Editorial

Exploring questions in technology, innovation and public policy

1. Introduction

The topic of technology and policy has received prominent attention in the last decade with the growing adoption of automation in the workplace, the rise of social media and digital platforms and the development of new markets and products – such as drone technologies, autonomous vehicles, gene editing, artificial intelligence, 3D printing, blockchain and many others. As such, scholars, policymakers and the general public have shifted their attention to understanding these new innovations, their societal implications and challenges and what may be "policy solutions" to a set of technologically disruptive decades.

Scholarship on technology, innovation and policy is interdisciplinary and ranges from research in economics, law, business, political science and policy journals. The topic areas often fall into three different research buckets: first, there are broader questions about how policy should evolve or respond to the fast-paced nature of new inventions and technological change. These types of questions tend to focus on higher-level policy approach, legal systems and institutional features, or about specific technological changes, inventions or set of disruptions. For example, this work builds on the foundational scholarship discussing disruptive technologies and economic change (i.e. Joseph Schumpeter, Richard Nelson and Sidney Winter, and David Mowery and Nathan Rosenberg).

Second, there is a host of scholarship focusing on firm-level activity of technology start-ups, and the various ways in which government policies may help or hinder the growth of start-ups, or how policies and regulations are impacting the structure of technology companies, financing, entry/exit rates, industries, type of innovation and many other features of technology firms and entrepreneurs. This type of research is not necessarily focused on higher-level questions of technological disruption and providing a policy approach but more so on evaluating either specific regulations or the policy environment for firm-level activity [1].

The third research bucket focuses on the role of policy for addressing how specific innovations or technological disruptions in general are impacting society and work. For example, this third component might address societal challenges and policy solutions from automation leading to displacement of jobs, or how digital platforms are transforming work and it what it means for worker and social safety nets. Concepts such as the "Digital Divide," which discuss the potential gap between members of society who will benefit from new technologies fall in this research bucket.

The purpose of this special issue is to contribute to our knowledge and understanding of these questions and further enhance the scholarly and public conversations on the pressing issues relating to technology, innovation and public policy. As such, the papers in the issue provide unique contributions that cover across all three research buckets, and our outlined below in each of their respective research areas.

1.1 Technological change and disruption: what is the role of policy?

There is a common perspective that while new technological transformations are radically shaping the future, government policies are statically clinging to the past. The idea is that many institutional, legal and policy features evolved in the context of a different era and as such, evolved to address different challenges. In some cases, outdated policies may persist

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because special interest groups benefit from existing regulations that may deter new entrants – and in recent years, the special interest surrounding taxi medallion regulations has been highlighted with the emergence of Uber (Koopman *et al.*, 2015). Indeed, technological innovation may itself be a means of changing "old-age" regulations – for example, scholars have discussed the prominent example of Uber's strategy that has "disrupted" 1930s-based taxi medallions regulations (Koopman *et al.*, 2015; Pollman and Barry, 2017). Other disruptive companies are attempting to follow suit – a concept that Pollman and Barry (2017) describe as "regulatory entrepreneurship."

Nevertheless, there is a "pacing problem" where conventional policies or laws cannot keep pace with new growth of technologies, and thereby may be either inapplicable, or maybe be hindering innovation (Marchant *et al.*, 2011; Epstein, 2013). This raises important normative questions about "what should be" a government's approach toward new technologies and innovation more generally. There are often discussions such as, "the right way to regulate tech" or "the right approach for the future of data security policy" or "should self-driving cars be banned?." One conceptual framework highlighted by Thierer (2014) is whether government approach should be guided by the principle of *permissionless innovation* or the *pre-cautionary principle*. The former refers to the notion that experimentation with new technologies and business models should be generally permitted by default, unless a compelling case can be made about serious harm to society. The pre-cautionary principle is an attitude that emphasizes "pre-damage control" and assess the anticipatory measure of risks about new innovations and developments before they occur. With the permissionless innovation approach, we would see vastly more innovation and technological activity, but it would come at cost of some unknown or uncertain risks that may need to be addressed along the way. With the pre-cautionary principle, this would limit the rate of technological progress and innovation but may come with the benefit of maintaining the status quo and limiting some uncertain risks. To the extent that there is greater value and immense benefits from technological progress and innovations, the permissionless approach would be more desirable.

Several studies focus on these higher-level questions, and the potential for some technologies to have massive disruptive effects across industries has heightened the importance of research in this area. For example, researchers are already discussing the future of policy for drones (i.e. McNeal *et al.*, 2017), autonomous vehicles (Anderson *et al.*, 2016; Zakharenko, 2016; Carp, 2018; Roth, 2020), 3D printing – especially as it relates to 3D printing guns (Thierer and Marcus, 2016), gene-editing (Tomlinson, 2018) and blockchain technologies and cryptocurrencies (De Filippi and Wright, 2018; Henderson and Luther, 2017).

In this vein, the first article in this issue by Abigail Devereaux on "The digital Wild West: on social entrepreneurship in extended reality" tackles the question of how a new regulatory infrastructure *is* required to address the challenges of innovations in extended reality. Devereaux argues that the agile and dynamic nature of this innovation also provides a fertile ground for social entrepreneurs to develop alternative forms of regulatory governance – and in particular, private governance, which will allow the type of experimentation that is needed to discover the appropriate rules in extended reality.

Devereaux's article thus complements some existing research highlighting that while a regulatory framework is needed for new innovations, there can be parties other than the government that take on the regulatory responsibilities. In fact, various other informal governance mechanisms or self-regulation is already evolving to fill the governance gap (Cohen and Sundararajan, 2015; Hagemann *et al.*, 2018). Hagemann *et al.* (2018) have coined this term as "soft law" and highlight the extent to which informal governance mechanisms are already providing governance in autonomous vehicles, commercial drones, the Internet of Things and advanced medical and health technologies. Alston (2020) has described the

innovations in different cryptocurrencies as competition for the means in discovering the best private governance models.

An institutional environmental that allows for not only experimentation in goods and services but also experimentation in rules surrounding new technologies and new markets is an important concept to explore. Light (2017) argues for a default presumption in favor of multiple regulatory voices – through federalism – that can allow for different "testing grounds' of regulations for new technologies. Scholarship in this research area should further explore the "patchwork of regulation" or "laboratories of democracy" theme in addressing the role of policy toward technological innovation.

On the other hand, the second paper in this special issue by Richard Epstein on "Liability rules for autonomous vehicles" seeks to address whether regulations and laws would need to change for autonomous vehicles. Epstein argues that while the "rules of the road" may need to change to accompany a world with self-driving cars on our roads, the liability rules – about how losses should be allocated to private parties when there has been an incident – should not change. Epstein's article thus turns the question around: which institutional features or laws *should not* change, even in the face of disruptive technological changes? While most research has been framed about the ways in which government policies or laws are "outdated," Epstein's article encourages scholars to also consider what kinds of rules, while "old," may still be applicable despite radical transformations.

1.2 Regulatory environment and firm-level activity and financing

The second bucket of research aims to address questions about the relationship between policy and start-up or firm behavior – including start-up financing, entry and exit rates, industries, type of innovation and other aspects of firm activity.

A vast amount of research in this bucket area analyses start-up financing – of which, institutional financing such as venture capital funds are of upmost importance because almost all technology start-ups rely on venture capital funding to enable them to grow from early to late stages, and eventually to acquisitions or IPOs as an exit strategy (Gompers and Lerner, 2004). There are a number of articles focused on start-up funding and how regulations can determine the existence and amount of venture capital funding. Gompers and Lerner (1999) made an important contribution which found that changes in regulation over pension funds in the United States led to more funding flowing to venture capital firms, thereby increasing the supply of venture capital funding. They also find that reductions in capital gains taxes in the United States increased the demand for venture capital funds. In other words, the market for venture capital take-off (and by extension, the technology start-ups backed by venture capital financing) traces its roots to policy and regulatory changes. Cummings and Johan (2018) also provide an overview of the research on how a variety of legal rules have an impact on entrepreneurial finance. Several other studies examine the specific government policies, regulations, the legal environment and taxes all significantly determine the availability of venture capital funding (Jeng and Wells, 2000; Da Rin, 2006; Lerner and Tag, 2013).

Along this line, the introduction of equity crowdfunding for start-ups has also received attention because equity crowdfunding can be another important source of funds, and therefore allow for greater growth of start-up activity. Several scholars have analyzed the institutional, legal and policy environments and their specific impacts on equity crowdfunding (Wilson and Testoni, 2014; Micic, 2015; Hornuf and Schwienbacher, 2017).

The third paper in this special issue by Antonella Francesca Cicchiello, Maria Cristina Pietronudo, Daniele Leone and Andrea Caporuscio on "Entrepreneurial dynamics and investor-oriented approaches for regulating the equity-based crowdfunding" contributes to the literature on the relationship between policy and equity crowdfunding. The authors

provide a legal text analysis that focuses on four main factors in equity crowdfunding regulations and investigates these across European countries with the highest concentration of equity crowdfunding platforms. The study finds that some countries have an investor-oriented approach based on "non-restrictive" equity crowdfunding regulation (such as in the United Kingdom, Germany and France), while other countries' regulations can be classified as a "restrictive approach" (such as those in Italy and Spain), which protects investors excessively. The study draws attention to how the regulations with a restrictive approach can limit the participation and volume of equity crowdfunding in those countries.

Other studies in this research bucket focus on ways in which regulation and policy may impact start-up and entrepreneurship rates directly. Several studies found that higher levels of regulation impede business activity and firm entry (Bripi, 2016; Branstetter *et al.*, 2013; Klapper *et al.*, 2006; Bailey and Thomas, 2017; Chambers *et al.*, 2018). Some of the entrepreneurship and business activity rates research also uses the Economic Freedom of the World index to test whether greater economic freedom is related to greater rates of entrepreneurship (Nyström 2008; Bjornskov and Foss, 2008).

While studies examining the relationship of regulation and economic freedom with firm activity have been on the forefront of this research avenue, there are few studies examining these relationships specifically for start-ups. The fourth paper of this special issue, "Institutions, entrepreneurial adaptation, and the legal form of the organization" by Indu Khurana, Dmitriy Krichevskiy, Gregory Dempster and Sean Stimpson, introduces a novel study investigating how the policy environment influences the legal structures of start-ups and how the ability to change the legal form of organization matters for the start-ups survival rates. In particular, the study finds that economic freedom matters for the initial choice of a start-up's legal structure, and the institutions that govern the ease of how start-ups are able to change their legal structure plays a role in their success or failures. In this way, Khurana *et al.* expand our knowledge of how the policy environment matters for start-ups by highlighting how policies can influence a start-up's legal form of organization.

Overall, research in this second bucket makes contributions in our understanding of how the policy and regulatory environment are significant for many facets and features of start-up activity. Further research in this area should specifically try to isolate technology start-ups in particular. For example, a recent study examined industry-specific regulation and technology start-up entry and exit (failure) rates in the United States and Canada among 20,000 young technology start-ups (Palagashvili and Suarez, 2020). Using the Mercatus Center's RegData dataset to capture the intensity of national-level industry regulations, Palagashvili and Suarez (2020) found that more regulated industries may exhibit lower rates of entry among young, technology start-ups and that more regulated industries are associated with a greater likelihood of a technology start-up closing. The magnitudes of their findings were significantly larger than comparable studies using the same methodology that analyzed standard small or large businesses.

Future research in this area should continue to isolate the technology start-ups because the relationship and the magnitude between technology start-ups and regulation may be different than when analyzing large, established businesses or when analyzing more typical "Main Street" small businesses. This is because, technology start-ups that grow quickly and become "large" are often market disruptors or emerge from undefined, unclear or regulatory gray areas. Some technology start-ups have even been described as engaging in "regulatory entrepreneurship" (Pollman and Barry, 2017) because they are involved in the business of changing regulations by mobilizing their consumer base, and they operate despite industry-specific regulations. In this way, the relationship between regulation and technology start-ups may look different than some existing studies may suggest.

1.3 Technology, work and society

This third category of research investigates how technology is impacting work and society, and what policy can or should do to address the challenges. The most significant question in this area of research is addressing the growing adoption of automation in the workplace, and what it means for wages, inequality, unemployment and welfare of workers, especially of low-income workers (Autor, 2015; Graetz and Michaels, 2015; Levy and Murnane, 2004; Sachs *et al.*, 2015; Sachs and Kotlikoff, 2012). Scholars find that jobs that involve a high level of routine are the highest at risk for being replaced by automation (Autor *et al.*, 2003; Autor and Dorn, 2013; Goos *et al.*, 2014). This means that the risk of unemployment or income loss is not equally distributed and may be particularly pronounced for those in routine occupations – often these are workers in the low or middle skilled occupations (Kurer and Gallego, 2019). A recent report also found that even though Black and Hispanic workers account for 13% and 18% of the US labor force, they are "overrepresented in jobs with high risk of being eliminated or significantly changed by automation" (Broady *et al.*, 2021).

However, it is important to also note that these technological disruptions are often part of a "creative destruction" cycle that while destroys specific industries and jobs, also leads to the creation of new jobs and industries. For example, technological disruptions have entirely eliminated the jobs of telegraph operators, blacksmiths and carriage and harness makers from the early 20th century, but by the late 20th century, entire new industries and jobs were created – for example, automobile, airline and computer and IT industries, which did not exist in the early 20th century. Nevertheless, the transition between the destruction and creation of jobs will likely be disruptive and these concerns have led to an explosion of commentary on universal basic income as a policy solution [2].

In addition to identifying the challenges of technological innovation on the question of "robots replacing workers," there is also an extensive interest and research in how technological changes in digital platforms are transforming work and leading to the so-called gig economy or growing independent workplace (Katz and Krueger, 2016; Abraham *et al.*, 2019; Jackson *et al.*, 2017; Collins *et al.*, 2019; Munger, 2015, 2018; Oranburg and Palagashvili, 2021). There has been concern about the impact of digital platforms on how we work, and whether individuals are being exploited at work.

Along this line of research, the fifth paper in this special issue by Nick Cowen and Rachela Colosi on "Sex work and online platforms: what should regulation do?" examines the impact of digital platforms specifically on the sex industry and evaluates what approaches to platform regulation are likely to benefit sex workers. The authors find that online platforms generally make sex work safer and regulation aimed at preventing platforms from serving sex workers is likely to harm their welfare. Instead, they argue that regulation of online platforms should take great care to differentiate coercive sex from consensual sex work and allow sex workers to experiment with governance mechanisms provided by entrepreneurs.

The paper by Cowen and Colosi raises a broader question about whether current policy attempts to interfere with workers on any digital platforms are warranted. Policies like California's AB 5 make it difficult to be independent workers, but reports show that this may harm independent workers, a majority of whom prefer to keep their arrangements because of the flexibility it affords them [3]. Indeed, economists using data from Uber found that drivers would require almost twice as much pay to accept the inflexibility that comes from adopting a "set schedule," as opposed to their current flexible schedule with Uber (Chen *et al.*, 2017). The study also concluded that drivers would reduce their hours driving on the Uber platform by more than two-thirds if they were required to work more inflexible hours, such as typical employees on a set 9–5 schedule. Boeri *et al.* (2020) also found that among these independent workers, "the degree of flexibility that self-employed work offers seems likely to be the main driver of relatively high levels of satisfaction." Overall, much of this research indicates that a vast majority of independent workers would prefer to keep their nontraditional job

arrangements that come with it. This means that taken directly from what independent workers say, most of them may be worse off if policies, such as California's AB 5, eliminated their options to be independent workers through digital platforms.

From a policy standpoint, when more workers begin to use digital platforms and pursue other means of independent work, there is a concern that labor and employment regulations may lose its relevance. This is because independent workers (such as gig workers, freelancers, self-employed and other contractors) are legally classified as independent contractors, and in contrast to legal employees, these workers are left out of the purview of employment-based protections and labor regulations (i.e. unemployment insurance, minimum wage, overtime regulations, paid leave, health insurance, workers compensation, etc.). Developments surrounding the global COVID-19 pandemic have also highlighted the problem of access to benefits for independent workers, and for this reason, the federal Coronavirus, Aid, Relief, and Economic Security (CARES) Act of March 2020 included a provision for unemployment insurance benefits for independent workers.

As a result of this growth and attention on the independent workforce, there has been interest in rethinking the role of labor regulations and employment benefits with attempts to move toward a solution that encompasses more flexible and portable benefits for workers, which are not tied to a particular employer. In a study published in the *Journal of Economics Perspectives*, economists found that approximately 80% of self-employed respondents indicated a type of portable benefits option would be a good idea (Boeri *et al.*, 2020) [4]. Research on these types of portable benefits solutions attempt to explain its importance or investigate its implementation (Hanauer and Rolf, 2017; Foster *et al.*, 2016; Rolf *et al.*, 2016).

Indeed, it seems future research and policy solutions should explore whether social safety net and benefits should be decoupled from employment and implemented into direct-provision government programs. Doing so, could help to address the growing concern of long-term unemployment from automation and the concern of the growth of the independent workforce.

2. Conclusion

The papers in this special issue are novel contributions that cover across all three research buckets and create further fruitful avenues of inquiry in technology, innovation and public policy. These questions are also vital to study because economists have long discussed how innovation and entrepreneurship are at the heart of economic growth and individual well-being.

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Notes

1. Additionally, there is a separate sub-area of research relating to anti-trust and technology companies (i.e. "Big Tech").
2. See, for example Cholbi and Weber (2019) providing a summary of universal basic income.
3. See, for example Bureau of Labor Statistics reported in 2018 that 79 percent of independent contractors preferred their arrangement over a traditional job. The report "Freelancing in America: 2019" found that that 71 percent of individuals engaging in independent work appreciate the increased flexibility of their work and that 51 percent of individuals engaging in independent work indicated that there is no amount of money that would compel them to switch back to traditional employment.
4. The question read as follows: "Policymakers have been discussing the idea of creating a fund to help self-employed workers obtain work-related benefits, such as health insurance and retirement

savings, that they would be able to receive regardless of where they worked, and they could take with them if they changed jobs. Do you think this is a good idea?".

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