

## General Discussion: The “New Economy”: Background, Historical Perspective, Questions, and Speculations

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*Chair: Arminio Fraga*

**Mr. Fraga:** It is clear that we are trying to understand something that, by now, we know is for real. The questions we are asking are very, very difficult. What will the future bring? We have interesting, open empirical issues to work on, and we need to filter the combination of bubbles and technological progress, which are always difficult to untangle.

I find that a lot of what we discussed here this morning seems to focus on a closed-economy environment (or U.S. economy environment). From where I sit, it is interesting to add to the debate and to embed it into our attempts at forecasting what will happen to the rest of the world. I can tell you from my own experience in Brazil that we are quite a few years behind the revolution. But it is coming to our shores. It comes blended with, in our case, a major effort in education, which we all know is a crucial component. Probably even if we are not in the very optimistic camp about how long this will continue over the years here in the United States, my hunch and hope is that the new economy will be very, very important for the future of the developing world, and, therefore, for the global economy.

It poses very interesting questions for developments, dreams, and strategies of countries like ours. Maybe this would be a first question in a way or a research topic: For a country like Brazil with limited resources, where exactly should we in government be looking as far as

the new economy and as far as our policy toward education, technology, and so on? Where should we be allocating our marginal dollar? Should we be thinking about regulating any of this? So, I will leave that as an open question to the authors and pass now to the first question that I see.

*Mr. Sinai:* A question for Chairman Greenspan on his tentative quantitative comments on the gains from capital gains on stocks and houses and their effects on consumption and the savings rate. I strongly endorse your call for accounts to better measure and track that phenomenon. Do you think the effects are symmetric—that is, similar but opposite in direction when there are capital losses, realized or unrealized? And, if so, or if not exactly symmetric roughly so, shouldn't we expect an unexpected rise in the savings rate now and unexpected weakness in consumption spending, apart from what conventional analysis of the wealth effect would suggest?

*Mr. Greenspan:* We obviously are working on the issue of symmetry between the impact of gains and losses. We are too early in the analysis to really get a good sense of that. Indeed, we really haven't had a full cycle to be able to catch the differential coefficients.

The broad econometric endeavors to capture the wealth effect almost by construction are symmetric.

My suspicion is that it is probably not symmetric, but that the differences may not be all that large.

I don't want to speculate on the question of whether the savings rate is going to go up independently of the issue of the impact of capital gains. That gets into monetary policy discussions and, as a lot of my friends know, I've learned over the last fourteen years that laryngitis in the face of such a question is an appropriate response.

*Mr. Fraga:* Thank you, Alan. There is one way in the back and a couple up here.

**Mr. Brynjolfsson:** This question is for Brad and Larry. I do try to spend some time talking to my colleagues over at the lab for computer science and the media lab. They share a lot of your optimism about some really amazing technological developments in the pipeline, not just a continuation of Moore's Law but some other very interesting technologies, some fraction of which will come to fruition. My question has to do with how we can think about this affecting GDP growth. As you pointed out, as long as the nominal share that we spend on these technologies and related technologies grows, then if we keep having something like a 25 or 30 percent real price decline in those goods, we are going to have an ever greater impact on productivity growth. The issue is that a lot of these goods and services often come out at vanishingly small prices. A lot of what people can browse on the Web might be comparable with several thousands of dollars' worth of encyclopedias and other goods (or similar e-mail could be thousands of times cheaper—even approaching zero cost). For those sorts of goods, you are not going to see an effect on the nominal share. You alluded to this in your example, but I would be interested in having you flesh that out a little bit more and think about whether the GDP numbers are really the right way to measure the effects of these technologies on the economy.

**Mr. DeLong:** Well, I think the answer is quite clear. The national income and product accounts aren't, they can't, they are not designed to value the utility that consumers get from goods that become essentially free. Back in the mid-1980s, Larry and I each wound up with a free copy of the Encyclopedia Britannica, which made both of us very happy at the time and certainly it's kind of discounted utility value to my household has been worth a lot more than the \$1,800 of market price that an Encyclopedia Britannica had then. But now, as Britannica searches for a new profit model, the capabilities that we had then are available to everyone with an interconnection now for free. In fact, the online Britannica is, in many ways, far superior to the paper Britannica, because the online Britannica has a much better index that is much more easily searchable. The gap between what Simon Kuznets & Company ideas of what you could measure in real GDP and what we would really want to measure in terms of material welfare or what

indifference curve you are on, that gap has always been there. But I do share your sense and the media lab's sense that that gap has become larger and more important over time. I am not clear exactly what new set of accounts we should call for to try to close that gap.

**Mr. Summers:** It seems to me that there are three ambiguities around this. One is that particular goods like encyclopedias and particular applications probably are subject to becoming free. Then, once they are free they can't get cheaper, as, in effect, happens with elimination. That is why I tried to emphasize the extents of margin and the new applications, as well as the intents of margin.

There is a second question that, I think, we need to reflect more on, having to do with the proper treatment of intermediate goods. If there are going to be sensors in cars, those are not, strictly speaking, components of GDP, if the car is valued as part of the GDP. So, how does one think about this weighted average framework if sensors for cars are going to be getting cheaper? Fleshing out your question would require that.

The third is the point that Alice emphasized, which is some of the benefits around all this—for example, medical errors. Reduced medical errors are probably sufficiently nonpecuniary in nature. It is a long time before the hedonic price indices are going to catch up with them. That is an additional source of distortion.

**Mr. Hall:** The paper's hostility to property rights puzzles me. President Summers added to it with material not in the paper of the discussion of the well where the imposition of a property rights regime on the well was harmful to everybody but the lucky owner.

The statement which says, "If information goods are to be distributed through marginal cost of production zero, they cannot be created and produced by entrepreneurial firms." I think that is a great oversimplification. What you see in these information products is very extensive bundling and the right to select within the bundle at zero incremental cost. That, of course, has been a central discussion with

respect to Microsoft, but you see it everywhere. It is happening now in professional journals. There is a very interesting debate going as to whether that should be allowed or not. The libraries are asking for a reversal of that. The pressure in the direction of zero marginal cost pricing within a bundle is very strong and it is a subject that Hal Varian has thought a lot about.

One thing that is endorsed very strongly in this paper, which again surprised me, is the effectiveness of the antitrust law. What is odd is that antitrust laws you see it being used very aggressively to attack bundling today to prevent the zero marginal cost solution within an entrepreneurial framework to prevent the property rights regime that we currently have from working. I believe that considerable rethinking is called for relative to the position you have taken in this paper in which intellectual property rights continue to have an important role and where bundling is respected as the way to get efficient allocation within a property rights regime, which provides incentives for innovation.

**Mr. Summers:** No doubt, after some further extensive discussion with you, the paper will include some expression of views on bundling, which it does not currently. There was not intended to be a position taken on bundling in an antitrust context. As I have said in other places and at other times, my sympathies are probably somewhat more in your direction with respect to the antibundling-type rationale for antitrust activity. I don't think the paper suggested otherwise and, if it did, it probably should not have.

I don't think, but I stand ready to be educated by you later, that the fundamental question, which involves the desirability of making sure that intellectual property is available at zero cost to be improved on is something that can be, even in principle, fully solved by bundling regimes. Any bundling approach that involves recovering full costs has to put the costs somewhere. The costs of entry to the bundle may then be distorted relative to what is appropriate with the set of efficiency consequences. So, I would have thought that the paper was actually sufficiently ambiguous to make it almost impossible for it to

be wrong in this area, since I would not have thought that you would want to take the position, even after your years at the Hoover Institution, that bundling is likely to assure that basic research in cellular mechanisms takes place at an adequate rate for all to be used, or that other kinds of basic research take place, and where on some continuum between the most basic kind of research. And the paper talks a little bit about the ultimate utility of research in pure mathematics—where in some continuum between basic research and applied research the line should be drawn does seem to be exactly the kind of very large question that one has to work through in the years and decades ahead. Precisely by virtue of only calling for a solution that was intermediate, I would have thought that the paper saved itself from the possibility there. The bundling question is one that I would be interested in talking to you about.

*Mr. Fraga:* Let me try to organize the last few questions. We have two questions—one in the middle and one toward the left—and Alan has asked to make a comment.

*Mr. Greenspan:* I wanted to follow up on a question. It has always struck me that when we are dealing with the paradigm of high fixed cost, zero variable cost, that the way the competition asserts itself is by the obsolescence of existing technologies and by competition through innovation. Property rights are a critical base for such innovation. It strikes me—I don't necessarily characterize your statements in the way that Bob did—there is a very interesting dilemma here. You certainly don't want to patent the wheel or generic ideas whose immediate application is uncertain. Consequently, there is no obvious absolute rule that applies to property rights on all issues of value. There can't be. Thus, it is unclear where you draw the line in this so-called "new information society" as differentiated from, as you put it, the Smithian society.

*Mr. Fraga:* If you don't mind, Larry, we'll let you have the last word. We'll have two questions—one over here and then Chuck in the middle.

**Mr. Eisenbeis:** I'd like to push on another dimension of the policy recommendation that is made. That has to do with the use of regulatory policy to segment markets, so that poor people—to use the example in the pharmaceutical area—in poor countries could pay a very low variable cost and the fixed cost would be paid through regulation imposed on people in highly wealthy countries. That has a problem if you are in a world economy where people can shift production offshore to avoid regulation. That sounds like Regulation Q again, where an indirect subsidy is used as a way of redistributing income. We know that doesn't work very well over the long haul.

The other alternative is to use grants and subsidies. That way one knows the value of the tax and the value of the subsidy and can target the subsidy exactly to where one wants.

**Mr. Freedman:** I just want to follow up on a comment by Arminio Fraga. One of the things that is striking about reading these five papers is that only one of them—the Baily paper—has any reference to what is going on in the rest of the world. As Chairman Greenspan has commented on occasion, it is fascinating that this technology acceleration has occurred largely in the United States and not elsewhere. The question is—Why? I don't have a complete answer to that question, but I do want to draw attention to a couple of points. One is that, to the extent that the United States is the major producer of technological equipment, it is not surprising to see the early evidence of productivity acceleration coming in the United States. When the users of technology begin to see increased productivity growth, then, of course, one should begin to see it in other countries as well as in the United States. In Canada we thought that we were getting it in the last couple of years until the slowdown made it less clear whether it is happening or not.

Another element, which I think could be quite important, is how the benefits get circulated around the rest of the world. We tend to think of standard of improvements in the living as being largely driven by productivity growth. Of course, that is true in the long run. Most of the time we think of terms of trade as a variable that remains more or less

flat, along with some cyclical movements. If the United States is a major producer and exporter of technological equipment that has declining prices, the U.S. terms of trade should have a trend decline over the next few years, or maybe indefinitely if this is an important factor. The rest of the world, which imports a lot of these goods, should have an improving terms of trade. Of course, the standard of living is a function of both terms of trade and productivity growth. So, it may well be that, although U.S. productivity growth is more rapid than elsewhere because of the production in the United States of technological equipment, improvement in the standard of living will be evened out to a considerable extent by the terms of trade adjustment. That remains to be seen.

*Mr. Fraga:* Thank you. Well, for a wrap-up, we'll let the authors speak.

*Mr. Summers:* Let me touch on three questions that have been raised and then give Brad the absolutely final word. I don't have a terrific answer to Alan's question of—if you can put it this way—what should not the length of a patent be but the width or the depth of what a patent should be going forward? I think the crucial questions involved, taking Alan's example, that it is indeed obsolescence that is the competitive discipline in Schumpeterian economy. To what extent do we allow those who innovate to have control over the prospects of their own obsolescence, which involves drawing on their technology? That is really the central difficulty. The central challenge, of course, is that, if you give them a lot, they may use it in ways that are unattractive. If you give them a little, then you are not really giving them anything like the full fruit of their innovation. So, there is a rather large market failure inherent in any allocation. That is why the somewhat going beyond property rights notions were put forward.

With respect to price discrimination, Hal Varian can speak to this with much more clarity than I probably can. I think it is important to clarify that the issues go beyond the question of the redistribution of income to the efficiency gains that are possible from allowing price discrimination between those with differing demand curves for any



reason can represent a substantial efficiency improvement quite apart from any redistribution of income that is achieved. To the extent that it is possible to allow that efficiency to be realized there will be gains that result. I think Arminio and Chuck's comment about the ignoring of globalization is a fair one. I don't know enough to respond intelligently to Chuck's question. It seems very relevant to me in thinking about it, though, that my PC embodies American ideas but was actually produced in Taiwan. As you think about it, it is not as simple as America being where it is all produced, very much to the contrary. It is a little more complicated than the story you told. But, just which way that works I can't think all the way through. I guess my answer to Arminio, which certainly falls very much in the hunch and hope category, would be to recommend an emphasis on education as the passport into all of this for a country like Brazil. I would record the view that some amount of the euphoria that has been propagated by a variety of places and people—certainly those in the industry and, at times, the U.S. government and the World Bank holding out the prospect that the Internet is going to be the salvation of African villages where nobody can read and there is no running water and there is currently no electricity—has been somewhat overdone. There would be some substantial risk in approaches that try excessively to jumpstart developments through information technology.

Finally, I think I find myself in sympathy with almost everything that Alice said, although I would highlight that is precisely the general-purpose nature of these technologies that leads us to the expectation that demand will be elastic for quite some time to come.

**Mr. DeLong:** Let me say that we cut all price discrimination and efficiency questions to Hal Varian, who will shortly give the definitive word on them. There were very interesting things said about the possible advantages of rents and subsidies, as opposed to regulatory policies to try to produce economic efficiency. For that, I would like to point people to the very interesting work of Michael Kremer at Harvard—about how one might think about shifting government support for research and development and other things with large externalities from an inputs to an outputs perspective, that is, instead of

paying scientists at NIH paying for results. I am still somewhat bemused by the fact that Bob Hall thought that our section on price discrimination was favorable toward standard antitrust doctrines. I want to agree with Alice Rivlin—first, in her observation that perhaps the real impediment to making great use of these technologies is organizational and, second, that the question of what exactly is an information technology industry is certainly going to be crucial. The industrial revolution, which starts with using a steam engine for coal mining and then automatic machinery for spinning cotton together, if you want to talk about those two sectors as the leading sectors of the late eighteenth century British economy, they are a relatively small part of output and they stay a relatively small part of output. But, the sectors in which those rapidly progressing technologies of metallurgy, of steam, of automatic machinery are used, those sectors grow to eventually expand and cover more than half of the economy. Even agriculture becomes a truly industrial sector—a very high capital-intensive, a very energy-intensive, a very knowledge-intensive part of the British economy, even though no one back when the Industrial Revolution began would have said that agriculture is ever going to be a “high-tech” industry from the eighteenth century standpoint. Yet, it became so. Similarly, I remember when I read Sam Walton’s autobiography about Wal-Mart and came across a paragraph about how information sharing had been one of his principal sources of competitive advantage that Walton believed very early in giving a store manager not only every single number relating to the store, but sharing those numbers with department heads in other stores so that people running stores in Kansas could see what was selling in Nebraska. Walton was an early proponent of business investments in IT, spending “hundreds of millions of dollars on computers and satellites to spread all the little details around the company as fast as possible.” In his view, they were worth the cost. If you think of a Wal-Mart store, to some degree it is an information-intensive enterprise getting the goods that customers in middle America would like to buy in large quantities onto the floor and visible in the right order and at the right time. We don’t usually think of selling plastic doghouses to consumers in the Missouri valley as the core of the new economy. Yet, there is a perspective from what that view is not far off.

As to Alan Greenspan's questions about where you draw the line and how much you promote intellectual property rights in order to provide incentives for innovation, as opposed to promoting them too far and, thus, giving businesses that have strong market positions control over the emergence of their own sector of their own successors, then, thus, the ability to manage the emergence of their own successors at a pace that is suitable for their shareholders rather than the economy as a whole, these are the most difficult questions of all. Now, if I were talking thirty or forty years ago, I would say that it is obvious that what is called for is a lot more government involvement in research and development, a lot more public funding of what is a public good. Today, we have a much sharper sense of the extent to which bureaucracies have their own bureaucratic failures, which can often dwarf market failures. And the idea that what is good about competitive market processes is not just that they provide correct incentives for people to engage in profitable activities, but also that they provide a lot of freedom for individual experimentation. There is a very strong sense in which we would like to have many pharmaceutical companies trying to develop drugs, as opposed to only those people who can get past an NIH review committee trying to develop drugs. These are issues on which our models aren't very much good. That is too bad because these may be the most important ones of all.

*Mr. Fraga:* Thank you.