Entropic And Cold Jigsaws In A Schumpeterian Economy

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ABSTRACT

A jigsaw puzzle is an amusement which consists in completing a given form or figure, which for the sake of argument we may call a landscape, by adding pieces smaller than the unity of the universe in such a way that their addition constitutes a particular combination. At this point we should separate pieces from this definition. First, we have the universe, a single body composed of parts or pieces in which no part is missing and none is superfluous. Secondly, the manner in which we position the pieces implies a specific mathematical combination, which may range from total individuality to total combination. Absolute simplicity means pieces having the same form and variables, for example colour and shape, such that placing any of them anywhere would in itself define the landscape. Absolute combination is a universe or landscape made up of different pieces formed in such a way that each has only one place; it is thus a combination of a total combination defined by all possible combinations.

Keywords: entropic, disorder, equilibrium, puzzle, universe

We both step and do not step in the same rivers. We are and are not [the same person]. All things are an interchange for fire, and fire for all things, just like goods for gold and gold for goods. (Heraclitus)

INTRODUCTION

The universe and, by analogy, an economic system can be divided into heterogeneous components or pieces each fulfilling a separate function but, in combination, comprising a dynamic whole. That dynamic whole has two sides to it: one static, the other dynamic. The universe of Walras is static, as are its components: all the consumers on one side – demand – and all the producers on the other – supply – contribute statically to the definition of the whole.

In a dynamic economy everything changes: taste, the people who demand and, in particular, the people who supply, due to a developing technology and a new industrial organisation. Everything is in a continual state of flux. It is akin to a dynamic jigsaw in which the both the pieces and the composite picture change.

Concepts Of Universe, Puzzle And Entropy

Concept of the Game Theory and the Entropy Theory

A jigsaw is a specific landscape or image composed of pieces that may or may not be proportional – fractions – of the initial universe. There is one or more than one way of building the final universe or image. In order to understand the puzzle we must assume various hypotheses of which the most important is the complete absence of learning, i.e. the person or persons building the landscape do it for the first and last time. In this way we can study the costs and returns resulting from the building process.

Returns are defined as the progress made in arriving at jigsaw completion. Costs signify the energy consumed getting there. As a general rule in simple jigsaws returns increase proportionally, or more than proportionally, as the builder approaches completion. At the same time, unit costs *decrease* faster, the closer the builder gets to completing the jigsaw.

Jigsaws are a species of puzzle. With other puzzles our conclusions would be precisely the reverse of those given above. An example would be Rubik's cube, where the degree of difficulty increases the closer one gets to solving it, because each move compromises the position or possible position of the other pieces. Costs increase, both in terms of movement and also in terms of prior comprehension, i.e. design.

This article will attempt to explain the concept of entropy, i.e. the degree of disorder within a system. That degree of disorder is caused, as it must be, by an energy, which disorganises. So, given disorder, there cannot be order, and therefore there cannot be prior knowledge of either present or future events. Disorder or chaos implies ignorance, which *is* compatible with chaos.

Concept of Puzzle and Entropy in Economics

The universe of puzzles can be seen as an equivalent of the economic system and its characteristics: a country, its system of production, the number of its inhabitants, the degree of their education, the technology, geography and so on, all seen together as a homogenous unit. The pieces of this combination form part of the whole, and not just partially; each part is fully integrated in each and every one of its aspects.

We call 'balance' that economic state wherein in a total sense of information and in immediate time the parts fit together and define the puzzle picture. What this means is that supply and demand establish an immediate all-embracing plebiscite such that no additional movement can arise because all the information has been generated and consumed. By information we mean that relating to prices and quantities, the factors of production and end goods.

Such a balance implies prior information on supply and demand: with respect to demand, the tastes of consumers, their income, whether the balance is capable of providing them with goods in the context of a neutral monetary system, and the price of other goods corresponding to the taste and income level of other consumers. On the supply side we have the productive resources, volume and variety, technology and the prices of these. Equilibrium implies therefore the supply and consumption of all these messages or information, otherwise known as the Walrasian theory of general equilibrium. It derives from the centripetal forces that bring the pieces together in the universe-cum-landscape. It is a stationary state.

At the other end of the scale from this general equilibrium we have entropy, which implies that bursts of information or messages interact with each other and explode into new messages that continually overwhelm the ability of the equilibrium to cope with them. Paradoxically, each message generates new uncertainty in its immediate environment. The system is continually moving away from balance, overpowering the centripetal gravitational forces. In other words, changes occur in the pieces, making them dynamic, capable of continually generating new pieces that in turn change the universe-cum-landscape. This is the Big Bang of the economic universe. There is nothing to say that the forces of expulsion, generating messages and uncertainty, will continue expanding indefinitely; in time they will generate new pieces that converge into a new equilibrium.

By form

With regard to combination and form, jigsaw puzzles are divided into those of a relatively simple conception and those approaching total combination. As we move away from simple puzzles, we can categorise combinatory puzzles by their essential characteristics: the size of the pieces (large, small), the number of pieces, the colours, and the spatial dimensions: points or flats (two-dimensional space), minimum volume (three-dimensional space) and other more complex dimensions.

Examples: simple flat jigsaw puzzle. This is made up of flat square figures each of the same colour and size. In this case it does not matter how the pieces are placed in terms of size or location as we will inevitably arrive at the landscape or universe. An example could be a blue sky having the same tonality throughout. A three-dimensional puzzle of various colours, let us say six, each side being of the same size would be Rubik's cube, considerably more complex than the above puzzle.

Moving on to size, puzzles are divided into those having small pieces proportionally smaller than the large pieces. We could also encounter fragments of irregular size between the small and large pieces. In the first case we would have small cubes of the same size which, in combination, become a larger cube, and by joining the larger pieces we arrive at a landscape having a single size.

The effort, and thus the cost, involved in making each of the puzzles varies in proportion to the complexity of each type of puzzle. The most economic, i.e. the cheapest to make, would be the simple puzzle, while the dearest would be the puzzle have the greatest complexity in terms of size, shape, colour etc.

By Energy

With regard to energy, puzzles can be divided into cold puzzles and entropic puzzles. Energy is the degree of entropy and this is the degree of disorder in a system without this necessarily implying a positive or a negative term with respect to economic health. Essentially, one degree, not the only degree, of entropy is an economy in growth. Growth itself has its different nuances. On one hand it measures the percentage increase in production and/or the form in which it grows, accelerated by the level of technological development. But there are co-existing forms of entropy that indicate in both a physical system and an economic system, movement, consumption and the release of energy.

A cold economy is an economy having an entropy equal to zero and could correspond, for example, to an economy of the medieval type and to a system, of whatever kind, that manifests a Walrasian equilibrium.

This last definition is the one we will take a closer look at below.

Causes Of Economic Entropy

In general the causes of economic entropy lie in energy factors arising in supply that disturb the balance of the initial starting point. The principle is, according to Schumpeter, whose line of research we follow, the entrepreneurial spirit of the undertaker, which is an integrative, globalising, vertical factor which irrupts in the system with new production proposals. This factor sets in train a series of technical innovations which alter the forms of production, the way work is organised, the way workers are organised and the quantity and quality of production and, particularly, the new products. We should add to the entrepreneurial spirit the search for new markets for factors of production, for new markets for placing products, for new forms of financial innovation in terms not only of seeking loans to produce but of granting loans to the purchasers of such products.

These activities constitute positive entropic elements, energy within the system, new messages in the system: quality and quantity of products, forms of purchase, etc. … and, above all, new uncertainties just round the corner. It is equivalent or identical, even, to creating new pieces of a jigsaw puzzle and new energies which, instead of placing and ordering an existing puzzle, disorder it in an expansive Big Bang. The alteration is such that it discomposes the landscape to a point where, in the event for example of an economic downturn or a rise in the level of uncertainty, the pieces reorder themselves into a landscape different from the original one. Nothing can return to how it was before. Although everything comes from what it was, as Heraclitus the Obscure says. These are the arguments on the supply side.

On the demand side we have entropic waves caused by changes in consumer likes and dislikes that set up perturbations in supply in a permanent oscillating spiritual and spiral movement to and fro. The interactions of supply and demand are unceasing and multiply by a factor greater than one the resulting messages and, by an even greater factor, the quantity of uncertainty. Technical innovations improve, as we noted, the quantity and quality of the products, even the manner in which they are supplied and financed. As a result the likes of consumers are continually changing and placing new demands on entrepreneurs: new and faster cars, safer cars, cars offering more for less, etc. This interaction is extremely entropic and makes the number of jigsaw pieces increase and the invisible hand consume greater energy in developing and configuring a landscape that, like a river, changes and yet remains the same.

Heraclitus And The Marxist And Schumpeterian Dialectics

The sequence of energy, entropy and message is a river in which economic systems bathe and, each time they do so, the water changes. That was Heraclitus' intuition. Each time it happens all the economic factors take part: supply and demand, and technology and all that technological advance entails. They work a sea change on the economic climate, causing an unceasing thesis-antithesis sequence. Each thesis, each antithesis, is in itself entropic, generating new messages. Allow us to clarify. So far we have not introduced any institution: not the Church, feudal privilege, bourgeois sense of superiority or the form of production. Suffice it to say that technical innovation and entrepreneurial undertakers create an economic and ideological superstructure that implies a change in mentality and an ideological shift, which these institutions resist. This resistance in itself means new messages and additional uncertainty, which themselves impinge on the manner of production: supply, demand, new requirements with respect to the quantity and quality of the product. It is this interaction which leads to economic development.

The landscape-cum-universe of our entropic puzzle acquires new dimensions: size, colour, shapes, all of which expand and move away from the point of equilibrium given that, be it under Heraclitan, Marxist or, particularly, Schumpeterian dialectic, nothing is what it was. Nor do we know what the universe-cum-landscape will end up being, given that the spread of uncertainty outpaces the messages.

Cold Puzzles

This would be a straightforward puzzle in which neither the pieces nor the final landscape undergoes any change. To define it we have to think in terms of a stable market in which supply and demand remain on an equal footing. This stability relates not only to quantity but also to the characteristics that define it.

In demand it is stable because tastes are lasting, as is the utility they generate; in supply due to the absence of entrepreneurial undertakers and technical innovation. The messages, i.e. preferences, prices, incomes and technology, are consumed and determined by a general equilibrium as defined by Walras. Another of its characteristics is that institutions convert the economic system in a circular isolated entity impervious to outside influence, creating the political ideas, the systems of oppression and circular markets.

An entropic puzzle can become a cold puzzle in extreme circumstances, for example as a result of a major economic depression which ruins entrepreneurs, freezes out the entrepreneurial spirit, depresses demand and paralyses factories. Other potential threats are dictatorships or ideological colonisation, which stifle human initiative. In such cases the pieces lack energy, and messages are minimal and wasted as supply and demand are equally balanced. By this route we return to the set landscape.

CONCLUSION

An economic system is a whole, which we call universe or landscape. It is constituted by pieces of the same or different shapes and sizes which occupy specific places to define a unique landscape. The components of demand and, particularly, those of supply – the entrepreneurial undertaker and technical innovation – generate messages that provide the energy that positions the pieces. At the same time this explosion of energy generates uncertainty, which leads to an alteration of the pieces and of the landscape. Cold puzzles imply a decline in messages and, in particular, of uncertainty, and thus converge towards the definition of a universe-cum-landscape.

These arguments are dynamic, temporal and, in the Heraclitic sense, fluid. In Schumpeter's view they are energetic; in that of Marx they are dialectic. What all three thinkers are saying is that messages interact.

AUTHOR INFORMATION

Jose Villacis Gonzalez is a Doctor in economics and graduate in political science. Lecturer in macro economics at the San Pablo CEU University of Madrid. Discoverer of the fact that macro economics first arose as the result of the work in Spain of Germán Bernácer (Alicante 1883-1965), some twenty years before Keynes wrote his 'General

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