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Towards a Capability Evolution View of Sustainability Transitions

By

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Abstract

This paper attempts to construct a capability evolution view of sustainability transitions (ST) by relying on institutionalists' outcomes such as economic theories of the firm, the profiting from innovation framework (PFI), and the dynamic capabilities (DC) framework, and economics as a moral science. The ideas on DC and PFI have contributed much to the study of the wealth of firms run by profit-driven entrepreneurs. In addition, we should pay attention to value distribution for society and the future generation as well as value protection by way of governance and related institutional issues and construct an entrepreneur model by taking into consideration the microfoundations, namely the diversity and dynamics of human nature. Our study makes a significant contribution to the ST literature because it eliminates the lacuna left in prior research on ST lacking the close interactions with, and deep investigation into, economics.

Keywords

Capability Evolution, Sustainability Transitions, Dynamic Capabilities, Profiting from Innovation, Governance, Profit Motives, Noble Purposes, Value Distribution

1. Introduction

This paper attempts to construct a capability evolution (CE) view of sustainability transitions (ST) (e.g., Geels, 2002, 2004, 2022; Geels and Schot, 2007; Kanger et al., 2020; Kivimaa et al., 2019; Köhler et al., 2019; Markard et al., 2012) by relying on institutionalists' outcomes such as economic theories of the firm (e.g., Coase, 1937; Hart, 1995, 2008; Williamson, 1975, 1985, 1996), the profiting from innovation (PFI) framework (e.g., Teece, 1986, 2006, 2018) and the dynamic capabilities (DC) framework (e.g., Teece, 2009; Teece and Pisano, 1994; Teece et al., 1997), and economics as a moral science (e.g., Cord ed., 2017; Marshall, 1961).¹

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¹ A series of abbreviations used in the paper and the original terms are listed in the Appendix.

In particular, we believe that Alfred Marshall and David Teece can be linked intellectually through the mediation of Ronald Coase, Marshall's follower (e.g., Coase, 1937, 1975; Medema, 2021; Taniguchi 2022a), Oliver Williamson (e.g., Williamson, 1975, 1985, 1996, 2010a), Coase's follower and Teece's predecessor (Teece, 2021), and Oliver Hart (e.g., Hart, 1995, 2008), a follower of Coase and Williamson. The intellectual genealogy from Marshall to Coase-Williamson-Hart (CWH) to Teece leads us to a new model of ST with an emphasis on the coevolution of firms and humans, involving CE.

In understanding ST, we argue that there are differences among these institutional economists in terms of theoretical focus, activity, motivation, and sustainability. First, the story of *firm emergence and boundaries* given by CWH emphasizes *incomplete contracts* where relation-specific investment by actors should be protected by crafting the mechanism of *governance*, including ownership determining surplus share from that investment, to economize transaction costs (e.g., Gibbons, 2005). In discussing *firm innovation* based on DC, Teece deals with *value creation* and *value capture/appropriation* or PFI to yield the *sustainable competitive advantage* (SCA) of the firm led by *profit-driven* entrepreneurs. For him, PFI with aid of the appropriability regime, the dominant design paradigm, and complementary assets is key for increasing SCA (e.g., Nelson, 2018a; Teece, 1986, 2006, 2018; Winter, 2006). On the other hand, Marshall concerns *value distribution* for society and the future generation and *sustainability in toto* on the basis of ethical *noble purposes* in discussing *organic growth*, implying the coevolution of humans and the economy (e.g., Marshall, 1961; Martins, 2021).

The novelties of our paper are threefold. First, we attempt to eliminate the lacuna left in prior research on ST lacking close interactions with, and deep investigation into, economics (Köhler et al., 2019) and economic theories of strategic management (e.g., Teece, 2009; Teece and Winter, 1984). In the main, prior research on ST has overlooked the ideas of institutional economics. Although Geels (2004) takes into account evolutionary economics (e.g., Nelson and Winter, 1982; Schumpeter, 1934, 1950) and new institutionalism (e.g., North, 1990; Scott, 1995), most ST researchers have failed to scrutinize thoroughly what those institutional economists have done by addressing separately the role of policy mixes (e.g., Edmondson et al., 2019; Kanger et al., 2020; Rogge and Reichardt, 2016) and innovation intermediaries (e.g., Kivimaa et al., 2019) to play in facilitating ST. Our attempt to have CWH, Teece, and Marshall encounter would contribute to a good understanding of ST implying sociotechnical reconfigurations towards sustainability *in toto*.

Second, we understand ST, implying how to promote and govern a fundamental transition towards more sustainable modes of production and consumption (Markard et al., 2012), in terms of the microfoundations of CE. Our model thus pays heed to the refinement of the micro-macro links (MML) of individuals and firms embedded in sociotechnical system (SS) and the refined ST governance by way of vision. In the model, CE occurring in the process of ST involves a change in the habit of thought, the growth of knowledge, the formation of routines, the ethical growth of humans, and economic changes (e.g., Foss, 1998; Hodgson, 1998; Langlois and Robertson, 1995; Marshall, 1961; Nelson and Winter, 1982; Schumpeter, 1934; Veblen, 1919/2012; Winter, 2013). CE is cumulative in the sense that it builds upon existing capability base and refines it (Geels, 2004).

Third, we believe that paying special heed to the coalignment of the economic and the ethical is needed for a good understanding of ST. Human growth, implying CE, makes individuals nobler and more ethical. This leads to the transformation of firms and thus the facilitation of ST. That is, firms start to engage in socially responsible activities, which can

be aggregated to ST. CE occurs when humans and firms become differentiated, their horizons are broadened, and their purposes become nobler and more ethical, enhancing ST. Also, as the purposes of humans become complex, a fulcrum shifts from the hedonic to the gain to the normative (e.g., Foss and Lindenberg, 2013; Lindenberg and Steg, 2007) regarding human capabilities, whereas it shifts from private entrepreneurship to public entrepreneurship (e.g., Klein et al., 2010) regarding entrepreneurial capabilities. Such shifts make the economic and the ethical compatible. This is required if ST occur successfully.

The issues known as “grand societal challenges (GSC)” (e.g., George et al., 2016; Howard-Grenville, 2021; Howard-Grenville et al., 2019; Köhler et al., 2019) include social welfare losses due to digital monopolies, economic stagnation caused by the Covid-19 Pandemic, nuclear disaster, terrorism, sterilization of young couples, climate change, ethnic cleansing, poverty, famine, diffusion of EVs (electric vehicles), the crisis of biodiversity, etc.² To solve these problems, one needs to consider ethical noble purpose for sustainability *in toto*, rather than exclusively engaging in profit maximization.

The rest of the paper is structured as follows. Section 2 reviews prior research on ST and shows why an encounter with institutional economists is needed for understanding ST. Section 3 clarifies an integrative view of CE. Section 4 shows how to understand ST in terms of CE. The paper ends with conclusions in Section 5.

2. Theoretical background

2.1. Prior research on ST

Let us start by elucidating what ST are by decomposing them into two elements: sustainability and transition. First, the concept of sustainability in the ST literature has a broader meaning than what economic sustainability implies. In particular, the transformative change framing in the literature addresses a failure in the capability of the existing SS for considering ends that are more inclusive than the increase of GDP and corporate profitability (Schot and Steinmueller, 2019). Taking into account that changes of the SS require the evolution of capabilities necessary for making it more sustainable, we focus on sustainability *in toto* systematically, but not sustainability at the economy level or at the firm level. Thus a multilevel approach to the SS as a whole should be adopted.

The multilevel perspective (MLP) is taken as a prompt approach in ST research, which comes about through interconnected processes on three levels: (1) *niche* where various innovations are created and tested; (2) *regime* regarded as the structure of the SS; and (3) *landscape* representing political-economic trends and environmental changes, integrating insights from evolutionary economics, structure theory, and institutional theory (e.g., Geels, 2002, 2004, 2005, 2011). Viewed from the MLP, ST are complex, multi-faceted processes, involving the passage of time, multiple actors, and competing and complementary technologies (Geels, 2004). However, some scholars criticize the MLP because it sets aside how different actors have different capabilities due to their positions vis-à-vis systemic relations in the SS (e.g., Svensson and Nikoleris, 2018). Thus we must pay heed to that since capabilities are divided and widely distributed among different actors, SS should be rearranged to make the different capabilities coaligned in an adequate manner (e.g., Aoki, 2010; Hayek, 1945; Nelson, 2003; Teece, 2009).

² In addition, these represent areas where the lack of capabilities results in political gridlock (Nelson, 2011).

ST researchers believe that the challenge for innovation no longer rests merely in the economic domain, but in the societal changes induced by innovation and the consequences of this for environmental and social sustainability (Smith et al., 2010). Actually, the global economy is on an unsustainable path and this needs to be improved (Fagerberg, 2018). We need to recognize that “despite important improvements in life expectancy and material welfare in many countries, persistent problems of economic crises and rising inequality coincide with a growing realization that current socio-technical systems for meeting our basic needs – whether in food, energy, mobility, materials, water or resources more generally – are unsustainable” (Schot and Steinmueller, 2018, p. 1554).

Second, the concept of transition relates to the change, innovation, transformation, and reconfiguration of the existing SS to make it more sustainable. But the problem is that the type of change representing ST is not something humans have a demonstrated capability to engage with appropriately (Schot and Steinmueller, 2019). To transform SS in which firms are embedded into more sustainable configurations and to facilitate greener firms, as well as more sustainable practices from all actors, can be a kind of the GSC for policymakers, practitioners, and academics (e.g., Berkhout, 2002; Rip and Kemp, 1998; Smith et al., 2005). If such ST are purposive ones, mobilizing external capabilities from a wider set of actors and articulating a vision that serves as a common reference point to coordinate their beliefs and actions towards sustainability *in toto* (e.g., Aoki, 2001; Gavetti, 2012; Schelling, 1960; Smith et al., 2005).

In doing so, we must emphasize the role of vision in making ST successfully done. Vision clarifies “what is being sustained, for whom it is being sustained, how it will be sustained, and why it should be sustained” (Berkhout et al., 2004, p. 59). We refer to these as the *fundamental properties of ST* (FPST). To understand these, we not only emphasize the role of ST governance in mobilizing capabilities, like prior research on ST, but also refine ideas of ST governance.

P1. ST Governance: Governing ST by way of articulating adequate vision matters in the MML of humans and firms that coevolve with the selection environments (SE) in which they are embedded.

With no doubt, it is the issue that well goes beyond firm capabilities that support corporate sustainability or SCA. Rotmans and Loorbach (2010) put an emphasis on transitions as a fundamental change caused by mutual interplays between institutions and actors through the media of practices. In the main, prior research on ST pays attention to the MML by assuming the inseparability of structure and agency (e.g., Geels et al., 2016; Svensson and Nikoleris, 2018), as institutional economists have argued (e.g., Aoki, 2001; Hodgson, 2004). In particular, a multidimensional model of agency shows us that bounded rational actors are self-interested, act strategically, and calculate which actions will best achieve their goals by following rules (e.g., Geels, 2020; Geels and Schot, 2007). CE occurs in the interactive process of the MML over time by enhancing the capabilities of actors needed for searching, learning, and experimenting in the SE (e.g., Rotmans and Loorbach, 2010).

Table 1 epitomizes the theoretical contributions of prior research to an understanding of ST by focusing on some of the articles on ST published in Research Policy, one of the journals taken as intellectual platforms for actively discussing issues of ST among researchers. This gives us a possible path along which the scholars should go to yield fruitful outcomes in the future. In sum, we should recognize that: (1) governance and

Table 1 Theoretical contributions of some of the articles published in Research Policy to an understanding of ST

The relevant articles on ST included in Research Policy	Theoretical contributions to an understanding of ST
(1) Berggren et al. (2015)	Showing that established firms (or regime actors) are active at both regime and niche levels, and calling for an approach beyond the niche-regime dichotomy on the basis of a comparative analysis of strategies in the heavy vehicle industry.
(2) Edmondson et al. (2019)	Understanding the coevolution of policy mixes and sociotechnical change with feedback loops for ST.
(3) Fagerberg (2018)	Showing the lessons that are important for effective policy making for ST: setting a firmer direction; embracing opportunities that are environmentally benign; mobilizing stakeholders to engage them towards a sustainable system; adopting a holistic perspective on innovation policy making; and improving governance.
(4) Geels (2002)	Presenting the MLP, which consists of landscape, regime, and niche, as a holistic framework to understand ST.
(5) Geels (2004)	Providing a coherent conceptual MLP to analyze long-term dynamics of SS and identifying the coevolution of multiple trajectories in user and market, sociocultural, policy, science, and technical regimes.
(6) Geels (2010)	Linking the MLP on ST to social science ontologies (e.g., rational choice theory, structuralism, and interpretivism).
(7) Geels (2022)	Advancing the understanding of causality, explanation, and the nature of ST research by mobilizing insights from the wider social sciences and proving epistemological support for ST scholars.
(8) Geels et al. (2016)	Reformulating of the typology of transition pathway (Geels and Schot, 2007) in terms of agency and institutions with aid of a comparative multilevel analysis of the German and UK electricity transitions.
(9) Geels and Schot (2007)	Refining the MLP on ST to clarify four transition pathways: transformation; technological substitution; reconfiguration; and de-alignment and re-alignment.
(10) Genus and Coles (2008)	Rethinking the MLP to enable more effective analysis of ST.
(11) Jørgensen (2012)	Proposing the AoD (Arenas of Development) approach, an alternative to the MLP, by paying attention to that actors operate in networks that involve institutions, technologies, visions, and practices.
(12) Kanger et al. (2020)	Identifying six policy intervention points for ST: stimulating different niches; accelerating the niches; destabilizing the regimes; addressing the broader repercussions of regime destabilization; providing coordination to multi-regime interaction; and tilting the landscape.
(13) Kivimaa et al. (2019)	Building a typology of innovation intermediaries (systemic, regime-based transition, niche, process and user intermediaries) in ST.
(14) Kivimaa and Kern (2016)	Proposing a novel conceptual MLP framework for policy mixes for ST, which facilitates to create niche innovations and destabilize currently dominant regimes.
(15) Lindberg et al. (2019)	Introducing the degree of sustainability and the degree of disruption to systematically analyze the politics of ST pathways.
(16) Markard et al. (2012)	Reviewing the origins of ST studies in the literature and dividing the field into five strands such as transition management, strategic niche management, the MLP, and technological innovation systems.

The relevant articles on ST included in Research Policy	Theoretical contributions to an understanding of ST
(17) Markard and Truffer (2008)	Proposing the concept of technological innovation systems to integrate the MLP and the innovation systems perspective for sociotechnical transitions.
(18) Nill and Kemp (2009)	Integrating strategic niche management, transition management, and time strategies to construct a paradigm for sustainable innovation policy.
(19) Pel et al. (2020)	Arguing that social innovation initiatives need to combine different forms of entrepreneurship and proactively adapt these in response to changing SE.
(20) Rogge and Reichardt (2016)	Deriving the extended policy mix concept that serves as an integrative framework for addressing the role of real-world policy mixes for ST.
(21) Safarzyńska et al. (2012)	Suggesting that evolutionary thinking can help us study the properties of concepts in the ST literature, including multilevel processes, multiphase dynamics, coevolution and learning.
(22) Schot and Steinmueller (2018)	Delineating three framings related science and technology policy: the innovation for growth framing; the national system of innovation framing; and the transformative change framing.
(23) Schot and Steinmueller (2019)	Arguing that transformative change is not something humans have an adequate capability to engage with efficiently and effectively.
(24) Shove and Walker (2010)	Considering how sustainable practices come into existence and how they disappear to underline the extent to which systems of practices are subject to ongoing reproduction, unlike the MLP suggesting that regimes constitute the SE in which niche innovations flourish or fail.
(25) Smith and Raven (2012)	Understanding systematically the dynamics of protective space in ST, involving agency, politics, and narratives of empowerment.
(26) Smith et al. (2005)	Modeling transitional contexts as a function of the degree of coordination to selection pressures and the locus of resources to represent four ideal types: reorientation of trajectories; endogenous renewal; emergent transformation; and purposive transition.
(27) Smith et al. (2010)	Arguing that the MLP posits that the way niches, regimes, and landscapes interact determines the characteristics of a transition.
(28) Svensson and Nikoleris (2018)	Establishing the ontological foundations of the MLP and arguing against that the MLP reduces transitions to quantitative shifts in the dominance of rules.
(29) Van den Ende and Kemp (1999)	Developing a coevolutionary model of technical transformations to examine how the digital computer regime grew out of existing computer regimes.

innovation are not necessarily separable; (2) policy mixes and sociotechnical change for ST coevolve; and (3) SE and SS coevolve.

P2. The inseparability of governance and innovation: getting the governance system right in the MML is needed for enhancing innovations for ST.

Williamson (2000) presents the four-layer model of institutional change in which

informal institutions such as customs and norms embedded in society are susceptible to slow change, requiring years well beyond human longevity to change, perhaps more than those necessary for landscapes to change (e.g., Geels, 2002, 2004). His main focus is on getting the governance system right by crafting order, mitigating conflict, and realizing mutual gains. Governance and innovation should be coaligned and thus be taken as complementary (Williamson, 1999). This echoes what ST researchers have argued. Better governance principles are needed to ensure that the process and direction of innovation take into account concerns around ethics for ST (e.g., Edler and Fagerberg, 2017).

P3. *The coevolution of policy mixes and sociotechnical change:* Policy mixes formulated by the government enhance the process of ST by which SS changes towards a more sustainable reconfiguration.

Prior research on such coevolution attempts to identify the process, pathways, and policy intervention points to facilitate niche innovations and destabilize currently dominant regimes, resulting in successful ST (e.g., Edmondson et al., 2019; Kanger et al., 2020; Kivimaa and Kern, 2016; Lindberg et al., 2019). In particular, our model will take into account that the capabilities to use policy mixes and intervention points require very competent public agencies, consisting of wise leaders such as politicians, bureaucrats, and policymakers, that can learn from others and failure (e.g., Fagerberg, 2018). This is about CE in policy making.

P4. *The coevolution of SE and SS:* SE coevolves with SS in which the government, the firm, and the individual are embedded. These actors are ontologically nested in a multilevel hierarchy.

Teece (2009) focuses on the coevolution of the market and the firm in which they mutually construct and are reconstructed over time. In his system, both market selection and entrepreneurship are critical to the increase in evolutionary fitness of the firm, as Pel et al. (2020) imagine. Thus we must pay heed to the changing balance between unconscious changes in SE (e.g., Alchian, 1950; Friedman, 1953) and conscious changes of entrepreneurial intentions (e.g., Penrose, 1952) in understanding ST (e.g., Smith et al., 2010). Although Smith and Raven (2012) argue that niches should be taken as “protective” spaces for innovations towards sustainability to compete within SE, the Schumpeterian entrepreneur, who is proactive and innovative, might not need any protection in moving ST forward by being driven by both profit motives and ethical noble purposes. Ultimately, in doing so, such an entrepreneur might have an authentic higher purpose “with no explicit expectation of getting something in return” (Quinn and Thakor, 2019, p. 14).

Rather, we admit that the process of CE requires one to consider the continuum between the economic and the ethical. Although propositions from **P1.** to **P4.** are taken into consideration in the traditional model that represents succinctly what prior research on ST has shown, we will extend it to construct a new model by elaborating ST governance by way of vision, by digging deeper into the MML embedded in SS, and by focusing on how to strike a right balance between ST and SCA. In particular, we believe that the coalignment between the economic and the ethical is key for understanding ST in terms of CE.

2.2. Why should an encounter with institutional economists be arranged for understanding ST?

2.2.1. Value creation and capture matter

Coase (1937) raised the problem of why firms exist in markets. For him, firm emergence and boundaries can be explained in terms of transaction cost economizing. Transaction costs due to the bounded rationality and opportunistic actions of actors should be mitigated by crafting the mechanism of governance (e.g., Williamson, 1975, 1985, 1996). The firm can facilitate efficient bargaining by leading them to share the surplus from their relation-specific investments. In particular, the share of surplus can be affected by residual control rights or, more simply, ownership (e.g., Hart, 1995, 2008; Hart and Moore, 1990). In sum, economic theories of the firm *à la* CWH focus on incomplete contracts where ownership or power relations matter in affecting the share of rents from the cooperating parties with distinctive capabilities. Firms use a set of incomplete contracts to access the resources they need to create and capture value (e.g., Bapuji et al., 2018).

The hold-up problem might result from situations where there is nothing that actors can do but write incomplete contracts (Hart, 1995). When one actor has made a prior commitment to a relationship with another actor, the latter can hold up the former for the value of that commitment. The possibility of hold-up can lead to underinvestment in relationship-specific investments and thus to social inefficiency. As a result, contractual complications and the ramifications for governance should be examined (Williamson, 2002).

In particular, it is critical for a firm to govern its arrangement and rearrangement of assets to achieve longevity and wealth (e.g., Chandler, 1977; Fruin, 1983). Top management with strong dynamic managerial capabilities (DMC) is critical if a firm wants to be immortal (e.g., Adner and Helfat, 2003; Kor and Mesko, 2013), and good governance to facilitate right actions that suit economic goals (e.g., profitability) and noble purposes (e.g., environmental sustainability) is important (e.g., Fruin, 1983). Governance capabilities are indispensable for sustainability *in toto* (e.g., Pitelis, 2013). These are also believed to be necessary to facilitate capability formation and discovery (e.g., Argyres et al., 2012).

As economic theories of the firm *à la* CWH focus on the emergence and boundaries of the firm where allocation of resources depends on the entrepreneur's authority, they have not scrutinized organizational capabilities evolving over time and still lack a deep understanding of where competitive advantages (CA) of a firm come from (Teece, 2010, 2019). They need to be revamped to take into account the essence of entrepreneurship that extends beyond the mere exercise of authority (Pitelis and Teece, 2009). In addition, they need to take into account the role of culture and stories to play in facilitating CE (Gibbons and Prusak, 2020), because relational contracts, a shared understanding of the actors' roles in and rewards from cooperating to facilitate CE, are central to many high-performing organizations (Gibbons and Henderson, 2012).

Teece (2019) elaborates on the necessity to construct a capabilities theory of the firm by combining economics and strategic management theories. He points out that economic theories of the firm *à la* CWH cannot explain fundamental questions about firms, particularly how firms repeatedly create and capture value as they pursue SCA in a domestic and global context. His system can explain firms' scope and potential for growth and profitability in a competitive market.

Teece attempts to integrate theory of the invisible hand and that of the visible hand to understand the coevolution of firms and markets (Teece, 2009). Using the impressive phrase "the wealth of firms" (p. viii), Teece (2011) argues that his system should be the firm-ori-

ented version of Adam Smith's *The Wealth of Nations* (1776/1994). Teece's claim can be regarded as an ambitious endeavor to explain a firm's sustained capture of wealth. Teece (2019) also argues that one cannot explain the wealth of either firms or nations without a theory of capabilities. Thus he aims at building a theory of firm capabilities by benchmarking both Smith and Alfred Chandler.

Teece explains the differences between DC and ordinary capabilities by saying that the former is about doing the right things, whereas the latter is about doing things right (Teece, 2014a). He puts particular emphasis on DC as a triple of sensing, seizing, and transforming, three activities necessary for PFI (e.g., Teece, 2009, 2014a, 2018; Teece and Linden, 2017). For firms to make excess profits (or rents) and to build SCA, DC, VRIN (value, rare, inimitable, and non-substitutable) resources, firm-specific signature processes, and good strategy should be coaligned (e.g., Teece, 2016, 2019).

In the meanwhile, Teece does not value ordinary capabilities which encompass operations, administration, and governance because he believes that having such capabilities is not a guarantee of a firm's SCA. As he focuses on firm innovation requiring DC, it might be reasonable to say that governance involving ordinary capabilities is secondary. However, governance per se may be hard and take time (Gibbons, 2020). Treating governance and other institutional issues as secondary might be inappropriate in research on ST (e.g., Argyres, 2011; Geels, 2004; Markard et al., 2012; Smith et al., 2005).

Furthermore, Teece (2009) focuses on studying entrepreneurs or, more accurately, entrepreneurial managers, rather than lay people (e.g., Coase, 2012; Marshall, 1961). For him, entrepreneurs are those who guide firms to both create and capture value (Teece, 2016). Rather, we should pay sufficient attention to the capabilities of human individuals, including entrepreneurs (e.g., Deakin, 2009; Marshall, 1961; Sen, 1985). In understanding ST, we should gain an understanding of the diversity and dynamics of human nature (e.g., Foss and Lindenberg, 2013; Marshall, 1961; Keynes, 1973; Sen, 1987; Smith, 1776/1994, 1759/2009) by establishing the microfoundation of CE (Felin and Foss, 2011).

Furthermore, Teece believes that profit motives are essential to entrepreneurs who engage in PFI. Teece (2019, p. 1) argues that "the pursuit of profit is core to capitalism. Profit, in turn, is generated through entrepreneurship and innovation". Indeed, profit might be one of the most important engines for capitalism, as Schumpeter (1934, 1950) imagined. A cornucopia of progress was made possible by the unleashing of the profit-seeking forces of capitalism (Boettke, 2022). For Schumpeter and Teece, "without profit there will be no entrepreneurship, and without entrepreneurship, there will be no profit" (Holcombe, 2007, p. 41).

However, it is worthy to point out that profit-driven businesses can sometimes cause serious damages to environmental sustainability and have no way to solve existing issues for social benefits. Profits are a common pool created by innovation that competitors will attempt to appropriate, causing the pool to dissipate as the market process plays out (Holcombe, 2014). The common pool resource can be inefficiently over-used as companies rush to claim a share before others because of the lack of well-demarcated property rights (Ostrom, 1990). As a result, consumers will have a wider range of choices in terms of similar goods or indifferent services.

On the other hand, creating innovation means that a variety of resources can be wasted for constructing, using, and maintaining market power (Stiglitz, 2019). Firms tend to hamper competition for increasing profits and facilitating corporate sustainability. As a result, it is likely that sustainability *in toto*, other than sustainability at the firm level, might be

sacrificed.

At present, there is a rising call for ST and the activities concerning ESG (Environmental, Social, and Governance) and SDGs (Sustainable Development Goals) by pushing firms to go beyond profit motives and corporate sustainability to make a significant contribution to sustainability *in toto* by tackling the GSC. Such needs for ST should constrain firms to make regulations, business models, and social responsibilities and obligations more sustainable (Buckley, 2018). The profit motives are not necessarily sufficient for firms to sustain and grow in the twenty-first century.

Notice that we never negate the role of profit motives in making firms innovative, although for ST to occur successfully, it should be emphasized that entrepreneurs who could make a decent profit decently are needed, and running a profitable company is not incompatible with doing it decently and ethically (Nohria, 2015). Profit-seeking can lead to both private and public good when pursued in moderation, although it achieves neither when it is indulged to excess (Hirschman, 1977). Thus, we aver that value distribution towards ST, implying that part of the excess profit gained by PFI on the basis of DC will be distributed for the future generation and the resolution of GSC, can be legitimized today.

2.2.2. Value distribution also matters

As value creation and capture help us explain the issues of firm boundaries and sustainable competitive advantage, many scholars in the field of strategic management have paid considerable attention to value creation and capture (Bapuji et al., 2018). Moreover, the pursuit of value creation versus capture might require different types of capabilities and the trade-offs between value creation and capture should be managed by developing ambidextrous DC (Pitelis, 2009).

But following Marshall, we would like to insist that value distribution also matters. He concerns value distribution and the evolution of human capabilities (Martins, 2021). Solving thorny issues such as poverty and income disparity requires “the moral and political capabilities of human nature” (Marshall, 1961, p. 4) to evolve. For him, human capabilities are of importance and CE is the main concern (Parsons, 1949). Also, ethically correct governance is necessary to enhance human capabilities (Pitelis, 2013).

Marshall (1907) demands entrepreneurs to go beyond profit motives and to have economic chivalry which includes the public spirit. He insists that “so long as wealth is applied to provide for every family the necessities of life and culture, and an abundance of the higher forms of enjoyment for collective use, so long the pursuit of wealth is a noble use” (Marshall, 1961, p. 137).

The assumptions that human capabilities are required for value creation, capture, and distribution and that entrepreneurs are driven by not only profit motives but also ethical noble purposes can be the key to conceptualizing CE. It would be necessary for one to view decent profits and noble purposes as possible drivers of human growth needed for ST.

For evolutionary economists, capabilities are the knowledge, skills, and experiences necessary to create changes (e.g., Langlois and Robertson, 1995; Loasby, 2010; Richardson, 1972). They share a common interest in CE. Veblen (1919/2012) studies the cumulative process of institutions with attention to a change in the habit of thought. Along with Schumpeter and Veblen, Marshall is an evolutionary economist (e.g., Nelson, 1995, 2018b; Raffaelli, 2003; Schumpeter, 1941). He paved a way for evolutionary economics by explaining the process of economic development with biological analogies (Marshall, 1898; Nelson, 2018b).

Marshall (1875) considers ethical growth as essential to the evolution of human capabilities, and he believes that capabilities evolve gradually. The principle of continuity, which refers to the graduality and continuity of change in historical times, is a key principle in Marshall's study on CE (Marshall, 1919/1932, 1961). He emphasizes irreversible changes (Nelson and Winter, 1982), implying CE in historical times. CE implies that learning and institutional evolution are important for humans to conquer nature (Marshall, 1961). This makes it possible for humans to utilize resources for specific goals and act efficiently (Helfat, 2018).

Marshall stresses the evolutionary mind and reflects it to the MML, which represent the interplay between the ethical growth of humans and the economy (Whitaker, 1975). The coevolution of humans and the economy is referred to as *organic growth* (Marshall, 1961). In particular, he believes that individuals and institutions are ontologically irreducible to each other (Martins, 2014), implying the MML in which individuals construct institutions and *vice versa*. Such an idea lies at the heart of institutional economics (e.g., Aoki, 2001, 2010; Bhasker, 1978; Hodgson, 1993, 2004; Taniguchi and Fruin 2022). The MML imply the entanglement, but not the separation, of the micro and the macro.

A good understanding of ST in terms of CE can be gained if one combines the ideas of institutional economists and deems the MML important. We believe that such a combination would inspire one to gain a deep understanding of ST involving CE, based on the MML of firms and individuals through the medium of entrepreneurs, all of which are embedded in SS. In this sense, an interplay between *ontological* levels such as the individual including the entrepreneur (the micro), the firm, (the meso), and SS (the macro) in the real world should be focused (e.g., Dopfer et al., 2004), rather than *epistemological* levels such as landscape, regime, and niche in the theoretical world (e.g., Geels, 2002, 2004, 2005).

Marshall believes that economic progress can be achieved only if wealth is used for the development of the noble life for humans (Caldari, 2004). He puts more stress on the study of human nobleness than that of wealth related to utilitarianism (e.g., Caldari et al., 2020; Loasby, 1989; Taniguchi and Fruin, 2022; Viner, 1941). Also, he believes that the development of free competition leads to moral development and thus CE (Marshall, 1961; Parsons, 1949). It results in the power of succeeding in the environment as well as that of giving some benefits altruistically to the environment (Marshall, 1873, 1961; Parsons, 1932). The former relates to value creation and capture, whereas the latter connects to value distribution.

Regarding value distribution, Marshall (1873) argues for the need for educating children in the context of a rise in the cultural level of humankind, rather than in the context of future economic gains for parents. He would put more stress on a commitment to ST for future generations which relies on moral judgment than self-interested utilitarian calculus (e.g., Etzioni, 1988; Sen, 1977). For him, self-interest and utilitarian calculus do not suffice for one to understand ST in terms of CE.

Marshall believes that morality mitigates the opportunistic actions of self-interested humans and leads to the formation of trust in society (Matthews, 1990). Marshall (1961) draws a realistic picture in which the evolution of firm capabilities would result in the creation of composite quasi-rents. For him, if good management would be sustained in the long run when organizational capabilities other than individual capabilities were developed (e.g., Aoki, 2010; Chandler, 1990, 1992; Fruin, 1983; Nelson and Winter, 1982; Winter, 2013, 2017), such rents can be accrued. Moreover, the distribution of such rents requires governance (e.g., Aoki, 1984). In his system, governance would be indispensable for value distribution.

For Marshall, moral science can be a tool to achieve the noble purpose of improving

social conditions surrounding humans (Viner, 1941). Also, Keynes (1973) argues that economics as a moral science should deal with the diversity and dynamics of human nature in the non-ergodic world. Contrary to their views, positive economics (e.g., Friedman, 1953; Robbins, 1932) neglect ethics and CE (e.g., Backhouse, 2006; Coats, 1996). The mainstream view that economists should avoid such issues would be misleading (Lawson, 2015). As it lacks a right balance between the ethical and the economic and results in an improper understanding of CE, ST research should go along with the moral science tradition.

3. Towards an integrative view of CE

3.1. The continuity and discontinuity of change

Marshall stresses continuous changes, whereas Schumpeter emphasizes discontinuous changes. In Marshall's system, there occurs a dialectical motion, which results from the coexistence of two heterogeneous paradigms, namely evolutionary economics and neoclassical economics (e.g., Cook, 2009; Hart, 2013; Martins, 2014; Niman, 1991; Parsons, 1931; Raffaelli, 2003). Schumpeter (1934) incorporates a dialectical motion arising from a tension between equilibration and disequilibration into his evolutionary economics as well. Nevertheless, he differs from Marshall in that he constructs a theory of economic development with particular emphasis on discontinuous changes.

Concerning whether change is continuous or discontinuous, there is a non-negligible gulf in the DC literature as well, which is known as an elephant in the room of DC (Di Stefano et al., 2014; Peteraf et al., 2013). Namely, research on DC can be divided into two groups: the economics-based, Teece group (e.g., Teece et al., 1997) and the organization-theory-oriented, Eisenhardt group (e.g., Eisenhardt and Martin, 2000).

Teece regards DC as necessary for creating innovations as discontinuous changes. He has developed the PFI and the DC framework for understanding the wealth of firms. According to him, firms adapt to environmental changes and, at the same time, create discontinuous changes proactively on the basis of DC as higher-order capabilities (e.g., Helfat et al., 2007; Pitelis and Teece, 2010; Teece, 2009, 2014a, b, 2016, 2017, 2019; Teece et al., 1997; Winter, 2003, 2017). The Teece group is clearly different from the camp of Marshall, Nelson, and Winter and the Eisenhardt group, which underline the continuity of change and routinization.

Moreover, Teece (2021) insists that "revolution cannot be readily routinized" (p. 18). He considers changes that occur at multiple dimensions such as the dimensions of technology, market, and business model, whereas evolutionary economics focuses on changes that occur at a single, technological dimension. Teece's system might seem more inclusive than evolutionary economics.

Institutions and technologies are closely related (e.g., Geels, 2002; Lindberg et al., 2019; Nelson, 1994). We should pay heed to the fact that a diverse set of institutions such as firms, industrial associations, governmental organizations, universities, and laws coevolve with technologies. We should stress that how well technology, market, user preferences, policy mixes, and business models can function depends on the evolution of institutions. The emergence of institutions that mitigate and buffer uncertainties is worthy to be examined (e.g., Dow, 2015; Hodgson, 1988; Langlois, 2007b). Thus, institutional dynamics are needed for understanding ST.

3.2. Entrepreneurs are driven by profit motives (the economic) as well as noble purposes (the ethical)

3.2.1. The origins of entrepreneurship

Schumpeter has failed to explain the reason why entrepreneurs emerge in the circular flow of the economy (Hodgson, 1993). It seems that Schumpeter's descendants, including Teece, inherit such a drawback as well. This is the issue of the origins of entrepreneurship, which cannot be explained by Marshall either (e.g., Hart, 2013; Niman, 1991; Parsons, 1931).

It would be instructive for one to scrutinize the origins of entrepreneurship in the context of uncertainty. For Teece, the origins of entrepreneurship can be reduced to profit motives (Teece, 2012, 2019). Teece (2017, p. 709) argues that the origin of the idea that “entrepreneurs must first cut through uncertainty and create each market before there are preferences and prices that can lead to market activity” goes back to Frank Knight. Knight focuses on the indeterminate outcomes of entrepreneurial decision-making under uncertainty (Hodgson, 2004). In the meanwhile, Teece links that “deep uncertainty impacts decision-making” (ibid.) to Keynes. Keynes associates uncertainty with the situation in which people cannot assign numerical probabilities because there is no scientific base to calculate them (Faulkner et al., 2021).

Uncertainty is related to unimagined possibilities (Faulkner et al., 2017). It implies unknown unknowns, the situations in which humans cannot imagine *ex ante* events that will occur in the future (Teece and Leih, 2016). Oddly, Teece (2017) argues that strong DC, including Keynesian animal spirits, “enable such *uncertainty to be managed*” (p. 716: emphasis added) successfully. Moreover, Teece (2019) insists that managers must foster an organizational capability to navigate unpredictable events “with a minimum of disruption” (p. 17). For him, a firm's SCA under uncertainty depends largely on whether firms can respond to the unexpected with “flexible and resilient” systems or not. Managing uncertainty to minimize disruption matters.

Yet, such an optimistic scenario that uncertainty can be managed might be an illusion. If uncertainty *à la* Keynes and Knight or, more accurately, fundamental uncertainty, could be managed perfectly, then there would be no room for entrepreneurship (Dow, 2015). In essence, uncertainty is not reducible to numerical risks that can be subscribed to probability calculation and to management. This is why Knight (1921) stresses that the nature of entrepreneurship lies in entrepreneurial judgment that is being made when future events cannot be predicted *ex ante*. When the category of an event is unknown, we do not have a foundation on which an agreement is to be made (Langlois and Cosgel, 1993). Thus, the essence of uncertainty lies in the evolution of the capabilities to articulate, communicate, and transmit estimates of the future (Foss and Klein, 2012). The fact that uncertainty cannot be eliminated gives a special meaning to entrepreneurship (e.g., Foss, 1994; Langlois, 2007a; Loasby, 2011).

In Teece's system, however, strong DC, namely part and parcel of “flexible and resilient” management, could eliminate uncertainties. But we aver that the origins of entrepreneurship are essentially connected with the impossibility of uncertainty management.

3.2.2. Beyond profit motives

Most economists (e.g., Foss and Klein, 2012, 2020; Langlois, 2007a; Teece, 2019) tend to insist that entrepreneurial actions are driven by profit motives under uncertainty. However, one should notice that entrepreneurs do not need to be straightjacketed by profit motives. It would be necessary for one to pay attention to the fact that entrepreneurs have nobler goals and become intrinsically motivated. The result is likely to be that “the opportunities of a

noble life may be accessible to all” (Marshall, 1897, p. 311). Beyond value creation and capture of firms, one should include value distribution for society as well, as Marshall promulgates. Doing so allows one to address how firms change towards ST by tackling the GSC.

Notice that value distribution includes moral judgment, which involves the issues of judging what is right and what is wrong. Such issues are related to ethics, deontology, moral codes, justice, etc. Dealing with such issues requires *phronesis* (Aristotle, 1998), including the capabilities to consider the vice and virtue for humankind, the capabilities to form the right beliefs, and the capabilities to choose the right actions. For Marshall, what is needed for the common good of humankind might be nobler than what is needed by a firm to gain profits. Value distribution for society facilitating ST might be nobler than value creation and capture merely for private interest.

For Teece, strong DC might be considered positively as good because it is likely to contribute to the establishment and sustenance of CA of a firm (Teece, 2014a). Higher profitability would be better and righter. But the definition of goodness and rightness can be changed as environmental and corporate changes occur in historical times. As profits are the product of the purpose of the corporation, they are not its purpose per se (Mayer, 2016). For firms in the twenty-first century, profits are derivative from purpose (Mayer, 2017) and profit-seeking is not necessarily the only thing of goodness and rightness to do.

It seems that sophisticated people in this century have begun to consider those who view goodness and rightness as related to firm profitability as narrow-minded and even menial. The definition and interpretation of “strong” DC should be changed. Thus, noble purposes may surpass profit motives. How to seek profitability by linking it to human nobility by dealing with the GSC might be in line with what Marshall (1961) has imagined when discussing organic growth.

In fact, the need for entrepreneurial judgment, which is based on noble purposes *and* profit motives, has increased gradually. As a result, firms must do the right things for the common good more than ever. For example, the Paris Agreement that was adopted in 2015 encourages all nations to contribute to the sustainability of the earth. Nations now must cope with the issues of climate change, and reducing the emission of greenhouse gas is one method. Besides, the Principles for Responsible Investment that the United Nations pronounced in 2006 demand investors to pay special attention to firms regarding ESG issues. The ESG movement goes beyond firm profitability and is coming into play, thanks to the initiatives of nations and investors.

Also, Larry Fink, the CEO of BlackRock, sent letters to the CEOs of the companies they invested in January 2018 to inform them that besides financial performance, companies should make significant contributions to society as a whole. Responding to this call, Business Roundtable announced that they will redefine their purposes to make economic development enjoyable for all people in the nation (Henderson and Serafeim, 2020). At least, modern firms have increasingly begun to ask for “authentic” purposes that facilitate investments for society as a whole, regardless of the sacrifice of instantaneous profits (e.g., Henderson, 2021; Henderson and Serafeim, 2020; Henderson and Van den Steen, 2015).

Due to such environmental changes, the social responsibilities of firms cannot be limited to profit-seeking driven by extrinsic motivations. The Friedman doctrine, which claims that “there is one and only one social responsibility of business – to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game” (Friedman, 1970), becomes an old-fashioned sophism. Namely, the assumption lying behind the doctrine that firm profitability can be completely separated from noble

purposes might have already become obsolete. Like Friedman, Teece's exclusive focus on activities such as sensing, seizing, and transforming, driven merely by profit motives, might be somewhat baleful if one takes the increasing interest in the ESG and SDGs movements seriously.

Paying heed to human nature, Marshall discusses the nobleness of CE in human history (Marshall, 1897, 1961). He also stresses the power of sympathy as the key to understanding human nature. Simultaneously, he worries that the growth of the firm driven by profit motives might deteriorate sympathy (Marshall, 1897). In particular, the domain of sociality rapidly can expand in the process of economic change. And as rationality grows increasingly, self-interest becomes increasingly mute (Parsons, 1949).

Interestingly, Michael Porter denounces ways in which firms and capitalism function on the basis of profit motives (e.g., Porter and Kramer, 2006, 2011). One of the fundamental reasons why modern firms engage in ESG and SDGs activities can be reducible to environmental changes they face (e.g., Foss and Linder, 2019). In response to normative pressure from society, firms may use CSR (corporate social responsibility) strategies by doing the right thing aimed at building corporate social capital (Geels, 2014).

In addition to the environmental factors, we can describe human nature: all humans have the duties of acting in a prosocial fashion inside and outside the firm (Serafeim, 2020). This relates to the ethical aspect of human nature. Although ethics has been surpassed by efficiency in economics, we must correct that as a matter of urgency and put human nature into business (Mayer, 2016).

Beyond the Friedman doctrine, linking firm profitability to noble purposes for ST would be the key to understanding the ways modern firms develop and nurture entrepreneurship toward the ESG and SDGs activities (e.g., Foss and Grandori, 2020; Mayer, 2019). Basically, we admit that profit motives would still be one of the most powerful engines that drive the progress of capitalism. But as capitalism evolves and technologies become complex, fundamental uncertainty concerning the sustainability of humankind and the earth drastically rises. This necessitates us to develop the capability to draw upon sources of knowledge from a wide range of areas (e.g., Lawson, 2010; Rosenberg, 1965). Thus, ESG and SDGs, much wider than firm profitability, can by no means be secondary and negligible. Also, the capabilities needed for these can be regarded as dynamic.

We are increasingly racked by the perplexing GSC that transcend the boundaries of disciplines such as economics, management, sociology, law, politics, biology, and so on. Problem-solving requires human cooperation and crossing borders in various areas. The reality is, even governments fail to find good solutions to such issues. This creates ample room for firms to tackle them instead of governments and individuals doing so (Hart, 2020).

As a result, ambidexterity (e.g., O'Reilly and Tushman, 2008; Tushman and O'Reilly, 1996) and social capital (e.g., Blyler and Coff, 2003; Eccles et al., 2020) are needed for coping with the issues at different levels simultaneously. Ambidexterity will contribute to a set of sustainability at multiple levels as well as the accumulation of social capital serving as a base of human cooperation in problem-solving. Such ambidexterity can be seen as DC needed for ST.

Teece (2017) compared his system to ideas of Marshall. To get one step further, we present **Table 2** to summarize the intellectual genealogy from Marshall to his descendants. One should cover not only DC but ordinary and other capabilities to construct an integrative view of CE. It is expected that a meeting of institutional economists such as Marshall, CWH, and Teece will lead to a proper understanding of how humans and firms change towards

Table 2 The intellectual genealogy from Marshall to his descendants**Research attributes**

Realism (Coase, 1975; Keynes, 1936; Marshall, 1961)
 An orientation to moral science for ethical noble purpose (Keynes, 1973; Viner, 1941)
 A focus on the micro-macro links between humans and environments (Keynes, 1936; Marshall, 1961)
 Ethical concern with value distribution and the CE of humans (Martins, 2021)

Agents (A)

Legal personhood under law (Deakin, 2017; Deakin et al., 2017)
 Bounded rational and opportunistic actors (Williamson, 1975, 1985, 1996)
 Distinction between the firm and the corporation (Deakin, 2012, 2017, 2019a, b)
 Entity shielding of the corporation (Deakin, 2012)
 Shareholders' interests in societal goals (Hart and Zingales, 2017, 2020)
 Comparative advantage of the corporations over individuals (Hart, 2020)
 Commitment on the basis of value judgment (Sen, 1977)
 Animal spirits (Keynes, 1936)
 Entrepreneurial judgment (Dow, 2015)
 The role of government (Keynes, 1936)

Motivations (M)

Noble economic chivalry beyond profit motives (Marshall, 1907)

Capabilities (C)

The capabilities of human nature (Marshall, 1875; Sen, 1987)
 The CE of individuals (Deakin, 2009; Sen, 1985)
 The CE of firms (Pitelis, 2020; Pitelis and Runde, 2017; Pitelis and Teece, 2009, 2010; Teece, 2009, 2017, 2019)

Activities (AC)

More ethically correct governance (Pitelis, 2013)

Environmental attributes (E)

The openness of economic systems (Lawson, 1997)
 Historical time (Keynes, 1936; Robinson, 1970)
 Fundamental uncertainty that cannot be managed (Dow, 2019; Keynes, 1936, 1973; Lawson, 1985)
 Unimaginable possibilities (Faulkner et al., 2017)
 The institutional evolution of capitalism (Hodgson, 2015; Marris, 1964; Pitelis, 2013, 2020)

Outcomes (O)

Sustainability of humankind (Marshall, 1873)
 A diversity of sustainability (Pitelis, 2013)
 Biodiversity (Dasgupta, 2004, 2021)

sustainability *in toto*.

In particular, Teece has a comparative advantage over other institutionalists in learning about discontinuous changes in the VUCA (Volatile, Uncertain, Complex, and Ambiguous) world (e.g., Shoemaker et al., 2018). Interactions among institutional economists beyond time can be complementary and mutually reinforcing in constructing an integrative view of CE.

3.2.3. A typology of sustainability

Here, we would like to present a typology of sustainability along two dimensions of scope and strength. If individuals have a narrow scope and cannot see past beyond the end of their noses by engaging exclusively in rational choice on the basis of self-interested utilitarian calculus as well as its related corporate sustainability on the basis of profit motives, it is likely that *local* sustainability results at best. Yet, as they grow and thus their capabilities

evolve, this enables them to have a wider scope enough to take into account issues occurring at ontological levels such as the industry, the region, the nation, and the earth, beyond themselves and their companies. Then, sustainability becomes more *global*.

On the other hand, sustainability can be either *weak* or *strong* in terms of whether natural capital is taken as substitutable or non-substitutable (e.g., Neumayer, 2003). Roughly speaking, the weakness or strength of sustainability can be dependent on whether issues of global climate change are regarded as trivial or non-trivial. Yet, utilitarianism does not allow the current generation to make sacrifices for the sake of future generations and requires that “more weight is given to the more present (and by presumption less well-off) generations” (ibid., p. 9).

We aver that seeking global and strong sustainability would be more desirable in the sense that issues of climate change should be tackled with a sense of urgency (SU) and the moral science tradition of Marshall permits us to take these as noble. In particular, Marshall’s economic chivalry (1907) connecting to public spirit and ethical purpose is nobler than narrow-minded profit motives merely enabling a firm to gain CA and achieve private goals successfully. In addition, winning the competition has ethical value and it affects the development of human capabilities (Knight, 1923).

We would like to stress two things. First, humans and firms can increase different kinds of intrinsic motivations, which are nobler than extrinsic ones. As humans become nobler and more ethical, their goals are likely to shift from the hedonic goal to the gain to the normative (e.g., Foss and Lindenberg, 2013; Lindenberg and Steg, 2007). They tend to be more intrinsically and less extrinsically motivated in the process of CE, as Marshall would imagine. CE implies that humans and firms are more capable than they used to be (Winter, 2013).

Second, the *raison d’être* or, more simply, purpose, of the firm (Langlois, 2007a) can become public. It would be possible for entrepreneurs to enable “social and nonprofit objectives by private individuals and firms” (Klein et al., 2010, p. 7). To repeat, profits are derivative from purposes. In this sense, these are not incompatible. But note that it is increasingly required for entrepreneurs in the twenty-first century to link corporate profitability to ethical noble purposes by dealing with the GSC to make a significant contribution to ST.

4. Understanding ST in terms of CE: a new model

We present a new model of ST. The model can be characterized by (1) the refined MML (P5.), (2) the refined ST governance (P6.), and (3) the coalignment of ST and SCA (P7.). These properties are novel in the sense that they have not been sufficiently scrutinized in the traditional model of ST.

P5. The refined MML: In the refined MML, the entrepreneur as an intermediary between the firm and the individual needs to articulate a vision that shows the direction toward which humans grow and facilitates sustainable transforming activities within a firm, hopefully leading to the simultaneous implementation of ST and SCA.

The MML is embedded in the larger SS. As world development can be taken as what arises out of the coevolution of national and corporate innovation systems (Lundvall and

Rikap, 2022), the relationship between the SS and the MML is hierarchically nested in the same way as that between the nation and the firm. In a similar vein, government is embedded in the SS where the former formulates policy mixes enhancing ST, whereas individual actors are embedded in the firm where the entrepreneur articulates a vision that can be expected to contribute to sustainable transforming activities within the firm.

According to Marshall, organic growth occurring on the MML implies the CE of actors (the micro) and institutions (the macro). It results in a good combination of human growth and the enhancement of well-being. Human growth reflects ethical noble purposes, thus leading to value distribution and ST that require us not only to care for others and future generations, but also to sense and tackle the GSC urgently. This is more about moral judgment or ethical problem-solving than profit maximization (Mayer, 2022).

Present generations must carry out obligations to future generations without passing “bads” (e.g., nuclear waste, contaminated water, infertile fishing ground, poor living conditions, national debt, and so on) on to our descendants. In particular, human growth implies that individuals in general and entrepreneurs in particular would become nobler, and more ethical and more intrinsically motivated beyond profit motives. We aver that CE necessary for striking a right balance between the economic and the ethical is of importance. Ambidextrous DC to do so is needed if global and strong sustainability should be sought.

P6. *The refined ST governance:* Vision plays two roles in ST governance. First, the vision that the entrepreneur articulates affects CC, coordinates the beliefs and actions of individual actors, and facilitates them to participate in governing a firm’s transforming activities towards ST in a democratic manner. Second, the vision initiates the firm organization to set an opportunity for public discourse to clarify and refine the FPST over time. A firm’s transforming activities at the micro level can be aggregated to ST at the macro level. This requires ST governance to function appropriately.

This proposition is derived from the refinement of **P1**, yielded in prior research on ST. The role of vision to play in making ST governance enforceable is pivotal. In particular, vision clarifies the FPST. It would be desirable for the entrepreneur to articulate a vision that gives cognitive frames to individuals (e.g., Gavetti, 2012; Witt, 1998, 2000). As the direction of CE might be affected by stories in organizations (Gibbons and Prusak, 2020), an environmentally sustainable vision plays a critical role to play in affecting stories leading to ST.

The building of support and expectations around a vision is a necessary step in attracting the capabilities of interests vital for facilitating ST (Berkhout et al., 2004). In this process, demonstrating leadership to persuade others to legitimize a fundamental transition towards more sustainable modes of production and consumption is of paramount importance (e.g., Gavetti, 2012; Helfat and Peteraf, 2015).

Also, the entrepreneur should articulate long-term visions which function as cognitive frames for formulating short-term goals and evaluating existing policy mixes as well as inspire individual actors to contribute to a firm’s transforming activities and thus ST (e.g., Rotmans et al., 2001).

For the entrepreneur to succeed in shaping communications and facilitating public discourse in a way that is advantageous to the propagation of the vision, demonstrating cognitive leadership or environmentally specific transformative leadership (ESTL) in terms of ST is required (e.g., Robertson, 2018; Robertson and Barling, 2013; Witt, 2000). For ESTL to be successfully exerted, the vision must be one that individual actors sympathize with, and

the entrepreneur has to be communicative and fair.

P7. *The coalignment of the economic and the ethical:* To coalign ST and SCA, the firm should develop ambidextrous DC for striking a right balance between the economic and the ethical. Such firms engage in socially responsible activities strategically, perhaps contributing significantly to ST, but not in exclusive profit-seeking. Thus, the firm, the entrepreneur, and the individual can change by seeking global and strong sustainability, involving CE necessary for ST.

Extremely, entrepreneurs can pay exclusive attention to either profit-seeking or going purpose. At one polar (seeking the economic only), as represented in Teece's system, a firm's CA and rents that it yields should be sustained by making PFI and DC work well to create innovations steadily because this imperative should be met to satisfy what capitalists (shareholders) want and enable the firm itself to win the competition. On the other polar (seeking the ethical only), firms should engage in morally good business without taking into account how much profits to be earned even if facing tough competition in SE. According to deontological ethics (Kant, 1964), good actions, including CSR, that arise out of self-interested profit motives are not taken as morally praiseworthy.

The problem is that the contradictory situation remains open that can be referred to as the CSR conundrum (Husted and Allen, 2011, p. 38): if the motivation for ethical action is profit, it is not ethical action but merely good business. On the other hand, if the motivation for ethical action is doing good, the firm is not doing business but merely charitable work. Also, entrepreneurs can be virtuous in engaging in profit-seeking when they intend to earn profits within a process that connects profits to value creation for customers, although they would engage in rent-seeking by obtaining favors from politicians and bureaucrats if the political process turns profit-seeking into rent-seeking. Thus, the intent to seek profit decently as well as the intent to forbear rent-seeking should be taken as two sides of the same coin (Munger and Russell, 2018).

Note that ST requires not only innovations in the economy and governance but ethics (e.g., Edler and Fagerberg, 2017; Fagerberg, 2018). Therefore, we can seek the third way by making the economic and the ethical, each of which seems mutually incompatible, compatible in a more realistic fashion. We believe that going purpose along this way carries considerable weight. Noble purpose should be "deep" in the sense that it can be regarded as a deeply felt intention that forms how to conduct business and reflects that the economic and the ethical can be linked in various ways because humans can engage in self-interested actions as well as sympathetic actions toward others and diverse in terms of how to combine the two (Gulati, 2022).

It seems likely that the extent to which a balance between the economic and the ethical in enhancing ST is right depends on the extent to which guidance on how to combine evolution and agency is deep (e.g., Alchian, 1950; Penrose, 1952; Smith et al., 2010; Teece, 2009). Hopefully, such guidance should be developed in the process of ST, requiring a series of problem-solving, which starts with discovering and formulating problems in the SE. This requires individuals to develop cognitive capabilities (CC) relating to SU. Although Teece would insist that a firm's DC needed for sensing opportunities and threats is more important than the CC of the individual, we should keep in mind that organizational sensing is underpinned by individual cognition (e.g., Foss, 2009). Problem-solving towards ST requires selective trial and error, but not random one if we pay heed to evolution-cum-design (e.g.,

Simon, 1962).

Individual CC consists of beliefs and SU. Beliefs are about the expectations of how others act and what happened in the SE. These coordinate the strategic choices of individual actors. SU is needed for not only casting doubt on the unsustainability of the firm and that of the SS consisting of various domains such as economy, polity, and commons (e.g., Aoki, 2001; Ostrom, 1990) or various regimes such as socio-culture, policy, science, technology, and user and market (e.g., Geels, 2004), but also grasping the inner nature of things with a critical attitude is of great importance for igniting and making ST occur successfully. SU is necessary for agilely sensing crises and risks that would jeopardize the sustainability of our daily lives. It is likely that such capabilities create momentum for existing system change and disrupt dominant unsustainable sociotechnical configurations (Kivimaa et al., 2019).

In the process of CE, the greater the number and variety of actors in the system, the greater are the chances for a new combination of capabilities arise (Bergek et al., 2008; Loasby, 2002). Thus CE implies an increase in the scale and scope of capabilities.

But sustainability *in toto* sometimes deteriorates without CE. The Fukushima nuclear disaster occurred mainly because TEPCO (Tokyo Electric Power Company) lacked the capabilities necessary for running nuclear power plants and had the unwillingness to learn from past accidents occurred at nuclear power plants at Fukushima and Niigata. In addition, ecosystem governance as a dynamic capability was underdeveloped in Japan. Yet, it should be enhanced to prevent society and the nuclear village from becoming entangled in the myth of nuclear safety and from letting another nuclear disaster occur by driving their constituents to give priority to ethically correct, rather than utilitarian, judgments and by educating and enlightening them to orient themselves to ST which support renewables and greener and safer technologies (Taniguchi, 2022b).

In the context of the EU's electricity policy mix, there is a gap between actors that want to continue along a centralized pathway based on fossil and nuclear power generation and those who want to expand the support for decentralized renewable power generation (Lindberg et al., 2019). Such a gap might retard ST. Also, in the car industry and the gas turbine industry, established companies had to evolve their capabilities along the current path, while simultaneously acquiring new complementary capabilities in order to develop optimized solutions (Bergek et al., 2013). Therefore, the evolution of ambidextrous DC for creative accumulation resulted in long-term and fundamental transformation processes (e.g., Markard et al., 2012).

5. Conclusions

We have attempted to yield a potential for one to elucidate ST in terms of CE by integrating institutional economists' ideas. Hopefully, an encounter with institutional economists has shown that ST, involving CE, can be understood based on the MML. This approach can be a novel one, which is different from the MLP in the ST literature.

In particular, Teece has made tremendous efforts in constructing a capability theory of the firm (Teece, 2019). Referring to the concept of DC as higher-level capabilities that are for change, he has made significant progress in understanding value creation and capture enabled by firm innovation. His ideas on DC and PFI, which rely on Schumpeterian evolutionary economics, have contributed much to the study of the wealth of firms run by profit-driven entrepreneurs. In addition, we should pay attention to value distribution for society

and the future generation (e.g., Marshall, 1873) as well as value protection by way of governance and related institutional issues (CWH) and construct an entrepreneur model by taking into consideration the microfoundations, namely the diversity and dynamics of human nature.

Countries with strong innovation capabilities and good governance systems do well while those without them tend to fall behind (Fagerberg and Srholec, 2008). We should attempt to construct a comparative framework of dynamic political economies (Nelson, 2022) for analyzing ST, involving CE, by which interdependent changes among actors, technologies, and institutions (e.g., Geels, 2004; Lindenberg et al., 2019) occur in countries.

To conclude, we hope that our attempt to arrange a meeting of institutional economists by putting new wine into old bottles will pave a way for the birth of a general theory of CE enabling such analysis and lead to burgeoning better theories and practices of ST in the near future.

References

- Adner, R., Helfat, C.E. 2003. Corporate effects and dynamic managerial capabilities. *Strateg. Manag. J.* 24(10), 1011–1025.
- Alchian, A.A. 1950. Uncertainty, evolution and economic behavior. *J. Polit. Econ.* 58(3), 211–222.
- Aoki, M. 1984. *The Co-operative Game Theory of the Firm*. Oxford University Press, Oxford.
- Aoki, M. 2001. *Toward a Comparative Institutional Analysis*. MIT Press, Cambridge, MA.
- Aoki, M. 2010. *Corporations in Evolving Diversity: Cognition, Governance, and Institutions*. Oxford University Press, Oxford.
- Argyres, N.S. 2011. Using organizational economics to study organizational capability development and strategy. *Org. Sci.* 22(5), 1138–1143.
- Argyres, N.S., Felin, T., Foss, N.J., Zenger, T. 2012. Organizational economics of organizational capability and heterogeneity. *Org. Sci.* 23(5), 1213–1226.
- Aristotle. 1998. *The Nicomachean Ethics*. Oxford University Press, Oxford.
- Backhouse, R. 2006. Sidgwick, Marshall, and the Cambridge school of economics. *His. Pol. Econ.* 38(1), 15–44.
- Bapuji, H., Husted, B.W., Lu, J., Mir, R. 2018. Value creation, appropriation, and distribution: how firms contribute to societal economic inequality. *Bus. Soc.* 57(6), 983–1009.
- Bergek, A., Berggren, C., Magnusson, T., Hobday, M. 2013. Technological discontinuities and the challenge for incumbent firms: destruction, disruption or creative accumulation? *Res. Pol.* 42(6–7), 1210–1224.
- Bergek, A., Jacobsson, S., Carlsson, B., Lindmark, S., Rickne, A. 2008. Analyzing the functional dynamics of technological innovation systems: a scheme of analysis. *Res. Pol.* 37(3), 407–429.
- Berggren, C., Magnusson, T., Sushandoyo, D. 2015. Transition pathways revisited: established firms as multi-level actors in the heavy vehicle industry. *Res. Pol.* 44(5), 1017–1028.
- Berkhout, F. 2002. Technological regimes, path dependency and the environment. *Global Environ. Change.* 12(1), 1–4.
- Berkhout, F., Smith, A., Stirling, A., 2004. Socio-technical regimes and transition contexts. In: Elzen, B., Geels, F.W., Green, K. (Eds.), *System Innovation and the Transition to Sustainability*. Edward Elgar, Cheltenham, pp. 48–75.
- Bhaskar, R. 1978. *A Realist Theory of Science*. Harvester-Wheatsheaf, Brighton.
- Blyler, M., Coff, R.W. 2003. Dynamic capabilities, social capital, and rent appropriation: ties that split pies. *Strateg. Manag. J.* 24(7), 677–686.

- Boettke, P.J. 2022. Capitalism. In: Melenovsky C.M. (Ed.), *The Routledge Handbook of Philosophy, Politics, and Economics*. Routledge, New York, pp. 267–275.
- Buckley, P.J. 2018. Can corporations contribute directly to society or only through regulated behaviour? *J. Brit. Acad.* 6(1), 323–374.
- Caldari, K. 2004. Alfred Marshall's idea of progress and sustainable development. *J. His. Econ. Thought.* 26(4), 519–536.
- Caldari, K., Dardi, M., Medema, S.G. 2020. *Marshall and the Marshallian Heritage: Essays in Honour of Tiziano Raffaelli*. Palgrave Macmillan, London.
- Chandler, A.D. 1977. *The Visible Hand: The Managerial Revolution in American Business*. Harvard University Press, Cambridge, MA.
- Chandler, A.D. 1990. *Scale and Scope: The Dynamics of Industrial Capitalism*. Harvard University Press, Cambridge, MA.
- Chandler, A.D. 1992. Organizational capabilities and the economic history of the industrial enterprise. *J. Econ. Perspect.* 6(3), 79–100.
- Coase, R.H. 1937. The nature of the firm. *Economica.* 4(November), 386–405.
- Coase, R.H. 1975. Marshall on method. *J. Law Econ.* 18(1), 25–31.
- Coase, R.H. 2012. Saving economics from the economists. *Harvard Bus. Rev.* 90(12), 36.
- Coats, A.W. 1996. Utilitarianism, Oxford idealism and Cambridge economics. In: Groenewegen, P. (Ed.), *Economics and Ethics?* Routledge, New York, pp. 80–102.
- Cook, S.J. 2009. *The Intellectual Foundations of Alfred Marshall's Economic Science*. Cambridge University Press, New York.
- Cord, R.A. ed. 2017. *The Palgrave Companion to Cambridge Economics*, vol. 1–2. Palgrave Macmillan, London.
- Dasgupta, P. 2004. *Human Well-Being and the Natural Environment*. Oxford University Press, Oxford.
- Dasgupta, P. 2021. *The Economics of Biodiversity: The Dasgupta Review*. HM Treasury, London.
- Deakin, S.F. 2009. Capacitas: contract law, capabilities, and the legal foundations of the market. In: Deakin, S.F., Supiot, A. (Eds.), *Capacitas: Contract Law and the Institutional Preconditions of a Market Economy*. Hart Publishing, Oxford, pp. 1–29.
- Deakin, S.F. 2012. The corporation as commons: rethinking property rights, governance and sustainability in the business enterprise. *Queen's Law J.* 37(2), 339–381.
- Deakin, S.F. 2017. Tony Lawson's theory of the corporation: towards a social ontology of law. *Camb. J. Econ.* 41(5), 1505–1523.
- Deakin, S.F. 2019a. Juridical ontology and the theory of the firm. In: Gagliardi, F., Gindis, D. (Eds.), *Institutions and Evolution of Capitalism: Essays in Honour of Geoffrey M. Hodgson*. Edward Elgar, Cheltenham, pp. 127–141.
- Deakin, S.F. 2019b. The evolution of corporate form: from shareholders' property to the corporation as commons. In: Clarke, T., O'Brien, J., O'Kelly, C.R.T. (Eds.), *The Oxford Handbook of the Corporation*. Oxford University Press, New York, pp. 687–710.
- Deakin, S.F., Gindis, D., Hodgson, G.M., Kainan, H., Pistor, K. 2017. Legal institutionalism: capitalism and the constitutive role of law. *J. Comp. Econ.* 45(1), 188–200.
- Di Stefano, G., Peteraf, M., Verona, G. 2014. The organizational drivetrain: a road to integration of dynamic capabilities research. *Acad. Manag. Perspect.* 28(4), 307–327.
- Dopfer, K., Foster, J., Potts, J. 2004. Micro-meso-macro. *J. Evo. Econ.* 14(3), 263–279.
- Dow, S.C. 2015. Addressing uncertainty in economics and the economy. *Camb. J. Econ.* 39(1), 33–47.
- Dow, S.C. 2019. Opportunities and challenges for post-Keynesian economics? In: Jespersen, J.,

- Olesen, F. (Eds.), *Progressive Post-Keynesian Economics: Dealing with Reality*. New Directions in Modern Economics. Edward Elgar, Cheltenham, pp. 1–15.
- Eccles, R.G., Johnstone-Louis, M., Mayer, C., Stroehle, J.C. 2020. The board's role in sustainability: a new framework for getting directors behind ESG efforts. *Harvard Bus. Rev.* September–October, 48–51.
- Edler, J., Fagerberg, J. 2017. Innovation policy: what, why, and how. *Oxford Rev. Econ. Pol.* 33(1), 2–23.
- Edmondson, D.L., Kern, F., Rogge, K.S. 2019. The co-evolution of policy mixes and socio-technical systems: towards a conceptual framework of policy mix feedback in sustainability transitions. *Res. Pol.* 48(10), 103555.
- Eisenhardt, K.M., Martin, J.A. 2000. Dynamic capabilities: what are they? *Strateg. Manag. J.* 21(10–11), 1105–1121.
- Etzioni, A. 1988. *The Moral Dimension: Toward a New Economics*. Free Press, New York.
- Fagerberg, J. 2018. Mobilizing innovation for sustainability transitions: a comment on transformative innovation policy. *Res. Pol.* 47(9), 1568–1576.
- Fagerberg, J., Srholec, M. 2008. National innovation systems, capabilities and economic development. *Res. Pol.* 37(9), 1417–1435.
- Faulkner, P., Feduzi, A., McCann, C. R., Runde, J. 2021. F. H. Knight's Risk, Uncertainty, and Profit and J. M. Keynes's *Treatise on Probability* after 100 years. *Camb. J. of Econ.* 45(5), 857–882.
- Faulkner, P., Feduzi, A., Runde, J. 2017. Unknowns, black swans and the risk/uncertainty distinction. *Camb. J. Econ.* 41(5), 1279–1302.
- Felin, T., Foss, N.J. 2011. The endogenous origins of experience, routines, and organizational capabilities: the poverty of stimulus. *J. Inst. Econ.* 7(2), 231–256.
- Foss, N.J. 1994. Why transaction cost economics needs evolutionary economics. *Rev. d'écon. Ind.* 68(2), 7–26.
- Foss, N.J. 1998. The competence-based approach: Veblenian ideas in the modern theory of the firm. *Camb. J. Econ.* 22(4), 479–495.
- Foss, N.J. 2009. Alternative research strategies in the knowledge movement: from macro bias to micro-foundations and multi-level explanation. *Eur. Manag. Rev.* 6(1), 16–28.
- Foss, N.J., Grandori, A. 2020. Entrepreneurship and the firm: a conversation on foundations and prospects. *Ind. Corp. Change.* 29(3), 581–598.
- Foss, N.J., Klein, P.G. 2012. *Organizing Entrepreneurial Judgment: A New Approach to the Firm*. Cambridge University Press, Cambridge.
- Foss, N.J., Klein, P.G. 2020. Entrepreneurial opportunities: who needs them? *Acad. Manag. Perspect.* 34(3), 366–377.
- Foss, N.J., Lindenberg, S. 2013. Microfoundations for strategy: a goal-framing perspective on the drivers of value creation. *J. Manag. Perspect.* 27(2), 85–102.
- Foss, N.J., Linder, S. 2019. The changing nature of the corporation and the economic theory of the firm. In: Clarke, T., O'Brien, J., O'Kelly, C.R.T. (Eds.), *ibid.*, pp. 539–562.
- Friedman, M. 1953. *Essays in Positive Economics*. University of Chicago Press, Chicago.
- Friedman, M. 1970. The social responsibility of business is to increase its profits. *New York Times Mag.* September 13.
- Fruin, W.M. 1983. *Kikkoman: Company, Clan, and Community*. Harvard University Press, Cambridge, MA.
- Gavetti, G. 2012. Toward a behavioral theory of strategy. *Org. Sci.* 23(1), 267–285.
- Geels, F.W., 2002. Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Res. Pol.* 31(8–9), 1257–1274.

- Geels, F.W. 2004. From sectoral systems of innovation to socio-technical systems: insights about dynamics and change from sociology and institutional theory. *Res. Pol.* 33(6-7), 897-920.
- Geels, F.W. 2005. *Technological Transitions and System Innovations: A Co-Evolutionary and Socio-Technical Analysis*. Edward Elgar, Cheltenham.
- Geels, F.W. 2010. Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. *Res. Pol.* 39(4), 495-510.
- Geels, F.W. 2011. The multi-level perspective on sustainability transitions: responses to seven criticisms. *Environ. Innov. Soc. Transitions*. 1(1), 24-40.
- Geels, F.W. 2014. Reconceptualising the co-evolution of firms-in-industries and their environments: developing an inter-disciplinary triple embeddedness framework. *Res. Pol.* 43(2), 261-277.
- Geels, F.W. 2020. Micro-foundations of the multi-level perspective on socio-technical transitions: developing a multi-dimensional model of agency through crossovers between social constructivism, evolutionary economics and neo-institutional theory. *Technol. Forecast. Soc. Change*. 152(March), 119894.
- Geels, F.W. 2022. Causality and explanation in socio-technical transitions research: mobilising epistemological insights from the wider social sciences. *Res. Pol.* 51(6), 104537.
- Geels, F.W., Kern, F., Fuchs, G., Hinderer, N., Kungl, G., Mylan, J., Neukirch, M., Wassermann, S. 2016. The enactment of socio-technical transition pathways: a reformulated typology and a comparative multi-level analysis of the German and UK low-carbon electricity transitions (1990-2014). *Res. Pol.* 45(4), 896-913.
- Geels, F.W., Schot, J.W. 2007. Typology of sociotechnical transition pathways. *Res. Pol.* 36(3), 399-417.
- Genus, A., Coles, A.M. 2008. Rethinking the multi-level perspective of technological transitions. *Res. Pol.* 37(9), 1436-1445.
- George, G., Howard-Grenville, J., Joshi, A., Tihanyi, L. 2016. Understanding and tackling societal grand challenges through management research. *Acad. Manage. J.* 59(6), 1880-1895.
- Gibbons, R. 2005. Four forma(lizable) theories of the firm? *J. Econ. Behav. Org.* 58(2), 200-245.
- Gibbons, R. 2020. Visible hands: governance of value creation within firms and beyond. *AEA Pap. Proc.* 110(May), 172-176.
- Gibbons, R., Henderson, R. 2012. Relational contracts and organizational capabilities. *Org. Sci.* 23(5), 1350-1364.
- Gibbons, R., Prusak, L. 2020. Knowledge, stories, and culture in organizations. *AEA Pap. Proc.* 110(May), 187-192.
- Gulati, R. 2022. *Deep Purpose: The Heart and Soul of High-Performance Companies*. Penguin, London.
- Hart, N. 2013. *Alfred Marshall and Modern Economics: Equilibrium Theory and Evolutionary Economics*. Palgrave Macmillan, Hampshire.
- Hart, O. 1995. *Firms, Contracts, and Financial Structure*. Oxford University Press, Oxford.
- Hart, O. 2008. Reference points and the theory of the firm. *Economica*. 75(299), 404-411.
- Hart, O. 2020. Shareholders don't always want to maximize shareholder value. In: Zingales, L., Kasperkevic, J., Schechter, A. (Eds.), *Milton Friedman 50 Years Later*. Stigler Center, Chicago, pp. 51-54.
- Hart, O., Moore, J. 1990. Property rights and the nature of the firm. *J. Polit. Econ.* 98(6), 1119-1158.
- Hart, O., Zingales, L. 2017. Companies should maximize shareholder welfare not market value. *J. Law, Fin. Account.* 2(2), 247-274.
- Hart, O., Zingales, L. 2020. Serving shareholders doesn't mean putting profit above all else. Zingales, L., Kasperkevic, J., Schechter, A. (Eds.), *ibid.*, pp. 55-58.

- Hayek, F.A. 1945. The use of knowledge in society. *AM. Econ. Rev.* 35(4), 519–530.
- Helfat, C.E. 2018. The behavior and capabilities of firms. In: Nelson, R.R. (Ed.), *Modern Evolutionary Economics: An Overview*. Cambridge University Press, Cambridge, pp. 85–103.
- Helfat, C.E., Finkelstein, S., Mitchell, W., Peteraf, M.A., Singh, H., Teece, D.J., Winter, S.G. 2007. *Dynamic Capabilities: Understanding Strategic Change in Organizations*. Blackwell, Malden, MA.
- Helfat, C.E., Peteraf, M.A. 2015. Managerial cognitive capabilities and the microfoundations of dynamic capabilities. *Strateg. Manag. J.* 36(6), 831–850.
- Henderson, R. 2021. Innovation in the 21st century: architectural change, purpose, and the challenges of our time. *Manag. Sci.* 67(9), 5479–5488.
- Henderson, R., Serafeim, G. 2020. Tackling climate change requires organizational purpose. *AEA Pap. Proc.* 110(May), 177–180.
- Henderson, R., Van den Steen, E. 2015. Why do firms have “purpose”? the firm’s role as a carrier of identity and reputation. *AM. Econ. Rev.* 105(5), 326–330.
- Hirschman, A.O. 1977. *The Passions and the Interests: Political Arguments for Capitalism before Its Triumph*. Princeton University Press, Princeton, NJ.
- Hodgson, G.M. 1988. *Economics and Institutions: A Manifesto for a Modern Institutional Economics*. Polity Press, Cambridge.
- Hodgson, G.M. 1993. *Economics and Evolution: Bringing Life Back into Economics*. Polity Press, Cambridge.
- Hodgson, G.M. 1998. On the evolution of Thorstein Veblen’s evolutionary economics. *Camb. J. Econ.* 22(4), 415–431.
- Hodgson, G.M. 2004. *The Evolution of Institutional Economics: Agency, Structure, and Darwinism in American Institutionalism*. Routledge, London.
- Hodgson, G.M. 2015. *Conceptualizing Capitalism: Institutions, Evolution, Future*. University of Chicago Press, Chicago.
- Holcombe, R.G. 2007. *Entrepreneurship and Economic Progress*. Routledge, London.
- Holcombe, R.G. 2014. The common pool of transitional profits. *Rev. Austrian Econ.* 27(4), 387–401.
- Howard-Grenville, J. 2021. Grand challenges, Covid-19 and the future of organizational scholarship. *J. Manag. Stud.* 58(1), 254–258.
- Howard-Grenville, J., Davis, G.F., Dyllick, T., Miller, C.C., Thau, S., Tsui, A.S. 2019. Sustainable development for a better world: contributions of leadership, management, and organizations. *Acad. Manag. Discov.* 5(4), 355–366.
- Husted, B.W., Allen, D.B. 2011. *Corporate Social Strategy: Stakeholder Engagement and Competitive Advantage*. Cambridge University Press, Cambridge.
- Jørgensen, U. 2012. Mapping and navigating transitions: the multi-level perspective compared with arenas of development. *Res. Pol.* 41(6), 996–1010.
- Kanger, L., Sovacool, B.K., Noorköiv, M. 2020. Six policy intervention points for sustainability transitions: a conceptual framework and a systematic literature review. *Res. Pol.* 49(7), 104072.
- Kant, I. 1964. *Groundwork of the Metaphysic of Morals*. Harper and Row, New York.
- Keynes, J.M. 1936. *The General Theory of Employment, Interest and Money*. Macmillan, London.
- Keynes, J.M. 1973. *The General Theory and After. Part II: Defense and Development*. In: *The Collected Writings of John Maynard Keynes, XIV*. Macmillan, London.
- Kivimaa, P., Boon, W., Hyysalo, S., Klerkx, L. 2019. Towards a typology of intermediaries in sustainability transitions: a systematic review and a research agenda. *Res. Pol.* 48(4), 1062–1075.
- Kivimaa, P., Kern, F. 2016. Creative destruction or mere niche support? innovation policy mixes for sustainability transitions. *Res. Pol.* 45(1), 205–217.

- Klein, P.G., Mahoney, J.T., McGahan, A.M., Pitelis, C.N. 2010. Toward a theory of public entrepreneurship. *Eur. Manag. Rev.* 7(1), 1-15.
- Knight, F.H. 1921. *Risk, Uncertainty, and Profit*. Houghton-Mifflin, Boston, MA.
- Knight, F.H. 1923. The ethics of competition. *Q. J. Econ.* 37(4), 579-624.
- Köhler, J., Geels, F.W., Kern, F., Markard, J., Onsongo, E., Wieczorek, A.J., Alkemade, F., Avelino, F., Bergek, A., Boons, F., Fünfschilling, L., Hess, D., Holtz, G., Hyysalo, S., Jenkins, K., Kivimaa, P., Martiskainen, M., McMeekin, A., Mühlemeier, M.S., Nykvist, B., Pel, B., Raven, R., Rohrer, H., Sandén, B., Schot, J., Sovacool, B., Turnheim, B., Welch, D., Wells, P., 2019. An agenda for sustainability transitions research: state of the art and future directions. *Environ. Innov. Soc. Transitions*. 31(June), 1-32.
- Kor, Y.Y., Mesko, A. 2013. Dynamic managerial capabilities: configuration and orchestration of top executives' capabilities and the firm's dominant logic. *Strateg. Manag. J.* 34(2), 233-244.
- Langlois, R.N. 2007a. The entrepreneurial theory of the firm and the theory of the entrepreneurial firm. *J. Manag. Stud.* 44(7), 1107-1124.
- Langlois, R.N. 2007b. *The Dynamics of Industrial Capitalism: Schumpeter, Chandler, and the New Economy*. Routledge, New York.
- Langlois, R.N., Cosgel, M. 1993. Frank Knight on risk, uncertainty, and the firm: a new interpretation. *Econ. Inq.* 31(3), 456-465.
- Langlois, R.N., Robertson, P. 1995. *Firms, Markets, and Economic Change: A Dynamic Theory of Business Institutions*. Routledge, London.
- Lawson, C. 2010. Technology and the extension of human capabilities. *J. Theory. Soc. Behav.* 40(2), 207-223.
- Lawson, T. 1985. Uncertainty and economic analysis. *Econ. J.* 95(380), 909-927.
- Lawson, T. 1997. *Economics and Reality*. Routledge, London.
- Lawson, T. 2015. *Essays on the Nature and State of Modern Economics*. Routledge, London.
- Lindberg, M.B., Markard, J., Andersen, A.D. 2019. Policies, actors and sustainability transition pathways: a study of the EU's energy policy mix. *Res. Pol.* 48(10), 103668.
- Lindenberg, S., Steg, L. 2007. Normative, gain and hedonic goal frames guiding environmental behavior. *J. Soc. Issues.* 63(1), 117-137.
- Loasby, B.J. 1989. *The Mind and Method of the Economist: A Critical Appraisal of Major Economists in the Twentieth Century*. Edward Elgar, Aldershot.
- Loasby, B.J. 2002. The evolution of knowledge: beyond the biological model. *Res. Pol.* 31(8-9), 1227-1239.
- Loasby, B.J. 2010. Capabilities and strategy: problems and prospects. *Ind. Corp. Change.* 19(4), 1301-1316.
- Loasby, B.J. 2011. Uncertainty and imagination, illusion and order: Shackleian connections. *Camb. J. Econ.* 35(4), 771-783.
- Lundvall, B.Å., Rikap, C. 2022. China's catching-up in artificial intelligence seen as a co-evolution of corporate and national innovation systems. *Res. Pol.* 51(1), 104395.
- Markard, J., Raven, R., Truffer, B., 2012. Sustainability transitions: an emerging field of research and its prospects. *Res. Pol.* 41(6), 955-967.
- Markard, J., Truffer, B. 2008. Technological innovation systems and the multi-level perspective: towards an integrated framework. *Res. Pol.* 37(4), 596-615.
- Marris, R.L. 1964. *The Economic Theory of 'Managerial' Capitalism*. Macmillan, London.
- Marshall, A. 1873. The future of the working classes. In: Pigou, A.C. (Ed.), *Memorials of Alfred Marshall*. Macmillan, London, pp. 101-118.
- Marshall, A. 1875. Some features of American industry. In: Whitaker, J.K. (Ed.), *The Early*

- Economic Writings of Alfred Marshall, 1867–1890, vol. 2. Macmillan, London, pp. 355–377.
- Marshall, A. 1897. The old generation of economists and the new. In: Pigou, A.C. (Ed.), *ibid.*, pp. 295–311.
- Marshall, A. 1898. Mechanical and biological analogies in economics. In: Pigou, A.C. (Ed.), *ibid.*, pp. 312–318.
- Marshall, A. 1907. Social possibilities of economic chivalry. In: Pigou, A.C. (Ed.), *ibid.*, pp. 323–346.
- Marshall, A. 1919/1932. *Industry and Trade: A Study of Industrial Technique and Business Organization; and of Their Influence on the Conditions of Various Classes and Nations*. Macmillan, London.
- Marshall, A. 1961. *Principles of Economics*, Text, 9th Ed. Macmillan, London.
- Martins, N.O. 2014. *The Cambridge Revival of Political Economy*. Routledge, London.
- Martins, N.O. 2021. The Cambridge economic tradition and the distribution of the social surplus. *Camb. J. Econ.* 45(2), 225–241.
- Matthews, R.C.O. 1990. Marshall and the labour market. In: Whitaker, J.K. (Ed.), *Centenary Essays on Alfred Marshall*. Cambridge University Press, Cambridge, pp. 14–43.
- Mayer, C. 2016. Reinventing the corporation. *J. Brit. Acad.* 4(March), 53–72.
- Mayer, C. 2017. Who's responsible for irresponsible business? an assessment. *Oxford Rev. Econ. Pol.* 33(2), 157–175.
- Mayer, C. 2019. *Prosperity: Better Business Makes the Greater Good*. Oxford University Press, Oxford.
- Mayer, C. 2022. The research background to the final report of the Future of the Corporation programme on “Policy & Practice for Purposeful Business”. *J. Brit. Acad.* 10(5), 1–15.
- Medema, S.G. 2021. Between LSE and Cambridge: accounting for Ronald Coase's fascination with Alfred Marshall. In: Caldari, K., Dardi, M., Medema, S.G. (Eds.), *ibid.*, pp. 231–268.
- Munger, M.C., Russell, D.C. 2018. Can profit seekers be virtuous? In: Heath, E., Kaldis, B., Marcoux, A. (Eds.), *The Routledge Companion to Business Ethics*. Routledge, London, pp. 113–130.
- Nelson, R.R. 1994. The co-evolution of technology, industrial structure, and supporting institutions. *Ind. Corp. Change.* 3(1), 47–63.
- Nelson, R.R. 1995. Recent evolutionary theorizing about economic change. *J. Econ. Lit.* 33(1), 48–90.
- Nelson, R.R. 2003. On the uneven evolution of human know-how. *Res. Pol.* 32(6), 909–922.
- Nelson, R.R. 2011. The Moon and the Ghetto revisited. *Sci. Public Pol.* 38(9), 681–690.
- Nelson, R.R. 2018a. Observations and conjectures stimulated by David Teece's “Profiting from Innovation in the Digital Economy...”. *Res. Pol.* 47(8), 1388–1390.
- Nelson, R.R. 2018b. Economics from an evolutionary perspective. In: Nelson, R.R. (Ed.), *ibid.*, pp. 1–34.
- Nelson, R.R. 2022. The economic system question revisited. *Ind. Corp. Change.* 31(3), 591–609.
- Nelson, R.R., Winter, S.G. 1982. *An Evolutionary Theory of Economic Change*. Harvard University Press, Cambridge, MA.
- Neumayer, E. 2003. *Weak versus Strong Sustainability: Exploring the Limits of Two Opposing Paradigms*. Edward Elgar, Cheltenham.
- Nill, J., Kemp, R. 2009. Evolutionary approaches for sustainable innovation policies: from niche to paradigm? *Res. Pol.* 38(4), 668–680.
- Niman, N.B. 1991. Biological analogies in Marshall's work. *J. His. Econ. Thought.* 13(1), 19–36.
- Nohria, N. 2015. Nitin Nohria's exhilarating journey. In: Pazzanese, C. (Ed.), *Harvard Gaz.* April 29, <https://news.harvard.edu/gazette/story/2015/04/i-had-this-extraordinary-sense-of-liberation/>
- North, D.C. 1990. *Institutions, Institutional Change, and Economic Performance*. Cambridge

- University Press, Cambridge.
- O'Reilly III, C.A., Tushman, M.L. 2008. Ambidexterity as a dynamic capability: resolving the innovator's dilemma. *Res. Org. Behav.* 28, 185-206.
- Ostrom, E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press, Cambridge.
- Parsons, T. 1931. Wants and activities in Marshall. *Q. J. Econ.* 46(1), 101-140.
- Parsons, T. 1932. Economics and sociology: Marshall in relation to the thought of his time. *Q. J. Econ.* 46(2), 316-347.
- Parsons, T. 1949. *The Structure of Social Action: A Study in Social Theory with Special-Reference to a Group of Recent European Writers*. Free Press, New York.
- Pel, B., Haxeltine, A., Avelino, F., Dumitru, A., Kemp, R., Bauler, T., Kunze, I., Dorland, J., Wittmayer, J., Jørgensen, M.S. 2020. Towards a theory of transformative social innovation: a relational framework and 12 propositions. *Res. Pol.* 49(8), 104080.
- Penrose, E.T. 1952. Biological analogies in the theory of the firm. *AM. Econ. Rev.* 42(5), 804-819.
- Peteraf, M.A., Di Stifano, G., Verona, G. 2013. The elephant in the room of dynamic capabilities: bringing two diverging conversations together. *Strateg. Manag. J.* 34(12), 1389-1410.
- Pitelis, C.N. 2009. The co-evolution of organizational value capture, value creation and sustainable advantage. *Org. Stud.* 30(10), 1115-1139.
- Pitelis, C.N. 2013. Towards a more "ethically correct" governance for economic sustainability. *J. Bus. Ethics.* 118(3), 655-665.
- Pitelis, C.N. 2020. Why unicorns exist? on Penrose, Hymer, and prediction. *Strateg. Manag. Rev.* forthcoming.
- Pitelis, C.N., Runde, J. 2017. Capabilities, resources, learning and innovation: a blueprint for a post-classical economics and public policy. *Camb. J. Econ.* 41(3), 679-691.
- Pitelis, C.N., Teece, D.J. 2009. The (new) nature and essence of the firm. *Eur. Manag. Rev.* 6(1), 5-15.
- Pitelis, C.N., Teece, D.J. 2010. Cross-border market co-creation, dynamic capabilities, and the entrepreneurial theory of the multinational enterprise. *Ind. Corp. Change*, 19(4), 1247-1270.
- Porter, M.E., Kramer, M.R. 2006. Strategy and society: the link between competitive advantage and corporate social responsibility. *Harvard Bus. Rev.* 84(12), 78-92.
- Porter, M.E., Kramer, M.R. 2011. Creating shared value. *Harvard Bus. Rev.* 89(1/2), 62-77.
- Quinn, R.E., Thakor, A.V. 2019. *The Economics of Higher Purpose: Eight Counterintuitive Steps for Creating a Purpose-Driven Organization*. Berrett-Koehler Publishers, Oakland, CA.
- Raffaelli, T. 2003. *Marshall's Evolutionary Economics*. Routledge, London.
- Richardson, G.B. 1972. The organisation of industry. *Economic Journal*. 82(327), 883-896.
- Rip, A., Kemp, R., 1998. Technological change. In: Rayner, S., Malone, E.L. (Eds.), *Human Choice and Climate Change: Resources and Technology*. Battelle Press, Columbus, pp. 327-399.
- Robbins, L. 1932. *An Essay on the Nature and Significance of Economic Science*. Macmillan, London.
- Robertson, J.L. 2018. The nature, measurement and nomological network of environmentally specific transformational leadership. *J. Bus. Ethics.* 151(4), 961-975.
- Robertson, J.L., Barling, J. 2013. Greening organizations through leaders' influence on employees' pro-environmental behaviors. *J. Org. Behav.* 34(2), 176-194.
- Robinson, J. 1970. Capital theory up to date. *Can. J. Econ.* 3(2), 309-317.
- Rogge, K.S., Reichardt, K. 2016. Policy mixes for sustainability transitions: An extended concept and framework for analysis. *Res. Pol.* 45(8), 1620-1635.
- Rosenberg, N. 1965. Adam Smith on the division of labour: two views or one? *Economica*. 32(126),

- 127–139.
- Rotmans, J., Kemp, R., Van Asselt, M., 2001. More evolution than revolution: transition management in public policy. *Foresight*. 31(1), 15–31.
- Rotmans, J., Loorbach, D. 2010. Toward a better understanding of transitions and their governance: a systemic and reflexive approach. In: Grin, J., Rotmans, J., Schot, J. (Eds.), *Transitions to Sustainable Development: New Directions in the Study of Long Term Transformative Change*. Routledge, New York, pp. 103–220.
- Safarzyńska, K., Frenkenb, K., Van den Bergh, J.C.J.M. 2012. Evolutionary theorizing and modeling of sustainability transitions. *Res. Pol.* 41(6), 1011–1024.
- Schelling, T.C. 1960. *The Strategy of Conflict*. Harvard University Press, Cambridge, MA.
- Schot, J., Steinmueller, W.E. 2018. Three frames for innovation policy: R&D, systems of innovation and transformative change. *Res. Pol.* 47(9), 1554–1567.
- Schot, J., Steinmueller, W.E. 2019. Transformative change: what role for science, technology and innovation policy? *Res. Pol.* 48(4), 843–848.
- Schumpeter, J.A. 1934. *The Theory of Economic Development*. Harvard University Press, Cambridge, MA.
- Schumpeter, J.A. 1941. Alfred Marshall's Principles: a semi-centennial appraisal. *AM. Econ. Rev.* 31(2), 236–248.
- Schumpeter, J.A. 1950. *Capitalism, Socialism, and Democracy*. Harvard University Press, Cambridge, MA.
- Scott, W.R. 1995. *Institutions and Organizations: Ideas, Interests, and Identities*. Sage, Thousand Oaks.
- Sen, A. 1977. Rational fools: a critique of the behavioral foundations of economic theory. *Phil. Public Aff.* 6(4), 317–344.
- Sen, A. 1985. *Commodities and Capabilities*. North-Holland, Amsterdam.
- Sen, A. 1987. *On Ethics and Economics*. Basil Blackwell, Oxford.
- Serafeim, G. 2020. Social-impact efforts that create real value: they must be woven into your strategy and differentiate your company. *Harvard Bus. Rev.* September-October, 38–48.
- Shoemaker, P.J.H., Heaton, S., Teece, D.J. 2018. Innovation, dynamic capabilities, and leadership. *Calif. Manag. Rev.* 61(1), 15–42.
- Shove, E., Walker, G. 2010. Governing transitions in the sustainability of everyday life. *Res. Pol.* 39(4), 471–476.
- Simon, H.A. 1962. The architecture of complexity. *Proc. AM Phil. Soc.* 106(6), 467–482.
- Smith, A. 1759/2009. *The Theory of Moral Sentiments*. Penguin Books, New York.
- Smith, A. 1776/1994. *An Inquiry into the Nature and Causes of the Wealth of Nations*. Random House, New York.
- Smith, A., Raven, R. 2012. What is protective space? reconsidering niches in transitions to sustainability. *Res. Pol.* 41(6), 1025–1036.
- Smith, A., Stirling, A., Berkhout, F. 2005. The governance of sustainable socio-technical transitions. *Res. Pol.* 34(10), 1491–1510.
- Smith, A., Voß, J.-P., Grin, J. 2010. Innovation studies and sustainability transitions: the allure of the multi-level perspective and its challenges. *Res. Pol.* 39(4), 435–448.
- Stiglitz, J.E. 2019. *People, Power, and Profits: Progressive Capitalism for an Age of Discontent*. W. W. Norton, New York.
- Svensson, O., Nikoleris, A. 2018. Structure reconsidered: towards new foundations of explanatory transitions. *Res. Pol.* 47(2), 462–473.
- Taniguchi, K.S. 2022a. Coase redux: whether Marshall's birthplace and family background

- affected his economic thought. Unpublished manuscript.
- Taniguchi, K.S. 2022b. Why Fukushima? a diachronic and multilevel comparative institutional analysis of a nuclear disaster. *Energy Pol.* 167(C), 113049.
- Taniguchi, K.S., Fruin, W.M. 2022. A research agenda for institutional economics as a moral science: the Cambridge School in the twenty-first century. *Keio Bus. Rev.* 56(1), 1-23.
- Teece, D.J. 1986. Profiting from technological innovation: implications for integration, collaboration, licensing and public policy. *Res. Pol.* 15(6), 285-305.
- Teece, D.J. 2006. Reflections on "Profiting from Innovation". *Res. Pol.* 35(8), 1131-1146.
- Teece, D.J. 2009. *Dynamic Capabilities and Strategic Management: Organizing for Innovation and Growth*. Oxford University Press, Oxford.
- Teece, D.J. 2010. Alfred Chandler and "capabilities" theories of strategy and management. *Ind. Corp. Change*. 19(2), 297-316.
- Teece, D.J. 2011. *Dynamic Capabilities and Strategic Management: Organizing for Innovation and Growth*, Paperback Ed. Oxford University Press, Oxford.
- Teece, D.J. 2012. Dynamic capabilities: routines versus entrepreneurial action. *J. Manag. Stud.* 49(8), 1395-1401.
- Teece, D.J. 2014a. The foundations of enterprise performance: dynamic and ordinary capabilities in an (economic) theory of firms. *Acad. Manag. Perspect.* 28(4), 328-352.
- Teece, D.J. 2014b. A dynamic capabilities-based entrepreneurial theory of the multinational enterprise. *J. Int. Bus. Stud.* 45(1), 8-37.
- Teece, D.J. 2016. Dynamic capabilities and entrepreneurial management in large organizations: toward a theory of the (entrepreneurial) firm. *Euro. Econ. Rev.* 86(C), 202-216.
- Teece, D.J. 2017. Towards a capability theory of (innovating) firms: implications for management and policy. *Camb. J. Econ.* 41(3), 693-720.
- Teece, D.J. 2018. Profiting from innovation in the digital economy: enabling technologies, standards, and licensing models in the wireless world. *Res. Pol.* 47(8), 1367-1387.
- Teece, D.J. 2019. A capability theory of the firm: an economics and (strategic) management perspective. *New Zeal. Econ. Pap.* 53(1), 1-43.
- Teece, D.J. 2021. Evolutionary economics, routines, and dynamic capabilities. In: Nelson, R.R., Dopfer, K., Potts, J., Pyka, A. (Eds.), *The Handbook of Evolutionary Economics*. Routledge, London, forthcoming.
- Teece, D.J., Leih, S. 2016. Uncertainty, innovation, and dynamic capabilities: an introduction. *Calif. Manag. Rev.* 58(4), 5-12.
- Teece, D.J., Linden, G. 2017. Business models, value capture, and the digital enterprise. *J. Org. Des.* 6(1), 1-14.
- Teece, D.J., Pisano, G.P. 1994. The dynamic capabilities of firms: an introduction. *Ind. Corp. Change*. 3(3), 537-556.
- Teece, D.J., Pisano, G., Shuen, A. 1997. Dynamic capabilities and strategic management. *Strateg. Manag. J.* 18(7), 509-533.
- Teece, D.J., Winter, S.G. 1984. The limits of neoclassical theory in management education. *AM. Econ. Rev.* 74(2), 116-121.
- Tushman, M.L., O'Reilly III, C.A. 1996. Ambidextrous organizations: managing evolutionary and revolutionary change. *Calif. Manag. Rev.* 38(4), 8-30.
- Van den Ende, J., Kemp, R. 1999. Technological transformations in history: how the computer regime grew out of existing computing regimes. *Res. Pol.* 28(8), 833-851.
- Veblen, T. 1919/2012. *The Place of Science in Modern Civilisation and Other Essays*. Echo, Fairfield.

- Viner, J. 1941. Marshall's economics, in relation to the man and to his times. *AM. Econ. Rev.* 31(2), 223–235.
- Whitaker, J.K. 1975. Introduction. In: Whitaker, J.K. (Ed.), *ibid.*, pp. 352–355.
- Williamson, O.E. 1975. *Markets and Hierarchies: Analysis and Antitrust Implications*. Free Press, New York.
- Williamson, O.E. 1985. *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. Free Press, New York.
- Williamson, O.E. 1996. *The Mechanisms of Governance*. Oxford University Press, New York.
- Williamson, O.E. 1999. Strategy research: governance and competence perspectives. *Strateg. Manag. J.* 20(December), 1087–1108.
- Williamson, O.E. 2000. The new institutional economics: taking stock, looking ahead. *J. Econ. Lit.* 38(3), 595–613.
- Williamson, O.E. 2002. The theory of the firm as governance structure: from choice to contract. *J. Econ. Perspect.* 16(3), 171–195.
- Williamson, O.E. 2010. Transaction cost economics: the natural progression. *AM. Econ. Rev.* 100(3), 673–690.
- Winter, S.G. 2003. Understanding dynamic capabilities. *Strateg. Manag. J.* 24(10), 991–995.
- Winter, S.G. 2006. The logic of appropriability: from Schumpeter to Arrow to Teece. *Res. Pol.* 35(8), 1100–1106.
- Winter, S.G. 2013. An evolutionary program for business history? *Ent. Soc.* 14(3), 498–506
- Winter, S.G. 2017. Pursuing the evolutionary agenda in economics and management research. *Camb. J. Econ.* 41(3), 721–747.
- Witt, U. 1998. Imagination and leadership: the neglected dimension of an evolutionary theory of the firm. *J. Econ. Behav. Org.* 35(2), 161–77.
- Witt, U. 2000. Changing cognitive frames-changing organizational forms: an entrepreneurial theory of organizational development. *Ind. Corp. Change.* 9(4), 733–755.

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Appendix.**A list of abbreviations in the text**

abbreviations	original terms
CA	Competitive Advantage
CC	Cognitive Capabilities
CE	Capability Evolution
CSR	Corporate Social Responsibilities
CWH	Coase-Williamson-Hart
DC	Dynamic Capabilities
DMC	Dynamic Managerial Capabilities
ESG	Environmental, Social, and Governance
ESTL	Environmentally Specific Transformative Leadership
EV	Electric Vehicle
FPST	Fundamental Properties of Sustainability Transitions
GSC	Grand Societal Challenges
MLP	Multilevel Perspective
MML	Micro-Macro Links
PFI	Profiting From Innovation
SCA	Sustainable Competitive Advantage
SDGs	Sustainable Development Goals
SE	Selection Environment
SS	Sociotechnical System
ST	Sustainability Transitions
SU	Sense of Urgency
TEPCO	Tokyo Electric Power Company
VRIN	Value, Rare, Inimitable, and Non-substitutable