in disused coal-mines which are then filled up to the surface with town rubbish, and leave it to private enterprises on well-tried principles of laissez-faire to dig the notes up again. . ., there need be no more unemployment and, with the help of the repercussions, the real income of the community, and its capital wealth also, would probably become a good deal greater than it actually is. It would indeed be more sensible to build houses and the like; but if there are political and practical difficulties in the way of this, this above would be better than doing nothing.[54]

Neo-Keynesians are more focused on ensuring that the economy does not tilt into recession (in large part through countercyclical fiscal policies) than on policies to spur productivity and innovation. One problem is that many neo-Keynesians think that the economy is always on the verge of a recession, or even worse, a replay of the Great Depression.[55] As a result, they often have a tendency to favor public spending that may produce short-run economic results—and give less emphasis on investments like support for innovation that can potentially lead to longer term results.

Areas Where the Neo-Keynesian Economic Doctrine Is Useful and Generally Accurate

Like neoclassical economics, neo-Keynesian economics contains important core insights. First, fairness is an important goal. Fairness and equity are cornerstones of the sustainability of western democracies, and societies in which income inequality is too high experience lower economic growth than more equitable societies.[56]

Second, when it comes to determining employment levels, neo-Keynesians are right in believing that macroeconomic factors (e.g., fiscal and monetary policy) are more important than microeconomic ones (e.g., minimum wage). They are also right in believing that full employment has beneficial effects on productivity and innovation. During the 1990s, full employment helped to boost the real wages of many workers, particularly those at the lower end of the wage scale.[57] Tight labor markets mean that companies must bid up wages, leading to more equal growth in incomes. Furthermore, in addition to being a tool for a fairer distribution of the fruits of growth, tight labor markets are a spur to growth. When companies must compete more to attract scarce workers, in part by paying higher wages, they are more likely to invest in new technology and automation as a way to cut costs and increase output.

Areas Where the Neo-Keynesian Economic Doctrine Is a Flawed Guide to Policy

Although the neo-Keynesian doctrine acknowledges the importance of private sector actions to boost productivity, at the end of the day, neo-Keynesian economics is still a demand-side story that doesn't adequately get at the real factors driving

investment and productivity growth. There is not now, nor has there been in the past, much of a relationship between consumer spending and productivity growth. Between 1990 and 1995, for example, consumer spending in the United States increased just 13 percent, yet productivity surged in the late 1990s. In contrast, consumer spending grew at essentially the same rate in the second half of the 1990s (20.4 percent) as in the first half of this decade (19.2 percent), but productivity growth rates have been somewhat lower recently.[58]

To be sure, during periodic economic slowdowns, the U.S. government can use temporary increases in spending or cuts in taxes to help boost spending and get the economy back to operating close to full capacity. But such government "pump-priming" policies do little to boost economic growth through higher productivity. Keynesian demand-side economic policies can make sure the "economic car" is going at its top-rated speed of 60 mph instead of charging along at an anemic 40 mph. What such policies can't do is build a faster economic car that can go 70 mph. Yet building a faster economic car is critical to boosting the incomes of all Americans because, despite what many liberal neo-Keynesians have claimed about the supposed large and growing gap between productivity growth and median income growth, changes in wages have been tied to changes in productivity over the moderate and long term—and continue to be so today.[59]

INNOVATION ECONOMICS: THE RIGHT ECONOMIC DOCTRINE FOR THE NEW ECONOMY

If Adam Smith is the patron saint of neo-classical economics and Keynes of neo-Keynesian economics, it is Joseph Schumpeter who is the patron saint of innovation economics. Indeed, if there is a "bible" for innovation economics, it is perhaps Joseph Schumpeter's classic 1942 book, *Capitalism, Socialism and Democracy.* Writing around the same time as Keynes, Schumpeter had a decidedly different take on the economy and on economics. For Schumpeter it was institutions, entrepreneurs, and technological change that were at the heart of economies and economic growth.[60] Schumpeter explained:

> The essential point to grasp is that in dealing with capitalism we are dealing with an evolutionary process ... the fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers' goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates.[61]

But because of the dominance of the Keynesian doctrine over the next 40 years, Schumpeter's insights were never really fully appreciated until more recently. It is only within the last 15 years that a theory and narrative of economic growth focused on innovation and grounded in Schumpeter's ideas has emerged. Indeed, a new theory and narrative of economic growth focused on innovation has emerged in the last decade. This new economic doctrine—known as "innovation

economics"—or by a range of other terms, including "new institutional economics," "new growth economics," "endogenous growth theory," "evolutionary economics," "neo-Schumpeterian economics"—provides an economic framework that explains and helps support growth in today's knowledge-based economy.

Unlike any of the three prevailing economic doctrines in the United States, innovation economics postulates that innovation drives economic growth. Thus, innovation economics, unlike the three economic doctrines currently prevailing in the United States, does not treat knowledge and technology as something that happens outside economic activity (exogenous factors in the economic model). Instead, innovation economics makes an explicit effort to understand and model how innovation occurs, seeing such advances as a result of intentional activities by economic actors, including government.[62] Today, innovation economists find their home mostly in the academy, sometimes in economics departments that are willing to buck conventional thinking, but often in Schools of Management, Public Policy, and City and Regional Planning.[63] Some also find their home in think tanks, such as the Information Technology and Innovation Foundation, the Economic Strategy Institute, the Woodrow Wilson Center, and the Council on Competitiveness.

Principles Guiding the Innovation Economics Doctrine

Innovation economics is guided by at least six key principles, outlined below.

Innovation drives economic growth. Innovation economists believe that what primarily drives economic growth in today's knowledge-based economy is not capital accumulation, as claimed by neoclassicalists, but innovation. The major changes in the U.S. economy of the last 15 years have occurred not because the economy accumulated more capital to invest in even bigger steel mills or car factories; rather, they have occurred because of innovation. The U.S. economy developed a wide array of new technologies, particularly information technologies, and used them widely. Although capital was needed for these technologies, capital was not the driver,nor was capital a commodity in short supply.

As William Baumol emphasizes, the most striking aspect of capitalism is not its capacity to generate allocative efficiency, but rather its remarkable propensity to drive economic growth through innovation, in what he terms as the "innovation machine."[64] Several recent studies that have attempted to explain the sources of economic growth agree. According to University of California/Berkeley economist Brad Delong, "growth accounting studies have found that capital deepening is responsible for only a small part of advances in labor productivity."[65] After reviewing an extensive and exhaustive literature, Richard Nelson concluded that the research, "provided evidence that neoclassical variables do not account for all of the differences among firms in productivity."[66] Robert Hall and Charles Jones studied 127 nations to determine why some grew so much faster: "[O]utput per worker in the five countries in 1998 with the highest levels of output per worker was 31.7 times higher than output per worker in the five lowest countries." These

researchers found something else that would probably come as a surprise to neoclassical economists who see more saving as the key to economic growth: "Relatively little of this difference was due to physical and human capital." Far more important than how much capital a nation had in economic growth—4.6 times more important in fact—was how a nation used its capital.

Other studies have come to similar conclusions. Klenow and Rodriguez-Clare decomposed the cross-country differences in income per worker into shares that could be attributed to physical capital, human capital, and total-factor productivity. (Growth in total-factor productivity represents output growth not accounted for by the growth in inputs like physical and human capital.) They found that more than 90 percent of the variation in the growth of income per worker was a result of how effectively capital is used, with differences in the actual amount of human and financial capital accounting for just nine percent.[67] Not all studies have found such a large share, but almost all find that innovation and how capital is used are the main drivers, with the expansion of capital accounting for a much smaller share.[68]

The major drivers of economic growth are productive efficiency and adaptive efficiency. If the focus in neoclassical economics is "the study of how societies use scarce resources to produce valuable commodities and distribute them among different people,"[69] the focus in innovation economics is the study of how societies create new forms of production, products, and business models to expand wealth and quality of life.

In contrast to neoclassical economics, which is focused on getting the price signals right to maximize the efficient allocation of scarce resources, innovation economics is focused on spurring economic actors—from the individual, to the organization or firm, and to broader levels, such as industries, cities, and even an entire nation—to be more productive and innovative. From the standpoint of innovation economists, if government policies to encourage innovation "distort" price signals and result in some minor "deadweight" loss to the economy, so be it, because allocative efficiency is not the major factor in driving economic growth in the 21st century knowledge-based economy.

Innovation economists believe that the primary drivers of growth are what economists call productive efficiency—the ability of organizations to reorganize production in ways that lead to the greatest amount of output with the fewest inputs, including labor inputs—and adaptive efficiency—the ability of economies and institutions to change over time to respond to successive new situations, in part by developing and adopting technological innovations. As innovation economist Douglass North explains:

> Adaptive efficiency . . . is concerned with the kinds of rules that shape the way an economy evolves through time. It is also concerned with the willingness of a society to acquire knowledge and learning, to induce innovation, to undertake risk and creative activity of all sorts, as well as to resolve problems and bottlenecks of the society through time. We are far

> from knowing all the aspects of what makes for adaptive efficiency, but clearly the overall institutional structure plays a key role to the degree that the society and the economy will encourage the trials, experiments and innovations that we can characterize as adaptively efficient. The incentives embedded in the institutional framework direct the process of learning by doing and the development of tacit knowledge that will lead individuals in decision-making processes to evolve systems that are different from the ones that they had to begin with.[70]

In the neoclassical economist's world, where allocative efficiency is all that matters and where market failures are few, one can make a compelling case for limited government, except perhaps to address issues of equity and areas of core government concern, like national security. This is because the key to economic prosperity is to reduce price distortions. But in a world in which productive and adaptive efficiency are what matters and where market failures are more the norm, the role for the government to institute explicit and effective innovation economics policies is more compelling. This is because innovation and productivity depend not just on the workings of individual firms acting alone, but on a wide array of supports, such as a strong research base, skilled workers, networks, standards, and a host of other factors that public-private partnerships can play a key role in helping to provide.

Spurring evolving and learning institutions is the key to growth. Neoclassical economics, which focuses principally on markets and individuals and firms acting in them as atomistic particles responding pretty much exclusively to price signals along supply and demand curves does explain a share of the economy. But innovation in the neoclassical economic model is an exogenous process—a black box, if you will, that works its magic solely in response to price signals. In this sense, the neoclassical model sees innovation as falling like "manna from heaven," not something that can be induced by proactive economic policies.

In innovation economics, innovation is central. Innovation economists recognize that innovation and productivity growth take place in the context of institutions. Indeed, it is the "social technologies" of institutions, culture, norms, laws, and networks that are so central to growth, yet are so difficult for conventional economics to model or study. Innovation economists view innovation as an evolutionary process in a market where firms act on imperfect information and where market failures are common.

Innovation economists also view innovation as an evolutionary process that takes place through the interaction and learning of firms, industries, and other organizations that collectively make up an overall national innovation system. National innovation systems are institutional arrangements that facilitate learning and innovation among economic actors—and a robust national innovation policy facilities innovation. National innovation systems differ significantly from country to country, depending upon culture, history, attitudes, institutions, and laws.

Innovation economics is based on the notion that the economy's productive and innovative power is enhanced only through actions taken by workers, companies, entrepreneurs, research institutions, and governments. Thus, innovation economics shifts the focus of economic policy toward creating an institutional environment that supports technological change, entrepreneurial drive, and higher skills. Because of this conceptualization, innovation economics focuses not just on macroeconomic and monetary issues like prices, but also on microeconomic and institutional issues.

When examining how the new economy creates wealth, innovation economists give answers that are strikingly different from those offered by neoclassical or neo-Keynesian economists; they also ask questions that are strikingly different:

- Are entrepreneurs taking risks to start new ventures?
- Are workers getting skilled, and are companies organizing production in ways that utilize those skills?
- Are companies investing in technological breakthroughs, and is government supporting the technology base (e.g., funding research and the training of scientists and engineers)?
- Are regional clusters of firms and supporting institutions fostering innovation?
- Are research institutions such as universities transferring knowledge to companies and individuals?
- Are trade policies working to ensure a level playing field for domestic companies free from mercantilist distortions?
- Are policymakers avoiding imposing protections for companies against more innovative competitors?
- Do individuals and firms have the right incentives and tools to adequately invest in new ideas and commercialize them?
- And, perhaps most importantly, are government policies supporting the ubiquitous adoption of advanced information technologies and the broader digital transformation of society and the economy?

So is innovation economics a demand-side or a supply-side economic doctrine? Innovation economics focuses on supply side factors like knowledge, skills, and investment. But innovation economics is also focused on the demand side of the equation in the sense that it seeks to increase the demand by organizations for the factors that boost growth and innovation—namely, new knowledge, new skills, and new capital equipment.

The new knowledge-based economy tends toward change rather than toward equilibrium. Innovation economics holds that although there is equilibrium in some markets at some times, in a growing share of markets in the new knowledge-based economy, equilibrium is a fleeting moment. The reason for thisis that markets are constantly roiled by entrepreneurial entry, disruptive technologies, political and social upheavals, changes in trade patterns, and more, never settling down into equilibrium. The lack of equilibrium is especially characteristic of industries characterized by higher levels of change and innovation. Moreover, innovation

economists believe that market disequilibrium is responsible not for economic inefficiency but for growth and progress. As innovation economist Joseph Schumpeter pointed out over half a century ago, "A system which is efficient in the static sense at every point in time can be inferior to a system which is never efficient in this sense, because the reason for its static inefficiency can be the driver for its long-term performance."[71]

Individuals and firms are not rational maximizers. Rationality has generally been understood to involve consistent decision-making based on measurable calculations. Decision-making involving risk can be made using rational decision-making. Decision-makers judge costs, revenues, and the risk involved in each and then make decisions. Innovative activity, particularly if it involves a high degree of novelty, typically involves uncertainty, where the outcomes and their associated probabilities are not known at all, rather than risk, where the outcomes are known with a calculable probability. As a result of such uncertainty, innovative efforts will meet with many failures, as well as some great successes.

When the economy is characterized by uncertainty—as it is today, for example, with respect to energy prices and the environment—price signals alone are not the best guide to decision-making. In this sense, when much more of the economy is in disequilibrium much more of the time, the old allocation models no longer provide adequate guidance, and relying on price signals alone to drive innovation is not enough. The Internet, for example, might never have been developed with a reliance on price signals alone because it was impossible to model the risk-reward ratio of investments in the Internet.

Innovation entails an information challenge, not just a supply and demand challenge. Innovation economist Allan Naes Gjerding has observed that although neoclassical economic doctrine holds, "that the market mechanism represents the most effective way of coordinating economic activities, innovation economics argues that the market must be endowed with interorganizational arrangements in order to achieve coordinative efficiency in cases where there is not complete knowledge about the characteristics of new products and processes."[72] Successful innovations are based on knowledge about users' needs and about the value of the innovation to users. In this sense, smart innovation policies try to fill what is fundamentally a knowledge gap. Thus, it is difficult, if not impossible, for individuals and firms to make effective decisions under conditions of uncertainty relying only on price signals.

Decision-making under uncertainty requires elements not commonly included in risk calculations.[73] As the venture capitalist T. Boone Pickens explained how he selected venture capital investments, "I sit him [the entrepreneur] down and look in his eyes. . .if I like what I see, I lay the dough down." Innovation economics, rather than being a theory that can be applied to all situations for all time (e.g., have markets set prices), is based on a set of practical guidelines that change depending on the context. It is for this reason that adherents of innovation economics focus not just on economics but also on technology, business, regional development, culture, and law. It is also why adherents very much look to a prag-

matic and empirical analysis of what has worked and what is likely to work in the future. To be sure, innovation economics offers a number of guidelines to policy makers, including to focus on innovation and productivity; to spur public-private partnerships; when appropriate to support competitive markets; and to embrace change and dynamism. But these guidelines are not and should not be reified into rigid rules.

Smart public-private partnerships are the best way to implement policy. Innovation economics rejects the almost exclusive reliance of many neoclassical economists on markets (an exception being liberal neoclassical economists' willingness to intervene to improve fairness). Because firms and individuals are not rational maximizers responding like automatons to price signals, markets sometimes underperform, particularly with regard to innovation. But innovation economics also rejects neo-Keynesians' suspicion of the corporate sector and their belief that "what is good for GM is probably *not* good for the country"—sometimes it is good, and sometimes it isn't.

Innovation economics suggests that the critical issue of the role of the state and of the market should not be framed, as it is currently by policymakers and others in Washington, as the state *versus* the market. Instead, as Beinhocker suggests, the issue should be framed as "how to combine states *and* markets to create an effective evolutionary system."[74] How to craft an effective evolutionary system that supports market organizations (including commercial enterprises, non-profit organizations, and government entities) in their quest to become more productive in the most effective way is largely an empirical and practical problem that cannot and should not be guided by broad sweeping ideological statements, like "government always gets it wrong," or "corporate profits are antithetical to the public good." Neoclassicalists will point to examples where government did get it wrong, while neo-Keynesians will point to cases where there was corporate excess and wrongdoing. But decisions about where to draw the line between what should be public, what should be private, and what should be public and private should be guided by actual experience, data, research, and logic.[75] To say that decisions made in Washington, D.C., are not today guided by these factors is indeed an understatement. If there is any ideology governing this, it should be that smart public-private partnerships can play a key role in helping non-governmental organizations become more innovative and productive where there are significant market failures limiting their own action.

Areas Where the Innovation Economics Doctrine Is Useful and Generally Accurate

Much like Einsteinian physics built on Newtonian physics, innovation economics builds on the economic models that preceded it. In this sense, innovation economics recognizes that many markets are characterized by more or less stable supply and demand factors with few market failures, and in these markets the neoclassical guidance just to get the prices right might be an adequate framework. But in

markets that are characterized by high levels of dynamism and uncertainty, as many markets are in today's global, knowledge-based economy, innovation economics provides a more accurate guide to policy than the neoclassical or Keynesian models. The focus on spurring innovation on the supply-side of the economy has been shown to be the right focus by a large number of growth accounting models.

Areas Where Innovation Economics Doctrine Is a Flawed Guide to Policy

Innovation economics can be a flawed guide to policy if used as a crutch by policymakers to intervene in markets (or to fail to remove barriers in markets) in ways that reduce productivity and innovation, or if its use is motivated by political factors instead of using the doctrine to intervene in ways that are beneficial and grounded in sound analytical reasoning and evidence. Innovation economics also does not excuse economic policymakers from the important tasks of making sure that markets are generally open and free, and that both macroeconomic conditions and the financial system are stable and healthy. Open and free markets and a stable macroeconomic environment are necessary conditions for robust innovation and growth, but they are not sufficient.

Yet many neoclassicalists persist in labeling innovation economics with the pejorative "industrial policy" label meant to imply inappropriate meddling in the market. In dismissing the need for action by the federal government to help boost U.S. competitiveness in the face of new challenges, for example, supply-sider Greg Mankiw framed the choice this way:

> Policymakers should not try to determine precisely which jobs are created, or which industries grow. If government bureaucrats were capable of such foresight, the Soviet Union would have succeeded as a centrally planned economy. It did not, providing the best evidence that free markets are the bedrock of economic prosperity.[76]

But this kind of "black and white" framing poses a false choice. It does not follow that any kind of national strategy based on innovation economics, even if done in ways that foster competition, rely on market tools, support firms to be more efficient and innovative, and is industry-led, is "industrial policy." But when your economic doctrine places the top priority on ensuring that markets set prices, any policy doctrine that seeks to intervene is by definition harmful.

Finally, with its focus on institutions, entrepreneurs, and technology, innovation economics is not a substitute for effective fiscal and monetary policy or for ensuring that the financial system operates effectively. Rather, it should be seen as a complement to good financial system policies.

APPLYING THE ECONOMIC DOCTRINES TO REAL-WORLD POLICY ISSUES

One way to appreciate the differences between the four economic doctrines—conservative and liberal neoclassical economics, neo-Keynesian economics, and innovation economics—is to consider how the doctrines lead to particular policy recommendations for a variety of real-world economic policy issues. As described below, these four doctrines often lead to quite different policy advice for general economic policy issues in the United States, as well as for specific economic policy issues.

General Economic Policy Issues

The approaches of the four economic doctrines to dealing with general economic policy issues—tax policy, public expenditure policy, trade policy, antitrust enforcement, and regulation—are quite different, as explained below.

Tax Policy. Perhaps no issue is more central to conventional economic policy than tax policy, in part because of the focus of neoclassical economics on monetary factors, but also because tax policy is directly under the control of policymakers. Adherents of conservative and liberal neoclassical economics, neo-Keynesian economics, and innovation economics have very different approaches to tax policy.

For both supply-siders and liberal neoclassicalists, the best tax code is the one that distorts allocative efficiency the least. Neoclassical economists generally believe that any tax distorts prices from what the "market" would naturally produce and therefore leads to economic welfare losses. Both supply-siders and liberal neoclassicalists would deal with this situation by making the tax code as simple as possible, eliminating most deductions and exemptions, and using the savings to pay for a lower statutory tax rate,[77] because even though both camps believe that taxes distort the economy and economic decision-making, they believe that differential tax rates applied to different activities distorts it even more. Supply-siders would go further and cut taxes, especially on high marginal rates since these, they argue, distort the market the most. Liberal neoclassicalists would be torn, on the one hand wanting the growth that lower taxes bring, but at the same time wanting higher taxes, especially on high earners, in order to increase public savings and foster economic fairness.[78]

Neo-Keynesians generally don't worry that higher taxes distort growth. In their view, because individuals with higher incomes have a lower propensity to consume than individuals with lower incomes, higher taxes on such individuals, then using them to support public spending, would drive economic growth. The reason is that almost all of the money collected as taxes from such individuals would be spent on public projects, instead of a large portion of it being saved, thereby driving growth.

Proponents of innovation economics would want the tax code to be used as an explicit tool to spur business investments in innovation and productivity. Thus, they would advocate tax policies that stimulate more investment in the kinds of

business activities that spur growth and innovation, such as first year expensing of investments in broadband and other information technologies, a more robust R&D tax credit, and a workforce training tax credit.[79]

Public Expenditure Policy. Adherents of conservative and liberal neoclassical economics, neo-Keynesian economics, and innovation economics also have very different views when it comes to public expenditure policy. Supply-siders want public expenditures to be limited to the essential activities that the market and individuals cannot easily pay for on their own, like national defense and the legal system, in part because they believe most government spending is inefficient.

Neo-Keynesians, on the other hand, want to expand public expenditures, in part because they see them driving demand and thereby spurring economic growth, but also because they see public spending as helping low and moderate-income individuals. The distinction between spending and investment (the latter being an expenditure that produces returns long after the initial investment is made) is one that neo-Keynesians typically do not make. For neo-Keynesians, spending on low-income housing or Medicare is in the same category as investment in broadband in terms of its impact on the economy. Both create jobs in the short term.

Liberal neoclassicalists, on the other hand, do distinguish between investment and spending. They generally favor the former, but because of their overriding emphasis on fiscal discipline, they are usually wary of significant increases in public investment. They generally prefer to use money to pay down the national debt.

Proponents of innovation economics distinguish between spending and investment as well. However, because they see the economic benefits from increased public investment as usually significantly outweighing the economic benefits of deficit reduction, they favor significantly expanding investments in innovation (e.g., direct public expenditures on research, or indirect public investments like an expansion of the R&D tax credit), skills, and infrastructure.

One can see the differences between the four doctrines by examining how each economic camp would recommend what the federal government do if it had an extra $50 billion. Neo-Keynesians would probably support spending the money on activities that would give more purchasing power to low and middle-income Americans in ways that would also address economic challenges facing working-class Americans (e.g., expanding health care coverage, unemployment insurance, low-income housing). In contrast, supply-siders would return the money to taxpayers through tax cuts for individuals, particularly higher income individuals. Liberal neoclassicalists would likely advocate that government use the money to reduce the budget deficit, or if in surplus, to pay down the national debt. Finally, innovation economists would probably invest most or all of the money in innovation—a more generous R&D tax credit, more federal support for research and development, incentives for companies to invest in new technology, infrastructure, etc.

Of course, the real issue is achieving the right balance. Raising the top marginal tax rate to very high rates in order to pay down the debt, as some neo-Keynesians

propose, would be counterproductive, just as cutting marginal tax rates to less than 20 percent while expanding the debt and shrinking public investment, as many supply-siders propose, would be.

Trade Policy. There is perhaps no more contentious economic issue in the United States than trade. Adherents of the four economic doctrines have dramatically different approaches to trade and fundamentally different beliefs about its efficacy.

Supply-siders and liberal neoclassicalists, with their overriding focus on promoting allocative efficiency and consumer welfare, strongly favor free trade; they oppose tariffs or other restrictions in large part because they see them as reducing allocative efficiency. Neoclassicalists believe that if each country specializes in what it supposedly is good at (has a competitive advantage in), efficiency is increased (just as it would be if prices are not distorted at home). Moreover, neoclassicalists largely focus on the benefits to consumers from low-wage production overseas and ascribe the costs to workers as just the natural results of market forces that are only resisted at the cost of economic peril. The only real difference between the two neoclassical camps is regarding what to do about workers who are hurt by trade. Supply-siders generally argue that there are significant risks from more generous policies to help those who are hurt by trade, including increasing government spending and blunting incentives for workers to work and take risks. In contrast, liberal neoclassicalists argue for helping workers who are hurt by trade, in part because they believe that by doing so they can limit political opposition to trade.

Because neo-Keynesians are concerned first and foremost with workers' welfare, they are more skeptical of trade, seeing that it leads some workers to lose their jobs. They also focus not on the benefits to consumers from low-wage production overseas but on the costs to workers. Neo-Keynesians believe that many U.S. workers see their wage increases restricted because of pressures on production wages from low-wage workers in developing nations. For that reason, most neo-Keynesians favor limiting steps to open new markets, particularly with countries with lower wages and weaker labor and environmental standards—and they sometime even favor reversing past market-opening steps. Because they want to blunt low-wage competition, neo-Keynesians' preferred solution to globalization is to push for stronger labor and environmental standards, assuming that if corporate costs go up in other nations, American workers will benefit.[80] The same motivation underlies neo-Keynesians' support for demands to have nations like China increase their currency values vis-à-vis the U.S. dollar.

Adherents of innovation economics are generally supportive of globalization and unimpeded international trade, but their support for trade is not based on increasing allocative efficiency the way neoclassicalists' support is. Instead, they support global trade for three main reasons. First, the increases in competition can spur companies to be more innovative and productive. Second, the natural evolution to a global trading system should naturally benefit high-wage countries by creating a new global division of labor, where the industrial base of these economies evolves toward more high value-added and innovation-based goods

and services. Third, they see globalization as increasing innovation in the sense that it spurs greater learning and collaboration across borders.

Yet adherents of innovation economics temper their support for global trade with the concern that manipulation of the trading system by countries embracing mercantilist policies (e.g., tariffs, unfair taxes, currency manipulation, discriminatory standards) that favor exports, coupled with disregard for intellectual property standards, not only can hurt richer nations' productivity and innovation but potentially can also lead to lower levels of global growth as companies make investments in places and in types of production that they would not make absent these mercantilist policies.[81] This is why people who subscribe to innovation economics advocate international efforts to move the global trading system away from national economic policies that promote exports in a beggar-thy-neighbor fashion (as is currently the case today in most nations) and toward policies that support domestic innovation and productivity.[82]

Like neo-Keynesians and liberal neoclassicalists, innovation economists do favor policies to help workers and communities adjust to trade-related dislocations; however, they would generally oppose policies to protect domestic companies from legitimate impacts from trade (as opposed to protecting them from the impacts of foreign mercantilist policies). Finally, innovation economists argue that for trade to be effective, it must be complemented with domestic innovation policies to help the economy move up the value chain and take advantage of global economic opportunities and respond to global challenges. For unlike neoclassical economists who believe that trade simply allows nations' competitive advantage to be "revealed," innovation economists believe that competitive advantage has to be created.

Antitrust Enforcement. How to deal with competition in the marketplace has been a concern of policymakers for over 100 years. As U.S. Senator John Sherman, who argued for passage of his 1890 antitrust bill, warned:

> If we will not endure a King as a political power we should not endure a King over the production, transportation, and sale of the necessaries of life. If we should not submit to an emperor we should not submit to an autocrat of trade with power to prevent competition and to fix the price of any commodity.[83]

Not surprisingly, there is little agreement among the conservative and liberal neoclassical economics, neo-Keynesian economics, and innovation economics camps on the proper approach to antitrust enforcement. Neoclassicalists of both camps favor competition—the more, the better. With their emphasis on allocative efficiency, neoclassicalists worry that undue market power will lead to inefficient prices and harm to the consumer. Thus, for example, legal scholar Robert Bork is convinced that allocative efficiency was not just the dominant but the sole consideration of Congress in enacting the antitrust statues:

> My conclusion, drawn from the evidence in the Congressional Record is that Congress intended the courts to implement only that value we

> would today call consumer welfare. . . Though an economist of our day would describe the problem of concern to (Senator) Sherman differently, as a misallocation of resources brought about by a restriction of output rather than one of the high prices, there is no doubt that Sherman and he would be thinking the same thing.[84]

But the two camps of neoclassicalists differ on the role of government in enforcing competition. Because supply-siders are skeptical of government, they generally favor weak antitrust enforcement, assuming that the market will adequately deal with any issues arising from market power or market abuse. In contrast, the liberal neoclassicalists' more favorable view of government leads them to favor more aggressive antitrust enforcement. Indeed, the focus of liberal neoclassicalists is almost exclusively on consumer welfare, often leading them to oppose mergers that lead to net societal gains (e.g., greater efficiencies, more innovation) if the mergers also increase prices for consumers. Furthermore, unlike supply-siders, liberal neoclassicalists worry about buyers' power, not just sellers' power. Thus, for example, some liberal neoclassicalists worry that the power of companies like Wal-Mart will be unfairly used to hurt business suppliers, thus hurting allocative efficiency.[85]

Neo-Keynesians are likely to favor strong antitrust enforcement, but their motivation is different from that of liberal neoclassicalists, who want to use antitrust policy to favor consumers. Neo-Keynesians want to use antitrust enforcement to favor workers by favoring producers that might be hurt by other competitors. We see this in the approach to antitrust in many regions of the world, particularly the European Union. Moreover, like Senator Sherman, neo-Keynesians also see antitrust enforcement as a political tool to limit the political power of large corporations they fear have the potential to subvert democracy.

Innovation economists, because of their focus on productivity, view mergers and market power in the context of how they affect company efficiencies and innovation.[86] Even if a particular merger might lead to an increase in market power and a concomitant reduction in allocative efficiency and/or hurt other companies in the marketplace, such a merger might expand economic welfare if it leads to even greater efficiencies from consolidation—particularly in industries with declining marginal costs, where added scale can drive significant cost savings. In addition, innovation economists are less concerned with buyer power, because the effects of this are largely to pressure other businesses to become more innovative and competitive. Moreover, innovation economists recognize that markets in which there is no market power, and hence low levels of profits, are markets where there is not much innovation because firms in such markets do not have the surplus to invest in R&D.[87] In addition, because innovation economists look at evolutionary dynamics rather than static efficiency, they are more prone to consider how disruptive technologies and new entrants might pose a challenge to firms with market power.

Finally, adherents of innovation economics see innovation as involving a learning and coordination challenge and therefore see interfirm collaboration

related to learning as a good thing to be encouraged, not a bad thing to be prosecuted, as neoclassicalists and neo-Keynesians might see it. Adherents of innovation economics might also see collaboration among producers to fight restrictions among middlemen and distributors as a good thing, particularly if such collaboration leads to companies being able to bypass protectionist restrictions.[88] In sum, innovation economics focuses on the pragmatic factors surrounding each issue, and judges it based on the extent to which it spurs innovation and productivity. Granted, these do not always generate the kind of clear and easily understood guidelines that the neoclassical and Keynesian doctrines generate, but good economic policy is not necessarily easy or simple.

Regulation. Adherents of conservative and liberal neoclassical economics, neo-Keynesian economics, and innovation economics have different approaches to economic regulation (e.g., regulation of prices and entry) and social regulation (e.g., labor market, health and safety, and environmental regulation), both of which have impacts on the U.S. economy.

Conservative and liberal neoclassicalists alike worry that economic regulation distorts price signals and leads to allocative inefficiency. Yet the two groups' views on social regulation differ. Supply-siders generally work to keep social regulation to a minimum, arguing that it limits economic growth (and personal freedom) and that other means (such as contracts) are more appropriate for dealing with these issues.[89] Liberal neoclassicalists, on the other hand, are more likely to support social regulation, arguing that it is key to creating a better society. At the same time, liberal neoclassicalists (like adherents of innovation economics) want the goals of social regulation to be achieved in the most efficient and cost-effective ways (e.g., reinventing government, using industry codes of conduct, harnessing information tools, and disclosure.)

Neo-Keynesians worry less than neoclassical economists about the effects of regulation on economic growth—believing that the costs of regulation are simply borne by corporations, and, by extension, wealthy shareholders—and more about making sure that regulation achieves its purposes. Consequently, neo-Keynesians are generally skeptical about means of regulation that might be more efficient than command and control, preferring mandates and stricter top-down regulation in order to be assured that intended goals are achieved.

Innovation economists place a particular emphasis on crafting regulatory systems that go beyond achieving their immediate objectives to explicitly help spur innovation (including digital transformation). Innovation economists and liberal neoclassical economists alike worry that regulations that are too blunt and inflexible could create additional costs, which other measures might avoid while still achieving the goals of regulation. In addition, both groups tend to view social regulation as a mechanism for providing investments in human capital that are a crucial input to creating new knowledge and ultimately innovative activity.

Specific Economic Policy Issues

As described below, the four economic doctrines lead to quite different prescriptions for specific economic policy issues confronted by U.S. policymakers, including: the design of an economic stimulus program; competitiveness and innovation policy; telecommunications policy; the U.S. housing crisis; government entitlement programs; energy prices; and surface transportation policy.

Economic Stimulus. The recent and current debate in the United States over the national economic stimulus package was reflective of the current division among adherents of conservative and liberal neoclassical economics, neo-Keynesian economics, and innovation economics.

Among neoclassicalists, supply-siders argued that the best stimulus package was permanent cuts in individual marginal tax rates.[90] Liberal neoclassicalists argued that any stimulus package should be targeted and temporary, for they did not want to boost the budget deficit over the long term.[91] Some even went so far as to argue that any stimulus should be paid back when times got better.

Neo-Keynesians used the need for a stimulus package to support a package of spending increases, including support for expanded unemployment insurance, aid to local government, and assistance to low-income workers.[92]

If innovation economists had engaged in the stimulus package debate, they would have likely focused not just on the amount of stimulus but on what kind of stimulus was being offered. In particular, they would argue for at least a part of the stimulus to be invested in areas that would boost productivity or innovation while also getting spending ramped up in the short run. Innovation economists might, for example, have advocated a multibillion-dollar grant program administered through the National Science Foundation to help research universities upgrade their undercapitalized research infrastructure. Such a package could be spent relatively quickly but, unlike checks to consumers, would have long-term growth benefits for the economy.

Competitiveness and Innovation Policy. As global economic competition has increased, the U.S. economy has faced increasing economic challenges. On this critical issue, adherents of conservative and liberal neoclassical economics, neo-Keynesian economics, and innovation economics propose quite different policies, and even have quite different views of the nature of the challenge.

Supply-siders, because of their overarching belief in the primacy of the market, are generally skeptical that a competitiveness challenge even exists, for in conservative neoclassical economic doctrine, it is axiomatic that market outcomes are not a problem. To the extent that there is any competitiveness problem, its sources must lie squarely with government—in particular, excessive government regulations and taxes.[93]

Many, but not all, liberal neoclassicalists are more willing to admit that there is a competitiveness challenge, at least in terms of its effect on some American workers. Liberal neoclassicalists don't reflexively question government support, but because of their general faith in the marketplace and their fear that government

action will distort allocative efficiency, they often limit their solutions to those that help foster general factor conditions to make it easier for companies to be competitive. In this regard, liberal neoclassicalists' favored solutions are to boost human capital (e.g., improve K-12 education, help more people go to college, boost high-skill immigration), increase support for basic research, and create a regulatory climate that is supportive of innovation.[94] Both conservative and liberal neoclassical economists are prone to view any more-targeted governmental efforts to help business become more innovative and productive as unwarranted industrial policy, even if such efforts are strategic and done in partnership with industry. Both groups of economists believe that government is inherently incapable of implementing an effective innovation policy.

To the extent that neo-Keynesians focus on the competitiveness issue at all, it is generally to propose policies to create "good jobs" for workers (as opposed to policies to directly spur innovation and productivity) through such means as instituting universal health insurance, funding infrastructure, and spurring the creation of new "green" jobs.[95] Neo-Keynesians are also often somewhat supportive of efforts to help individual firms become competitive, particularly if they are targeted to small firms. But they are more skeptical of policies that might provide financial incentives to larger corporations, for example, by letting them expense investments in equipment in the first year. Neo-Keynesians also worry that efforts to reform regulation (e.g., tort reform) to boost innovation will work to the detriment of working people. They are however, often willing to use the tax code to give companies incentives to create good jobs at home and otherwise act in "socially responsible ways."

Innovation economists would argue that the innovation process is rife with market failures (e.g., the inability of firms to capture all of the benefits of their innovation activities, high levels of uncertainty, coordination failures, etc.), and for that reason, the market left to itself will produce less innovation and productivity than is economically rational. Consequently, although people who subscribe to innovation economics support policies to ensure that there are adequate inputs into the innovation process (e.g., an ample supply of scientists and engineers, and expanded funding for basic research) and a better regulatory climate, they would go further and advocate for policies that help organizations become more innovative and productive. Such policies would include tax policies to spur companies to invest more in innovation (e.g., the R&D tax credit); new institutional forms to help spur innovation (e.g., a National Innovation Foundation);[96] more targeted R&D funding, especially to industrial consortia; and efforts to spur digital transformation in particular industries, like health care. Moreover, unlike neo-Keynesians, adherents of innovation economics would have no preference for small firms, arguing instead that the goal should be to spur innovation and higher productivity and that policies should be neutral with regard to firm size.

Finally, adherents of innovation economics would make a distinction between policies that help companies do something socially beneficial that they would not otherwise do or not do as much of (e.g., training workers in broader skills, spend-

ing more on research and development), and programs and policies that offer subsidies but do nothing to help make companies more productive or innovative. Examples of policies that would help companies do something socially beneficial that they might not otherwise do or do as much of include programs that either: (1) raise the capacity of companies to be more productive and innovative, like the National Institute of Standards and Technology's (NIST) Manufacturing Extension Partnership (a program to provide technical assistance to help small and medium-sized manufacturers); or that (2) help companies develop new technology, like NIST's Technology Improvement Program.[97] Examples of programs and policies that offer subsidies but do not make companies more productive or innovative include those that give money to companies with no increase in productive or innovative potential, such as agricultural subsidies and price supports that postpone needed market adjustments while propping up inefficient farm producers. In contrast to innovation economists, both conservative and liberal neoclassical economists would tag all such interventions, whether investments or subsidies, pejoratively as "industrial policy."[98]

Telecommunications Policy. As the digital economy has emerged, telecommunications policy has become not just more complex, but more important. Telecommunications policy is viewed differently by adherents of conservative and liberal neoclassical economics, neo-Keynesian economics, and innovation economics.

For conservative neoclassicalists, there is little need for a telecommunications policy (as the telecom industry, in their view, is no different than any other), and many favor abolishing or radically reducing the role of the Federal Communications Commission. Supply-siders see telecommunications services as a private good (with no public goods aspects or externalities) and are therefore largely content to let the market decide how to provide service.[99] They believe that markets are generally competitive and are not in need of prescriptive regulations—and that where markets are not competitive, new entrants will come in if incumbents abuse their market power. Finally, they believe in strong property rights and generally oppose a balancing between fair use and the rights of content owners.[100]

In contrast, adherents of the other three doctrines do worry that telecommunications markets are not fully competitive; they also believe that telecommunications has inherently public aspects (e.g., with respect to use of the electromagnetic spectrum) and that there is a role for telecommunications policy to ensure access to telecommunications services by all. Nevertheless, the three camps differ significantly in how they would craft telecommunications policy.

Liberal neoclassicalists and neo-Keynesians would use telecommunications policy to help create more competitive markets, but for different reasons. Liberal neoclassicalists, reflecting their overall belief in competition driving allocative efficiency, support policies to increase competition in telecommunications, believing that this will drive down prices and help consumers.[101] Neo-Keynesians, reflecting their general wariness of large corporations, also support more competition, particularly if it comes from government-owned telecommunications providers (e.g.,

municipal provision of broadband) or small companies.[102] In addition, neo-Keynesians would use the power of government to limit the market freedom of large telecommunication providers, for example, by crafting strict "net neutrality" mandates and banning or severely limiting circumstances under which telecommunications providers can deploy network management technologies.[103] In addition, neo-Keynesians see the communications industry as a key anchor of democratic discourse and would impose regulatory requirements (e.g., minority ownership rules) on the industry to further these goals.[104] Finally, they believe that there should be a very weak copyright regime, with individuals free to download and copy virtually all content, all in the name of "fair use."[105]

In contrast, innovation economists believe that some telecommunications markets are characterized by significant economies of scale (especially in providing "last-mile" services) and that increased competition, especially that promoted proactively by government, could result in significant excessive and duplicative investments, thereby lowering industry productivity and ultimately raising consumer prices.[106] In addition, because innovation economists see telecommunications infrastructure as a "general purpose technology" that drives innovation and productivity, most tend to favor explicit policies to give incentives to private providers to invest more, particularly in higher speed broadband and in getting broadband to more areas and more people. Thus, adherents of innovation economics would support a national policy with measures to spur not just more access to broadband networks but the development of better networks—for example, through tax incentives to broadband providers to deploy very high-speed networks.[107]

With respect to fairness, both liberal neoclassicalists and innovation economists believe that telecommunications access for all is an important goal, but they would not make universal access the primary goal of telecommunications policy. Part of the reason is that liberal neoclassicalists and innovation economists believe that doing so could create tradeoffs with economic growth, particularly if the monies for the expenditures are derived from higher taxes on telecommunications services. In contrast, neo-Keynesians are much more supportive of an expansive role for government to ensure telecommunications access for all, and are likely to propose measures such as creating a robust universal service fund paid for by taxes on telecommunications services.[108]

The Housing Crisis. With the dramatic fall in U.S. housing prices and the increase in mortgage foreclosures, many of them involving subprime mortgages, policymakers are looking to solutions to the crisis. Again, the differences among adherents of conservative and liberal neoclassical economics, neo-Keynesian economics, and innovation economics in terms of their approach to the housing crisis are notable.

Both conservative and liberal neoclassicalists focus on the impacts of the housing crisis on markets, the impact of the fall in prices on homeowners, and the potential limiting of credit due to the crisis impact on banks. Supply-siders generally believe that market forces will lead to the right outcomes and worry that any

kind of intervention, either to bail out lenders or borrowers, will create moral hazard.[109] Liberal neoclassicalists are less worried about creating moral hazard and more willing to intervene in order to ensure that markets work in the present.

Neo-Keynesians worry even less about moral hazard than liberal neoclassicalists but would focus their efforts more on helping borrowers who have been hurt, even if the borrowers provided inaccurate information in order to obtain their loans. In addition, neo-Keynesians would seek to institute new regulations limiting what lenders could do in the future.[110]

Adherents of innovation economics focus less on the impact of the housing crisis on markets (which they see as simply impacts on prices) and more on the impact on real output—in this case, the lost economic output of having large numbers of houses vacant due to foreclosure. For them, the fall in housing prices is simply a transfer of wealth from owners to buyers (as housing prices fall owners lose but new buyers gain). The real loss to society is from falling housing output. As a result, people who subscribe to innovation economics would press for policies that would reduce foreclosures and get homes that have been foreclosed back on the market as quickly as possible.

Government Entitlement Programs. With an aging population and increases in the cost of health care exceeding inflation, government entitlements—Social Security and Medicare in particular—are expected to grow significantly. Each of the four economic doctrines look at this problem differently and propose dramatically different solutions.

Both conservative and liberal neoclassicalists look to the market, in this case the financial market, for part of the solution. Supply-siders argue that letting people put their money in the stock market instead of in the Social Security trust fund would solve the problem, since over the long term the stock market has outperformed other investments.[111] Even though liberal neoclassicalists generally oppose using Social Security funds to create personal private retirement accounts (because of fairness concerns), some embrace the same logic and embrace a version of privatization that would have the government invest at least a portion of the trust fund assets in equity markets.[112]

Conservative and liberal neoclassicalists alike argue for cutting entitlement spending now in order to have enough money in the future. They propose cutting entitlement spending now to save for the future in a variety of ways—for example, indexing increases in benefits to inflation rather than wage rates, which go up faster because of increases in productivity, and rationing health care. Liberal neoclassicalists are more likely than supply-siders to support what is called progressive indexing, in which higher income individuals see benefits indexed to inflation and lower income individuals see benefits indexed to wages (which historically have gone up faster than inflation).

In contrast, most neo-Keynesians minimize the extent of the entitlements problem, arguing that it's overstated. Moreover, even if the problem is real, they argue that cutting needed benefits would hurt those who need government's help the most.[113] To the extent that there are shortfalls, neo-Keynesians believe that they

should be made up by raising taxes (e.g., increasing the taxable base of income subject to Social Security taxes and/or dedicating estate taxes to Social Security.)

Innovation economists tend to be skeptical of asset-based approaches to save Social Security. The reason is that they believe that if payroll taxes were invested in the stock market, equity prices would rise as the demand increases. But as soon as baby boomers begin to retire and start selling their stocks to pay their mortgages, medical bills, and other expenses, stock prices would begin to fall as the number of sellers exceeds buyers. At that point, the real return to the stocks would fall and the supposed miracle of higher returns would have evaporated. Shifting Social Security payments to the stock market confuses real wealth that society can draw upon with asset prices that reflect supply and demand factors. To address the Social Security entitlements problem, innovation economists would instead focus relentlessly on boosting productivity so that in later years, relatively fewer workers would be able to produce enough to meet their own consumption needs and the consumption of the increased number of retirees. Even though relatively fewer U.S. workers will support more retirees, if these workers produce much more, they could maintain or even increase their after-tax income while allowing Social Security payments to retirees not to fall.

Similarly, with respect to health care costs, innovation economists stress spurring innovation and productivity in the health care system so that society can consume more health care (as people get older) with the same or even lower costs.[114] Finally, to the extent that cost savings and productivity improvements do not get us all the way, innovation economists would still focus on the real economy and favor people working longer, both by reducing the incentives for individuals to retire early and by increasing the retirement age.

Energy Policy. With the rise of gas prices to about $4.00 a gallon, pressure for some kind of public policy response is growing. Adherents of conservative and liberal neoclassical economics, neo-Keynesian economics, and innovation economics would again respond with different solutions and approaches.

Among neoclassicalists, supply-siders assume that increasing market prices for oil will spur people to consume less oil and spur producers (oil companies) to produce more, especially if they are not hindered by regulations (e.g., restrictions on offshore oil exploration or expanded drilling in Alaska). But in line with their faith in markets, supply-siders generally oppose the government favoring any particular energy technology, even a technology that has significantly fewer environmental impacts than current technologies.[115] Liberal neoclassicalists similarly believe that higher energy prices will lead to more supply and less demand, but they are less willing than supply-siders to eliminate regulatory protections (i.e., permit offshore drilling) to expand supply, and somewhat more willing to consider government support for particular energy technologies, especially if the support is limited to basic research. Likewise, neo-classical economists (and innovation economists) would use price signals to spur alternative energy production, by having some kind of pricing on greenhouse gas emissions.

Neo-Keynesians worry most about the impact of oil prices on low-income individuals, and many of them favor subsidies to those individuals most affected by high energy prices. In addition, in line with their focus on economic redistribution, many would favor some kind of excess profits tax on oil companies,[116] while others would limit oil futures trading based on the belief that speculators and other monied interests are artificially bidding up the price of oil in pursuit of short term profits. For the longer term, they would favor regulations to spur energy efficiency (e.g., stronger corporate average fuel economy, or "CAFE," regulations on vehicles) and large new federal investments in R&D directed at developing cost-effective alternatives to oil consumption (e.g., electric or fuel cell cars), in part because of the economic stimulus effect such federal investments would create.[117]

Innovation economists see the challenge of oil prices as essentially a long-term challenge, particularly given the emergence of large numbers of middle-class consumers in developing nations and a potentially dwindling known supply of oil. But they are less sanguine than neoclassicalists about the power of price signals alone to bring about a solution, even if supplemented by carbon pricing. They believe that price signals work only when there are adequate alternatives for consumers to shift to. Without viable electric cars, for example, people will still drive gasoline-powered cars, albeit slightly more fuel-efficient ones. Consequently, adherents of innovation economics would address the challenge of high oil prices by significantly expanding federally-supported R&D efforts (including R&D tax credits) focused on developing cost-effective and viable technological alternatives to oil consumption.

Surface Transportation Policy. The availability of surface transportation—road, rail, transit, bicycle and foot—is an important driver of economic growth (and quality of life). Not surprisingly, adherents of conservative and liberal neoclassical economics, neo-Keynesian economics, and innovation economics have very different views when it comes to surface transportation policy.

Supply-siders generally support reducing the role of the government in the provision of surface transportation infrastructure and relying more on the private sector to provide it (e.g., private toll roads). Toward that end, supply-siders often oppose raising the gas tax, fearing that a higher gas tax would simply perpetuate the government-dominated system.[118] Liberal neoclassicalists similarly favor increased use of pricing and privatization where it makes sense; and they also worry about increased reliance on the gas tax and other indirect taxes, believing that the more prices for using the system are tied to costs imposed on the system, the more efficient the system will be. Liberal neoclassicalists differ from supply-siders, however, in that they believe that there is a stronger role for government in supporting equity and access to surface transportation, whether by subsidizing transit or subsidizing low-income users of the road system if road pricing is introduced.[119]

Neo-Keynesians emphasize that transportation policy can be used as a means to create jobs, and argue for increased transportation infrastructure spending as a way to spur demand and higher paid jobs.[120] For this reason, they are much less

concerned about how the revenues are raised and are more supportive of using general funds revenues, even though this reduces the link between system use and price paid. Because of their focus on fairness, many neo-Keynesians would invest a larger share of system resources in transit and oppose greater reliance on user charges (e.g., tolling), believing that such charges hurt lower income users most.

People who subscribe to innovation economics, because of their focus on technology and institutions, believe that the government should play a role in spurring the adoption of new technologies in the transportation system (e.g., "intelligent transportation systems"). They also believe that the federal government should use its powers to spur innovation in the provision of transport services by state and local governments.

CONCLUSION

In the 21st century global economy, innovation and knowledge are the most important factors driving economic growth. The U.S. government can no longer view its role in the economy as driving capital accumulation and ensuring the more efficient allocation of scarce economic resources, as conservative and liberal neoclassical economists advocate, or simply redistributing resources to the needy (or even the middle class), as neo-Keynesians advocate.

To effectively foster an innovation economics agenda, Washington policymakers must understand the limitations of today's prevailing economic doctrines and appreciate the potential offered by the emerging doctrine of innovation economics. In addition, they must embrace an innovation economics agenda that places spurring organizational innovation and productivity at the center of U.S. economic policy. For unless the current playbook of economic doctrines changes, the plays available to U.S. policymakers will remain the same. Given the new challenges facing the U.S. economy, we need both new plays and a new playbook. This report is intended to help guide the way.

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1. For example, with the 2000 Lisbon Proclamation, Romano Prodi, President of the European Commission, committed the European Union to becoming the world's innovation leader to ensure prosperity and a high standard of living in the EU. Similarly, in 2006 the National Governors Association in the United States named innovation as the number one priority in its mandate for Innovation America.
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3. Paul M. Romer, "Endogenous Technological Change," *Journal of Political Economy*, Vol. 98 (1990) pp. 71-102.
4. Douglass C. North, "Poverty in the Midst of Plenty." (Stanford, CA: Hoover Institution, 2000) <www.hoover.stanford.edu/pubaffairs/we/current/north1000.html.> (Accessed Nov. 23. 2005).
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6. See, for example, William Baumol, *Free Market Innovation Machine: Analyzing the Growth Miracle of Capitalism* (Princeton: Princeton University Press, 2002).
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8. Lawrence B. Lindsey, *The Growth Experiment: How the New Tax Policy is Transforming the U.S. Economy* (New York, New York: Basic Books, 1990) p. 12.
9. John Maynard Keynes, *The General Theory of Employment, Interest and Money*, (New York: Harcourt Brace and World Inc., 1936).
10. See "Find Your Economic Type" for a test to determine one's economic doctrine. <www.innovationeconomics.org>
11. Robert D. Atkinson, *Supply-Side Follies: How Conservative Economics Fails, Liberal Economics Falters, and Innovation Economics is the Answer* (Lanham, Maryland: Rowman Littlefield, 2006)
12. Economist Robert Solow found that only 19 percent of long-run change in labor productivity was due to increased capital intensity, the remainder was due to what he called "technical change." Robert Solow, "A Contribution to Theory of Economic Growth," *Quarterly Journal of Economics*, Vol. 70 (1956) 65-94. Based on a review of most growth accounting models, Boskin and Lau (1992) estimated that half of economic growth came from technical progress. Michael Boskin and Lawrence Lau, "Capital, Technology, and Economic Growth," in Nathan Rosenberg, Ralph Landau and David C. Mowery (eds), *Technology and the Wealth of Nations*, (Stanford, CA: Stanford University Press, 1992.) Jones comes up with a similar estimate for the period of 1950 to 1993, with an additional 30 percent stemming from higher levels of education. Charles I. Jones, "Sources of US Economic Growth in a World of Ideas", *American Economic Review*, 2002, Vol . 92(1) (2002), pp. 220-39.
13. Mandel documents this, illustrating that most economics classics completely overlook technology. For example, the term does not appear in the index of Milton Friedman's 1979 bestseller, *Free to Choose*. Michael Mandel, *Rational Exuberance: Silencing the Enemies of Growth* (New York: Harper Collins, 2004).
14. For a list of materials on innovation economics, see www.innovation.economics.org/resources.
15. See, for example, *OECD Science, Technology and Industry Scoreboard 2007: Innovation and Performance in the Global Economy* (Paris: OECD, 2007).
16. The Brookings Institution is actually home to two camps. The liberal neoclassicalists largely inhabit the Economics Studies Program, while the innovation economists are in the Metropolitan Studies Program.
17. Solow, op. cit.
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20. Gene Sperling, *The Pro-Growth Progressive* (New York: Simon and Schuster, 2005), 85.
21. Allan Naes Gjerding, "Innovation Economics: Part I: An Introduction to Its Birth and International Context," Aalborg University, Center for International Studies.
22. Adam Smith, *The Wealth of Nations* (New York: Penguin Classics, 2000) p. 32.
23. Arthur B. Laffer, "The Laffer Curve: Past. Present and Future," Laffer Associates, 6 Jan. 2004. <www.ncpa.org/iss/eco/LafferCurve.pdf> (accessed September 11, 2008).
24. Blinder, op. cit., 162.
25. William A. Niskanen and Stephen Moore, "Supply Tax Cuts and the Truth About the Reagan Economic Record," *Cato Policy Analysis* No. 261, (Washington, DC: Cato Institute, 1996).
26. Sperling, op. cit.
27. Peter R. Orszag, "Marginal Tax Rate Reductions and the Economy: What Would Be the Long-Term Effects of the Bush Tax Cut?" (Washington, DC: Center on Budget and Policy Priorities, March 2001), p. 1.
28. Heritage Foundation economist Dan Mitchell actually asks, "Is spending hindering economic performance because of the taxes used to finance government? Would the economic damage be reduced if government had some magical source of free revenue?" He concludes that even if somehow government programs could be implemented at no cost, they would still harm eco-

nomic growth. Daniel J. Mitchell, Supplement to "The Impact of Government Spending on Economic Growth" (Washington, D.C.: The Heritage Foundation, March 15, 2005).

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30. David Warsh, *Knowledge and the Wealth of Nations*, (New York: WW Norton and Company, 2006), p. 266
31. Blinder, op. cit.,107.
32. Ibid, p. 58.
33. Paul Krugman, *The Age of Diminished Expectations*, (Cambridge, MIT Press, 1990), p. 18.
34. Atkinson, op. cit.
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36. Robert D. Atkinson, "Expanding the R&D Tax Credit to Drive Innovation, Competitiveness and Prosperity" (Washington, D.C.: Information Technology and Innovation Foundation, April 2007) <http://www.itif.org/files/ExpandR&D.pdf>.
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39. Jonathan Temple, "The New Growth Evidence," *Journal of Economic Literature*, 37 (March 1999): pp. 112-156.
40. Paul A. Samuelson and William D. Nordhaus, *Economics*, (New York: McGraw Hill, 1998), 4.
41 Joseph A. Schumpeter. *Capitalism, Socialism and Democracy* (New York: Harper Perennial, 1942, 1975), p. 37.
42. Eric D. Beinhocker, *The Origin of Wealth: Evolution, Complexity, and the Radical Remaking of Economics* (Boston, Massachusetts: Harvard Business School Press, 2006), p. 39.
43. Ibid., p. 31
44. See Ralph Gomery and William Baumol, *Global Trade and Conflicting National Interest* (Cambridge, MA: MIT Press, 2000). See also Elvio Accinelli, Silvia London, Edgar J. Sanchez Carrera, "Complementarity and Imitative Behavior in the Population of Firms and Workers," 2008 <ssrn.com/abstract=1136323> (accessed on February 28, 2008).
45. For example, research by economist Elvio Accinelli, in "Complementarity and Imitative Behavior in the Population of Firms and Workers," has shown that there is strategic complementarity between the percentage of high-skill workers and high-value added, innovative firms in an economy. Accinelli finds that economies can be in perfect neo-classical equilibrium at either high levels of innovation, or in a "poverty trap" of low skills and underinvestment in innovation. Since the poverty trap can be avoided if the number of innovative firms in an economy exceeds a threshold level leading to an increased number of skilled workers, there is a role for public policy to move economies to a high-level equilibrium on innovation. Accinelli, op cit.
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47. Beinhocker, op. cit., p. 122.
48. Jared Bernstein and Dean Baker, "The Benefits of Full Employment: When Markets Work For People" (Washington, DC: The Economic Policy Institute, 2003), p. 2.
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