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## On Artificial Intelligence's Razor's Edge: On the Future of Democracy and Society in the Artificial Age\*

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### Abstract

The introduction of Artificial Intelligence (AI) in our contemporary society imposes historically unique challenges for humankind. The emerging autonomy of AI holds unique potentials of the eternal life of robots, AI and algorithms alongside unprecedented economic superiority, data storage, and computational advantages. However, the introduction of AI to society also raises ethical questions. What is the social impact of robots, algorithms, blockchain and AI entering the workforce and our daily lives on the economy and human society? Should AI become eternal or is there a virtue in switching off AI at a certain point? If so, we may have to define a 'virtue of killing' and a 'right to destroy' that may draw from legal but also philosophical sources to answer the question how to handle the abyss of killing with ethical grace and fair style. In light of robots already having gained citizenship and being attributed as quasi-human under Common Law jurisdiction, should AI and robots be granted full citizen rights – such as voting rights? Or should we simply reap the benefits of AI and consider to define a democracy with different classes having diversified access to public choice and voting – as practiced in the ancient Athenian city-state, which became the cradle of Western civilization and democratic traditions spread around the globe. Or should we legally justify AI slaves to economically reap their benefits, as was common in ancient Rome, which became the Roman Law legal foundation for Continental and some of Scandinavian Law traditions and which inspired very many different codifications around the world. Finally, we may also draw from the Code Napoléon, the French Code Civil established under Napoleon in 1804, which defined male and female into two classes of human with substantial right and power differences, and – to this day – accounts for one of the few documents that have influenced the whole world in legal and societal ways. In asking critical questions and unraveling the ethical boundary conditions of our future artificial world, the paper thereby takes a descriptive – afar from normative – theoretical angle targeted at aiding a successful introduction of AI into our contemporary workforce, democracy, and society.

**Keywords:** AI, Artificial Intelligence, Athenian city-state, Code Civil, Code Napoléon, Democracy, Right to destroy, Roman Law, Slavery, Society, Workforce

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## 1. Introduction

Artificial Intelligence (AI) poses historically unique challenges on humankind. The article addresses the introduction of Artificial Intelligence (AI) in our contemporary society. What is the impact of robots, algorithms, blockchain and AI entering the workforce and our daily lives on the economy and human society? As emerging globally trend, AI is extending its presence at almost all levels of human conduct having raised both expectations and concerns (Cellan-Jones, 2018; Sofge, 2015; United Nations, 2017). AI will hold the potential to replicate human existence but grant eternal being.

On innovation's razor's edge of 24/7 working robots that can live eternally and have no feelings, ethical questions arise whether robots, algorithms and AI should be granted citizenship and legally be considered as quasi-human beings — a technocratic and legal trend that has already started (Weller, 2017). As AI is currently reaching status of actual personhood – e.g., via citizenship and quasi-human rights applied in the Common Law but also Roman Law territories of the US and the EU – this legal personhood raises challenging legal and ethical questions (Browne, 2017).

The novel predicament between eternity and overpopulation hence calls for revising legal codes for killing, which would allow switching off AI at a certain point to curb overpopulation and harmful behavior. But how to argue legally the right to kill? And when to pull the plug? How do we switch quasi-human intelligence off when misbehaving or if AI life has become a burden that cannot be borne by society? How to balance robots living forever in light of overpopulation and finite resources? We may want to draw on the ethics of dying and virtues of killing as well as suicide literature to answer these novel questions. The proposed frame offers innovative insights for legal conducts but also overlapping generations relationships. The nature of algorithms and digital technology being global demands for an international response, potentially via international law supremacy principle.

Is feelingless AI vulnerable and prone to become enslaved or will the computational power and energetic capacities of robots outperform and enslave humankind? Should we have a democracy with a diversified populace of human enslaving robots? In light of robots already having gained citizenship and being attributed as quasi-human, should AI and robots be granted full citizen rights – such as voting rights? Given the humane fallibility and biases, would a rational AI agent make better democratic choices? Should AI, therefore, be used for governance as for being insusceptible for bribery and fraud, or does the installment of algorithms in leadership positions imbue dangers to humankind? How should we organize the human-led evolution of AI production and the blend of human-AI enhanced workforce? Or will algorithms in charge put humankind in danger? And what is it that makes human humane in the artificial age?

The paper proposes to investigate the economic, legal and societal impact of AI from an ethical perspective. The current legal status of robots being referred to as quasi-human will be discussed as for implications to society and democracy.

The power divide imperatives between human and AI robotics will become subject to scrutiny in light of historical examples of early forms of ancient Athenian democracy and Roman Law civilization that legally allowed for slavery but also with an eye on French Napoleonic code civil that established a supremacy of a man over his wife and children with attention to possession and property.

Humanness will be highlighted as key to future success in the age of AI and automated control. The proposed research will thereby draw from behavioral human decision making insights and evolutionary economics in order to outline what makes human humane and how human decision making is unique to set us apart from AI rationality. AI will be argued to bevalue humanness and improve the value of human-imbued unique features.

While the research is planned to be descriptive – afar from normative – and targeted to aid a successful introduction of AI into the workforce and society, the project will ask critical questions and unravel the ethical boundary conditions of our future artificial world. The findings promise to hold novel insights on future success factors for

human resource management but also invaluable contributions for the successful introduction of AI and digital humanities in modern democracies and societies. Innovation's razor's edge is thereby aimed to be ennobled by ethical imperatives as old as humankind civilization.

The paper is structured as follows: First, the ontology of AI is outlined as well as an analysis of legal personhood. Then, the predicament between eternal life and overpopulation is presented. The virtues of dying and killing but also philosophical arguments for choosing suicide are discussed. The paper then embarks on the discussion of a future society with AI and draws on the socio-historic and legal examples of the Athenian city-state democracy with different access to democratic rights, the ancient Roman Empire justification of a society featuring slavery but also the Code Napoléon of 1804, which granted male and female different rights establishing a substantial and justified power hierarchy between different classes of human. The article closes with an international law prospect on regulating AI.

## 2. Theory

### 2.1 Artificial Intelligence (AI)

Artificial Intelligence (AI) is “a broad set of methods, algorithms, and technologies that make software ‘smart’ in a way that may seem human-like to an outside observer” (Noyes, 2016). The “human-like” intelligence of machines derives from machines being created to think like humans but at the same time to also act rationally (Laton, 2016; Russell & Norvig 1995; Themistoklis, 2018). AI is perceived as innovative technology or as the sum of different technological advances as the privilege of the private, technological sector with little — if any — public regulation (Dowell, 2018).

As the most novel trend, AI, robots and algorithms are believed to soon disrupt the economy and employment patterns. With the advancement of technologies, employment patterns will shift to a polarization between AI's rationality and humanness. Robots and social machines have already replaced people in a variety of jobs – e.g., airports smart flight check-in kiosks or self-check-outs instead of traditional cashiers. Almost all traditional professional are prospected to be infused with or influenced by AI, algorithms, and robotics. For instance, robots have already begun to serve in the medical and health care profession, law and – of course – IT, transportation, retail, logistics, and finance, to name a few. Social robotics may also serve as quasi-servants that overwhelmingly affect our relationships. Already, social robots are beginning to take care of our elderly and children, and some studies are currently underway on the effects of such care (Alemi, Meghdari & Saffari, 2017). Not only will AI and robots offer luxuries of affordability and democratization of access to services, as they will be – on the long run – commercially more affordable and readily available to serve all humanity; but also does the longevity potential of machines outperform any human ever having lived (Hayes, 2018). However, the new technology also comes with the price of overpopulation problems and the potential for misuse and violent action. Just like many other technologies, robots could be misused for wars, terrorism, violence, and oppression (Alemi et al., 2017; Puaschunder, 2018).

AI's entrance in society will revolutionize the interaction between humans and AI with amply legal, moral and social implications (Kowert, 2017; Larson, 2010). Autonomous AI entities are currently on the way to become as legal quasi-human beings, hence self-rule autonomous entities (Themistoklis, 2018). AI is in principle distinguished between weak AI, where “the computer is merely an instrument for investigating cognitive processes” and strong AI, where “[t]he processes in the computer are intellectual, self-learning processes” (Wisskirchen, Biacabe, Bormann, Muntz, Niehaus, Jiménez Soler & von Brauchitsch, 2017, 10). Weak AI is labeled as Artificial Narrow Intelligence (ANI) while strong AI is further classified into Artificial General Intelligence (AGI) and Artificial Super Intelligence (ASI).

The emergence of robotics technology is developing much quicker than previously thought. Robots are anticipated to soon be as ubiquitous as computers are today (Meghdari & Alemi, 2018). Society has long been concerned with the impact of robotics technology from nearly a century ago, when the word “*Robot*” was devised for the first time (Cápek, 1921; Meghdari & Alemi, 2018). The EU Committee on Legal Affairs (2016, p. 4) holds that

"[U]ltimately there is a possibility that within the space of a few decades AI could surpass human intellectual capacity in a manner which, if not prepared for, could pose a challenge to humanity's capacity to control its own creation and, consequently, perhaps also to its capacity to be in charge of its own destiny and to ensure the survival of the species." AI mimicking human intellect could soon surpass humans intellectually but also holistically breaking the barrier of human controlled-automization (Schuller, 2017; Themistoklis, 2018). Modern literature about robots features cautionary accounts about insufficient programming, evolving behavior, errors, and other issues that make robots unpredictable and potentially risky or dangerous (Asimov, 1942/1950, 1978, 1985; Meghdari & Alemi, 2018). "Observe, orient, decide, act" will, therefore, become essential in the eye of machine learning autonomy and AI forming a new domain of intellectual entities (Armstrong & Sotala 2012, p. 52; Copeland 2000; Galeon & Reedy, 2017; Marra & McNeil, 2013). The uncertainty surrounding AI development and self-learning capabilities give rise to the need for guarding AI and an extension of the current legal system to cope with AI (Themistoklis, 2018; Puaschunder, 2018).

With the advancement of technology, social robots have found broader applications in the private and public sectors, such as educational and cultural affairs, games and entertainment, clinical and rehabilitation, nursing of children and/or elderly, search and rescue operations (Meghdari, Alemi, Shariati & Zakipour, 2018). For example, social robots such as ASIMO, Nao, iCub, ARASH, and RASA have been developed for "Edutainment" or "education entertainment" purposes. They aid the study of cognition (both human and artificial), motion, and other areas related to the advancement of robotics serving our society (Meghdari & Alemi, 2018). In addition, a few medical and healthcare toy-like robots, such as PARO, which looks like a baby seal, or ARASH, which is a humanoid, have been designed for therapeutic purposes such as reducing distress, stimulating cognitive activity, teaching specific subjects, and improving socialization (Meghdari, Shariati, Alemi & Vossoughi, 2018). Similarly, Sharif University of Technology's socially assistive robot RASA has been developed to help coach and teach Persian Sign-Language to Iranian deaf children (Meghdari, Alemi, Zakipour & Kashanian, 2018). Personal care and companion robots are increasingly being used to care for the elderly and children, such as RI-MAN, PaPeRo, and CareBot (Meghdari & Alemi, 2018; Puaschunder, 2018).

In recent years, robotics technology has extended its applications from factories to more general-purpose practices in society – for instance, such as the use of robots in clinical and rehabilitation, nursing and elderly care, search and rescue operations (Meghdari & Alemi, 2018). Social robots have become clinical and educational assistants for social interventions, treatment, and education such as language trainings but also assistance with children with disabilities like autism, down syndrome, cancer distress, hearing impairment, etc. (Meghdari et al., 2018). Initial investigations clearly indicate that social robots can play a positive role in the improvement of children's social performance, reduction of distress during treatments, and enhancing their learning abilities (Meghdari & Alemi, 2018). Surprisingly, although not too hard to imagine, relationships of a more intimate nature have not quite been satisfied by robots yet (Meghdari et al., 2018; Veruggio, 2005).

### **3. AI's ethical boundaries**

In today's economy, robots and algorithms now taking over human decision-making tasks and entering the workforce but also encroaching our private lives currently challenges legal systems around the globe (Themistoklis, 2018). The attribution of human legal codes to AI is one of the most groundbreaking contemporary legal and judicial innovations. Until now, legal personhood has only been attached directly or indirectly to human entities (Dowell, 2018). The detachment of legal personhood from human being now remains somewhat of a paradox causing an extent of "fuzziness" of the concept of personhood (Barrat, 2013; Solum, 1992, p. 1285). As AI gets bestowed with quasi-human rights, defining factors of human personhood will need to be adjusted (Dowell, 2018). Human concepts, such as morality, ownership, profitability, and viability will have different meaning for AI. The need for redefining AIE has therefore reached unprecedented momentum.

As a predicted trend, the co-existence of AI with the human species is believed to change the fundamental concepts of social, political and legal systems. AI has already produces legal creations and will do so even more in the near future, through its developing autonomy. In addition, the technology leading to AGI and ASI is already present, posing moral and legal dilemmas about who should control it and under what terms (Themistoklis, 2018). The

emergence of AGI and ASI will necessitate the attribution of some extent and of some type of legal personhood, bearing rights and obligations. AI will not be most probably an exact replication of human intellect behavior (Themistoklis, 2018). "[U]ltimately, robots' autonomy raises the question of their nature in the light of the existing legal categories – of whether they should be regarded as natural persons, legal persons, animals or objects – or whether a new category should be created, with its own specific features and implications as regards the attribution of rights and duties" (Committee on Legal Affairs 2016, p. 5). Behavioral economists add the question whether AI and robots should be created to resemble human beings' decision making with fast thinking and fallible choices or rather be targeted at perfect rationality and slow thinking (Kahneman & Tversky, 1979). General conscious is strived for so that AI possesses consciousness, which it can evolve and enhance on the basis of its own critical reflection and assessment of external factors (Themistoklis, 2018). A lower level of autonomy exists if an entity can demonstrate such consciousness at a narrow field or can self-evolve and self-adapt to external influences, thus reaching decisions "of its own," without being conscious of its intelligence as such (Themistoklis, 2018). As AI emerges as new types of intellect capacities coupled with human-like emotional features, they are attributed a legal personhood in order to ensure to be comprehended correctly and to avoid unfair treatment, towards humans as well (Themistoklis, 2018). Artificial entities are currently gaining human or quasi-human status in the Western and Arab worlds in forming an intellectual autonomy of the entity (MacDonald, 2016). For instance, in Saudi Arabia, the first female robot got a citizenship in 2017, and the robot appears to have more rights than a human female in Saudi Arabia. With the rise of AI persons, their eternal life poses ethical challenges in light of overpopulation and evolutionary perfection, which could crowd out human fallibility if determining merit-based eternal life.

With citizenship and quasi-humanness being attributed to AI, the power relation between human and AI will need to be defined. Should AI be granted full citizenship rights, the problem of overpopulation occurs, since there is the possibility of infinite life of AI. In a human-led evolution, AI will have to be switched off for various reasons, such as malfunction but also merit-based efficiency calculus. If now AI is considered as quasi-human and granted citizenship rights, switching off AI becomes a legally problematic.

While there is currently cutting-edge writing about the potential emergence of an AI personhood as well as concern over the merge of AI with cyberspace that might lead to the breach of the relationship between legal personhood and nation-state sovereignty and a nomenclature is emerging on legal characterizations of different levels of AI development; hardly any information exists about the eternal living of AI (Beerbaum & Puschunder, 2018; Hildebrandt, 2013). From the theoretical standpoint, the eternal longevity of AI contradicts the fundamental concept of fairness in death, as a general condition for all. From the practical standpoint, the international community is currently urged to think on the basis of global commons in terms of AI and AI eternal life potentials contributing to overpopulation. Thereby global commons theories may be tabbed on, which primarily offer guidance for a regulatory framework, which establishes control "...for the benefit of all nations" and refer to space constraints (Clancy, 1998; Puschunder, 2018; Tsagourias, 2015).

Regarding limited space, longevity and eternal life appears problematic. Humankind may face tough decisions whether or not to have AI proceed and what kind of developments to flourish and what to extinct. In what cases should we consider to switch off AI? In 1950, Isaac Asimov introduced the idea robot to (1) not injure a human being or, through inaction, allow a human being to come to harm. (2) A robot obeying the orders given it by human beings except where such orders conflict with the first law. (3) A robot must protect its own existence as long as such protection does not conflict with the first or second law. So in the cases of overpopulation and harm emerging from AI, algorithms, and robots can be considered to be switched off. But when to stop AI?

An economic killing market mechanism may be natural market selection via price mechanisms and the falling rate of profit. Regarding prices, natural supply and demand mechanisms will always favor innovation with a higher price and following supply of goods lead to a price drop. The falling rate of profit is one of the major underlying features of business cycles, long-term booms and downturns (Brenner, 2002, 2006a, b). Capitalism is thereby described as competitive battle for innovation and reaping benefit from first-market introductions. Once followers enter the market, profit declines, leading eventually to market actors seeking novel ways to innovate in order to regain a competitive market advantage and higher rates of profit. Thereby industries and innovations fade and die

off. Such a natural market evolution is also likely to occur with AI innovations, which will determine which AI traits will remain and which ones will fade off (Puaschunder, 2018). Apart from soft market mechanisms that may lead to AI evolution, what are the cases when AI should be shut down or switched off or – in the case if AI personhood – be killed?

#### 4. Killing AI

*Errors and Safety:* The main and leading concern about any new and emerging technology is to be safe and error-free (Meghdari & Alemi, 2018). Therefore, sufficient and numerous tests on health and safety must be performed by developers and/or well-known independent sources before rolling out any technology onto the marketplace and society (Meghdari & Alemi, 2018). In robotics, the safety issue mainly centers around software and/or hardware designs (Meghdari & Alemi, 2018). Even a tiny software flaw or a manufacturing defect in an intelligent machine, like a smart car or a social robot, could lead to fatal results (Meghdari & Alemi, 2018). When these deviations occur and especially when they are harmful to the human community but also to other AI species, the faulty AI should be terminated. With regard to the risk of robotic malfunctions and errors, product legal responsibility laws are mostly untested in robotics (Meghdari & Alemi, 2018). A usual way to minimize the risk of damage from social robots is to program them to obey predefined regulations or follow a code-of-ethics (Meghdari & Alemi, 2018). Ethical codes for robotics are currently needed and should become formed as a natural behavioral law to then be defined and codified as law. Laws but also an ethical understanding to terminate AI, algorithms, and robots in case of impairment and harm are needed.

*Morals, Ethics, and the Law:* As social robots become more intelligent and autonomous and exhibit enough of the features that typically define an individual person, it may be conceivable to assign them responsibility and use them in social, educational, and therapeutic settings (Meghdari & Alemi, 2018). In the currently ongoing research on the integration of computers and robotics with biological corpse it is found that a cognizant human brain (and its physical body) apparently has *human-rights*; hence, replacing parts of the brain with artificial ones, while not harming its function, preserves those rights (Meghdari & Alemi, 2018; Warwick & Shah, 2014). Also, consider a handicapped person featuring an electronic robot arm that commits a crime. It becomes obvious that half-robot-human beings should be considered as human and robots as quasi-human beings. Meghdari & Alemi (2018) speculate that at some point in the future, we may face a situation in which more than half of the brain or body is artificial, making the organism more robotic than human, which consolidates the need of special *robot-rights* and attributing (quasi)-human rights onto robots. When considering robots as quasi-human beings, their termination appears legally questionable and ethically challenging, requiring revisiting laws as legitimation to kill a likewise species as well as ethical consensus on the virtue of killing (Puaschunder, 2018).

The legal argumentation may draw on justifiable homicide as outlined in criminal law cases – such as prevention of greater harm to innocents during an imminent threat to life or well-being in self-defense. According to the United Nations Universal Declaration of Human Rights, Article 3 states that everyone has the right to life, liberty, and security of person and most nations' policy allows for some degree of leniency for self-defense, which reduces charges. Potentially excusing conditions common to most jurisdictions include wartime, when the person's death is inflicted by the effect of a lawful arrest or prevention of lawfully detained person's escape, quelling riot or insurrection, when the use of force is „no more than absolutely necessary." Some countries deem it lawful for a citizen to resort to violence to protect valuable property and there is the "heat of the moment" defense argument, in which the defendant deemed to have lost control through provocation. Doctrine of necessity allows, for example, a surgeon to separate conjoined twins and killing the weaker twin to allow the stronger twin to survive. While fetuses are considered as unborn children in the US, the right to an abortion was upheld in the US legal system as exemption from prosecution (*Roe v. Wade*, 1973). Several countries, such as the Netherlands, Belgium, Switzerland, Japan, and the U.S. states of Oregon and Washington, allow both active and passive euthanasia by law if justified. Where the person concerned is to be arrested for an offense referred to in Schedule 1 or is to be arrested on the ground of having committed such an offense, and the person authorized under this Act to arrest or to assist in arresting him cannot arrest him or prevent him from fleeing by other means than killing him, the killing shall be deemed to be justifiable homicide. If any arrestor attempts to arrest a suspect and the suspect resists the attempt, or flees, or resists the attempt and flees, when it is clear that an attempt to arrest him or her is being made,

and the suspect cannot be arrested without the use of force, the arrestor may, in order to effect the arrest, use such force as may be reasonably necessary and proportional in the circumstances to overcome resistance or to prevent the suspect from fleeing: Provided that the arrestor is justified in terms of this section in using deadly force that is intended or is likely to cause death or grievous bodily harm to a suspect, only if he or she believes on reasonable grounds (§7 Judicial Matters Second Amendment Act 122 of 1998).

In light of overpopulation and harmful behavior of AI, switching off artificial life, which is currently be granted quasi-human status, will need to be argued legally and supported ethically. Killing in terms of the death penalty is justified legally in the 5th (and the 14th) amendment that states “no person shall be deprived of life, liberty, or property without due process of law,” while the eighth amendment prohibits “cruel and unusual punishment.” Killing in terms of harmful behavior of AI can be grounded on similar legal reasons to ensure that no AI harms the collective. Overpopulation claims leading to the need to take AI partially off the grid more lead to philosophical sources that argue for individual’s free will to choose to live or die (Critchley, 2015).

Apart from self-defense, suicide may also serve as legally justified argument for switching off AI, if artificial life is programmed to terminate itself when harmful in such way that AI causes injury to a human being or, through inaction, allow a human being to come to harm. A robot not obeying the orders given it by human beings except where such orders conflict with the first law. We could argue that AI should stay alive at whatever the cost in virtue of killing AI when turning harmful.

Suicide has been tabooed for most part of history and propagated to be a religious sin or classified as a psychological disorder (Critchley, 2015). Yet the human gift of reflection and search for meaning in life or death could leverage into an asset in the AI evolution in the decades to come. Suicide understood as neither a legal nor a moral offence but as right to death bestowed upon human beings in their self-conscious reflection may be extended as a virtue of killing in the artificial age, when human beings will have to decide what AI should stay alive and what AI be taken off the grid. Human will thereby become the rulers of the forthcoming AI evolution.

The ethical imperative of switching AI off may be found in David Humes’ saying ‘*No man ever threw away life, while it was worth keeping*’ (Critchley, 2015, p. 15f.). Hume’s point is that when life has become a burden that cannot be borne, one is justified in taking it. In this argumentation line, if AI life has become a burden that cannot be borne by society, society is justified in taking AI’s life. Critchley (2015) recommends reflective compassion based on empathy and introspection, but we may also need foresight and inclusion of future externalities. In the artificial age, AI may, therefore, be programmed with a constitution for suicide. Also in Seneca, we find that when a human life no longer flourishes, one being permitted to end it (Critchley, 2015). The Stoic tradition argued that suicide is a legitimate act and an honorable gesture of farewell from a state of unbearable pain, whether physical or psychological (Critchley, 2015). In this sense, AI’s death may be argued to be justified when AI imposes a state of unbearable pain unto others. Religious stances that suicide is wrong because only God having moral authority over human lives and thus us being property of God could be subsumed into a condition to legitimize human having authority over AI and thus being our property, in which we can decide what developments to maintain and which ones to switch off in a human-led AI-evolution. This human-led evolution is believed to revolutionize modern society and civilization. Killing AI – or determining what AI development should survive – may, therefore, become an act of self-defense or legalized suicide.

As in a suicide note that speaks as final communication to the descendants, algorithms that are forced to be switched off should also store information on the reason that terminated them and be conserved in a blockchain that serves to educate the network about malfunction and malpractice. This piece of publicity should serve as disciplinary and signal function. In suicides with guns, people aim at the head, not the heart – while both head and heart stop function in human thereafter, in AI, we may program that the brain function, that is constant storage of information, and adaptive reprogramming and actions get switched off, but some positive parts remain intact to be reprogrammed (Critchley, 2015). Death will end the incoherence in creating a beautifully benevolent AI structure, which we may see as evolutionary cleansing of destruction coming out of AI. The death algorithm button will bestow coherence to the human-led evolution of AI. The voluntary switch to shut AI off will be the

pejorative of human and dominating privilege of human over AI. There will be a beauty to death, the stillness, the rest and the finally stopped negative character of AI evolution (Puaschunder, 2018).

The virtue of killing could also be grounded on Viktor Mayer-Schönbergers “right to be forgotten,” which ensures data privacy through automated deletion of contents after a certain period and grants individuals rights to have their data been destroyed (Puaschunder, 2018; forthcoming). In this line, we may argue a “right to destroy” and program AI to stop itself should it incur hurt, damages and losses to humankind. However, the implementation of this right is still in infancy and hindered by questions of what court is responsible for an as such claim. As a legal subsumption, we may speculate that individuals may be granted a ‘right to terminate’ and can order for robots to be switched off if causing harm to them. As the ‘right to be forgotten’ law can be overruled by concern for public safety, this may also apply to the right to terminate. Thereby it deserves mentioning that safety differs around the world and also expected safety standards (Puaschunder, 2018). All these developments are prospected to lead to an AI-evolution, in which human are meant to select the process what AI should survive or be killed. Key decision maker thereby divert favorable traits and developments from unfavorable. But who should determine what should survive, human or AI? A question that can be answered by sorting out the legal power relation between AI and human.

## 5. AI human democracy and society

With AI entering human society and being considered as quasi-human and granted citizenship, the ethical question arises, what kind of citizen AI are? Should AI be considered as full citizens, we run into the problem of overpopulation as discussed. In addition, AI dominance of physical and computational power creates risks of AI outperforming and eventually dominating human. With this scenario in mind, a legal power hierarchy should be established that grants a predominance of human over AI that allows human to benefit from AI but also ensures that dignity in the treatment of AI is upheld for the sake of breeding a generally favorable and amicable climate in society.

### 5.1 Human predominance over AI

When considering the enormous physical and longevity advantages AI hold over human, a natural dominance of AI over humankind is implied. In order to ensure that human lead AI and are not subordinated, a society should be established, in which robots gain quasi-human rights but may not have the same powers and rights as human beings. In the earliest form of democracy in the ancient Athenian city-state, different classes of citizenship existed.

The first known democracy developed around the fifth century BC in the Greek city-state of Athens, which featured the first government by its people, in which the supreme power was vested in the people and exercised directly by them or by their elected agents under a free electoral system. The ancient Athenian democracy became an important source for 18th-century revolutionaries' intellectual background during the American, French and other continental European revolutions. State constitutions around the globe and over time, political speeches and writings about nation states and society reflect the core principles conveyed in the ancient Athenian city-state democratic model, which become a model for shaping civilization throughout the world. To this day, a democracy accounts for the most advanced political order in an egalitarian society (Vlassopoulos, 2009).

In 507 BC, the Athenian leader Cleisthenes introduced a system of political reforms called *demokratia* or rule by the people to ensure security, stability, and prosperity to the entire community. Key features of democracy are equality, accountability, citizen participation, rule of law, political tolerance, transparency, economic freedom, and a multi-party political system. In the ancient Athenian democracy model, not every citizen had the right to vote, run for office and participate in political discussions. Yet to all, the democracy was meant to protect and uphold dignity of all people. Therefore, the Athenian democracy bestowed a favorable climate in society without political equality of all citizens.

As a direct democracy, citizens voted directly on legislation and executive bills. However, participation in democracy was not open to all residents but limited to adult, male citizens excluding women, foreign residents,

and slaves. In ancient Athens, only male Athenian citizens who had completed their military training had the right to vote, and only about 10 to 20% of inhabitants actually participated in governmental decision making. Women had limited rights and privileges, restricted movement in public and were legally segregated from men. Also excluded from voting were citizens whose rights were under suspension – foremost for failure to pay debt to the city. Only descendants from two Athenian parents could claim Athenian citizenship. Citizenship could also be granted by the assembly and sometimes given to large population groups as a reward for service to the state. As slavery was widespread in Athens and seemed to have developed the city-state, the ancient Athenian democracy is attributed to economically be based on slavery, which allowed the general public to devote privileged amounts of time to political life.

The Athenian form of direct democracy does not only serve as an example of not all citizens being allowed to vote being a feasible governmental structure but also – as for its direct character – as a forerunner of electronic democracy. A future world with AI blended into society could structure the human – AI relation based on the ancient Athenian city-state societal composition, in which different classes of citizenship lived together in harmony. As in the ancient Athenian democracy model, not every citizen should have the right to vote, run for office and participate in political discussions. AI could become citizen, yet not be allowed to vote, run for office and participate in political discussions. Yet to all, AI and human, democracy, and citizenship is meant to protect and uphold dignity of all people and AI.

In order to create a more inclusive democracy than the ancient Athenian direct electronic democracy may be introduced, in which voters vote on a political agenda featuring different spectra of choices (e.g., libertarian versus state-controlled, pro-against immigration...) and the mean of their choices then gets processed by algorithmic choice of programs to be enacted by politicians. Algorithms could thereby compute the standard choice of politicians representing different agenda based on historical information and aid to inform politicians about the outcomes of several choices in the past. AI and algorithms hold the computational power and data calculus capacity to do so. This would ensure closer accuracy of political will resembling collective choice and enable to reap AI benefits for political choice while ensuring human to stay in charge but enhanced by artificial benefits. This integration of AI in form of an advisory role to governments could enable AI access to democracy as a compromise without AI having direct voting rights.

## 5.2 Human reaping benefits of AI

AI entering the workforce and holding enormous physical and longevity advantages over human, implies the economic gains to be reaping. Standard economic growth models hold that capital and labor are essential for an economy to flourish. While capital is usually considered as fungible and exchangeable and eternal; labor is more individual, human and inflexible. AI entering the workforce and blending in as a substitute to human capital will change the nature of labor, potentially dividing labor into a putty, flexible, eternal and exchangeable AI part and a clay labor of inflexible human capital (Puaschunder, work in progress). In order to ensure that human can legally benefit from the economic output and growth generated by AI, a society should be established, in which robots gain quasi-human rights but may not have the same material needs and rights as human beings. In the earliest form of society in the ancient Roman Empire, a society existed that featured a high culture and human protection but legal slavery.

Slavery in ancient Rome played an important role in society and the economy. Slaves provided manual labor and agriculture, working on farms, mines, and mills, household domestic services, urban crafts and services but also skilled, educated professions, such as accountants and physicians as well as imperial and public services. Slaves were considered property under Roman Law and had no legal personhood. Unlike Roman citizens, they could be subject to corporal punishment, sexual exploitation, torture, and summary execution. Over time in history, slaves gained increased legal protection, including the right to file complaints against their masters.

Legal foundations of slavery can already be found as early as in the Twelve Tables, Rome's oldest legal code. Around the 2<sup>nd</sup> century, Ulpian defined slavery as an aspect of the *ius gentium*, a customary international law held in common among all people. Slavery was held to be a practice common to all nations, who might then have

specific civil laws pertaining to slaves. In ancient warfare, the victor had the right under the *ius gentium* to enslave a defeated population. The *ius gentium* was not a legal code but reasoned compliance with standards of international conduct (Bederman, 2004). During the Roman imperial expansion, substantial growth of slavery transformed the economy (Hopkins, 1983). Delos in the eastern Mediterranean was made a free port in 166 BC and become one of the main market venues for slaves. Augustus imposed taxes on slave trade, which was increased over time with the rising number of slaves, which comprised of up to 35-40% of Italy's population (Harris, 2000). The price of slaves was determined by origin, health, character, intelligence, and education. The living conditions of urban slaves was inferior to free persons living with them but sometimes superior to that of many free urban poor in Rome. Household slaves likely enjoyed the highest standard of living among Roman slaves, next to publicly owned slaves, who were not subject to the whims of a single master (Johnston, 1957). Imperial slaves were those attached to the emperor's household (The Oxford Encyclopedia of Ancient Greece and Rome, 2010). Sophisticated slaves that were used for economic trade were permitted to earn money for their personal use (Berger, 1991). Slaves could also be freed by a magistrate's declaration with the prior authorization of the Senate or the Emperor.

Slaves were seen as excluded from the *persona*, the synonym for the true nature of the individual, and considered to not have a personality. A slave would not own his or her body, had no ancestors, no name, no cognomen and no goods of his or her own (Mauss, 1979). The testimony of a slave could not be accepted in a court of law unless the slave was tortured. Rome differed from Greek city-states slaves in allowing freed slaves to become citizens. After *manumission*, a male slave who had belonged to a Roman citizen and now acquired *libertas* as a *libertus/a* (freed person) enjoyed active political freedom including the right to vote. The former master become a patron. Freed slaves become the class of *libertini*, who were not entitled to hold public office or state priesthoods, nor could they achieve senatorial rank. Any future children of a freedman would be born free, with full citizenship rights. Roman slaves could hold and use property, which belonged to their masters as if it were their own (Gamauf, 2009). Skilled or educated slaves were allowed to earn their own money in hope to buy their own freedom (Kehoe, 2011). Slaves that were abandoned by masters were also free. Legal protection of slaves grew over time and history due to egalitarian views of humanity of the Stoics. A master who killed a slave without just cause could be tried for homicide, and it became common for slaves to complain against cruel and unfair treatment of owners (Dillon & Garland, 2005). Rebellions and runaways of escaped slaves were punished and those returning fugitives rewarded. Fugitives were branded on the forehead or had to wear a metal collar around the neck with the contact of the master. Slave rebellions occurred several times, and most noticeable are the First, Second and Third Servile War. On the countryside, the Roman Empire also featured practiced serfdom. The Stoics and early Christians opposed ill-treatment of slaves.

In order to ensure that human can legally benefit from the economic output and growth generated by AI, robots should be granted quasi-human rights but may not have the same material needs and rights as human beings. Slavery thereby allows to reap the benefits AI. AI's newly assigned roles appear to overlap with slave tasks of ancient Rome slaves that provided manual labor and agriculture, working on farms, mines and mills, household domestic services, urban crafts, and services as well as skilled, educated professions, such as accountants and physicians as well as imperial and public services. Like in ancient Rome, AI should be considered as property with no legal personhood. However, unlike ancient Roman slaves, they should not be subject to corporal punishment, sexual exploitation, torture, and summary execution. Over time in history, AI – as the ancient Roman Law example of slaves – may gain more sophisticated legal protection, including the right to file complaints against misuse.

As for the international character of AI and algorithms, their fungibility and fluid capital character; broad legal foundations of AI and the overarching regulatory framework how to classify reaping benefits from AI should be codified in customary international law held in common among all people. This would resemble the ancient tradition of Roman slavery being codified under *ius gentium* – an ancient predecessor of international law – and

allow AI to remain fully fungible and practiced common in all nations, who might then have specific civil laws pertaining nuances of AI conduct in society.

As practiced during slavery in the Roman Empire and proposed by Bill Gates, reaping benefits from AI should be taxed based on the revenue generated by AI and/or the price of AI determined by sophistication. Defining AI as slaves would ensure to uphold decent standards of living for these creatures, while human naturally stay in charge of the evolution and introduction of AI into human society. As debated in the ancient Roman society, sophisticated AI that is used for economic trade may also be permitted to earn money for their personal use; but should never be freed and gain the same rights as human as there is something unique and special to humanness, which will be discussed in more detail in the discussion section of this paper. The uniqueness of human naturally leads to the natural exclusion of AI from the *persona*, the synonym for the true nature of the individual, and considered to not have a personality. As a Roman Law slave, AI should not own his or her body, have no awareness of its ancestors, and no goods or material cravings of his or her own. The testimony of AI should not be accepted in a court of law unless AI reports misuse that can be harmful to humankind. Differing from Roman Law slavery, AI should never be freed, and human should always stay masters of their own creation. AI should not be entitled to hold public office or religious leadership and remain without rights to hold and use property on their own. AI and robots should not be allowed to earn their own money, and even if being abandoned by masters, they should never be considered as free.

In order to protect humankind against rebellions of robots and AI, fugitives or deviant developens should be published, stopped according to the right to destroy and those aiding to inform about deviant developments rewarded. While fugitives in the ancient Roman Empire were branded on the forehead or had to wear a metal collar around the neck with the contact of the master; stopped AI or robots should be integrated into a blockchain as a trace of information on unwanted AI and robot behavior but also as a disciplinary function against other AI uprising and rebellious tendencies.

As in the case of the Greek and the Roman Law slaves, legal protection of AI may grow over time and history due to egalitarian views of humanity. For instance, destruction of AI without just cause could be tried for homicide and complaints of robots against cruel and unfair treatment of owners be supported in front of courts. In order to oppose ill-treatment of slaves immediately, dignity may be upheld in applying a legal code with two different classes of society. As such, the Code Napoléon as the first civil code may serve as guiding example.

### **5.3 Dignity upheld in the treatment of AI**

If AI gets legally and economically subordinated to human, ethical questions arise. According to Kant's categorical imperative, which states one should only engage in actions, one wants to be done to oneself, and AI should be protected against harm and misuse or abuse. The concern here is less so the emotional and psychological state of AI, which arguably may not exist given missing self-cognition and emotions in AI, but more to set a signal and not to allow triggering sadist and negative compulsion in human that could be taken out on other human as well, if human become conditioned and learn from mistreating AI on a daily basis.

A legal code that may serve as reference hereby may be the Code Napoléon of 1804, a Civil Law code that defines and classifies male and female as human beings but legally bestows upon them substantial power differences, especially regarding material possession and democratic participation.

The Napoleonic Code (Code Napoléon, Code civil de Français) is the French civil code established under Napoléon I in 1804. As the first clearly written and accessible compilation of modern law, the Code Napoléon has become one of the most influential legal documents in history that influenced the law of many countries around the world (Mohamed, 2016). The Napoleonic Code became the most influential legal civil law code around the world that was adopted as the basis of private law systems of Arab world, Austria, Belgium, Canada, Chile, the Commonwealth, Egypt, Germany, Italy, Ireland, Latin America, the Netherlands, Portugal, Poland, Puerto Rico,

Romania, Russia, Scandinavian countries, Scotland, Spain, Switzerland, United Kingdom, United States Louisiana to name a few.

With regard to family, the Code established the supremacy of the man over the wife and children, which was the general legal situation in Europe at the time (Smith, 2006). A woman was given even fewer rights than a minor.

In the attempt to protect AI against suffering, harm, and misuse or abuse, the Code Napoléon may be applied and define AI and human as quasi-human and grant citizenship to both forms but different power regarding material possession, democratic participation, and public leadership. A natural supremacy of human over AI and robots could be established. As the role of woman and minor even differed, a power hierarchy could even be codified between sophisticated and less-sophisticated AI and robots.

## **6. The value of humanness in the artificial age**

Globalization led to an intricate set of interactive relationships between individuals, organizations, and states. Unprecedented global interaction possibilities have made communication more complex than ever before in history as the whole has different properties than the sum of its increasing diversified parts. Electronic outsourcing in the age of artificial intelligence is likely to increase and with this trend a possible nudgital divide in the 21<sup>st</sup> century. In the light of growing tendencies of globalization, the demand for an in-depth understanding of how information will be shared around the globe and artificial intelligence hubs may evolve in economically more developed parts of the world has gained unprecedented momentum. Another predictable trend in the wake of the artificial intelligence revolution will feature time. Artificial intelligence with eternal life and 24/7 productivity capacities will change tact.

Finally, we may address the question what is it that makes human humane? In the age of artificial intelligence and automated control, humanness is key to future success. Future research may draw from behavioral human decision making insights and evolutionary economics in order to outline what makes human humane and how human decision making is unique to set us apart from artificial intelligence rationality.

Drawing from proposed research will thereby draw from behavioral human decision making insights and evolutionary economics in order to outline what makes human humane and how human decision making is unique to set us apart from AI rationality; AI is argued to bevalue humanness and improve the value of human-imbued unique features.

Humanness as found in heuristics, decision-making errors but also procreation and creativity is believed to become more valuable in a future of AI entering the workforce and our daily lives.

The findings promise to hold novel insights for future success factors for human resource management but also invaluable contributions for artificial intelligence ethics. Having parts of the world being AI-driven and others being human capital grounded is prospected to increase the international development divide in the years to come. While in the AI-hubs human will be incentivized become more creative and humane while AI performs all rational tasks to a maximum productivity, other parts of the world will naturally fall back as for being stuck in spending human capital time on machine-outsourcable tasks and not honing humane skills, which are not replicable by machines.

Future research endeavors may address inequality drawing on the future vision that central rational AI-hubs will outperform underdeveloped remote areas of the world even more in the digital age.

## **7. Discussion**

Overall the ongoing research project plays an important role in the evaluation of AI's entrance into the workforce and our daily lives. Depicting nudging during this unprecedented time of economic change and regulatory reform holds invaluable historic opportunities for capturing AI's influence on the stability of economic markets and

societal systems. Global governance policymakers can snapshot AI's potential in the digital age and bestow market actors with future-oriented foresighted. The results are aimed at guiding a successful AI and robot implementation to lower systemic economic market downfalls with attention to the changes implied in the wake of the ongoing artificial intelligence revolution. Market and societal policy recommendations for global governance experts on how to strengthen society by AI but also overcome unknown emergent risks within globalized markets and bestow market actors with key qualifications in a digitalized world are endeavored in future research.

## References

- Acevedo, S., Mrkaic, M., Novta, N., Poplawski-Ribeiro, M., Pugacheva, E. & Topalova, P. (2018). *How can low income countries cope? The effects of weather shocks on economic activity*. Presentation delivered at The New School Economics of Climate Change Project, New York: The New School, April 12.
- Alemi, M., Meghdari, A., Saffari, E. 2017. "RoMa: A Hi-tech Robotic Mannequin for the Fashion Industry." *Lecture Notes in Computer Science (LNCS): Social Robotics* 10652: 209-219, Springer, Nov. 2017.
- Altenburg, T. & Assmann, C. (2018). *United Nations Environment Programme Report on Green Industrial Policy: Concept, Policies, Country Experiences (2018)*. Geneva, Bonn: United Nations: United Nations Environment Programme & German Development Institute / Deutsches Institut für Entwicklungspolitik.
- Altenburg, T. & Rodrik, D. (2018). Green industrial policy: Accelerating structural change towards wealthy green economies. In T. Altenburg & C. Assmann (Eds.), *United Nations Environment Programme Report on Green Industrial Policy: Concept, Policies, Country Experiences*, pp. 2-20. Geneva, Bonn: United Nations: United Nations Environment Programme & German Development Institute / Deutsches Institut für Entwicklungspolitik.
- Andreoni, J., Erard, B. & Feinstein, J.S. (1998). Tax compliance. *Journal of Economic Literature*, 36, 2, 818-860.
- Armstrong, Stuart & Kaj Sotala. 2012. "How We're Predicting AI--or Failing to," in *Beyond AI: Artificial Dreams*, edited by Jan Romportil, 52. Pilsen: University of West Bohemia.
- Asimov, I. 1942. Runaround, In *I, Robot*, 33 – 51. London: Grafton Books.
- Asimov, I. 1950. *I, Robot* (2004 ed.). New York: Bantam Dell.
- Asimov, I. 1978. My own view. In *The Encyclopedia of Science Fiction*, ed. Robert Holdstock, N.Y.: St. Martin's Press.
- Asimov, I. 1985. *Robots and Empire*. New York: Doubleday.
- Asmundson, I. (2017). *Financial services: Getting the goods*. IMF entry retrieved from <http://www.imf.org/external/pubs/ft/fandd/basics/finserv.htm>
- Bai, S., Koong, K. & Valenzuela, E. (2018). The dynamic impact of oil price shocks on stock returns: Evidence from U.S. energy companies in the value chain. *6<sup>th</sup> International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France*, May 24-25.
- Barrat, James. 2013. *Our Final Invention: Artificial Intelligence and the End of the Human Era*. New York: St. Martin's Press.
- Barro, R. (1990). Government spending in a simple model of endogenous growth. *Journal of Political Economy*, 98, 103-125.
- Bederman, D.J. (2004). *International law in antiquity*. Cambridge, UK: Cambridge University Press.
- Berbaum, D. & Ptaschunder, J.M. (2018). A behavioral economics approach to digitalisation: The case of a principles-based taxonomy. Proceedings of the 10th International RAIS Conference on Social Sciences and Humanities; Published by Atlantis Press; Part of Series: ASSEHR; ISSN: 2352-5398, Volume 211.
- Berger, A. (1991). *Encyclopedic Dictionary of Roman Law*. American Philosophical Society.
- Bienenfeld, M. (1988). Regularity in price changes as an effect of changes in distribution. *Cambridge Journal of Economics*, 12, 247-255.
- Bonato, M. (2018). Realized correlations, betas and volatility spillover in the agricultural commodity market: What has changed? *6<sup>th</sup> International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France*, May 24-25.
- Brenner, R. (2002). American economic revival, In R. Brenner, *The Boom, and the Bubble: The US in the World Economy*. New York: Verso.
- Brenner, R. (2006). From boom to downturn, In R. Brenner, *The Economics of Global Turbulence: The Advanced Capitalist Economies from Long Boom to Long Downturn, 1945-2005*. New York: Verso.

- Brenner, R. (2006). The puzzle of the long downturn, In R. Brenner, *The Economics of Global Turbulence: The Advanced Capitalist Economies from Long Boom to Long Downturn, 1945-2005*. New York: Verso.
- Bürgenmeier, B. (1994). Environmental policy: Beyond the economic dimension. In B. Bürgenmeier (Ed.), *Economy, environment, and technology: A socio-economic approach*, pp. 166-175. New York, NY: Armonk Sharpe.
- Burke, M., Hsiang, S.M. & Miguel, E. (2015). Global non-linear effect of temperature on economic production. *Nature*, 527, 235-239.
- Cāpek, K. 1921. *Rossum's Universal Robots* (2004 ed.), trans. Claudia Novack. New York: Penguin Group.
- Cellan-Jones, R., 2014. "Stephen Hawking Warns Artificial Intelligence Could End Mankind," *BBC News*, 2 December 2014. [www.bbc.com/news/technology-30290540](http://www.bbc.com/news/technology-30290540).
- Centeno, M.A., & Tham, A. (2012). *The emergence of risk in the global system*. Princeton, NJ: Princeton University working paper.
- Centeno, M.A., Creager, A.N., Elga, A., Felton, E., Katz, St.N., Massey, W.A. & Shapiro, J.N. (2013). *Global systemic risk: Proposal for a research community*. Princeton University, NJ: Princeton Institute for International and Regional Studies working paper.
- Chancel, L. & Piketty, Th. (2015). *Carbon and inequality: From Kyoto to Paris*. Paris, France: Paris School of Economics.
- Chilcote, E.B. (1997). *Interindustry structure, relative prices, and productivity: An input-output study of the U.S. and O.E.C.D. countries*. Doctoral Thesis. New York, NY: The New School for Social Research Department of Economics.
- Cialdini, R.B. (1996). Social influence and the triple tumor structure of organizational dishonesty. In D.M. Messick and A.E. Tenbrunsel (Eds.), *Codes of Conduct*, pp. 44-58. New York, NY: Sage.
- Cifarelli, G. & Paesani, P. (2018). Fundamentalists, chartists, and hedgers: A non-linear dynamic model of futures oil pricing: Theory and empirical evidence. *6<sup>th</sup> International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France, May 24-25*.
- Clancy, Erin. 1998. "The Tragedy of the Global Commons." *Indiana Journal of Global Legal Studies* 5(2): 601-19.
- Cockshott, W.P. & Cottrell, A. (1993). *Towards a new socialism*. Nottingham, UK: Spokesman.
- Committee on Legal Affairs. 2016. *Draft Report with Recommendations to the Commission on Civil Law Rules on Robotics*. May 31, 2015/2103(INL)
- Copeland, Jack. 2000. "What is Artificial Intelligence?" *AlanTuring.net*, May. [www.alanturing.net/turing\\_archive/pages/Reference%20Articles/what\\_is\\_AI/What%20is%20AI02.html](http://www.alanturing.net/turing_archive/pages/Reference%20Articles/what_is_AI/What%20is%20AI02.html)
- Critchley, S. (2015). Notes on suicide. Fitzcarraldo.
- Dawes, R.M. (1980). Social dilemmas. *Annual Review of Psychology*, 31, 1, 169-193.
- Dillon, M. & Garland, L. (2005). *Ancient Rome: From the early republic to the assassination of Julius Caesar*. London, UK: Routledge.
- Dowell, Ryan. 2018. "Fundamental Protections for Non-Biological Intelligences or: How we Learn to Stop Worrying and Love our Robot Brethren." *Minnesota Journal of Law, Science & Technology* 19(1): 305-36.
- Dukhanina, E., Leveque, F. & Massol, O. (2018). *Policy measures targeting a more integrated gas market: Impact on prices and arbitrage activity*. Retrieved from [https://www.eeg.tuwien.ac.at/conference/iaee2017/files/paper/649\\_Dukhanina\\_fullpaper\\_2017-06-30\\_21-58.pdf](https://www.eeg.tuwien.ac.at/conference/iaee2017/files/paper/649_Dukhanina_fullpaper_2017-06-30_21-58.pdf)
- Ekhholm, T. (2018). Climatic cost-benefit analysis under uncertainty and learning on climate sensitivity and damages. *6<sup>th</sup> International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France, May 24-25*.
- Elgouacem, A. & Legrand, N. (2018). The delaying effect of storage on investment. Evidence from the crude oil sector. *6<sup>th</sup> International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France, May 24-25*.
- Emmert, H. (2018). *The melting point: The economics and environmental impact of the winter sports industry*. Unpublished working paper, Economics of the Environment, The New School, New York.
- Environmental Defense Fund (2018). *How climate change plunders the planet: A warming earth disturbs weather, people, animals and much more*. Retrieved from <https://www.edf.org/climate/how-climate-change-plunders-planet>
- Esposito, M., Haider, A., Semmler, W. & Samaan, D. (2018). Enhancing job creation through the green transformation. In T. Altenburg & C. Assmann (Eds.), *United Nations Environment Programme Report on Green Industrial Policy: Concept, Policies, Country Experiences*, pp. 50-68. Geneva, Bonn: United Nations: United Nations Environment Programme & German Development Institute / Deutsches Institut für Entwicklungspolitik.

- EU Committee on Legal Affairs. 2016. "Draft Report with Recommendations to the Commission on Civil Law Rules on Robotics," May 31.
- Feld, L.P. & Frey, B.S. (2002). Trust breeds trust: How taxpayers are treated. *Economics of Governance*, 3, 2, 87-99.
- Figueroa-Ferretti, I. & Cervera, I. (2018). *Recent credit risk and bubble behavior in the corporate energy sector*. Retrieved from <https://repositorio.comillas.edu/jspui/handle/11531/26571>
- Filip, O., Janda, K., Kristoufek, L. & Zilberman, D. (2018). *Food versus fuel: An updated and expanded evidence*. CAMA working paper 73. Retrieved from [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3070704](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3070704)
- Foley, D. (2007). *The economic fundamentals of global warming*. Santa Fe, NM: Santa Fe Institute Working paper 07-12-044. Retrieved from <https://www.santafe.edu/research/results/working-papers/the-economic-fundamentals-of-global-warming>
- Fotopoulos, T. (1997). Towards an inclusive democracy. Cassel.
- Frey, B.S. (1992). Tertium datur: Pricing, regulation and intrinsic motivation. *Kyklos*, 45, 2, 161-184.
- Frey, B.S. (1997). *Not just for the money: An economic theory of personal motivation*. Cheltenham, UK: Edward Elgar.
- Galeon, Dom & Christianna Reedy. 2017. "Kurzweil Claims That the Singularity Will Happen by 2045." *Futurism*, October 5, [futurism.com/kurzweil-claims-that-the-singularity-will-happen-by-2045/](http://futurism.com/kurzweil-claims-that-the-singularity-will-happen-by-2045/).
- Gamauf, R. (2009). Slaves doing business: The role of Roman Law in the economy of a Roman household. *European Review of History*, 16, 3, 331-346.
- Ganepola, C., Garrett, I. & Cho, S. (2018). Oil prices, discount rate news and cash flow news. *6<sup>th</sup> International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France*, May 24-25.
- Gonglewski, M. & Helm, A. (2010). An examination of business case methodology: Pedagogical synergies from two disciplines. *Global Business Languages*, 15, 3, 17-31.
- Greiner, A. & Semmler, W. (2008). *The global environment, natural resources, and economic growth*. Oxford, UK: Oxford University Press.
- Harris, W.V. (2000). Trade. In: *The Cambridge Ancient History: The High Empire A.D. 70-192*, p. 11. Cambridge, UK: Cambridge University Press.
- Hasseldine, J.D. (1998). Prospect theory and tax reporting decisions: Implications for tax administrators. *International Bureau of Fiscal Documentation*, 52, 11, 501-505.
- Hayes, A. (2018). Decentralized banking: Monetary technocracy in the digital age. Social Science Research Network working paper retrievable at [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2807476](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2807476)
- Held, D. & McGrew, A.G. (2007). *A new world economic order? Global markets and state power: Beyond globalization/anti-globalization: Beyond the great divide*. New York, NY: Polity.
- Helm, A. (2009). Global marketing classroom: Green marketing. *American Marketing Association Global SIG Newsletter, Global Interests*.
- Hildebrandt, Mireille. 2013, "Extraterritorial Jurisdiction to Enforce in Cyberspace? Bodin, Schmitt, Grotius in Cyberspace?" *Toronto Law Journal* 63: 196-224.
- Hopkins, K. (1983). *Conquerors and slaves: Sociological studies in Roman history*. New York: Cambridge University Press.
- Ielpo, F. & Sevi, B. (2013). *Forecasting the density of oil futures returns using model-free implied volatility and high-frequency data*. Montpellier, France: Centre de Recherche en Economie et Droit de l'Energie CREDEN Equipe ART Dev, Université Montpellier, Faculté d'Economie, Cahier de recherche n° 13.10.106.
- Ji, Q., Liu, B.Y., Zhao W.L. & Fan, Y. (2018). Modelling dynamic dependence and risk spillover between all oil price shocks and stock market returns in the BRICS. *6<sup>th</sup> International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France*, May 24-25.
- Johnston, M. (1957). *Roman life*. Chicago, IL: Scott, Foresman.
- Kaabia, O., Dhaoui, A., Abid, I. & Guesmi, K. (2018). *Oil supply-demand shocks and stock prices*. Retrieved from [https://www.researchgate.net/publication/324687727\\_Oil\\_supply-demand\\_shocks\\_and\\_stock\\_prices](https://www.researchgate.net/publication/324687727_Oil_supply-demand_shocks_and_stock_prices)
- Kahneman, D. & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47, 2, 263-291.
- Kehoe, D.P. (2011). *Law and social function in the Roman Empire. The Oxford Handbook of Social Relations in the Roman World*. Oxford, UK: Oxford University Press.
- Kilian, L. & Zhou, X. (2018). *The propagation of regional shocks in housing markets: Evidence from oil price shocks in Canada*. Centre for Economic Policy Research, London, UK, CEPR Discussion Paper DP12845. Retrieved from [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3159148](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3159148)

- Kirchler, E.M. (2007). *The economic psychology of tax behaviour*. Cambridge, UK: Cambridge University Press.
- Klein, T., von Mettenheim, H.J., Walther, Th. & Wegener, Ch. (2018). Forecasting high frequency realized volatility of oil with exogenous regressors. *6<sup>th</sup> International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France*, May 24-25.
- Kowert, Weston. 2017. "The foreseeability of human-artificial intelligence interactions." *Texas Law Review* 96: 181-204.
- Kowert, Weston. 2017. "The foreseeability of human-artificial intelligence interactions." *Texas Law Review* 96: 181-204.
- Kruse, R. & Wegener, Ch. (2017). *Time-varying persistence in real oil prices and its determinants*. Working paper retrieved from [http://www.wisostat.uni-koeln.de/sites/statistik/abstracts/RKB-Time-Varying\\_Persistence\\_in\\_Real\\_Oil\\_Prices\\_and\\_its\\_Determinant.pdf](http://www.wisostat.uni-koeln.de/sites/statistik/abstracts/RKB-Time-Varying_Persistence_in_Real_Oil_Prices_and_its_Determinant.pdf)
- Larson, David Allen. 2010. "Artificial Intelligence: Robots, Avatars, and the Demise of the Human Mediator." *Ohio State Journal on Dispute Resolution* 25: 105-64.
- Larson, David Allen. 2010. "Artificial Intelligence: Robots, Avatars, and the Demise of the Human Mediator." *Ohio State Journal on Dispute Resolution* 25: 105-64.
- Laton, David. 2016. "Manhattan\_Project.Exe: A Nuclear Option for the Digital Age." *Catholic University Journal of Law & Technology* 25(4): 94-153.
- Laton, David. 2016. "Manhattan\_Project.Exe: A Nuclear Option for the Digital Age." *Catholic University Journal of Law & Technology* 25(4): 94-153.
- Legnazzi, Ch. (2018). Forward-looking VaR and CVaR: An application to the natural gas market. *6<sup>th</sup> International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France*, May 24-25.
- Leontief, W. (1997). *Input-output economics*. Oxford, UK: Oxford University Press.
- Lin, P., Abney, K., Bekey, G.A. 2012. *ROBOT ETHICS: The Ethical and Social Implications of Robotics*. London, England: The MIT Press.
- Lips, J. (2018). *Debt and the oil industry: Analysis on the firm and production level*. Retrieved from [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3026063](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3026063)
- MacDonald, Fiona. 2016. "Harvard Scientists Think They've Pinpointed the Physical Source of Consciousness." *Science Alert*, June 23. <http://www.sciencealert.com/harvard-scientists-think-they-ve-pinpointed-the-neural-source-of-consciousness>.
- MacDonald, Fiona. 2016. "Harvard Scientists Think They've Pinpointed the Physical Source of Consciousness." *Science Alert*, June 23. <http://www.sciencealert.com/harvard-scientists-think-they-ve-pinpointed-the-neural-source-of-consciousness>.
- Mahadeo, S.M.R., Heinlein, R. & Legrenzib, G.D. (2018). New contagion applications for the energy-finance nexus: A higher moment approach. *6<sup>th</sup> International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France*, May 24-25.
- Markowitz, E.M., Grasso, M. & Jamieson, D. (2015). Climate ethics at a multidisciplinary crossroad: Four directions for future scholarship. *Climate Change*, 130, 3, 465-474.
- Marra, William & Sarah McNeil. 2013. "Understanding "The Loop": Regulating the Next Generation of War Machines." *Harvard Journal of Law & Public Policy* 36: 1139-87.
- Marra, William & Sarah McNeil. 2013. "Understanding "The Loop": Regulating the Next Generation of War Machines." *Harvard Journal of Law & Public Policy* 36: 1139-87.
- Marron, D.B. & Morris, A.C. (2016). *How to use carbon tax revenues*. Washington, D.C.: Tax Policy Center Urban Institute & Brookings Institution.
- Marx, K. (1867/1995). *Capital: A critique of political economy*. Moscow, RU: Progress.
- Mauss, M. (1979). A category of the human mind: The notion of the person, the notion of 'self,' In M. Mauss, p. 81, *Sociology and Psychology*, London, UK: Routledge.
- Meghdari, A. & Alemi, M. (2018). Recent advances in social & cognitive robotics and imminent ethical challenges. Proceedings of the 10th International RAIS Conference on Social Sciences and Humanities organized by Research Association for Interdisciplinary Studies (RAIS) at The Erdman Center at Princeton University, Princeton, New Jersey, United States. Cambridge, MA: The Scientific Press.
- Meghdari, A. & Alemi, M. (2018). Recent advances in social & cognitive robotics and imminent ethical challenges. Proceedings of the 10th International RAIS Conference on Social Sciences and Humanities organized by Research Association for Interdisciplinary Studies (RAIS) at The Erdman Center at Princeton University, Princeton, New Jersey, United States. Cambridge, MA: The Scientific Press.
- Meghdari, A., Alemi, M., Zakipour, M., Kashanian, S.A. 2018. "Design and Realization of a Sign Language Educational Humanoid Robot." *Journal of Intelligent & Robotic Systems*, pp. 1-15, Springer, 2018.

- Meghdari, A., Alemi, M., Zakipour, M., Kashanian, S.A. 2018. "Design and Realization of a Sign Language Educational Humanoid Robot." *Journal of Intelligent & Robotic Systems*, pp. 1-15, Springer, 2018.
- Meghdari, A., Shariati, A., Alemi, M., Vossoughi, G.R., et al. 2018. "Arash: A Social Robot Buddy to Support Children with Cancer in a Hospital Environment." *Proc. of the IMechE, Part H: Journal of Engineering in Medicine* 232(6): 605-618.
- Meghdari, A., Shariati, A., Alemi, M., Vossoughi, G.R., et al. 2018. "Arash: A Social Robot Buddy to Support Children with Cancer in a Hospital Environment." *Proc. of the IMechE, Part H: Journal of Engineering in Medicine* 232(6): 605-618.
- Mohamed, A.M.I. (2016). *Globalization and new international public works agreements in developing countries: An analytical perspective*. London, UK: Routledge.
- Moore, J.W. (2009). *Ecology and the accumulation of capital: A brief environmental history of neoliberalism*. Paper presented at the Workshop on Food, Energy, Environment: Crisis in the Modern World-System. Fernand Braudel Center, Binghamton University, October 9-10.
- Mumford, A. (2001). *Taxing culture*. Aldershot, UK: Ashgate.
- Nordhaus, W.D. (1994). *Mapping the global commons: The economics of climate change*. Cambridge, MA: MIT Press.
- Noyes, Katherine. 2016. "5 things you need to know about A.I.: Cognitive, neural and deep, oh my!" *COMPUTERWORLD*, March 3. [www.computerworld.com/article/3040563/enterprise-applications/5-things-you-need-to-know-about-ai-cognitive-neural-and-deep-oh-my.html](http://www.computerworld.com/article/3040563/enterprise-applications/5-things-you-need-to-know-about-ai-cognitive-neural-and-deep-oh-my.html) [<http://perma.cc/7PW9-P42G>].
- Noyes, Katherine. 2016. "5 things you need to know about A.I.: Cognitive, neural and deep, oh my!" *COMPUTERWORLD*, March 3. [www.computerworld.com/article/3040563/enterprise-applications/5-things-you-need-to-know-about-ai-cognitive-neural-and-deep-oh-my.html](http://www.computerworld.com/article/3040563/enterprise-applications/5-things-you-need-to-know-about-ai-cognitive-neural-and-deep-oh-my.html) [<http://perma.cc/7PW9-P42G>].
- Noyes, Katherine. 2016. "5 things you need to know about A.I.: Cognitive, neural and deep, oh my!" *COMPUTERWORLD*, March 3. [www.computerworld.com/article/3040563/enterprise-applications/5-things-you-need-to-know-about-ai-cognitive-neural-and-deep-oh-my.html](http://www.computerworld.com/article/3040563/enterprise-applications/5-things-you-need-to-know-about-ai-cognitive-neural-and-deep-oh-my.html) [<http://perma.cc/7PW9-P42G>].
- Ordu-Akkaya, B.M. & Soytaş, U. (2018). The impact of foreign portfolio investment on financialization of commodities. *6<sup>th</sup> International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France*, May 24-25.
- Orttung, R. (2010a). *Politics and profits in Russia's foreign oil and gas conflicts*. Center for Security Studies Colloquium, Swiss Federal Institute of Technology, August 30.
- Orttung, R. (2010b). *Five myths about energy security*. Energy Forum 2010, Swiss Federal Institute of Technology, May 11.
- Orttung, R. (2014). *Russia's place in the world energy system: Fueling the future: Deconstructing the role of energy in contemporary international relations*. Toronto, Canada: University of Toronto, January 25.
- Orttung, R. (2015). Promoting sustainability in Russia's artic: Integrating local, regional, federal, and corporate interest. In S. Oxenstierna (Ed.), *The Challenges for Russia's Policized Economic System*, pp. 202-219. London, UK: Routledge.
- Orttung, R. (2016). *Sustaining Russia's arctic cities: Resource politics, migration, and climate change*. New York, NY: Berghahn.
- Orttung, R. & Overland, I. (2011a). A limited toolbox: Explaining the constraints on Russia's foreign energy policy. *Journal of Eurasian Studies*, 2, 1, 74-85.
- Orttung, R. & Overland, I. (2011b). Russia and the formation of a gas cartel. *Problems of Post-Communism*, 58, 3, 53-66.
- Perovic, J., Orttung, R.W. & Wenger, A. (2009). *Russian energy power and foreign relations*. London: Routledge.
- Puaschunder, J. M. (2015). Trust and reciprocity drive common goods allocation norms. *Proceedings of the Cambridge Business & Economics Conference*. Cambridge, UK: Cambridge University.
- Puaschunder, J. M. (2017b). Mapping Climate in the 21st Century. *Development*, 59, 3, 211-216.
- Puaschunder, J. M. (forthcoming a). Climate polices with burden sharing: The economies of climate financing. *Advances in Financial Economics*.
- Puaschunder, J.M. (2016). Intergenerational climate change burden sharing: An economics of climate stability research agenda proposal. *Global Journal of Management and Business Research: Economics and Commerce*, 16, 3, 31-38.
- Puaschunder, J.M. (2017a). *Climate in the 21<sup>st</sup> century: A macroeconomic model of fair global warming benefits distribution to grant climate justice around the world and over time*. *Proceedings of the 8th International RAIS Conference on Social Sciences and Humanities organized by Research Association for Interdisciplinary Studies (RAIS) at Georgetown University, Washington, D.C., United States*, March 26-27, pp. 205-243.

- Puaschunder, J.M. (2017c). Socio-psychological motives of socially responsible investors. *Advances in Financial Economics*, 19, 1, 209-247.
- Puaschunder, J.M. (2017d). Sunny side up! From climate change burden sharing to fair global warming benefits distribution: Groundwork on the metaphysics of the gains of global warming and the climatorial imperative. *Proceedings of the Administrative Sciences Association of Canada Annual Conference*, HEC Montreal, Quebec, Canada.
- Puaschunder, J.M. (2017e). The call for global responsible inter-generational leadership: The quest of an integration of inter-generational equity in corporate social responsibility (CSR) models. In *Natural resources management: Concepts, methodologies, tools, and applications: Information resources management association*. Hershey, PA: IGI Global.
- Puaschunder, J.M. (2018). Artificial Intelligence Evolution: On the virtue of killing in the artificial Age. Social Science Research Network working paper retrievable at [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3247401](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3247401)
- Puaschunder, J.M. (2018a). Gifts without borders: Intergenerational glue connecting over distance and time as pure international development in the age of migration. In J. M. Puaschunder (Ed.), *Intergenerational responsibility in the 21<sup>st</sup> century*, pp. 143-174. Wilmington, DE: Vernon.
- Puaschunder, J.M. (2018b). *Value at looking back: Towards an empirical validation of the role of reflexivity in econo-historic backtesting: Economic market prediction corrections correlate with future market performance*. Social Science Research Network Working Paper retrieved from [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3170734](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3170734)
- Puaschunder, J.M. (forthcoming b). *Governance and climate justice: Global South and developing nations*. Cham, Switzerland: Palgrave Macmillan.
- Puaschunder, J.M. (forthcoming c). Nachhaltigkeit und Investment. In E. Bamberg & C. Schmitt (Eds.), *Psychologie und Nachhaltigkeit: Konzeptionelle Grundlagen, Anwendungsbeispiele und Zukunftsperspektiven*. Hamburg, Germany: Springer.
- Puaschunder, J.M. (forthcoming). Artificial Intelligence Ethics.
- Puaschunder, J.M. (work in progress). *Climate change induced market prospects*. Washington, DC: George Washington University working paper.
- Puaschunder, J.M. (work in progress). Putty and clay labor: What to learn from the Cambridge Controversy for the entrance of AI in today's workforce.
- Renz, A. (2018). Sector competition for energy resources in a carbon constrained hoteling model. 6<sup>th</sup> *International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France*, May 24-25.
- Ricardo, D. (1817/1951). On the principles of political economy and taxation. In P. Sraffa (Ed.), *The Works and Correspondence of David Ricardo*, pp. 1951-1973. Cambridge, UK: Cambridge University Press.
- Roberts, G., Barbier, E. & van't Veld, K.V. (2018). *The beginning of the end of the age of oil*. Retrieved from <https://cenrep.ncsu.edu/cenrep/wp-content/uploads/2016/08/Roberts.pdf>
- Rosenlund Soysal, E. (2018). Share repurchase under diverging beliefs about carbon risk. 6<sup>th</sup> *International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France*, May 24-25.
- Russell, Stuart & Peter Norvig. 1995. *Artificial Intelligence a Modern Approach*. New Jersey: A. Simon & Schuster Company.
- Russell, Stuart & Peter Norvig. 1995. *Artificial Intelligence a Modern Approach*. New Jersey: A. Simon & Schuster Company.
- Russell, Stuart & Peter Norvig. 1995. *Artificial Intelligence a Modern Approach*. New Jersey: A. Simon & Schuster Company.
- Sachs, J.D. (2014). Climate change and intergenerational well-being. In L. Bernard & W. Semmler (Eds.), *The Oxford Handbook of the Macroeconomics of Global Warming*, pp. 248-259. Oxford, UK: Oxford University Press.
- Saffari, E., Meghdari, A., Vazirnezhad, B., Alemi, M. 2015. "Ava (A Social Robot): Design and Performance of a Robotic Hearing Apparatus." *LNCS: Social Robotics* 9388: 440-450, Springer, Oct. 2015.
- Saussay, A. & Sato, M. (2018). *The impacts of energy prices on industrial foreign investment location: Evidence from global firm level data*. Retrieved from <https://personal.lse.ac.uk/satom/publication/currentss/>
- Schmölders, G. (1960). *Das Irrationale in der öffentlichen Finanzwirtschaft*. Frankfurt am Main, Germany: Suhrkamp.
- Schuller, Alan. 2017. "At the Crossroads of Control: The Intersection of Artificial Intelligence in Autonomous Weapon Systems with International Humanitarian Law." *Harvard National Security Journal* 8: 379- 425.

- Schuller, Alan. 2017. "At the Crossroads of Control: The Intersection of Artificial Intelligence in Autonomous Weapon Systems with International Humanitarian Law." *Harvard National Security Journal* 8: 379- 425.
- Schütze, F., Aleksovski, D. & Mozetic, I. (2018). *Stock market reactions to international climate negotiations*. Retrieved from <https://bibbase.org/network/publication/schtze-aleksovski-mozeti-stockmarketreactionstointernationalclimatenegotiations-2018>
- Schweiger, H. & Stepanov, A. (2018). *Energy subsidies, energy intensity and management practices*. Retrieved from <https://www.ebrd.com/cs/Satellite?c=Content&cid=1395236502077&d=Mobile&pagename=EBRD%2FCContent%2FCContentLayout>
- Sherman, H.J. (1967). Marx and the business cycle. *Science & Society*, 31, 4, 486-504.
- Smith, B. (2006). Gender. Gale Virtual Reference Library. Charles Scribner's.
- Sofge, E. 2015. "Bill Gates Fears A.I., But A.I. Researchers Know Better." *Popular Science*. [www.popsci.com/bill-gates-fears-ai-ai-researchers-know-better](http://www.popsci.com/bill-gates-fears-ai-ai-researchers-know-better).
- Sofge, E. 2015. "Bill Gates Fears A.I., But A.I. Researchers Know Better." *Popular Science*. [www.popsci.com/bill-gates-fears-ai-ai-researchers-know-better](http://www.popsci.com/bill-gates-fears-ai-ai-researchers-know-better).
- Solum, Lawrence. 1992. "Legal Personhood for Artificial Intelligences." *North Carolina Law Review* 70(4): 1231-87.
- Solum, Lawrence. 1992. "Legal Personhood for Artificial Intelligences." *North Carolina Law Review* 70(4): 1231-87.
- Somanathan, E., Somanathan, R., Sudarshan, A. & Tewari, M. (2014). *The impact of temperature on productivity and labor supply: Evidence from Indian manufacturing*. Discussion Paper in Economics 14-10, Indian Statistical Institute, Economics, and Planning Unit.
- Soros, G. (2003). *The alchemy of finance*. Hoboken, NJ: Wiley Finance.
- Soros, G. (2009). *The crash of 2008 and with is means*. New York, NY: Public Affairs.
- Soros, G. (2013). Fallibility, reflexivity and the human uncertainty principle. *Journal of Economic Methodology*, 20, 309-329.
- Soskice, D. (1978) Strike waves and wage explosions, 1968-1970: An economic interpretation, In C.Crouch & A. Pizzorno (Eds.), *The Resurgence of Class Conflict in Western Europe since 1968*, pp. 221-245, London, UK: Palgrave Macmillan.
- Sraffa, P. (1960). *Production of commodities by means of commodities*. Cambridge, UK: Cambridge University Press.
- Stiglitz, J. (1998). The private uses of public interests: Incentives and institutions. *Journal of Economic Perspectives*, 12, 3-22.
- Stroebe, W. & Frey, B.S. (1982). Self-interest and collective action: The economics and psychology of public goods. *British Journal of Social Psychology*, 21, 2, 121-137.
- Taheri, A.R., Meghdari, A., Alemi, M., Pouremad, H.R., et al. 2018. "Human–Robot Interaction in Autism Treatment: A Case Study on Three Pairs of Autistic Children as Twins, Siblings, and Classmates." *Int. Journal of Social Robotics* 10(1): 93-113.
- Täuber, S., van Zomeren, M. & Kutlaca, M. (2015). Should the moral core of climate issues be emphasized or downplayed in public discourse? Three ways to successfully manage the double-edged sword of moral communication. *Climate Change*, 130, 3, 453-464.
- The Oxford Encyclopedia of Ancient Greece and Rome. (2010). Oxford, UK: Oxford University Press.
- The World Bank (2015). *Green bonds attract private sector climate finance*. World Bank Brief, 2015.
- The World Economic Forum 2015 Report*. (2015). Davos, Switzerland: World Economic Forum.
- Themistoklis, T. (2018). Artificial intelligence as global commons and the "international law supremacy" principle. Proceedings of the 10th International RAIS Conference on Social Sciences and Humanities organized by Research Association for Interdisciplinary Studies (RAIS) at The Erdman Center at Princeton University, Princeton, New Jersey, United States. Cambridge, MA: The Scientific Press.
- Themistoklis, T. (2018). Artificial intelligence as global commons and the "international law supremacy" principle. Proceedings of the 10th International RAIS Conference on Social Sciences and Humanities organized by Research Association for Interdisciplinary Studies (RAIS) at The Erdman Center at Princeton University, Princeton, New Jersey, United States. Cambridge, MA: The Scientific Press.
- Trinks, A., Mulder, M. & Scholtens, B. (2017). *Greenhouse gas emissions intensity and the cost of capital*. Retrieved from <https://pdfs.semanticscholar.org/c8f5/d6b192df64cde5f578f100d7fb2a6b40515b.pdf>
- Tsagourias, Nicholas. 2015. "The legal status of cyberspace." in *Research Handbook, International Law and Cyberspace*, edited by N. Tsagourias & R. Buchan, 13-29. Cheltenham: Edward Elgar Publishing.
- Tversky, A. & Shafir, E. (1992). Choice under conflict: The dynamics of deferred decision. *Psychological Science*, 3, 6, 358-361.

- Tyler, T.R. & De Cremer, D. (2006). How do we promote cooperation in groups, organizations, and societies? In P.A.M van Lange (Ed.), *Bridging Social Psychology: Benefits of Transdisciplinary Approaches*, pp. 427-433. Mahwah, NJ: Lawrence Erlbaum.
- United Nations Department of Economic and Social Affairs. 2017. *Will robots and AI cause mass unemployment? Not necessarily, but they do bring other threats*. New York: <https://www.un.org/development/desa/en/news/policy/will-robots-and-ai-cause-mass-unemployment-not-necessarily-but-they-do-bring-other-threats.html>
- United Nations Department of Economic and Social Affairs. 2017. *Will robots and AI cause mass unemployment? Not necessarily, but they do bring other threats*. New York: <https://www.un.org/development/desa/en/news/policy/will-robots-and-ai-cause-mass-unemployment-not-necessarily-but-they-do-bring-other-threats.html>
- United Nations Report on the World Social Situation (2011). *The global social crisis*. New York, NY: United Nations Department of Economic and Social Affairs Report ST/ESA/334.
- Veruggio, G. 2005. "The Birth of Roboethics." ICRA 2005, IEEE Int. Conference on Robotics and Automation: Workshop on *Robo-Ethics*, Barcelona, April 18, 2005.
- Vlassopoulos, K. (2009). *Politics antiquity and its legacy*. Oxford, UK: Oxford University Press.
- Warwick, K. & Shah, H. 2014. "How Good Robots Will Enhance Human Life." In book: *Treatise on Good Robots Edition: PRAXIOLOGY: The International Annual of Practical Philosophy and Methodology Vol. 21, Book Chapter*, Transaction Publishers, USA Editors: Krzysztof Tchoń, Wojciech W. Gasparski, January 2014.
- Wenger, A., Orttung, R.W. & Perovic, J. (2009). *Energy and the transformation of international relations: Toward a new producer-consumer framework*. Oxford, UK: Oxford University Press.
- Wisskirchen, Gerlind, et al. 2017. *Artificial Intelligence and Robotics and their Impact on the Workplace*. London: IBA Global Employment Institute.
- Wisskirchen, Gerlind, et al. 2017. *Artificial Intelligence and Robotics and their Impact on the Workplace*. London: IBA Global Employment Institute.
- World Bank 2015 Report*. (2015). Washington, D.C.: World Bank.
- World Bank Group Migration and Development Brief 26 (2016). *Migration and remittances: Recent development and outlook*. Washington D.C.: International Bank for Reconstruction and Development, World Bank Group, April 2016.
- World Investment Report (2015). *Reforming international investment governance*. United Nations Conference on Trade and Development Report. New York, NY: United Nations.
- Yarlik, M.V., Filis, G., Lloyd, T. & Degiannakis, St. (2018). Forecasting oil price volatility: The role of mixed-frequency data (MIDAS) model. *6<sup>th</sup> International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France*, May 24-25.
- Zhang, D. (2018). Upgrading China's energy structure: The role of financial markets. *6<sup>th</sup> International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France*, May 24-25.
- Zhou, S.L., Smulders, S. & Gerlagh, R. (2018). Closing the loop in a circular economy: Saving resources or suffocating innovations? *6<sup>th</sup> International Symposium on Environment Energy & Finance Issues, ISEFI 2018, Paris, France*, May 24-25.