A Proposal for a 'National Innovation System Plus Subjective Well-Being' Approach and an Evolutionary Systemic Normative Theory of Innovation

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Abstract It is argued that development of a 'National Innovation System plus Subjective Well-being' (NIS+SWB) approach would be a natural extension of current research into innovation systems, 'happiness' research and attempts to develop a normative theory of innovation that tries to avoid what can be called the long-run fallacy of normative innovation economics, i.e. the axiomatic assumption that innovation and economic growth are always desirable. After reviewing the literature on national innovation systems and recent contributions, from diverse literatures, relevant to the development of a normative theory of innovation, some of the implications of a NIS+SWB approach are explored. In particular, it is argued that the approach requires an evolutionary systemic normative theory, because of the systemic and co-evolving nature of both the NIS and SWB. This has to be clearly distinguished from individualistic (micro-level) welfare theory, although both are best seen as complementary. Confusing societal and micro-level analysis is an example of the ecological fallacy. Further, the choice of SWB measure is highlighted. It is suggested that life satisfaction is the currently preferred SWB measure for a NIS+SWB approach. However, more research into a merger of SWB research and Sen's capability approach seems called for. Last but not least, some general implications of a NIS+SWB approach for innovation policy are discussed.

1 Introduction

The development of a normative theory of innovation has become an active area of research in recent years. Fagerberg et al. (2013, p. 1), addressing the evolution and future challenges of innovation studies, argue that ". . ., to recognize that innovation is desirable because of its assumed beneficial effects is not sufficient in itself." As highlighted by, among others, Soete (2013), although there is a widespread

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tendency in the literature to assume that innovation is always good, it does not necessarily benefit society at large. It might benefit the few instead of the many, or it might lead to unsustainable consumption growth and environmental degradation. Assessing the distribution of rewards of innovation is perhaps the most important issue currently facing innovation researchers (Nelson 2013).

How can this issue be addressed? Considering recent developments in evolutionary economics, the move to go 'beyond GDP' in assessing welfare (Stiglitz et al. 2009; European Commission 2014) and the maturing of 'happiness' or subjective well-being (SWB) research, use of a 'SWB lens' as an additional tool for assessing the impacts of innovation seems a promising, and so far mostly unexplored, way forward. Engelbrecht (2014) proposes a general model of the innovation-SWB nexus and advocates measurement of a wide variety of SWB impacts of not only outcomes, but in particular of *processes*, as an additional indicator in the assessment of innovation and in innovation policy-making.[1] The innovation-SWB nexus is a complex adaptive system, consisting of a number of elements and linkages between them, allowing for complex reverse causality and feedback effects, thereby highlighting many impacts usually neglected in innovation research. Broader societal factors are regarded as framework conditions that impact on the elements and links between them.

A number of other recent developments also indicate that it is timely to explore the relationships between innovation and SWB. Empirical work linking the two is beginning to appear outside of the psychological literature (e.g., Dolan and Metcalfe 2012). Also, the 2013 Global Entrepreneurship Monitor Report (Amorós and Bosma 2014) for the first time links entrepreneurship indicators and SWB measures. Amorós and Bosma (2014, p. 11) find that "... in all regions, entrepreneurs exhibit relatively higher rates of subjective well-being in comparison to individuals who are not involved in the process of starting a business or owning-managing a business." In several economies, 10–30% of the labour force could be considered early-stage entrepreneurs or business owners. If it is correct that they have high levels of SWB, this could raise *aggregate* SWB (ibid., p. 62).

More generally, there is increasing 'hard' evidence on the objective benefits of SWB for a broad range of behavioural traits and life outcomes. For example, De Neve et al. (2013) find that SWB predicts future health, mortality, productivity, and income, after controlling for other possible determinants. SWB seems to be associated with greater cooperation, motivation and creativity, and these are important for success in the workplace and life in general. A moderate degree of SWB seems to be optimal for achieving these effects.

Noting similarities between some aspects of the general model of the innovation-SWB nexus and the National Innovation Systems (NISs) approach, Engelbrecht (2014) suggests that an exploration of the relationship between the model and the literature on NISs might be a promising area of further research. This paper begins to explore more closely the rationale for a NIS+SWB approach and tries to draw out

[1] On the importance of procedural utility for human well-being, see Frey et al. (2004).

some of the general implications for the development of a normative theory of innovation.

The chapter is organised as follows. Section 2 reviews the NIS approach. It discusses some of its basic features, perceived strength and weaknesses, and some normative and policy aspects. Section 3 discusses some recent contributions, from a number of disciplines, relevant to the development of a normative theory of innovation. Section 4 explores how such a normative theory might be integrated with the analysis of NISs to form the NIS+SWB approach. Section 5 provides some concluding comments.

2 The National Innovation Systems Approach

2.1 Basic Features, Perceived Strengths, Weaknesses and Challenges

The NISs approach builds on the insight that in modern economies, innovation is ubiquitous and the outcome of many interactions and interactive learning among individuals and organisations that are shaped by the (mostly national) institutional framework. It adopts a systems perspective where elements are linked in many different ways, that include many feedback effects, creating distinctive national innovation system 'patterns' (Johnson and Lundvall 2013). There are many, often similar, definitions of NISs focussing on the complex, interactive, dynamic and systemic character of innovation and the important role of learning processes and government policies.[2] Although they appear to be fairly comprehensive, it is less clear what the elements and linkages contained within the NIS are or should be (Edquist 2005). From the start, this created diversity within the approach.

Edquist (2005, pp. 184–186) summarises the strengths and weaknesses of the innovation systems approach as follows. Its strengths are that it (a) places innovation and learning processes at the centre of focus, (b) adopts a holistic and interdisciplinary perspective, (c) employs historical and evolutionary analysis, which makes the notion of optimality irrelevant, (d) emphasises interdependence and non-linearity, (e) can encompass both product and process innovations, as well as subcategories of these types of innovation, and (f) emphasises the role of institutions. Its chief weaknesses are its conceptual diffuseness, i.e. key terms like institutions are defined differently by different authors, its unclear boundaries, and the lack of formal theory. Moreover, given the system features of the approach, even if we knew all of the determinants of innovation, policy can only influence the development of NISs to a limited extent (ibid., p. 191).

[2]The contributions by Freeman (1987), Lundvall (1992a) and Nelson (1993) are commonly credited with having started the by now very large modern literature on NISs. For surveys of the NISs literature, see Balzat and Hanusch (2004), Edquist (2005), Carlsson (2007), Soete et al. (2010), Johnson and Lundvall (2013), Teixeira (2014).

In a new chapter added to the re-print of his classic 1992 book, Lundvall (2010) argues that the wide diffusion of the NIS concept, both in academic and policy-making circles, has distorted its original meaning. A narrow focus on R&D and science too often seems to dominate, incorrectly suggesting that experienced-based learning and tacit knowledge have become less important over time. Lundvall (2010) remains convinced that a broader view is needed if we want to understand innovation and its impacts.

Johnson and Lundvall (2013) see five main challenges for future NISs research. *First*, it needs to further improve our understanding of learning, capability building and innovation, in particular how they interact and how to better combine learning processes based mostly on codified knowledge and mostly on tacit knowledge. *Secondly*, future research needs to provide a better understanding of how work organisation (i.e. the 'learning organisation') affects innovation. This is a central topic for NISs research because work organisation differs greatly between countries. *Thirdly*, future research needs to focus on welfare and inequality in society. Building on Sen's capability approach, Johnson and Lundvall (ibid., p. 1344) emphasise that "learning capability is the most dynamic of the human capabilities, and it is conditioned by national institutions . . . an uneven access to learning and competence improvement is a central dimension to inequality". *Fourthly*, the interrelationships between the NIS and regional and urban innovation systems warrant further analysis. *Fifthly*, there is a bias in NISs research that regards innovation as progress. Future NISs research needs to be better able to analyse system failure, i.e. cases where user-producer relationships and the institutional framework lead to unsatisfactory paths of innovation. We suggest that adoption of a NIS+SWB approach would go some way towards meeting these challenges.

2.2 *The Normative Dimension of National Innovation Systems: From Long-Run Fallacy to. . .?*

Advocates of the NISs approach have long struggled with its normative dimension. For example, Lundvall (1992b, pp. 6–8) acknowledges that there seems to be a broad social acceptance of international competitiveness and economic growth being the main goals. However, he already argued that we must go beyond this. In particular, the trade-off between growth and environmental sustainability needs to be taken into account.

Despite these comments, other NISs researchers, and innovation and growth researchers in general (i.e. be they neo-classical or not), have subscribed to a mostly uncritical 'innovation and economic growth are good' view. This view can be called the long-run fallacy of normative innovation economics.[3] It is usually

[3]There are exceptions. Witt (1996), e.g., recognises the trade-off between long-term (economic) gain and short-term pain for some members of society and suggests a contractarian approach to navigate the trade-off.

regarded as self-evident, i.e. axiomatic, in light of the rise in general living standards in developed countries over the last two centuries, or what Witt (1996) calls 'Schumpeterian progress'. McCloskey (2013, p. 1710) puts this view harshly by arguing "the historical facts speak loudly enough. Clearly, *some* people are hurt by economic change, every time." However, the "Win-Win-Win-Win-Wins far outnumber the lone Lose" (ibid.). She then seems to argue that anyone objecting to this must be a Neo-Luddite!

The long-run fallacy comes close to assuming that the ends justify the means, even if the means greatly impact negatively on some people in the present and the beneficiaries are members of future generations.[4] Suffice to say, even while subscribing to such a view, many researchers have pointed out that performance measurement is a major challenge for the NISs approach (Carlsson et al. 2002; Fagerberg 2013; Lundvall 2013; Nelson 2013; Soete 2013).

In a recent survey of the NISs literature based on a quantitative description using bibliometric analysis, Teixeira (2014) argues that the NISs approach has not yet converged on an integrated analytical framework. This reflects persistent methodological weaknesses, in particular the lack of formal and diversified quantitative methodologies for assessing the performance of NISs.[5] This echoes earlier assessments of the NISs approach (e.g., Balzat and Hanusch 2007). We would argue there are good reasons for this state of affairs, a major one being the lack of an appropriate normative theory of innovation.

Teixeira (2014) agrees with Dodgson et al. (2011) that the current weaknesses of the NISs approach are likely to result in ill-defined policy design and evaluations. In particular, Dogson et al. (ibid.) argue that despite acknowledging the importance of national differences for innovation, innovation policy prescriptions still tend to be uniform and related to addressing market failure that are applicable in all nations at all times. Using the case of Australia as an example, they argue that notions of system failure, instead of just market failure, can improve future policy-making.

These views about policy are similar to those expressed earlier by, e.g., Nelson and Winter (1982), Metcalfe (1995, 2007), Nelson (2009), Malerba (2009). They are based on well recognised basic properties of evolutionary economics that eschew neo-classical economic notions of equilibrium and optimisation, and policies based on them that aim to correct 'market failure' (i.e. deviations from a theoretical optimum) to bring an economy closer to Pareto-optimality. Innovation, by definition, involves extensive externalities and (massive) spillovers. Market

[4]Hanusch and Pyka (2007, p. 277) argue that the future developmental potential of socio-economic systems is the normative principle of Neo-Schumpeterian Economics. Their Neo-Schumpeterian corridor, i.e. a goldilocks development path between bubbles and stagnation, is defined in innovation and economic terms. Although an improvement over the usual long-run fallacy, on its own it seems of limited use when trying to develop a normative theory of innovation.

[5]To give but two examples of quantitative studies, see Guan and Chen (2012) and Castellacci and Natera (2013). In both cases normative aspects are limited to the 'innovation is good' view and methodological features common in neo-classical economic analysis (i.e. efficiency, optimality and maximisation) are adopted.

failure is a misnomer as such 'failures' are an essential feature of innovation (Metcalfe, 2007).[6]

By necessity, i.e. given the characteristics of innovation, NISs are complex evolving systems characterised by path dependence and positive as well as negative feedback effects. As pointed out by Antonelli (2009), individual and systemic path dependence can be identified and articulated. Moreover, the

> . . . architectures of the system into which firms are localized exert a key role in shaping the dynamics both at the aggregate and the individual level. The structure of interactions, the networks of cooperation and communication, the flows of technological externalities, the structure of the markets for products and processes and the forms of competition that prevail in each of them, the geographical distribution of firms, their density in regional and technological spaces, the forms of organization within and among firms, the institutional context are the meso-economic carriers of history and, as such, embody the memory of the system. They change through time, albeit at a slow rate, as a result of the dynamics of agents and of the aggregate . . . *[and]* act as a filter between the dynamics at the individual and the aggregate level.
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> (Antonelli 2009, p. 639)

This supports the view that analysis at *both* the micro level and system level is not only legitimate but necessary in the context of NISs, and that they should not be confused. Below it will be argued that this applies even more so to the analysis of SWB in a NIS context.

3 Contributions to the Development of a Normative Theory of Innovation

This section briefly discusses some recent contributions, from researchers based in a variety of disciplines, that either try to develop their own normative theory of innovation and/or provide insights that are useful in the context of trying to develop a normative theory for a NIS+SWB approach.

3.1 Some Recent Contributions by Evolutionary Economists: Schubert and Binder

In a series of papers, Schubert (2012a, b, 2013, 2014) argues for an evolutionary theory of well-being that incorporates aspects of SWB and procedural utility, but in

[6]Some neo-classical economists have also recognised the pervasiveness of massive direct and indirect externalities associated with innovation. The prime example is Baumol (2002). He emphasizes the trade-off between innovation and beneficial spillovers, and struggles with Pareto-optimality: Zero spillovers cannot be Pareto-optimal, but there is no one level of positive spillovers that is clearly optimal, or, interpreted differently, they are all optimal (ibid., p. 122).

some ways goes beyond them. Schubert (2012a) proposes a well-being measure based on 'effective preference learning'. This is based on an individualistic viewpoint, i.e. based at the micro level, as Schubert regards system-level views as being at odds with basic tenets of evolutionary thinking. He (ibid., p. 609) sees a resemblance between his notion of well-being and parts of Sen's (1985, 1999, 2009) capability approach. However, he regards his approach as more subjectivist than Sen's.

In another contribution, Schubert (2012b) again strongly argues against the use of aggregate measures of SWB as a proxy for an empirical social welfare function, i.e. as something to be maximised (the hedonic maximisation approach). Instead, he prefers the constitutional approach to SWB politics that focuses on procedural sources of SWB arising from the design of the institutional framework of society, but argues it needs to be extended because the pursuit of 'happiness' transcends procedural utility. More precisely, it should include anticipation of hedonically valuable outcomes (and path-dependency, i.e. the time profile, in general), as well as preference learning.

Schubert and Cordes (2013) introduce a formal model that allows for learning biases that can result in desirable and undesirable paths of preference learning. Their focus is on consumption preferences, and specifically on the negative impacts of status consumption and status races.[7] Schubert (2013) tries to further strengthen his case for effective preference learning, and against the use of SWB, by taking guidance from Schumpeter's writings.

Last but not least, Schubert's (2014) criticism of Generalized Darwinism as a basis for an evolutionary theory of policy-making again focuses on the individualistic versus systemic approach to an evolutionary welfare economics. He criticises Hodgson and Knudsen (2006) as deficient because their approach runs the risk "to ... stress, in a one-sided way, the supra-individual ("systemic") level of welfare to the detriment of the level of individual well-being" (Schubert 2014, p. 500).

To summarise, Schubert makes some valuable points about the dangers of adopting system-level analysis that ignores impacts on the quality of life of individuals and about hedonic maximisation. They need to be taken seriously in the context of a NIS+SWB approach. However, his emphasis on preference learning and on an individualistic approach seems overdone and limiting. We suggest an evolutionary normative theory needs to come to terms with the complex issue of *both* individual and collective (i.e. systemic) 'welfare'. Moreover, Schubert does not make clear how preference learning can be empirically measured. Last but not least, he seems to equate SWB, life satisfaction (LSF), happiness, hedonic well-being and hedonic utility. This is inappropriate as they capture different

[7]Some aspects of their model are confusing. For example, they associate experienced utility (i.e. the hedonic approach) to mean happiness maximisation (Schubert and Cordes 2013, p. 139), and they limit procedural utility to (consumption) preference learning. This seems a major limitation of their theory, a fact they themselves acknowledge when suggesting that what one might call 'procedural utility in the wider sense' (e.g. that derived from work and political participation) could be targeted by policy.

psychological aspects and have different correlates. Engelbrecht (2014) argues for LSF as the appropriate SWB measure in the context of the innovation-SWB nexus. Further evidence supporting this view is presented below in Sects. 3.4 and 4.2.

In contrast to Schubert, Binder (2013) argues that research has progressed to a stage where SWB measures can be used to assess the welfare effects of innovative change. Theories of SWB enable "a nuanced and comprehensive assessment of the effects that innovativeness has on a society" (ibid., p. 561). Binder acknowledges many of the diverse dimensions of the innovation-SWB nexus. For example, he emphasises that impacts at the micro and macro level, as well as production and consumption impacts, have to be taken into account.[8] However, his views on policy are rather hands-off and similar to Schubert's constitutional approach. Policy is to focus on creating the institutional frameworks that allow individuals to pursue SWB.

In a further contribution, Binder (2014) sketches a promising way forward in the development of a well-being theory of innovation, i.e. he suggests using features of Sen's capability framework to enrich the SWB perspective. He is not the first to link SWB with aspects of Sen's capability approach. However, reviewing the relevant literature, he argues that most of the earlier attempts have focussed on incorporating and subsuming SWB into Sen's approach, e.g. by making SWB a valuable functioning.[9] Instead, Binder argues that welfare assessments should be based on the assessment of 'SWB capabilities', i.e. on the substantive opportunity of individuals to achieve SWB. This arguably overcomes some major weaknesses of both the capability and the SWB approaches (i.e. the problem of hedonic adaptation; the lack of an agency perspective of SWB; how to select a list of valuable functionings in the capability approach). Binder does not implement his proposal empirically, and a dynamic perspective of this approach remains to be developed. Furthermore, he continues to advocate an institutional approach to policy and, like Schubert, uses the terms SWB and happiness inter-changeably.

[8]Binder (2013) suggests two evaluation rules to impose some structure on the analysis of SWB impacts of innovation. The 'life domain evaluation principle' restricts analysis to life domains that impact on SWB regardless of context and culture. He mentions health, the social domain and the work domain (ibid., 572). When compared to the model in Engelbrecht (2014), this principle seems like a rather restrictive rule for selecting system elements. Secondly, the 'welfare dynamics principle' aims to impose structure on the analysis over time by taking into account the time dimension of domain-specific hedonic adaptation patterns.

[9]Sen (1999, p. 75) explains the key concepts of his capability approach as follows: "The concept of "functionings,"...reflects the various things a person may value doing or being...A person's "capability" refers to the alternative combinations of functionings that are feasible for her to achieve. Capability is thus a kind of freedom: the substantive freedom to achieve alternative functioning combinations...". 'Alternative functioning combinations' can be interpreted as different lifestyles and capabilities reflect a person's freedom to choose between lifestyles (Clark 2006).

3.2 The Search for a Normative Dimension of Social Innovation and Social Entrepreneurship

Social innovation and social entrepreneurship researchers are also exploring normative perspectives, and some contributions emphasise Sen's capability approach and/or SWB research, but so far this literature seems separate from that of evolutionary economics.

Pol and Ville (2009) suggest a definition of 'desirable social innovation' that includes the notions of quality and quantity of life as integral parts. Quality of life is defined in objective, not subjective, terms, i.e. what they call 'macro-quality of life' that is characterised by "the set of valuable options that a group of people has the opportunity to select" (ibid., p. 882). Pol and Ville include things like material well-being, education opportunities, health, job security, family life, environment, political stability and freedoms. Ziegler (2010) suggests using the capability approach as a normative framework for the assessment of social innovation and social entrepreneurship. He defines social innovation as the carrying out of new combinations of capabilities, and social entrepreneurship as creating such new combinations.

Both Pol and Ville (2009) and Ziegler (2010) explicitly dismiss notions of SWB. In contrast, Wobbe (2012, p. 321) suggests that a 'happiness indicator' might be a relatively simple indicator for monitoring the effects of social innovations, but he does not take this suggestion any further. Mulgan (2012a, b) emphasises the potential importance of *both* SWB and capabilities for assessing the outcomes of social innovation. He argues they "could provide both the theoretical and practical glue to hold social innovation practice together, and provide some common measures of success" (Mulgan 2012a, p. 61).

Furthermore, it should be noted that in the chapter of the World Happiness Report 2013 that focuses on policy implications of SWB research (i.e. O'Donnell 2013), many of the examples from around the world where SWB analysis has influenced policy decisions have led to actions that can be described as social innovation and social entrepreneurship. They include, e.g., government policy and social mobilisation in Brazil to clean up polluted water-ways, improve waste management and train fencers drawn from favelas, and policies in Singapore to improve prison service outcomes for prisoners and society. A strong case can be made for increased collaboration between SWB researchers and social innovation and social entrepreneurship researchers.

3.3 Political Scientists Analysing Subjective Well-Being Across Many Countries

Another strand of research relevant to the development of a normative theory of innovation that is not usually cited by evolutionary economists is associated with Ronald Inglehart, a political scientist, and his co-researchers. They adopt an

evolutionary perspective that links changes in values, agency and freedom to SWB. Using comparable data for large samples of countries collected by the World Values Surveys and the European Values Study, they progressively develop and empirically test evolutionary theories of human development, emancipation, cultural and institutional change (Inglehart and Welzel 2005; Inglehart et al. 2008; Welzel and Inglehart 2010; Welzel 2013).

Some findings from this literature relevant in the current context are: (1) LSF and happiness, i.e. two alternative SWB measures, can move in different directions for significant periods of time, with LSF being more sensitive to economic conditions. In short, the choice of SWB measure matters. (2) Average levels of SWB for entire societies do change; they do not stay fixed. (3) Factors like free choice (Inglehart et al. 2008), agency (Welzel and Inglehart 2010), action resources and freedoms (Welzel 2013) that are closely related to Sen's capability approach are found to be important for SWB, i.e. they have positive impacts on it. (4) There is reciprocal causality between historical, cultural and institutional factors, and SWB. This needs to be taken into account, especially when considering applying the NIS+SWB approach over long time periods. (5) Analysis is usually conducted at both the individual (micro) and societal (country-average) level. Results can and often do differ. It indicates that analysis should be conducted at both levels in order to avoid wrongly assuming that findings at one level also apply at the other. The findings strengthen the case for pursuing the same approach in the context of NIS+SWB. Wrongly assuming that societal level results apply at the individual level is known as the 'ecological fallacy' (O'Dowd 2003).

3.4 Psychologists Analysing Gallop World Poll Data

In a number of recent papers, a group of researchers associated with Ed Diener, a psychologist, re-assess some of the main issues raised in SWB research and explore some new ones using Gallup World Poll data available from 2005 onwards, which are arguably the best SWB data for cross-country comparisons currently available (Diener et al. 2010a, 2013; Tay and Diener 2011). Compared to Inglehart and Welzel's contributions, their approach is more empirical and less aimed at developing an over-arching theoretical framework. Never-the-less, some of their findings are highly relevant. For example, they provide further evidence for the view, advocated in Engelbrecht (2014) in the context of the innovation-SWB nexus, that LSF (or life evaluation[10]) is the more appropriate of the SWB measures for a NIS+SWB approach, despite sometimes appearing contradictory on the issue.

All three studies use three SWB measures, i.e. a life evaluation measure, and positive and negative feelings. Diener et al. (2010a, 2013) re-examine the

[10]In this paper, we regard LSF and life evaluation as synonymous. They arguably assess the same aspects of SWB. This is discussed further in Sect. 4.2.

relationships between SWB measures and income. They re-confirm that life evaluation is closer related to income than are the feelings measures, and that this is somewhat stronger in wealthy countries. Diener et al. (2013) also find this applies to the relationship between life evaluation and changes in income. The implication is that income and LSF are closer inter-twined than often assumed. Interestingly, relative income considerations were found to be based on a mostly global standard of income, not on within-country differences.

The workplace is an important element of the innovation-SWB nexus (Engelbrecht 2014). However, Diener et al. (2010a) relate 'flow' experiences in the workplace, as well as novelty and learning, to positive feelings. This seems highly questionable. Flow occurs when a person's skills are fully engaged in overcoming a challenge that is just manageable (Csikszentmihalyi 1997, p. 30). On theoretical grounds, many positive psychologists argue that flow is more associated with LSF and not with positive emotions like happiness. Csikszentmihalyi (ibid., p. 32) explicitly states that it is "flow, rather than happiness, that makes for excellence in life. When we are in flow, we are not happy, because to experience happiness we must focus on our inner states, and that would take away attention from the task at hand".[11] Seligman (2011, p. 11) argues that "if you ask people who are in flow what they are thinking and feeling, they usually say, "nothing"."

Tay and Diener (2011) address somewhat different questions by focussing on the relationships between the three SWB measures and the fulfilment of needs.[12] They find that basic needs are the strongest predictor of life evaluations. This weakens, but persists, when income is taken into account. Low needs fulfilment is associated with low life evaluation and vice versa. Importantly, they find a difference between life evaluation and feelings measures when it comes to societal need fulfilment:

> . . . a person with a certain level of need fulfilment will have a higher life evaluation if living in a society with high need fulfilment than a person with identical personal need fulfilment living in a society in which needs are not as frequently fulfilled. By contrast, positive and negative feelings appear to be tied to individual-level conditions rather than country-level conditions.
>
> (Tay and Diener 2011, p. 360)

The authors conclude there are universal need predictors of well-being, i.e. needs and the three measures of SWB are closely related, but they display different patterns. Focussing on life evaluation, lack of needs is found to lead to low

[11]This is easily illustrated by some examples: "If a rock climber takes time out to fell happy while negotiating a difficult move, he might fall to the bottom of the mountain. The surgeon can't afford to feel happy during a demanding operation, or a musician while playing a challenging score" (Csikszentimihalyi 1997, p. 32). In fact, one might even feel 'unhappy' doing some of these activities, e.g. mountain climbing. In most of his writings, Csikszentimihalyi seems to associate flow with leading the good life, i.e. something closely associated with LSF.

[12]The Gallup World Poll includes questions about the following six needs: Basic needs for food and shelter; safety and security; social support and love; feeling respected and pride in activities; mastery; self-direction and autonomy (Tay and Diener 2011, p. 355).

life evaluations, but needs fulfilment is not sufficient for high life evaluation, i.e. additional factors are relevant. Arguably, Tay and Diener's findings provide further support for the use of LSF as the SWB indicator at the system level. Somewhat surprisingly, Sen is not referenced in Tay and Diener (2011). Further research, both theoretical and empirical using Gallop World Poll data, on how Sen's capability approach relates to needs fulfilment and SWB, seems to be called for.

3.5 Sen, Subjective Well-Being, and the Further Development of the Capability Approach

Some of the literature reviewed so far suggests that an evolutionary theory of SWB with a focus on LSF that also takes Sen's capability approach into account might be a useful basis for a normative theory of innovation. Hall (2013) directly addresses similarities and differences between the SWB literature and the capability approach and expresses surprise that they are not closer aligned. However, the suggestion that they should be might seem strange to some readers, especially when considering some of Sen's statements. For example, Schubert (2012a) reports Sen's conclusion that purely subjectivist accounts of welfare should be abandoned in favour of the more objective account of capability (i.e. in order to avoid the 'happy peasant' syndrome). Never-the-less, a closer look at some of Sen's writings and those of some other researchers that have explored the SWB-capability links reveals that the two literatures are less antagonistic than sometimes thought.

Turning first to Sen's writings (Sen 1999, 2008, 2009), he mostly uses the terms pleasure and happiness when referring to modern SWB research. This usage suggests a somewhat biased portrayal of SWB research not uncommon in economics (e.g. compared to psychology). This said, it is also clear that Sen (2009, p. 274) is quite conciliatory towards SWB research, regarding it as extremely important. However, the "... central issue is not the significance of happiness, but the alleged insignificance of everything else, on which many advocates of the happiness perspective seem to insist" (ibid., p. 273). This is a dismissal of the 'happiness maximisation' approach to policy. Importantly, Sen (2008, p. 27) says that although happiness is not all that matters, it can often provide useful evidence on whether we achieve our objectives. Happiness thus has evidential merit.

While it is correct that agency and freedom are different from LSF, they are often positively correlated (see, e.g., Welzel 2013, p. 43), a fact acknowledged by Sen (2009, p. 287). This raises the question, 'how important are differences between SWB (and in particular LSF) and capabilities empirically'? Some findings indicate that although discussions about conceptual differences will continue (partly due to stake-holder interests and scientific silos), differences might be less pronounced when it comes to measurement and policy advice.

Veenhoven (2010) asks what capabilities are required to lead a satisfying life and how happiness contributes to capabilities, and finds that "Capability is typically

conducive to happiness, while happiness enhances capability" (ibid., p. 350).[13] Moreover, capabilities improve happiness not only to the extent that they are functional in mastering the problems of life, but also by aiding in the process of functioning (although Veenhoven doesn't explicitly refer to 'flow' experiences, that seems to be what he has in mind). The main causal effect by which happiness affects capabilities is by fostering activity, which in turn fosters the maintenance and development of skills.

In short, the differences between the two approaches are likely to be overstated. With reciprocal causality, there might be little conflict between policies that prioritise either LSF or capabilities! This should not be surprising. Hall (2013) argues that both approaches were developed, at least in part, to tackle the same problem, i.e. 'to go beyond GDP' when measuring human achievement. The two approaches are not antagonistic. Rather, they provide complementary pictures of, and offer improvements to, human lives, and they can benefit from each other.

However, Sen does not say much about analysis at different levels of aggregation, presumable reflecting the micro-level character of his theory. The Human Development Report 2013 (UNDP 2013) suggests that the capability approach should become less individualistic, and this is elaborated in more detail in the background paper by Stewart (2013):

> Individuals cannot flourish alone: indeed, they cannot function alone. The human development approach, however, has been essentially individualistic, assuming that development is the expansion of individual's capabilities or freedoms. Yet there are aspects of societies that affect individuals but cannot be assessed at the individual level... (UNDP 2013, p. 36, Box 1.7)

> The capability approach, developed by Sen (1999) and Nussbaum (2000), provides the theoretical underpinning of much discussion of human development ... the primacy of individualism in the capability approach is at odds with the flourishing of social beings. (Stewart 2013, pp. 1–2)

Acknowledging this, the Report (UNDP 2013) focuses on the nature of social institutions and social competencies that are favourable to human flourishing, raising many questions about the relationships (and mutual causation) between individuals and social institutions.[14] Social institutions are defined as "all institutions in which people act collectively (that is, involve more than one person), other than profit-making market institutions and the state" (ibid., Box 1.7, p. 36). They include, among others, formal non-governmental organisations, informal associations (like neighbourhood associations, social clubs), cooperatives and producer associations, sports clubs, savings associations, as well as norms and rules of behaviour. They interact with the state and markets, but have been much less

[13]Note that Veenhoven uses 'happiness' to denote LSF, i.e. the enduring satisfaction with one's 'life-as-a-whole'.

[14]Stewart (2013, p, 2) argues that Sen (2009, pp. 244–247) has begun to hint at the more fundamental role of society in determining individual capabilities. Sen seems to argue he always has done so, if indirectly.

researched (Stewart 2013, p. 2). Social competencies are defined as "what such institutions can be and do—i.e. they are in a sense the capabilities of institutions, . . ." (ibid., p. 2). Although only a partial step towards a more *societal or systemic view* of capabilities (such a view would potentially include *all* institutions), it suggests that such a view is not impossible and should not be dismissed.

4 Towards a NIS+SWB Approach

We now begin to explore how a normative theory of innovation might be integrated with the analysis of NISs. After commenting on some general aspects of evolutionary methodology as espoused by Foster and Potts (2009), and on an earlier attempt of interpreting NISs from an evolutionary perspective, there is a more detailed discussion of the choice of SWB measure, the issue of aggregation and level of analysis and, last but not least, of general implications of an evolutionary systemic normative theory of innovation for NISs policy.

4.1 Neo-Schumpeterian Evolutionary Methodology

Foster and Potts (2009) have suggested building an integrated mixed-method methodology for evolutionary economics based on a micro-meso-macro perspective. They see the economy as driven by a variety of rules (cognitive, behavioural, socio-cultural, organisational, technical, institutional). Microeconomic analysis refers to individual carriers of rules and their local operations, a meso unit refers to a rule and its population of carries, and macroeconomic analysis studies coordination and change in the meso structure of an economy (ibid., p. 57/58). Foster and Potts (2009, pp. 58, 60) argue that ". . .economic evolution involves the origination, adoption and retention of a novel meso rule in the micro and macro structure of the economy. . ." and that "The goal is to identify the different kinds of generic rules that enable value-generating connections between the components of identifiable systems."

Foster and Potts equate value with economic value, i.e. with output or utility from consumption, which suggests that their implicit normative perspective is of the 'innovation is always good' variety. Never-the-less, features of their evolutionary view of the economy might lend themselves to analogies in terms of the innovation-SWB nexus and the development of a NIS+SWB approach. There are obvious parallels between economic structures as an incomplete network of connections (ibid., p. 58) and the innovation-SWB nexus with its many links between elements (Engelbrecht 2014). Moreover, institutional features not only greatly affect the evolution of the economic system and the NIS, but also of SWB.

In a footnote, Foster and Potts (2009, Note 6, p. 60) state that the institutional context, which they explicitly label the meso, has often been neglected by

neo-classical economists and also by neo-Schumpeterian evolutionary economists.[15] It is therefore not surprising that there exists little research addressing the issue of how to interpret NISs from an evolutionary perspective. Kastelle et al. (2012) are an exception. Echoing Foster and Potts' sentiment they argue that much of the NISs literature is biased towards a macro perspective of institutional engineering that regards the NIS as static and exogenous. Instead, they propose to endogenise NISs by adopting a micro-meso-macro framework. This enables them to view such systems as macro rules within a micro-meso-macro rule system. Change in the NIS can then be "defined by the entry of a new meso unit, which thus requires micro adoption and retention" (ibid., p. 7). More precisely (ibid.):

> The study of innovation systems from the evolutionary perspective thus proposes a micro meso macro framework in which: micro refers to the adoption of new innovation system rules; meso refers to the resultant set and respective populations of innovation system rules; and macro, refers to the emergent complex structure of meso rules that compose the (macro) innovation system. This framework enables us to conceptualize innovation systems (as a macro construct) composed of interacting meso populations that are themselves composed of micro adoptions of these rules.

Viewing economic and innovation systems as co-evolving in this way leads Kastelle et al. (2012) to develop three propositions. First, different innovation systems (e.g. NIS, regional, sectoral) interact at the level of the actors (i.e. through micro evolution). Actors are simultaneously embedded in different types of innovation systems and "all of these systems are able to contribute meso rules that might influence the process of innovation" (ibid., p. 11). This highlights the diversity subsumed under the NIS and enables us to better understand how different innovation systems interact. Secondly, by according an important role to actors at the micro level, mutual causation and co-evolution is emphasised. Innovation systems (i.e. their institutional set-ups) affect actors, but actors can also change innovation systems by spreading new meso rules. Thirdly, innovation systems are best analysed using population dynamic methodologies. This implies that such systems are heterogeneous.

Conceptualising the NIS as being driven by different meso rules raises interesting questions, such as 'what combination of meso rules is most effective' and 'which rules do not interact well and why' (ibid., p. 17). However, Kastelle et al. (2012) seem to judge 'effective' and 'well' in terms of economic outcomes, which we argue is not an appropriate basis for a normative assessment.

The task of developing an evolutionary systemic normative theory of innovation requires not only that the institutions forming the NIS are endogenised using an evolutionary methodology, but that the evolution of the normative criterion is also included (and the latter needs to be broad enough to include procedural utility in the wider sense). NISs (and other innovation systems) and their actors co-evolve, and so does SWB. At this point one may speculate how to proceed to

[15] Also see Nelson (2002) on this point. In hindsight this seems odd, given the importance of the meso for evolutionary methodology.

develop a NIS+SWB approach. While NIS and SWB are interconnected, a starting point may be to separately analyse the NIS and SWB meso rules, and then explore their interactions. We currently have little knowledge about the feasibility and usefulness of a micro-meso-macro analysis of SWB, let along how this might interact with micro-meso-macro analysis of the NIS.

4.2 Choice of SWB Measure

The choice of SWB measure to be used in the context of a NIS+SWB approach is an important issue. The term happiness is often used to denote all kinds of SWB. This is misleading and conceptually confusing. The practice should be stopped. This plea is addressed, in particular, to economists, but also to the popular media for whom happiness is more attention-grabbing and often intuitively appealing (OECD 2013). The OECD (ibid., p. 184), therefore, recommends against using only the term happiness, especially for releases of SWB data by national statistics agencies. They also note another source of confusion, i.e. the practice of some authors to use the term wellbeing as shorthand for SWB.

The OECD (2013) guidelines on measuring SWB provide much needed clarification that is also of help in the current context. They identify three broad subcategories of SWB, i.e. *life evaluation*, *affect* and (so far less researched) *eudaimonia* or psychological flourishing. Life evaluation is recommended as the core measure that should be measured by all member states. There are two main candidate questions to assess life evaluation. They are the Self-Anchoring Striving Scale (Cantril Ladder of Life scale, e.g. as adopted by the Gallup World Poll) and a version of the commonly used LSF question (e.g. as used in the World Values Surveys). As noted earlier, we treat LSF and life evaluation as equivalent SWB measures. Both the Cantril Ladder of Life scale question and the LSF question account for longer-term considerations instead of short-term emotions. Diener et al. (2010b) argue that both reflect primarily a judgement, and Helliwell et al. (2010) find that both show similar correlations with key underlying structural variables, although LSF values tend to be higher than Cantril Ladder values.

For both conceptual and pragmatic reasons, LSF seems to be the most appropriate systemic measure in the context of a NIS+SWB approach. It is the most commonly available, and most recommended, SWB measure. If possible, it should be reported not only at the aggregate level, but supplemented with life domain specific and group specific data. This will be especially important when trying to identify and assess policy interventions. OECD (2013, Chap. 4) discusses in some detail how SWB data should be presented and reported. In any empirical application, besides reporting mean values (the preferred measure of central tendency), due consideration needs to be given to alternative ways of reporting levels, the distribution of values, aggregation across life domains, reporting changes over time and between groups etc.

An issue that requires further clarification, especially in the context of a NIS+SWB approach where procedural utility is important, is how LSF and eudaimonia are related. OECD (2013, p. 32/33) notes that psychological flourishing has fairly low correlations with the other SWB measures. It remains to be seen whether this will be confirmed in future studies using larger data sets. OECD (ibid.) further notes that eudaimonia has more to do with capabilities than the other SWB measures, and therefore has a more instrumental focus, but that its conceptual structure is less fleshed out. Eudaimonia might prove to be an important link between SWB and Sen's capability approach.

4.3 Societal (System-Level) Versus Individualistic (Micro-level) Analysis

Not only does use of an inappropriate SWB measure lead to misunderstandings, so does confounding different levels of analysis. Foster (2011) notes that much of the evolutionary restlessness observed at the micro-economic level is averaged out at more aggregate levels of analysis. This also applies in the case of SWB measures. Much confusion and mutual miscomprehension in academic discussions probably arises when different researchers argue about the advantages and disadvantages of linking innovation and SWB while implicitly assuming different levels of analysis or ignoring systemic aspects. Confusing system-level phenomena with micro-level processes is an example of the ecological fallacy. We briefly discuss some evidence highlighting the importance of distinguishing between the two.

Veenhoven (2010) points out that the relationships between capabilities and SWB can be addressed at both levels. At the micro level, analysis focuses on the relationships between capabilities and SWB of persons. At the societal or system level, the focus is on the level of capabilities in society and average SWB. Relationships can differ between the two levels. For example, schooling does not seem to make pupils happier, but it does so indirectly at the societal level because modern societies require high levels of education. Therefore, it seems to make sense to distinguish between 'individual capabilities' and the 'level of capabilities in nations' (ibid.).

Similarly, Tov and Au (2013) observe that societal-level and person-level correlates of SWB often differ. There is usually not a direct and perfect relation between factors at the different levels of analysis. To illustrate this, consider an increase in GDP. It is unlikely to improve a person's well-being if he or she remains unemployed. Suicide rates are another example. They may not affect well-being if they apply to a small segment of society rather than one's close friends and family (ibid., p. 456). Importantly,

> The point is that we must not make assumptions about the individual motives and desires of *all* people in a country based on societal SWB alone ... interpreting aggregated data requires a shift in perspective toward broad, societal conditions and norms.
>
> (Tov and Au 2013, p. 457)

Consider, e.g., the case of divorce rates. They are positively correlated with average SWB, despite married people having higher SWB than un-married people (ibid.). In general, assessing impacts at the individual and system levels might highlight important trade-offs that need to be considered by policy-makers. Binder (2013, p. 570/1) provides another example: International competitiveness of countries, a system-level indicator, might only be achieved by reducing SWB of individuals.

Recent research on the complex relationships between SWB and entrepreneurship using Global Entrepreneurship Monitor (GEM) data indicates the feasibility and usefulness of societal-level analysis of this important aspect of a NIS+SWB approach. Naudé et al. (2014) empirically explore whether the presence and nature of entrepreneurship impacts on national 'happiness', and whether nations with 'happy' citizens are better for entrepreneurs to start new businesses.[16] They find some support for both hypotheses, and also that the nature of entrepreneurship (i.e. whether it is 'early stage', opportunity driven or necessity driven) matters greatly. An extended analysis is reported in the Global Entrepreneurship Monitor 2013 Global Report (Amorós and Bosma 2014). It uses both overall LSF and work domain-specific LSF. Amorós and Bosma (2014) provide many interesting, if preliminary, empirical insights and indicate that a larger, dedicated report on the issue is forthcoming. In principle, GEM data can be used for analysis at both the micro and societal levels. They seem to be a prime candidate for use in an empirical application of a NIS+SWB approach.

4.4 An Evolutionary Systemic Normative Theory of Innovation and NIS Policy

There seems to be agreement among prominent NISs researchers and evolutionary economists that public policy has to be based on systems thinking (Nelson 2009; Malerba 2009). Malerba (2009) argues that policies should generate a satisfactory performance in terms of technological change and rate of innovation. 'Optimal intervention' and 'best' policies cannot be identified in a changing and uncertain world where direct, let alone indirect, consequences of policies are difficult to predict and often surprising. However, public policy is necessary to address evolutionary and systems failures, such as learning failures, competence lock-ins, and trade-offs regarding exploration and exploitation, variety generation and selection, appropriability and the distribution of competences (ibid.).

This similarly applies to SWB. A normative theory associated with a NIS+SWB approach should focus on identifying evolutionary and systemic LSF failures and weaknesses that then might be addressed by policy in order to keep systemic LSF at

[16]They measure 'happiness' by LSF, i.e. like many researchers, they are not specific enough in their use of SWB terms.

a satisfactory level. More positively, it can be described as supporting externalities and spillover effects that might raise, but not maximise, systemic LSF.[17] This is emphasised by, e.g., De Neve et al. (2013). They suggest that this enables people to flourish across all life domains, ranging from health to traffic safety and, one may add, innovation. Such an approach is different from the two main perspectives on the 'politics of happiness', i.e. SWB maximisation and the constitutional approach. It is a third approach that is evolutionary and experimental, relying explicitly on trial and error. For example, if we can identify major negative LSF impacts in a particular life domain, they could be targeted by policy. By aiming to counteract major known negative LSF impacts, policy might also help to reduce anti-innovation views.

A key example of an element of the innovation-SWB nexus that is of great importance to both NISs and SWB researchers is the workplace. Hall (2013, p. 146), among others, reports that there is a strong correlation between job satisfaction and overall life evaluation across countries. Procedural utility derived from work matters greatly. NISs researchers seem to agree. As noted earlier, Johnson and Lundvall (2013, p. 1344) regard a better understanding of how work organisation affects innovation as one of the major challenges facing NISs research. They agree that well-being in the work domain and innovation performance are correlated. In fact, there is a large literature, across many disciplines, on the contribution of the work domain to procedural utility and SWB. To give but a few recent examples, contributors include economists (Helliwell and Huang 2011; Phelps 2013), management researchers (Dewe and Cooper 2012; Erdogan et al. 2012), sociologists (Gershuny and Fisher 2014), organisational and industrial psychologists (Warr 2013). In short, analysis of workplace impacts, and the design of policies to address any shortcomings in the work domain, should have a prominent place in a NIS-SWB approach.

In general, we should take advantage of increasing knowledge about the source and impacts of SWB and develop an evolutionary systemic normative theory of innovation that takes into account as many of the impacts suggested by the general model of the innovation-SWB nexus as possible. LSF at the system level is probably best viewed as a 'SWB thermometer' or broad warning indicator that might highlight shortcomings of the NIS in terms of measured LSF. To what extent a particular level of systemic LSF should be tolerated or acted upon is ultimately a separate political issue that will also be informed by analysis of LSF at the micro-level, and other policy considerations. Hopefully, my making the impacts and trade-offs involved visible, systemic policies remain connected to their impacts on individuals.

[17]This also implies that a NIS+SWB approach should not be described as utilitarian. Utilitarianism requires maximisation; it is one of its defining features (Eggleston 2012).

5 Concluding Comments

Development of a NIS+SWB approach seems a natural extension of current research into NISs, SWB and attempts to develop a normative theory of innovation. Adding the analysis of SWB to that of the NIS probably strengthens the 'N' in NIS, because SWB is, in important ways, influenced and shaped by national factors (formal and informal institutions, e.g. laws, regulations, social conventions). This should reduce doubts (see, e.g. Balzat and Hanusch 2004) about the continuing significance of the national perspective. However, given the systemic and co-evolving nature of the NIS and SWB, there are potentially so many direct and indirect links between them that we cannot possible hope to capture them all. Using the model of the innovation-SWB nexus adapted to a specific country as a guide and focusing devise, it should be possible to make progress in determining the more important links and impacts.

Moreover, development of a NIS+SWB approach has to overcome some special challenges associated with the long-run fallacy of normative innovation economics and with the danger of committing the ecological fallacy. The former is addressed using SWB, or more precisely, a particular form of SWB (i.e. LSF), as a normative indicator. By measuring LSF across 'life-as-a-whole', as well as for specific life domains (e.g. the work place) in order to assess the impacts of processes as well as of outcomes, it is made clear that innovation should raise human well-being not just in the multi-generational long-run, but also for the people more immediately affected.

The ecological fallacy highlights the importance of clearly distinguishing between analyses at the systemic or societal level from that at the micro level. A NIS+SWB approach, being a systems approach, requires a systemic normative dimension. The NIS and SWB co-evolve as a complex adaptive system, and 'SWB maximisation' is simply impossible. That is why we advocate development of an evolutionary systemic normative theory of innovation that aims at an 'acceptable' level of (systemic) LSF. This does not preclude individualistic or micro level analysis. In fact, it will be desirable to undertake both. In this way, a NIS+SWB approach should be able to overcome Schubert's (2014) criticism of Generalized Darwinism, i.e. as being completely detached from the realm of individuals' concerns.

The case for the development of a NIS+SWB approach put forward in this paper is, by necessity, exploratory and tentative, focussing on broad general issues. Never-the-less, it is an important step that puts innovation firmly in the context of the search for well-being indicators that go 'beyond GDP'. It remains to be refined and many potential extensions and implications need to be explored.

One area of further research is the relationship between Sen's capability approach and SWB research. Both NISs researchers (e.g. Lundvall 2010) and evolutionary economist trying to develop a normative theory of innovation seem to be converging on the view that Sen's approach should be an important element of any normative assessment of innovation. How should 'SWB capabilities', to use

Binder's (2014) term, be measured empirically? The answer to this question might also affect to what extent 'objective' well-being indicators are separately included in the analysis. The use of LSF data is advocated as a pragmatic first step when trying to implement a NIS+SWB approach, but it might not be the last word on how to measure SWB.

Research is also required on the possible implications of extending a NIS+SWB approach to other innovation systems, e.g. regional and technological systems, as well as to global systems of innovation. Last but not least, most of the NISs literature focuses on innovation in highly developed countries (Teixeira 2014). It has been recognised that it needs to be extended to developing countries. This will pose additional challenges for a NIS+SWB approach as such countries are much more diverse, e.g. with respect to institutions. To some readers, the long-run fallacy might seem more justifiable in the context of poor countries. We would argue that such a view is incorrect.

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