

Was Vickrey 10 Years Ahead of the Profession in Macro?

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When you read the Nobel citation for Bill Vickrey, it is clear that he was cited for his work in micro. Had Bill been here today he would not have been talking about micro; he would have been talking about macro policy. Specifically, he would be chastising policy makers for not working hard to expand the economy beyond where it currently is. It was because of his work in macro that Bill was pleased that he won the Nobel Prize. He fully intended to use that prize as a bully pulpit to spread his views on macro policy.

Bill had been talking about macro policy for a number of years, and in his presidential address to the AEA he made some of the arguments he would have reiterated and refined here. I attended that address and I remember overhearing two young economists sitting in front of me as they shook their heads and asked, "Who is this kook? Is he for real?" While the majority of macro economists would have been far more subtle and polite, they would have agreed in principle with that assessment. Somehow, the thought, in the early 1990s, that you could expand the economy significantly below the then perceived 6.5 percent natural rate of unemployment qualified Bill as a kook.

Bill knew how the profession felt, and it didn't bother him; after all, in micro, he had been considered a kook until the profession caught up with him. And, in transportation, he had roller skated to work back in the 1950s, predating by 40 years the roller blading craze. Being years ahead of the profession was a standard operating policy for Bill.

Bill's Early Work in Macro

Let me begin by talking a bit about Bill's early work in macro. Many will be surprised to hear that there was any early work, but, in fact, in 1963 he wrote a macro text, *Metastatics and Macroeconomics*. In that book he set out his basic understanding of macro issues. The first thing one sees when reading that book is that Bill saw macro as an extension of micro; his 1963 framing of the macro problem in a general equilibrium micro perspective occurred years before others caught up with him and created New Classical economics. In the first part of that book he discussed metastatics, which he defined as an analysis of change through time in which uncertainty is excluded. In it he developed a general metastatic intertemporal equilibrium in a hypothetical futures economy "as a prelude" to dealing with macro issues.

Of course, Bill wasn't much at marketing; entitling the book "Metastatics" was not a wise marketing move. Had he chosen "New Classical Economics with Rational Expectations," which has essentially the same definition, he may have had more marketing luck.

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Bill's impatience with theorizing for the sake of theorizing shows up in that book. Bill's interests in theory always flowed from policy issues. Thus, since he could intuit the policy result of his general equilibrium metastatic model—perfect markets working perfectly always lead to the conclusion that government should not intervene—he had no interest in expanding and formalizing metastatics as modern researchers have done. Instead, Bill saw metastatics as a logical, neat first step into the interesting issues of macro dynamics. This, of course, was the case of many early Keynesians, and if younger economists spent a bit more time reading the work of those economists on whose shoulders they are standing, and less time assuming their Keynesian predecessors were dumbbells who failed to understand metastatic intertemporal issues, the profession would be much further along in its understanding of macro than it currently is.

The point is that Vickrey, and many early Keynesians, saw nothing inconsistent between a dynamic interpretation of Keynesian economics and their view of metastatic general equilibrium. Such a perfect foresight equilibrium was so far from reality that to waste time studying it would violate the law of significant digits. Their interest was in dynamic inconsistency issues—issues that they recognized were beyond the mathematical tools available to them, and thus inappropriate for formal study. It is only now, in the 1990s, with the development of the science of complexity, that such formal work begins to make sense. And what that new work tells us is that Keynesian economics has a potentially solid theoretical foundation in a framework of intertemporal dynamics with uncertainty, just as Bill argued it did in his metastatics book.

Bill was not interested in exploring theory for theory's sake: He was essentially an economic engineer whose interest was policy; theory for Bill was a way to understand the economy so that he could design policies and new institutions to make the economy operate more efficiently and fairly. For Bill, economists were the economy's investment in institutional technological change.

Bill's interest in macro theory followed from his interest in policy, and in his 1963 book his reading of the macro policy was relatively clear. We had the tools to expand the economy, but we did not have the tools to see that that expansion resulted in real output growth rather than inflation, nor did we have an acceptable braking system to slow the economy down without causing a recession.

A Simple Idea

I'm up here speaking because in the 1970s it was I who brought Bill's interest back to macro. Bill was intrigued by a little paper I wrote in 1974 called "The Free Market Solution to Inflation." The idea in that paper was a simple one: Let's say that, instead of its current institutional structure, the economy had a different institutional structure in which rights to change nominal prices were rationed in the following way: Suppliers could lower or raise their nominal prices only if they found other suppliers who would agree to raise or lower their nominal value added weighted prices by an offsetting amount. Such an economy, I argued, could have no inflation problem.

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Bill was intrigued by my simple idea. It was, for him, a major breakthrough in our understanding of the institutional structural change we needed in our real-world economy to solve the inflation problem. It would allow the level of inflation to be institutionally set, and, by doing so, would allow the economy to reach a preferable real equilibrium.

This view needs some explanation since it is quite inconsistent with the "natural rate" view of aggregate equilibrium, which has become the new orthodoxy. Bill, and most early Keynesians, did not accept the concept of a unique natural rate of unemployment. Bill saw the economy as capable of achieving a variety of unemployment equilibria. Which one it achieved was dependent on expectations, government policy, and institutions. Thus, Bill considered our economy a multiple equilibria economy. Unique equilibria existed only in an irrelevant-for-policy metastatic general equilibrium model.

Bill did not try to develop his model from micro foundations; the interrelationships in the economy were too complicated for that. Instead, he formulated his concept of aggregate equilibrium as a systemic concept—one in which the dynamic pressures pushing the price level up equaled the dynamic pressures pushing the price level down. Within the range of unemployment where our economy generally operated—between 4 and 8 percent unemployment—these inflationary pressures were only minimally affected by aggregate demand. Moreover, core inflationary pressures were subject to significant shifting around due to institutional changes and random events. Inflation was primarily a supply side/expectational phenomenon. In such a systemic model, equilibrium is still brought about by individual decision makers, but the connection between the market incentives they face and the aggregate equilibrium outcomes their decisions lead to are too tenuous for individuals to take their contribution to the aggregate equilibrium into account in their decision making; thus, individual rationality does not imply collective rationality.

The Short-Run/Long-Run Connection

The macro policy question for Bill was: What policies should we use to get the economy to a desirable equilibrium? His support of substantial deficits can be understood in this light. Bill believed that within the economy's standard operating range, a deficit, combined with expansionary monetary policy, would push the economy to a preferred short-run equilibrium. Doing so would create new patterns of trade, coordination, and technology, increasing productivity and thereby leading the economy to a preferred long-run equilibrium.

This short-run/long-run connection was central to Vickrey's, and early Keynesians', analysis of the economy, and underlay their support for expansionary aggregate demand management policy. The long-run equilibrium toward which the economy gravitated depended upon what short-run equilibrium government policy led it to.

Expressed in modern terminology: Expansionary aggregate demand policy influences the long-run equilibrium through its effect on the equilibrium selection

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mechanism. The unique equilibrium natural rate model misses that effect since it assumes away the need for an equilibrium selection mechanism.

If one accepts Bill's view of how a short-run expansion can lead to a preferred long-run equilibrium, Keynes's quip that "in the long run we're all dead" has been seriously misinterpreted. It should not be interpreted as meaning that we should forget about the long run; instead, it should be interpreted as meaning that the long-run equilibrium is dependent on the short-run equilibrium we choose. Specifically, in the 1930s, early Keynesians believed, I think correctly, that unless we dealt with the short-run problems, our economic system would not survive. Abba Lerner clarified this when he said, "In the long run we are simply in another short run."

To clarify their views further, what should be added to that is that the short-run equilibrium we find ourselves in, in the long run, depends on the short-run policies we adopt now. If Bill's views were right, throughout the 1990s we have been operating at lower output than was possible and economists' unique natural rate vision has cost our society hundreds of billions of dollars of forgone achievable output. This was the message Bill wanted to get out.

The Death of the Natural Rate Theory

For those of us interested in the spread of ideas, the introduction of the natural rate as the fulcrum for economic policy is an interesting case study. It caught on because it fit the data of the 1970s better than did the standard Phillips curve. It has, however, never provided an especially good statistical fit with the data, and in the 1990s, it has failed miserably. In terms of predicting how much room existed for expansion, most economists, with the exception of a few such as Bill Vickrey and Bob Eisner, have serious egg on their face. Given recent experience it is clear that the natural rate theory has provided a false certainty about policy prescriptions. *It should, at this meeting, be declared dead, and given a proper burial*, just as the false certainty of fine tuning was declared dead some 30 years ago.

Of course, I speak the above with hindsight. Unlike Bill, who was arguing the above throughout the 1980s and 1990s, and being called a kook for doing so, I chose to keep my "reasonable economist" designation, and to keep quiet about macro policy. I did so because I see far more ambiguity in our understanding of the macro economy than did Bill. In my view, there is no one model of the economy that is appropriate for all times; the appropriate model changes. Policy oriented economists' job is to pick the right model, not to provide a single model.

Let me explain what I mean. Models are a way of compressing information. Efficient compression of workable policy precepts is likely to involve hierarchical compression in which policy precepts are initially separated by the economy's structural characteristics at that time. Given those structural operating characteristics, one can develop a model, and come up with policy precepts.

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The first thing a policy economist must do is to select the appropriate model. We economists have not done well in that selection process, in large part because we seem to want one model to fit all. That desire has led us often to use a model for a time period in which it is inapplicable. We end up like the child in the fairy tale who, having been told that the correct way to bring home a dog is with a leash, carries over that "lesson" to the next time he is sent to pick up something. He drags home a pound of butter on a leash.

What I am arguing is that many of the economic issues relevant for policy are not technical modeling issues, nor are they issues that can be resolved by technical statistical analysis currently available; they are judgment issues, and judgment is not something that is selected for in the process that turns young men and women into economists. I look out at the economy today, one in which inflation is not a serious problem, and where there are serious questions of a global glut, one in which global competition is holding wages and prices down, and I see the type of economies early Keynesians saw in the 1950s and early 1960s. Yet, I see economists conceptualizing their policy prescriptions based on the structural characteristics of the 1970s, not the 1990s, economy.

The Natural Range Theory

The death of the natural rate theory raises the question: What theory are we going to replace it with? I suggest a far less certain theory, one which reflects our actual knowledge of the economy. This theory might be called a *natural range of unemployment theory*--a theory that sees a range of non-accelerating inflation rates of unemployment equilibria as possible. This range is institutionally determined, and, for the United States, is somewhere between 3 to 4 percent unemployment on the bottom side, and 8 to 9 percent unemployment on the high side. The macroeconomic policy debate is primarily about what the appropriate policy should be within the range, with a secondary policy debate concerning the size of the range. Once the economy is outside this range, there is little policy debate.

I am attracted to this natural range theory because it is encompassing enough to accept both Bill's view of the economy and the current mainstream view. These views differ about the nature of the tradeoff within the natural range. Bill's view paralleled that of Abba Lerner's that, within this natural range, there was essentially no inflation/unemployment tradeoff. Alternatively expressed, within this range, the Phillips curve is flat, and aggregate demand has little effect on inflation. If this theory is true it suggests that the relationship between deviations of unemployment and inflation are nonlinear, and the statistical fit we get between increases in inflation and unemployment comes primarily from the extremes, not from small deviations.

This natural range theory is much more inclusive than the natural rate theory. It accepts, as Bill did, that current standard economic theories are relevant outside the natural range. Given the current U.S. economy's structural characteristics, below 3 to 4 percent total unemployment, aggregate demand creates inflationary pressure, and causes inflation. Above 8 to 9 percent unemployment, cutting aggregate demand will eliminate inflation and, depending on institutional characteristics of the economy, it may actually create deflationary pressures. But it also is consistent with Bill's view that within the 4 to

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8 percent range, the standard relationship breaks down, and one must look elsewhere for ways to fight inflation.

Unlike the standard Phillips curve, or the natural rate theory, a natural range theory is consistent with both the 1970s and the 1990s experiences of the economy. The 1970s inflation was caused by major nominal upward price shocks, combined with wage- and price-setting institutions conducive to inflation, both of which became built into expectations of inflation. The 1990s lack of inflation, in spite of expanding aggregate demand, is due to (1) nominal downward price shocks, (2) wage- and price-setting institutions experiencing significant international competition, and (3) the building of the above structural characteristics into expectations of declining inflation.

Dealing with the Inflation Problem

Bill's view does not mean that inflation cannot be a problem; it simply means that within the 4 to 8 percent range, inflation is a separable problem from unemployment. Within that range, inflation is best dealt with by means other than contractionary monetary and fiscal policy. Contractionary policies to fight inflation simply add to the misery index without significantly reducing inflation. Running contractionary aggregate demand policy to fight inflation is the modern equivalent to the practice of blood letting to cure diseases; it piles one misery onto another, without doing any significant good.

In 1996 anyone who had been so bold as to say that unemployment could be reduced to 4.6 percent without generating accelerating inflation would have been labeled a kook. That didn't stop Bill from arguing that, and if Bill were here today he would be telling you that, given current conditions, unemployment could, and should, be reduced to 4 percent, or even 3.5 percent, without generating accelerating inflation.

I don't know whether Bill was right in that view, but I also don't know whether he was wrong. The empirical evidence, when scrutinized, is ambiguous, and does not allow us to reject a wide variety of theories. Many, if not most, economists would agree with me on this, especially if they include the evidence of the last two years. But, by that same token, the evidence does not allow us to hold the theories we hold with much certainty. Yet economists seem to hold deeply whatever theory they subscribe to, as if it is the truth. Economists seem to have a genetic predisposition against uttering: "We don't know, and the empirical evidence doesn't tell us the answer."

Induced Unemployment as an Immoral Policy

To say that Bill had a complete formal theory of the aggregate economy would be wrong. But for Bill that did not matter. His interest was in translating the understanding we did have into policy proposals that would achieve his normative judgments about what our economy should be. Unemployment, for Bill, was an immoral way of holding down inflation. Given our institutions, the burden of that unemployment was borne unequally by the poor and the less well-off, which meant that not only was it inefficient, it was also unfair. Thus, even if he were wrong in his assessment that reducing unemployment to less than 4 percent would not generate accelerating inflation, he said he

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would still advocate doing so. His answer to those who said that the result would be that government would be forced to change policy and induce a recession was: No; fighting inflation by keeping the poor and less well-off unemployed should violate society's collective normative judgment. He followed Beveridge in believing that it is society's job to create more positions than job seekers, so that firms do the primary searching for workers, not workers for jobs.

The appropriate policy, if an inflation were started, would be a change the institutions of the economy so that the lower unemployment rate is consistent with no inflation. You don't accept a normatively unacceptable rate of unemployment as an equilibrium.

The Free Market Solution to Inflation

It is here where my free market solution to inflation, later renamed MAP (the market anti inflation plan) by Abba Lerner and myself, came in. Bill saw MAP as the institutional change needed to guarantee that a true full employment—roughly 2 to 3 percent unemployment—could be reached in a way that was institutionally compatible with a non-inflationary economy. And it could do so in a way that was fully consistent with existing institutions.

To see why, consider the following questions: Assuming there were property rights on value-added prices, what would the price of raising price be, and what implication for the economy's natural rate would a positive price of raising price have? The answers are simple: By definition, assuming there were no inflationary pressures, the price of raising price would be zero. If there were a positive price of raising price, then MAP would be eliminating inflation pressure; the higher the price of raising price, the more inflationary pressure it would be eliminating.

To emphasize that the purpose of this program was to allow real growth, rather than to stop inflation, in his recent work Vickrey had started to call the rights to change prices "growth warrants." Here's how the growth warrants were allocated: All firms are allowed warrants equal to their level of value added at the initial starting period. Each year firms receive additional warrants equal to the average increase in productivity in the economy. Thus, all firms are allowed nominal raises in input prices consistent with a non-inflationary economy—that is, increases in growth warrants equal to the average total factor input productivity.

When firms hire additional workers, or invest more, they receive additional growth warrants equal to the value of those inputs in their previous use. This means that firms increasing their inputs would receive additional growth warrants, and firms decreasing their inputs without lowering their value-added price would be forced to buy additional warrants. This would create inflows of capital to growing firms from firms who were monopolizing—increasing their value added per input. That's why the plan can also be seen as a tax on monopolization.

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A positive price of growth warrants would encourage hiring and price cuts. The MAP plan is a type of synthetic competition that modifies our current institutional structure so that it acts as if it is more competitive than it actually is.

There are many technical and practical issues that need to be answered before these plans can become reality. Concern about these issues kept many economists who supported the plan in principle from supporting it in practice. However, no serious attempt was made to deal with these issues. Bill felt that all of these practical and technical issues had answers—not perfect answers, but answers—and that a major effort should be undertaken to resolve them. It never was undertaken because, politically, such a major institutional change was not in the cards.

The higher the price of these growth warrants, the higher the cost in administrative expenses and misallocated resources. But the higher the price of these growth warrants, the lower the achievable unemployment rate. Thus, the imposition of this plan would present government with a new tradeoff—the systemic gain in aggregate efficiency against the administrative costs of the plan.

The plan has one other major advantage: It will allow a much more precise use of monetary policy. This follows since the price of growth warrants would give us a direct measure of the inflationary pressures in the economy. We would no longer need to operate monetary policy blind; instead we could set a monetary rule based on the price of these growth warrants.

Bill was much more of a visionary than I, and much more willing to argue that MAP was ready for prime time. I do not know whether MAP actually is workable in practice, or whether the politics of inflation control could ever change sufficiently so that it could be tried; however, I will argue that it should be explored in much greater detail than it has been. I will also say that there are large potential gains from it, and, it was precisely the type of actual policy that Bill could see working in practice that other economists could not.

Concluding Comment

Let me conclude with an observation about the profession's reactions to Bill's views on macro. With the benefit of the observations of the late 1990s, it is now clear that Bill's view that, within the natural range, inflation and unemployment are separable issues has much more merit than the profession has perceived in it. A profession that can turn out young economists who see such ideas as kooky, without a deep consideration of them, is not training their young economists acceptably. Somehow, we need to give young economists a better sense of our lack of our understanding of the economy.

I suspect that with recent developments, and economists' poor record in predicting those developments, Bill's macro views will be making a comeback. It is quite likely that, sometime in the future, the profession will come to believe that Bill was not only years ahead of the profession in micro; he was also years ahead of the profession in macro.

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Junk at end not be edited.

There is a well known joke about the economics profession. A student comes up to his professor of 20 years ago, and looks at his exam. Having a good memory, he recognizes the exam, and asks his professor how can he be giving the same exam 20 years later. His professor answers; in economics the questions don't change, it's only the answers that change.

There is a well known tale I tell my kids, about —who is always responding to

Economists have been searching for a general theory—Keynesians, Classical. The lesson of the last 100 years is that there is no general theory—at least as it relates to . What macro policies are appropriate depend on where the economy is in relation to its experience curve, and where. Sometimes we are in a Keynesian situation, and aggregate demand is the constraint. At other times aggregate supply is a constraint. And at other we are in a neather world between the two. there is a limit on how much we can expand output. In other economics

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Markets are economist's ether; they assume them to exist, because they need them, but they do not show that their existence is compatible with individual incentives. Thus Vickrey had little patience with further specification of that model unless it was to capture a further insight. —an institutional innovation.

Given these seller-set markets, the inflation pressure existed, and had to be offset in some way. If luck were with the economy, the economy could achieve the low level of full employment, as we have in the 1990s; if luck were against the economy, the economy would be forced to go back to the low level of full employment. Bill was so intrigued with the MAP plan because it replaced luck in setting inflation with a market mechanism.

Moreover, it placed normative issues in a quite different setting. Bill's approach to policy was also different; in it one uses what might be called loose theory to decide what goals are feasible, what goals are not, and then having normatively chosen ones goals, one sets out to determine what institutional changes were needed to achieve efficiency.

So there is a different equilibrium for each, and indeed the MAP credit price. With that implemented, we would have to wonder if there was slack in the economy. The MAP credit price would tell us. It has been close to zero the last five years, and

Bill called them growth warrants, to emphasize that

The scheme that so intrigued Vickrey, Lerner and myself involves a major institutional change—one establishing property rights in prices and letting. A number of technical issues on the establishment of those prices—they are on value added input prices. Specifically, they would only be for the largest five hundred firms, as that would probably (presenting the hurdle problem) It is a change in the lottery system—the system subsidizes a percentage of the initial.

Now no one claims that this program is without administrative and set up costs. Any market has those. What supported do claim. is that with this system we can achieve 2%-3% unemployment, permanently reaching the economy's low level unemployment.

Let me now turn to my free market solution to inflation that so intrigued Bill. Decisions had multi-market consequences, and feedbacks, given our institutions of seller-set prices that he took at given. I should make clear that seller set prices have nothing to do with fixed prices. Instead they mean that the auctioneer and the seller are one in the same, and that gives the seller some temporary, but no steady state monopoly power over price, the monopoly return being the rent for setting up the market

The process of inflation and the real economy are only loosely related. Inflation presents a constraint upon policy that can be seen in Lerner's Phillips curve and his concept of high full employment and low full employment—the ranges of the curve.

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By choosing institutions and policies economists job was to choose the equilibrium it wants within the general ranges of feasibility—somewhere between 2% and 10%.

Short run macro policy was a way of guiding expectations . Keep the economy going and expectations would remain high, and the deficit would no longer be needed.

The potential for accelerating inflation was also well understood.

Bill did not accept the concept natural rate. Instead he approached the economy as having a feasible rate, by which he meant that there was nothing natural about what people were calling the natural rate. He saw 1-2 percent unemployment as possible and feasible. In his 15 fallacies he writes.

The engineering problem was: how do you achieve that desired level of unemployment? The first thing you do is expand the economy as fast and as hard as you can. We know how to do that with expansionary monetary and fiscal policy. The feasible rate is then discovered. If you held a balanced growth theory of long run growth, this approach seems kooky—you are trying to do the impossible, but the long run balanced growth theory is inconsistent with Keynesian economics as Bill understood it. They had a quite different view of the nature of the long run and the relationship between the long run and the short run.

This ultimately became my dissertation, and I worked on it with Abba Lerner and Bill Vickrey. ¹_____

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Approaching the macroeconomic problem, as he did, as a micro economist, he naturally thought about unemployment as a flow equilibrium—but he saw the need to create an institutional structure in which job searchers were significantly lower than job offers. But, his view was a general equilibrium view in which he saw systemic inefficiency rather than individual market inefficiency. The inefficiency was inherent in the monetary system which, given institutions, could. Thus he saw a change in wage and price setting institutions could significantly affect the equilibrium, which they in fact did in the 1990s quite opposed to all those economists who claimed that there was a natural rate that was determined by private demographic forces. It was his view that has been proved historically correct.

Thus, Lerner had a low level full employment and a high level full employment. and the issue some institutional redesign was needed to achieve 2%, then let's consider that institutional redesign. There was nothing natural about the natural rate, especially the way it was measured in the U.S. which was to look at the past.

It is a systemic technological change that is enormous. But that didn't stop Bill who understood that those problems would be solved if the economy had the will to try it. the way you implement a policy is by implementing it, and adjusting it.

. Seeing this as a problem of search and waiting, and individual incentives was not useful to Bill; it wasn't relevant, but it didn't focus on the what he felt was the right set of issues for the institutional change he was thinking about. Specifically, he was thinking of a systemic change—a change in the way markets worked, . I played a role in getting him to think about that change, and

He became much more enamored with it that I—I read the writing on the wall—politically and professionally, there was little interest in it; I would switch my focus, and try and understand why—manpower training programs, information.

It was about information, but it was systemic information—the way a multi-market seller set price market processed information about the price level and fed that information back to incentives of individual price setters. There was a serious systemic problem there, which prevented the use of expansionary aggregate supply-demand policy to increase output. When the brakes were pushed slightly, there was a disparity, which could send the economy in a spin, and that spin. The fear of doing so prevented the economy from reaching what Lerner called high full employment and what Vickrey called chock-full

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employment. But they both saw multiple equilibrium. I might say that recent history has shown them right. At the time Vickrey was out calling for expansionary policy—a majority of economists were saying that if the economy got below 6% unemployment accelerating inflation would begin.

Vickrey didn't see that, although he did admit that within a regime there was many unemployment rate that would be compatible with relative wage and price stability. You expand to the limit of those, and then you change institutions if current institutions are incompatible with your goals.

the gains in welfare and unemployment savings.

Let me take an example: how do we explain the tremendous run of good luck that had characterized the U.S. economy in the 1990s.. By a change in regimes. Discussion of regimes go into this, but it is more complicated. Regimes are not simply made by a policy maker; they are determined by an entire actions of systems.

Ironically, it was precisely the 1990s that the early Keynesians had in mind when they talked about equilibrium. For Bill and Abba there was a high level and a low level employment equilibrium—the achievable of the latter was dependent on how quickly inflation became built into the wage and price setting institutions.

It seems ironic that just

Vickrey was an old time Keynesian, and he wore that badge as a badge of honor. For those who have not read Keynes,

Most conceptions of the relationship between the long run and short run assume a unique long run. When there is not a unique long run, let's say there are two long runs, the standard conclusions fall apart; let's consider the standard fiscal policy paradox.

Moreover, they did not accept a unique long run growth rate or level of income to which the economy would gravitate. Instead, they believed that the short run and long run were inextricably entwined. The long run growth path is a figment of economist's ex-post imagination, and the forces which drive the economy back to it, are simply non existent or too weak to do the job of overriding the large number.

Nate Rosenberg's excellent work on growth (For a nice recent statement on this see Richard Nelson.

Modern work in the science of complexity has shown that view to have a solid foundation. In complex systems inevitably have Simple linear generating functions will

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do poorly at matching such systems over time, and the operating characteristics of such systems can change suddenly.

The world may be fully deterministic, but as an operating rule, that determinism would still be chaotic. It was such an underlying world view that Vickrey had.

The view that expanding

The second component of Vickrey's thinking that did not fit was that the savings rate posed a limitations for growth. That followed since growth was not capital, but instead activity based.

One of Keynes' greatest lines was "in the long run we are all dead. It was a put down that didn't settle the issue, and in many ways confused it, because it was the acceptance of a unique "natural" long run existed, independent of the short run, that would come back to undermine Keynesian theory. Bill's view, and most early Keynesian's view was fundamentally different than the modern view. They did not accept . Instead they viewed that there were a variety of equilibrium were possible, and They were wrong in how to get them; in my view most of these equilibria are expectationally based.

Simple models in a could not capture the interaction, but some simple . Thus, a central element of long run growth is an economy wide experience curve—a learning curve for the economy. High output in the short run creates the neural nets which forms the possibility of high output in the long run. It is precisely the same phenomenon they are discovering with development of the brain and children's learning. Stimulate children's minds, and you stimulate their brain; you set up new neural nets which influence the economy in the long run.

High short run real growth creates the patterns of trade and experience upon which long run growth is based. Thus the future growth rate is dependent on the present growth rate, and the short run policies we follow.

There is no long run independent of the short run and any theorizing based on the assumption that there is, as is the natural rate underlying much of the macro that will be presented at this conference is simply wrong.

To see our macro models as engineering models rather than as scientific first principles models in now how they have always been presented, leading how they were developed, but Bill was not part of that development. He was busy developing schemes for highway pricing.

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