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The Reality of Competition in the Broadband Market

Everett Ehrlich, Ph.D.

The debate over "net neutrality" could determine the future of the Internet. Definitions of "net neutrality" differ, and different proponents see different dangers. Some believe broadband providers (primarily cable television companies and the telecommunications providers of DSL or fiber-optic connections) will offer websites different levels of speed and reliability for the content they offer, creating a "premium" Internet for websites willing to pay for it, and second-class treatment for others. (Internet *users*, of course, can pick whatever level of service they desire by picking among the offerings of different access providers – the central issue in this paper is not their access.) Another concern is that broadband providers will allow some sites or content "exclusivity" on their system – for example, allowing one online music vendor the exclusive right to sell its service over the provider's network (or in some variants, allow only content owned by the network provider).

All of these concerns are speculative, and instances of them are hard to find in the history of the Internet or mobile telephony. But most importantly, all of them rest on a central premise – that the broadband market is uncompetitive. Critics claim it is dominated by a "duopoly" of cable television companies and regional telephony companies that do not compete with each other. Moreover, these critics embrace the further assumption that the level of competition in these markets will only get *worse*, as "neutrality" problems have yet to emerge but are presumed to do so as time goes on.

The state of competition in the broadband market is important because a competitive market would inevitably dispel all of the "neutrality" concerns, whether it's the question of exclusive content, diversity of service, or whatever else. Competitive markets would not allow broadband providers to force consumers to buy content they didn't want, or impose restrictions on Internet access that they were not willing to accept.

Thus, the question of the degree of competitiveness in the market for connectivity underlies the current debate over "net neutrality." In this paper, we argue that the broadband market is very competitive, with different companies providing customers with different approaches and technologies, and with more on the way. And the evidence substantiating this view stands in contrast to the tenuous assumption that telephone and cable companies are a duopoly that restrains competition and innovation. Faced with the same contrast, the Federal Trade Commission summarized the matter best, when it said: "*Policy makers should be wary of calls for network neutrality regulation simply because we do not know what the net effects of potential conduct by broadband providers will be on consumers….*"[1] But even this statement

does not capture the *affirmative* nature of competition. In short, the broadband market is competitive, and there are reasons to expect it to be so today and in the future.

DIMENSIONS OF COMPETITION

The fact that telephony and cable television companies are large doesn't mean they cannot act competitively. Instead, they can be judged on their behavior in the market. We expect competitive markets to restrain prices while providing a diverse range of products and services that meet consumer needs, to lead to faster-growing output, and to induce greater levels of innovation. All of these outcomes should be examined in determining the state of competition in the market for connectivity.

Price, Quality, and Output. We expect competitive markets to deliver ever-improving value. That means measuring both prices and quality, which requires some constant measure of what is being sold. A ton of steel is a ton of steel and a box of cereal is a box of cereal; it's easy to measure by how much their prices are falling. But prices for other, more innovative goods change dramatically over time. For example, a 2008 computer model and a computer manufactured ten years ago may have both cost $1,000, but today's computer is much better in every aspect, meaning that computers' *effective* prices are constantly falling. It's as if the same amount of money that used to buy hamburger now buys steak.

The same is true in the broadband market. The "price" of an Internet connection must be seen in the context of the speed and reliability of that connection; the price of connectivity and the quality of the connectivity offered must be considered side by side. For example, the average speeds offered to residential customers have grown rapidly in the last decade, and particularly in the last few years, while the price of connectivity has declined substantially. Consider:

- The average cost of a one megabit per second (mbps) connection in 2006 was about $7 per month; the same connection cost more that $26 per month in 2002, and several years before that, did not generally exist in the commercial market.[2]

- Between 2003 and 2006, the price of connectivity via cable modem fell 70 percent before any discounts for bundling of other services.[3]

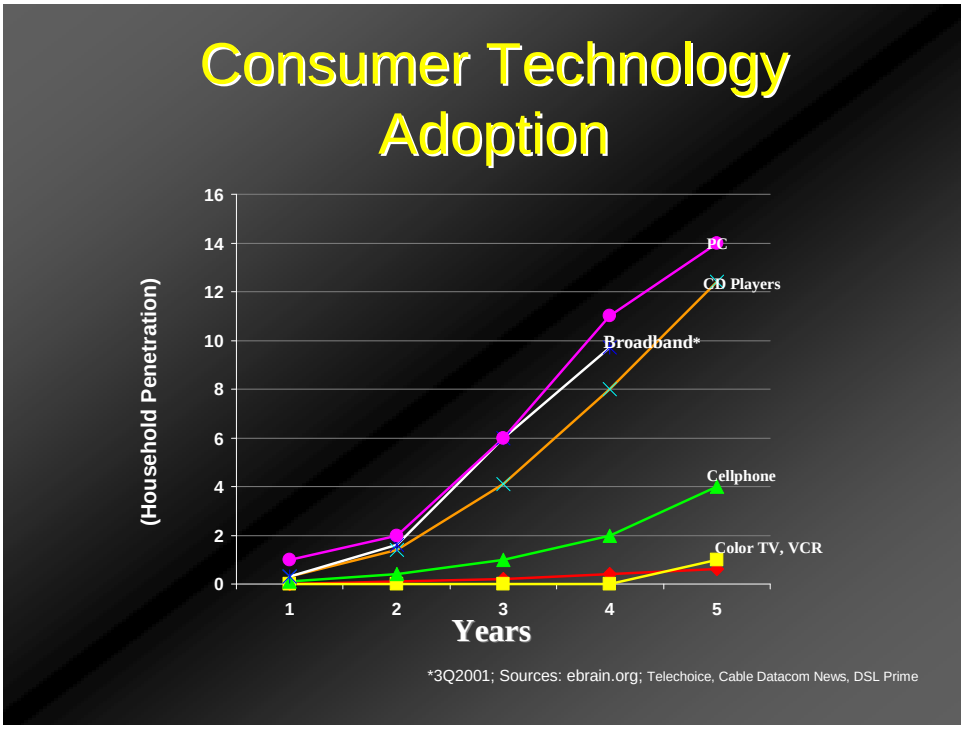
- The price of a basic telco wireline broadband connection has fallen by at least 50 percent since 2001.[4]

Year	Technology	Speed
1981	Hayes modem	300 baud
1983	Hayes modem	1.2 kbps
1985	Watson modem	2.4 kbps
1991	U.S. Robotics	14.4 kbps
1994	U.S. Robotics	28.8 kbps
1995	U.S. Robotics ISDN	56 kbps 112 kbps
1996	Early cable modem	1.5 mbps
1997	Early ASDL	768/128 kbps
2001	Cable modem (DOCSIS 2.0)	3 mbps/128 kbps
2003	Cable modem DSL	3 mbps 1.5-3 mbps/128 kbps
2004	DSL FiOS 3G wireless	3 mbps 5-30/2-5 mbps 1 mbps
2006	Cable modem (DOCSIS 3.0)	8-16 mbps
2007	FiOS DSL WiMax	50/20 mbps 7 mbps 2-4/1-2 mbps

Source: Verizon Policy Blog, August 4, 2008, post by Link Hoewing (http://policyblog.verizon.com/policyblog/blogs /policyblog/linkhoewing9/523/history-lessons-broadband-and-it.aspx)

The converse of higher prices is reduced growth of output. Market power allows companies to hold output back to enforce higher prices. We would expect, therefore, the penetration of broadband to be slower if its provision was non-competitive.

Yet in the past few years, consumers have witnessed both the greatest absolute progress in speeds and in connections themselves. According to the FCC, there were 101 million "high speed lines" in the U.S. in June of 2007, of which 66 million were residential lines.[5] Of the 101 million, 35 percent were added in the previous twelve months alone. U.S. households with broadband outnumber dial-up users by a ratio of more than five to one, whereas dial-up connections outnumbered broadband ones as recently as 2004.[6] As the chart below makes clear, broadband has been introduced into the U.S. market at a rate commensurate with the most rapid penetrations of other innovations.[7] It is on par with the provision of such competitively supplied products as the personal computer and the compact disc player, and considerably ahead of cell phones, color televisions, and VCRs.



The data, therefore, indicate that the broadband market has grown rapidly while innovating –from speed and capacities, to new services and products enabled because of the new speeds and capacity – and maintaining price moderation. In reality, all of these phenomena are part of a single competitive dynamic in which broadband providers are forced to compete through pricing and innovation to satisfy the public's desire for faster and more reliable connections. Even the allegedly anti-competitive members of the "duopoly" compete with each other to offer faster connections and to bring them to market at competitive prices. The claim that they are uncompetitive because their products end up similarly priced is outlandish.[8] Virtually *all* competitive products end up selling for the same price – if they didn't, consumers would shift their purchases until they did. In fact, competition forces prices to converge – cable operators are already dropping prices, for example, in places where Verizon's fiber to the premises broadband and video service, FiOS, has been introduced.[9] The reality is that those competitive prices represent ever-increasing values over time, as connection speeds increase. In other words, consumers of broadband are now buying steak for the price of hamburger.

Supply Diversity. Neutrality advocates refer to a "cable-telco duopoly" because these are the two dominant ways to get broadband access in any one place – either through the phone company or the cable company. But this characterization doesn't square with the emerging reality of a diverse broadband market, and it will be even less relevant in the future.

First, the dominating presence of broadband via cable modem and via DSL over phone company wires is itself only a recent affair. As recently as 2005, over half of all Internet

connections in the U.S. were dial-up.[10] The vision of an entrenched cable-telco "duopoly" is a reaction to those two segments' pioneering success in the past several years. And just as the broadband "duopoly" of cable modem and DSL (and now fiber) challenged and supplanted dial-up connectivity, these new technologies will face their own challenges in the years ahead. In fact, while DSL was regarded as a competitive service (because of the many providers who entered the market to provide it when regulation allowed them access to phone lines on a common-carriage basis), it is now being pushed out of the market because the technology is being supplanted by faster speeds and greater amounts of innovation elsewhere. Critics who claim that cable- and telco-based broadband are not competitively provided should note that they are beating "competitive" DSL in the marketplace.

For example, the FCC estimates that technologies other than cable modem, DSL, or fiber – specifically, satellite and both mobile and fixed wireless – already account for 36 percent of what the agency calls "high-speed lines." Even more remarkably, these alternative technologies accounted for 69 percent of the *new* lines created from June 2006 to June 2007. Many of these lines are in the commercial, rather than residential, sector, but Bernstein Research estimates that these alternative technologies will account for more than 10 percent of additional broadband hook-ups in the residential sector by the end of 2008, and almost 16 percent by 2010.[11] And while the definition of "high-speed" used by the FCC is a lenient one – 200 kbps in at least one direction – the data illustrate the strong interest in wireless connections in the marketplace; if wireless users are interested in 3G connections at their current speeds (see below), imagine what the demand will be like when their speeds increase. The result may be similar to the manner in which mobile phones are continuing to displace landlines.[12]

In fact, alternatives to cable and the telecom companies are on the threshold of having an important presence in the U.S. market beyond the 36 percent for which they now account. "Third generation" (3G) wireless services already provide download speeds comparable to DSL (600 kbps to 1.4 mbps)[13] and will soon achieve far greater speeds; a mobile broadband service in Australia will soon offer peak network download speeds of 21 mbps.[14] There are now about 250,000 Wi-Fi hotspots; Starbucks now offers Wi-Fi in 7,000 locations, McDonald's in 10,000 of its restaurants, and Panera Bread in 1,440 locations.[15] And with announcements, such as Verizon's of a new, more open and global 4G mobile telephony architecture to be deployed beginning in 2010, we are seeing a new broadband platform emerging.

Nor do these technologies exist in isolation. According to the FCC, 95 percent of U.S. zip codes were served by three or more broadband providers in June 2007, up from 58 percent just four years before. About 64 percent of U.S. zip codes had six or more such providers, with the logical assumption being that these accounted for a disproportionate share of the population, given the role of population density in making many of these technologies less expensive.[16]

But perhaps the most important challenge to both cable and telco providers of broadband is about to come from fixed wireless, or WiMAX. In June 2008, Alcatel-Lucent,

Cisco, Clearwire, Intel Corporation, Samsung Electronics and Sprint joined together to form the Open Patent Alliance (OPA), to accelerate the widespread deployment of 4G WiMAX technology. And in early November, the FCC approved the merger of Sprint Nextel and Clearwire, clearing the way for the combined companies to launch a national WiMAX network, reaching as many as 140 million people. Hardware manufacturers have already committed to embedding over 50 million WiMAX chipsets in PCs and other devices, giving it an instant base. Morgan Stanley views WiMAX as soon reaching speeds of 10 mbps, and as having "the potential to disrupt both broadband solutions such as cable modems and DSL as well as 3G PC card solutions."[17]

The prospective proliferation of broadband technologies is important regardless of what one thinks of the level of competition *today*. It argues that the broadband market will be more competitive *tomorrow* than today. This is important, because the abuses that concern net neutrality advocates haven't happened yet – broadband providers have neither imposed their content on consumers nor habitually restricted other content. And the prospect of a more competitive market in the future means that their ability to do so will decline in the years ahead.

THE SPECIAL NATURE OF BROADBAND COMPETITION

The evidence suggests that competition in broadband provision has rapidly brought down effective prices and accelerated its market penetration. But for many, this evidence is hard to accept; after all, aren't there only really two providers of broadband – one's cable company and one's telephone company? Regardless of the evidence, isn't that a classic duopoly?

Leaving aside the reality that the broadband market is and promises to be even more diverse, addressing this concern requires going back to the economic theory. In 1838, Augustin Cournot pioneered the theory of duopoly, which described markets containing only two competitors. He concluded that were they to incorporate the other's reactions into their pricing decisions, they would end up with a joint optimization of profits that would deprive the public of its maximum economic welfare. Over a century later, John Nash, now made famous in the film *A Beautiful Mind*, used the mathematics of game theory to describe a process by which the two "Cournot-type" competitors learned to co-operate against the welfare of consumers by limiting output and raising prices.

To proponents of net neutrality, the Nash-Cournot model of duopoly fits the market for broadband perfectly. In many if not most markets, the preponderance of high-speed connections is provided either by the local telephone company (telco) or the provider of cable television (cable). The telco-cable duopoly's anti-competitive potential, in the view of these critics, requires a regulatory response.

The evidence described earlier in this paper, however, suggests the opposite. The speed of connectivity available to almost all consumers and businesses has increased dramatically and promises to continue to do so. The effective price of connectivity continues to fall. New technologies are aimed at this market, most conspicuously the recent Sprint-Clearwire commercial WiMAX launch. These all suggest an underlying problem with the duopoly view of the broadband market.

But there is a larger problem: the duopoly model is fundamentally inappropriate to the market for connectivity. In the balance of this paper, we will argue that the duopoly model is too static and too limited to describe the competition between cables and telcos. The reasons cited are fivefold:

- Consumer-led technological innovation creates dynamism not found in the duopoly model;
- High fixed costs give both cable and telco incentives to price to maximize yield;
- The "easiest" conversions to broadband – dial-up customers – are drying up, forcing cables and telcos to compete more aggressively with each other over time;
- The public's growing preference for mobility may disadvantage both cable- and telco-wireline systems; and
- Cable and telco, beyond price and quality, compete for the right model of service provision.

These will be examined in this section.

Dynamism. The theory of duopoly holds that two competitors may collude by agreeing not to reduce price, instead of competing. But the underlying assumption in this theory is that the product is static, and that further inroads into the market at the expense of the competitor can only be made *through* price. There are no other "dimensions" of competition – price is the only way to divide the market – and eliminating price competition eliminates competition. The oligopolies of the 1950's – most famously, the steel industry – fit this view. Technology was stable and the product evolved very little – the only way to sell more was to price less.

The market for broadband is almost precisely the opposite. Price is important, of course, but quality counts just as much. The product has evolved continually in response to the overwhelming sentiment voiced by consumers – *the need for speed*. Consumers talk about their connections the way auto enthusiasts discuss their cars, citing performance characteristics and expressing frustration when their machines do not deliver.

Imagine a world in which cable and telco broadband providers *colluded* on pricing. Over time – and not very much time, given the rapid pace of innovation – the market would move to the provider with better service, as measured by speed, reliability, or whatever else consumers value. The loser in that technological competition would have no recourse *but* to respond by lowering prices, or abandoning a massive investment.

A tacit agreement, therefore, not to compete on the basis of price makes sense for static products and markets. But the broadband market, with high levels of investment and innovation, is wholly different. Non-price competition persists regardless of what prices do, and makes agreements to limit price competition pointless, if not unproductive.

High Fixed Costs. For decades, services such as local telephony- and electricity-generation were considered "natural monopolies." This was due to their very high fixed costs; the more they produced, the lower unit costs became. By allowing one producer to monopolize the market (and subjecting that producer to price regulation), costs fell to their lowest possible level and consumers received a maximum benefit.

Broadband networks also have high fixed costs – the amortization of investment is said by industry executives to approach 50 percent of all costs of provision, and that is before considering operating costs that are common to the entire network. Moreover, this high-fixed-cost character reproduces itself throughout the system. System backbone costs can be spread over more local loops; the costs of local loops can be spread over more households connected to them.

With that being so, these systems have a strong incentive to price to a target *yield rate*, in order to spread these fixed costs over a large number of users. Rather than not competing, these systems are driven to compete in order to improve yield and profits. As I predicted fifteen years ago: "One day, capital-intensive, fixed-cost systems will compete in a business defined by market penetration ... pressures to price to gain share will be unrelenting. … Signal carriers – be they cables, telcos, Sky TVs, or whatever – will be forced to innovate continually to cut costs and support their drive for share."[18]

The Death of Dial-Up. Since the introduction of broadband, providers have been able to draw customers from a pool of dial-up users. But that pool of dial-up users is becoming an Aral Sea – it is drying up quickly.

For example, projections made by Technology Futures, Inc., demonstrate this point. Between now and 2014, about 35 percent of the nation's households will switch to connections with speeds of 24 mbps. But the percentage of all households with broadband connections in the U.S. will rise by less than 20 percent. This means that the rest of the market share for the new technologies offering 24 mbps – 15 percent of all U.S. households – must come from other, *existing*, broadband customers. In fact a parallel shift is occurring *right now* in the U.S. market, as a significant number of customers are moving to fiber-based broadband from DSL, not dial-

up. This confirms that speed-based – or quality-based – competition is already underway among the forms of broadband at hand. This competition is now so active that some in the industry say that "DSL is the new dial-up."[19]

So, in short, the "low-hanging fruit" in the competition for broadband penetration has been picked. In order to win new customers, broadband providers will have to offer price and quality upgrades that are as compelling as the upgrades entailed in going from dial-up to the first broadband connections (e.g., DSL). This will require *more*, rather than less competition – it means that cable and telcos will have to compete with a generation of products they had previously installed to win over consumers who will be both better informed and more discerning.

Mobility. As mentioned above, in the duopoly model, producers collude on price because price is the only available dimension of competition. But, also as discussed earlier, speed and quality are important differentiators in this market. There is also, however, the prospect that both cable *and* telco have made the wrong bet, and that an even more important dimension of competition will be *mobility*. Many telephony customers – particularly younger ones – value mobility over the superior quality of a land-line connection; one in six phone users own *only* a mobile phone.[20]

The preference for mobility may extend to broadband. Customers who pay for land line connections and for the ability to connect to Wi-Fi "hot spots" may find their arrangements costly and duplicative when Wi-Fi is replaced with WiMAX and hot spots merge into a seamless coverage area. Moreover, as the speeds of 3G mobile connections improve, these will increasingly compete for customers' attention. At that point, both wire-based cable and telco offerings would be less valued in the market and subject to greater competition and price pressure. And this is before we consider the rapid growth in the capability of what we once called a "phone."

This prospect is on the verge of becoming a reality as Sprint and its partner, Clearwire, begin the commercial launch of WiMAX. The technology press reports that within its service area, WiMAX will be capable of delivering download speeds of between 3 and 5 mbps – speeds equal to or better than those experienced by many customers of fiber optic or cable networks.[21]

The Search For a Customer Model. Despite its dramatic penetration in the market and its remarkable technological advances, broadband is still a relatively new product. This is particularly true regarding the "customer model" that guides its provision.

For example, the "customer model" for automobiles was stable for a very long time – model-specific show rooms sold new cars, alongside a large and atomistic market for maintenance and subsequent sale. Today, showrooms still exist, but warranties and features

such as “On Star” build a service layer on top of the car, and CarMax has commoditized the used-car business.

What is the “customer model” for broadband? Or for mobile telephony? This question is unanswered, and cable and telcos are competing to find the answer. For example:

- Do customers want tie-ins to products such as the iPhone – are they willing to accept limitations on their choice of carrier in exchange for getting specific equipment?

- Do they want their various information services – telephony, mobile telephony, Internet access, and television – bundled for simplicity, or unbundled to allow greater choice?

- How do they trade off the presence of advertising versus the cost savings it brings for service? Are they willing to pay not to be exposed to it, or how much are they willing to pay to be subjected to it?

- Do customers want specialized, added, or exclusive content or applications as part of their broadband provision?

This last question goes to the heart of the policy debate over the future of broadband. Some advocates worry that access to the Internet will not be “open” – that users won’t have access to all content on the Internet, that the Internet must be provided on an “open” basis. But until there is verifiable evidence to the contrary – and thus far, none exists – we should assume that an “open” Internet exists.

Why? Because consumers – via the thriving broadband market we see today – have made it abundantly clear that they want to choose, not have the choice imposed on them.

We know this because telecommunications providers, applications developers, and content creators have experimented with a variety of customer models, some of which involved limited or customized Internet access.

Consumers, for example, generally want robust access to the full range of the Internet, with only those limitations they choose to impose on themselves and their families. Just as few would shop at a grocery store that stocked only house brands, no one would use an Internet service provider that provided only proprietary content, as AOL learned almost a decade ago. In early 2006, for example, ESPN launched its own cell phone service. Seven months later, it was scrapped, having signed up just 30,000 subscribers, far below the reported break-even mark of 500,000.[22] Its customers did not want limitations on the content the phones could access – they wanted an “open” system. (ESPN over mobile wireless has recently been reintroduced, as that business searches for the right business model to reach its market.)

In some cases, consumers want a "mixed" system – they want their mobile-phone network to have access to all destinations and interoperability with a broad range of equipment, but appear willing to accept some limitations to avoid receiving spam (i.e., telemarketing calls) and to preserve system quality.

We are only now beginning to learn the comparable statements about broadband provision. Open access to the Internet is only one part of the issue. For example, would consumers be more willing to choose a broadband provider that offered its own, lower-cost or even free alternative to iTunes, with access to its own online library of entertainment? Would they accept network management practices such as slowing down high-bandwidth uses (such as streaming video) during periods of congestion, or would they prefer that such sites be able to buy a higher level of uninterrupted service?

The answers to these questions should be determined through experimentation and competition, as we have seen throughout the development process of the Internet and broadband worlds. Imposing "neutrality" regulation now assumes the question, "what do consumers want?" has been answered. But, in fact, this is one of the most important dimensions of competition in the broadband market.

CONCLUSION

Advocates of "net neutrality" claim that broadband providers – cable and telcos – are an uncompetitive "duopoly" and that their market power poses a threat to consumers. But the standard economic theory of a duopoly idea fits neither the evidence nor the underlying conditions presented by the broadband market. Cable and telco broadband providers produce a rapidly-changing product with high fixed costs and with new competitors poised to enter the market. They have produced a steady stream of innovation themselves, while their networks have enabled boundless amounts of innovation, from applications to services to hardware. They are expanding connectivity and effectively reducing prices. In the face of these realities, it would be a serious mistake to predicate the future of the Internet on the assumption that the provision of broadband is anything other than competitive.

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Everett Ehrlich

Dr. Everett M. Ehrlich is one of the nation's leading business economists. His firm, ESC Company, combines economic analysis, business development, and communications skills to solve a wide range of business problems. ESC's diverse clientele have included leading firms in the financial, accounting, pharmaceutical, automotive, and other industries, and such diverse organizations as the Pew Center for Global Climate Change and the Major League Baseball Players Association. He also recently served as Executive Director of the CSIS Commission on Public Infrastructure under co-chairmen Felix Rohatyn and Warren Rudman; a bipartisan bill to enact their recommendations was introduced in the 110th Congress.

Dr. Ehrlich served in the Clinton Administration as Under Secretary of Commerce for Economic Affairs, the principal economic policy official for Commerce Secretaries Brown and Kantor and chief executive of the nation's statistical system. As such, he led the first comprehensive strategic review of the nation's economic statistics in four decades, leading to a major modernization of featured measures of the economy. He supervised the redesign of the 2000 decennial census. He co-chaired the White House working group on the restructuring of the U.S. economy in the face of information technology, was a leader in the U.S. planning effort for the two G-7 Jobs Summits, and oversaw the Administration's economic analysis of global climate change.

Prior to his service as Under Secretary, Dr. Ehrlich was Vice-President for Economic and Financial Planning, and for Strategic Planning, of Unisys Corporation from 1988 to 1993. As such, he had responsibilities concerning corporate development and finance, formulating business strategy, and economic forecasting. He reported directly to two chairmen of the company. He has also been the Senior Vice President and research director of the business-based think tank, the Committee for Economic Development.

Dr. Ehrlich earlier served as Assistant Director of the Congressional Budget Office, where he directed the CBO program in trade and technology, infrastructure and space transportation, energy and the environment, and agriculture. He joined CBO in 1977, after having served as a Legislative Aide to Congressman John Conyers, Jr., and having briefly taught economics at the university level.

Dr. Ehrlich is the author of two critically-acclaimed novels: Big Government (1998) and Grant Speaks (2000), both by Warner Books. He was a regular economics commentator on National Public Radio's *Morning Edition* for eight years, and his writings have appeared in *The Financial Times, Investor's Business Daily, The Christian Science Monitor, The Washington Post, The International Economy*, and other publications.

Dr. Ehrlich was born in New York City in 1950 and is a product of its public schools. He received a B.A. in 1971 from S.U.N.Y. Stony Brook and a Ph.D. in economics in 1975 from the University of Michigan. He lives with his family in Bethesda, Maryland, where he has coached Little League, acted in children's theater, been wardrobe master for the high school chorus, and waits for the Washington Nationals to win the World Series. Dr. Ehrlich can be reached at ehrlich@evehrlich.net.