Capabilities for the Common Good

A study on the Social Justice Foundations of the Missions-oriented Innovation Policy Framework

Burim Orlishta

Master's thesis

Technology, innovation, and knowledge

TIK Centre for Technology, Innovation, and Culture

UNIVERSITY OF OSLO

28.11.2022

Specialization: Innovation and Global Challenges (TIK 4021)

Capabilities for the Common Good: A study on the Social Justice Foundations of the Missions-oriented Innovation Policy Framework

Supervisor: Fulvio Castellacci

http://www.duo.uio.no/

Abstract

Missions-oriented innovation policies have received increasing attention by scholars and policymakers in recent years. Proponents of the missions-framework argue that transformative innovation policies are needed to address important societal challenges, such as e.g., mitigate the effects of climate change. Critics, however, have recently argued that the missions-framework lacks strong theoretical foundations. This thesis addresses this criticism and analyses the theoretical and philosophical foundations of the missions-oriented innovation policy approach. Specifically, the thesis draws inspiration from theories of social justice in political philosophy, and it discusses the relations between different theories of social justice and the rationales and foundations of innovation policy. The thesis carries out a review of social justice theories with the aim of reflecting upon the relations that these have with innovation policy foundations. Specifically, the thesis argues that the theories of the *capabilities approach* and *responsive communitarianism* are more closely related to, and provide promising foundations for, the missions-framework.

Keywords: Innovation policy, missions-oriented innovation policy, the entrepreneurial state, social justice theory, utilitarianism, communitarianism, capability approach, well-being

Acknowledgements

With the submission of this thesis, I now conclude what has been two highly eventful years at the TIK-centre. In light of this occasion, it is only appropriate that I take the opportunity to thank those who have contributed to making this period memorable.

I am grateful to the Professors, researchers, staff, and fellow students at the TIK-centre who made my entry into a new and largely unknown field of study all the more welcoming and engaging. I consider myself fortunate to have been part of the great community at TIK.

To my supervisor Fulvio, thank you for your constant encouragement, support, and patience. Your feedback, perspectives, and positive (even humorous) outlook, have been greatly appreciated. It has been a pleasure to have worked with you on this thesis, as well as in my capacity as research assistant.

On a more abstract note, I would like to acknowledge that this thesis could not exist without the great works by thinkers who were passionate about understanding the world and its potential for improvement. It has been a simultaneously sobering and inspiring experience to have worked with so closely with their ideas.

Lastly, to my close friends, my family, and my partner in life, Ingvild, I am forever grateful for all your continuous support and love.

Burim Orlishta
Oslo, 28.11.2022

Table of contents

1. Introduction

Societies all over the world are currently faced with several societal challenges which pose grave threats to the welfare of their citizens. The persistence of such *grand societal challenges* has several underlying causes. Among other things, it implies a failure of innovation in its capacity to provide new technological (or social) solutions that are needed to resolve and overcome such threats. While the lack of cheap and effective technological solutions to mitigate the effects of global climate change is one such failure, the Covid-19 vaccine on the other hand, was developed and distributed in under a year following the first reported outbreak of the virus and has since then rendered the disease nearly obsolete (Staff, 2022). This effective resolution to the pandemic was largely the result of scientific and technological innovations, as well as government policies aimed at minimizing risks associated with development, manufacturing, and demand, for the private pharmaceutical companies engaged in vaccine development (Frank et al., 2021). The notion that governments may have an important role to play in directing innovation towards solutions to societal challenges has in recent years gained increased recognition among policymakers and scholars.

In the field of innovation studies this notion is formalized as the *missions-oriented innovation policy framework* and is closely associated the work of economist Mariana Mazzucato (2018a, 2018b, 2018c, 2021). The increased recognition of what I will often from here on simply refer to as the *missions-framework* marks a radical departure from the traditional focus on the economic growth of innovation, towards its capacity for solving complex societal challenges (Papaioannou, 2020). Although the Covid-19 pandemic had comprehensive and destructive societal effects, the challenge it posed was always only one technological innovation (i.e., the vaccine) away from being resolved. More complex societal challenges – such as climate change, rising economic inequality, or ageing populations – require several social and technological solutions to be successfully resolved. These more complex issues demand a higher degree of government commitment than what was needed in the case of the Covid-19 vaccine. Because this level of commitment is implausible given traditional organizational, economic, and political structures, Mazzucato advocates instead for what she refers to as the *entrepreneurial state* (Mazzucato, 2021). She reimagines the role of the state as one that is not limited to merely fixing failures of the markets but rather one that serves to create new and shape existing markets by setting a direction for the economy, designing missions to tackle

societal challenges, and involving different stakeholders in the innovation process (Mazzucato, 2021).

The entrepreneurial state is, due to its active intervention in the market, not an economically neutral state but rather a normative one. Normativity, I would argue, demands more in the way of justification than what is necessary given a neutral position. So how is the entrepreneurial state justified? One justification has already been given, that of the inherently harmful and destructive effects of grand societal challenges and the importance of public policy in resolving them. Another justification, which is more relevant to the economic point, is that some of the most pervasive technologies available today were the result of mission-policies enacted by the entrepreneurial states (Mazzucato, 2021). In her book *Mission Economy: A Moonshot Guide to Changing Capitalism* (2021), Mazzucato draws empirical evidence from the historical examples of the camera phone, LED light, CAT scan, and portable computer among several other innovations that were the result of the government led Apollo 11 mission (Mazzucato, 2021, pp. 66-67). While the entrepreneurial state was the primary risk-taker in the space race, several of the technologies that were developed as a result of the Apollo-project would later be appropriated by private firms who thereby secured the rewards of the governments investment for themselves (Mazzucato, 2018a, 2021). Although the US government did not receive *direct* returns on their investment, they did receive *indirect* returns through taxes on the economic growth of the private firms who successfully commercialised the technologies that the government had a central role in developing (Mazzucato, 2021).

The two justifications for the entrepreneurial state which I have outlined here are however not considered sufficient to liberal thinkers and policymakers who are convinced that the free market should be left to its own self-governing mechanisms and free of government intervention. These critics typically formulate a twofold argument against the entrepreneurial state: that (i) Mazzucato's use of historical evidence in the support of the entrepreneurial state is selective and misrepresents public sector contributions to the innovation process (Karlson et al., 2021; Mingardi, 2015); and that (ii) the free market is able to provide technological solutions to grand societal challenges without normative government intervention and can do so in a way that is neither paternalistic or coercive, but instead based on voluntary transfers. The first claim criticises the empirical weakness of the missions-framework; the second claim criticises its theoretical foundations. I mainly focus on addressing the latter claim in this thesis.

In this thesis I argue that the theoretical foundations of the entrepreneurial state can be strengthened by its expansion to include social justice perspectives. Social justice is a branch of political philosophy that studies the function of justice in society, as well as the role that the state has to foster social progress and the welfare of its citizens. However, social justice perspectives have traditionally been neglected in innovation studies, due to the implicit assumption that innovation is a *value neutral* process, i.e., pertaining only to neutral economic values as opposed to normative values of justice (Papaioannou, 2021). If innovation processes are indeed value neutral, the justification for interventionist policies by the entrepreneurial state will become all the more difficult to sustain in the long term as it would conflict with innovative actors, firms, and institutions (Papaioannou, 2021). This thesis is motivated by a different starting point: that innovation process is in fact *value laden*, as it is a necessarily tied to human actions, and therefore influenced by normative moral, political, and economic judgments (Papaioannou & Srinivas, 2018). Given that the innovation process is inherently value-laden, perspectives of social justice can yield valuable insights on the purpose of innovation and its important societal role. Social justice asks questions such as: how the state should act; what moral principles should govern the way it treats its citizens; and what kind of social order should the state seek to create (Swift, 2014). It is generally accepted among policymakers that innovation has an important role to play in the economy and society at large, however what that role entails is often an object of disagreement. I therefore argue that perspectives on social justice can help clarify these disagreements by revealing the underlying assumptions, logic, and motives of the arguments employed by different policymakers and scholars.

RQ: *What are the social justice foundations of the entrepreneurial state?*

This research question calls for a bridging of the two distinct academic traditions of innovation studies and political philosophy. The thesis will consist of a literature review on the topics of innovation policy and social justice which will ground my inquiry and analysis. From a selection of five prominent theories of social justice, I will first seek to identify the relationship between theories of social justice and the major existing innovation policy frameworks. I will then engage in a more substantial discussion on the social justice foundations of the missions-framework and its implications. Of particular interest to this thesis, is how social justice is manifested in the setting of a direction, design of a mission, and view of public and private stakeholders of the missions-framework. On the whole, this thesis provides a theoretical contribution to innovation policy and the missions-framework, rather than an empirical one. As

such, the methodology that is employed in the thesis is a thorough literature review and novel conceptual analysis that seek to provide a stronger theoretical foundation of the missions-framework.

The thesis is structured as follows. Chapter 2 will present a review of the literature on innovation and innovation policy, with a specific focus on the missions-framework. Chapter 3 will present a review of the literature on social justice. This chapter will discuss different relevant theories of social justice, and how each of these provide important conceptual underpinnings for the foundations of innovation policy. Based on this review, chapter 4 will then carry out a discussion of the research question, about the normative and ethical foundations of the missions-oriented approach. Chapter 5 will then summarize the main points and conclude the thesis.

2. Innovation policy - Approaches and foundations

The scientific field of innovation studies emerged from the intellectual environment of the *Science Policy Research Unit* (SPRU) at the University of Sussex in the late 1960s (Fagerberg, 2017; Fagerberg & Verspagen, 2009; Lundvall, 2013). At SPRU, innovation scholars with diverse academic backgrounds sought to better understand the interplay between science, technology, innovation, and policy. This research was motivated by the argument that an increased knowledge of these processes would lead to economic and societal benefits. As such, the aim of innovation studies is the development of systematic and reliable knowledge about how to best influence and exploit innovation and its latent effects (Fagerberg, et al., 2013, p. 1).

Although the SPRU marked the start of what came to be known as the field of innovation studies, the study of innovation as a social and economic phenomenon can be traced back to the early 20th century work of economist Joseph Alois Schumpeter (1883-1950). Schumpeter's interest was to describe how innovations serve to disrupt the *circular flow of economic life*. The circular nature of the economy was traditionally seen as one wherein the flow of money circulated from the producer to the worker, from the worker to the consumer, and from the consumer back to the producer again. This circular flow was traditionally believed to lead to *static equilibrium*[1], an economic state wherein the prices of goods (i.e., products and services) would balance out and become static according to their supply and demand within this flow (Schumpeter 1934/1983). Schumpeter however recognized that the development and commercialisation of innovations would cause disruptions to this flow that would prevent it from ever stagnating or balancing out into an equilibrium (Schumpeter, 1934/1983). I will in the following section provide a more detailed account of Schumpeter's theoretical contributions, particularly those in *The Theory of Economic Development* (1934/1983) and *Capitalism, Socialism & Democracy* (1942/1994), and their influence on the economics of new growth theory and evolutionary economics.

[1] While it was not necessarily believed that static equilibrium could realistically occur, it was nevertheless regarded as a useful theoretical construct that interpreted the rules believed to govern economic flow.

2.1. The role of innovation for economic development

Schumpeter's *The Theory of Economic Development* (1934/1983) centres innovation as the result of entrepreneurship at the centre of capitalist economic development. In Schumpeter's theory, entrepreneurs are described as individuals that bring about innovations through their innate ability to identify and seize opportunities. As economic agents, entrepreneurs are dynamic risk-takers that leave familiar circumstance to act upon uncertainty and introduce *new combinations* to the economy that serve to disrupt the circular flow and thus create endogenous growth (Schumpeter, 1934/1983). For Schumpeter, innovations originate from new combinations of existing knowledge, capabilities, and resources (Edler & Fagerberg, 2017; Schumpeter, 1934/1983, p. 66). This interpretation of innovation as new combinations is fundamental to our contemporary conception of innovation in which it is understood as "the introduction of new solutions in response to problems, challenges, or opportunities that arise in the social and/or economic environment" (Edler & Fagerberg, 2017, p. 4). Whether as Schumpeter's 'new combinations' or the more contemporary 'new solutions', innovations are notable for their capacity to be economically disruptive and are therefore considered, by both Schumpeter and the scholars he inspired, to be the main driver of economic development. According to Schumpeter (1934/1983, p. 66), new combinations can result in development through (i-v):

(i) The introduction of a new good
(ii) The introduction of a new method of production
(iii) The opening of a new market
(iv) The conquest of a new source of supply
(v) The carrying out of the new organisation of any industry

From Schumpeter's conception of innovation as new combinations, we can draw a distinction between *incremental innovations* and *radical innovations*. Although Schumpeter doesn't employ these terms himself, these concepts are apparent in his acknowledgement that some innovations have more disruptive qualities than others. What determines the disruptive quality of innovations has to do with what the combinations consists of. If a new combination is the result of continuous small step improvements of existing combinations, as is primarily the case in the concept of incremental innovations, then there is less disruption and subsequently less development and growth. However, if the new combinations appear discontinuously, as is conceptualised by radical innovation, then there is more disruption, development, and growth

(Schumpeter, 1934/1983, pp. 65-66). Rather than slight improvements to already existing and similar combinations then, radical innovations are understood to be the result of new combinations of disparate (yet compatible) types of knowledge, capacities, and resources. Considering that Schumpeter's interest was to develop a new theory of economic growth, it follows that he chose disruptive, or radical innovations, as his primary focus.

For there to be disruption however, the new combinations must have economic consequences. Schumpeter introduces a distinction between invention as a novelty and innovation as the implementation of novelty in practice (Schumpeter, 1934/1983). Novelty is here understood broadly as that which is new to anyone in a specific context. Schumpeter's reason for introducing this distinction was the realization that what matters economically and societally is not the new idea itself, but rather the implementation of that idea in practice, and particularly its exploitation in the economic and social system (Edler & Fagerberg, 2017). Another aspect to Schumpeter's theory is that innovation primarily originates from the activities and concerns of producers (i.e., entrepreneurs, innovators, firms etc.), as opposed to the traditional view that consumer demand is what instigates the supply of innovation (Schumpeter, 1934/1983). Although he does not deny that consumer demand might influence innovation, it is the producers who "as a rule initiate economic change" (Schumpeter, 1934/1983, p. 65). In competitive economies then, new combinations imply the competitive elimination of old combinations. New combinations are not, according to Schumpeter, the result of employing means of production that happen to be unutilized, e.g., unemployed workers, unsold raw materials, or excess productive capacity, but rather emerge as the result of existing combinations (Schumpeter, 1934/1983). Schumpeter adds that this process (which he later refers to as *creative destruction*) is what determines the social and economic rise or fall of individuals, or in other words, what determines the winners and losers of the economy. In an contrasting economy that is not founded on competition the new combinations appear to coexist with existing combinations. As they would not be in competition, the economic consequences (i.e., disruption of equilibrium and economic growth) would not be as impactful, and consequently would not have winners or losers at all (Schumpeter, 1934/1983, p. 67).

The period between the writing and publication of his earlier book *The Theory of Economic Development* (1934/19883) and his later book *Capitalism, Socialism and Democracy*

(1942/1994) marks a change in Schumpeter's conception of entrepreneurship and innovation[2]. This also marks a change in Schumpeter's influence on entrepreneurship studies and innovation studies. Although both fields of study are rooted in the Schumpeterian idea of innovation, entrepreneurship studies follow directly from Schumpeter's conception of innovation as something primarily conducted by risk-taking individual entrepreneurs (Lundvall, 2013). Beyond this focus on the individual entrepreneur's ability to innovate (i.e., 'the entrepreneurial function'), Schumpeter's later work expands to include collective action as well, which opens for greater analysis on how innovation relates to larger organizations, research and development (R&D), and science and research policy (Lundvall, 2013).

Schumpeter's *Capitalism, Socialism and Democracy* (1942/1994) investigates the political consequences of innovation. Here he introduces a refined version of the previous conception of new combinations, as creative destruction (Schumpeter, 1942/1994, p. 83). This concept describes how the introduction of innovation causes a dismantling of 'the old' to make way for 'the new', a process which Schumpeter considers to be the driving force of capitalism. As with new combinations, a core aspect of creative destruction is the idea that there are definite winners and losers in the economy. The winners are primarily the entrepreneurs that dare to pursue new combinations, while the losers are primarily the competitors of innovators and entrepreneurs, as well as their employees, their suppliers and so forth (Kurz, 2012, p. 52). Nevertheless, the process of constant renewal implies efficiency and productivity gains which has the effect of growing the economy and is therefore generally considered a central political aim. Government involvement that is aimed at stabilizing the economy, however, was viewed quite sceptically by Schumpeter who considered economic instability to be both the cause and effect of successful creative destruction (Schumpeter, 1942/1994). As such, the allocation of resources through distributive or redistributive policies by the government would only serve to paralyze or halt the unyielding progress of innovative change. However, Schumpeter (1942/1994) acknowledges that state-intervention can be useful given particular circumstances. This dynamic and contextual conception of when the state should rightly intervene does take into consideration aspects of time and space of the innovation policy process as the limitations or opportunities of when and where to engage in intervention. The circumstances when intervention is acceptable for a specific policy is whenever the net effects aid rather than prevent

[2] This change has also been referred to as the difference between Schumpeter Mark I (i.e., his earlier work) and Schumpeter Mark II (i.e., his later work).

the adjustment to structural change that is inherent in development. In other words, government intervention is, according to Schumpeter, acceptable whenever the policy in question aids more than it does prevent the transition (or creative destruction) of the companies' strategies, production methods, and habits, from the old to the expected new (Schumpeter 1942/1994). The state should not therefore come to the aid of those who 'get into trouble' due to their own overproduction or as the result of other failed business strategies. Beyond government intervention and creative destruction, Schumpeter theorizes that the socio-economic transformations that occur because of creative destruction will ultimately lead to the replacement of capitalism with socialism (Schumpeter, 1942/1994). According to Schumpeter, an increasingly discontent intellectual class will emerge to protest capitalism and elect policymakers who implement welfare policies that trend towards socialism, while challenging the free-market and restricting entrepreneurship (Schumpeter, 1942/1994).

Schumpeter's contributions laid the groundwork for the development of two influential theories of economics, namely new growth theory[3] and evolutionary economics, both of which mark departures from orthodox neoclassical economics. In neoclassical economics, people and firms are considered to be profit and utility maximizing economic agents who are rational and primarily influenced by exogenous (i.e., external) forces on the economy through the information of prices determined by supply and demand (Nelson & Winter, 1982). According to the neoclassical view, governments should prioritize reaching a state of market equilibrium, as it is argued that this is the most effective allocation structure of resources. Innovation is in neoclassical economics assumed to be stimulated largely by demand side effects, rather than endogenously within firms (Nelson & Winter, 1982). Because of this, the neoclassical economics view predicts that economic growth will cease in the long run because of decreased marginal productivity of capital over time, as well as the constant returns to scale of each factor in the production function (Castellacci, 2007). The neoclassical view is therefore better suited to explain economic growth that is 'catching up' (i.e., economies of poor countries), than it is in explaining economic growth in well-established industrial economies that have steady populations growth rates and savings rates (Castellacci, 2007).

New growth theory was developed in the 1980s in response to this perceived weakness of the neoclassical view on economic growth (Castellacci, 2007). New growth theory is founded on

[3] Also known as "endogenous growth economics" (Kurz, 2012).

the idea that long run growth is the result of endogenous (i.e., internal) forces, such as human capital, knowledge spillover and information technology. One such internal factor of central significance is knowledge. According to new growth theory, investment into knowledge, particularly in education and R&D is expected to generate increasing returns and drive the economy forward (Sengupta, 1998).

Evolutionary economics, developed by Richard R. Nelson and Sidney G. Winter in their book *An Evolutionary Theory of Economic Change* (1982), offers a theory on the capabilities and behaviour of firms and their role in instigating economic change. This theory is heterodox in that it departs from orthodox economic assumption that the actions of economic agents (firms and consumers) are "profit-maximizing over a well-defined and exogenously given choice sets" (Nelson & Winter, 1982, p. 4). Instead, evolutionary economics theory considers economic agents to be heterogenous and to have a bounded rationality. The heterogenous aspect of the theory describes how economic actors are influenced by their own routines and habits of thought, which affects their intent and economic outcome (Castellacci, 2007; Fagerberg, 2002). Individuals or firms can according to EE therefore learn through empirical insights and make decisions that are not fully rational, thereby opposing rational choice theory. Thus is the evolutionary theory made to highlights how the innovation, retention, and selection of routines (and firms) shape aggregates and industrial development (Lundvall, 2013, p. 40).

2.2. Innovation policy in an ever-changing world

From Schumpeter to the SPRU and beyond, developments in the study of innovation have yielded new insights into the significant role innovation can play in bringing about economic and societal development. Recognition of this fact has given policymakers greater cause to design and implement public policies that support new and existing innovation actors across different economic sectors. The tradition of public policy to influence innovation in this way is defined as innovation policy, the subject of which draws heavily on interpretive work on past experiences, present circumstance, and future predictions, to form a stable knowledge base for policy analysis for the purpose of advising policymakers on the benefits and costs of policies (Schot & Steinmueller, 2018). The use of public policies in this regard can either be purposefully designed to impact innovative activity (e.g., by establishing an innovation fund), or be motivated by other ends while still having an impact on innovative activity (e.g., by increasing the minimum wage). We can distinguish innovation policies as being either narrow

or broad, where the narrow policies are intentionally designed, and broad policies are unintentional in terms of innovation (Edquist, 2004).

Although the research and analysis done on public policy and its effects on innovation in the past form an increasingly persuasive and stable knowledgebase, innovation policy remains an interpretive and dynamic branch within innovation studies – subject to circumstance and influences that can cause it to change. Its changing nature is evident by the fact that what we today most commonly refer to as innovation policy used to be referred to as 'science policy' and later 'technology policy' (Fagerberg, 2017). These changes are rooted in the political climate at the time they were in use. During the early years of the SPRU in the 1960s, innovation policies were labelled science policy because policymakers were primarily concerned with how to influence scientific advancements for economic and societal benefit. During the 1980s however, the focus of policymakers shifted from science to technological development, thereby labelling such policies as technology policy. It was not until the mid-1990s that the term 'innovation policy', which is still arguably the most recognizable term, became widely used (Fagerberg, 2017). Despite the terminological change and shifting focus, each interpretation has in common the interest of utilizing public policies for economic growth and societal gains. This common interest can be traced throughout different institutions, organizations, and policies, so that we can confidently delineate and draw comparisons to the innovation policies of the past, despite the minor hurdle made by the terminological differences (Fagerberg, 2017).

In addition to distinguishing innovation policies under different historical labels, we can also draw distinctions based on their different orientations[4]. Innovation policies can be distinguished as either being *invention-oriented policies*, *systems-oriented policies*, or *missions-oriented policies* (Edler & Fagerberg, 2017, p. 5). From these distinctions we are able to draw extended theoretical frameworks that encompass other aspects of innovation policy such as its objectives, government rationales, policy-instruments, and that of particular interest to this thesis, its social justice foundations. As with the missions-framework, I will from hereon also mainly refer to

[4] There have been other suggestions for distinguishing innovation policies. Schot and Steinmueller (2018) use the term "framing" to describe a framing for growth, a framing for national innovation systems, and a framing for transformative change. Others have focused on "failures", with a focus on market-failures, systems-failures, and transformation-failures. Although I have chosen to categorize policies in terms of their orientation, other distinctions may also appear in the text.

the other two frameworks as *inventions-framework* and *systems-framework*. Although the three innovation policy frameworks appear theoretically distinct, their applied use in historical political contexts are not always as easily distinguished. This does not, I would argue, indicate a flaw in the theoretical frameworks, but is rather the result of the many voices, opinions, and vested interests (e.g., lobbying firms or organizations) in political discourse and policymaking.

Despite this, the influence of each innovation policy framework can be depicted chronologically as broad trends in the economic history of western industrially developed democratic countries[5]. The inventions-framework characterized the innovation policy of the pre- and post-World War II era, until the rise in popularity of the systems-framework in the 1990s, which was followed by the increased popularity of the missions-framework from the 2010s till present day (Edler and Fagerberg, 2017, p. 5; Schot & Steinmueller, 2018). It is worth noting that these frameworks, although they are depicted chronologically do not replace existing frameworks, they are rather part of the same policy-landscape available to policymakers and thus in competition with one another on the basis of their merits and persuasion (Schot & Steinmueller, 2018). Furthermore, the theoretical rationales for certain policies have been around for centuries and thereby predate the constructs of these frameworks. Despite instances of such "ex post rationalization" (Edler & Fagerberg, 2017, p. 6), the frameworks provide a systematic perspective on the limitations and possibilities of innovation policies. In the following three subsections I provide an interpretation on the literature of each of the three innovation policy frameworks. These subsections are structured by historical origin, rationales for state intervention, policy objectives and instruments, and drawbacks. The following accounts draw heavy inspiration from two highly important and influential articles on the subject, namely *Innovation policy: what, why, and how* by Jakob Edler and Jan Fagerberg (2017), and *Three frames for innovation policy: R&D, systems of innovation and transformative change* by Johan Schot and Edward Steinmueller (2018).

2.2.1. Invention-oriented innovation policy

Invention-oriented policies are focused on creating economic growth through the first phase of the innovation process which is related to R&D and invention. Knowledge is the central aspect

[5] The US, the UK, and western EU make up for most of the historical empirical evidence which these frameworks draw from.

of this phase as it is argued that new combinations of existing knowledge will lead to new knowledge and novelty which, through its implementation and exploitation within an economic system, will result in innovation and economic growth (Schumpeter, 1934/1983). This view of the innovation process would later become modelled as the linear model of innovation[6] which depicts the innovation process as one that flows in one direction, where research leads to development, development leads to production, and production leads to marketing (Kline & Rosenberg, 1986). Invention-oriented policies are thus concerned with safeguarding how knowledge, whether as R&D or novel inventions, is created and distributed in society.

Invention-oriented policies, despite not being labelled as such at the time, emerged in the 1930s as the tacit view that science and technology had inherent potential for sustaining economic growth through mass production and consumption (Schot & Steinmueller, 2018, p. 1555). With the onset of World War II in 1939, economic interventionist policies (particularly in the US and UK) were largely justified as part of the war effort with governments investing heavily in various sectors of the economy, particularly sectors related to national defence, public security, and military warfare (Edler & Fagerberg, 2017; Schot & Steinmueller, 2018). By the end of the war this justification became obsolete which led to the re-emergence of the neoclassical economics argument that the best organization of the economy is that of the 'laissez faire' free market. With little justification for intervention left, there was a fear that governments would begin to withdraw intrusive policies and return the market to its self-regulating mechanisms (Schot & Steinmueller, 2018). This fear gave rise to public concerns that a lack of investments into significant sectors in the economy would cause the reoccurrence of pre-war era recessions, which were marked by rampant inflation, unemployment, and economic instability (Schot & Steinmueller, 2018). Ultimately, these concerns, together with the ensuing Cold War and the recognition that knowledge is disposed to cause *market failures* without adequate government involvement, yielded a new justification for government intervention (Edler & Fagerberg, 2017; Schot & Steinmueller, 2018).

The free market describes a system wherein goods and services are exclusively subject to the principles of supply and demand which balance out to create a price equilibrium. Markets fail due to market distortions which are caused by an inefficient distribution of goods and services,

[6] This model is often contrasted with the *chain-linked model of innovation* (Kline & Rosenberg, 1986) which will be presented in the section 2.3.2. on systems-oriented policies.

thereby leading to disequilibrium within the market system (Edler & Fagerberg, 2017). Distortions of this kind can be the result of several socioeconomic mechanisms, I will however focus on the ones relevant for the market failure of knowledge, namely the mechanisms of *externalities* and *public goods*. Externalities describe how a transaction between producers and consumers can incur either costs (as a negative externality) or benefits (as a positive externality) on a third party who is neither involved in the production or consumption of the transaction object. Air-pollution for instance, can be considered a negative externality as it results from economic transactions that have negative effects on communities and society at large. In such a case where a transaction causes air-pollution, governments are largely justified in increasing taxes on the good or service in question so that it better reflects the true cost of all affected parties.

Knowledge however is recognized as a positive externality, meaning it produces benefits to a third 'freeloader' party who have neither engaged in its production nor consumption. Due to these 'spillover effects', investors lose incentives to invest in knowledge since they are not the sole beneficiaries of their own investment (Edler & Fagerberg, 2017). In other words, the price of knowledge in a free market does not accurately reflect the true cost of knowledge investment and the benefits it produces. If left unprotected, competitors and imitators can easily forego the investments into knowledge themselves and appropriate the knowledge produced by others to their own benefit, without any investment cost. In addition to being disposed to create positive externalities, knowledge is also considered to be a public good (Stiglitz, 1989). Public goods are defined as commodities or services that have the properties of being *non-rivalrous* and *non-excludable*. As a public good, knowledge is considered non-rivalrous because its consumption is not marked by its depletion, nor does the use of knowledge by one party prevent others from using that same knowledge to their own ends which makes it non-excludable and essentially available to all. Given these traits that make knowledge a public good, what sort of government policies does the market-failure approach justify? The inventions-framework seeks to fix such market failures by allowing governments to intervene in the self-regulating market to ensure a stable investment level in the production of new knowledge as well as protect its production and dissemination. These narrow policies (i.e., they have intended effects on the innovation process) range from subsidizing R&D in private firms, making public investments in education and basic scientific research, and the strengthening of intellectual property rights (IPRs) (Edler & Fagerberg, 2017).

Spending public money to subsidize R&D programs of private firms is assumed to cause a higher degree of private investment by the firms themselves which would be missing otherwise. Because of the important role leading firms have in the national economy, governments are justified according to the market failure approach to promote firms which show potential for innovation and economic growth. By 'picking the winners' in this way, the return on investment for governments is apparent in the increase to the gross national product (GDP) and taxes derived from the commercialisation of technological innovation, which has been criticised for not reflecting the true risk and reward relationship of the transaction between private firms and the government (Laplane & Mazzucato, 2020). Public investment in basic scientific research and education are justified on the grounds that technological innovation requires long-term commitments that private firms (who are generally more concerned with short-term profits) lack the sufficient incentives to invest in (Edler & Fagerberg, 2017). However, the inventions-framework offers no suggestion as to what the optimal level of public investment into basic scientific research and education might be to derive the greatest benefit at the minimal cost (Edler & Fagerberg, 2017). Lastly, IPRs are central to the market-failure approach as it is argued that inventions can be stimulated by implementing policies that reduce patent requirements (or increasing application approval rates) on novel technologies that are suitable for industrial application as well as extending the validity of the patent over longer periods. Such policies are intended to provide inventors with an easier patent process and long-term protection from imitators, but they can also have the unintended consequence of prohibiting new inventions if patent laws are too strict, to the point where they become unproductive in an innovation economy (Mazzucato, 2018b). To avoid this, patents are commonly balanced out both in terms of the process of application as well as the expiration date of patents, so that once it has expired the knowledge becomes publicly available. Once this occurs, the knowledge or technology is in turn expected to be rapidly appropriated and diffused in the economy which would cause productive economic growth.

Theoretically, the inventions-framework approach to government intervention is founded on new growth theory which, as has been mentioned, argues that that the production of knowledge is an asset in instigating innovations, making knowledge itself a public good that is worthy of policy support. Knowledge-based economies will warrant continuous growth according to new growth theory due to spillover effects of investments into science and technology (Edler and Fagerberg, 2017). However, this view of innovation and its overemphasis on the spillover effects of knowledge and singular focus on the early stage of the linear innovation process has

received criticism for being too simplistic an explanation for generating innovation and economic growth (Edler & Fagerberg, 2017; Mazzucato, 2021). Criticisms of the inventions-framework and view of innovation, point to its vagueness in policy advice, appropriability problems, conflation of knowledge and information. The nature of knowledge (as a positive externality and public good) makes it difficult to know what the 'true' value of it is or should be in society. It thus becomes a challenging political question to determine how much the government should invest in knowledge creation (and its safeguarding, diffusion etc.) to reach the socially optimal level. Furthermore, it is argued that the appropriability problem of knowledge is exaggerated in the framework, since the capability mechanisms, culture, and routines, contribute to making the knowledge of the firm difficult to imitate and exploit (Edler & Fagerberg, 2017). Overall, the inventions-framework contradicts much of the empirical knowledge surrounding innovation in contemporary innovation studies (Edler & Fagerberg, 2017). Despite these issues however, the inventions-oriented framework is continuously invoked as a rationale for public investment into R&D, basic research, or the protection of IPRs. The issues that the inventions-framework fails to account for, and its subsequent lack of explanatory power on how innovation can be facilitated to result in economic growth, gave way to the next generation of innovation policy, namely systems-oriented policies.

2.2.2. Systems-oriented innovation policy

The systems-framework provides a holistic view on the dynamics of the innovation process. These dynamics play out as the interdependent social, industrial, political, and economic factors in environments that either serve to promote or stagger innovation. As such, the central focus of the systems-framework is on the interaction among actors in who share an economic environment.

The economic growth of the post-war period until the late 1970s started its decline in the 1980s (Edler and Fagerberg, 2017; Schot & Steinmueller, 2018). With the economic stagnation that followed, it became clear to scholars that the inventions-framework was not an adequate framework to secure long-lasting economic growth for all countries. As mentioned, under the inventions-framework it was assumed that the nature of knowledge as a public good also meant that it was a global public good. Implicit in this assumption was the notion that the globalization of the market would cause rapid diffusion of knowledge, technologies, and innovations between developed and developing countries, which would bridge the technological gap (Schot &

Steinmueller, 2018). However, due to either too strict protection of IPRs and knowledge by rich countries, or the lack of capabilities to implement the knowledge and technologies by poorer countries, this did not occur at the rate which was implied by the inventions-framework (Schot & Steinmueller, 2018). Further recognition that countries were heterogenous in terms of their institutional organization, their capabilities to create and diffuse knowledge, their availability of resources and more, motivated innovation scholars to develop a new framework that could account for country-specific characteristics for innovation (Edler & Fagerberg, 2017). This led to the development of *national systems of innovation* (NIS) (Freeman, 1987; Lundvall, 1992; Nelson, 1993).

The NIS framework identifies the technological dynamics of national environments as instrumental for the successful development and diffusion of innovation. It was recognized that different configurations of national organisations, institutions, capabilities of firms, and their intersectoral cooperation could yield more productive or less productive innovative outcomes (Freeman, 1995; Schot & Steinmueller, 2018, p. 1558). The emphasis on cooperation and interaction among agents draws on evolutionary economics and Schumpeterian perspectives on innovation whereby the innovation process is viewed as the central force behind economic and social change, while also being the result of social processes (Nelson & Winter, 1982; Schumpeter, 1942/1994). The NIS literature has inspired theoretical adaptations on other levels such as *regional innovation systems*, *sectoral innovation systems*, and *technological innovation systems*. These adaptations focus on similar interaction measures as NIS but in different environments.

The systems-framework departs from the inventions-framework in several important ways. For one thing, NIS holds that innovations are not only dependent on the endogenous social components within the firm or organization that conduct R&D, but also on the broader social and economic environment which it is introduced into (Edler & Fagerberg, 2017, p. 9). In this way NIS framework offers a better explanation for the distinct economic performance of countries by including networks of institutions in both public and private sectors, wherein the activities and institutions initiate, import, modify and diffuse novel technologies (Freeman, 1995). Instead of the linear approach of the inventions-framework, the NIS framework embodies *the chain linked model of innovation* (Kline & Rosenberg, 1986). With the chain linked model it was recognized, by Freeman (1995, p. 10) among others, that technical change was not merely the result of R&D and knowledge investments, but rather influenced by a range

of variables such as training, education, design, quality control and so forth, that together determined the innovation process. Moreover, empirical investigations had revealed that the flow of innovation did not only progress in a linear fashion (i.e., in one direction from knowledge to product), but could rather be influenced in non-linear ways as well by feedback loops. Non-linear feedback loops could for instance explain how consumers of a technology can provide producers with information of their preferences for the technology design, which in turn can be incorporated to satisfy the customer base and increase productivity and economic gains. In such cases, the innovation process is impactfully influenced by the consumers input, which is something the linear model of the inventions-framework completely omits from its analytical framework. As such, knowledge could be seen as influencing all aspects of the innovation process, not just the initial phase (Freeman, 1995; Kline & Rosenberg, 1986). It also departs from the traditional view of economic behaviour as 'hyperrational' choices based on perfect information towards a more bounded rationality that accounts for uncertainties and localised learning (Freeman, 1995). The chain linked model does in this way greatly expand upon the rationale of for government intervention compared to the minimal intervention permitted by inventions-framework.

At the government level, this expanded rationale supports government interventionist policies that correct systems-failures, which are more encompassing than the previous market-failures. According to Fagerberg (2017) systems can fail when innovative environments lack *knowledge, skills, market demand, financial support, or institutional support*, leading to unproductive or reduced interaction within the system. I draw on Fagerberg's (2017, pp. 504-505) account of these broad policies (i.e., that influence innovation) that address systems-failures next. The systems-failure of knowledge[7] builds on the market-failure of knowledge rationale to include policies that enhance productive interactions between public R&D organisations and private firms and other actors by enabling access (or sharing) of knowledge. Lack of skills can also cause systems-failures, which requires policies aimed at education and training people in general or specialized skills that enhance the productivity of firms and their ability to engage with other actors within the system. Governments can furthermore correct systems-failures by increasing demand through public procurement policies and supporting markets through

[7] The 'Triple Helix' model of innovation is another useful concept aimed at analyzing the interaction between academia, industry, and government in order to foster productivity and economic growth (Etzkowitz & Leydesdorff, 1995).

regulations. Governments can also correct the systems-failures of finance by de-risking innovation-processes that are deemed too big of a risk for firms to undertake without financial public support. Lastly, policies can correct system-failures by making changes to institutional rules, or what Fagerberg (2017, p. 12) 'the rules of the game' by influencing IPRs among other things.

In such cases when systems fail, the government's role is to fix these systems by providing the missing resources, necessary changes, or supporting systems, to enable the unobstructed interactions between actors within the system (Edler and Fagerberg, 2017, pp. 8-10). The NIS framework enables greater empirical analysis of how the strengths and weaknesses of industrial and economic dynamics which can guide the decision process of policymakers. Overall, the systems-framework justifies a higher degree of government interventionism compared to the public goods and positive externality rationale of the invention-framework.

Nevertheless, even strong innovation systems have proven largely unable to provide the necessary innovations and technological change to solve societal challenges, such as climate change. One reason for this is that the strong position of established actors in the economy make it difficult for new firms and technologies to overtake them. This notion has been linked to strong path-dependencies of the economy (Castellacci, 2008; Unruh, 2000). Path dependencies describe how one current technological position is the result of past decisions, routines, and activities (Nelson & Winter, 1982). If the trajectory of the path dependence leads to a desired outcome, then actors within the firms can enforce current routines, thereby building a stronger path dependence which can increase the momentum towards that desired future outcome. However, if the future trajectory outcome is undesirable, changing the path dependence can prove challenging, but not impossible. The momentum of path dependence is directly tied to the rigidity of the routines and when those routines in turn are enforced beyond a certain threshold, the momentum can seem almost irreversible, causing a 'lock-in'. One well-known instance of selection and lock-in path dependency is the QWERTY keyboard (David, 1985). Despite its inefficiency compared to other available alternatives, the extensive implementation of this particular keyboard setup has made it practically irreplaceable. This is analogous to the issue of climate change, as even the systems-framework is arguably not suited to facilitate for the innovations needed to successfully mitigate and overcome climate change. Compared to the inventions-framework, the systems-framework does incorporate both a more precise view of the innovation process as well as a stronger rationale for what governments are justified in

doing to support innovation systems, it does not however reimagine what the objective of innovation and governments should be in any meaningful way. Of the two innovation policy frameworks that have now been covered, neither offer an adequate path forward on how innovation can be made to address time-sensitive societal challenges.

2.2.3. Missions-oriented innovation policy

The missions-oriented innovation policy framework views innovation as a tool to solve grand societal challenges (Mazzucato, 2018b). Rather than merely fixing market failures or correcting systems failures then, the missions-framework argues that governments should use their capacity to influence the directionality of the market towards innovations that serve societal needs. Of the three extant innovation policy frameworks in the innovation studies literature, the missions-framework advocates for the highest degree of government interventionism.

The first literary reference of something being missions-oriented can be found in Alvin Martin Weinberg's *Reflections on Big Science* (1967) where he argues that the federal R&D that was at the time conducted largely in the aerospace, military, and the nuclear sector should become missions-oriented towards solving societal issues, such as pollution, disease, and energy-demand – issues that were of *national interest* (Weinberg, 1967, pp. 137-142). This notion was further developed by Henry Ergas in *Does Technology Policy Matter?* (1986) where he compares "diffusion-oriented countries" with "mission-oriented countries" describing the latter as countries whose public policy goal is the "development of technological capabilities in technical fields considered of primary national importance" (Ergas, 1986, p. 4).

What should count as matters of "national interest" and "national importance" in the context of innovation and technological change would later become a central question in Richard Nelson's book *The Moon and the Ghetto* (1977) and his subsequent article *The Moon and the Ghetto Revisited* (2011). In the book, Nelson questions how a country like the 1970s US could achieve the technological feat of landing a man to the moon while simultaneously struggle to provide an effective education for ghetto kids, to maintain affordable medical care, and to reduce drug addiction in the population (Nelson, 1977). Put in another way, Nelson questioned why it is the case that our ability to meet some kinds of needs are greater compared to other kinds of needs. The answer, according to Nelson, is that some needs are more naturally aligned with the evolutionary process of innovation, particularly with how knowledge develops a strong

scientific knowledge base through experimentation (with selection-mechanisms, variety creation, routines etc.) to result in technological advancements that become solutions to certain kinds of needs, rather than others (Nelson, 2011). The Apollo program, in addition to successfully landing a man on the moon, caused a surge of innovative activity in related sectors which resulted in new technologies that produced economic growth and societal benefits (Mazzucato, 2021, pp. 86-87). If the need in question is not however naturally aligned in this way, as is the case with the need for effective education according to Nelson, this process becomes ineffective. The prospect of slow technological advancement turns such needs into unattractive investment objects for investors who generally seek fast returns and high payoffs. Lack of sufficient investment contributes to the problem as it causes perpetual technological stagnation to the needs that are misaligned with evolutionary innovation processes (Nelson, 2011). We can break out of such cycles, according to Nelson (2011), if we manage to create and sustain persuasive arguments for technological advancement, pay-off opportunities and through reorientation of sectoral innovation systems. The lack of sufficient technological advancement in mitigating climate change and overcoming other societal challenges can therefore be viewed as issues of misalignment to evolutionary innovation processes (Nelson, 2011, pp. 682-687).

> *It is a good bet that if a persuasive argument could be made that effective, environmentally benign, energy-related technologies could be developed quickly and cheaply through government programs aimed at that purpose, there would be a real movement on that front. In fact the movement is limited, in part because the argument is not fully persuasive.* (Nelson, 2011, p. 682)

Mazzucato attempts to develop precisely such a persuasive argument in her book *The Entrepreneurial State* (2018a), where she describes the effort as a "discursive battle" that requires a "new language and rhetoric". Compared to 'old' missions[8] which were directed towards specific technological solutions to promote defensive or offensive national sovereignty (e.g., the Manhattan project and the Apollo program), new missions are reimagined as responses to grand societal challenges that are broader in scope, more complex, and require long-term commitments (Mazzucato, 2018a, 2021). Mazzucato refers to these new challenges as 'wicked', in the sense that they are particularly misaligned with the evolutionary process of innovation,

[8] For a more in-depth perspective on the characteristics of old missions see Soete and Arundel (1993, p. 51)

as described by Nelson (2011; Mazzucato, 2018b, p. 803). It has therefore been argued that the solutions to new wicked challenges cannot rely on the same mechanisms, structures and policy instruments that were involved in the development of the atomic bomb or moon landing, but rather we must define new policy models (Mazzucato, 2021; Mowery et al., 2010; Schot & Steinmueller, 2018). Next, I address three central aspects of the missions-framework: the setting of a direction, the design of missions, and the relationship between the public and private sector.

Mazzucato (2018b, p. 803) writes that innovation has "not only a rate but also a direction", implying that as a value-laden (or normative) human activity, it necessarily also has a set economic and societal direction. This claim opposes the traditional view that markets are free and therefore value-neutral and directionless, rather the missions-framework addresses directionality-failures. Instead, Mazzucato argues that the question should not be whether we should have a direction or not, but rather which considerations should guide it (Mazzucato, 2018b). As has been noted, the guiding considerations for the direction of the economy should, according to Mazzucato (2021), be that of grand societal challenges. The UN's Sustainable Development Goals might be a good place to start when setting a direction as these goals were developed with broad inclusion of different stakeholders across the world (Mazzucato, 2021). Broad inclusion of the public and their support is essential to the success of missions when setting a direction, as lack of support can cause dissatisfaction. Because a normative directionality of the economy implies that some economic actors are more likely to succeed than others, it is therefore important to have legitimate claims on why the directionality is in place. Once an economic direction is set, new policies can be designed around missions that support the profitability of going in that direction (Mazzucato, 2018b, p. 804).

How these missions-policies are designed is important because "missions-oriented policies are not just about throwing funds at problems but doing so in specific ways" (Mazzucato, 2018b, p. 803). Next, I present some of the central characteristics of a well-defines mission according to Mazzucato (2018a, 2018b, 2021). To engage the public and diverse stakeholders in the set economic direction, missions need to be designed so that they are *clear-targeted* and enabling of *cross-sectoral innovation* through a portfolio of projects and bottom-up experimentation, thereby fixing the directionality failures of the market (Mazzucato, 2021). Clear targeted missions are measurable and time-bound with goals for investments and technological progress that are simultaneously feasible and ambitious. Unrealistic missions are unlikely to gain sufficient investment and support, while missions that lack ambition will not inspire effort or

investment (Mazzucato, 2021). Well-defined missions should embrace heterogenous actors and sectors (both public and private) across the entire economy that engage in experimentation through a broad portfolio of R&D innovation projects. This is expected to increase the likelihood that some of these projects will succeed in developing new solutions to societal challenges, while other will fail. Failure should however be expected and recognized as a learning experience, because even failure generates knowledge that can be useful in future attempts of technological experimentation. One final characteristic of a well-defined mission is its use of joined up policymaking whereby missions are translated into concrete policy instruments and actions that are coordinated and carried out by all levels of the public institutions involved. While those missions should involve a range of public institutions, it is crucial that there is a strategic division of labour among them, with well-defined responsibilities for coordination and monitoring (Mazzucato, 2018b).

Mazzucato argues that the focus of mission policies should not be on the creation of growth but rather the solution of problems (Mazzucato, 2021). The argument here is that the unpredictable nature of innovations (their development and successful diffusion) makes individual innovations unsuited as deliberate targets of policy aimed at growth. Instead, governments should aim policies at clear mission targets and facilitate for bottom-up experimentation, collaboration across sectors, and mission investments, which is more likely to spur innovations that will result in growth (Mazzucato, 2021). Mazzucato (2021, p. 111) notes that: "after all, the internet itself did not arise from a focus on computing but from the need to get satellites to communicate". Missions that lack these characteristics (i.e., missions that are ill-defined) increase the risk of directionality failure which can prove damaging to efforts intended to solve societal issues as can have the unintended consequence of strengthening existing path-dependencies. A set economic direction accompanied by well-defined mission-policies enables the entrepreneurial state to take a leading role in influencing innovation processes of the market.

In this role, the entrepreneurial state does not so much 'pick the winners' that serve to increase the country's GDP as is traditionally the aim of neutral governance, but rather to 'pick the willing' (Mazzucato, 2018b). The willing refers to actors, firms, or even entire sectors (both public and private) who are willing to contribute to the stated mission in combination with both vertical (hierarchical) and horizontal (cooperative/interactive) policies to experiment and stimulate innovation across different sectors. Aligning the different capabilities of the willing is important for a successful mission, and so is having a precise diagnosis of the technological,

sectoral, or national innovation system that the mission-policy intends to transform. Missions are designed to be transformative across the entire value chain, creating and co-creating new markets wherever there is potential for innovations and technological change in accordance with the directionality and missions, and not limited to areas in the economy where positive and negative externalities occur (as is the market-failure approach) (Mazzucato, 2018b, p.807). Those that are willing are therefore more likely to receive benefits through the distributional arrangements enforced by the entrepreneurial state while others who oppose the directionality are more likely to face hardships that force them to find alternative ways to succeed. For instance, if the direction of the economy is set to mitigate the effects of climate change, actors in the oil and gas industry will experience difficulties as the economy favours sustainable alternatives to meet energy demand. Following the mission's framework, the state therefore becomes an entrepreneurial state as it reaches its capacity to foster variety creation and manage selection mechanisms to create or shape markets to meet these challenges (Mazzucato, 2018b).

One important aspect to how Mazzucato reimagines the private-public relationship is the value-extraction of the private-sector, and how the entrepreneurial state may combat it. Mazzucato argues that the entrepreneurial state is more likely to invest into long-term and high-risk areas (where the big disruptive innovations often are), since private actors are restrained by shorter-term profit considerations to stay competitive (Mazzucato, 2018c). Currently, state supported innovations are often left unprotected and accessible in the market, and companies exploit the publicly funded technology for their own gains. Unsurprisingly, companies that engage in value predatory capitalism, i.e., rent-seeking, value extraction, legal loopholes, monopolistic behaviour, are often the ones who get the most benefit from such exploitation and manage to outcompete others in the creative destruction process.

Mazzucato argues that we should do away with the antiquated depiction of private entrepreneurs as being the only ‘real’ risk-takers. The policy implementation of missions involves instruments such as “procurement contracts, grants, loans and prize schemes” (Mazzucato, 2021, p. 124).

> *It explores how the dominant narratives about innovators and the reasons for their success fundamentally ignore the deeply collective and cumulative process behind innovation. This failure to recognize these processes has in turn led to a problematic distribution of rewards for innovation, and to policies which, in the name of innovation, have enabled a few companies to extract value from the economy* (Mazzucato, 2018c, p. 190).

Mazzucato (2018c, pp. 190-191) identifies fours ways in which this kind of value extraction occurs: (i) through the financial sector's (particularly venture capital and stock market) interact with processes of technology creation; (ii) through increased IPRs protection; (iii) through price-setting that does not reflect the true value of innovative products; and (iv) through first mover advantage in networks which enable monopolistic rewards. While she does not explicitly invoke the concept of justice in any way, predatory capitalism and value-extraction practices heavily imply an ambiguous moral character in Mazzucato's writings. She has several mentions of instances where value extraction and rent-seeking (both opposite trends of what she calls 'productive capitalism') are described as foul-play and a direct cause of the rise of inequality in the 21st century (Mazzucato, 2018c, p. 5).

For instance, Mazzucato claims that Apple through taxation loopholes in Ireland has successfully extracted value from Irish taxpayers, but not only that, the Irish government has extracted value from the US taxpayer. This is due to the fact that Apple has its headquarters and started its venture in California, with use of technology that was publicly funded (Mazzucato, 2018c). Apple created a subsidiary in Reno, Nevada, to avoid the Californian corporate income and capital gains tax. By channelling their profits through this subsidiary, they avoided 2.5 billion in interests and dividends (Mazzucato, 2018c).

There are however passages, concepts, and other aspects of Mazzucato's written work where she indicates what she considers the wrong and right distribution of benefits and burdens in society. Drawing from these instances then we learn that Mazzucato holds the view that the distribution of gains from an innovation *should* reflect the actual distribution of contribution to that innovation, and not disproportionally fall into the hands of rent-seeking capital investors or other actors who engage in *predatory* practices.

> *It is clear that Apple's highly complex tax arrangements were principally designed to extract the maximum value from its business by avoiding paying substantial taxes which would have benefited the societies in which the company operated. Apple certainly creates value, of that there is no doubt: but to ignore the support taxpayers have given it, and then to pit states and countries against each other, is surely not the way to build an innovative economy or achieve growth that is inclusive, that benefits a wide section of the population, not only those best able to 'game' the system*. (Mazzucato, 2018c, p. 3).

The entrepreneurial state is based on the idea that government institutions and organizations are not simply concerned with fixing market failures or systems-failures to create an equal economic system for all actors involved, but rather directing actors through carefully designed missions aimed at a public objective (Mazzucato, 2018, p. 804). While Mazzucato's argument for the entrepreneurial state and missions-framework has received a lot of attention in recent years, there are still many who are sceptical of the proposition that we should abandon a value-neutral market-oriented political structure for a normative entrepreneurial state, although though they might also acknowledge that climate change and other societal challenges are damaging. These liberal critics hold the view that the free market is able to provide technological solutions to grand societal challenges without normative government intervention, moreover it does so in a way that is not coercive but rather based on voluntary transfers. While this objection on the grounds of paternalism might be persuasive to some, this argument may also be countered by the claim that a degree of paternalism in the short run (to the extent that innovation systems are transformed, and technological solutions are created) might be acceptable given the alternative of suffering the consequences of inaction on societal challenges. Moreover, it could even be argued that beyond the short-term, the entrepreneurial state is simply a more effective and equitable framework for innovation governance regardless of societal challenges.

3. Social justice and innovation policy

An important trait of SPRU's approach specifically and innovation studies more generally is interdisciplinarity and commitment to the inclusion of various perspectives from different academic disciplines and traditions (Lundvall, 2013; Perez, 2013; Steinmueller, 2013). This

openness is however largely determined by the compatibility of the other fields of study with innovation studies, of which empirical scientific disciplines that include social components (e.g., social sciences, development studies, science, and technology studies) are better suited than less compatible fields (e.g., physics). Political science is in this sense highly relevant for innovation studies, and moreover innovation policy. With reference to the work of Mazzucato, innovation scholar Bengt Åke Lundvall notes that merely fixing market failures is far from what governments actually do and far from what they should do, to which he prescribes that the research should conduct further "collaboration with political scientists" (Lundvall, 2013, p. 61). While the discipline of political sciences on the one hand is mainly concerned with explaining the nature of politics through empirical means, the tradition of political philosophy is concerned with developing normative conceptions of politics through moral inquiry. The former part of Lundvall's quotation, on what governments actually do, is rightly suited for collaboration with political scientists. The latter part however, on what governments should do, is a matter for pertaining to political philosophy. This is the branch of philosophy that will ground my analysis into the study of innovation policy and its foundations in social justice.

In political philosophy, the state in question is primarily the democratic state whose central feature is the fact that the law does not distinguish between the leaders and the subjects of the state (Swift, 2014). Modern democracies are constituted by a collective representation of citizens who decide on what its laws are through democratic processes. So, when we are discussing the question of what governments should do and how the state should treat its citizens, we are in fact discussing what we, as citizens should do and how we should treat one another (Swift, 2014). This shows us that "moral philosophy sets the background for and boundaries of, political philosophy" (Nozick, 1974, p. 6). Political questions are in this way abstractions of inherently moral questions, mainly pertaining to individual judgments of the rightness or wrongness of actions.

The founder of the modern theory of the state, Thomas Hobbes (1588-1679), viewed people in the state of nature (natural human conditions pre-government) as inherently partial to themselves and their own interests, or as he writes "for it is a voluntary act: and of the voluntary acts of every man, the object is some good to himselfe" (Hobbes, 1651/1901, p. 103). Hobbes' claim here limits perspectives on individual morality and social justice to that which is only within the scope of self-interest. It is a claim which is challenging refute in its entirety because there is some truth to it as people do often act to promote and preserve their self-interest (Swift,

2014). Moreover, if we assume this cynical position, even the most altruistic acts can be framed as inherently self-serving, as for instance when the act giving money to a beggar is framed as an act of relieving oneself of the discomfort of seeing someone in need[9]. The question of whether people are inherently selfish or altruistic, is arguably a false dichotomy, as it presents only two options to a more complex and nuanced concept. Philosopher and economist Adam Smith (1723-1790) argued that although people are self-interested, they are also influenced by moral sentiments such as sympathy:

> *How selfish soever man may be supposed, there are evidently some principles in his nature which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it except the pleasure of seeing it* (Adam Smith, 1759/2002, p. 11).

If we acknowledge then that peoples' deep motivational structures are not merely selfish or altruistic (or singular in other ways), but rather complex and heterogenous, we can better engage in the discussion of how theories of justice influence people, institutions, and society at large.

In political philosophy there are traditionally three kinds of justice, these being *retributive justice, compensatory justice,* and *distributive justice* (Thomas, 2000, p. 109). Retributive justice posits that people who have committed wrongdoings are due punishment proportional to their act. This notion of justice is meant to deter further offences from being committed and is foundational to the criminal justice system. Compensatory justice seeks to ensure that victims of injustice are rightly compensated with the aim of minimizing the impact of harm done by the injustice. Distributive justice concerns the fair distribution of resources, opportunities, and privileges in society, or what is often referred to as the distribution of "the benefits and burdens of social cooperation" (Rawls, 1971/1991, p. 4). This distribution can either be narrow by benefiting or burdening only a few or broad by impacting many. The distribution of the benefits and burdens in society is a result of economic, political, or social frameworks that are powered through institutions (Thomas, 2000).

The inclusion of the role of institutions here points to an important distinction between *justice* and *social justice*. While justice refers to the idea of fairness, social justice refers to how ideas

[9] Example based on a historical account of when Thomas Hobbes was seen giving money to a beggar, and when asked about it, offered self-interest as his reason (Losco, 1986).

of fairness manifest in social institutions (Swift, 2014). In other words, social justice is often viewed as being synonymous with distributive justice, as it describes a just and equitable division of resources, opportunities, and privileges among members of society. Implicit in this definition is also the division of burdens, such as taxation. It is through manifestation of formal and informal applications of justice in different contexts that social justice becomes apparent in social institutions (e.g., the government, the economy, the legal system, the family). Its appearance through manifestation enables critical engagement with institutions and the social justice foundations it acts upon. This can be done through inquiry into the implications of their action or inquiry into the alignment of the act with their explicit or non-explicit conception of justice, to which deviations can be corrected so as to reinstate the integrity of a justice system (Capeheart & Milovanovic, 2007, pp. 1-2).

> *Justice is the first virtue of social institutions, as truth is to systems of thought. A theory however elegant and economical must be rejected or revised if it is untrue; likewise laws and institutions no matter how efficient and well-arrange must be reformed or abolished if they are unjust*. (Rawls, 1971/1991, p. 3)

The dynamics of social justice can be illustrated by returning to the example of the Covid-19 vaccine development. While the development of the vaccine was indeed successful and the pandemic largely resolved, the distributional arrangements and outcomes of the vaccine development process serves to challenge some of our notions of social justice. Following market-failure and systems-failure rationales, the US government was already before the pandemic a substantial investor in the basic scientific research of big pharmaceutical companies (‘big pharma’) (Frank et al., 2021). With the onset of the pandemic the global race to be the first to develop a vaccine had started, and because American pharmaceutical companies are highly competitive and benefit from strong sectoral innovation systems, the US government saw their opportunity to be one of the first global suppliers of the Covid-19 vaccine, which would be sold internationally and create economic growth in the US. In addition to the pre-Covid investments in basic research, the US government provided assurance through R&D support and further investments into the different stages of vaccine development to minimize the risk associated with development, which greatly benefitted the innovation process of the privately owned pharmaceutical companies. Frank et al. (2021) serves up estimates from different sources ranging from 18 billion dollars at the lowest level towards 39.5 billion dollars at the highest level, on how much the US government spent on the development of vaccines.

Taxpayers, who effectively had a hand in the development of the vaccine through these billions of dollars spent by the government on their behalf, had to pay yet again through public procurement to receive the vaccine once it was developed as a finished commercial product and distributed through the market. As such, the taxpayer can be seen as having had to pay twice, once for the development of the vaccine, and a second time for its purchase, while a narrow group of shareholders of the pharmaceutical companies involved in the Covid-19 vaccine development received the rewards. To what extent can this distributional arrangement be said to be just?

Even though this is a simplistic account Covid-19 vaccine development program, I would argue that it does serve as an effective illustration of how our intuitions of social justice and fairness of distributional arrangements manifest themselves in the formal or informal applications of innovation policy and governance. While the US government likely justified their institutional conduct on the grounds that a vaccine had to be developed due to the high societal economic and societal cost of the pandemic, we do not have to accept that this was the best, nor the only way, in terms of social justice, that this process could be handled. Theories of social justice provide us with theoretical frameworks that can assist in guiding people's moral intuitions towards reducing injustice. However, people have not always had the luxury of having established theoretical frameworks to rely on in this manner.

Throughout most of pre-modern history, the contents of justice have largely been defined by those in positions of power with the aim of serving their own interest, and with little regard for the needs of the majority[10]. The industrialisation of France and Britain in the mid 18th century laid the groundwork for our modern conception of justice, where central idea was that the justice of society's institutions could be challenged (Barry, 2005). In practical terms, this meant that the market system along with the owners of capital, who have a lot of influence in deciding how society should be organized could be challenged on claims of justice (Barry, 2005). In essence, this meant that unrestricted capitalism and the institutions supporting it could now have their powers limited, in other words, a measure of accountability for injustice was introduced. Following the end of the second world war, many social democratic parties in Europe converged on some ideas on how to restrict capitalism that were rooted in ideas of social justice (Barry, 2005). Generally, these ideas included in some form or another the establishment of

[10] This is particularly evident in Karl Marx's writings on class struggle.

trade-unions and worker-representation, taxation for a more equal distribution of wealth, and universal availability of education and health services (Barry, 2005).

New conceptions of justice have also developed from the justice-struggles of minorities, activists, and other such 'grass-roots' initiatives or social movements. It has been argued that when the contents of justice are born out of struggles, discussions and democratic support, the definition is more in line with true social justice, as opposed to definitions born out of coercion of money and power by a few of societies elites (Capeheart & Milovanovic, 2007). I will however mainly focus on a third group of people who have made theoretical contributions to social justice, specifically political philosophers, and social theorists. Their approach is theoretical, meaning that they rely on reflection, reasoning, logic, and argumentation to determine the moral principles from which they construct comprehensive theoretical frameworks.

These theoretical constructs are often founded on foundational values, of which equality and liberty are two of the more prominent values. The principles of social justice are traditionally viewed through the left to right political spectrum, wherein theories belonging to the left side emphasize equality (e.g., socialism) while theories belonging to the right side emphasize the right to freedom (e.g., libertarianism). Because both sides of the spectrum appeal to their own *foundational values* neither side can be seen as willing to rationally forego their position by appeal of the opposing value since there is no way to argue for equality over freedom, or freedom over equality (Kymlicka, 1990, p. 3). However, in political philosophy, equality is important for another reasons as well, as it is argued that every plausible theory or conception of justice contains it in some form or another. Even libertarian theories that specifically place emphasize liberty over equality, are founded on a conception between individual equality, whether as rights or otherwise, social justice is therefore sometimes referred to as the being on an egalitarian plateau (Kymlicka, 1990).

3.1. Theories of justice

This subchapter will provide an account of five major theories of social justice and their relationship with innovation. Before doing so, I will first provide a brief account of my reasoning behind this coming selection. My selection of theories was determined by criteria of *applicability* and *prominence*. The applicability criterion reflects how well the theory is suited

to the case of the modern democratic state, its institutions, and innovation policy perspectives, while the prominence criterion reflects how often the theory was featured in the academic literature searches. This means that my selection of social justice theories is delimited in two ways; by the exclusion of some theories of inherently undemocratic ideologies (e.g., anarchism, autocracy, or oligarchy) due to their failure to satisfy the applicability criterion, as well as by the exclusion of potentially interesting but fringe theories of justice that fail to satisfy prominence criterion. Based on these criteria, I decided to focus on the major theories that reflect the philosophical positions of libertarianism, utilitarianism, liberalism, the capabilities approach, and communitarianism. Because these philosophical positions often contain several distinct interpretations by different authors, I have focused my account on one or two prominent authors whose contributions have had an important impact on the tradition to which they belong. Moreover, I have ordered the theories according to the extent that they justify state intervention, ranging from the minimal state conceived by libertarian philosophy to the more active and interventionist state argued for by communitarian approaches.

Although the main interest of this thesis is in the political morality (i.e., the basic structures of society and distributional organization) of social justice, theories of social justice are deeply rooted in considerations of individual morality (i.e., the moral actions of individuals). Feminist theories of social justice have even made this one of their central arguments, following their famous slogan that 'the personal is political'. Their claim is that what matters in terms of justice is not only apparent in the basic structures of society, but also in the personal experiences and behaviours of individuals, and the exclusion of either one of these perspectives will diminish the quality of the theory. Although the feminist theory of justice is not included in this review (due to the selection criteria stated above and overall constraints of the thesis), feminist theories may arguably yield some interesting insights of power-relations and gender equality in the innovation context. I leave this as a theme for future research.

Hence, I will therefore include both the aspect of political morality as well as individual morality in my analysis. It is of course important to add that due to space limitations, these accounts are necessarily simplifications of the grand and complex theories. For each of the following sub-sections, I will first introduce the main ideas and concepts of the theory of justice, then point out some typical criticisms facing the theory, and finally draw comparative lines between the theory and innovation policy.

3.1.1. Libertarianism, or justice as entitlement

The libertarian conception of justice is closely associated with the works of economist and philosopher Friedrich August Hayek (1899-1992) and of political philosopher Robert Nozick (1938-2002). Although they are both considered libertarians[11], they offer each their own interpretation of libertarian justice. I will therefore include both interpretations, first Hayek's view which is then followed by Nozick's view, followed thereafter by a discussion on some weaknesses of the theories, as well as an account the compatibility of libertarian position with innovation policy frameworks.

In the second volume of his book *Law, Legislation and Liberty* (1982), Hayek rejects the very notion that social justice could be in any way related to justice. Justice, according to Hayek, is only an attribute of actions conducted by human beings and cannot therefore be applied to distributional outcomes, as most theories of social justice attempt to do (Hayek, 1976). Because the distributional outcomes are neither intended nor performed by any one individual who can rightfully be held responsible, the outcome cannot be considered just or unjust in any way. The same way as a *stone* does not have the necessary moral value to be judged in terms of justice, so too are societies distributional outcomes devoid of any such moral value – to argue otherwise is to make a 'category mistake' that obstructs an already efficient system of distribution, according to Hayek (1976, p. 31, p. 78). This efficient system of distribution is the free market, and it plays a central role in Hayek's theory.

Instead of having governments ordering the distribution of benefits and burdens in society then, Hayek argues that the spontaneous order created by the free market, which he refers to as *catallaxy*, offers the optimal organization of distribution. Catallaxy describes the emergent properties of the market, such as prices, division of labour, economic growth etc., that are outgrowths of the diverse and disparate goals of the individuals in a community (Hayek, 1976, pp. 107-109). The optimal order of societal distribution is therefore the result of constant competition between individuals and their interests. The centralization of the economy through distributional policies founded on 'mistaken' conceptions of social justice by governments threatens this ideal order of catallaxy, in Hayek's view. Socialism, according to Hayek (1976, p. 136), intends to transform catallaxy into an economy wherein uniform values determine

[11] It might be argued that Hayek and Nozick were in fact liberals rather than libertarians, however the difference between the two is subtle and their inclusion here made to contrast other more liberal theories in the review.

which needs are satisfied and which are not. Hayek argues that such a selection of needs leads to two issues: (i) that only the knowledge of the organizers or managers can have any impact in the organization of a socialist economy; and (ii) that members of such an economy must serve the uniform hierarchy of objectives in all their actions (Hayek, 2002, p. 14). In contrast to these issues, catallaxy uses the knowledge of all participants, and furthermore serves the objectives of all its participants in all their diversity and polarity (Hayek, 2002).

The use of knowledge by participants here does not reflect the Schumpeterian conception of knowledge as 'new combinations', rather it describes the informational basis for the spontaneous order of catallaxy. The local nature of knowledge makes it essentially unavailable to central planners (i.e., governments), and is therefore better reflected by the spontaneous order of the market (Hayek, 1945). For instance, if there is a change in the economic order that is caused by shortage of a particular resource, this change will spread through the market causing a price increase for products that rely on that resource, which affected agents will have to adapt to without knowing anything about the circumstance of the initial shortage (Hayek, 1945). This process is not designed by any authority but rather carried out by the spontaneous order of the market through which knowledge is signalled in the pricing of that good. Those affected by the price signal (producers, consumers, suppliers etc.) will naturally know to adapt to the change and by doing so, their action contributes to further changes in the knowledge web of the spontaneous order. Catallaxy does in this way "contribute to the realization of a number of individual objectives which no one knows in their totality" (Hayek, 2002, p. 14). No centralized authority can, according to Hayek, possess the same amount of knowledge of everyday micro-transactions in the market that would be needed to design a distributional arrangement that is better than the one created by the market itself (Hayek, 1945).

While Hayek rejects government intervention on the grounds of catallaxy, Nozick offers a different rationalisation for why government intervention is unjust. In his book, *Anarchy, State and Utopia* (1974) Nozick argues that the minimal state, or what he calls the 'night-watchman state', is the most expansive state that can be justified without violation of people's liberties (Nozick, 1974, p. 26). He grounds this view in his *entitlement theory of justice* wherein the role of the government is limited to the "protection against force, theft, fraud, enforcement of contracts, and so on" (Nozick, 1974, p. xi), or in other words to protect the rights of individuals to self-ownership, right to hold property, and right to decide for themselves what to do with what is justifiably theirs. Governments that impose distributional policies fail to protect these

rights and serve only to oppress individual liberty by using some people as means to other people's ends (Nozick, 1974). The injustice of such an oppression is exemplified in Nozick's quote that "taxation of earnings is on a par with forced labor" (Nozick, 1974, p. 169). By drawing this comparison between distribution and forced labour, Nozick discloses the significance he places on the value of liberty as the moral principle of justice. For Nozick, liberty is the only thing that upsets patterns of distribution (or what I have referred to as distributional arrangements), which is something he illustrates in his Wilt Chamberlain thought experiment.

Nozick (1974, pp. 161-164) describes Wilt Chamberlain, a basketball player who was – at the time of Nozick's writing – very popular and in high demand. Chamberlain's appearance in games consistently causes a rise in ticket sales, leading him to sign a contract in which he lays claim to a percentage of the bonus revenue for himself. He is able to justify this as he has put in the time and effort to develop his skills and persona in order to become talented and popular enough to draw more attendants to the game than there otherwise would be. Nozick argues that the extra income Chamberlain receives is fair, just, and lawful since that money would not have been generated if he did not decide to play. Moreover, the attendants freely chose to buy the tickets in order to see Chamberlain play. Nozick then asks us to consider whatever patterned distribution of goods we want, whether a pattern of equality, inequality, or any social plan in-between. The cleverness of the thought experiment is that it shows that no matter which pattern we choose, the liberties and actions of Chamberlain, the attendants, event-managers, and all other parties involved serve to upset that pattern. If we assume a pattern of distributional equality wherein every individual initially receives the same amount of money, then the voluntary actions of Chamberlain and the attendees would serve to upset that pattern, so that some (i.e., Chamberlain) would be better off than others (i.e., the attendees), without anything unjust having occurred.

This is further substantiated by Nozick's view that the natural world and its many combinations can only be legitimately claimed and owned by the following three processes of rightful ownership: (1) original acquisition of holdings (being the first to claim the object); (2) transfer of holdings (buying, trading, or receiving an object); and (3) rectification of injustice in holdings (restoration of ownership if earlier transfers are unjust). These three principles are central to Nozick's entitlement theory of justice. In terms of what can be owned, Nozick offers three categories of objects that can rightfully be owned: (i) ownership over the self (including limbs,

brain cells, etc.); (ii) ownership over the natural world (including islands, land, minerals, etc.); and (iii) ownership over the things made by people who apply themselves to the natural world to create, for instance, cars, food, clothes, etc. One might furthermore combine different objects of rightful ownership and rightfully own the object that is the result of that combination. Having established the process (1-3) as well as the objects (i-iii) of rightful ownership Nozick develops his theory of entitlement as the following (a-c): (a) A person who acquires a holding in accordance with the principle of justice in acquisition is entitled to that holding; (b) a person who acquires a holding in accordance with the principle of justice in transfer, from someone else entitled to the holding, is entitled to the holding; and (c) no one is entitled to a holding except by (repeated) applications of (a) and (b) (Nozick, 1974, p. 151).

As I have now provided an account of the core arguments of both Hayek and Nozick's libertarian positions, I will address and discuss some apparent weaknesses of the theories. Hayek's rejection of social justice can be stated as the following argument: no one intended the distribution of benefits and burdens in society therefore no one can be held accountable for its outcome. This argument is not entirely persuasive because there are instances when one could in fact be held accountable for an outcome that one did not intend. If you for instance forget to check the breaks on your car and run someone over as a result you could be held accountable (for negligence) for the outcome despite never having intended it (Swift, 2014). Similarly, if members of a society come together in recognition that some circumstance is inherently unjust (e.g., extreme poverty), that recognition can cause accountability measures to emerge which would warrant that everyone contributes to mitigate that injustice, by not contributing in this way you would be deemed accountable for distributive outcome that persists extreme poverty, despite not having intended it (Swift, 2014).

The rules Nozick proposes in his principles of ownership and transfers have drawn a lot of criticism for being inconsistent and having undesirable implications. Initial acquisition, voluntary transfer, and rectification all have practical implications that make them unsuitable as principles (at least without further clarification). The practicalities of knowing who the initial acquisition owner of an object is can be quite tricky in instances that outdate historical records for instance. Voluntary transfers say nothing about the power-dynamics in play, for instance where exploitation, threats, manipulation is employed to yield a 'voluntary transfer'. Rectification of injustices is simply unrealistic in the real world as there are too many instances of both past and current injustices occurring and no legal justice system is fitted to handle the

overwhelming amounts of requests that this principle would necessitate. Rather than being perfect principles however, they serve a descriptive function of revealing the underlying mechanisms of the economy, which is best served, according to Nozick, by maintaining the sanctity of individual liberty and reducing the role of the state to its protection (Nozick, 1974).

Which of the three innovation policy frameworks are the libertarian theories of Hayek and Nozick compatible with? Judging purely on the basis libertarianism holds for the limited political structures government intervention, the answer would be the inventions-oriented approach. However, both Hayek's notion of catallaxy and Nozick's theory of entitlement struggle to justify the market-failure rationale which suggests that governments should enforce IPR regimes, invest in basic scientific research and education in order to fix the market failure, and subsidize R&D in different private companies. While theories do permit and support governments ability to enforce IPR regimes as this libertarian view this as primarily a matter of protection rather patterned or centralised distribution, it is less clear the extent to which they would permit or support public investments into knowledge and private subsidies in R&D. Innovation suffers, according to Hayek, when governments place limitations on people's entrepreneurial spirit by organizing distributional outcomes (Hayek, 2002). This argument of catallaxy goes arguably against empirical evidence from decades of innovation studies research on market-failures and the significant value of knowledge for technological change, which is founded on the premise that taxes are needed to fund basic scientific research (Edler & Fagerberg, 2017). Instead, innovation can be said to suffer according to the inventions-framework when governments neglect their role in fixing market failures. How can the libertarian position justify a market fixing role for government when it does not support distributive taxation?

From Hayek and Nozick's theories we can assume that a truly libertarian society would eliminate all government funding and avoid policies that create better conditions for some technologies or firms over others while IPRs and rights of ownership would by strengthened as this would incentivize innovation (Cozzens, 2007). With limited (or non-existing) taxation, bureaucracy, directionality, or government regulations, the 'free' market would become even less constrained. Such an unconstrained economic environment could lead to the development of undesirable, damaging, or even unhumanitarian technologies, which would so long as the technological innovation process satisfies Nozick's principles of just transfer and holdings be deemed unchallenged by claims to justice.

Although Hayek considers catallaxy the optimal distributor of societal benefits and burdens, he does acknowledge that governments might under certain circumstance employ distributive measures to ensure the basic needs of its members, if those needs are not met by the market.

> *Far from advocating such a 'minimal state', we find it unquestionable that in an advanced society government ought to use its power of raising funds by taxation to provide a number of services which for various reasons cannot be provided, or cannot be provided adequately, by the market.* (Hayek, 1979, p. 41)

Some have taken this passage to mean that Hayek was a supporter, at least in principle, of universal basic income, although this has been contested by others due to its inconsistency with Hayek's conception of justice as catallaxy (Rallo, 2019). What Hayek appears to be advocating here is a limited welfare distribution so that those who lack the opportunity to engage with the market may be given that opportunity for a period so that they can become economic agents that contribute to catallaxy. It stands to reason that the fewer people that are involved in the market, the less spontaneous the market order becomes. From this point, we can gather that Hayek does seem to permit some level of centralised distribution, specifically to the extent that it supports the catallaxy of the market without impeding on the spontaneous mechanisms of choices made by autonomous agents. This line of reasoning offers arguably some support of the market-failure rationale that permits governments to fix the imperfections of the market as a 'necessary evil', although it remains unclear and open to interpretation whether Hayek would in fact support this rationale as it relates to knowledge and the different policies it involves. In this way, Hayek's version of the libertarian position makes a stronger claim on the inventions-framework than his libertarian counterpart. It is less clear how market failure would be addressed by Nozick's theory of entitlement, as no distributional pattern carried by taxation is permissible beyond the enforcement of voluntary contracts and strengthening of IPR regimes. We might speculate that Nozick would likely answer that the increased protection of IPRs would do most of the work to fix the market-failure of knowledge, while voluntary philanthropy by those who amass great wealth through the IPR regime would ensure a certain threshold of investment into knowledge to address the market failure of knowledge. However, I would argue that it is highly unlikely that such a system would be sustainable given the voluntary nature of philanthropy as well as the vast investments into knowledge required by modern knowledge and information economies. As a result, the rate of innovation would likely suffer. As such, I

conclude that the libertarian position on social justice exhibits a minimal level of compatibility with the inventions-framework.

3.1.2. Utilitarianism, or justice as utility maximation

Utilitarianism describes the view that what is of moral significance is the maximization of happiness (or utility), and that the right action in any given situation is that action which produces the greatest amount of happiness there is. Despite varying interpretations on how utility should be understood, the utilitarian view considers utility as intrinsically valuable, as an end in itself (Swift, 2014; Thomas, 2000, p. 104). The aim of utilitarianism is therefore not only to promote that which is intrinsically good, but to maximize the occurrence of such states of affairs (or to aggregate its occurrences) (Thomas, 2000, p. 105). Due to the focus on the maximation of utility, utilitarianism traditionally includes a rule of distributional equality which can give the appearance of being an egalitarian approach to social justice without actually being so.

The maximation principle (i.e., the rule that says to always maximize happiness) has largely been conceptually consistent since the first systematic account of utilitarianism by philosopher Jeremy Bentham (1748-1832). The definition of utility on the other hand has evolved through different interpretations. Political philosopher Will Kymlicka (1990, p. 12-18) describes this evolution through four distinct definitions of utility: welfare hedonism, non-hedonistic mental-state utility, preference satisfaction, and informed preferences.

Utility as *welfare hedonism* is associated with Bentham who considered the experience or sensation of pleasure and pain as the determinant factor of morality. Bentham (1824/1987, p. 65) writes that it is for pleasure and pain "to point out what we ought to do, as well as to determine what we shall do", which in his view is to maximize pleasure and minimize pain. However, this account has received its fair share of criticism for being too simplistic. If it were the case that pleasure was the only moral fact of life, then people could and should simply inject themselves with drugs that induce sensations of continuous pleasure (Nozick, 1974). Few would however agree that such a life, whereby the sensation of pleasure is perpetually maximized, can be said to be a morally good life. While Bentham defined utility as the single mental state of pleasure, the *non-hedonistic mental state* view of utility argues that we need to take all valuable mental states into account, even those that are not linked with pleasure. This definition also

however runs into the same issue as before, given that for instance, mental states that are valuable to you can be recreated by an artificial-reality machine. It is not as much the mental state of reading poetry that is valuable as it is the actual experience of reading poetry (Kymlicka, 1990, p. 14). Because few will accept that artificial mental states are what determines morality, the object of utility must be defined in another way. The third definition of utility departs from the mental-states approach of the two former definitions and looks instead to preferences.

The view of utility as *preference satisfaction* argues morality is determined by whether individuals have their preferences, whatever they may be, satisfied. Individuals who are in an artificial-reality machine that maximizes their satisfaction of preferences by their own preference are free to do so according to this view, but importantly, they are also free to leave at any point should their preference change. What matters in this view is that the satisfaction of preferences will lead to increased well-being. However, because our preferences can be flawed, it does not follow that their satisfaction would increase well-being in all cases. People's ideas of their own preferences can be flawed as a consequence of, for instance incomplete information, miscalculations about the benefits and costs of actions, or even through manipulation by others (Kymlicka, 1990). Moreover, people can also choose to satisfy what they deem to be a perfect preference in one moment, and still come to regret doing so later. Actions that satisfy mistaken preferences can therefore also lead to regret and a reduction of well-being. What matters in the moral sense then should not be the satisfaction of faulty or mistaken preferences, but rather the satisfaction of *informed preferences.* This fourth and final definition of utility claims that people should aim at satisfying those preferences that are based on rational judgement and reject those based on irrational judgement. This definition also has a weakness, as it does not offer much guidance as to what the utility of informed preferences might be. In Bentham's view, utility is simply increased pleasure and reduced pain, and in this sense easily distinguishable and measurable. In cases of conflicting utilities, it would simply be a calculation of what causes the most pleasure and reduces the most pain to discover the right course of action. Informed preferences on the other hand are difficult to measure because the rationality of preferences is less clear. Regardless of this weakness, the informed preferences are widely regarded as among the more prominent definitions of utility and is highly influential in modern political and economic structures.

The central argument of utilitarianism is that society is just when it is ordered so that its institutions are able to achieve the greatest total utility summed over all its individuals. The role

of government is therefore to promote social utility and rights that are drawn out from this principle. Mill, in his essay *On Liberty* (1991) argues that the principle to which we should all adhere is that of self-protection. Here, Mill seeks to develop this simple principle as something which is entitled to "govern absolutely the dealings of society with the individual in the way of compulsion and control, whether the means used be physical force in the form of legal penalties, or the moral coercion of public opinion" (Mill, 1991, p. 30).

> *That the only purpose for which power can be rightfully exercised over any member of civilized community, against his will, is to prevent harm to others. His own good, either physical or moral, is not a sufficient warrant. He cannot rightfully be compelled to do or forbear because it will be better for him to do so, because it will make him happier, because, in the opinions of other, to do so would be wise, or even right*. (Mill, 1991, p. 30).

If individual action is in line with this principle, in that they promote happiness while not being in the way of others ability to do the same, the act is considered just. Unjust actions on the other hand are actions which deprive others of their ability to do that by violating their personal property or liberty (Capeheart & Milovanovic, 2007; Mill, 1991). Paternalistic actions, i.e., actions that are intended to promote someone's good on their behalf by limiting their rights or liberties, are in this way viewed as unjust by utilitarian's. Mill did not however support a justice approach where the free market would freely dictate justice, rather, he included other aspects such as social institutions.

Which of the three innovation policy frameworks is the utilitarian theory of justice compatible with? Utilitarianism argues that distributional arrangements are fair as long as they increase (or maximize) total well-being. In terms of innovation policy, utilitarianism is mainly concerned with the benefits created by the economic growth caused by policies that fix market failures or correct systems-failures. In this way, utilitarianism is compatible with the inventions-framework and systems-framework, whereby utility maximation supports profit-maximation practices that are ultimately expected to generate overall increases in well-being, while maintaining a neutral government that respects the sovereignty of individual rights. Inequalities in the distributional outcomes are thus justified by the overall benefits experienced by the majority. However, if distributional inequalities produce outcomes that serve to reduce total

well-being, then even actions that contribute to inequality are deemed unjust in utilitarian terms (Cozzens, 2007).

Technological innovation is in the utilitarian view best served by the market mechanisms and capitalistic practices that are aimed at maximizing profits. Contrary to the former libertarian positions of Nozick and Hayek, Bentham and Mill's utilitarianism offers a rationale for the support of government policies that serve this aim, whether as policies that invest in basic scientific research, subsidises the R&D of private firms, strengthens IPR regimes, or facilitate the circumstances high performance innovation systems. Because innovation in the utilitarian view still serves the market however through the maximization principle innovation is best served by the systems-framework which is considered a more effective innovation policy-framework for economic growth in innovation studies. Cozzens (2007) notes that because of the market-oriented distribution of utilitarianism, pharmaceutical countries are more likely to develop products targeted at diseases that mainly afflict citizens of wealthy countries, as opposed to less profitable products aimed at deadly diseases of third-world countries (e.g., malaria or tuberculosis) (Cozzens, 2007). The benefits of wealth generated by innovation is likely to accumulate in small groups, which is also true for the benefits of innovations in terms of the solutions they bring in making life easier, as seen with the consistent innovations in cell-phone technology, while other products like malaria vaccines continue to be underfunded.

3.1.3. Liberalism, or justice as fairness

The liberal position is closely associated with the work of philosopher John Rawls (1921-2002). In his book *A Theory of Justice* (1971/1991) Rawls offers an alternative to the pervasive utilitarian conception of justice, arguing that its foundation in consequentialist ethics (i.e., the outcomes of moral decisions) makes it unsuitable as a theory of justice. The issue with having a justice theory based on outcomes, according to Rawls, is that it permits objectionable immoral acts so long as the immoral act yields in more happiness in the long run (Rawls, 1971/1991). I will in this section provide an account of Rawls theory of justice, followed by some perceived weaknesses of this theory and implications for innovation.

Instead of the outcomes-focused consequentialist ethics of utilitarianism, Rawls develops his theory on deontological ethics whereby rules and procedures determine what is morally right. For Rawls then, the right action is prior to the good action. Rawls theory of justice, which he

calls *justice as fairness* defines two principles. The first of which, *the greatest equal liberty principle*, states that "each person is to have an equal right to the most extensive total system of equal basic liberties compatible with a similar system of liberty for all" (Rawls, 1971/1991, p. 60). This involves having equal civil and political liberties such as the right to vote, the right to hold property, and freedom of speech. The greatest equal liberty principle establishes the kind of political democratic system that would be a prerequisite for a just society and is therefore ordered as the first principle[12] in Rawls theory. The second principle is subdivided in two parts as (a) *the difference principle,* and (b) *equal opportunity principle*. It states that "social and economic inequalities are to be arranged so that they are both (a) reasonably expected to be to everyone's advantage, and (b) attached to positions and offices open to all" (Rawls, 1971/1991, p. 60). Rawls justifies these principles with reference to *the original position* and *the veil of ignorance*.

The original position is a hypothetical situation in which free and equal members of a society are directed to choose and agree on the basic structures of their social arrangements (Rawls, 1971/1991). In the original position, individuals are expected to act with self-interest and impartiality. Rawls assumes that justice is the overriding feature to require the basic structure and that the justice of actions by individuals and groups is ultimately dependent on the justice of the basic structure (Thomas, 2000). Rawls introduces a second aspect to the original position with the veil of ignorance (Rawls, 1971/1991). In the scenario the subject is placed in a position of deciding on what principle of justice they would want to adopt into the world if they knew nothing about the world they would be born into. Behind the veil of ignorance, the subject would know nothing of their talents, interests, position in life, status, inherited wealth, genetic disposition, and so on. In such a state, it would be in the subjects' interest to adopt a principle of social justice that ensures their well-being if they should turn out to become the least advantaged in society. The practical argument that evokes consensus is that we would be likely to select principles of justice that promote our interests, no matter what our specific interests and talents happen to be. Furthermore, we are more likely to identify principles on which all rational people (who go through this reasoning process) could agree. The moral argument is that determining theories of justice behind a veil of ignorance will lead us to minimize the

[12] In terms of the order of the principles, Rawls suggests that the greatest equal liberty principle is prior to the two others, however also that the equal opportunity principle is prior to difference principle, despite not being written in that order (Rawls, 1971, p. 78).

influence of luck (natural talents, social status, family influences) in determining peoples' life prospects. The veil of ignorance scenario argues that rational actor would choose a society which maximizes fairness, that is, an egalitarian-oriented society. The veil of ignorance exercise enables us to identify and 'agree upon' the principles of a fully just society, as well as isolates the institutional needs that need to be satisfied to reach such a society (Sen, 2006). The veil of ignorance thought experiment seems to be justification enough for Rawls for him to assert that fairness is what justice should be about.

The priority of governments should, according to Rawls the greatest equal liberty principle, be to ensure the protection of liberties such as the freedom of religion, freedom of speech, and freedom of the press. Rawls argued that these liberties are essential to any just society and cannot be sacrificed, nor may we sacrifice any individual's civil liberties for the benefit of others (as one would be able to with a utilitarian conception of justice), not even for the majority (Rawls, 1971/1991). According to Rawls, it is only when the government and society succeed in securing these individual liberties, that we can start to discuss a system for the distribution of primary goods. A primary good, as defined by Rawls, is a good that everybody needs and wants in order to be able to lead a "good life", no matter what the individual preferences of a person are (Rawls, 1971/1991). Rawls distinguishes between two types of primary goods, social and natural. Social primary goods are directly distributed by social institutions, like income and wealth, opportunities and powers, rights and liberties, while natural primary goods like health, intelligence, and talent are influenced by social institutions. The scarcity of primary goods gives weight to the difference principle, as subject in behind the veil of ignorance would want a distributional arrangement that ensures that the least advantaged would receive enough primary goods to pursue their own conceptions of the good life. The difference principle does however permit distributional inequality, but only to the extent that the inequality promotes the well-being of the least well-off members of society. Differences in wages can for instance be justified if the difference serves to motivate those with special talents (such as Schumpeter's entrepreneur) to use their talents to the advantage of the least advantaged.

Rawls theory of justice advocates for a neutral state, as opposed to a normative one. The state should not, according to his theory, determine or coerce people to follow, a specific conception of the good, but rather leaves them free to decide for themselves which kind of life they want to pursue (Kymlicka, 1990). Whereas the normative state would arrange distribution according to this conception, the neutral state on the other hand leave people free to choose their own

conception of the good life without being penalized by the distributional arrangement of society (Kymlicka, 1990). In essence then, Rawls advocates for the establishment of welfare states wherein social institutions are safeguarded and the least advantaged are protected by an institutional safety net. According to contractarianism, whatever would be agreed upon by freely contracting, cognitively competent, rational agents under (fair) conditions of equality and impartiality, would be just (Thomas, 2000).

I will here highlight four possible objections to Rawls theory of justice. First, the difference principle does not distinguish clearly between different types of disadvantages. Primary social goods would, according to Rawls theory, be distributed equally between two disadvantaged people, even though one poor because they are unable to work, while the other is poor because they choose not to work. Second, the distribution of social primary goods does not compensate for the disadvantages in the distribution of natural primary goods. A person who is handicapped cannot profit in the same way from an equal bundle of social primary goods as a healthy person. Critics have challenged Rawls' theory on the grounds that his idealistic and transcendental approach leads to a utopian that is neither relevant nor applicable to current societal circumstances, and therefore not a satisfying theory of justice. This criticism is reflected in two distinct arguments. First, the criticism of his idealistic approach argues that Rawls' theory misrepresents people's capacity for altruism and overemphasizes rational moral principles (Swift, 2014). According to this critique, Rawls' neglect of the irrational parts of people makes his ideal theory too idealistic. Second, the criticism of his *transcendental approach*[13] argues that although Rawls' theory might be correct, it does not prove helpful as a theory of justice here and now (Swift, 2014). Rawls approach to justice is one where he defines the ideal society and draws moral principles from that end, that should be followed to reach such a society. However, there is a lot to be desired in this approach to justice, as there are current injustices in society that need to be addressed to which his moral principles of utopia offer little help. *The comparative approach* developed by economist and philosopher Amartya Sen presents an alternative to Rawls' transcendental approach and will be discussed at greater length in the next section. In brief, it argues that we should instead found our actions on a comparison between two states of the world and their relation to justice and commit to that action which brings about that state with less injustice.

[13] For a more on the transcendental critique see section X on the capabilities approach or Sen (2009).

Which innovation policy framework is compatible with Rawls' theory of justice as fairness? I would argue that because of Rawls commitment to the neutral role of government, his theory is most compatible with the systems-framework. While the inventions-framework also incorporates the view of the neutral state, Rawls' emphasis on distribution through the difference principle contrasts the view implicit in the inventions-framework that distributional arrangements are 'a necessary evil'. Following the difference principle, Rawls argues that the inequality between an entrepreneur with good prospects and the unskilled labourer is only justified if the difference between the two is to the advantage of the one who is worse off (i.e., the unskilled labourer) (Rawls, 1971/1991). The greatest equal liberty principle, in combination with the equal opportunity principle, create an environment whereby the entrepreneur is expected to innovate and create better prospects. The purpose of innovation in a Rawlsian society would therefore be to reduce inequalities between those with good prospects in life and the disadvantaged. The argument being that the less inequality there is in a society, the less is required on the part of entrepreneurs, firms, and other economic actors, to contribute to bridging the divide between those with prospects and those without (Rawls, 1971/1991). Free market capitalism is therefore limited by its ability to contain rising inequalities. Rawls theory of justice as fairness therefore argues that although there might be a slower pace of technological development overall, the benefits of having a fair system for innovation and technological development would be overall beneficial to society. Importantly for Rawls, "talent" is something which is arbitrary in a moral sense, because as seen from the original position people are free and equal and unknowing of their potential abilities. The rewards of technological innovation are therefore not attributed to Schumpeter's daring entrepreneur but rather the social and societal context to which innovation occurs. When it comes to self-ownership, most people agree on its intuitive validation in some way. The big difference in Rawls and Nozick's view of self-ownership is that Nozick tries to extend that aspect to also regard stuff made by the self, which Rawls does not accept.

3.1.4. Capabilities approach, or justice as effective freedom

The capabilities approach, as originally conceived by economist and philosopher Amartya Sen, is not so much a theory of social justice[14] – in the sense of a theory that proposes a distributional arrangement according to moral principles – as it is a framework for evaluating the *informational focus* of justice. The informational focus of justice describes the different ways we might inform our judgements about people's advantages (and disadvantages), or as Sen (2009, p. 231) puts it: "which features of the world we should concentrate on in judging a society and in assessing justice and injustice). Sen's original version of the capabilities approach is therefore more so an alternative to the informational focus of justice of *resourcism* and *utilitarianism*, than it is an alternative to the Rawls or Nozick's theories of justice.

The informational focus of resourcism, or resource-based approach, is prominently featured in economic analysis as it argues that well-being is best measured in terms of the income, wealth, and other resources (material or otherwise) available to different people. Rawls theory of justice as fairness also employs a resource-based approach in his conception of 'primary goods'. While primary goods might be a useful indicator of well-being in most cases, the resource-based approach fails to adequately address how well-being is effectively achieved (Sen, 2009). A resource, such as a brand-new bicycle, would according to the resource-based approach be considered an increase in one's overall access to resources and therefore result in an increase of one's well-being. However, if it should turn out that one does not know how to ride a bike, and have no overall interest in bikes, the resource-based approach would regardless claim that receiving the bike serves to increase one's well-being. This is wrong according to Sen, because what matters in this case is not merely whether you receive the bike or not, but whether you also know how to ride it and find the activity of doing so meaningful – an increase in resources does therefore not necessarily equate to an increase in well-being (Sen, 2009). After all, even billionaires who have great wealth and resources available to them can experience reduced well-being as well.

[14] Although Sen's original version of the capabilities approach is not considered a theory, it can be called a theory once certain capabilities sets are applied to it. To make things simpler for myself, I sometimes refer to Sen's version as a theory in this thesis when used in combination or comparison with other theories, as is evident in its inclusion under the header 'theories of social justice', despite it not being one.

The informational focus of utilitarianism, or the utility-based approach, equates well-being with individual happiness which is either derived from the classical definition of utility as pleasure, or the more contemporary definition of utility as the satisfaction of informed preferences[15]. Sen (1992, pp. 31-32) criticises the utility-based approach on the grounds that its sole focus on the achievement of utility causes it to neglect other morally relevant concerns, such as substantiative freedoms. This criticism is described in two arguments. First, Sen (1985, p. 175) argues that act consequentialism (i.e., when acts are judged solely on their positive outcomes) discounts other important claims of justice. This argument shares similarities with Rawls' critique of utilitarianism which states that too much injustice would be permitted if we accept that outcomes are the only determinants of morality. Instead, Sen argues for comprehensive consequentialism, whereby other considerations on fairness and justice are included (Sen, 2009). Second, the focus on subjective mental-states in the utility-based approach is unreliable measure of utility because people grow naturally accustomed to different levels of utility, thereby making utility calculations flawed (Sen, 2009). Welfare policies are largely designed with either resources or utility as its informational focus which, although they might be beneficial for cost-benefit mathematical analysis, do not provide a true measure of how individual well-being is achieved according to Sen (2009). What matters is not monetary concerns, or the means to freedom, but rather whether individuals have the *effective freedom* to achieve well-being themselves.

The informational focus of effective freedom, or the capabilities approach, views the real opportunities[16] people have to live the lives they want to live as the proper measure of individual advantage and just societal distributional arrangements (Sen, 1984). Central to the capabilities approach are the two interrelated concepts of *functionings* and *capabilities*. Functionings refers to *ways of being* and the related activities that can be considered valued achievements, or as Sen puts it - the "beings and doings" that constitute life (Sen, 1992, p. 39). Relatedly, capabilities refer to functionings (or sets of functionings) that a person has the effective freedom and opportunity to achieve. Functionings are in this way contingent upon the substantive

[15] See subsection '2.3.3. Utilitarianism, or justice as utility maximation' for a more detailed account of the different interpretations of utility.

[16] The distinction between formal and effective freedom shares some similarities to that of Isaiah Berlin's (1958/2003) distinction of positive and negative freedom, which describes the freedom from interference (negative) and the freedom to act (positive). However, this distinction is not as clear as it may appear and is often debated – see Swift (2014, pp. 60-72) for a more nuanced discussion on negative and positive freedom.

opportunities, or capabilities, that determine whether achieving one's chosen functionings is at all possible. The scope encompassed by functionings can vary greatly from basic achievements such as being nourished or reading a book, to more complex achievements such as being educated, learning how to swim, or being able to express yourself in public without shame (Stiglitz et al. 2010, p. 151). The difference between functionings and capabilities becomes clearer if we compare someone who for instance is a victim of famine and someone who is intentionally undergoing starvation for political or religious reasons. While both persons can be said to lack the functioning of being nourished, only the latter person possesses the capability of being nourished. In this sense, functionings tell us something about what people value, while capabilities tell us something about how to evaluate effective freedom. This furthermore marks a departure from basic needs theory (i.e., Maslow's hierarchy of needs) which measures human advantage according to thresholds of satisfied needs. Basic needs do not take into account cases in which people foregoes their functionings willingly and therefore measure the act as a lack of a basic need, such as is the case in the fasting example. Capabilities depend both on the endowment of the individual (i.e., the circumstances of their lives) and on the way a society is organized. The capabilities approach suggests that the well-being of a person is a summary index of the persons functionings (Stiglitz et al. 2010).

Table 1. *Comparison between resource- and utility based approaches (left) and the capabilities approach (right)*

Resource	**Utility**
Bike	Well-being
Food	Well-being

Resource	**Capability**	**Functioning**	**Utility**
Bike	Being able to ride around	Ride around	Well-being
Food	Being able to eat food	Nourishment	Well-being

As indicated in the previous section on Rawls', Sen was highly critical of Rawls' *transcendental approach*[17] which holds that we should not look at the social order from our own situation (or perspective), but rather engage with a point of view that everyone can adopt on an equal ground,

[17] This is also known as transcendental institutionalism (Sen, 2009), or ideal theory (Papaioannou, 2021).

thereby aligning everyone's perspective (Sen, 2006, p. 215). Sen grounds the capabilities approach in the alternative *comparative approach* to justice, which suggests that instead of asking ourselves 'what is a just fully society', we should ask 'which social arrangement is comparatively more just'. What matters to Sen is that we increase the amount of justice (Sen, 2006). Comparative gains on justice can be achieved through the capabilities approach once certain capability sets have been determined as the proper measures of justice.

Sen does however not commit to a singular set (or list) of what he deems to be the relevant and morally significant capabilities. This choice has been criticised by among others philosopher Martha Nussbaum who herself adapted the capabilities approach to a set of relevant capabilities (Nussbaum, 2007). Nussbaum's (2007) capabilities theory suggests the following set of ten core capabilities that should be valued in any democratic society by both the public and the state:

> (1) life; (2) bodily health; (3) bodily integrity; (4) senses, imagination, and thought; (5) emotions; (6) practical reason; (7) affiliation; (8) other species; (9) play; and (10) control over one's environment.

Sen's Capability Approach in its normative 'developmental' aspect, is mainly concerned with practical incremental improvements; Nussbaum's approach is rather more utopian in that it demands the full implementation of minimal justice (achievement of the minimum thresholds of all fundamental capabilities) for all, and this is specified so demandingly that no country yet meets the capability requirements. Sen rejects this by arguing that mere theory is not suited to offer the conclusive ideal list of capabilities. Rather, such a list should be selected through a procedural democratic deliberation that incorporates social choice theory, thereby ensuring that the heterogenous group affected by a specific policy get to decide which capabilities are the relevant ones. The reasoning Sen offers here is consistent with his critique of Rawls and other theories of social justice that try to arrive at justice through utopian principles. According to Sen, ideal theory fails to effectively combat injustices already apparent in society by increasing the threshold for action as decisions need to be consistent with the principles of utopia. Rather, Sen argues that it is far more reasonable to commit to doing whatever we can to combat existing injustices, thereby achieving justice incrementally rather than paradigmatically. Identifying the relevant capabilities is something Sen leaves societies to do for themselves based on public ethical and political evaluation through reasoning, discussion, and consensus (Sen, 2005).

Which of the three innovation policy frameworks is Sen's capabilities approach compatible with? From Sen's works on the capabilities approach, we can draw a picture on how innovation policy frameworks founded on the capabilities approach might look like. The capability approach argues that policies should enhance capabilities by comparing different social arrangements in relation to their capabilities to arrive at that policy-design which decreases injustice and increases justice. Instead of having policy focus on the instrumentally valuable aspects of well-being (i.e., money, commodities, or other material or immaterial resources) then, the policy should focus on the intrinsically valuable aspects of well-being (i.e., capabilities and functionings). This implies a shift from a focus on mere formal freedom of a neutral government towards a focus on more effective freedom, which would arguably require a normative government. Interventionism, or coercion for normative aims held by government institutions would be justified on the grounds that they enhance the relevant capabilities of individuals. This I would argue reveals the compatibility of the capabilities approach with the missions-framework.

3.1.5. Communitarianism, or justice as the common good

The communitarian tradition of social justice was developed in response to the neoclassical paradigm of radical individualism that permeates the dominant utilitarian conception of social justice (Etzioni, 1988). Etzioni (1988, p. 1) notes that: "when these paradigms are used to formulate theories and policies that are limited in their empirical and ethical scope, the study of our world suffers, and so do efforts to administer to its ills". Communitarians argue that the neoclassical paradigm neglects the important role social relations and constitutive communities play in people's lives. As individuals, we spend most of our lives living in different communities that shape our identities, our choices, and our well-being. Those that lack a strong connection to their communities are therefore more likely to be disoriented, lonely, incapable of making informed moral and political judgement (Etzioni, 1996; Swift, 2014). Communitarians argue that as members of communities, we have a duty to support and nourish the communities that provide meaning for our lives, and furthermore, recognize that communities should play an even larger role in our moral and political judgements. The common good of the community is considered the "substantive conception of the good life" (Sandel, 1982). There were two major waves of theoretical contributions to the communitarian

tradition, that of *academic communitarianism* of the 1980s, and that of *responsive communitarianism* of the 1990s[18] (Etzioni, 2015).

Academic communitarianism is associated with among others Michael Sandel[19] who criticizes Rawlsian liberal and Nozickian libertarian theories of justice and their portrayal of *the self* as an autonomous entity that can fulfil one's interests and exercise self-determination outside of any social context (Sandel, 1982/1988). Rawls and Nozick's theories hold the underlying view that the moral good is external to the individual and can only be accessed by autonomous choice. In this view, the self is therefore free to partake in social practices, question them, and decide on whether to maintain the social practice or reject it entirely (Kymlicka, 1990). Contrary to this, Sandel that this does not account for how social environments both frame and actualize the self and its ability to effectively fulfil one's interests (Sandel, 1982/1988). Instead of having the moral good be external to us, academic communitarianism suggests that the moral good is latent in the individual and their relationship with their community, and that the way to access it is to engage with a process of self-discovery of one's embeddedness in a social context (Kymlicka, 1990; Sandel, 1982/1988).

Realizing the moral good thus requires one to discover ones moral nature ('who am I?') through social roles and communal identity, instead of choosing ones moral nature freely ('who do I want to be?') (Kymlicka, 1990). It is through this process of social self-discovery that we can come to recognize a common good, or as Sandel (1982/1988, p. 183) writes: "to know a good in common that we cannot know alone". The abstractions made by Rawls in his concepts of the original position and veil of ignorance (see section 3.1.3. of this thesis) are therefore premised on faulty individualistic assumptions that neglect the value of community and ultimately lead to a wrongful portrayal of social justice and the role of government (Sandel, 1982/1988). As such, the academic communitarian traditions can be seen as trying to construct a *social thesis of the self (*Taylor, 1985, as cited in Kymlicka, 1990) which would involve a societal shift from the value-neutral liberal views of the self and the role of government towards value-laden views

[18] The distinction between academic and responsive communitarianism also appears as traditional and political communitarianism respectively in the communitarian literature.

[19] Sandel writes quite explicitly that he does not consider himself a communitarian and disagrees with several points made by other writers in the tradition (Sandel, 1982, p. ix). However, because of his prominent communitarian contributions to the liberal vs. communitarian debate of the 1980s, I will assume that his position is one that is representative of the broader academic communitarian tradition.

that are founded on communitarian values. While the academic communitarian tradition does offer some valid criticisms of the libertarian, utilitarian, and liberal positions, the tradition ultimately fails to develop a convincing argument for the social thesis of the self as a foundation for a grand communitarian theory that could pose as an alternative to the liberal paradigm (Kymlicka, 1990).

> *Our good is neither universal nor unique, but tied in important ways to the cultural practices we share with others in our community. We share enough with others around us that a well-intentioned perfectionist government could, by drawing on the wisdom and experience of others, arrive at a reasonable set of beliefs about its citizens' good. Of course, we might doubt that governments have either the right intentions or abilities to execute such a programme. But nothing in principle excludes the possibility that governments can identify mistakes in people's conceptions of the good* (Kymlicka, 1990, p. 203).

Following the academic communitarian tradition, sociologist Amitai Etzioni founds a new communitarian branch called responsive communitarianism in which he attempts to strike a more careful balance between individual rights (i.e., freedom and autonomy) and social responsibilities (i.e., social control and order) – for the common good of society (Etzioni, 2015). Etzioni (1996) recognizes that the individuals' need for autonomy and society's need for a social order are two opposing forces in that are in open conflict with one another, the solution to which is neither to impose stricter social control nor a higher degree of protection to individual liberties, but rather to make the existing social order more *responsive* to the *true needs* of societies members. True needs are described by Etzioni (1996, p. 3) as the direction of human behaviour after the mechanisms of socialization and social control slacken, at which point the behaviour will either persist or decrease to reveal the character of people's needs. For instance, given a large sum of money (enough to live the rest of one's life in luxury), many people would likely decide to quit their current jobs and do something else with their time. Quitting one's job once the social control, which in this case is enforced by having financial expenses, slacken would indicate a decrease in the relevant behaviour and not be considered a true need. There might however also be those who, due to the satisfaction and meaning they derive from their work, would continue working as though nothing essential had changed, indicating true need for them to do their work, which indicates a persistence in the relevant behaviour.

By making the social order more responsive to the true needs of the community's (i.e., society's) members, the social order of the community becomes supported rather than imposed. Any imposed social order is inherently unstable as it infringes on the autonomy of other members and groups within the community whose needs aren't reflected in the community's structure, which gives rise to dissatisfaction. Etzioni (1996, pp. 1-5) introduces three categories of communities: (i) authentic communities that are responsive to the true needs of all its members; (ii) partial communities that are responsive to the true needs of some of its members; (iii) inauthentic communities that are responsive to the false needs of its members. The aim of responsive communitarianism is thus to promote and cultivate authentic communities that minimize the penalties associated with order and the dangers associated with autonomy. It should however be noted that communities can only be made to be 'more responsive' rather than 'perfectly responsive' because "evidence strongly suggests that the built-in contradictions can be significantly reduced but not eliminated" (Etzioni, 1996, p. p3). As such, the idea of a fully authentic community implies a transcendental approach to justice (as opposed to the comparative approach) grounded in a utopian vision that can be approximated through personal and collective efforts (Etzioni, 1996).

> *A responsive community is much more integrated than an aggregate of self-maximizing individuals; however, it is much less hierarchical and much less structured and "socializing", than an authoritarian community* (Etzioni, 1988, p. 8)

The basic mechanisms that govern communities, according to Etzioni, are those of *centripetal* and *centrifugal* forces. Centripetal forces describe the influences that contribute to a community's social cohesion. These forces pull towards such things as increased voluntary work, regulation, collective action etc. (Etzioni, 1996, p. 6). If the centripetal force of a community is unrestrained, it will lead to an increased social control of members which can draw society in the direction of totalitarianism[20]. Etzioni however argues the centrifugal force serves to constrain and oppose the centripetal forces of social control. Centrifugal forces describe a community's tendency towards less cohesion through influences of differentiation, individualization, self-expression etc. (Etzioni, 1996, p.6). If the centrifugal force is similarly

[20] Totalitarianism attempts to do this by asserting total control over the lives of its citizens, whereas authoritarianism prefers the blind submission of its citizens to authority.

unrestrained it can draw society in the direction of anarchy. In authentic communities these two forces balance each other out in an inverted symbiotic (i.e., pulling in opposite directions) relationship which characterises a high degree of responsiveness to the true needs of members. The implication of this, according to Etzioni (1996), is that social order and individual autonomy are simultaneously preserved without oppression. Etzioni (1996) furthermore stresses that maintaining such a balance requires constant calibration and adjustment to the true needs of the members, as there are many influences in societies and communities that exert pressure in one direction or the other. As such, conflicts within communities are solved by precise calibration of the centripetal and centrifugal forces as a means to increase the responsiveness of the community by that community's authority. Conflicts that arise between different communities however need to appeal to an overarching community, what Etzioni (1996) calls the 'community of communities' (e.g., the UN). It is therefore perfectly in line with responsive communitarian thinking to be a member of several communities simultaneously, for instance through having shared loyalties to one's regional, national, and supra-national community.

I now turn to the question of what kind of government and political structure is proposed by Sandel's academic communitarianism and Etzioni's responsive communitarianism, as well as which innovation policy framework the communitarian position is compatible with. Communitarianism opposes the liberal argument for individualism and state neutrality. Liberals strongly support individuals' ability to be self-determinant as a way of respecting individuals fully as moral beings (Kymlicka, 1990). Paternalism is the idea that the government may coerce citizens, in their interest but against their will.

The assumption liberals make in this argument is that every individual wants (or rather deserves) to have their self-determination respected by others and the state, rather than to be coerced or oppressed by government institutions. Communitarians would however argue that this is not often the case, nor should it be. It is no secret that living life will involve periods of hardship and difficulties that are not so easily navigated. With the difficulty of not knowing what to do, some people choose to act wrongly, in manners that cause harm to themselves or others. The liberal perspective of respecting these individuals' self-determination will in such cases result in abandoning them to continue their path to an unhappy fate (Kymlicka, 1990). Rather than abandoning people to their own devices then, communitarians advocate for a higher degree of paternalism in government policies.

Communitarianism also challenges the libertarian position that it is paternalistic to interfere with individual choices based on personal preferences. In keeping with their view concerning the social constitution of individual identity, communitarians argue that personal preferences are to a significant extent not autonomous but rather a reflection of the larger culture, aspects of which can be heavily influenced by nonrational forces such as commercial advertising (Kymlicka, 1990). Hence, public efforts to influence such preferences in beneficial ways, say in campaigns against smoking and obesity, do not undermine personal autonomy and are not a violation of human dignity. from a communitarian viewpoint, informal social controls are vastly superior to state coercion, because they ultimately leave the choice of violating social norms up to the individual, letting her determine whether or not she is willing to pay the social costs – as all innovators and social change leaders have – or conform.

> *innovation often requires collectively provided resources well beyond the means and efforts of most individual innovations. True, some innovation occurs merely in the mind, in a kitchen sink, or a garage (e.g., the invention of the prototype of mass production of personal computers, the Apple). However, most innovation, especially in advanced industrial societies, occurs in specialized collective settings, by teams and not by individuals, drawing on a concentration of resources.* (Etzioni, 1988, p. 192-193).

In terms of innovation policy, the communitarian state would be one in which economic actors are encouraged to adopt conceptions of the good that conform to the community's 'way of life', while discouraging conceptions of good that conflict with it. It is clear that a communitarian state is a normative state that projects different rankings on different ways of life. In this sense, it is aligned with the only innovation policy framework which similarly argues for a normative government.

> *Without collective approval and collective support, innovations – even if some individuals come up with them – do not take off, in the sense of an idea or prototype leading to a product that gains acceptance. Often, the mere accumulation of new knowledge or of technical breakthroughs is insufficient; approval by the community is required.* (Etzioni, 1988, p. 193)

4. The social justice foundations of the missions-framework

Innovation policy frameworks may be distinguished on the basis of their theoretical economic foundations, their views of the state and rationale for intervention, their overall objective, and their policy design (Castellacci, 2022). In the present chapter, I propose a fifth dimension – that of the social justice foundations – to expand upon the existing innovation policy frameworks. The key point of this chapter is to discuss explicitly the thesis' main research question:

RQ: What are the social justice foundations of the entrepreneurial state?

As previously noted, social justice manifests itself as formal or informal applications of justice in social institutions (Capeheart & Milovanovic, 2007). In terms of innovation policy, the relevant social institutions are primarily that of government and the policies they enact which serve to govern the distribution of benefits and burdens that result from innovation activities. In chapter 3, I presented an overview of different theories of social justice, and for each of them I briefly discussed their possible relations and implications in terms of innovation policy. In the present chapter, I will extend and deepen this discussion by analysing which theory of social justice is more closely related to the three major innovation policy framework, and specifically which view of social justice may provide a promising philosophical foundation for the missions-oriented approach.

4.1. Social justice foundations of innovation policy

To structure the discussion, I point out five major dimensions that characterize social justice theories, and that I will use in the subsequent analysis: (i) political morality; (ii) individual morality; (iii) distributional principle; (iv) informational focus; (v) approach to justice. These categories will serve to ground my analysis as they indicate different aspects which may have a low or high degree of correspondence with three major innovation policy frameworks, and in particular the missions-approach. The first category (i) indicates whether the social justice

theory views the state as neutral or normative[21]. The second category (ii) notes whether the theory emphasises the rights or duties of individuals. The third category (iii) points out whether the guiding distributional principle is one of equality or liberty. The fourth category (iv) indicates whether the informational focus is one of resources, utility, or capabilities. Lastly, the fifth category (v) focuses on whether the approach to justice is comparative or transcendental. While the categories of political morality (i) and distributional principle (iii) are typically made explicit in the three innovation policy frameworks, the remaining categories are normally not discussed in the innovation policy literature, and I point them out in order to ground more explicitly the implications of the justice foundations. These categories are not clearly mutually exclusive, as there may be some overlap and degrees of nuances that are not accounted for, but they are primarily meant as useful tools to structure and organize the following discussion. Table 2 provides an overview of these five dimensions for the various theories of social justice that were discussed in chapter 3. The analysis will now proceed with a brief account of the social justice foundations of the inventions-framework and the systems-framework, followed by a more detailed account of the social justice foundations of the entrepreneurial state.

[21] Sen's version of the capabilities approach is (as described in section 3.1.4. of this thesis) adaptable as a theory to different contexts. However, because it does not view the role of the state as neutral but rather normative, the correlation is reduced between it and innovation policy frameworks which incorporate a neutral view of the state.

Table 2. *Overview of the main dimensions of social justice theories used in the analysis*

	Political morality	**Individual morality**	**Distributional principle**	**Informational focus**	**Approach to justice**
Libertarianism	Neutral (entitlement protection)	Rights	Liberty	Resources (ownership)	Transcendental
Utilitarianism	Neutral (maximization principle)	Rights	Liberty	Utility	Comparative
Liberalism	Neutral (difference principle)	Rights	Equality	Resources (primary goods)	Transcendental
Capabilities approach	Normative (well-being)	Rights and duties	Liberty	Capabilities (effective freedom)	Comparative
Responsive Communitarianism	Normative (authentic communities)	Rights and duties	Equality	Social utility	Transcendental (authentic communities)

***Invention-oriented innovation policy*.** As noted in chapter 3, the inventions-framework has its economic foundation in new growth theory which views economic growth as an endogenous process driven by innovating firms whose R&D investments introduce positive economic externalities in the economic system (Sengupta, 1998). Because of the significant role of science in causing technological change and economic growth, governments are justified in fixing market-failures of knowledge by investing into basic scientific research and education, subsidizing and supporting R&D in private firms, and enforcing IPR regulations in order to create better conditions for a competitive market (Edler & Fagerberg, 2017). In chapter 3 I noted that both libertarianism and utilitarianism are compatible with the inventions-framework.

While both libertarianism and utilitarianism view the state as neutral (i.e., it does not determine the moral good on behalf of its citizens), these philosophical views differ slightly in terms of how they view the purpose of the state intervention in the economy. Libertarianism holds that the state should be minimal and limited to the protection of individual rights and enforcement of contracts, while utilitarianism holds that the state should seek to increase the total amount of well-being (or utility) of its citizens. While the view of the state in the inventions-framework is similarly neutral, its purpose exceeds the scope of what libertarian theory would consider desirable. The view of the state in the inventions-framework is however more aligned with the utilitarian theory, where public intervention is justified to the extent that it provides an overall increase in well-being, which is for instance what innovation-driven economic growth is typically expected to do. While libertarian influence is apparent in the inventions-framework, utilitarianism appears to exhibit a higher degree of correspondence with the rationales of the inventions-framework.

Both libertarian and utilitarian theories emphasise rights instead of duties, as well as a distributional principle that focuses on liberty rather than equality. The two views differ however in terms of the last two conceptual dimensions, as libertarianism employs an informational focus on resources and a transcendental approach to justice, while utilitarianism has a focus on utility and a comparative approach to justice. While the influence of the libertarian theory of justice is apparent in the inventions-framework emphasis on the neutral and minimal market-oriented state, its correlation is hampered by its rejection of any intended distributional arrangement on the grounds of justice. According to the inventions-framework, intentional distributional arrangements are deemed necessary to address market-failures through policy-instruments such as investment into basic scientific research, subsidising R&D

of private firms, and the strengthening of IPR regimes (Edler & Fagerberg, 2017). Libertarians would only accept the strengthening of IPR regimes policy-instrument and would not permit policies that give advantages to some over others (Cozzens, 2007). The utilitarian theory of justice on the other does permit and support the efforts of invention-oriented policies on the grounds that they serve to maximize overall happiness. As such, we can conclude that the inventions-framework of innovation policy, being founded upon a utilitarian conception of justice, largely shares the same characteristics of utilitarianism. To put it differently, utilitarianism is the theory of social justice that more closely corresponds to, and provide the philosophical foundations for, the invention-framework of innovation policy.

Systems-oriented innovation policy. The systems-framework has its conceptual foundations in evolutionary economics, which focuses on how economic growth generates from evolutionary processes driven by firm heterogeneity and industrial market competition (Nelson & Winter, 1982). According to an innovation system approach, the role of governments in innovation policy is to correct so-called system-failures, that can arise from the lack of well-functioning interactions among private actors and public science organizations and institutions, by implementing policies that support and strengthen national, regional, sectoral, or technological innovation systems. This may be done by developing clusters, enabling university-government-industry interaction (i.e., triple-helix policy), and/or other policy instruments that may contribute to reduce interaction costs. In this way, the systems-framework theorizes and provides foundations for a more interventionist state than the inventions-framework discussed above. In chapter 3, I pointed out that the systems-framework is closely related to both the utilitarian and liberal theories of justice.

Both utilitarianism and liberalism uphold a neutral view on political morality. In terms of individual morality, utilitarianism holds to rights over duties, while liberalism holds to both (for instance, it is difficult to distinguish Rawls difference principle as being related to one or the other). In terms of the distributional principle, the two views differ, as utilitarianism is liberty-based while liberalism is equality-based. They also differ in terms of distributional focus, as utilitarianism has a utility-focus, while liberalism is more based on a resource-focus (or what Rawls calls *primary goods*). Finally, their approach to justice is also different as utilitarianism has a comparative approach, while liberalism is rather based on a transcendental approach. These many differences between the two views are indicative of the fact that Rawls' theory of justice as fairness developed as a critique of the utilitarianism.

The liberal correlation with the systems-framework is, I would argue slightly reduced by egalitarian focus in the political morality (i.e., difference principle) and distributional principle which places duties (in addition to rights) on people to promote a certain distributional arrangement. These concerns, although they are compatible with the systems-framework, are not evident in it, as the main motivation for its development was merely increasing the rate of innovation that could lead to economic growth. Although the systems-framework is compatible with both approaches, I would argue that it is closer in spirit and more compatible with the utilitarian framework, given its prevailing focus on rights, liberty, and utility, rather than rights and duties, equality, and resources. This motivation is, I would argue, better reflected in the utilitarian conception of justice, thereby making the social justice foundations of the systems-framework also utilitarian. While I arrive at the conclusion that utilitarianism is the social justice foundations of both the inventions-framework and the systems-framework by independent literary analysis, the notion that utilitarianism is a pervasive and dominant theoretical paradigm is also reflected in much of the broader literature of both political philosophy and innovation studies, as well as other fields (Castellacci, 2022; Cozzens, 2007; Swift, 2014; Thomas, 2000).

Missions-oriented innovation policy. The missions-framework is founded on the evolutionary economics paradigm, and it emphasises the important role of governments in directing innovation towards addressing grand societal challenges (Mazzucato, 2018a). By setting a direction for the market selection process and supporting economic actors who are willing to engage in missions, governments seek to create and shape markets and promote important innovations that will contribute to solve major societal challenges. In chapter 3, I pointed out that the two philosophical views known as the capabilities approach and responsive communitarianism are closely related to and potentially compatible with the missions-framework.

This argument is based on the following points. First, Both the capabilities approach and responsive communitarianism employ normative political morality, whereby the government is justified in promoting some conception of the good on its citizens. The good according to the capabilities approach is the enhancement of people's effective freedom (i.e., capabilities) through capability sets, while the responsive communitarian conception of the good is tied to sustaining authentic communities. In terms of individual morality, the two philosophical views

differ slightly. The capabilities approach has a focus on duties (to reduce injustice); while responsive communitarianism seeks to strike a balance between duties and rights (none should be prior to the other in an authentic community). As for the distributive principle, in the capabilities approach this is focused on enhancing individual liberty as people's effective freedom, while responsive communitarianism focuses on enhancing equality. In terms of informational focus, the capabilities approach emphasizes the importance of capabilities, while responsive communitarianism focuses *traditionally* on resources. The two views of social justice do also differ in terms of their approach to justice. The capabilities approach promotes a comparative approach to justice, pointing out that what matters are incremental improvements of justice. By contrast, the responsive communitarian tradition promotes a transcendental approach, whereby authentic communities are the utopias that should guide current justice considerations.

Based on these points, I would therefore argue that both the capabilities approach and the responsive communitarian view – in spite of a few differences noted above – exhibit seemingly a high degree of compatibility with the missions-framework. For the capabilities approach this claim is supported by the fact that societal challenges are inherently damaging to people's effective freedom to live the lives people might want to live, which implies that justice requires comparative action towards enhancing capabilities and reducing injustices. Similarly, because societal challenges are damaging to societies and communities, they need to be addressed so that authentic communities persist. It is therefore important to ask whether insights from both of these theories of social justice may be combined in order to provide a stronger social justice foundation to the missions-framework of innovation policy. Based on this idea, the next section will argue that the missions-framework can be said to be founded on the *capabilities for the common good.*

Table 3. *Innovation policy frameworks adapted from Castellacci (2022), and their social justice foundations*

	Invention-oriented policy	**Systems-oriented policy**	**Missions-oriented policy**
Theoretical foundation	New growth theory	Innovation system approach	Evolutionary economics / Entrepreneurial state
Policy rationale and role of the state	Correct market failures	Correct system failures	Foster variety creation; Manage selection mechanisms
Objectives	Increase size of R&D sector	Strengthen interactions among economic agents	Market-creating and market-shaping to solve grand challenges
Typical instruments	R&D fiscal incentives; IPRs regulations	University industry links; Cluster policies	Public procurement
Potential drawbacks	Simple utilitarian framework that neglects non-economic and distributional impacts	Lack of social welfare analysis; It neglects interaction costs	Non-market failures. Paternalism. It neglects opportunity costs
Social justice foundations	Utilitarianism	Utilitarianism	Capabilities approach and responsive communitarianism

4.2. Capabilities for the common good

While it is in general hard to combine different theories of social justice due to inherent differences in philosophical views and backgrounds, such as their use of principles and prioritizations (e.g., utilitarianism and liberalism), I argue here that the two philosophical views of capabilities approach and responsive communitarianism, in spite of some differences, are related to each other and largely complementary. It is therefore possible to draw combined insights from these theories in order to provide a stronger philosophical foundation to the missions-oriented approach.

This synthesis is largely possible due to the fact that both of the theories justify normative aims, and also because of the unique position of the capabilities approach as an *evaluative framework* of justice rather than a fully-fledged *theory* (Robeyns, 2017; Sen, 2009). Since the capabilities approach does not make claims on what justice precisely is but rather on how it should be evaluated, it can therefore be applied to different contexts where the aim is to enhance people's effective freedom. It is thus reasonable to combine insights from the two views and argue that these provide the relevant philosophical foundations that may contribute to the development of the conceptual roots of the missions-oriented approach to innovation. Before doing so, some possible objections to this argument need to be addressed.

I offer two possible objections here. First, one could argue that since the focus of the capabilities approach is on individual well-being, this framework is too individualistic and agent-focused to be compatible with the community-focus of responsive communitarianism. However, while Sen does in fact place the measure of justice on the capabilities and functionings of individuals, he does so because that is where the relevant analytical change occurs (Sen, 2009). Sen does acknowledge, though, that social and societal factors influence individuals in determining what they have a reason to value, as such there is "no great difficulty in thinking about the capabilities of groups" Sen (2009, p. 244). Second, one could argue that in order to be foundational to the missions-framework the capabilities approach needs to employ an explicit set of relevant capabilities, i.e., it must be a theory rather than simply an approach. While it arguably true that the capability approach is best serves by having explicit capabilities in terms of its practical application, I would argue that this does not however create issues for its theoretical application. As such, I refrain from adapting the approach for two reasons. The first reason is due to space limitations as devising a new set of capabilities would require extensive reflective deliberation that would exceed the scope of this thesis which is focused on laying the theoretical groundwork

between innovation policy and social justice. Second, devising such a set of capabilities would arguably be best served by empirical work through the inclusion of different communities and members who contribute to deliberate and define the common good in relation to their individual capabilities and functionings. I therefore leave the development of a clear set of capabilities following the capabilities for the common good as a theme for future research. However, even without explicit capability sets, we can still discuss some central aspects of the missions-framework based on a general understanding of its foundations in the capabilities approach and responsive communitarianism.

What are the underlying implications and insights of the proposed synthesis from the capabilities and communitarian approach for the missions-framework? I will now discuss this question by returning to the three major aspects of the missions-framework that were previously presented in section 2.2.3, namely: (1) the setting of a direction; (2) the design of missions; and lastly the (3) relationship of the public and private sector. To provide an illustration of my argument, I will ground my view in some examples of major societal challenges, such as global climate change and the Covid-19 pandemic.

The setting of a normative economic direction for innovation by the entrepreneurial state requires a clear and robust justification for doing so. Different conceptions of social justice which emphasize individual rights and liberty, such as libertarianism, utilitarianism, and liberalism, consider a normative government structure inherently unstable because sustaining such claims, however legitimate, involves paternalistic oppression of the individual. The unstable nature of oppressive policies implies that they will sooner or later be repelled by the oppressed or otherwise dissatisfied with the governments intrusion, causing the economy to return to its self-regulating mechanisms (i.e., the state of catallaxy). This argument challenges the entrepreneurial state and its normative direction-setting aim because resolving grand societal challenges require long-term commitments to a direction. How then, can the capabilities of the common good approach support the entrepreneurial state's ability to maintain long-term normative interventionist policies?

It can do so if societal challenges deprive people of their capabilities to achieve their desired functionings. In the case of global climate change, these effects are evident in the disastrous environmental and societal consequences which are expected to follow from a warming planet, for instance the increased rate and scope of dangerous weather patterns and events. It is important to note that it is not the damaging effects on the environments and society themselves

that are of interest in the capability approach but rather how these effects impact agent's well-being, as Sen argues: "the impact of the environment on human lives must be among the principal considerations in assessing the value of the environment" (Sen, 2009, p. 248). In this sense, the capability approach does not view the eradication of Covid-19 as a loss of nature in the same manner as it would view the eradication of the amazon rainforest as a loss of nature (Robeyns, 2017). This is mainly because Covid-19 deprives people of their capabilities while the Amazon rainforest largely enhances well-being. As such, societal challenges should be understood by the extent to which they enhance capabilities and therefore justice or serve to limit these.

In a recent example, Pakistan experienced a historical flood which was exacerbated by climate change and submerged an estimated one third of the country's landmass under water (Harvey, 2022). The damages caused by the flood marks a severe reduction in the overall capabilities of Pakistan's population as millions of people were displaced from their homes, large crop yields and important infrastructure destroyed, and thousands of lives lost (Peshimam, 2022). Extreme weather events such as these are expected to increase in the future, in both rate and scope, due to climate change. While climate change is largely the result of heavy emissions over centuries by wealthy industrialised countries of the global north, the most severe effects of climate change are projected to disproportionally impact the poorer developing countries of the global south.

This asymmetry and the question of whether the global north owe some debt to the global south has for decades been a subject of conflict that has caused gridlock in climate negotiations between the two communities. Recently however, at the 2022 UN Climate Change Conference (COP27) leaders of the global north offered a historic recognition that a "Loss and Damage" fund which would need to be established to support vulnerable countries that suffer the impacts related to climate change (UNFCCC, 2022). In responsive communitarianism this recognition reflects how conflict between communities can be curtailed through layered loyalties to communities and appeal to a 'community of communities', which in one sense could mean the supranational institution of the UN, or in another sense could mean the community *of all people* (Etzioni, 1996).

Directionality, through the view of the capabilities for the common good, can therefore be justified on the grounds of how societal challenges deprive people of their capabilities and subsequently well-being, as well as informed by how conflicts that may arise due to the

instability of interventionist policies can be resolved by appeal to higher-order communities, so that communities can yet again become responsive.

I now turn, for the third time in the thesis, to the example of the US government's handling of the Covid-19 vaccine development program. The first time, I introduced the example as a story of successful innovation whereby private pharmaceutical companies managed, with the support of government investment, to develop a vaccine within a year of the first outbreak, that has since then rendered the societal challenge that was Covid-19 largely obsolete. The second time, I use the example to test how our moral intuitions of the distributional arrangement related to public funds and private enterprise, whereby the US taxpayers essentially paid once for the development of the vaccine and a second time for its purchase, the rewards of which went to narrow group of shareholders. This third time, I want to examine the case in light of the missions-framework and the capabilities for the common good approach.

As with the example of climate change, Covid-19 was a pandemic which exacted a severe reduction in overall well-being by imposing limitations to people capabilities and functionings, while also reducing the interpersonal and communal bonds, thereby causing increased individualism through quarantines and societal lock-down.

One of the drawbacks of the missions-framework, it has been argued, is its acceptance of paternalistic policies. This criticism describes government action to limit the autonomy or rights of groups or individuals 'for their own good' and is often followed by an additional implicit or explicit claim that such tendencies trend toward totalitarian societies (i.e., the so-called slippery slope argument). I would argue that the force of this criticism, while not entirely effective in the first place, is furthermore substantially weakened by establishing the social justice foundation of missions-framework as that of the capabilities for the common good. I find that both theories of the capabilities approach and responsive communitarianism have conceptual measures that protect against paternalism.

While the entrepreneurial state – given its newfound social justice foundation – is in this sense explicitly accountable for any incursion it makes on individual rights by becoming overly paternalistic. To illustrate, let us suppose that the leadership of a hypothetical entrepreneurial state decide to implement from one day to the next a thousand missions-policies aimed at varying societal challenges, and importantly do so without proper support or inclusion of the public. In such a case, the social control (i.e., centripetal forces in the inverted symbiotic

relationship) required would exert too much power of the rights and freedoms of individuals, causing a reduction in civic engagement and good will which hinders the potential success of missions.

My main argument here is that there is accountability of the entrepreneurial state in the public will, without which it will fail to meet its goals. A utilitarian liberal government on the other hand cannot be held accountable in the same way due to their neutrality and loyalty to the maximization principle and market processes and outcomes, as seen with the example of Covid-19 vaccine development. In this example, because the utilitarian-liberal government hold to value-neutrality, the public (taxpayers) cannot hold government institutions accountable in the same manner because what they did made economic sense and therefore utilitarian sense, despite causing an unequal distributive effect. Moreover, as with the previous example of hypothetical government, a hypothetical utilitarian-liberal government could from one day to the next implement a thousand inventions- or systems-oriented policies that serve the utilitarian maximization principle while creating unequitable outcomes, and still elude accountability.

5. Conclusion

The failure of innovation to develop solutions to our most pressing societal challenges is fundamentally tied to our views on social justice, what we owe each other as citizens, and how institutions should distribute the benefits and burdens of society. The onset of global climate change, as perhaps the greatest challenge humanity has yet to face, puts these matters in a greater perspective and places enough pressure on current paradigms of innovation policy and social justice to force new perspectives to light. Compared to the traditional innovation policy frameworks of inventions-oriented innovation policies and systems-oriented innovation policies which focus on economic growth, Mazzucato's missions-oriented innovation policy framework suggests a new purpose for innovation, to address grand societal challenges. Instead of the value neutral view of innovation as implicit in the market- and systems-failure approaches, Mazzucato's missions-framework recognises that innovation is in fact not a value neutral process but rather value laden, which further strengthens the view that social justice perspectives are important in the innovation sphere. This shift in how we understand innovation and its governance implies that new approaches are needed to understand how institutions should be structured and how distribution should be arranged.

With this foundation comes an extension of the theoretical scope of innovation policy frameworks in general and the missions-framework in particular. It builds on the assumption that social justice manifests itself in social institutions as formal or informal applications of the different interpretations of justice. These interpretations are best described by theories of social justice, of which I ground my analysis in the theories of libertarianism, utilitarianism, liberalism, the capabilities approach and communitarianism. I discuss which of the theories are compatible with specific innovation policy frameworks as well as which of the theories reflect the foundations of the innovation policy frameworks. From my analysis I reaffirm claims in extant literature that utilitarianism is the true social justice foundations of both inventions-oriented frameworks and systems-oriented frameworks while carrying out a novel reimagining of the social justice foundations of the missions-oriented frameworks. contribute with new insights on the foundations of the missions-framework as that of the capabilities approach and responsive communitarianism.

The contribution of the thesis is the strengthening the theoretical integrity of the missions-framework, by defining and discussing the social justice foundations of the missions-

framework and their implications. The thesis is also novel in that I propose and define the groundwork for a synthesis between two complementary theories of justice, what I refer to as *capabilities for the common good*. As the foundation of the entrepreneurial state, I argue that the capabilities for the common good approach have built in conceptual accountability measures that prevent institutions from exerting too oppressive social control on its citizens (i.e., from becoming authoritarian). Exerting such control would serve to make the national community less responsive, and moreover diminish civic engagement with missions greatly.

The aim of this thesis has been to clarify what is implied whenever policymakers adopt certain innovation policies as opposed to others, and the benefits and challenges they might face as a consequence. To the extent that the literature on innovation policy is used to advise policymakers on what governments should or should not do, I argue here that social justice is an important perspective that merits inclusion in such policy-advice. I conclude now by addressing some limitations to the present thesis and potential avenues for future research into the relationship between innovation policy and social justice. First, the thesis is limited by the selection of theories of social justice as well as the specific concepts I have chosen to focus on. There is a great amount of literature reflected in both the tradition of political philosophy as related to other theories that were not included in this thesis, as well as in the specific theories included, related to different concepts and approaches. Although some limitations were required given the nature of the thesis, there may still be further value in a broader analysis including other theories, for instance feminist theories and their influence on innovation policy for instance.

6. References

Barry, B. (2005). *Why social justice matters* (1st ed.). Polity.

Berlin, I. (2003). Two Concepts of Liberty, in Edited by Henry Hardy (ed.), *Liberty*, (2nd Edn) Oxford Academic. doi.org/10.1093/019924989X.003.0004. (Original work published 1958)

Capeheart, L., & Milovanovic, D. (2007). *Social Justice: Theories, Issues, and Movements*. Rutgers University Press.

Castellacci, F. (2007). Evolutionary and New Growth Theories. Are They Converging? *Journal of Economic Surveys, 21*(3), 585-627. doi-org.ezproxy.uio.no/10.1111/j.1467-6419.2007.00515.x

Castellacci, F. (2008). Innovation and the competitiveness of industries: Comparing the mainstream and the evolutionary approaches. *Technological forecasting & social change, 75*(7), 984-1006. doi:10.1016/j.techfore.2007.09.002

Castellacci, F. (2022). Innovation and social welfare: A new research agenda. *Journal of Economic Surveys*, 1-36. doi.org/10.1111/joes.12537

Cozzens, S.E. (2007). Distributive justice in science and technology policy. *Science and Public Policy, 34*(2), 85-94. doi:10.3152/030234207X193619

David, P.A. (1985). Clio and the Economics of QWERTY. *The American Economic Review, 75*(2), 332-337. https://www.jstor.org/stable/1805621

Edler, J., & Fagerberg, J. (2017). Innovation policy: What, why, and how. *Oxford Review of Economic Policy, 33*(1), 2-23. doi:10.1093/oxrep/grx001

Edquist, C. (2004) Reflections on the systems of innovation approach, *Science and Public Policy, 31*(6), 485-489. doi.org/10.3152/147154304781779741

Ergas, H. (1986). *Does Technology Policy Matter?* Self-published. https://ssrn.com/abstract=1428246

Etzioni, A. (1988). *The Moral Dimension: Towards a New Economics*. Free Press.

Etzioni, A. (1996). The Responsive Community: A Communitarian Perspective. *American Sociological Review, 61*(1), 1-10. www.jstor.org/stable/2096403

Etzioni, A. (2005). Communitarianism. In The Encyclopedia of Political Thought (1st ed). Edited by Michael T. Gibbons. *John Wiley & Sons, Ltd*. doi: 10.1002/9781118474396.wbept0184

Etzkowitz, H. & Leydesdorff, L. (1995) The Triple Helix - University-Industry-Government Relations: A Laboratory for Knowledge Based Economic Development, *EASST Review, 14*(1), 14-19, https://ssrn.com/abstract=2480085

Fagerberg, J. (2002). A Layman's Guide to Evolutionary Economics. Centre for Technology, Innovation and Culture, University of Oslo, Working Papers.

Fagerberg, J. (2017). Innovation policy: Rationales, lessons and challenges. *Journal of Economic Surveys, 31*(2), 497-512. doi:10.1111/joes.12164

Fagerberg, J., Martin, B.R. & Andersen, E.S. (2013). *Innovation Studies: Evolution & Future Challenges*. Oxford University Press.

Fagerberg, J., & Sapprasert, K. (2011). National innovation systems: the emergence of a new approach, *Science and Public Policy 38*(9). doi.org/10.3152/030234211X13070021633369

Fagerberg, J., & Verspagen, B. (2009). Innovation studies - The emerging structure of a new scientific field. *Research Policy, 38*(2), 218-233. doi.org/10.1016/j.respol.2008.12.006

Frank, R.G., Dach, L & Lurie., N. (2021, May 14). *It Was The Government That Produced COVID-19 Vaccine Success*, Health Affairs Forefront. 10.1377/hblog20210512.191448

Freeman, C. (1987). *Technology Policy and Economic Performance: Lessons from Japan.* Pinter Publishers.

Freeman, C. (1995). The 'National System of Innovation' in historical perspective. *Cambridge Journal of Economics, 19*(1), 5-24. https://www.jstor.org/stable/23599563

Harvey, F. (2022). Pakistan floods 'made up to 50% worse by global heating'. The Guardian. https://www.theguardian.com/environment/2022/sep/15/pakistan-floods-made-up-to-50-worse-by-global-heating

Hayek, F.A. (1945). The Use of Knowledge in Society. *The American Economic Review, 35*(4), 519–530. http://www.jstor.org/stable/1809376

Hayek, F.A. (1967). *Studies in philosophy, politics and economics.* Taylor & Francis Books Ltd.

Hayek, F.A. (1973). *Law, Legislation and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy, Vol. 1: Rules and Order.* Routledge and Kegan Paul.

Hayek, F.A. (1976). *Law, Legislation and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy, Vol. 2: The Mirage of Social Justice.* Routledge and Kegan Paul.

Hayek, F.A. (1979). *Law, Legislation and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy, Vol. 3: The Political Order of a Free People.* Routledge and Kegan Paul.

Hayek, F.A. (1978). *New Studies in Philosophy, Economics and the History of Ideas*. Routledge and Kegan Paul.

Hayek, F.A. (2002). Competition as a Discovery Procedure. *The Quarterly Journal of Austrian Economics. 5*(3), 9-23.

Hobbes, T. (1909). *Leviathan*. Clarendon Press. (Original work published 1651)

Karlson, N., Sandström, C. & Wennberg, K. (2021). Bureaucrats or Markets in Innovation Policy? – a critique of the entrepreneurial state. *The Review of Austrian Economics, 34,* 81-95. https://doi-org.ezproxy.uio.no/10.1007/s11138-020-00508-7

Kline, S., & Rosenberg, N. (1986). An overview of innovation. In R. Landau & N. Rosenberg (Eds.), *The Positive Sum Strategy: Harnessing Technology for Economic Growth*. National Academy Press.

Kurz, H.D. (2012). *Innovation, Knowledge and Growth: Adam Smith, Schumpeter and the Moderns*. (1st ed.). Routledge.

Kymlicka, W. (1990). *Contemporary Political Philosophy: An Introduction*. Clarendon Press.

Laplane, A. & Mazzucato, M. (2020). Socializing the risks and rewards of public investments: Economic, policy, and legal issues. *Research Policy, 42*, 1-11. doi.org/10.1016/j.repolx.2020.100008

Losco, J. (1986). Understanding Altruism: A Critique and Proposal for Integrating Various Approaches. *Political Psychology, 7*(2), 323-348. doi.org/10.2307/3791129

Lundvall, B.Å. (1992). *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. Pinter Publishers.

Lundvall, B.Å. (2013). Innovation Studies: A Personal Interpretation of 'The State of the Art'. In Fagerberg, J., Martin, B.R. & Andersen, E.S. (Eds.), *Innovation Studies: Evolution & Future Challenges* (pp. 21-70). Oxford University Press.

Mazzucato, M. (2013). Smart and Inclusive Growth: Rethinking the State's Role and the Risk-Reward Relationship. In Fagerberg, J., Martin, B.R. & Andersen, E.S. (Eds.), *Innovation Studies: Evolution & Future Challenges* (pp. 194-201). Oxford University Press.

Mazzucato, M. (2018a). *The Entrepreneurial State: Debunking Public vs. Private Sector Myths*. Anthem Press.

Mazzucato, M. (2018b). Mission-oriented innovation policies: challenges and opportunities. *Industrial and Corporate Change, 27*(5), 803-815. doi:10.1093/icc/dty034

Mazzucato, M. (2018c). *The value of everything: Making and Taking in the Global Economy*. Allen Lane.

Mazzucato, M. (2021). *Mission Economy: A Moonshot Guide to Changing Capitalism.* Allen Lane.

Mill, J.S. (1991). *On Liberty.* Routledge.

Mill, J.S. & Bentham, J. (1987). *Utilitarianism and Other Essays*. Penguin Classics. (Original

work published 1824)

Mingardi, A. (2015). A critique of Mazzucato's entrepreneurial state. *Cato Journal, 35*(3), 603-625.

Mowery, D.C., Nelson, R.R., & Martin, B.R. (2010). Technology policy and global warming: Why new policy models are needed (or why putting new wine in old bottles won't work). *Research Policy, 39*(8), 1011-1023. doi.org/10.1016/j.respol.2010.05.008

Nelson, R.R. (1977) *The moon and the ghetto.* W.W. Norton & Company.

Nelson, R.R. (1993). *National Innovation Systems: A Comparative Study*. Oxford University Press.

Nelson, R.R. (2011). The Moon and the Ghetto revisited. *Science and Public Policy, 38*(9). 681-690. doi.org/10.1093/scipol/38.9.681

Nelson, R.R., & Winter, S.G. (1982). *An Evolutionary Theory of Economic Change.* Belknap Press: An Imprint of Harvard University Press.

Nozick, R. (1974). *Anarchy, state, and utopia*. Basic Books.

Nussbaum, M. (2007). Human Rights and Human Capabilities. *Harvard Human Rights Journal*, 20, 21-24.

Papaioannou, T. (2020). Reflections on the entrepreneurial state, innovation and social justice. *Review of Evolutionary Political Economy*, 199-220. doi.10.1007/s43253-020-00018-z

Papaioannou, T. (2021). The Idea of Justice in Innovation: Applying Non-Ideal Political Theory to Address Questions of Sustainable Public Policy in Emerging Technologies. *Sustainability, 13*(5). doi:10.3390/su13052655

Papaioannou, T. & Srinivas, S. (2018). Innovation as a political process of development: are neo-Schumpeterians value neutral? *Innovation and Development, 9*(1). 1-18. doi.10.1080/2157930X.2018.1535872

Perez, C. (2013). Innovation, Evolution, and Economics: Where We Are and Where We

Should Go. In J. Fagerberg, B. R. Martin, & E. S. Andersen (Eds.), *Innovation Studies: Evolution & Future Challenges* (pp. 90-110). Oxford University Press.

Peshimam, G.N. (2022). Pakistan flood recovery plan key to continued financial support -IMF. Reuters. https://www.reuters.com/markets/asia/imf-finalising-flood-recovery-plan-by-pakistan-is-key-continued-financial-2022-11-23/?UTM_CAMPAIGN=Big_Moments&UTM_SOURCE=Google&UTM_MEDIUM=Sponsored

Rallo, J.R. (2019). Hayek Did Not Embrace a Universal Basic Income. *The Independent Review*, *24*(3), 347-359. Retrieved from: http://www.jstor.org/stable/45238860

Rawls, J. (1991). *A Theory of Justice*. Oxford University Press. (Original work published 1971)

Robeyns, I. (2003). Sen's Capability Approach and Gender Inequality: Selecting Relevant Capabilities. Feminist Economics, 9(2-3), 61-92. doi:10.1080/1354570022000078024

Robeyns, I. (2017). *Well-being, Freedom and Social Justice: The Capability Approach Re-Examined.* Open Book Publishers.

Sandel, M.J. (1998). Liberalism and the Limits of Justice: Second Edition. *Cambridge University Press*. (Original work published 1982)

Schot, J., & Steinmueller, W.E. (2018). Three frames for innovation policy: R&D, systems of innovation and transformative change. *Research Policy, 47*(9), 1554-1567. doi.org/10.1016/j.respol.2018.08.011

Schumpeter, J.A. (1994). *Capitalism, Socialism & Democracy*. Routledge. (Original work published 1942)

Schumpeter, J.A. (1983). *The theory of economic development: an inquiry into profits, capital, credit, interest, and the business cycle*. Routledge. (Original work published 1934)

Sen, A. (1992). *Inequality Reexamined*. Oxford University Press.

Sen, A. (1999). *Commodities and Capabilities.* Oxford University Press.

Sen, A. (2005). Human rights and capabilities. *Journal of Human Development 6*(2),

151-166. doi.10.1080/14649880500120491

Sen, A. (2006). What Do We Want from a Theory of Justice? *The Journal of Philosophy*, *103*(5), 215-238. http://www.jstor.org/stable/20619936

Sen A. (2009). *The idea of justice*. Belknap Press of Harvard University Press.

Sengupta, J.K. (1998). *New Growth Theory: An Applied Perspective.* Edward Elgar Publishing.

Smith, A. (2002). *The Theory of Moral Sentiments*. Cambridge University Press. (Original work published 1975)

Soete, L., & Arundel, A. (1993). *An Integrated Approach to European Innovation and Technology Diffusion Policy: A Maastricht Memorandum*. Commission of the European Communities, Dissemination of Scientific and Technical Knowledge Unit, Directorate-General Information Technologies and Industries, and Telecommunications.

Staff, G. (2022, January 12) *The COVID-19 vaccine race*. Gavi. https://www.gavi.org/vaccineswork/covid-19-vaccine-race

Steinmueller, W.E. (2013). Innovation Studies at Maturity. In J. Fagerberg, B. R. Martin, & E. S. Andersen (Eds.), *Innovation Studies: Evolution & Future Challenges* (pp. 147-167). Oxford University Press.

Stiglitz, J.E. (1989). *The Economic Role of the State*. Blackwell Pub.

Stiglitz, J.E., Sen, A., & Fitoussi, J.P. (2010). *Mismeasuring our lives: why GDP doesn't add Up: the report by the Commission on the Measurement of Economic Performance and Social Progress.* The New Press.

Swift, A. (2014). *Political philosophy: a beginners' guide for students and politicians* (3rd ed.). Polity.

Thomas, G. (2000). *An Introduction to political philosophy.* Gerald Duckworth & Co Ltd.

UNFCCC. (2022, November 20). *COP27 Reaches Breakthrough Agreement on New "Loss and Damage" Fund for Vulnerable Countries*. https://unfccc.int/news/cop27-reaches-breakthrough-agreement-on-new-loss-and-damage-fund-for-vulnerable-countries

Unruh, G.C. (2000). Escaping carbon lock-in. *Energy Policy 30*(4), 317-325. doi.org/10.1016/S0301-4215(01)00098-2

Weinberg, A. (1967). *Reflections on Big Science*. Pergamon Press.