"Mechanical" Metaphors and Theory Formation: a Cognitive-Historical Analysis of Economic Discourse

„Mechaninės" metaforos ir teorijos formavimas: ekonomikos diskurso kognityvinė-istorinė analizė

SAL 27/2015

"Mechanical" Metaphors and Theory Formation: a Cognitive-Historical Analysis of Economic Discourse

Received 06/2015

Accepted 09/2015

SOCIOLINGUISTICS / SOCIOLINGVISTIKA

Natalya Davidko

PhD, associated professor, lecturer at Moscow Institute TOURO (MIT), head of the Humanities department.

http://dx.doi.org/10.5755/j01.sal.0.27.13744

Abstract

Metaphors and categories are an inalienable part of any science. For centuries, mechanical metaphors have been active in shaping economic thought performing their cognitive function. Economists as different as A. Smith and J. Hicks resorted to metaphors not only to name new phenomena (filling vocabulary lacuna), but, what is more important, to make sense of ontologically given parts of economic reality (a heuristic function) and create a cognitive conceptual system, which served as a basis for economic theories (a theory-constructive function). In this article, I will endeavor to analyze why the way of thinking based on mechanical analogies has proved so fruitful in the history of economics. For this purpose, a cognitive-historical model of analysis is used, which allows one to place the emergence of concepts in the 'context of discovery'. I will undertake to examine the ideology underlying mechanical metaphors, their epistemology and interpretative capacity, as well as their theory generating power. One more aspect of research is to see how the development of a science enriches the language itself. The subject matter of the current research is the focal concepts of modern economics such as 'the market', 'the economy', 'the business cycle', etc. Their analysis is based on the works of the leading economists, starting from the the 17th century. Belonging to different schools of thought, addressing different economic phenomena, they have one thing in common – reliance on mechanical metaphors.

KEYWORDS: cognitive-historical analysis, mechanical metaphors, theory-constructive function, discovery context, economic ideology, discourse, metaphorism, schema, interpretative kernel.

ktu 1922

Research Journal
Studies about Languages
No. 27/2015
ISSN 1648-2824 (print)
ISSN 2029-7203 (online)
pp. 53-68
DOI 10.5755/j01.sal.0.27.13744

'How soon can you start as sheriff?'
'I wouldn't know how to do this job. I only know how to fix things.'
'It's the same thing. You see how things work. How they fit together. Little clues that other people miss.'
'You are talking about machine.'
'People aren't much different.'

(Hugh Howey 2013, 104)

Introduction

Two potent deep-rooted metaphorical veins – organic vs mechanical – have been running through philosophical, political, and economic writings at all times. Though these metaphors had been supplying images for conceptualization of human experience from time immemorial, they received special attention and elucidation only in the the middle of the 20th century when their role as orienting models in the world and "the substructure of thought" was brought to the fore. Called "root" metaphors (Pepper, 1961) or "conceptual archetypes" (Black, 1962) or "absolute" metaphors (Blumenberg, 2010), they underlie metaphorical thinking and have a clear determinate effect on human cognition, forming "the cognitive foundation for systems of thought and world hypotheses" (Pepper, 1961, p. 151). According to these philosophers, organic and mechanical metaphors operate at the level of the unconscious supplying "ways of seeing within which concepts are formed and undergo modifications" (Blumenberg, 2010, p. 5). They are indispensable to human cognition because they give a "structure to a world" (ibid., 2010, p. 14). In economics, since its conception, mechanical metaphors have been instrumental in the cognizance of economic reality and shaping economic ideas.

The **aim** of this article is to analyze the concept- and theory-constructive power of mechanical metaphors in the history of economic thought and assess their interpretative capacity of economic reality and specificity. A **cognitive-historical method of analysis** is employed in this article in combination with content and discourse analysis. The cognitive-historical method is commonly applied in the works devoted to the history of science. It is cognitive in that it proceeds from and deals with concepts, their formation, signification and implications they had for the development of a science. It is historical in that it considers the environment of the actual emergence of concepts, in other words, it is imbedded in the 'context of discovery' – a complex combination of ideology, science, social and cultural background. It has been pointed out that actual linguistic practices in concept formation have gone largely unexamined (Nersessian, 1987, 2008). That is why it is of utmost importance to complement the cognitive-historical method with the time-proven **method of discourse analysis**. "Discourse analysis of economic theory is a question of seeing how language and other discursive forms can produce the meanings that determine partly our cognitive experiences of economic reality." (Amariglio, 1990, p. 16). The advantage of this methodology is that it combines tools from cognition and linguistics to analyze economic discourse. The **material** for the current research comprises economic writings of the renown economists whose ideas actually created economics as a modern science and at different times revolutionized it opening up new venues for discovery and development. Their writings span a period of four centuries: Mercantilists (17th century); A Smith (18th century); A. Marshall and L. Walras (19th century); R. Frisch and J, Hicks (20th century). They belong to different times and countries, different schools of thought and philosophical background[1]; however, what they all have in common is the use of analogous imagery – metaphors. Finally, **content analysis** was applied to the chosen discursive formation. Content analysis is a sophisticated research tool focusing on concepts rather than words within texts or sets of

1 See 'notes'.

texts (Carley 1990). It starts with identifying concepts present in the chosen discursive formation and proceeds to explore mental models – in this research models generated by figurative thinking – in their cognitive, linguistic, socio-cultural, and historical integrity. For practical purposes, kernel concepts of modern macroeconomics have been chosen: 'the economy', 'the market', 'the business cycle', 'money', and some others which were signified by and explicated through mechanical metaphors. Metaphors are studied as a reflection of cognitive processing of reality and as a key to theory formation.

Metaphors in science

The importance of metaphors for all sciences – both 'hard' and 'soft' – has only recently been recognized. Being vehicles for projecting one conceptual field onto another, metaphors help interpret complex abstract ideas in terms of simpler and familiar ones.

> *"Metaphorical bridging of the new and old is precisely the mechanism that makes cognitive shifts possible. And for that reason metaphors function as far-reaching instruments for the theoretical language in science and scientific reasoning itself"* (Radman, 1997, p. 61).

Economics as a science with its own conceptual system is no exception. Being a relatively young intellectual discipline, economics is a direct descendent of political economy and philosophy of the preceding centuries with their established metaphoricity. Metaphorical paradigms (historically conditioned sets of metaphors associated with a particular period) shape economic discourse, "control concepts and theories" and "authoritatively indicate not merely the solutions to problems, but the kinds of problems which are to be conceptualized as requiring solution" (Pocock, 1989, p. 13). Thus, the exploration of the history of metaphors goes hand in hand with the exploration of the history of economic ideas. The analysis of metaphors in historical discourse is insightful in understanding scientific concepts and models.

In any science, metaphors perform at least five important functions 1) a heuristic function that helps to visualize a new phenomenon; 2) a catachrestic function filling lexical gaps in terminology; 3) an exegetical function of transmitting concepts down to new generations of scientists; 4) a theory-constitutive function that ensures the creation of a conceptual system of a science; and finally, 5) an explanatory, or didactic function which provides for the dissemination of knowledge (Boyd, 1993; Resche, 2012). The focal interest of this research is the ability of metaphors to help shape economic theories, methodology, and fundamental economic concepts. I intend to analyze theoretical reasoning of economists through the lens of metaphors they use. As McCloskey has justly put it,

> *"Economics is very much a system of metaphors. The choice between schools of thought is thus between their respective modes of discourse, their respective system of metaphors"* (McCloskey, 1985).

Though metaphors are part and parcel of any scientific inquiry inasmuch as metaphors become theory- and concept-constructive, they, however, have serious drawbacks: metaphors highlight one aspect of a phenomenon and obscure others. They produce a "kind of one-sided insight" (Morgan, 1998, p. 13).

> *"In particular, one has no guarantee that a seemingly apt metaphor will actually prove appropriate and helpful when pushed beyond the limited observations that initially inspired it. An investigator who wishes not to be misled must make himself aware of the metaphors he uses and remain alert to both their limitations and the continuous pressure they subtly exert"* (Langacker, 1991, p. 507).

A brief survey of research literature

Much has been written about metaphors in general (Gibbs, 2010) and little about the role and specificity of organic or/and mechanical metaphors in economic theory construction. The best known work comparing the two archetypes is the book "The Americans" (Gorer, 1948), where the author claims that European metaphors are organic, whereas American metaphors are mechanical. What is interesting in this book is that the differences in the ways of interpreting reality by the two nations speaking practically the same language are traced back to the layer of root metaphors that have conditioned a particular interpretation of the world and behavioral patterns.

Consonant to this view are the conclusions arrived at by the researchers of the American Constitution and government structure. Historians claim to have identified dominant metaphorical paradigms and that the machine was the organizing image in eighteenth-century America (HLR, 1997, 1833). They state that with its checks and balances, the American Constitution is "a direct product of mechanism" (Landau, 1972, p. 84) and that American government is "a sort of unconscious copy of the Newtonian theory of the universe" (HLR, 1997, 1835).

Metaphors are used as convenient tools of analysis in business management. Being a purely pragmatic approach to metaphors – and other images for that matter, – it helps enhance managerial efficiency by applying imagery to multifarious situations that an executive has to take in his stride and which require a non-traditional solution. This approach explains how one can use metaphors as practical frameworks for "reading and shaping" organizations.

> *"It shows how we can harness the power of metaphors to deepen our understanding of situations and create new, more effective ways of managing and organizing"* (Morgan, 1998, p. 12).

There are numerous studies of conceptual metaphors in advertising and mass media and surveys of conceptual metaphors used in oral and written speech by political leaders, economists, and influential public figures. The purpose is to study the affective significance of metaphors, infer hidden implications, and evaluate their persuasive efficacy. In politics, metaphors are regarded as ideological devices which help political elites create "privileged" accounts of reality.

However, none of these studies aims at exposing a formative influence of metaphors on economic science or explains the emergence of theories governed by them.

A potted history of organic and mechanical metaphors

Organic metaphors are probably the oldest in the history of human thought and cognition. The image of the world as a living organism has been present in philosophical writings since ancient times. When Plato (428–348 BC) used the notion '*anima mundi*' (the sole of the world), he employed the organic metaphor comparing the universe to the human being:

> *"We may consequently state that: this world is indeed a living being endowed with a soul and intelligence ... The god made the world a single, visible, living being, containing within itself all living beings that are naturally akin to it" (*Plato, 2008, p. 19).

Contrastingly, when Ptolemy (90–168 AD) presented the universe as a set of nested spheres, he resorted to the mechanical metaphor describing the world as a machine and laid down the foundation for the conception of an overarching notion of '*machina mundi*' (world machine) which became very popular in the Middle Ages due to the works of J. Sacrobosco (1195–1256). Johannes de Sacrobosco, a monk, astronomer, mathematician, and a teacher at the University of Paris whose *Tractatus de Sphaera* (a textbook on astronomy) seized hold of inquisitive minds in medieval Europe, wrote about "the machine of the universe", the nine layers of the heavens revolving around the earth with divine regularity and suggested that the solar eclipse during the crucifixion of Jesus was a disturbance in the orderly functioning of that machine: "The mechanism of the universe was dissolved!" (Thorndike, 1949, p. 142).

As a result, the two views of the universe – '*anima mundi*' and '*machina mundi*' – have existed side by side ever since they were formed, with the organic view prevailing up to

approximately the 14th century when medieval philosophers, advocates of the latter approach, started to make inroads on the organic turf. By the 17th century, with the development of mechanics, mathematics, astronomy, and amazing breakthroughs in physics, "the world machine" had become the central metaphor in the philosophy of science of that time.

Ideology

Trying to draw a borderline between the two world views, researchers stress that organic metaphors are "begotten" from nature, whereas mechanical metaphors are based on man-made prototypes, hence they display a modeling capacity and represent reality in an extraordinary completeness of a closed system in which the "main interest lies in the automaticity and regularity of the mechanism" (Blumenberg, 2010, p. 71). In economics, Claude Menard (1981) contrasted "naive" organic metaphors and metaphors imported from physics, especially mechanics and celestial astronomy. Historiographers and economists, among whom are Nobel prize laureates, believe that reliance on the mechanical metaphor in economics augments a social discipline to the status of a science (Mirowski and Cook, 1990) and places it on equal footing with physical sciences.

> *"Economics aspires to a place in this group of sciences: though its measurements are seldom exact, and are never final; yet, it is ever working to make them more exact."* (Marshall, 1961, p. 31).

Mechanical metaphors carry a specific type of ideology. Ideology in economics refers to the frameworks of perception by which societies organize and interpret "the raw stuff" (parts of reality) (Heilbroner, 1990, p.105). Ideology is the foundation that provides the axioms and theories to explain the ways that the world works. It is the ideology that shapes perceptions of economic processes. Mechanical metaphors represent the world, and the economy for that matter, as an assemblage of working parts and control levers, cogwheels, springs, strings and gears which are connected together and move simultaneously; however, the mechanism may falter and can be put right again by moving the proper control lever or replacing gears; or it may rattle and even break down, but, like any other machine, it may be taken down into parts, fixed, and launched anew. The machine metaphor gives people an illusion of power over nature. Man can pull strings if he understands the laws and rules according to which the machine of nature runs. Thus, the machine metaphor embodies functionality, order, regularity, mobility, and predictability, but what is more important – the possibility of modeling and control. As far back as the 18th century, A. Smith stressed the usefulness of this view.

> *"A system is an imaginary machine invented to connect together in fancy those different movements and effects which are already in reality performed"* (Smith, 1980, p. 66).

Scientific underpinnings

The Scientific revolution of the 17th century enhanced the mechanistic cosmology. Analyzing the techno-cultural milieu of the early modern period, we can single out three factors that aided mechanical metaphors to enter mainstream scientific thought. First, the explosion of technical inventions: suffice it to mention a steam turbine, the first submarine, an adding machine, a barometer, an air pump, a telescope and microscope, and many others. Second, the rapid development of 'hard' sciences caused a dramatic change in the worldview. Galileo's theory of motion and acceleration, Kepler's laws of planetary motion, Copernican model of the planetary system, and Newton's laws of universal gravitation caused the revision of accepted ideas and beliefs. Physics, and mathematics had a great impact on philosophers who willingly absorbed and incorporated the novel ideas. The third factor, and probably the most important one, was the emergence of a new philosophy of nature – the mechanical philosophy. Its key figure was Rene Descartes (1596-1650). In 1644, he wrote,

> *"I have described the earth, and all the visible world, as if it were a machine in which there was nothing at all to consider except the shapes and motions of its parts"* (Descartes, 1931, p. 289).

It is believed that Descartes legitimated the machine metaphor as a model tool of the new science. As a result, the mechanical metaphor – THE UNIVERSE IS A MACHINE – started shaping scientific thinking.

One of the first economists to embrace the idea of the machine-universe was the 18th-century economist A. Smith (1723-1790). In his work "The Theory of Moral Sentiments" we find the best description of this metaphor: the world around us is "the immense machine of the universe."

> *"...all, even the smallest of the coexistent parts of the universe, all, even apparently the most insignificant of ... events are exactly fitted to one another in one immense and connected system"* (Smith, 1976, p. 289).

Smith mentions "the various appearances which the great machine of the universe is perpetually exhibiting with the secret wheels and springs which produce them" (ibid., 19). What is still more important is that each part of the machine is designed for a specific purpose which it successfully fulfills.

In the nineteenth century Physics continued to have an overwhelming effect on all sciences. Neoclassical economists of this century enhanced the mechanistic view of the economy by equating economic variables to those of physics. The most prominent figure among them was French economist Leon Walras (1834-1910) who wanted to create a "new science .. . a science of economic forces analogous to the science of astronomical forces." For him, the analogy was "complete and striking" (Walras, 1965, p. 119-120). Leon Walras was trying to find an isomorphism between physics and economics and as a result constructed a model of economic dynamics drawing heavily on mechanical and astronomical metaphors. The overarching metaphor in his works is THE ECONOMY IS THE ASTRONOMICAL UNIVERSE. Accordingly, its components resemble celestial bodies. He explained utility[2] as potential *energy*, which sets in motion the exchange of goods; compared marginal satisfaction to the *equilibrium* of a "balance romaine" (steelyard)[3] and applied the Newtonian metaphor of attraction of bodies in celestial mechanics to price changes in general equilibrium. His writings are strewn with terms such as *force, energy, attraction, mass*, *gravity*, etc. It is impossible to overestimate the influence Walras' general-quilibrium theory exerted on economic thinking. It is at the core of the market theories of *lassez-faire* capitalism; for a long time it was pivotal in theories of the business cycle; today, it is the foundation of Development Economics.

Another famous economist of the 19th century A. Marshall (1842–1924) was so fascinated with physical sciences that, in 1860, he produced a paper called "Ye Machine," in which he postulated the existence of a machine capable of receiving impressions from the external world, on the basis of which different parts of the machine contemplate befitting actions (Marshall, 1868). The Cartesian metaphor MAN IS A MACHINE (Descartes, 1931) was extended to MAN IS A THINKING MACHINE. Reason, perception, and cognition were mechanized.

In the philosophy of the 20th century, the mechanical view of the world gave birth to the philosophy of Instrumentalism – a modern school; interprets scientific theories as practical instruments or tools for the purposes of analyzing the current state of affairs, predicting future events, or changing the world in accordance with one's beliefs and aspirations.

2 Pleasure and satisfaction a person gets from using a commodity.

3 A special kind of scales

An ardent adherent to instrumentalism in economics, John Hicks (1904–89), believed that economics was comprised of tools: concepts, assumptions, models, and economic theories. The aim of economic science was to build a 'toolkit' of useful and efficient tools[4]. These tools could provide economists with insights into economic reality. It bears mentioning here that it was mercantilists, who pioneered the use of the words tool and instrument in reference to economic phenomena. For example, when describing the decaying trade they write:

> *"The whole instrument of Trade must needes bee out of order, and discompounded, like a distemptered Lock, which wil neither open nor shut" (*Malynes).

The tool/instrument metaphor has proved prodigious in creating many modern theories, especially in the spheres of money, investment, and banking. Economists speak of *instruments of central banking; money tools in fiscal policy; monetary policy tool; the tool of choice, leverage, and so on.*

The clock metaphor

The clock-metaphor is one of the first, but certainly most potent, mechanical metaphors, which came into being in the 14th century with the appearance of mechanical clocks in Europe (weight driven clocks were developed in the 13th century; pendulum clocks appeared in the 17th century). It was a most complex mechanism of the time and served as an epistemological foundation for the metaphor in question. Based on this mechanism, the clock metaphor encompasses two facets in its interpretative kernel[5]: (1) the *mode of structure* (a skillful arrangement of many parts) and (2) the *mode of functioning* (an ability to work with predictable regularity). The metaphor was "called upon" to bolster up a new ideology and help ingrain a new worldview in collective consciousness.

The medieval philosopher and mathematician Bishop Nicole d'Oresme (1330-1382) applied the metaphor to the description of the universe – the "clockwork universe" – presenting the world as "a regular clockwork that was neither fast nor slow, never stopped, and worked in summer and winter" (quoted in Frank, 2011, p. 84). The planets circling around the earth are "similar to when a person has made a *horloge* [a clock] and set it in motion, and then it moves by itself" (ibid. 85).

Amazingly, two centuries later Kepler repeated the idea:

> *"the celestial machine is to be likened not to a divine living thing, but rather to a clockwork (horologium) … in so far as nearly all the manifold movements are carried out by means of a single quite simple magnetic force, just as in a clockwork all the motions come from a single weight"* (cited in Matthews, 2000, p. 216).

If we can go by the data in the Oxford English Dictionary, the expression 'clockwork' appeared in the English language much later: the first case of figurative usage is registered around 1628: a 17th century unnamed clergyman in his sermon compared religion to a mechanism: "In this curious clocke-worke of religion, every pin and wheele that is amisse distempers all" (OED).

The metaphor cut across philosophy, sciences, religion, social life, and polity. In 1710, Berkeley (1685–1753) in his famous treatise applied this metaphor to nature

> *"And how comes it to pass that whenever there is any fault in the going of a watch, there is some corresponding disorder to be found in the movements, which being mended by a skilful hand all is right again? The like may be said about the clockwork of nature great part whereof is so wonderfully fine and subtle"* (Berkeley, 2003, p. 64).

4 Before Hicks, A. Marshall expressed similar views.

5 "Kernels" are salient features of the source that are internally consistent with some properties of the target (Camp 2006, 165). They constitute the interpretative and organizing core of the newly conceived image.

John Locke applied the clock metaphor to brain, John Comenius to human psyche and social behavior, Thomas Hobbes to the animal world and political order. The metaphor inspired Newton to call God the "Divine Watchmaker".

From religion and philosophy, the metaphor was transferred to trade. Mercantilists used the clock-and-wheel variant to describe international trade.

> *"And ever as in a Clocke, where there be many wheeles, the first wheel being stirred, driveth the next, and that the third, and so foorth, till the last that moveth the instrument that strikes the clocke; even so is it in the course of Traffique[6]: for since money was invented and became the first wheele which stirreth the wheele of Commodities and inforceth the Action. But the third wheele of exchange of monyes betweene Countrey and countrey, is (in effect) like to the instrument that striketh the Clocke, being therein the thing Active"* (Malynes, 1622).

The clock metaphor existed for more than four centuries successfully instilling the idea of a mechanical universe as the most viable structure of the world. It has fulfilled its role of making the mechanical world view customary, intelligible, and credible. Once omnipotent, later it went out of use with the appearance of new mechanisms and contrivances. In modern English, it is preserved in the form *to work like clockwork*, meaning regularly, easily, without a hindrance.

Theory-constitutive metaphors

Mechanical metaphors did not only substantiate worldviews, but, what is more important, played a role in forming or modifying concepts and generating new theories. Every discipline professing to be a science has its own paradigm of concepts and categories. Master concepts of economics are: 'the economy', 'the market', 'capital', 'money', 'labor', 'output', and some others. This part of the article analyzes the role of mechanical metaphors in the elaboration of these concepts.

The Economy

Up to the 17th century the prevailing view on the economy was organic. A country's economy was commonly represented as a human body or organism. Suffice it to mention François Quesnay's "Tableau économique"[7] or Thomas Hobbes' "Leviathan". The break with the old tradition became evident in the writings of mercantilists and was endorsed by A. Smith who made considerable use of machine analogies in relation to a variety of economic phenomena. Later, A. Marshall, who although asserted that "the Mecca of the economist" is organicism, finally agreed that economics must "give a relatively large place to mechanical analogies" (Marshall, 1920, p. xiv).

The root metaphor – THE ECONOMY IS A MACHINE – gives us an opportunity to get an insight into how metaphors fulfill their heuristic function, analyze their ontology, and see how economic rhetoric enriches the language.

Let us consider some examples in more detail. The overarching metaphor MACHINE applied to 'the economy' goes under many guises. First, the economy is depicted as A MEANS OF TRANSPORTATION – a generic model which lacks specificity and serves as a schema[8] for further metaphorical images of the concept in question. The generic cognitive model performs a selectional function by importing from the source domain those features which are to constitute the epistemological foundation for a new metaphor and contribute to its interpretative capacity. The interpretative kernel in this case includes such salient properties as (1) the *mode of action* (carrying passengers and/or loads to a place of destination) and (2) *the*

6 International trade

7 F. Quesnay represented sectors of French economy as parts of human body.

8 The term 'schema' is used here in Kantian sense as a "procedure of imagination in providing an image for a concept" (Kant 1953, 182). Kant considered that schemata are not images as such; their function is to provide images.

mode of operating (an agent who directs and controls the vehicle). The generic model is then actualized in concrete surface conceptual models.

Mercantilists saw the economy as a ship which sails out to sea with a captain at the rudder. It is not surprising: the mastery of the sea was crucial to the survival of an island nation. Today we find vestiges of the ship image in the metaphorical expressions (metaphorisms)[9] which are used to describe the economy: *run onto the rocks; steer the economy, weather the storm, pay full freight, a flagship company, mainstay*[10] *of the economy, look for a safe haven*.

After the basic metaphor gets rooted in a new domain, the transfer of other properties of the donor object in the source continues, which accounts for numerous metaphorisms. It can be best exemplified with the expression *a flagship* applied to the description of a company. Literally, it was the most important ship in a fleet, which carried the fleet's admiral and flew his flag. The kernel in this case is "importance and prestige"; so when we call a company a 'flagship', we mean "of high renown and repute". Likewise, the metaphorism *mainstay* when transferred to the economic domain retained the meaning "providing crucial support" as in "agriculture is a *mainstay* of the economy in many countries."

Another interesting case is when a metaphorism starts a life of its own. From macroeconomics, the *safe-haven* metaphorism span off to the investment theory where it was "augmented" to the status of a metaphor, filling the vocabulary lacuna, and started to mean "An investment that is expected to retain its value or even increase its value in times of market turbulence" (Investopedia). As the investment theory developed its risk hedging tools, it brought forth several metaphorisms based on the new metaphor: *safe haven currency, safe haven industry* and others. E. g. "Gold is typically considered a *safe haven* when currency markets are volatile" or "The Swiss frank retains its allure as *a safe haven* as this drama continues to play out." (ibid.)

For A. Smith, the economy was a wagon; the metaphor proved linguistically unproductive and has not left any traces in the language.

The 19th century saw the economy as a train, hence the expressions: *the economy is losing/ picking up steam, grinds to a halt, on the right/wrong track, full steam ahead, end of the line, plans got derailed, light at the end of the tunnel, etc.*

In the 20th century, the car metaphor established itself in the language and in economics parlance.

> *"The national economy is like an automobile. The accelerator pedal is marked 'higher government spending/lower taxes'; the brake is marked 'lower government spending/ higher taxes'. A government that drives deftly and carefully can bring economic growth and stable prices"* (Buchholz, 1999, p. 126).

The metaphorisms that ensued are: *Keep the economy on the road, to be in the driving seat, get it out of the ditch, to jump start the failing economy, to accelerate, gain/lose traction, be stalled, etc.*

If the economy is seen as a car engine, it may become *overheated,* the driver must *look under the hood* and *fine-tune* it.

Later the airplane image added expressions to economic speak: *a hard landing, a bumpy ride, piloting your business, overloaded plane, to nose-dive*.

Another mechanical view of the economy is THE ECONOMY IS MACHINERY, so tools must be applied to fix it*: tighten or loosen the* screw on the economy; the parts of this machinery must be *greased* or *oiled*.

9 The term 'metaphorism' was suggested by Reddy (1979) to denote metaphorical expressions referring to one abstract conceptual structure through which we infer conceptual metaphors..

10 'Mainstay' a rope that supported the main mast of a ship.

The ontology of metaphors discussed above brings out some important regularities. First, a root/absolute metaphor sets a general direction for cognizance of reality, and serves as a prototype at the level of the unconscious for abstract conceptual structures which are conceived at the conscious level. Second, by modifying the prototype, a generic conceptual model is produced, which is a schema for generating metaphorical images via importing relevant properties from the source domain/domains necessary and sufficient for constructing the interpretative kernel for a new metaphor. Third, the schema allows of variability and is susceptible to modifications in full conformity with techno-scientific progress and cultural milieu in creating basic surface metaphors. Fourth, each basic metaphor gets "encrusted" with multiple expressions (metaphorisms) which add to the characterization of the target concept and at the same time enrich the language. Fifth, metaphorisms can branch out into new domains generating new conceptualizations and giving birth to still more metaphorisms.

As far as the theory-constructive function of the aforementioned metaphors is concerned, they all have been instrumental to the development of views which support government interference in the economy. The image is crystal-clear: in order to reach a desired destination, a ship must have a captain, a car a driver, a plane a pilot. Starting with Mercantilists, who believed that "Trade without Order and Government" is like a ship with holes which will sink, up to nowadays, there is a wide variety of theories representing Regulatory Economics which theorize that the economy must be run by the "visible hand" of government.

The business cycle

The notion of the business cycle – alternation of good and bad times in the economy – is central in the description of the economy. Though business cycles have existed since Year One – the Bible mentions "fat" and "lean" years, – they received systematic exposition only in the 19th century in the works of French economists Leonard de Sismondi and Charles Dunoyer. Famous economists Robert Owen, Karl Marks, Joseph Schumpeter devoted hundreds of paged to crises. For a long time business cycles were described in terms of organic metaphors. Alfred Marshall, for example, compared the dynamics of growth and eventual decay of an industry or economy to the cycle of growth of trees in a forest (Marshall, 1920, p. 316-317). It was customary to describe the upturns and downturns of cycles in terms of "waves", and shocks an economy received in terms of natural elements such as sunspots or storms.

Interesting however the organic view is, I will address myself to mechanical metaphors, the most spectacular example of whose constitutive role is Ragnar Frisch's successful endeavor to get at the core of the causal structure underlying the business cycle with a sequence of mechanical metaphors. It provides an impressive illustration of the importance of figurative rhetoric in theory construction. When R. Frisch first began analyzing the business cycle, the mechanical view of the phenomenon in question was already popular with his contemporaries. The conventional constitutive metaphor was Newtonian celestial model and based on it Walras' general-equilibrium theory asserting that periodicity of cycles was revolving around some equilibrium organizing force.

R. Frisch felt that the business cycle was too complicated to be analyzed within the framework of general equilibrium which emphasized the self-correcting nature of business cycles and left neglected the role of many economic factors such as innovation, interest rates, etc. Walras himself admitted that the general equilibrium hypothesis was an ideal, and not a real state. In his intellectual pursuits, Frisch tried several other models and metaphors, looking for a suitable image that may facilitate access to the phenomenon in question. First, he analogized the business cycle with the swing of a simple pendulum[11], but very soon understood that the swings of a pendulum, unlike unpredictable turns of the cycle, were too regular; he tried the movements of a composite system of pendula: he demonstrated to his students at

11 Many famous mathematicians and scientists have studied and learned from the pendulum, including Sir Isaac Newton Galileo, Foucault. Dutch physicist Christiaan Huygens invented the first pendulum clock.

Yale a larger pendulum with smaller pendula attached to it. He poured water (water signified innovations) on the pendulum in order to disturb the rhythmic swings. However, he was dissatisfied with the pendulum metaphor too, so he resorted to another image – a rocking chair, which was finally replaced with a 'stick and rocking horse'[12] metaphor, comparing upswings and downswings in the economy to a rocking horse movements that is given a push from time to time with a 'stick'. He felt intuitively that the rocking horse captured the salient features of the cycle: its intrinsic dynamics (what he called the propagation mechanism) and outside impulses (irregular pushes) that corresponded to various random shocks to the economy (Frisch, 1933). These features constitute the informative kernel of the metaphor. The metaphorical shift enabled the theoretician to cast off the fetters of conventional ways of seeing the phenomenon and embark on a new path. Thus, an insightful metaphor was instrumental in the formation of the Neoclassical business cycle theory.

The Market

The central concept in modern economics is the Market. It is argued that the success and vigor of a capitalist economy depends on a system of markets. The mainstream theory of the Market abounds in mechanical metaphors: *market forces*, *a self-correcting mechanism*, *equilibrium*, t*he price mechanism* to name but a few. The idea of a self-regulating market dates back to Adam Smith. The central trope in his work is the "Invisible Hand" which is theory-constitutive and helps to visualize the workings of the market mechanism. If we interpret it as a mechanical metaphor[13] then it stands for some force regulating the system, the idea imported from classical mechanics and Newtonian astronomy.

A. Smith depicted the equilibrium price (natural price in his terminology) as the center of the "market universe":

> *"The natural price, therefore, is, as it were, the central price, to which the prices of all commodities are continually gravitating. But whatever may be the obstacles which hinder them from settling in this center of repose and continuance, they are constantly tending towards it"* (Smith, 1804, p. 52).

In the 60s of the last century there was an attempt to present 'the market' as traffic (Taylor, 1966). The author postulated that behavior of drivers in traffic in a given country may be instructive to behavior in markets. However, the metaphor did not strike root in the market theory.

Balance of trade

This is one of the most important economic indicators that investors and policymakers watch closely to assess the state of the economy. The metaphor appeared it he 17th century but without it we cannot imagine modern economics. Introduced by F. Bacon in 1616, the term got currency in mercantilists' pamphlets. It is believed that the word 'balance' was originally used by physicists to describe the state of equilibrium in the natural world. However, mercantilists offer a simpler – but probably more plausible and no doubt more *prima facie* – explanation, drawing an analogy with scales/balances.

> *"The gain or loss in trade cannot be known till the forraine Commodities and the Native Commodities bee cast into The Balance of Trade, to bee waighed and tried one against the other. For as a paire of Scales or Balance, is an Invention to shew vs the waight of things whereby we may discern the heavy from the light: So is also this Balance of Trade, an excellent and politique Inuention, to shew vs the difference in waight in the Commerce of one Kingdom with another" (Misselden, 1623, p. 116).*

12 The metaphor was borrowed from K. Wicksell (a Swedish economist) who compared the trade cycle mechanism to that of a rocking horse that was pushed by a stick.

13 There is another interpretation of the Invisible Hand metaphor which claims that it embodies the 'wisdom of nature' and hence is regarded as an organic metaphor.

Today, the metaphoric nature of the term is scarcely discernible. Nevertheless, it has fulfilled its role by creating a methodology of assessing a country's success or failure in international trade. Other terms in this series are from banking and accounting: *balance of a banking account*, *balance of payments*, *balance sheet.*

Price

All price theories in modern economics are purely mechanical and are based on the Walrasian equilibrium, where market prices are determined by supply and demand. However, there is a very interesting case of the Scissors metaphor which likens demand and supply to two blades of a pair of scissors. Introduced by A. Marshall in his "Principles" to discuss "what governs value" of a commodity, the scissors metaphor almost immediately became pregnant with multiple interpretations. Originally, the two blades of this simple instrument denoted, on the one hand, 'utility', on the other, 'cost of production'.

> *"We might as reasonably dispute whether it is the upper or the under blade of a pair of scissors that cuts a piece of paper, as whether value is governed by utility or cost of production. It is true that when one blade is held still, and the cutting is effected by moving the other, we may say with careless brevity that the cutting is done by the second"* (Marshall, 1961, p. 348).

The analogy was carried over to the distinction between short and long periods in the economy, supply and demand, and finally, the price theory. The most important extension of the original metaphor in modern economics is "Price scissors". Price scissors occur when the value of a sector falls dramatically (short blade) while another sector rapidly gains in price (long blade). This phenomenon can cause chaos as individuals do not expect prices to take such wild and opposite direction from the norm. For example, if a country exports dairy products and imports crude oil, a large price drop in the worldwide value of milk combined with a sharp increase in the value of a barrel of oil would cause a price scissors (Investopedia).

Money

Metaphors describing money are innumerable including both organic and mechanical ones. Moreover, they are often so fused that it is difficult to delineate them. When we say 'the economy is flooded with money,' do we mean flood as an element of nature or as a part of Fluid Dynamics? Or, when scientists use the word "wave", do they borrow it from nature or from physics? Since we are interested in mechanical metaphors, we shall disregard the organic side and concentrate on what may be considered mechanical. Ever since the conception of the very first theory of money in the oeuvres by N. Oresme, money has been treated as something liquid (for Oresme it was four humors: blood, black bile, yellow bile and phlegm). Later T. Hobbes described money as "the blood of the economy." These metaphors generated such expressions as *liquidity, liquid assets, money flow, etc*.

This image of money as liquids inspired B. Phillips to build, in 1949, an economic machine for the University of Leeds and the next year another one for the London School of Economics. His aim was partly pedagogical: to illustrate to his students the circular flow of money within the economy. It was the first attempt to explain the functioning of economy through visual mechanical modeling. The machine consists of pumps, tanks, pipes, valves, and sluices made of transparent plastic through which colored water is pumped. The aim is to show "how the production flow, consumption flow, stocks and price of a commodity may react to one another" (Phillips, 1950, p. 284). It is a visual embodiment of such expressions as *money flow, pump money into the economy, inject money in the economy*, etc.

Not only economists come up with interesting metaphors. Henry Ford, the famous car maker, tried to analogize money with his favorite cars.

> *"The function of money is not to make money but to move goods. Money is only one part of our transportation system. It moves goods from man to man. If ... money will not move goods, it is just the same as an engine that will not run. Someone will have to get out and fix it"* (quoted in Brevig, 2004, p. 54).

The metaphor did not resonate. But, as George McDowell (2004) rightly put it, metaphors are never perfect, sometimes even misleading, but almost always instructive.

Conclusion

Summing up, the conception of many modern economic theories has become possible, to a great extent, due to the application of mechanical metaphors, e. g. Development economics, Neoclassical business cycle theory, Regulatory economics, Free market economic theory and others.)

The 17th century was the turning point from the organic paradigm to the mechanical worldview. The break with the old orientation system was corroborated by technical revolution, dramatic developments in physics and astronomy, and the appearance of new philosophical schools.

The attractiveness of mechanical metaphors is in their ideology – beliefs that the outside world can be controlled and, if necessary, amended. They present any phenomenon as a finite structured system, akin to some mechanism, governed by determinable laws and rules. The task of an economist is to discover these rules and prescribe a suitable 'toolkit' for the "machine" of economy to run smoothly.

Ontologically, mechanical metaphors fall into two types: those borrowed from other sciences – mainly physics and philosophy; and those drawing images from man-made mechanisms (mundane contrivances and gadgets).

Epistemologically, mechanical metaphors generate new knowledge (concepts and theories) due to their interpretative capacity which is grounded in their "cognitive content" - kernels of salient properties transferred from the source domain. Further proliferation of acquired metaphorical meaning continues within the new domain via spin-offs. A success or failure of a metaphor depends on its ability to facilitate access to economic phenomena requiring solution.

The research has also exposed the onto-genesis of mechanical metaphors in economics: From the absolute archetype (machine) to a generic conceptual schema (means of transportation, machinery) to basic surface images tuned to the current cognitive and socio-cultural context.

Basic metaphors become what Goodman called "a whole apparatus of organization" (Goodman, 1968, p. 73) for the new domain, where they form open-end systems of metaphorisms adding any possible property to the basic concept that metaphorical imagination can conjure up.

As a result, economics as a system of rhetoric, enriches the language itself. Metaphors display different degrees of metaphoricity, from trite metaphors (balance) to those which retain their figurativeness (scissors), to the ones that exist as economic 'artifacts' mainly known to specialists (rocking horse).

Metaphors give true insights about reality. There is an ongoing process of rethinking and redefining economic concepts. If economists explore alternative perspectives, we may be in for new metaphors. Whether they will be organic or mechanical will depend on historical context.

Notes

Frisch Ragnar (1895–1973), a Norwegian economist and the co-winner of the first Nobel Prize in Economic Science in 1969. Frisch was one of the founders of economics as a modern science. He coined a number of new words including *econometrics, microeconomics/macroeconomics*. His 1933 work on business cycles became one of the principles of modern New Classical business cycle theory.

Hicks John (1904–1989), a British economist, one of the most influential philosophers of the 20th century. In 1972 he received the Nobel Memorial Prize in Economic Sciences.

Marshall Alfred (1842–1924) was one of the most influential economists of his time. His book, *Principles of Economics* (1890), was the dominant economic textbook in England for many years. He is known as one of the founders of economics.

Mercantilism is the first economic teaching, a kind of economic "nationalism"; its purpose is to build a wealthy and powerful state through trade with other countries. The originators of mercantilism were merchants, sea-farers, "men of affairs", directors of companies, and advisers to European kings; they had firsthand knowledge of commerce and were excellent pamphleteers.

Smith Adam (1723–1790) was a Scottish philosopher, pioneer of political economy. Smith laid the foundations of classical free market economic theory, was a precursor to modern economics. He is known for his famous metaphor "the invisible hand."

Walras Leon (1834–1910), a French mathemtical economist. He pioneered the development of general equilibrium theory.

References

1. Amariglio, J., 1990. Economics as a Postmodern Discourse. In: Samuels, W. J. (ed.). *Economics As Discourse*. New York: Springer Science, pp. 15–46.
2. Berkeley, G., 2003. *A Treatise Concerning the Principles of Human Knowledge*. Dover: Dover Publications Inc.
3. Black, M., 1962. *Models and Metaphors.* Ithaca, New York: Cornell University Press.
4. Blumenberg, H., 2010. *Paradigms for a Metaphorology.* New York: Signale Book.
5. Boyd, R., 1993. Metaphor and Theory Change. In: A. Ortony (ed.). *Metaphor and Thought.* Cambridge: Cambridge University Press, pp. 481-532.
6. Brevig, R., 2004. *Beyond our Consent: A History of Secret Power, Deception, and Abandonment of Freedom in America*. Canada: Trafford Publishing.
7. Buchholz, T., 1999. *New Ideas from Dead Economists.* London: Penguin Books.
8. Camp, E., 2006. Metaphors in mind. In: *Philosophy Compass* 1/2, pp. 154–170. [Online] available at http://philosophy-compass.com. [Accessed July 2015].
9. Carley, K., 1990. Content analysis. In: Asher, R.E. (ed.), *The Encyclopedia of Language and Linguistics.* Edinburgh: Pergamon Press.
10. Descartes, R., 1931. Principles of Philosophy, part IV, principle CLXXXVIII; In: *The Philosophical Works of Descartes.* Cambridge: Cambridge University Press.
11. Frank, A., 2011. *About Time: From Sun Dials to Quantum Clocks, How the Cosmos Shapes Our Lives.* New York: Free Press.
12. Gibbs, R., 2010. *The Cambridge Handbook of Metaphor and Thought.* Cambridge: Cambridge University Press.
13. Goodman, N., 1968. *Languages of Art: An Approach to a Theory of Symbols.* New York: Bobbs-Merrill Company.
14. Gorer, G., 1948. *The Americans, a Study in National Character*. London: Cresset Press.
15. Heilbroner, R., 1990. Economy as Ideology. In: Samuels W. (ed.) Economics as Discourse. New York: Springer Science, pp.101–116.
16. Howey, H., 2013. Wool. London: Random house.
17. *Kant, I., 1953. Critique of Pure Reason.* Translated by Norman Kemp Smith. London: St. Martin's Press.
18. Landau, M., 1972. *Political Theory and Political Science: Studies in the Methodology of Political Inquiry.* New York: Humanities Press.
19. Langacker, R., 1991. *Foundations of Cognitive Grammar*. Vol. 2. Stanford, CA: Stanford University Press.
20. Matthews, M., 2000. *Time for Science Education: How Teaching the History and Philosophy of Pendulum Motion Can Contribute to Science Literacy*. New York: Kluwer Academic.
21. McCloskey, D., 1983. The Rhetoric of Economics. *Journal of Economic Literature,* no. 31, pp. 434–461.
22. McDowell, G., 2004. The Market as Traffic: An Economic Metaphor. *Journal of Economic Issues,* vol. 38, no. 1, pp. 270-274

23. Menard, C., 1981. La machine et le coeur. In *Analogie et connaissance: séminaires interdisciplinaires du Collège de France*. Paris: Maloine, pp. 1980-1981.
24. Mirowski, Ph., and, Cook, P., 1990. Walras' "Economics and Mechanics". In W. Samuels (ed.), *Economics As Discourse*. New York: Springer Science, pp. 189–224.
25. Morgan, G., 1998. *Images of Organization.* Thousand Oaks, Ca.: Sage Publications.
26. Nersessian, N., 1987. A Cognitive-Historical Approach to Meaning in Scientific Theories. In: *Science and Philosophy*, volume 3, Amsterdam: Springer Netherlands, pp 161–177.
27. Nersessian, N., 2008. *Creating Scientific Concepts*. Cambridge, MA: MIT Press.
28. Organic and Mechanical Metaphors in Late Eighteenth-Century American Political Thought. *Harvard Law Review,* vol. 110, no 8, June 1997, pp. 1832–1849.
29. Phillips, B., 1950. Mechanical Models in Economic Dynamics. *Economica*, *New Series,* vol. 17, no. 67, pp. 283-305.
30. Plato, 2008. *Timaeus and Critias*, trans. R. Waterfield. New York: Oxford University Press Inc.
31. Pocock, J., 1989. *Politics, Language, and Time: Essays on Political Thought and History*. Chicago: The University of Chicago Press.
32. Radman, Z., 1997. *Metaphors: Figures of the Mind*. Dordrecht: Kluwer Academic Publishers.
33. Resche, C., 2012. Towards a Better Understanding of Metaphorical Networks in the Language of Economics. In H. Herrera et al. (eds.), *Metaphor and Mills*. Berlin: De Gruyter Mouton, pp. 77-102.
34. Reddy, M., 1979. The Conduit Metaphor – a Case of Frame Conflict in our Language about Language. In: A. Ortony (ed.) *Metaphor and thought.* Cambridge: Cambridge University Press, pp. 284–324.
35. Taylor, J., 1966. *The Ethical Foundations of the Market.* New York: Appleton-Century-Crofts.
36. Thorndike, L., 1949. The *Sphere of Sacrobosco and its Commentators*. Chicago: The University of Chicago Press.

Research Material

1. Frisch, R., 1933. Propagation Problems and Impulse Problems in Dynamic Economics. In *Economic Essays in Honor of Gustav Cassel: October 20th 1933*. London: George Allen and Unwin, pp. 171-205.
2. Hicks, J., 1939. *Value and Capital*. Oxford: Clarendon Press.
3. Malynes, G., 1622. *Maintenance of Free Trade*. [Online] available at: http://www.efm.bris.ac.uk/het/malynes/malynes.txt [accessed July 2015].
4. Marshall, A., 1961. *Principles of Economics*. 9th edn. London: Macmillan.
5. Marshall, A., 1868/1986. Ye machine. In *Research in the history of economic thought and methodology*. Archival Supplement, 4, pp. 116-132. Greenwich, CT, USA: JAI Press
6. Misselden, E., 1622. *Free Trade or The Meanes To Make Trade Florish.* [Online] available at: http://socserv.mcmaster.ca/~econ/ugcm/3ll3/misselden/freetrad.txt [accessed May 2015].
7. Misselden, E., 1623. *The Circle of Commerce or the Balance of Trade*. London: John Dawson.
8. Smith, A., 1804. *An Inquiry Into the Nature and Causes of the Wealth of Nations*. Hartford: Lincoln and Gleason Printers.
9. Smith, A., 1976. *The Theory of Moral Sentiments.* Oxford: Oxford University Press.
10. Smith, A.,1980. *Essays on Philosophical Subjects.* Oxford: Oxford University Press.
11. Walras, L., 1909. Economique et Mecanique. *Bulletin de La Societe Vaudoise de Sciences Naturelles,* 45, Paris, pp. 313-325.
12. Walras, L., 1969. *Elements of Pure Economics.* Translated by William Jaffe. New York: Kelley.

Reference Sources

1. Investopedia. [Online] available at http://www.investopedia.com/terms/p/price-scissors.asp#ixzz3bi5oH9Nl
2. Oxford English Dictionary (OED) 1928/1989. Oxford: Oxford University Press.

Santrauka

Natalya Davidko. „Mechaninės" metaforos ir teorijos formavimas: ekonomikos diskurso kognityvinė-istorinė analizė

Metaforos ir kategorijos yra būdingos bet kurios mokslo šakos dalys. Visais laikais mechaninės metaforos buvo plačiai naudojamos formuojant ekonomikos mintį ir kartu atliko kognityvinę funkciją. Skirtingi ekonomistai, pvz., A. Smithas ir J. Hicksas pasitelkė metaforas ne tik norėdami įvardyti naujus

reiškinius (taip užpildydami žodyno spragas), bet, ir tai svarbiausia, suteikti prasmę ontologiškai duotoms ekonomikos realybės dalims (heuristinė funkcija) ir sukurti kognityvinę konceptualiąją sistemą, kuri buvo ekonomikos teorijų pagrindas (konstruktyvinė teorijų funkcija). Šiame straipsnyje bandoma analizuoti, kodėl mąstymo būdas, besiremiantis mechaninėmis analogijomis, pasirodė besąs toks vaisingas ekonomikos mokslo istorijoje. Šiuo tikslu bus naudojamas kognityvinis-istorinis metodas, kuris duoda galimybę sąvokų atsiradimą nagrinėti „atradimų kontekste". Bus bandoma tyrinėti mechanikos metaforų idėjų pagrindą, jų epistemologiją bei interpretavimo ir teoriją generuojančius gebėjimus. Dar vienas aspektas yra patyrinėti, kaip mokslo plėtra turtina pačią kalbą. Šio mokslinio tyrimo tema yra tokios pagrindinės šiuolaikinės ekonomikos sąvokos, kaip *rinka, ekonomika, verslo ciklas* ir kt. Jų analizė remiasi žymiausių ekonomistų darbais. Nors ir priklauso skirtingoms mokslinės minties mokykloms ir įvardija skirtingus ekonomikos reiškinius, jos turi vieną bendrą bruožą, t. y. susijusios su mechaninėmis metaforomis.

About the author

Natalya Davidko

PhD, associated professor, lecturer at Moscow Institute TOURO (MIT), head of the Humanities department.

Research interests

Linguistics, language and business, business terminology, cognitive linguistics; sociolinguistics; diachronic linguistics; didactics: teaching ESL and ESP.

Address

20 Podsosensky Pereulok, Moscow, Russia.

E-mail:

natalyadavidko@yandex.ru