Centro Einaudi   Scuola di Liberalismo   Centro Pannunzio

Scuola 2020 di Liberalismo

I cyber mercati, vulnus per il liberalismo

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Queste slide a
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CYBERNETICS

PLANNING AND MODELS

AGENT-BASED SIMULATION

ARTIFICIAL INTELLIGENCE

MARKETS

EMPLOYMENT

THE DAWN OF INFORMATION TECHNOLOGY (1/2)

The magic moment is that of the mid-1940s, when great minds like John von Neumann, Oskar Morgenstern and John Nash, led to an exceptional joint emergence.

That of: (i) the new calculation tools, (ii) a new language for the social sciences (game theory), (iii) the concept of complexity.

Hanappi, H. (2013). The Neumann-Morgenstern Project–Game Theory as a Formal Language for the Social Sciences. In H. Hanappi, editor, *Game Theory Relaunched*. InTech.
Moscati, I. (2011). Von Neumann, Morgenstern, and the creation of game theory. From chess to social science, 1900–1960. *Journal of Economic Methodology*, 18(4):434–440, 2011. doi: 10.1080/1350178X.2011.628460.

THE DAWN OF INFORMATION TECHNOLOGY (2/2)

With them, Norbert Wiener and the **cybernetics**.

https://en.wikipedia.org/wiki/Norbert_Wiener

Wiener, N. (1948), *Cybernetics: Or Control and Communication in the Animal and the Machine.* MIT Press, Camb. MA, 2nd revised ed. 1961.

https://en.wikipedia.org/wiki/Cybernetics:_Or_Control_and_Communication_in_the_Animal_and_the_Machine#cite_note-1

Rosenblueth, A., and Wiener (1945), The Role of Models in Science, *Philosophy of Science*, 12, 4, 316-321., N.

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Input Output Models

The roots of these models are in the *Tableau économique* by François Quesnay, dated 1758.

Economic planning and models (2/8)

Wassily Leontief (1966) / Vera Cao-Pinna (1958)

Cao-Pinna, V. (1958). *Analisi delle interdipendenze settoriali di un sistema economico*. Edizioni Scientifiche Einaudi. Boringhieri.

Leontief, W. (1966). *Input-output Economics*. Oxford University Press, 1966.

(valori ai prezzi d…

TRANSAZIONI INTERIN…

SETTORI VENDENTI \ SETTORI ACQUIRENTI	Agricoltura (1)	Foreste (2)	Pesca e caccia (3)	Estrazione di combustibili (4)	Estrazione di minerali (5)	Industrie alimentari e del tabacco (6)	Industrie tessili (incl. maglieria e calzetteria) (7)	Industrie del vestiario (del cuoio, calzature e abbigliamento) (8)	Industrie del legno e sughero (9)	Industrie della carta e cartotecnica (10)	Industrie poligrafiche ed editoriali (11)	Industrie chimiche e delle fibre artificiali (12)	Industrie dei derivati del petrolio (13)	Industrie dei derivati del carbone (14)
1 Agricoltura	20.000	—	—	—	—	1.071.960	247.915	250	6.359	7.123	—	5.821	—	—
2 Foreste	16.817	—	—	370	688	8.306	—	—	57.583	3.831	—	7.553		
3 Pesca e caccia	—	—	—	—	—	9.658	—	—	—	—	—	—	—	—
4 Estrazione di combustibili	—	—	—	—	79	2.507	5.039	256	78		35	9.754	170.500	47.130
5 Estrazione di minerali	3.393	—	200	—	—	8.079	159	756	342	1.117	—	43.526	455	
6 Industrie alimentari e del tabacco	189.000	—	—	—	710	.—	150	23.720	262	603	—	32.471	3.100	—
7 Industrie tessili (incl. maglieria e calzett.)	6.023	200	1.800	—	—	2.897	44.470	247.005	6.844	2.624	—	984		
8 Industrie del vestiario (del cuoio, calzat. e abbigl.)	—	—	—	—	—	—	—	—	2.281	—	—			
9 Industrie del legno e sughero	—	—	200	500	500	9.079	454	2.458	—	2.099	—	885		
10 Industrie della carta e cartotecnica	602	—	—	—	—	5.800	2.902	4.254	—	1.050	70.790	6.885	—	
11 Industrie poligrafiche ed editoriali	—	—	—	500	—	5.790	2.724	946	—	682	—	8.853	500	
12 Industrie chimiche e delle fibre artif.	106.000	—	—	660	4.862	20.715	101.948	14.976	4.415	28.782	5.623	19.181	7.280	690
13 Industrie dei derivati del petrolio	25.046	1.500	4.563	320	931	18.400	10.259	1.731	2.216	3.633	2.130	16.821	—	2.084
14 Industrie dei derivati del carbone	—	—	—	—	—	164	43	63	54	20	120	13.154	—	
15 Industrie della gomma	3.885	—	—	—	200	1.400	1.211	2.901	154	248	1.180	1.351	365	68
16 Industrie della lavoraz. dei miner. non metallici	154	—	—	—	—	2.933	—	145	1.165	311	27	4.131		
17 Industrie metallurgiche	2.724	—	—	—	—	12.159	—	—	—	—	510	13.803	—	
18 Industrie meccaniche	8.432	2.050	460	2.000	3.570	25.188	15.599	6.306	16.643	2.897	4.470	18.620	9.000	4.000
19 Industrie manifatturiere varie	—	—	237	—	—	—	—	1.899	105	121	85	515		
20 Costruzioni di abitazioni civili	—	—	—	—	—	—	—	—	—	—	—	—	—	—
21 Edilizia pubblica, lavori e opere pubbl.	—	—	—	—	—	—	—	—	—	—	—	—		
22 Energia elettrica, gas e acqua	12.924	250	—	1.300	3.960	18.965	12.927	2.434	5.199	6.023	1.030	23.492	800	3.528
23 Credito, assicurazioni e altri servizi(*)	—	—	—	—	—	—	—	—	—	—	—	—		
24 (Trasporti)	(82.609)	(14.820)	(2.097)	(14.246)	(13.552)	(137.334)	(20.286)	(11.415)	(15.901)	(2.322)	(375)	(14.010)	(15.096)	(2.732)
25 (Commercio)	(106.119)	(7.524)	(39.897)	(12.755)	(8.660)	(340.883)	(144.580)	(97.000)	(23.833)	(8.798)	(9.200)	(43.751)	(20.900)	(4.400)
26 (da 1 a 23) Totale acquisti dai settori produttivi	395.000	4.000	7.460	5.650	15.500	1.224.000	445.800	310.100	103.700	63.390	86.000	227.800	192.000	57.500
27 Valore { Prodotto netto	2.361.000	96.000	22.000	14.000	68.000	576.000	340.000	120.000	153.000	46.000	82.000	258.000	124.000	11.000
28 Aggiunto { Ammortamenti	198.000	—	1.000	12.000	22.000	56.000	43.000	17.000	19.000	7.000	7.000	53.000	18.000	6.000
29 Servizi resi dalla Pubblica Amministraz. (*)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
30 Produzione vendibile (al costo dei fattori) (30 = 26 + 27 + 28 + 29)	2.954.000	100.000	30.460	31.650	105.500	1.856.000	828.800	447.100	275.700	116.390	175.000	538.800	334.000	74.500
31 Importazioni (C.I.F.)	397.363	15.138	5.925	266.476	29.355	117.098	58.750	5.357	35.681	8.891	1.988	92.366	18.078	2.212
32 Disponibilità totali di beni e servizi intermedi e finali (ai prezzi di mercato)	3.587.734	146.572	95.650	363.772	181.626	3.147.855	1.133.790	605.900	374.025	160.186	183.562	784.987	563.993	85.843

(*) I valori dei servizi di credito, assicurazioni ed altri servizi forniti ai settori produttivi (riga n. 23), nonché quelli dei servizi strumentali resi al settore privato dalla Pubblica Amministrazione (riga n. 29) sono compresi nel prodotto netto dei singoli settori, non essendo stato possibile ripartirli tra gli stessi.

(1) Duplicazioni relative al valore dei servizi di trasporto e distribuzione commerciale a carico dei settori prodotti, già comprese nei valori della domanda finale.
(2) Differenza statistica netta.
(3) Incremento netto di scorte.

A small portion of the 405 sector table of the *U.S. Bureau of Economic Analisys*, 2012, https://www.bea.gov/industry/input-output-accounts-data

CENTRAL PLANNING

If the table is used to drive an economy in a prescriptive way, micro detailed data become essential and the calculation power crucial, but not sufficient. To plan an economy in its details, you need the data and–most of all–the decentralization of their collection and utilization.

In Gerovitch (2008), we have the outline of the critical links among information technology, planning economics, and economic reality.

Gerovitch, S. (2008). InterNyet: why the Soviet Union did not build a nationwide computer network. History and Technology, 24(4), pp. 335–350.

Quoting Gerotvich (2008):

In October 1961, just in time for the opening of the Twenty-Second Congress of the Communist Party, the Cybernetics Council of the Soviet Academy of Sciences published a volume appropriately entitled, *Cybernetics in the Service of Communism*. This book outlined the great potential benefits of applying computers and cybernetic models in a wide range of fields, from biology and medicine to production control, transportation, and economics.

The great computerized economic plan did not turn into a reality due (i) to a sequence of complex contrasts between the decision-makers, much more than (ii) for technological problems.

ECONOMIC PLANNING AND MODELS (7/8)

The main issue was the design to create a perfect top-down system,

forgetting the necessity of proceeding by a process of trial and errors, adaptations, and learning, that has to characterizes the development of any wide-ranging computerized system.

Cybernetics at (in) the Service of Communism

At https://terna.to.it/CybCom/ we have several chapters of Berg (1961), in the 1962 English translation.

To have an image of that period, the suggestion is Spufford (2010/2012)

Berg, A., I. (a cura di) (1961). *Kibernetiku–na sluzhbu kommunizmu (Cybernetics at the service of communism).* vol. 1, Gosenergoizdat, Moscow. Traduzione pubblicata da: Office of Technical Services, U. S. Department of Commerce, Washington, D. C., 1962.
Spufford, F. (2010), Red Plenty. Faber&Faber, (2012), Gray Wolf.

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AGENT-BASED SIMULATION, ALSO FOR PLANNING (1/2)

More recently, starting about 30 years ago, we had Agent-Based Models (ABMs), that can also be used to implement experiments and trial and errors learning processes.

This methodology allows the construction of artificial worlds, populated by agents, interactively explaining the emergence of macro-type effects with their behavior.

AGENT-BASED SIMULATION, ALSO FOR PLANNING (2/2, TO BE CONTINUED)

Observer & Model:
two levels
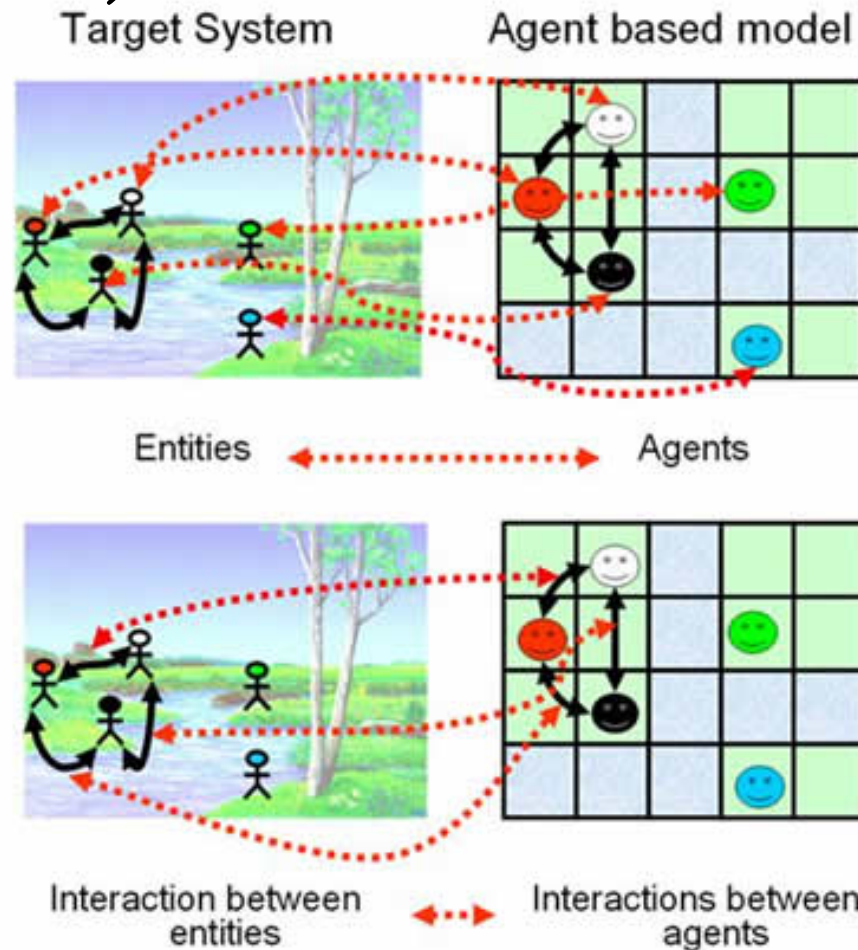
From M. Galán, L.R. Izquierdo, S.S. Izquierdo, J.I. Santos, R. del Olmo, A. López- Paredes, B. Edmonds: Errors and artefacts in agent-based modelling. *Journal of Artificial Societies and Social Simulation*, 12 (1):1, 2009. ISSN 1460-7425. URL http://jasss.soc.surrey.ac.uk/12/1/1.html and from B. Edmonds (2001) The Use of Models - making MABS actually work. In Moss S and Davidsson P (Eds.) *Multi-Agent-Based Simulation*, Lecture Notes in Artificial Intelligence 1979: 15-32. Berlin: Springer-Verlag..

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Artificial intelligence (1/3)

Kasparov (2018) offers us a fulminating *incipit*:

The recent world chess championship saw Magnus Carlsen defend his title against Fabiano Caruana. But it was not a contest between the two strongest chess players on the planet, only the strongest humans.

Kasparov, G. (2018). Chess, a Drosophila of reasoning. *Science*, Vol. 362, Issue 6419, pp. 1087, DOI: 10.1126/science.aaw2221. URL http://science.sciencemag.org/content/362/6419/1087.full.

ARTIFICIAL INTELLIGENCE (2/x)

About the strongest computer program, Kasparov notes:

AlphaZero prioritizes piece activity over material, preferring positions that to my eye looked risky and aggressive. Programs usually reflect priorities and prejudices of programmers, but because **AlphaZero programs itself**, I would say that its style reflects the truth.

(the bold is mine)

ARTIFICIAL INTELLIGENCE (3/3)

Certainly, it is a *Drosophila*. We cannot imagine that a system with self-learning, after having assimilated all the texts of philosophy, gives us the "fundamental answer".

In more straightforward fields–much simpler even if so complex–like economics, machine intelligence can instead very quickly produce surprising suggestions.

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ARTIFICIAL INTELLIGENCE AND ABMS, ECONOMIC PLANNING AND MARKETS (1/11)

THE NOVELTIES ARE ALREADY HERE

How Amazon deliver us not routinary items in just a few hours? It feeds its warehouses, mostly decentralized, on the basis of forecasts and we know that it does so using relatively soft artificial intelligence.

A so huge buyer's decisions on how much to buy is not far from deciding how much to produce; moreover, choosing selling prices for those productions, is not far from planning the economy.

ARTIFICIAL INTELLIGENCE AND ABMS, ECONOMIC PLANNING AND MARKETS (2/11)

THE ECONOMIST (2019), with another *incipit*:

Amazon's six-page memos are famous. Executives must write one every year, laying out their business plan. Less well known is that these missives must always answer one question in particular: how are you planning to use machine learning? Responses like "not much" are, according to Amazon managers, discouraged.

(The) Economist (2019). Amazon's empire rests on its low-key approach to AI. Apr 11th 2019. URL
https://www.economist.com/business/2019/04/13/amazons-empire-rests-on-its-low-key-approach-to-ai?frsc=dg%7Ce

ARTIFICIAL INTELLIGENCE AND ABMS, ECONOMIC PLANNING AND MARKETS (3/11)

The usual objection, from "Il ministro della produzione nello stato collettivista" of Enrico Barone (we quote from the Barone [2012] translation, p. 110):

> The determination of the coefficients economically most advantageous can only be done in an *experimental way*: and not on a *small scale*, as could be done in a laboratory; but with experiments on a *very large scale*, because often the advantage of the variation has its origin precisely in a new and greater dimension of the undertaking.

Barone, E. (1908a). Il ministro della produzione nello stato collettivista. *Giornale degli Economisti*, 37 (Year 19):267–293. ISSN 11252855. URL http://www.jstor.org/stable/23222736. Barone, E. (1908b). Il ministro della produzione nello stato collettivista (continuazione). *Giornale degli Economisti*, 37 (Year 19):391–414. ISSN 11252855. URL http://www.jstor.org/stable/23221778. E. Barone (2012). The ministry of production in the collectivist state. Giornale degli Economisti e Annali di Economia, 71 (Year 125) (2/3):75–112, (Italian edition 1908). ISSN 00170097. URL http://www.jstor.org/stable/43828055.

Artificial intelligence and ABMs, economic planning and markets (4/11)

After Barone, Ludwig von Mises (1920) and the so called *Economic calculation problem*

Do not forget Peter John De La Fosse Wiles (1964), with a systematic analysis of the politca economiy of communism.

Mises, L. (1920). *Die wirtschaftsrechnung im sozialistischen gemeinwesen*. Archiv für Sozialwissenschaft und Sozialpolitik, 47(1):86–121, 1920. Tradotto come *Economic calculation in the socialist commonwealth*, volume 47. Lulu Press, Inc, 2016, URL https://www.mises.ch/library/Mises_Economic_Calculation_in_the%20Socialist_Commonwealth.pdf.

Wiles, P. J. D. (1964), *The Political Economy of Communism*, Harvard University Press, Boston.

Artificial intelligence and ABMs, economic planning and markets (5/11)

As a summary: Barone demonstrated, thanks to a rigorous mathematical analysis that, without a price system that changes through trials and errors, determining the production choices, it is impossible that the work of the *ministro della produzione dello stato collettivista* succeeds.
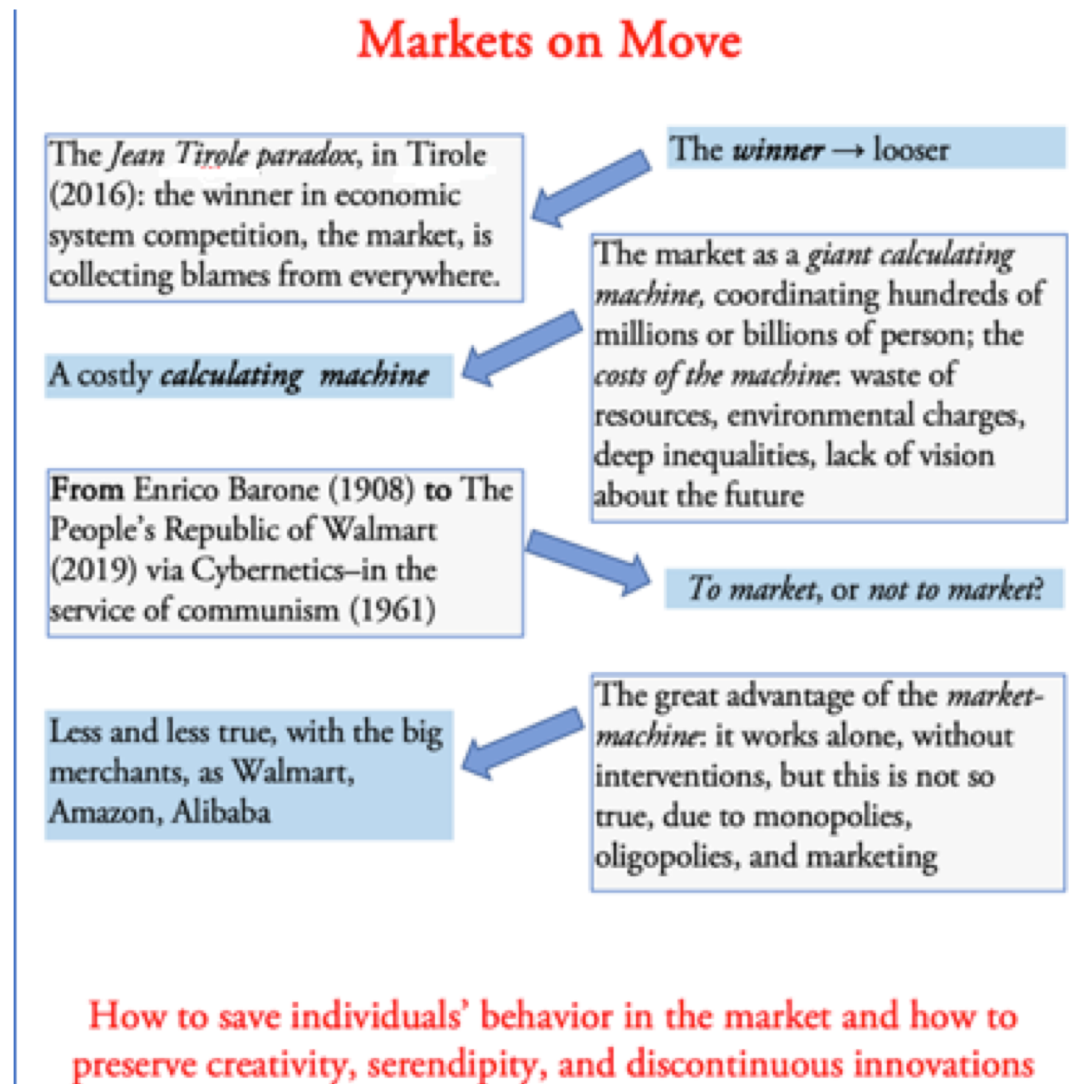
The novelty now is that, with artificial intelligence and ABMs, it is possible to **simulate those processes of trial and errors.**

While AI is generating possible choices, ABMs can quite easily verify the related consequences.

Tirole, J. (2016), *Économie du bien commun*, Presses Universitaires de France, Paris.

Phillips, L., and Rozworski, M. (2019). *The People's Republic of Walmart: How the World's Biggest Corporations Are Laying the Foundation for Socialism*. Verso, 2019.

Markets on Move

The *Jean Tirole paradox*, in Tirole (2016): the winner in economic system competition, the market, is collecting blames from everywhere.

The *winner* → looser

A costly *calculating machine*

The market as a *giant calculating machine*, coordinating hundreds of millions or billions of person; the *costs of the machine*: waste of resources, environmental charges, deep inequalities, lack of vision about the future

From Enrico Barone (1908) **to** The People's Republic of Walmart (2019) via Cybernetics–in the service of communism (1961)

To market, or *not to market?*

Less and less true, with the big merchants, as Walmart, Amazon, Alibaba

The great advantage of the *market-machine*: it works alone, without interventions, but this is not so true, due to monopolies, oligopolies, and marketing

How to save individuals' behavior in the market and how to preserve creativity, serendipity, and discontinuous innovations

TO CONCLUDE THIS SECTION

The economic world is **already** moving in an accelerated way toward new structures, shaped by artificial intelligence. From a quite recent interview Brian Arthur (2019, personal transcription):

(…) we're all familiar with the standard economy, which is an economy of I think 50 years ago, 100 years ago, an economy of factories and of vehicles and workers, etc. Now we have an economy that I vaguely see as under the surface. It's a digital economy or a virtual economy. I like to call it the autonomous economy. It's an economy of machines talking to machines, servers talking to servers, algorithms in conversation with other algorithms, making decisions.

ARTIFICIAL INTELLIGENCE AND ABMS, ECONOMIC PLANNING AND MARKETS (8/11)

A lot of the economy, the decision-making, the control of production, the consumer choices and ordering things online is done on the Internet and done autonomously and increasingly done with this external intelligence I'm talking about. It's always on. It's not as if it's only on during working hours like shops are. It's always on. It's self-governing to quite a degree. (…)

I don't see that there is an intelligent godlike way to govern all this. We're new territory all the time. As these big technologies come online, we're learning about different problems and really reacting to those rather than anticipating the problems in advance and doing something about it then.

Arthur, W.B. (2019). The Autonomous Economy, Harvard Business Review podcast, URL https://hbr.org/podcast/2019/06/the-autonomous-economy.

ARTIFICIAL INTELLIGENCE AND ABMS, ECONOMIC PLANNING AND MARKETS (9/11)

SUMMARIZING: AI POWER OR MARKET POWER?

A network of AI capabilities helping in reducing transportation overload, waste of resources, energy needs, environment damages, inequalities, or …

a world of fighting or colluding oligopolies, managing markets, and directing consumptions?

ARTIFICIAL INTELLIGENCE AND ABMS, ECONOMIC PLANNING AND MARKETS (10/11)

SUMMARIZING: A DREAM OR A NIGHTMARE?

With Arthur, in this «new territory» we need new policies, the emergence of new political capabilities.

What a wonderful, or terrifying, new research field for social scientists.

ARTIFICIAL INTELLIGENCE AND ABMS, ECONOMIC PLANNING AND MARKETS (11/11)

FROM EUROPE:

WHITE PAPER On Artificial Intelligence - A European approach to excellence and trust (19.2.2020)
https://ec.europa.eu/info/publications/white-paper-artificial-intelligence-european-approach-excellence-and-trust_en

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL AND THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE
Report on the safety and liability implications of Artificial Intelligence, the Internet of Things and robotics (19.2.2020)
https://ec.europa.eu/info/sites/info/files/report-safety-liability-artificial-intelligence-feb2020_en_1.pdf

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NEW WORLD ECONOMY AND EMPLOYMENT (1/6)

EMPLOYMENT AND ROBOTS

Leontief again, quoting a 1983 paper (p.405):

Using a somewhat shocking but essentially appropriate analogy, one might say that the process by which progressive introduction of new computerized, automated, and robotized equipment can be expected to reduce the role of labor is similar to the process by which the introduction of tractors and other machinery first reduced and then completely eliminated horses and other draft animals in agriculture. The competitive price mechanism played a decisive role in this process.

Leontief, W. (1983), Technological advance, economic growth, and the distribution of income. *Population and Development Review*, pages 403–410.

ABMS AGAIN

A nice definition of ABMs:

Compactly, in agent-based computational models a population of data structures representing individual agents is instantiated and permitted to interact.

One then looks for systematic regularities, often at the macro-level, to emerge, that is, arise from the local interactions of the agents.

Typically, the only equations present are those used by individual agents for decision-making.

New World Economy and Employment (4/6)

A nice definition of ABMs (cont.):

Different agents may have different decision rules and different information; usually, no agents have global information, and the behavioral rules involve bounded computational capacities—the agents are "simple".

This relatively new methodology facilitates modeling agent heterogeneity, boundedly rational behavior, non-equilibrium dynamics, and spatial processes.

Axtell, R. L., and Epstein, J. M. (2006). Coordination in transient social networks: an agent-based computational model of the timing of retirement. In J. M. Epstein, editor, Generative social science: Studies in agent- based computational modeling, page 146. Princeton University Press. http://www.econ.tuwien.ac.at/lva/compeco.se/artikel/epstein_coordination_in_transient_social_networks.pdf Look at p.6 on line

NEW WORLD ECONOMY AND EMPLOYMENT (5/6)

A quite recent model of mine:

http://www.netlogoweb.org/launch#http://ccl.northwestern.edu/netlogo/community/RicardoMarx_v_0_97.nlogo
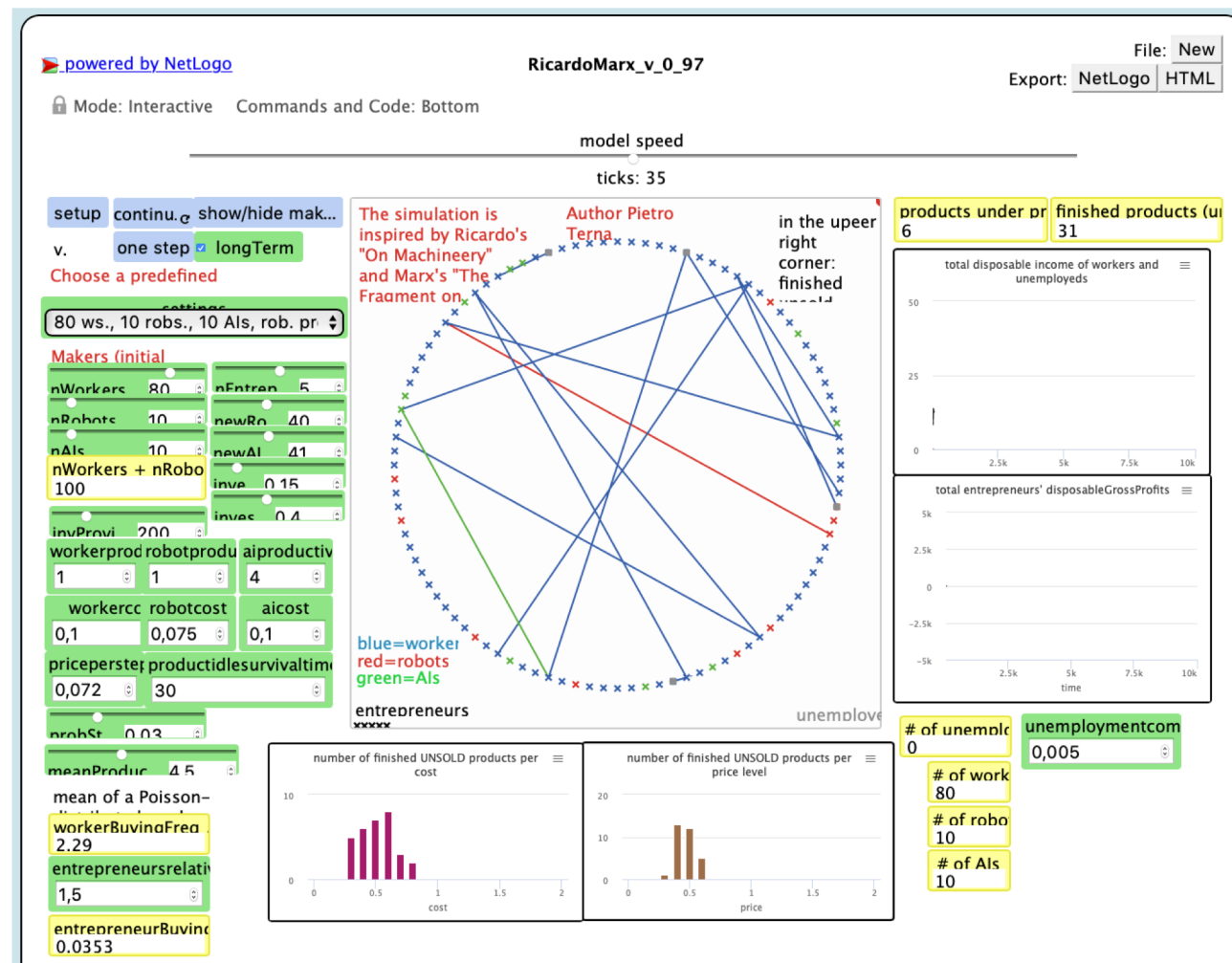
A tale of production, profits, employment, and prices … but this is another story.

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