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# A SYNOPSIS OF LAWRENCE R. KLEIN'S THOUGHTS AND CONTRIBUTIONS TO ECONOMICS

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## Abstract

In the present paper as a special tribune on Klein's various thoughts and contribution to economics we will abstain from a value judgment of his character, feelings and social behaviour, and will concentrate primarily on his scientific achievements. These will be analysed with respect to the following issues: the development of the Keynesian macroeconomic model; the advancement of special econometric projects and techniques; the specific suggestions toward economic policy; and the methodology and history of economics. The paper will conclude with an evaluation of Klein's place in the future history of economics.

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## 1. Introduction

After winning the 1980 Nobel Prize in Economics, Lawrence Klein entered the classroom and his graduate students stood and applauded; then, he broke into a broad smile and said: "You make me feel like a politician". When he was asked about the prize money, he responded: "It's not a big thing" (Mann, 1980). This small conversation shows much more than a scientist's attitude toward scientific achievements. It really shows Klein's priorities regarding the various "values of life", proving that he follows the ancient Greeks' axiom that man's material improvement is not the ultimate end of life.

However, in the coming pages we will abstain from a value judgment of his character, feelings and social behaviour, and will concentrate primarily on his scientific achievements. After giving some biographical data in the first section, we will present in a synoptic perspective his various significant ideas and contributions in economics. These will be analysed

with respect to the following issues: the development of the Keynesian macroeconomic model (section 2); the advancement of special econometric projects and techniques (section 3); the specific suggestions toward economic policy (section 4); and the methodology and history of economics (section 5). The paper will conclude with an evaluation of Klein's place in the future history of economics.

## 2. Biographical profile

Lawrence Robert Klein was born in 1920 in Omaha, Nebraska. He is the second of the three children born to an American mid-Western family. His education began in public school system of Omaha. Later, he studied at the University of California at Berkeley (BA in 1942), where he concentrated on mathematics and economics. After completion of his undergraduate studies, he continued under Paul Samuelson at MIT and completed his Ph.D research in economics in 1944. This period of his life was very fruitful and it was a first step toward a more mathematically oriented analysis. Afterwards he joined the econometric team under Jacob Marschak on the Cowles Commission (1944-7). He also worked for the National Bureau of Economic Research (1948-51) and at the Survey Research Center at the University of Michigan (1949-54). Being opposed to the activities of the McCarthy Committee, he left for England and the Oxford University Institute of Statistics where he worked for four years (1954-8). Then, he returned to the USA and accepted the position of Professor at the University of Pennsylvania where he remained from 1958 until his retirement. Besides the Nobel Prize of 1980, he also received the John Bates Clark Medal of the American Economic Association (AEA) in 1959 and he became president of the Econometric Society in 1960 and president of the AEA in 1977.

His activities are numerous and did not reside only in economic theorizing and practice. Aside from his research and publication duties, in collaboration with some other economists such as M.Morishima, he established the well known academic journal International Economic Review and also served as a general editor of Econometrica.[1] He was, as well, personally in-volved in the advancement of computer facilities and particularly in three research directions: (1) "Use of the microcomputer for conventional econometrics",

(2) "Cooperative computing, whereby conventional computers are linked in a network for simultaneous computation", and (3) "Use of the supercomputer to accommodate the ever increasing demand of the expanding LINK system" (in Breit, Spencer, 1986, p. 39).

His philosophy is based on the following general attitudes toward the spheres of teaching, research activities, and economic policy involvement. He believes that the best teaching method is based on the principle of learning-by-doing, by which the students not only gain experience but, furthermore, are exercised in the decision- making process. His research activities, as he notes (1992a, p. 183), are conducted through the following steps: "statement of the issue to be investigated (economics), specification of the models (mathematics and economics), preparation of the data base (quantitative economics and method), estimation of the model (statistical method), validation of the model (statistics and economics), and use of the model for policy and other forms of analysis (statistics and economics)".

As far as economic policy is concerned, he joined in decision- making by serving as coordinator of President Jimmy Carter's economic task force and offering similar assistance to other governmental posts, such as, to the mayor of Philadelphia. Related to this experience, admitted that politicians "taught me a bit about handling the media, about public appearances", but "I feel most comfortable in academia" (in Breit, Spencer, 1986, p. 39). He was totally involved in science and was lost by policy, although as he said (1992a, p. 185), he gained something from his political involvement: "I prefer to have a sense of detachment and serve only informally as a policy person when requested. And as far as public policy is concerned, I believe that we (i.e. the economists) have duties and responsibilities to act in pro bono publico servicing of the economy".

He also did some journalistic writing about economic affairs in newspaper columns, in order to inform the public audience about the consequences of specific policy measures (Klein, 1997, p. xxxv).

The decision of the Royal Swedish Academy of Sciences to award him the Nobel Prize of 1980 (1981, pp. 79-80) was based upon the following assessments of his contributions to economic science:

1 .He was -and it seems still is- the leading researcher in the field of economic science "which deals with the construction and analysis of empirical models of business fluctuations".

2. He succeeded in creating models which, as an instrument for forecasting, proved successful for various predictions.
3. He established influential and leading econometric models all over the world and with worldwide countries' participation (i.e. the LINK project).[2]
4 He successfully studied the manner and rate of diffusion of economic effects in various countries.
5. He stimulated research work in econometrics, not only through his writings, but mostly by his extensive guidance throughout the world, not only in scientific institutes but also in public administration, political organizations and large enterprises. Thus, the overall conclusion of the committee was: "Few, if any, researchers in the empirical field of economic science have had so many successors and such a large impact as Lawrence Klein" (Ibid., p. 80).

## 3. Advances in Keynesian framework

His 1944 doctoral thesis at MIT, under the supervision of Paul Samuelson, was published as a book with revisions in 1949, and introduced for the first time the expression "Keynesian Revolution". However, his theoretical contributions began earlier in his 1947 article on the theories of effective demand. In this paper he formalized the classical, Marxian and Keynesian systems and showed the "distinctions between necessary and sufficient assumptions that underlie each theory" (1947, p. 108). Also, at this very early time, he posed his future plans by arguing that only "by making accurate quantitative measurements" of the various economic variables and propensities, the final result of any policy measures would be determined (1947, p. 130).

In his Keynesian Revolution, Klein not only anticipated some of Thomas Kuhn conjugates, but also "embarked on a classic career of normal science" (Pearce, Hoover, 1995, pp. 183-4). In this work he tried not only to offer a formalized version of Keynesian economics but, furthermore, to clarify, simplify and enrich Keynes' theories. Also, he studied the process whereby Keynes had moved from the formulas and ideas of his *Treatise on Money* (1930) to the new theory of his *General Theory* (1936). Klein (1982a, pp. 244-5) argued that Keynes had strong ties with the neoclassical school and

that his main microeconomics -except for the demand function for labour- had neoclassical bases and origin. He considers that Keynesian theory develops a revolutionary doctrine "in the sense that it produces theoretical results entirely different from the body of economic thought existing at the time of its development" (1949, p. ix). Klein's central argument was that price inflexibility was not the "key to understanding the Keynesian system". It was rather the influence of money illusion and the marginal productivity equation "that was a price determining equation" (Ball, 1981, p. 86).[3]

What is amazing is that he extensively used historical materials not only on empirical data, but also on economic thought in clarifying any influence on Keynes advancement in economic theorizing and conclusions for policy strategies.[4] More than that, his Keynesian model (1949, ch. VIII) was introduced and adopted by many scholars in their analysis of the standard Keynesian system.

Klein is not a "monolithic" researcher who inflexibly maintains his ideas and theories when some empirical factors change. On the contrary, he distanced himself somewhat from the heavy Keynesian influence in stressing the significance on supply side analysis, research and policy orientation. By retaining a keen critical attitude toward the progress of economics and recognizing the dead end of a solely demand approach, he turned to a more classical orientations, that is, toward supply side fundamentals. In his presidential address to the American Economic Association (1978), he introduced two suggestions in regard to the future of economic research and theory:

*First*, the new economic analysis should produce a formal model which would "combine the Keynesian model of final demand and income determination with the Leontief model of interindustrial flows" (1978, p. 1).

*Second*, extending the analysis on the supply side will be incorporated into the system some variables such as the resource exhaustion, environmental pollution, etc. which will help us to resolve various empirical problems (1978, p. 6; 1982b, pp. 177-8). He particularly suggests the extension of production function to a new one that he terms KLEM, whose inputs consist of capital, labour, energy and materials (1978, p. 3).

Klein, in his book *The Economies of Supply and Demand* (1983b), takes a critical look at Keynesian ideas (Blaug, 1985, p. 115). In this work, which was based on his 1982a Royer Lectures at the University of California, he tried to

modify the mainstream macroeconomic model for the analysis of structural implications by introducing dynamic microeconomic elements. He recognized that Keynesian economics is not sufficient for solving present -day economic problems (particularly the stagflation of the 1980's). Thus he departed from the sole application of demand management policy put forward through the adoption of a Keynesian macromodel which he earlier supported.[5]

Klein, by emphasizing the role of supply in economics, did not share (see 1982b, p. 176; 1983b, p. 13; 1997, p. xxiv) the "populist view" of the supply side adopted by President Reagan's administration policy and Laffer's curve of tax cuts and shortrun incentives to investment activity. Far from such a policy orientation, he put major emphasis (1983a, pp. 32-3, 43-5) on supply factors such as: a new production function (i.e. the KLEM function), demographical factors, food supply, environmental policy regulations and competitiveness. He also criticized the rational expectation model and the strict monetarists policy suggestions (1982b, pp. 167-175; 1983b, pp. 98-107; 1994, p. 631) on the grounds that: the first did not rely on realistic assumptions and wrongly stressed the external control on the quantity of money, and that the second gives too much credit and influential power to the function and regulation of money supply.

The above theoretical contributions of Klein have resulted in the development of at least two important orientations in economics. The first is that of aggregation or the microfoundations of macroeconomics.[6] The second is in the theory of capacity measurement, about which he was published several influential papers (Ball, 1981, p. 87).

## 4. Contributions to Statistics and Econometrics

Klein became a mathematical economist mainly because as he admitted (1992a, p. 181), there are important and "distinct leanings to the quantitative side" of economics. Thus, he attached himself "to a quantitative bent that found expression in the trinity of econometrics - economic analysis, statistical method, and mathematics" (Klein, 1997, p. xix).

His collaboration with the Cowles Commission directed him and gave him the possibility of making applied econometric work on Keynesian economics. He marked this collaboration in two ways: Firstly, he tried to translate others'

theoretical developments into applied work, something which is best exemplified by his second major work *Economic Fluctuations in the United States, 1921-42* published in 1950. Secondly, the association with his colleagues "deepened his interest in problems of statistical estimation", an interest maintained throughout the years (Ball, 1981, p. 82).

He worked extensively on studying and applying economics based on empirical data and then expanding econometrics to the top of verified instruments. His contribution on special econometric subjects concerned the lags in the effect of explanatory variables, multicollinearity, and so on. He also initiated a multitude of econometric projects all over the world. In particular, he established his main project as early as the 1960's: "The project, begun in the late 1960s, aims to coordinate econometric models of various countries to help forecast international trade and capital movements. The model is used to show such things as how an increase in oil prices influences inflation, employment and trade balances." (Mann, 1980).

His overall scientific treatment of statistics was far away from the "measurement without theory" approach of the 1920s (Karayiannis, 2001, pp. 228-234). By having an instrumentalistic attitude toward the usefulness of science, he tried firstly to establish a well- approved theory and then to test it empirically. As he claimed recently (1997, p. xxii): "I still believe that the best way to proceed is from a theoretical model to observation and then to statistical inference".

In the 1960's he also produced some outstanding contribution to statistics. One of them was his dealing with the two stage least squares method for estimating econometric relationships, and another was the efficiency of estimation of a statistical system and particularly for the estimation of distributed lags (Ball, 1981, pp. 87-8). He particularly incorporated (1972) the role of expectations in forecasting models through time lagged variables.

He was also the heart and mind of the Brookings model, the formation of which was decided in a meeting of the Social Science Research Council's Committee on Economic Stability (1959-1960). This project started in 1961 with seminars at Dartmouth College where many young aspiring economists worked in collaboration with one another. The Brookings model, as Klein noticed (1975, p. 14), not only played "a large role in shaping applied econometric work throughout the world", but also "served primarily as a

research center for theoretical and methodological work on econometric model building". The establishment and function of the Brookings model owed much to Klein's inspiration and hard work. The main scope of this model was to be used as a "good approximation to explanation" of economic system (Klein, 1975, p. 28) rather, than as an instrument for forecasting. His other major achievement, the Wharton Econometric Model was developed to a profitable enterprise rising funds for research at the University of Pennsylvania (in Breit, Spencer, 1986, p.31).

Klein's works on econometrics continued with the collaboration of Goldberger. They published a very influential book (1955) in which they incorporated the theory of prices and wages in a "crude" model of Keynesian macroeconomic structure to develop an instrument for economic explanation and forecasting. For some time this model remained in the Anglo-Saxon world as the work "to which both student and research references were made" until 1960's (Ball, 1981, p. 83).

In regard to the usefulness of formal models in economics, Klein shows an ethically neutral approach by trying to substitute the characteristic objective accompanying titles such as Keynesian, neoclassical, etc., with a national income accounting (NIA) model, arguing (1983a, p. 2): "Although I participated as fully as anyone else in that approach to model building, I have lately come to feel that a more rewarding approach that is neutral as far as doctrine is concerned will be through the accounting structure". He tried during the 1960's and succeeded in establishing a world- wide model network based on this approach (in Breit and Spencer, 1986, pp. 34-5).

His second major project on the international linkage of national economic models (LINK) was established in order to tie together, "the ongoing major macroeconometric models being used in each of the main countries or regions of the world" (Klein, 1983a, p. 175). This project, originating in the Social Science Research Council (SSRC) committee, was created at a meeting at Stanford in 1968 where Klein shared responsibilities as principal investigator with Bert Hickman of Stanford, Rudolf Rhomberg of the International Monetary Fund and Aaron Gordon of the University of California. The LINK model with the Brookings model created a great deal of related and incremental research in world- wide econometric model building projects. The valuable work that Klein conducted in the field of econometrics and statistics reinforced and preserved the place of the University of Pennsylvania in the top

ten of the U.S.A, University ranking (see Laband, 1985, p. 21-2; Conroy, Dusansky, Drukker, Kildegaard, 1995, p. 1969).

Klein did not favour the "small is beautiful" argument in econometric practice, claiming that (1992a, p. 184) "I prefer the following rule: the largest possible system that can be managed and that can explain the main economic magnitudes as well as the parsimonious system is the better system to develop and use". The main explanation as to why he preferred "bigness" rather than "smallness" in economic investigations, is based on the multiplicity of factors interconnected and interchanged in a complicated economic environment just as the empirical one is. He always tried to build and work with large econometric models and a great deal of computer power by following the rule: "the largest possible system that can be managed and that can explain the main economic magnitudes" (Klein, 1992a, p. 184).

By emphasizing the predictive power of economic models he did not hesitate to mark the ground for the future generation of macroeconometric models. He considers that in the future models there "will be more financial detail, better leadlag structures, and more explicit tax system" (1982b, p. 178). Also, much more attention should be shown to (a) data accuracy, (b) structural change, and (c) error analysis of uncertain inference (1992c, p.332).

His impact on econometric advances was tremendous and, through his extensive guidance to various research groups from all over the world, econometric models for forecasting and practical analysis of economic policies were framed.

## 5. Economic Policy

Klein, generally speaking, believes that does not exist any automatic self-regulated economic system. As he claims (1992a, p. 186): "the economy definitely needs guidance- even leadership -and it is up to professional economists to provide public policy makers with the right information to deliver such leadership. As for the methods of doing this, I see no alternative to the quantitative approach of econometrics, but I do realize that all policy issues are not quantitative and measurable".

By arguing that macroeconomics is a distinct economic subject in itself, he emphasized its use as an "organon" for economic policy conclusions. He

turned against those economists who consider that "there is no such thing as macro-economics in its own right" (Klein, 1993, p. 21), and analysed the following three special techniques (1993, p. 26) that form "the bridge between microeconomics and macroeconomics": (a) the representative agent specification; (b) the index construction; and (c) the introduction of distribution functions. Thus, without distancing the microeconomic foundation of macromodels, he suggests its usefulness as an instrument for conducting proper fiscal and monetary policies (Ibid., pp. 31-3). More specifically, he proposed both macroeconomic and microeconomic policy measures which would also be grounded in the supply side of economy, namely the new theoretical advancement which would be outlined in the form of the Keynes-Leontief model. He developed such a model in his 1982a paper where he extended the Keynesian model to incorporate some supply side factors.

His main thesis concerning economic policy is that it has to be based on long run rather than short run targeting, and in order to be effective it has to be "as steady as possible" (1982c, p. 615).

Although he remained in academia and did not have permanent positions in government, he tried to use econometric practice in real world problem solving. And still energetic in the 1990s, he intends (1997, p. xxxv) to continue working along the following lines: (a) "consuming" the fruits of the "information age", (b) extending the LINk model, and (c) relating military activity to economic performance. As recently as the mid-90's, his researches (e.g. his papers of 1995, 1996) in the area of arms reduction was being used to promote the over all benefits of peace to society.

## 6. Methodology and history of economic thought

Klein used mathematics not only as an instrument of abstract theorizing in economics, but also as an instrument of conclusions and assumptions verification. He proceeded on such a methodological road, as he admitted, prompted by his own belief and "feeling that mathematics could be used in the analysis of economic problems" and by the influence of Samuelson (in Breit, Spencer, 1986, pp. 22-3). He specifically stressed (1954, pp. 360-1) the usefulness of mathematics in economics through the establishment of well specified theories which may be verified by experience. However, he warned

about the ultra mathematization of economics without empirical relevance. As he claimed (1950, p. 606): "One cannot simply build tricky models that have solutions in some mathematical sense and then claim automatically to have a representation of economic behavior. Each equation must be capable of being derived from some set of first principles and identified with the economic behavior of units that make up the system".

In regard to the extension of his methodological approach to his empirical work, he followed the Friedmanian route emphasizing the forecasting result of the economic models. And particularly with respect to applied econometrics, he regards "forecasting" as its bottom line (1983a, p. 164) and not only that the "ability to predict is the ultimate test of a model" (1997, p. xxvi), but further that "the test of an economic theory or method is its ability to predict" (1982b, p. 179).

He considers that the prediction power of economics is similar to weather prediction (1983b, p. 113) as they are both partially based upon "a solid ground"; which in economics is the relative stability of such "laws", such as Pareto's law, Engel's law, etc. (1983b, pp. 116-7; 1983c, pp. 10-5). He claimed that by using such laws, the prediction of economic assessments is in good condition since "realistic targets for the validity of economic judgments should perhaps be to aim for correctness two-thirds of the time, with precision bands of plus or minus 10 percent" (1983b, p. 131).

However, he is skeptical about the present- day formalism without empirical justification in economics, observing that (1997, p. xxi) "the theory of the 1980s and 1990s provides little guidance for economic policy, partly because the theory-builders are subjectively opposed to positive policy, and partly because they lack a tested theory of behavior. I doubt that they can make usable predictions from their theoretical models, and they seem not to care, but I take predictive ability seriously, as the most rigorous test of abstract economics". Thus, his methodological overtone seems to come closer to instrumentalism and operationalism than to logical positivism.

The theoretical engagement of Klein did not end with Keynesian economics. His interest was extended also to the past and, particularly, to the early endeavours of economists to use empirical data for the production and/or estimation of economic models. His first attempt in this field was a study of important "antecedents'" contribution in macroeconomic model building. Klein, with his colleagues Bodkin and Marwah (1991),

distinguished among four main lines of model developments: (a) the Walras-Pareto equilibrium model, (b) the business cycle models of Ragnar Frisch and Michael Kalecki, (c) the Keynesian model, and (d) empirical justifications of Keynesian concepts. Then, they presented the various steps and elements of progress of these models, their empirical significance and various attempts at estimation.

Klein continues to investigate the historical significance of ideas with his specific study of Adam Smith's empiricism (1992b). In this paper he demonstrates that Smith used systematic data in the same way as modern quantitative economists have done. Also, he makes clear that Smith had deduced some extremely important relationships between economic variables through a proper examination of monetary and real magnitudes.

## 7. Conclusions

It has been argued elsewhere (Drakopoulos, Karayiannis, 1999) that a specific theory, or an economist's contribution to the advancement of the science, is established when such a theory or person takes a place in the history of economics' textbooks. In the case of Klein, his eternal fame has been guaranteed as his name and work have already been introduced in the history of economics textbooks. More specifically, in two modern textbooks of the history of economic thought, H.Landreth's (1976) and H.Brems (1986), his economic contributions were given space. The first text (1976, pp. 382-3) describes the main purpose of Klein's econometric model, while the second considers him as one of the 84 pioneers of economic science from the time of the mercantilists until the present (1986, pp. 2-3) and credits his contribution on macroeconomic models as the leader of the two "first generation" models (Ibid., p. 248). And last, but not least, specific historical works on the history of econometrics give special mention and place to Klein's various econometric contributions. R.Epstein (1987) gives ample space in presenting Klein's early models of 1950's (1987, pp. 104-5), "the Klein-Goldberger Model and Its Critics" (Ibid., pp. 114-8) and his place in "the Econometrics Symposium" (Ibid., pp. 118-121). Also, Mary Morgan (1991, pp. 256-7) presents Klein's methodological departure from a general equilibrium point in searching the influence of various dynamic elements.

From the previous analysis may be deduced that the outstanding contribution of Lawrence Klein to economics was not a product of momentary ingenious discovery. It was rather a product of systematically persistent work in a new area, where his empirical estimation and foresight created an opportunity for future worldwide cooperation.

## NOTES

1. For a more extensive biography of Klein, see in Breit, Spencer (1986); Beaud, Dostaler (1995).
2. Ragnar Bentzel, a Swedish economist who sits on the economics selection committee, said that Klein's current project, called "Link," is his "crowning achievement." (Mann, 1980).
3. In such a context Klein wrote a paper with Ball (1959) in which an embryonic Phillips curve was developed before Phillips published his seminar paper (see also Ball, 1981, p. 86; Klein, 1997, p. xxix).
4. Klein, for example, analysed Wicksell's theory on interest and price rates (1949, pp. 23-5); the arguments of some Swedish economists on macroeconomic analysis (Ibid., pp. 50-1); anticipations of Keynes on "glut" theory (Ibid, ch. V). Also, in his other works (e.g. 1982b), he presented Keynes' neoclassical underpinnings.
5. As Klein himself noted: "When I was writing The Keynesian Revolution, almost forty years ago, I was an aspiring young economist taking issue with those of my elders who asserted that they could find nothing revolutionary in the Keynesian theory" (1983b, p. 89).
6. As Ball (1981, p. 86) comments: "Klein has always instinctively believed in the significance of macro-economics as a reflection of the underlying rational behaviour of individual decision making units".

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