

In Memoriam: Zvi Griliches, 1930-1999
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There is no doubt that Zvi Griliches stands out as one of the most important and influential empirical economists of our times. His contributions, both direct (in the form of his many scientific publications)¹ and indirect (through his formative influence on students, colleagues and applied economists at large), can be thought of as consisting of two pillars: one refers to quantum advances that he brought about in specific areas of research, the other to his impact on the conduct of empirical research as such.

The bulk of Zvi Griliches' specific contributions have to do with the detailed study of technological change as the main source of long-run economic growth, including the determinants of the diffusion of new technology, the measurement of physical capital, the role of education, and the contribution of research and development. A unifying thread in many of Griliches' papers in this area is the view that technological change itself is an economic phenomenon amenable to economic analysis, rather than "manna from heaven". Indeed, Griliches devoted a great deal of research effort to expand the scope of analytical and measurement frameworks, and to gather new types of data, in order to bring aspects of technological change further and further under the scrutiny of the economic lenses.

Griliches' work on the diffusion of hybrid corn (the first article, stemming from his Ph.D. dissertation, was published in 1957), catapulted him to instant fame, and has since turned into a true "classic". It was novel and original in every respect, it spanned a whole new field of diffusion studies using Griliches' basic methodology, and it remains still today a

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¹ Griliches wrote over 120 scientific articles, 13 books, and scores of comments and notes. Reflecting their impact and lasting importance, his publications have received an extraordinarily large number of citations.

prime example of powerful, thorough, and original empirical research. In a follow-up paper Griliches computed a rate of return to research in hybrid corn, again breaking new ground and again setting the standard (as well as the benchmark) for many years to come.

Many of Griliches' other contributions stemmed from his repeated attempts to scrutinize the inside of the productivity growth "black box." In the late fifties and early sixties the works of Solow, Abramovitz, and Denison, among others, resulted in one of the most important empirical discoveries in economics: that most of the growth experienced by the industrialized world was due, not to capital accumulation, but to productivity growth. This conclusion was reached within the measurement framework of an aggregate production function, that is, looking at the size of the "residual" that obtains when subtracting the growth of inputs from the growth of output. Quite fittingly, Abramovitz labeled the size of this residual "a measure of our ignorance". Could it be, Griliches asked, that a great deal of what goes into the residual is due in fact to measurement and specification errors? This question turned into a multifaceted, decades-long research agenda.

One of the places to look was prices. Perhaps, Griliches reasoned, the price indices used to deflate inputs and outputs (in order to obtain "real" magnitudes) are not correct. In particular, Griliches suspected that those indices might not accurately reflect the effects of quality change. This led to his work on "hedonic prices", spanning again a whole new line of research that is still as vital and vibrant today as it was 30 years ago. Even though Griliches was not the first to formulate the very idea of a systematic link between prices and the characteristics of products, there is no doubt that his 1960-61 papers putting forward and applying the "hedonic" methodology were path-breaking, and by far the most influential in the field.

The unraveling of the residual took Griliches in several other directions as well: the assessment of scale economies in production functions, the issue of capital utilization, the contribution of schooling to the quality of labor and, by extension, to the observed inequality in wages, and the extent to which technological change is due to current and past research and

development. In each of these domains Griliches' work had a decisive impact in defining the research agenda and the methodology for a whole generation of researchers (who are by now the senior economists in the field), and established the benchmark empirical results.

Taking a more micro perspective, in his more recent work Griliches sought the sources and effects of technological change at the level of individual firms, assembling for that purpose an impressive data set that included patents, R&D, market value, sales, etc. for hundreds of individual corporations over many years. Griliches' work with patents using the notion of "knowledge capital" has generated many insights into the process of technological advance at the micro level, and has fostered and inspired further research along those lines on key issues such as spillovers and appropriability.

In the field of econometrics proper, Griliches made a number of contributions, by himself and together with several associates, but he is probably best known in that respect for his work on distributive lags, as manifested in his article, "Distributive Lags: A Survey", Econometrica 35:16:49, 1967, which was named a "citation classic" in 1992 by the SSCI and the SCI (at that point the article had received more than 310 citations).

Griliches' research not only profoundly influenced other academic investigations, but it also had important practical implications for the measurement of national income, product and prices. He served on both the Stigler Commission (1960-61) and the Boskin Commission (1995-96), each of which provided influential and thoughtful recommendations on price measurement to the U.S. Bureau of Labor Statistics.

We now turn to the other major facet of Griliches' contributions, namely, his impact on the conduct of empirical research. These innovations range from the design of novel econometric tools and the ingenious use (and constant refinement) of existing statistical methods, to the creative gathering of data on a large scale and the relentless search for *new types* of data to be incorporated in economic research. Notably, empirical research in economics does not have the pristine quality of theoretical work, whereby a mathematical

proof is the ultimate and incontrovertible criterion for scientific truth. The “real” economic world is extraordinarily messy and complex, and easily quantifiable manifestations of what goes on in it are rare. Thus, it takes not just extraordinary command of economics as a discipline and of method to uncover the facts of the real world, but enormous creativity, tenacity, and the most inquisitive and penetrating eyes.

Moreover, since the criteria for the empirical corroboration of hypothesis are by no means clearly and unequivocally defined, and since replication is always problematic, some key traits of character are required to make a good empirical economist, in particular built-in skepticism, as well as unbending professional integrity and honesty. This is indeed a very demanding list of qualities. It is no coincidence then that the occurrence of all of those in one economist is so rare and, when found, so striking. Zvi Griliches was the very embodiment of those attributes of the mind and soul, and more: he possessed *wisdom*, that rare capacity to put knowledge in perspective, to have a grasp of things beyond the mere facts, to see the forest and not just the trees, and to impart to others around him a similar sense of curiosity, insight and understanding.

A brief biographical note on Zvi Griliches

Zvi Griliches was born in Lithuania in 1930, to a well to do, well-educated family and, judging from his memories of it, he had a nice, cheerful childhood. All that came to an abrupt end in August 1941, when the Nazis moved him, his sister and parents to the Kovno ghetto. The family managed to survive for about three years, by hiding in pretty deplorable conditions until the Nazis caught up with them in June 1944, and deported the family to concentration camps in Germany. Zvi was at a forced labor camp outside Dachau, his father died there, his mother was killed at the camp, and at the last moment Zvi was liberated by Patton's 3rd Army in May 1945 (he was 15 years old at the time). Zvi wandered in Europe for a while, then tried to move to Israel but ended up instead in Cyprus, was captured by the British, until finally in 1947 he arrived in Israel. He lived in a

Kibbutz for a year, took part in the war of independence, spent some time in Tel Aviv and in 1950 entered the Hebrew University.

Up to that point Zvi had very little formal schooling: essentially since age 11 until age 20, he was a displaced person, and did not attend any form of school. By age 20, he had lost sight in one eye. Zvi was very much self taught, and he would often tell friends about how much he read during those years, and the extent to which reading and self study helped him cope with the terrible events that were happening around him.

Shortly after entering the Hebrew University Zvi, was accepted to Berkeley, to study agricultural economics, what he called “useful economics”. Zvi graduated from Berkeley and entered the graduate program in economics at the University of Chicago in 1954, and from there on it was a meteoric rise. He completed his Ph.D. in 1957 (the legendary hybrid corn work, which catapulted him into fame), and joined the faculty at Chicago, soon becoming one of the leading applied econometricians in the US.

Until WWII empirical work in economics was rather sparse, rudimentary, and not a well-established, well-defined research enterprise. Economics had existed as a discipline for over a century and a half prior to that, but overwhelmingly as a conceptual/theoretical field of inquiry, not as an empirical discipline. Zvi belongs to a cohort, actually to a very small group of economists, that managed to change that dramatically - a quantum jump took place there and then both in terms of methodology (econometrics) and data, and Zvi was at the forefront of it.

Zvi was awarded the John Bates Clark Medal in 1965, at the age of 35 (significantly, the Bates Medal is given every two years to the best economist under the age of 40). In 1969 he moved to Harvard, in 1975 he was elected to the National Academy of Sciences, and in 1993 Zvi was elected president of the American Economic Association. In the late 1970s Zvi became the head of the Productivity Program at the NBER, essentially established the program, and led it since then until his death in 1999. For twenty years that

program was one of the main pillars of research in the field of productivity, technological change, R&D, etc. in the world, and Zvi played an extraordinary role as a combination of entrepreneur, guru, manager, and spiritual leader of the people in this field. Indeed, one of the hallmarks of Zvi was the extent to which he gathered around, nourished and mentored a remarkably large number of disciples – not just students in the formal sense, but followers, people that he advised, influenced, pushed, encouraged, and touched in so many ways.

Zvi imparted to those privileged to be around him a joy of asking, pursuing and tentatively answering research questions. His characteristic humor and playfulness evident once again, he described in a 1997 *Econometrica* article the surprisingly circuitous path research can take, quoting from A. A. Milne's *The House at Pooh Corner* as follows:

“How would it be,” said Pooh slowly, “if, as soon as we’re out of sight of this Pit, we try to find it again?”

“What’s the good of that?” said Rabbit.

“Well,” said Pooh, “we keep looking for Home and not finding it, so I thought that if we looked for this Pit, we’d be sure not to find it, which would be a Good Thing, because we might find something that we weren’t looking for, which might be just what we were looking for, really.”

“I don’t see much sense in that,” said Rabbit.

“No,” said Pooh humbly, “there isn’t. But there was going to be when I began it. It’s just that something happened to it on the way.”

Finally, we cannot resist making some personal remarks. It is not a usual matter, it is not something to be taken for granted, that in the course of a lifetime one encounters such an extraordinary figure as Zvi. There is something extremely rare, indeed unique about Zvi’s overall package of human qualities - that combination of paternal warmth, intuitive understanding, ultimate wisdom, and cautious but firmly entrenched optimism. We had the immense fortune to grow with it into professional maturity and beyond, never stopping to reflect on what a singular experience that was. We are not just better economists because of

Zvi, but we are better people, for we had the privilege to glimpse in Zvi the greatness of spirit, and the depths of human grace and bond and wisdom.