

**Evolutionary Economic Policy
and Competitiveness**

Michael Peneder

Evolutionary Economic Policy and Competitiveness

Michael Peneder

WIFO Working Papers 662/2023
July 2023

Abstract

This paper advances a dynamic rationale for competitiveness policy that focuses on an economy's ability to evolve in order to achieve high real incomes along with desired qualitative changes in the socio-economic system. It highlights that the ubiquitous "rationalities of failure", either of markets, governments, or systems, are rooted in a peculiar habit of accepting hypothetical perfect states as normative benchmarks. In contrast, competitiveness policy starts from the objectives that the system wants to achieve. By combining the structuralist ontology of the micro, meso and macro levels of development with the basic system functions of evolutionary change, a general typology is developed that differentiates, organizes, and integrates various economic policies according to their respective contributions to the evolvability of the system. Among other advantages, the proposed concept of competitiveness policy allows (i) to replace the negative "logic of failure" with the active pursuit of dynamic development goals, (ii) to break the ideologically afflicted dichotomy between "vertical" and "horizontal" policies and (iii) to better align the theoretical rationale with the actual perception of the societal purpose of public interventions by most policy agents.

E-mail: michael.peneder@wifo.ac.at

2023/1/W/0

© 2023 Österreichisches Institut für Wirtschaftsforschung

Medieninhaber (Verleger), Hersteller: Österreichisches Institut für Wirtschaftsforschung
1030 Wien, Arsenal, Objekt 20 | Tel. (43 1) 798 26 01-0 | <https://www.wifo.ac.at>
Verlags- und Herstellungsort: Wien

WIFO Working Papers are not peer reviewed and are not necessarily based on a coordinated position of WIFO. The authors were informed about the Guidelines for Good Scientific Practice of the Austrian Agency for Research Integrity (ÖAWI), in particular with regard to the documentation of all elements necessary for the replicability of the results.

Kostenloser Download: <https://www.wifo.ac.at/wwa/pubid/70860>

Evolutionary Economic Policy and Competitiveness

Michael Peneder*

July 24, 2023

Abstract

This paper advances a dynamic rationale for competitiveness policy that focuses on an economy's ability to evolve in order to achieve high real incomes along with desired qualitative changes in the socio-economic system. It highlights that the ubiquitous 'rationalities of failure,' either of markets, governments, or systems, are rooted in a peculiar habit of accepting hypothetical perfect states as normative benchmarks. In contrast, competitiveness policy starts from the objectives that the system wants to achieve. By combining the structuralist ontology of the micro, meso and macro levels of development with the basic system functions of evolutionary change, a general typology is developed that differentiates, organizes and integrates various economic policies according to their respective contributions to the evolvability of the system. Among other advantages, the proposed concept of competitiveness policy allows (i) to replace the negative 'logic of failure' with the active pursuit of dynamic development goals, (ii) to break the ideologically afflicted dichotomy between 'vertical' and 'horizontal' policies and (iii) to better align the theoretical rationale with the actual perception of the societal purpose of public interventions by most policy agents.

Forthcoming in **Handbook of Evolutionary Economics**, Chapter 23, edited by Dopfer K., Nelson R.R., Potts J., Pyka A., Routledge, London, 2023.

JEL Codes: B52, L52, L53, O11, O12, O43

Key Words: Evolutionary economics, competitiveness, structural change, policy classification

* Austrian Institute of Economic Research, Arsenal Obj. 20, A-1030 Vienna, Austria, Tel.: + 43-1-798 26 01 480; E-mail: Michael.Peneder@wifo.ac.at

1 Introduction

This paper elaborates on the concept of competitiveness as a comprehensive heuristic of evolutionary economic policy. The core objective is to replace the conventional emphasis on allocative efficiency and the associated rationalities of failure with an evolutionary focus on the drivers of economic development. Following Schumpeter (1911), one can define development by the growth in real income combined with qualitative transformations of the socio-economic system. Thus, we further define that *competitiveness* is the ability of an economic system to achieve high real incomes together with qualitative change, be it within firms, at the level of firm populations, sectors, or the aggregate economy, in a sustainable manner and in support of the overall goals of society. In other words, competitiveness is the *ability to evolve* in accordance with a long-term improvement of social and environmental living conditions. *Competitiveness policy* is the set of public interventions that aim to foster a system's capacity to evolve in the above sense.¹

To begin with, one must acknowledge that the common paradigm of ‘market failure’ has been extremely successful in rationalizing public interventions that we generally consider good and necessary, e.g. with regard to public goods, external effects, asymmetric information, or indivisibilities that constrain competition. Its success originates in the smart choice of assumptions and rules that enabled a winning balance between flexibility in response to actual policy needs and comprehensible principles for general guidance. But as Nelson (2009, p. 9) points out, “these concepts and maxims are not logically tied to a structure of modern neoclassical economic theory. They are perfectly at home within an economic analysis structured by evolutionary theory”.

What difference does it then make, whether we apply one or the other logic of intervention? Nelson highlights the more realistic approach to institutional complexity as one of the main advantages of evolutionary theorizing. Obviously, this is particularly important to the design and practice of economic policy. It specifically helps to overcome the privileged standing of pure market organization as the presumed default structure, which is misleading since markets are never perfect and never exist in a pure form. Instead, they are always conditioned by non-market institutions, which can be either more obstructive or supportive of particular activities and outcomes. Accepting the high degree of uncertainty together with a strong dependency of the effectiveness of public interventions on the situational context renders the idea of optimized policy prescriptions untenable. Instead, the evolutionary approach emphasizes the importance of policy experiments and the need to provide institutional space for processes of discovery (Metcalf, 1994; Cantner and Pyka, 2001).

¹This contribution is an updated and condensed discussion of a topic that the author has previously addressed in more detail and from different perspectives in Peneder (2001, 2017) or Peneder and Rammer (2018). It owes greatly to many valuable debates, most notably Kurt Dopfer’s Vienna Seminar on Evolutionary Economics and the Thematic Platform on Competitiveness of the Austrian Institute of Economic Research (WIFO). The usual disclaimer applies.

The present analysis adds further aspects to an evolutionary paradigm of economic policy. First and foremost comes the transition from the negative ‘logic of failure’, where policy is only admissible if it corrects inefficiencies in the static allocation of resources, towards the dynamic goal of enhancing the system’s ability to evolve. Second, the *evolutionary-structuralist* perspective (Dopfer et al, 2004; Lipsey et al, 2005) opens our field of vision to the problem of competitiveness not only for individual firms, but also at the level of industries, regions and countries. The competitiveness of aggregate entities thus becomes a meaningful and necessary concern of policy, generally characterized by the statistical moments of variables on economic performance in heterogeneous populations. Competitiveness policy is thus tightly embedded in a multi-layer system of enterprise, industrial and general framework policies. Third, the evolutionary framework invokes the *political economy* dimension of government action, such as the rules which determine the returns to productive *vs* rent-seeking activities, group conflicts, regulatory capture, or corruption. Their quality depends on the strength and integrity of the public institutions. To this, we must add the degree of development, which affects the kind of policies needed and the capacity to conduct them, as well as strategic concerns, such as the threat of escalating trade and subsidy wars. Finally, by taking the various advantages together, the dynamic approach better aligns the theoretical rationale for public interventions with the actual intentions and motivations of many of the actors responsible for particular policies in practice.

The argument will proceed in four steps: Section 2 offers some basic considerations to clear the ground. Section 3 distinguishes the micro, meso and macro levels of development for targeting public interventions. In Section 4 this is done for the different system functions that enable evolutionary change. The combination of both dimensions produces an integrated classification of evolutionary economic policies in Section 5. The resulting typology differentiates policies according to their characteristic functions, and target level and integrates them by their common purpose of enhancing the economic system’s capacity to evolve. Section 6 summarizes and concludes.

2 Basic considerations

Before turning to the core argument of this policy note, this section briefly addresses two potential misconceptions and resulting objections to the notion of competitiveness as defined earlier. First, in the context of growing ecological concerns about the limits to growth, the focus on rising real incomes requires an explanation that points to the significance of Schumpeter’s interest in qualitative transformations for the contemporary emphasis on the socio-economic objectives *beyond GDP*. Second, to further clear the ground, Krugman’s influential critique of the notion of competitiveness for aggregate economies shall be refuted.

2.1 Qualitative change and growth ‘beyond GDP’

Evolving systems must be open to new opportunities. Hence, to Schumpeter there are no definite boundaries to innovation, at least known, neither from running out of feasible technological changes, nor an ultimate saturation of demand. Like his teacher Friedrich Wieser, he believed in the common psychological trait of people continuously “discovering new directions of desire”.² Because aspirations and demands tend to rise along with the attained standard of living, “satiety becomes a flying goal, particularly if we include leisure among consumers’ goods.”³

In Schumpeter’s time, the ecological limits of growth were not yet a general concern. However, their ever-growing importance today warrants a short reference to the Austrian theory of value. In his contribution to modern welfare economics, Friedrich Wieser stressed that “price is a social fact, but it does not denote the estimate put upon goods by society.”⁴ Wieser’s immediate concern was the difference between average utility as a measure of subjective well-being and marginal utility as a determinant of prices – for example, in the case of a monopoly raising prices to the disadvantage of consumers. Today, we may also think, for instance, of negative externalities from environmental degradation, or the accurate measurement of welfare beyond the common national product, which is generally based on transaction prices.⁵ In case of conflict between subjective utilities and transaction values (i.e. prices), Wieser left no doubt as to the proper prioritization: “The highest principle of all economy is utility. Where value and utility come into conflict, utility must conquer; there is nothing in the nature of value which could give it the ascendancy.”⁶ Schumpeter clearly agreed with his teacher’s view, for example, when stressing the importance of income distribution in the determination of social value.⁷

In face of the contemporary problems of growing inequality and degradation of the natural environment, one cannot doubt that the aspired transformation to more sustainable and ecological means of production would add to a society’s utility and well-being, and hence also to real income in terms of the quality of life people can afford. Consistent with our definition of competitiveness, such a transformation goes together with qualitative change and a rising standard of living, which points exactly at the deeper and very contempo-

²Wieser (1914, p. 26).

³Schumpeter (1942/1950, p. 131). On logical grounds one cannot preclude satiation, and the recurrent fear of secular stagnation is a reasoned possibility that Schumpeter acknowledged. But he also argued that the historical record of technological change suggests otherwise (Schumpeter, 1939, p. 1035; 1942/1950, pp. 111ff).

⁴Wieser (1889, p. 64f).

⁵Jones and Klenow (2016), Stiglitz et al (2018).

⁶Wieser (1889, p. 54).

⁷“Not only must the sum of individual wealth be given, but also its distribution among individuals. Marginal utilities do not depend on what society as such has, but on what individual members have. [...] The distribution of wealth is important for determining values and shaping production, and it can even be maintained that a country with one and the same amount of general wealth may be rich or poor according to the manner in which that wealth is distributed” (Schumpeter, 1909, p. 214f).

rary meaning of Schumpeter's theory of economic development. Clearly, his vision reached *beyond GDP*, and so should our conceptions of competitiveness and competitiveness policy.

2.2 Krugman's critique

According to Paul Krugman (1994, 1996), the concept of competitiveness applies only to individual firms. In contrast, nations or regions would not compete in any meaningful sense. But competition arises from scarcity, which, among other factors, can affect natural resources, capital, labor, human skills, or technological knowledge. Also, the access to certain markets can be scarce, giving a natural advantage to firms in a location that is better integrated than others. The crucial question, therefore, is whether such scarcities only affect individual enterprises, households or workers. This can hardly be the case, since the relative abundance of the various factors of production, including knowledge, influences firms' locational choices and their differential performance. In other words, relative scarcities at the aggregate level are the source of 'comparative advantages', which affect industrial location and specialization at the meso level. And when industries systematically vary in their productivity performance, differences in industrial specialization also affect a region's overall per capita income.

At a very fundamental level, the notion of competitiveness acknowledges that locations are not in the state of a unique, full employment perfect equilibrium (Fagerberg, 1996). Instead, they regularly compete for activities with high value added as the source of high per capita incomes and hence material well-being. While zero-sum-games are indeed exceptions rather than the rule, the rivalry between different business locations can take various forms: First, locations compete *directly* for scarce resources, as is the case with the promotion of inward foreign direct investments. This carries a considerable potential of mutual conflict, e.g. when negotiating the terms of international agreements on investments and trade. Second, most often the competition between locations is *indirect*, trying to provide a favorable business environment in general, or fostering e.g. innovation and productivity growth with a focus on the particular needs of individual sectors. 'Technology races' are a case in point, where an economy's better ability to earn rents from innovation also implies a greater command over scarce resources. Third, a peculiar kind of rivalry originates in the strive for political support and legitimation. By comparing their economic, social and environmental performance, numerous popular benchmarks exploit the governments' ambition to score high in comparison to other countries or regions. By definition, the number of top ranks is limited, hence scarce and incites rivalry. To conclude, competitiveness at the aggregate level is a common and widely accepted concern of economic policy, grounded in various forms of actual competition, whether direct, indirect, or through a general competition for political support and legitimacy.

3 Ontology of change: micro, meso and macro

Krugman's critique of the concept of competitiveness fails to recognize the fundamental relationship between the micro, meso and macro levels of economic development that constitute the basic ontology of evolutionary change as a multi-level process.⁸ Aggregate populations thereby evolve through the changing composition of their individual entities which tend to associate and emerge into structure (Dopfer et al, 2004). From an evolutionary perspective, the economy is generally not in perfect equilibrium with full employment. Instead, economies develop in a permanent succession of disequilibria. For such initial conditions, Figure 1 illustrates the connectedness between the micro, meso and macro levels of economic development with a schematic representation of how changes in competitiveness at one level systematically affect also the competitiveness at each of the other levels. For example, we may assume that all firms in a particular sector become more competitive either in terms of increased profitability, faster growth or improved odds of survival or entry of a new firm. *Ceteris paribus* and by mere aggregation, this will also raise the competitive performance at the meso level of its according industry in that location. Typical measures of performance would be the average profitability of the sector, the growth in sector output and the growth in the number of active firms or an increase in the sector's revealed comparative advantage (RCA). By the same reasoning, the better performance of that industry positively affects the aggregate performance at the level of individual countries or regions. The improved competitiveness may affect aggregate MFP growth, employment and hours worked as well as GDP per hour. Each of those changes will end up in an increase of GDP per capita and hence average income.

But the causal effects do not only move from the micro to the meso and then the macro level through simple aggregation. For example, higher overall income feeds back to the individual firm via increased demand for final and intermediate goods, which will positively affect competitiveness at the firm level. In addition to this positive feedback from the macro to the micro level, the stronger industry performance also raises the potential for positive spillovers (e.g. via knowledge diffusion, or specialized suppliers and labor), thus establishing also a positive feedback from the meso to the micro level.

But there exists no *perpetuum mobile*, and even without assuming perfect equilibrium with full employment there will be negative feedbacks, or trade-offs, from the expanding use of scarce resources. For example, higher incomes at the macro level increase the demand and competition for general inputs of production such as labor, capital or natural resources, and thereby raise their prices. Similarly, the faster growth of a particular industry tends to increase the demand for and the prices of specialized inputs. Consequently, the tighter competition for common but scarce resources weakens the position of firms with a lesser ability to raise the necessary funds relative to those who can better afford to purchase inputs at the elevated price. These negative feedbacks from the macro and the meso level

⁸In philosophy an ontology is about the basic structures of reality and their classification. Relatedly, in information science it defines a set of concepts and categories that represent a subject.

negatively affect the individual firm, but not necessarily the competitiveness of the industry as such. The reason is that higher input prices also foster structural change, driving the less competitive firms out of the market and thereby increasing the share of those with a higher profitability, capacity to grow, etc. At least in the medium to long run, this change in the composition of firms may improve the performance of the industry at the meso level. Relatedly, the competition for general inputs may foster structural change at the meso level and shift the composition of production towards the more productive sectors that create more value per inputs and hence can afford to pay higher prices. In a nutshell, the micro, meso and macro levels of economic development are inextricably interwoven, i.e. interdependent parts of the same reality.

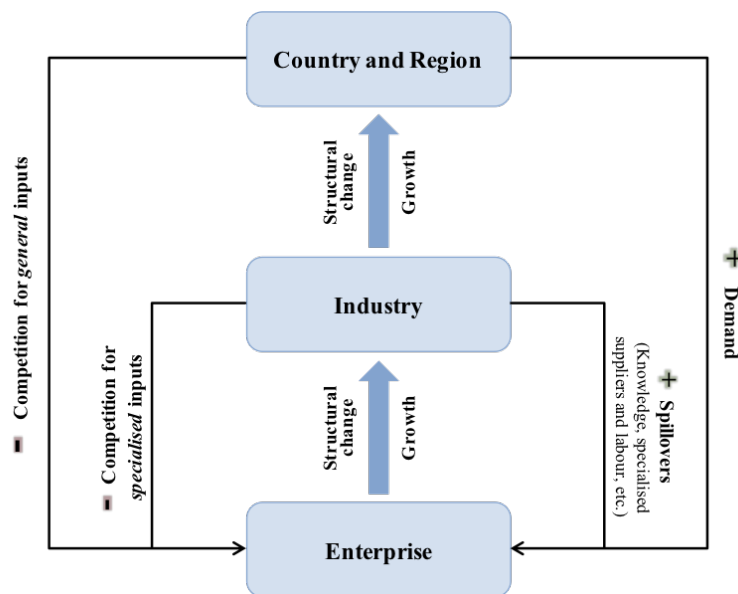


Figure 1: Co-evolution of the micro, meso and macro levels of competitiveness

The evolutionary-structuralist agenda has produced a wealth of literature that provides further specificity to this very general relationship between the micro, meso and macro levels of development. Starting from the bottom upwards, at the micro level the individual processes of creating, maintaining and capturing value from competitive advantage are highly situational and idiosyncratic. While novelty originates in the opportunity-seeking creativity of individual and corporate entrepreneurship, organization and management define the structural context of incentives and decision making, determining which ideas get authorized and funded. The *dynamic capabilities* approach has particularly embraced the evolutionary perspective at the level of strategic management. Merging the idea of Schumpeterian competition with *resource based theories* of the firm in the tradition of Penrose (1959), the focus is not on efficient allocation or contracts, but on how firms create and

capture value within fast moving environments (Teece et al, 1997; Pitelis and Teece, 2009). One core finding is that distinctive competences cannot, in general, be acquired through market transactions, but the firm itself must search, build, integrate and continuously re-configure them. Within complex environments this involves substantial sunk costs from long-term commitments to particular competence domains with the consequence of organizational inertia. Since search tends to be local, typically in the neighborhood of existing knowledge, competencies and routines, history and organization-specific processes of capability accumulation shape the evolution of firms and entire industries (Helfat and Winter, 2011; Helfat, 2018).

At the meso level of firm populations, the study of corporate demography and *organizational ecology* pursues a deliberate evolutionary approach (Hannan and Freeman, 1989; Carroll and Hannan, 2000, Carroll and Khessina (2019). One of its most interesting hypotheses concerns *resource partitioning* among large and small firms, which is more effective in discovering and exploiting varied niches from segmented markets and heterogeneous consumer tastes. It is a compelling instance of how the industry-level composition of heterogeneous firms impacts on the aggregate creation of value. While the micro level explains the sources of variation, consumer tastes and preferences define the selection environment. Of course, these are not independent, but also conditioned by their perception of what variety and quality of goods the firms can offer. In short, the micro and meso level co-evolve with qualitative transformations that relate to changes in the composition of lower-level structural characteristics.

If we finally move towards linking the meso and macro levels of economic activity, Pasinetti (1981, 1993) provided the canonical model of *structural economic dynamics*. Structural variations enter via sectoral differences in technological change and demand elasticities. Both sources are exogenous, but the model elaborates their interaction within a closed economy characterized by macro-economic resource constraints. The main mechanism shows that productivity growth in a particular sector leads to a decline of its relative prices, whereas consumers spend the according gains of real per capita income also on other sectors, depending on their respective income elasticities of demand. While technological change drives the growth of real income, different demand elasticities determine the sectoral composition of production, which in turn affects the weight of further productivity gains of a sector in aggregate growth.⁹

The upshot is that aggregate populations must evolve through structural changes in favor of more productive activities, and thereby raise the average ability to alter the given material constraints. Consistent with our definition of competitiveness, this directly relates to an economy's capacity to earn high and sustainable per capita incomes by adapting to qualitative transformations of the system as well as actively managing them.

⁹In the meantime, manifold extensions of Pasinetti's multi-sector model have flourished. To give an example, Araujo and Lima (2007) highlight how the combination of sectoral specialization and aggregate income affect the elasticity ratio of export *vs* import demand and thereby the economy's overall growth path. Among further examples, see Cimoli and Porcile (2011) or Araujo and Trigg (2015).

4 System functions: The logic of public intervention

4.1 Rationalities of ‘failure’

Theoretic rationales of economic policy start from the basic dichotomy of arguments for or against public intervention. On one side of the debate we find arguments in support of free markets and laissez-faire, who lay much emphasis on ‘government failures’, typically cast in terms of agency problems that make room for bureaucratic inefficiencies or regulatory capture by vested interests.¹⁰ On the other side of the debate, the supporters of public interventions invoke either the common rationales of ‘market failure’, or alternatively refer to notions such as ‘system failure’ and ‘strategic failures’ in policy making.¹¹ These *rationalities of failure* are generally well defined and obviously have their true points: Government failure is omnipresent. If taken literally, market failure is equally ubiquitous, simply because the idea of perfect competition represents a hypothetical ideal state that is generally untenable in real business. Also, the notion of system failure correctly addresses blind spots in the previous arguments, for instance, by paying attention to barriers of cooperation and knowledge flows between relevant actors and organizations. Finally, strategic failure can result from the government’s lack of understanding that there are multiple potential equilibrium solutions or how their policy choices can affect their actual realization. However, because these rationales are so ubiquitous, they regularly apply simultaneously. Despite their theoretical rigor, in practice, they regularly leave policymakers to make informed judgemental decisions.

Moreover, it is particularly revealing that all the rationales refer to *failures* in order to legitimize, motivate, or discard public interventions. Can we think of other areas in which we accept such a *logic of failure* to motivate human actions? Probably not. It is rather a very peculiar attitude of our profession that accordingly calls for an explanation. In short, economists learn to accept the ideal of hypothetical perfect states as a normative benchmark. This directly relates to our preoccupation with welfare economics. What has been developed there for good analytical purposes, has by means of routinized exposure in the textbooks and habit in the scientific discourse become so deeply engrained in our canon, that it is mostly taken for granted without initiating much further reflection. Or who, in the realm of policy debate, has taken seriously the implication of Arrow’s (1950) *impossibility theorem*, which demonstrated that neither political voting nor the market mechanism can create optimal social choices in the sense of a rational and consistent aggregation of the preferences of sovereign individuals:

“The failure of purely individualistic assumptions to lead to a well-defined social welfare function means, in effect, that there must be a divergence between social and private benefits if we are to be able to discuss a social optimum. Part of each individual’s value system must be a scheme of socio-ethical norms, the realization of which cannot, by their nature, be

¹⁰Tullock (1967), Krueger (1974).

¹¹See, e.g., Smith (2000) or Cowling and Tomlinson (2000).

achieved through atomistic market behavior” (Arrow, 1950: 343).

Other paradoxes and inconsistencies in the aggregation of individual preferences have since cropped up.¹² For instance, Jackson and Yariv (2014, 2015) point at the systematic bias towards the present, and showed that with heterogeneous time preferences any Pareto and non-dictatorial method of aggregation must either be time-inconsistent or intransitive.

To conclude, the frequent assumption of an all-powerful, omniscient and benevolent dictator, who appears in numerous policy models, is not that innocuous as generally perceived. It does not, as many believe, merely abstract from the obvious difficulties of policy implementation, but avoids to admit the theoretical impossibility to determine the public intervention by the benchmark of a reasonably defined and unique social welfare optimum. This is even more the case when we turn to dynamic and open systems. Their normative yardsticks of hypothetical perfect states are ill-defined, and thus the heuristic of ‘failure’ is a poor basis for public intervention. In contrast, competitiveness policy requires a dynamic rationale instead of the traditional static argument of allocative efficiency. Based on the distinct heuristic of economic development, the key question to start with is not what ‘failure’ a policy needs to fix, but *what goals it wants to achieve*.

4.2 Ability to evolve

As defined in the beginning, competitiveness policy aims to foster economic development, which is tantamount to the objective of enabling and molding evolutionary change. At the most general level, and consistent with a wide array of authors,¹³ evolutionary change is characterized by the simultaneous interplay of the three elementary principles of *variation*, *cumulation*, and *selection*. They are not meant as an analogy from the natural sciences, but represent a higher level of abstraction (a meta-theory), which can characterize the time behavior of many different systems and forms. It, therefore, goes without saying that the evolution of a socio-economic system is not a process of natural selection, but one of *cultural evolution* (Dopfer, 2016; Dopfer and Nelson, 2018). But irrespective of the manifold differences among their specific realizations, no system can evolve if either of the three functions is missing. In short, novelty and the according variety are requisite to any change, accumulation introduces the dimension of time and renders the system dynamic,¹⁴ and finally, selection channels the process towards altering constraints. The selection environment is where scarcity, and hence competition and competitiveness, come into play.

Table 1 further illustrates the requisite nature of these functions for evolutionary change. None of them raises much analytic interest, if considered alone. A common example for

¹²Blackorby and Donaldson (1990).

¹³See Veblen (1898), Nelson and Winter (1982), Hodgson (1993, 2002), Metcalfe (1994, 1998), Aldrich et al (2008), or Winter (2014). For a critical view, see Witt (2008), Buenstorf (2006) and Cordes (2006).

¹⁴The emphasis on ‘accumulation’ is owed to the interest in economic development and growth of real income. Other disciplines use different terms, such as ‘reproduction’ in biology, ‘integration’ in sociology (Luhmann, 1997), or ‘retention’ in institutional economics (Hodgson, 1993).

pure variation is *white noise*, where any observation $y_t = \epsilon_t$, and ϵ_t is an independently distributed random variable of zero mean. Without selection, there is no scarcity and hence no economic interpretation. The same applies to mere accumulation, for instance, the deterministic but *blind growth* by a constant factor a , where $y(t) = y_0 e^{at}$. Finally, pure selection without variety has nothing to operate upon. We may call this state *stasis*. For illustration, consider the general selection dynamics

$$\frac{dx_i}{dt} = x_i(f_i - \phi), \quad (1)$$

where x_i is the frequency of type i , which increases (decreases), if its fitness f_i is higher (lower) than the average fitness of a population ϕ . Without variety, f_i must be equal to ϕ . Hence, there won't be any change in the frequencies, or other dynamic behavior. Still, this description can be of practical importance, since systems may get locked into such a situation, if selection has previously consumed all of its requisite variety and no (endogenous) source of novelty refuels the process.

When two of the elementary principles apply, complexity increases and some familiar characterizations emerge. First, we consider variation in combination with accumulation, while no principle of selection applies. Again, the lack of selective constraints implies that this system is not subject to any economic interpretation. The typical example would be a *random walk*. In the simplest case, the time series is determined by the expression $y_t = y_{t-1} + \epsilon_t$ with ϵ_t being a random source of variation and y_{t-1} representing the cumulative and time-dependent nature of the system. If we add a constant trend component d , the process $y_t = y_{t-1} + d + \epsilon_t$ is called *random drift*.

We can similarly imagine a system in which only the two elements of variation and selection interact, but no accumulation takes place. This would correspond to a *stationary state* such as in the familiar static equilibrium models. The lack of accumulation means that the system is invariant with respect to time. Variations only cause fluctuations around a certain equilibrium configuration determined by the selective constraints. The crucial assumption is that at any point in time, the probability distribution p of the variable y_t remains the same: $p(y_t) = p(y_{t+m})$. Perfect competition achieves exactly that by assuming the strongest possible mechanism of selection, which instantaneously eliminates any deviations from the optimal equilibrium solution.

Steady state growth is a convenient example of the interaction of cumulation with selection. It is the foremost starting point for breaking through from a stationary state to a dynamic system and implies that in equilibrium the various quantities grow at constant rates. Stochastic variations may exist (as with the aforementioned stationary state), but consistent with their macroeconomic focus, the models do not depict variation with a continuing effect in the sense of structural changes.¹⁵ Theories of endogenous growth also rely

¹⁵Note that Hicks refused to consider them dynamic: "I do want to say that perfect foresight models, such as steady state models, really are static. Although there are differences between one moment of time and another, they have so much in common that the thing really remains static" (quoted in Klammer, 1989,

Table 1: General characterization of system dynamics

	Variety → <i>Change</i>	Cumulation → <i>Time</i>	Selection → <i>Direction</i>
<i>Stochastic</i>			
Stasis	-	-	+
Blind growth	-	+	-
White noise	+	-	-
Static equilibrium	+	-	+
<i>Structural</i>			
Random walk/drift	+	+	-
Steady state growth	-	+	+
Evolutionary change	+	+	+

Source: Peneder (2001).

on the framework of steady-state equilibrium analysis, thereby eschewing the even more complex dynamics of evolutionary change.¹⁶

This brings us to our final characterization of *evolutionary change* as the simultaneous interplay of all three functions. At its most general, consider a constant population of $\vec{x} = (x_1, \dots, x_n)$ units of selection, let's say individual firms. These are carriers of either of $i = 1, \dots, N$ distinct information sets, let's say different production systems. Firms may change from system j to system i with probability q_{ji} . The transition matrix $Q = [q_{ij}]$ is stochastic and quadratic ($n \times n$). Innovation, i.e. the introduction of a novel production system, corresponds to a change of frequency x_i from 0 to 1. Other changes in the frequencies represent the further diffusion, decline, or extinction of a production system.

Selection occurs over the simplex S_n , i.e. $\sum_{i=1}^n x_i = 1$, and production systems have different fitness values f_i . Changes in the frequency of particular production systems depend on their advantage or disadvantage relative to the average fitness of the population $\phi = \sum_{i=1}^n x_i f_i$. If fitness values depend on the frequency distribution of production systems

p. 173).

¹⁶See Aghion and Howitt (2009) for models of innovation as an endogenous driver of Schumpeterian *growth*. This is nevertheless different from Schumpeterian *development*, with its additional emphasis on structural change among heterogenous populations.

\vec{x} , a fundamental equation of evolutionary change (Nowak, 2006) can be expressed as follows:

$$\frac{dx_i}{dt} = \sum_{j=0}^n x_j f_j(\vec{x}) q_{ji} - \phi x_i. \quad (2)$$

Such models typically offer no closed solution, but require the use of analytic simulations (e.g., Caiani et al, 2014; Dosi et al., 2014). Note that the neoclassical equilibrium with perfect competition characterizes a special case, where all firms simultaneously know about a new technology, can adopt them (or enter and exit the market) without cost, and must immediately do so. Otherwise, consumers can instantaneously and without cost shift to the most competitive rival. Since these assumptions don't allow for any meaningful differences in the relative fitness of the firms, the entire dynamic of this equation, i.e. the structural changes in the frequency distribution of the population won't occur.

In contrast, with evolutionary change firms must continuously search their fitness landscape, which is a time-consuming process of learning, often by means of costly trial and error. Hayek (1945) already characterized market competition as a discovery process, which effectively co-ordinates the largely decentralized knowledge about supply and demand. But thinking of the above selection equation, market competition additionally fosters learning about one's own competitive advantage, helping to specialize in activities that congrue with one's actual relative strengths and weaknesses. In their pursuit of favorable resource niches, populations thus tend to 'move uphill', i.e. find or adopt information sets with higher fitness values. Since the variety of behavior is not instantaneously selected away by any rule of perfection, novel ideas enjoy a certain margin of error. This permits experimentation and the accumulation of more complex information sets through learning. Selection still operates in favor of production systems that are more effective in altering given scarcities. In the sphere of cultural evolution, this means foremost the deliberate search and adoption of better rules and practices through learning. Where such capabilities are constrained, differential growth, or the dynamics of entry and exit will take its place (Nelson and Winter, 1982; Metcalfe, 1998).

5 Fitting the pieces: An integrated classification

Combining the target levels and system functions of economic development, one can organize a fairly comprehensive variety of different public interventions into a concise and meaningful typology of competitiveness policies, as shown in Table 2. To begin with the distinction between the micro, meso and macro levels of development, (i) *enterprise policies* address individual firms, whereas (ii) *structural policies* target intermediate levels of aggregation, such as specific industries, technologies, clusters, or networks and (iii) *framework policies* comprise economy-wide regulations and institutions, infrastructure, as well as public interventions for macroeconomic stabilization. At each target level, concrete policies

aim to serve the basic system functions of (i) resurrecting requisite varieties by means of *novelty*, (ii) the accumulation of *productive resources*, or (iii) shaping the selection environment through *markets* and *regulations*. The various elements are interdependent and co-evolve within complex, path-dependent and non-deterministic processes (Arthur, 2014). Though the different functions and target levels must consequently overlap in terms of specific organizational bodies and institutional arrangements, this is not to detract from their characteristically distinct logic of public intervention.

A few examples may illustrate the point. If we begin with the system function of introducing *novelty* to the system, one can apply the common convention of distinguishing between research, technology and innovation policies in terms of our micro, meso and macro structure of the target levels. Research policy then addresses the macro-level framework of R&D without directly discriminating between particular firms, sectors or technologies. The emphasis is typically more on basic research and scientific excellence rather than business applications and immediate economic returns. Political savvy in terms of the ability to promote an agenda and to assert one's claim for public resources, legal expertise together with a thorough understanding of how rules and regulations affect the incentives within the research community are distinctive competences needed at this level of policy making. In contrast, technology policies target particular fields of activity, such as certain general purpose technologies, and directly intervene in their favor. Typically, they address basic and applied research. Pursuing the same overall function of introducing novelty to the system, the target communities, instruments, tools and required expertise are nevertheless fundamentally different from the former activities at the macro level. Strategic planning and the ability to set priorities among different technology fields are distinctive competences. For the selection of proper targets, policy puts much emphasis on science-industry relationships and the involvement of stakeholders. Finally, at the micro level, innovation and start-up policies address individual enterprises, which may, for example, apply for grants, preferred loans, guarantees, or equity-related instruments provided by specialized promotion agencies. The focus accordingly shifts from basic to applied research and the establishment of new enterprises. A key competence is in handling individual projects, e.g. by offering a fair, efficient and accurate selection among submissions. This requires specific process knowledge and a reasonable ability to understand and evaluate heterogeneous projects.

If we turn to the second general system function, i.e. the *accumulation of productive resources*, investment in its various forms is the key concern and framework policies at the macro level dominate the picture. Monetary policy is relevant given that the non-neutrality of money with respect to real output directly relates to the evolutionary-structuralist perspective.¹⁷ Fiscal policy uses taxes and public spending to affect, for example, returns on investment, disposable income, or incentives to work, as well as to stabilize expectations about future demand. At the meso level, strategic considerations can trigger public

¹⁷Peneder and Resch (2021).

spending targeted to specific locations and activities, such as the provision of advanced transportation systems, communications networks or specialized educational facilities as well as targeted programs to foster the diffusion of new technologies, each adapted to the needs of local industries and clusters of related activities. At the micro level, most policies that target individual enterprises relate to the funding of investments, for instance by means of subsidized loans, guarantees or equity instruments. Many initiatives target small and medium-sized enterprises, venture capital, exports, or underprivileged groups (e.g. minorities, women, people in distressed areas). In a dynamic perspective, the tricky challenge for policy is to help kick-start a process, but to get out of the way when private initiatives start to develop.

Table 2: General typology and examples of an integrated Competitiveness Policy

Target level	System functions		
	<i>Novelty</i>	<i>Resources</i>	<i>Markets & regulation</i>
Micro	Innovation & start-up policy	ENTERPRISE POLICIES Subsidies, micro-credit, venture capital, etc.	SWFs, public procurement
Meso	Technology policy	STRUCTURAL POLICIES Targeted investment & diffusion schemes, regional clusters	Competition policy, trade policy, sector regulations
Macro	Research policy	FRAMEWORK POLICIES Monetary- & fiscal policy, infrastructure, education	Economic integration, environmental-, social- & labor regulations

Source: Peneder (2017).

Finally, public policy shapes the *selection environment* in many ways. At the macro level, far-reaching choices regard the kind and degree of economic integration. While not easily explained in terms of market failures, levelling the selection environment among otherwise segmented markets is arguably one of its distinctive goals.¹⁸ In addition, there

¹⁸Integration strongly interacts with the other functions. Besides the productivity enhancing effects of

are all kinds of social, labor, environmental and other regulations that shape the selection environment by defining by what means firms are allowed or not allowed to compete.

Many policies affect the selection environment at the meso level. For instance, trade agreements specify very detailed rules for different industries. The same applies to the many detailed product regulations. Moreover, competition policy deliberately aims to enhance the efficiency of selection in the economic system and seeks to protect consumers and potential new entrants from the abuse of market power by incumbent firms. One of its biggest challenges is to balance the trade-off with the function of introducing novelty, where temporary monopoly rents from innovation are the primary incentive to invest resources in R&D and related activities.¹⁹ Policies that interfere with the selection process by addressing individual enterprises are a particularly discriminating form of intervention. State ownership and picking-the-winners type industrial policies are notorious cases that recall many historical examples of government failure. But in the wake of globalization, the rapid growth and expansion of sovereign wealth funds has also altered the picture in recent years. Public procurement is another notable instance. It draws least attention, where it is most common, i.e. with regard to favoring local content in the regular procurement of goods and services by (local) governments and public organizations. From a dynamic perspective, maintaining a varied and differentiated ecology of firms can be a valid goal of regional development, and especially in distressed regions may well dominate pure efficiency considerations. However, the economic cost of restricting one's supply base by way of privileges to firms with a local representation increases with economies of scale and technological complexity.

6 Summary and conclusions

This short paper summarises the evolutionary concept of competitiveness policy as driver of Schumpeterian development, characterized by the combination of growing real incomes and qualitative changes of the socio-economic system. Proposing a distinct dynamic logic of public intervention, it aims to reconcile the theoretic rationales of economic policies with the actual concern of most public agencies in practice. In summary, we can highlight the following findings:

- First, the analysis has shown that the conventional critique on the notion of competitiveness for aggregate economies ignores the fundamental relatedness between the micro, meso and macro levels of development. Rather than passively adapting to given factor endowments and according comparative advantages, locations compete

increased competition, the larger markets offer bigger opportunities for economies of scale and specialization, hence raising the incentives for investment, including innovation. Policies range from pegging one's currency to that of a major trading partner, various multi- and bilateral agreements on trade, FDI, or intellectual property rights, up to the EU's Single Market Programme.

¹⁹Aghion et al (2005), Peneder and Woerter (2014), or Pyka and Nelson (2018).

for favorable business conditions to generate higher incomes and living standards by creating and capturing more value within the global systems of production.

- Second, economists show a peculiar attachment to ‘rationalities of failure’, be it either of markets, governments, or systems. It originates in our habit to accept hypothetical perfect states as normative benchmarks, inherited from the canon of static welfare optimization. This stands in contrast to a dynamic logic of intervention, which should target the functions that we aim to accomplish within an open system.
- Third, by matching different target levels with the functional principles of evolutionary change, the resulting classification of economic policies allows to better coordinate and direct them toward their common development goals. More specifically, for each type of intervention, it substitutes the conventional ‘rationality of failure’ in terms of allocative efficiency by its particular dynamic function to enhance the system’s ability to evolve.

While many economic policy measures can also be reasoned with the traditional rationale of market failure, the situation resembles a *tilted image*: Once one acknowledges the dynamic function of these policies and their orientation towards economic development, the efficiency-based logic of failure appears uncomfortably forced. Moreover, it cannot provide an integrated perspective. Allocative efficiency is generally not their constitutive purpose, but more an intellectual bracket to align common policy sense with the theoretical canon. The uneasiness of this match has greatly contributed to the widening gap between politics and economic research. In contrast, the contribution of the various policies to a well-performing socio-economic system, reasonably efficient in the short run, but more importantly capable of development in the long run, can better provide for a unifying goal. It is also more consistent with how people working in the various policy agencies perceive themselves and their contribution to society. The switch of perspective from the canonical rationalities of failure towards the system’s ability to evolve thus creates the opportunity for a novel, more realistic and better-integrated understanding of economic policy.

But what does all this say about when governments should or should not actually intervene? Aren’t we losing the clear guidelines typically offered by the simpler rationale of market failure? In short, the dynamic perspective is necessarily more comprehensive. It offers more complex answers but in reply to deeper questions. However, the core of the market failure argument is easily taken on board by the even more straightforward rule of *opportunity costs*: If private markets are more efficient than governments in accomplishing a certain task, then don’t waste public resources on it that can create more value in other uses. Given the scarcity of public resources, a positive net gain in welfare thus need not be sufficient to justify a particular initiative. Instead, governments must set priorities according to their anticipation of the relative benefits and costs with respect to their overall development goals.

Table 3: Different time horizons of competitiveness policy: selected examples

Time horizon	Change in framework conditions	Adaptive system response	Policy objectives
Short-term	Fluctuations of demand, exchange rates, prices, etc.	Profit margins, wages, public spending, monetary policy, etc.	Attenuation of cyclical fluctuations and crises (jobs, production, prices)
Medium-term	Technology (standards etc.) Globalization (e.g. value chains)	Innovation, education & training, investment, internationalization	Productivity, full employment, market shares, resource efficiency
Long-term	Artificial intelligence, societal demands, climate change	Education, public infrastructure, environmental and health standards, etc.	High real incomes, social inclusion and participation, decarbonization

Source: WIFO.

Finally, an integrated and dynamic perspective cannot ignore the fact that both synergies and conflicts arise between different dimensions of competitiveness. To ensure that long-term goals are not neglected in favor of the ever more pressing short-term needs, competitiveness requires the simultaneous consideration and balancing of different *time horizons*, as shown in Table 3.²⁰ In the short term, the focus is on the system's capacity to adapt to changing framework conditions. Imbalances should be avoided and macroeconomic stability maintained by either constraining or mobilizing current spending. Typical empirical measures are, for example, real effective exchange rates, unit labor costs, inflation, or the current account balance. Monetary policy, fiscal policy and wage policy are among the most important macroeconomic tools of public intervention. In the medium term, the core objectives regard the dynamics of the economic system, which is reflected

²⁰The present distinction by time horizons originates in the joint work with Thomas Url, Angela Koepl, Peter Mayerhofer and Thomas Leoni; see <https://www.wifo.ac.at/jartprj3wifomain.jart?rel=en&content-id=1568136628866&reserve-mode=active>.

both in productivity growth and in the goals of full employment, high market shares in exports and improvements in energy and resource efficiency. Key determinants include innovation, investments, internationalization as well as competition and regulation. Finally, in the long term, the quality of life must be at the center of attention. Priorities are sustainable high real incomes, social inclusion and participation as well as the improvement of the natural environment and the avoidance of irreversible climate change. Advancing the implementation of these goals simultaneously with all other objectives thus remains one of the greatest challenges of competitiveness policy.

References

- Aldrich, H.E., Hodgson, G.M., Hull, D.L., Knudsen, T., Mokyr, J., Vanberg, V. 2008. In Defence of Generalized Darwinism, *Journal of Evolutionary Economics* 18, 577-596
- Aghion, P., Bloom, N., Blundell, R., Griffith, R., Howitt, P. 2005. Competition and Innovation: An Inverted-U Relationship, *Quarterly Journal of Economics* 120, 701-728
- Aghion, P., Howitt, P. 2009. *The Economics of Growth*, MIT Press, Cambridge MA
- Araujo, R.A., Lima, G.T. 2007. A Structural Economic Dynamics Approach to Balance-of-Payments-Constrained Growth, *Cambridge Journal of Economics* 31, 755-774.
- Araujo, R.A., Trigg, A. 2015. A Neo-Kaldorian Approach to Structural Economic Dynamics, *Structural Change and Economic Dynamics* ...
- Arrow, K., 1950. A Difficulty in the Concept of Social Welfare, *Journal of Political Economy* 58 (4), 328-346
- Arthur, W.B. 2014. *Complexity and the Economy*, Oxford University Press, Oxford
- Blackorby, C., Donaldson, D. (1990), The Case Against the Use of the Sum of Compensating Variations in Cost-Benefit Analysis, *Canadian Journal of Economics* 23 (3), 471-494
- Buenstorf, G. 2006. How Useful Is Generalized Darwinism as a Framework to Study Competition and Industrial Evolution?, *Journal of Evolutionary Economics* 16 (5), 511-527
- Caiani, A., Godin A., Lucarelli S. (2014), A Stock Flow Consistent Analysis of a Schumpeterian Innovation Economy, *Metroeconomica* 65 (3), 397-429
- Cantner, U., Pyka, A. 2001. Classifying Technology Policy from an Evolutionary Perspective, *Research Policy* 30 (5), 759-775
- Carroll, G.R., Hannan, M.T. 2000. *The Demography of Corporations and Industries*, Princeton University Press, Princeton
- Carroll, G.R., Khessina O.M., 2019. Organizational and Corporate Demography, in: *Handbook of Population* (Second Edition), Poston D.I.Jr. (ed.), 521-554, Cham, Switzerland: Springer Nature.
- Cimoli, M., Porcile, G. 2011. Global Growth and International Cooperation: A Structuralist Perspective, *Cambridge Journal of Economics* 35, 383-400
- Cordes, C. 2006. Darwinism in Economics: From Analogy to Continuity, *Journal of Evolutionary Economics* 16 (5), 529-541
- Cowling, K., Tomlinson, P.R. 2000. The Japanese Crisis – A Case of Strategic Failure?, *Economic Journal* 110, F358-F381

- Dopfer, K. 2016. Evolutionary Economics, in: Faccarello, G., Kurz, H.D. (eds.), *Handbook of the History of Economic Analysis*, Vol. III Development in Major Fields of Economics, Chapter 14, Cheltenham UK: Edward Elgar.
- Dopfer, K., Foster, J., Potts, J. 2004. Micro–Meso–Macro, *Journal of Evolutionary Economics* 14 (2), 263-279
- Dopfer K., Nelson R.R., 2018. The Evolution of Evolutionary Economics, in: Nelson R.R., Dosi G., Helfat C.E., Pyka A., Winter S.G., Saviotti P.P. Lee K., Malerba F., Dopfer K. (eds.), *Modern Evolutionary Economics*, Cambridge UK: Cambridge University Press, 208-229
- Dosi, G., Napoletano, M., Roventini, A., Treibich, T. 2014. Micro and Macro Policies in the Keynes + Schumpeter Evolutionary Models, OFCE Working Paper 2014-19
- Fagerberg, J. 1996. Technology and Competitiveness, *Oxford Review of Economic Policy* 12 (3), 39-51.
- Hannan, M.T., Freeman, J. 1989. Organizational Ecology, *Harvard University Press*, Cambridge MA
- Hayek, F.A. 1945. The Use of Knowledge in Society, *The American Economic Review* 35, 519-530
- Helfat C.E. 2018. The Behavior and Capabilities of Firms, in: Nelson R.R., Dosi G., Helfat C.E., Pyka A., Winter S.G., Saviotti P.P. Lee K., Malerba F., Dopfer K. (eds.), *Modern Evolutionary Economics*, Cambridge UK: Cambridge University Press, 85-103
- Helfat C.E., Winter S.G. 2011. Untangling Dynamic and Operational Capabilities: Strategy for the (N)ever-changing World, *Strategic Management Journal* 32, 1243-1250.
- Hodgson, G.M. 1993. *Economics and Evolution. Bringing Life Back to Economics*, Polity Press, Cambridge UK
- Hodgson, G.M. 2002. Darwinism in Economics: From Analogy to Ontology, *Journal of Evolutionary Economics* 12, 259-281
- Irwin, D.A. 2004. The Aftermath of Hamilton's "Report on Manufacturers", *Journal of Economic History* 64 (3), 800-821
- Jackson, M.O., Yariv, L. 2014. Present Bias and Collective Dynamic Choice in the Lab, *American Economic Review* 104 (12), 4184-4204
- Jackson, M.O., Yariv, L. 2015. Collective Dynamic Choice: The Necessity of Time Inconsistency, *American Economic Journal: Microeconomics* 7 (4), 150-178
- Jones C.I., Klenow P.J., 2016. Beyond GDP? Welfare across Countries and Time, *American Economic Review* 106 (9), 2426-2457.
- Klamer, A. 1989. An Accountant Among Economists: Conversation with Sir John R. Hicks, *Journal of Economic Perspectives* 3 (4), 167-180
- Krueger A.O. 1974. The Political Economy of the Rent-Seeking Society, *American Economic Review*, 64 (3), 291-303.
- Krugman, P. 1994. Competitiveness: A dangerous obsession, *Foreign Affairs* 73(2), 28-44.
- Krugman, P. 1996. Making Sense of the Competitiveness Debate, *Oxford Review of Economic Policy* 12 (3), 17-25.
- Lipsey, R.G., Carlaw, K.I., Bekar, C.T. 2005. *Economic Transformations*, Oxford University Press, Oxford
- Luhmann N., 1997. *Die Gesellschaft der Gesellschaft*, Frankfurt am Main: Suhrkamp.

- Metcalf, S.J. 1994. Evolutionary Economics and Technology Policy, *The Economic Journal* 104 (425), 931-944
- Metcalf, S.J. 1998. *Evolutionary Economics and Creative Destruction*. The Graz Schumpeter Lectures, Routledge, London
- Nelson, R.R. 2009. Building Effective ‘Innovation Systems’ versus Dealing With ‘Market Failures’ as Ways of Thinking About Technology Policy, in: Foray D. (ed.), *The New Economics of Technology Policy*, Edward Elgar, Cheltenham UK, 7-16
- Nelson, R.R., Winter, S.G. 1982. *An Evolutionary Theory of Economic Change*, Belknap Press, Cambridge MA
- Nowak, M.A. 2006. *Evolutionary Dynamics: Exploring the Equations of Life*, Belknap, Cambridge MA
- Pasinetti, L.L. (1981). *Structural Change and Economic Growth: A Theoretical Essay on the Dynamics of the Wealth of Nations*, Cambridge University Press, Cambridge UK
- Pasinetti, L.L. (1993). *Structural Economic Dynamics*, Cambridge University Press, Cambridge UK
- Peneder M., 2001. Entrepreneurial Competition and Industrial Location, Cheltenham UK: Edward Elgar.
- Peneder M., 2017. Competitiveness and Industrial Policy. From Rationalities of Failure Towards the Ability to Evolve, *Cambridge Journal of Economics* 41, 829-858.
- Peneder M., Rammer C., 2018. Measuring Competitiveness, Report to the European Commission, DG GROW, 2018, Vienna: WIFO.
- Peneder, M., Resch, 2021. Schumpeter’s Venture Money. Oxford: Oxford University Press.
- Peneder, M., Woerter, M. 2014. Competition, R&D and Innovation: Testing the Inverted-U in a Simultaneous System, *Journal of Evolutionary Economics* 24 (3), 653-687
- Penrose E.T., 1959. The Theory of the Growth of the Firm, New York: John Wiley Sons.
- Pitelis, C.N., Teece D.J. 2009. The (New) Nature and Essence of the Firm, *European Management Review* 6, 5-15
- Pyka A., Nelson R.R., 2018. Schumpeterian Competition and Industrial Dynamics, in: Nelson R.R., Dosi G., Helfat C.E., Pyka A., Winter S.G., Saviotti P.P. Lee K., Malerba F., Dopfer K. (eds.), *Modern Evolutionary Economics*, Cambridge UK: Cambridge University Press, 104-128
- Schumpeter J.A., 1909. On the Concept of Social Value, *Quarterly Journal of Economics* (Feb.), 213-232.
- Schumpeter, J.A. 1911. *Theorie der wirtschaftlichen Entwicklung*, 4th edition. Duncker & Humblot, Berlin
- Schumpeter J.A., 1939. Business Cycles, A Theoretical, Historical, and Statistical Analysis of the Capitalist Process, New York: McGraw Hill.
- Schumpeter J.A., 1942/1950. Capitalism, Socialism and Democracy, 3rd edition, New York: Harper & Row.
- Smith, K. 2000. Innovation as a Systemic Phenomenon: Rethinking the Role of Policy, *Enterprise & Innovation Management Studies* 1 (1), 73-102
- Stiglitz J.E., Fitoussi J-P., Durand M., 2018, Beyond GDP. Measuring What Counts for Economic and Social Performance, Paris: OECD.

- Teece, D.J., Pisano, G., Shuen, A. 1997. Dynamic Capabilities and Strategic Management, *Strategic Management Journal* 18 (7), 509-533
- Tullock, G. 1967. The Welfare Costs of Tariffs, Monopolies, and Theft, *Western Economic Journal* 5 (3), 224-232
- Wieser F., 1889/1893. Der natürliche Werth, Vienna (English translation as 'Natural Value'), London: Macmillan.
- Winter, S.G. 2014. The Future of Evolutionary Economics: Can We Break Out of the Beachhead? *Journal of Institutional Economics* 10 (4), 613-644
- Witt, U. 2008. What Is Specific About Evolutionary Economics? *Journal of Evolutionary Economics* 18, 547-575