

Towards Economics as a Natural Science

(vista view)

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Abstract

A hypothesis has been suggested for economics to become a natural science. The object of the science would be the system of reproduction of the life of people. The source of data would be the vague perceptions of experts. The instrument would be a language of generalized terms. The criterion of truth would be the consensus of opinions. The sphere of application would be the global economy. The method of application would be the proliferation of knowledge through the World Wide Web to produce social synergy forces within the economy.

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Economics describes the needs of people and it attempts to give advice on the production and distribution of wealth. Both the descriptions and the advice are expressed in terms appropriate to particular case studies which often don't support each other. So the subject of economics is vague and the advice is many-minded. For that reason economics doesn't seem to be a natural science but there is a breakthrough for it in store.

Economic ideas

Economic theories seem to be preoccupied with the question of how to survive and how to make the life better, the word "better" being cunningly identified with the word "wealthier". There are some governing ideas intended to explain what is good and what is bad and many theories have been worked out in support of them. Many minds have been infused into the social conscience but economics has not established a distinct method of control of the production and distribution of commodities. Instead monetary methods of fiscal policy have got flourishing to substitute the notion of wealth for a monetary equivalent. And this is not an adequate substitution because wealth is a many-faceted idea which penetrates the minds of people by some other ways.

Economics in decision-making

Economic decisions are always supported with monetary calculations but principally they are derived from physical or psychological ideas and that is where the economics plays its role as a potential science. Economic ideas always have alternatives and in order to persuade the opponents some common language is needed. It is not always can be found in the way of negotiations but has to be composed of the elements of policy – a language very much resembling that of the animals – either wagging its tail or showing its teeth. Anyhow politics is the sphere where economics manifests itself most vividly. But so far it's not a science at all.

Scientific basis of economics

Economics uses quite an arsenal of scientific methods: statistical analysis, econometric models, game models, optimization procedures, input-output analysis, methods of consolidation of expert judgments, sociological analysis, various emulation models and so on. True, it looks very scientific but the system of production and distribution of commodities is principally dependent upon the qualities of humans and these qualities need a special instrument for their investigation. In order for the instrument to tackle human qualities adequately it must be human itself but paradoxically as it is a human can't be a judge. Hence the instrument must be a machine but the sensors of the machine must be the humans. The machine will not be produced by man. It will appear as an emergent effect of technological progress in the sphere of communication. It's worthy of noting that the Nature has made provisions for such a machine having encoded in the gene pool of all nations some probability of birth of persons with a subdued instinct of survival. Such persons (which are called passionarios) are inclined to risky modes of behaviour in response to uncommon knowledge. If under the influence of communication processes the uncommon knowledge becomes a common property the behavior of passionarios will happen to be synergy consolidated into a social force effecting considerable social changes. So the existence of passionarios implements a powerful machine driving the historical process on in compliance with the common knowledge.

The perspective economics is expected to become a science about such social machine.

Imminent breakthrough in economics

The progress in telecommunication technologies amazes us with possibilities we could have hardly imagined a century ago and the obvious acceleration in the production of new artefacts makes us anticipate the appearance of personal electronic secretaries (PES) within some two or three decades.

A PES would relieve us of any necessity to have a computer. If we need some information we'd just ask the PES in our natural language and it would surf the WEB and would provide us with the necessary answer.

The PES would keep record of our likings, preferences and obligations and keep us in the know about what we are expected to do.

The PES would carry out correspondence with our referent social groups without our help unless the question needs our personal comment.

The most important thing the PES would do for us will be providing us with the knowledge about how many people share our views and what they are going to do in case of probable happenings. That's where passionarios would tell their word but in order for the word to be reasonable the common knowledge must be essentially meaningful. This can be the case if the PESes would organize themselves into man-machine societies producing common knowledge on the basis of an appropriate science. Supposedly the science will be the economics of the following content.

The object of the science would be a system of reproduction of the life of people. The system will consume (dissipate) energy in various forms and produce things and knowledge. The production would be governed by ideas (formalized knowledge) and the evolution of the production would follow the lines of minimum uncertainty in the distribution of energy over the governing ideas.

The lines of minimum uncertainty may be contradictory. The choice of the lines would be made by a control subsystem effecting the distribution of things and knowledge. The control is always performed by feedback signals emanated from the ideas of production and the ideas of consumption, the proportion between them being set depending on the density of energy in the economy (a new notion in economics).

Thus economics would acquire attributes of a natural science which will be discussed below more closely in connection with its pragmatic use.

A self-monitoring science

Usually a science is applied to a natural object receiving from the latter objective experimental data. It is not quite so with economics. The data needed to identify the object of science (an economy) can not be obtained experimentally. It comes to us through observations and any observation is nothing more than some interpretation of facts by humans. So our knowledge of the economy turns out to be a function of our faculty of understanding and the only criteria of truth is the consensus of opinions (not the compliance with facts). Thus the application of the science becomes alienated from a scientist leaving to his judgment only the formalism of establishing the consensus which will be sketched hereabout. The formalism deals with abstract things describing the life of societies and is intended for collective reasoning about "the human use of human beings" (an adroit expression of Norbert Wiener). Outside the collective application the formalism has no practical sense because one person is incapable of emulating the consensus but what he needs is a common language to be used in a self-monitoring science – the economics.

The elements of the science

1. Material balance

Human beings cannot do without producing and consuming things and all things must be taken into account but it is impossible due to the “curse of dimensionality”. We have to aggregate things into abstract generalized products, give keys to their understanding and bind them into a model describing the human interactions adequately though probably very vague and cloudy. This fuzziness of description is not a flaw but a natural quality of things. Some twenty generalized products will be enough for the model. Here are the recommended products.

1.1. Energy

Energy in economics is a vector. The structure of utilized forms of energy is an essential characteristic of the quality of a product produced with the energy. The components (energy carriers) of the energy vector may be numbered from 2 to 7 depending on the application.

1.2. Substance

It is to be thought of as an artificial substance produced with the consumption of oil, gas, electricity and a lot of heat. Rubber, chemicals, plastics, medicines etc. But such substance as a liquid crystal should be sooner interpreted as a combination of electricity and knowledge. It is for the society of experts to discuss the interpretation of a product.

1.3. Ferrous metal

It plays a dominant role in the economy and though it doesn't seem to be a generalized notion it may pose difficult questions to the expert estimation of the material balance. For example the production and consumption of rolled steel is measured in tones. How to co-measure the quantities of rolled steel produced in different years and different countries if the stress resistance of the metal and the nomenclature of the rolled metal are varying? The quality of the rolled steel influences the efficiencies of machinery and construction industries and its taking into account may be critical.

1.4. Non-ferrous metal

This product distinguishes very much from the ferrous metal both in technology (consumed energy forms) and the purpose of use. It is an essential component in military production and high technologies.

1.5. Wood products

They are not only a key substance of the economy (cellulose, paper, construction materials) but a major carrier of the consumed solar energy which is very meaningful.

1.6. Kinematic pairs

It is an omnipresent product: each machine or any moving gadget perform their functions only due to there being kinematic pairs: bearings, hinges, sliding surfaces. They are aggregated in one product not only because they all implement Newton's laws of movement in material things but also because they are united by common technological ideas – cutting, abrasion, precision casting and other. Though big and heavy kinematic pairs differ very much from the tiny and delicate ones it is not practical to disaggregate them in separate categories because it will be inherently done in the process of vague expert judgment.

1.7. Rigidity holders

This product is to be met almost in every thing where deformation means the loss of function: body of a tool machine, rigid frame, the thickened part of a construction to hold a bearing, forging bed etc. The production of rigidity holders is heavily dependent on casting and welding.

1.8. Space dividers

A most wide spread product: body of a car or a carriage, cabins, walls paneling, household utilities, roofs, fences and many other things where the Hook's law of

deformation does not hamper the function of the product. Production of space dividers involves press forging, stamping, extrusion, assembly, riveting and so on.

1.9. Transportation of lump loads

This means relocation of heavy cargos or large groups of passengers by railway or by ships.

1.10. Transportation of light loads

The relocation of passengers or cargos by cars or by aircraft.

The two kinds of transportation are separated because they differ very much in the forms of energy both consumed and invested.

1.11. Building

The yield of this product means changing the topology of the earth surface (ground and underground) and fixing technological spaces upon it.

1.12. Biological means of the reproduction of life

This product describes agriculture as a way to transform the solar energy into things used for nutrition. Animal husbandry, though traditionally referred to agriculture, would not fit into this category because it is essentially a technology of conversion of primary food products into more effective ones by partial dissipation of energy.

1.13. Physical means of the reproduction of life

It goes without saying that such things as clothes, footwear, furniture, medical equipment etc. are indispensable to support and reproduce the life of people.

1.14. Service

This notion includes all forms of assistance in the process of consumption such as food industry, technical repairs and help, tourist accommodation, entertainment and pleasure industry and generally all processes which are necessary for normal functioning but not critical for survival.

1.15. Consolidating symbols

This category of products is of paramount importance for any society. It comprises propaganda of ideologies, religious rituals, fine arts, festivals, sports and so on. In general it is the product which triggers the generation of synergy of social opinions or attitudes.

A distinctive feature of this product is that while its technologies consume significant resources the product itself is seemingly nowhere to be consumed. It just changes the quality of the society and thus exerts influence upon the efficiency of investments.

2. Adequacy of modeling

The above classification seems to be capable of describing an economy as a self-contained system provided that the vague quality of its products is accepted as a natural phenomenon. Now let's see what other sources of inadequacy are in store for us in the process of modeling.

2.1. Input-output analysis

In order to evaluate if the system is balanced we have to compare all the produced products with all the consumed ones. But such comparison may not be correct because the consumed products had been produced earlier when their quality was different. This must be taken into account in the vague calculations.

It is not always possible to point out how much of one product is needed to produce another product because its production may be done with a combined technology. For example it is impossible to tell how much heat is spent for the production of a ton of petrol because the consumed heat produces furnace oil at the same time and one has only to guess whether the furnace oil is a by-product of the petrol or vice versa. This inadequacy can be avoided by letting the consumption assume negative values.

Material balance is a dynamic indicator: each distinct moment the economy is

disbalanced due to hidden resources accumulated in its technologies. So the input-output analysis must be carried out with respect to its averaged meaning.

2.2. Dynamic analysis

The evolution of an economy is governed by two factors:

- a) the material capability of investments and
- b) the capability of the prevailing ideas to assimilate the investments.

The first factor can be tackled with the input-output analysis, the vague quality of which being not our weakness but a natural state of things.

The second factor needs special modeling and there is nothing to be said about its adequacy unless consensus should be reached within a group of differently minded persons. Anyhow in the next section we are forwarding a scheme of reasoning which may happen to become a seed thrown upon a good soil.

3. Configuration space

The life of people is certainly driven by some ideas (the binders of courses and consequences). We are often unconscious of it. We are driving cars and rolling steel without thinking that all this is the implementation of the idea of a wheel. A lot of energy is consumed to implement the idea – production of bearings and tyres, construction of motorways and railways and many other things.

Many ideas refer to the behaviour of people. Some patterns of the behaviour may be considered the best for people's welfare. Other ideas may stipulate the measures to ensure the proper behaviour of people and ultimately the functioning of the economy will be effected by some distribution of energy over the ideas.

Each technology, profession, devotion or passion is never upheld by a distinct idea but always by a mixture of ideas. So to produce an economic entity the ideas may be combined by summing and by extracting. The resulting multitude of ideas we should call the configuration space.

The configuration space is an immensely vast cloud of ideas but each its separate idea can be expressed as a combination of a small number of some primary ideas which we should call the basis of the configuration space and use it as its alias.

The basis can be chosen in more or less detail depending on the perceptibility of the economy.

The following ideas have been chosen for the basis.

3.1. Monitoring the constituent parts

- 3.1.1. Distinguish parts by distance measures
- 3.1.2. Distinguish parts by national character
- 3.1.3. Distinguish parts by exclusion
- 3.1.4. Distinguish parts by social tags

3.2. Identifying the state and interaction of parts

- 3.2.1. By distribution of the carriers of value
- 3.2.2. By way of direct measurement and enforcement
- 3.2.3. By way of synergy feedback

3.3. Reproducing the economy

- 3.3.1. Via the consumption of renewable resources
- 3.3.2. Via the consumption of non-renewable resources

3.4. Self-guarding the identity of the economy

- 3.4.1. By concentrating the energy on ideas of resistance
- 3.4.2. By concentrating the energy on ideas of adaptation.

The basis may vary.

Features of economics as a natural science

The economics outlined above is principally analogous to such sciences as physics, chemistry or thermodynamics. The analogy is not complete but the differences arise from the specifics of its nature. So if we accept that the vague existence of the observed elements is their natural quality and that the measurement of the elements is to be substituted for their perceived evaluation then the science emerges as the following complex of entities.

1. The object of the science is a society as a holistic entity comprising the humans and the machines.
2. The means of observation – collecting statistical and expert data amenable to consensus.
3. The method of study - numerical modeling approved by consensus.
4. The instrument – a language of generalized terms allowing the consensus to be established.
5. The criterion of truth – empirical evidence of historical facts accepted by consensus.
6. The sphere of application – the control of the global economy.

Now let's review the analogies of the economics and other natural sciences. The most prominent one concerns the law of entropy. The evolution of an economy changes the value of its entropy but unlike thermodynamics the economic entropy decreases because the economy produces knowledge which reduces uncertainty. This is done at the expense of dissipation of energy hence by increasing the thermodynamic entropy.

The political term “level of development” applied to an economy is wholly analogous to the term “temperature”: the higher is the temperature the smaller is the gradient of thermodynamic entropy, and similarly the higher is the level of development the smaller is the gradient of the entropy of the economy. This explains why energy is usually exported from low developed countries to higher developed ones.

To draw the analogy further one can point out that a thermodynamic system can not receive energy from another system if both systems have the same temperature – the intake and the outlet of energy will be equal. The same is with economies – if two economies have equal levels of development the materialized export of energy will be equal to the materialized import of energy.

Since economics treats energy as a vector the entropy will also be a vector, its different components being the images of essential subsystems of the economy.

In economics the Heizenberg's principle of uncertainty is evidently valid: the more definite is the quantity of a generalized product the more indefinite becomes its quality.

In economics the principle of Le Shatelier is also workable: if some changes in quantities are effected within an economy the economy will respond with such changes in qualities which will push the economy to restore its material balance.

Closer consideration of empirical facts makes one feel that there are more analogies in store.

Application of the science

Unlike other natural sciences the economics cannot be applied to its object explicitly because its output is not the conviction but the collective persuasion. So it must purvey its knowledge in a comfortable form on the Internet and thus make it available to all decision-makers. This common knowledge will result in synergy biases in all economic decisions and thus be assimilated by the economy. The control effect of the assimilated knowledge may be great.

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