



Laudatio

Laura Castellucci

Dale Jorgenson spent large part of his career at Harvard University where he received his PhD in Economics in 1959 and where he was appointed professor of economics in 1969 after the experience of being associate professor first and then professor of economics at the University of California, Berkeley (in 1961 and 1963 respectively). Since 2002 he is Samuel W. Morris University Professor at Harvard and Chairman of the Board on Science, Technology and Economic Policy (since 1998 while from 1991 to 1998 he was a Member).

Jorgenson wrote 240 articles, he is author or editor of 27 books; he “produced” 65 PhD students, received an impressive number of awards (including the prestigious John Bates Clark Medal of American Economic Association in 1971); he has covered high professional charges as consultant in the U.S. and abroad; he is member of the most prestigious economic and non-economic societies (as the American Philosophical Society, the Royal Swedish Academy of Sciences, the U.S. National Academy of Science, American Economic Association, American Statistical Association, Econometric Society and many others); he is or has been editor of the most important economic journals (as Bell Journal of Economics, Review of Economics and Statistics, Quarterly Journal of Economics, American Economic Review, Journal of the American Statistical Association and others); served as President of the American Economic Association and of the Econometric Society; gave many invited lectures around the world and received several grants for specific research.

The “quality” of his work is even more impressive. He left his mark both on theory and on empirical methods, covering a wide variety of fields: growth, cost of capital, productivity, tax policy, welfare measurement, education, environment, international comparison of economic growth, human-capital accumulation and of course, information technology. To all these fields his scientific production gave seminal and enduring contributions.

I try to collect his main results within three topics:

1. information technology and growth, 2. tax policy, 3 consumer behaviour and social welfare measures.



1. INFORMATION TECHNOLOGY AND ECONOMIC GROWTH

Jorgenson's studies on information technology have offered a new key to interpreting the economic resurgence of growth in America and in some other developed countries in the 1990's.

Jorgenson explains why the information technology (IT) can be considered as the main cause of the late 1990's growth in the US and elsewhere and shows how the process took place, namely through the behaviour of IT prices. The finding of this result shows Jorgenson's remarkable abilities as a theoretical and applied economist. He felt the necessity to depart from an aggregate production function of Solow type since a single output as a function of capital and labour inputs does not allow to capture the role of separate prices of investment and consumption goods and therefore any possible role for IT prices would be missing, but he was also unsatisfied with available price indexes wanting to apply constant quality price indexes, which he developed.

By using constant quality price indexes to deflate investments that are incorporated into IT capital he was able to translate the improvement in the production characteristics into accurate measure of investment and output, having adopted a standard hedonic price model for the price of semiconductors (basic IT good) which shows it to be a function of both performance and quality of the product.

Jorgenson found that the rapid decline in the price of semiconductor and in turn of computers, software and communications equipment (that make use of semiconductors), arose from the conversion of industry from a three-year product cycle to a two-year. In particular, he estimated that since 1995 the semiconductor prices declined around fifty percent.

The lower cost of IT assets determined fundamental changes in the productive process: the U.S. economy experienced a massive substitution of IT investment for labor and other form of capital input.

Jorgenson's contribution was providing a new conceptual approach able to capture all these technological changes. In fact his approach is perfectly suitable to model “substitution” among different type of capital and non-capital input.

The innovative idea of using a production possibility frontier instead of an aggregate production function, had also the advantage of extending the standard definition of investment to include human capital. Jorgenson considered investment in human capital as the output of the educational sector. Since the level of education depends on investment in non-human capital undertaken by educational institutions, this new approach captures the



interaction between tangible and non-tangible assets in the production process or, in other words, it allows to formalize the impact of human capital on production process.

To investigate growth more deeply, Jorgenson analyzed the patterns of economic growth of the G7 economies. To do that he first constructed consistent data on the determinants of these patterns over the period 1960-1995 and then he introduced a production possibility frontier for each country in order to include the available data on investment in IT. He found that the most important driver of growth in the G7 were investments in human capital and tangible assets. According to his estimations such investments were also key to explain the international differences in output per capita.

Finally, Jorgenson's studies on growth left another main mark: he implemented a new system of U.S. national accounts by introducing estimates of the sources of economic growth. Jorgenson accounting system integrates wealth accounts with income and product accounts giving raise to a more consistent data set on tangible and non-tangible assets and assets prices involved in the production process. His approach has the advantages of allowing a more accurate measure of investment in human and non-human capital and of providing a wider set of information necessary for a more satisfactory interpretation of economic growth.

2. TAX POLICY

In the early 1980s dissatisfaction was growing with respect to tax base “erosion” which was transforming the typical income tax system into a consumption one although the process had started, in the US but also in other countries such as UK and Sweden, for the good reason of stimulating savings and investments. A true change in this process took place with the 1986 Tax Act mainly due to Jorgenson ideas and proposals.

This reform was inspired by two concepts introduced in the specific literature by Harberger and Jorgenson such twenty years earlier: the (marginal) effective tax rate and the cost of capital.

Jorgenson was convinced that a broadening of the tax base was necessary; that to stimulate investment without introducing distortions in the market decision process an equalization of marginal effective tax rates on capital income was also necessary and that these two targets could be achieved without deep shifts in the tax burdens by using different tax rates for labor income and property income.

Combining the concepts of effective tax rate and the cost of capital, Jorgenson proposed the Efficient Taxation of Income (ETI) that reversed the process of tax base erosion and opened the way to other tax reforms in many countries equally inspired to efficiency. To implement



an Efficient or Non-distortionary taxation of capital income the cost of capital remains a key concept as far as it explains the mechanism behind investment decisions, while the marginal effective tax rates properly represent the impact of these decisions on tax liabilities enhancing tax rules transparency. Of the two pillars upon which ETI was based, namely taxation of income rather than consumption, and different tax rates for labor income and capital income, only the first one was truly taken by the 1986 Tax Act while the second was only partially taken in that some disparities in the tax treatment of different forms of capital income remained even within the business sector and no attempt was made to equalize the burden on business and households housing.

It is not surprising that, at present, Jorgenson is again at work to push an entirely Efficient Taxation reform. Just last April he estimated that "gains to consumption from ETI would be equivalent to the addition of 19 cents to every dollar of U.S. national wealth. The total gains would be a whopping \$ 4.9 trillion!".

Finally, as he did with respect to growth, Jorgenson produced very relevant international comparisons of capital income tax reform during the 1980s and 1990s in the G7, plus Australia and Sweden. By comparing the marginal effective tax rates for all types of capital income in all these countries he showed that the changes in the taxation of capital income were all in line with those in the United States. In fact the reforms in the nine countries were aimed at reducing tax rates in combination with the broadening of tax base to reduce disparities of tax treatment among different forms of capital income within the business sector but no one was achieving a complete equalization between households and business capital taxation as it were the case in the U.S. at the time.

The message is clear: there are still potential gains to get from a truly ETI almost in every countries and he already estimates the possible gains for the U.S.

3. CONSUMER BEHAVIOR AND MEASURES OF SOCIAL WELFARE

Jorgenson's empirical studies extend to consumer behaviour and social welfare analysis; actually his main contributions to welfare analysis strongly depend on his achievement on the theory of consumer behaviour, namely his econometric model of aggregate consumer behaviour.

He started by building an econometric model of aggregate demand obtained by aggregating over consumers with heterogeneous preferences. The introduction of heterogeneity in the households' preferences is indeed an innovation with respect to the widespread representative consumer theory. Heterogeneity is captured by allowing preferences to depend on several attributes of individual households, such as demographic characteristics. This new approach has proved to be also empirically robust.



To incorporate differences in households' preferences into a model of aggregate demand, Jorgenson introduced a translog indirect utility function depending on attributes of individuals and showed that, under exact aggregation, this translog indirect utility function provides cardinal measures of individual welfare that are comparable among individuals with heterogeneous preferences. In particular, starting from his model of aggregate demand he recovered these measures of individual welfare from the individual demand functions. This innovation allowed solving the limits of standard ordinal approach that is not capable of producing interpersonally comparable measures.

Jorgenson combined these cardinal measures into an indicator of social welfare which includes both horizontal and vertical equity. This new econometric approach to normative economics provides new methods for evaluating different policies and also for measuring poverty and inequality. And in fact Jorgenson formulated new indexes of poverty, inequality and the cost of living which, in the last decade, stimulated wide interests both among professional economists and policy makers.

In the end I like to mention the work of Jorgenson on the calculation of the cost of living. He did not introduce *ex-novo* an index for the cost of living, but he integrated the set of information already included in the standard Consumer Price Index and went on in using his econometric method. He found that his estimated inflation rates over the period 1945-1995 were rather close to those provided by the CPI and in particular that inflation rates were increasing over the first half of the period and decreasing for the second half. He also found that, according to his estimation, there were not wide differences among the cost of living for individuals and household with different characteristics, except for the elderly, for whom the cost of living was slightly higher than the average since the 1973.

Given these results Jorgenson suggested to index Social Security government programme by a cost of living index for the elderly. If this were also the case in Italy the suggestion would not be trivial as our country is facing ageing population problems.

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