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Innovativeness and Subjective Well-Being

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Abstract What are the effects of innovativeness on well-being? This paper argues that research on subjective well-being has progressed to a point where measures of subjective well-being (or: happiness) can usefully be employed to assess the welfare effects of innovative change. Based on a discussion of the prospects and pitfalls associated with subjective well-being as welfare measure and benchmark of societal progress, an argument is put forward as to why these measures are particularly well-suited in the context of innovative change. Empirically well-founded and with an explicit dynamic foundation, theories of subjective well-being allow for a nuanced and comprehensive assessment of the effects that innovativeness has on a society. Two evaluation rules, the "life domain evaluation principle" and the "welfare dynamics principle" are suggested to guide such normative assessment.

Keywords Subjective well-being · Innovations · Public policy · Happiness

1 Introduction

Innovativeness is a key feature of Western economies and has led to sustained growth of per capita income over the last centuries (Mokyr 1990). But while innovations seem to be a key driver of economic growth and for that matter the engine of progress of capitalist societies (Rosenberg 1996; Metcalfe 2001), their very nature brings problems for economic analysis: to the extent that an innovation is something novel, it cannot be anticipated. Both its commercial success and more broadly its effects on economic growth are subject to considerable uncertainty (Rosenberg 1996). Additionally, innovations have distributional aspects that are difficult to foresee as well and not necessarily benefit everyone equally.

The uneven nature of innovativeness has long been recognized by scholars and is reflected in metaphors such as Schumpeter's "perennial gale of creative destruction"

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(Schumpeter 1942, p. 84) or Metcalfe's notion of the "restless nature of capitalism" (Metcalfe 2001, p. 561). Both metaphors hint at the transformative role that innovative change plays for a society and the well-being of its individuals. This holds especially for "radical innovations" (Abernathy and Utterback 1978), that is, innovations that are more encompassing, less predictable and have a large societal impact. These metaphors caution us that while incomes historically have risen as a consequence of technological change, this rise has been uneven and was beneficial only in the long-run and on average (Witt 1996, p. 116). Due to the unforeseeable nature of innovations, there is no guarantee that this relationship will hold in the future. It is thus necessary to better understand why and to what extent innovativeness can really lead to increased growth and well-being of a society.

From a theoretical perspective, these considerations translate into systematic evaluation problems that innovativeness brings regarding a society's well-being (see more comprehensively Binder and Witt 2011). Under the standard welfare economic view, individual well-being is captured by an individual's given and unchanging preferences. Given these constant preferences, a pre-innovation state could be compared with the post-innovation state of society as to the individuals' preference satisfaction. But to assume that consumers have unchanging preferences becomes untenable when one considers the very essence of innovativeness. Through innovations, new and so far unknown opportunities for consumption come into existence. Innovations induce new preferences and, in consequence, given preferences become theoretically incoherent as measuring rod for welfare (Sugden 2006), creating "a central welfare economic problem that needs to be addressed—a problem that is absent from a static world but strikingly present when information is incomplete … and when tastes and values are constantly being reformed" (Nelson and Winter 1982, p. 369). Under these conditions, the supposition of the standard notion of economic rationality consumers are imbued with (transitive, complete preference orderings) loses their meaning: consumers have to try out new products and services and have to develop likings for these (or not). Since these newly developed preferences are the results of adaptive efforts in unknown environments, the learning of preferences might exhibit non-optimal patterns (lock-ins into unsustainable consumptions patterns, ignorance of long-term preference development paths, or the neglect of hedonic adaptation to new product characteristics come to mind as examples). Therefore, these types of dynamic (learning) processes need to be taken into account within a systematic evolutionary framework.

While using an inconsistent measuring rod to assess individual well-being and social welfare will at best make the welfare implications empty or irrelevant (Sen 1987; Atkinson 2001), it can ultimately have even worse practical consequences. As critics point out, there is the danger of coming to systematically wrong policy conclusions when basing economic models on empirically unrealistic assumptions such as that of static preferences: "in the world of dynamic change in which we live a static body of theory consistently and persistently yields the wrong policy prescriptions" (North 1999, p. 80).

But how can we assess the welfare impact that innovativeness entails? Given the above diagnosis, different conceptualizations of well-being have different credibility. Based on the discussion of different notions of well-being in Binder and Witt (2011), this paper aims at elaborating such a credible theory of welfare and focuses on the role of a hedonistic notion of subjective well-being. In Sect. 2 such a subjective well-being notion is discussed and the main correlates of individuals' subjective well-being are presented. The positive parts of this theory rest on empirically well-founded assumptions about the behavioral foundations of human action. These will allow for solid ground to be established for the

resulting welfare implications. Via insights from psychology and the behavioral sciences, the informational basis of the corresponding welfare concept is considerably broadened. The approach is also decidedly dynamic by a focus on "hedonic adaptation" phenomena (Frederick and Loewenstein 1999), shedding new light on the normative implications of different welfare dynamics. Having presented the empirical background on subjective well-being, Sect. 3 discusses the prospects and pitfalls of subjective well-being as a concept of welfare. Section 4 then relates subjective well-being to innovativeness and elaborates on why and how it is well-suited as a notion of welfare to assess innovations and their impact on society. Section 5 concludes.

2 Subjective Well-Being: Empirical Background

Research has successfully inquired into the determinants of subjective well-being (synonymously: happiness) for quite some time now (Frey and Stutzer 2002b; Dolan et al. 2008). Various empirical measures have been suggested as an approximation to the underlying concept of subjective well-being (Ryff and Keyes 1995; Frey and Stutzer 2002a; Diener and Seligman 2004), but a broad distinction can be made between indicators of affective and cognitive aspects of well-being, as well as indicators that encompass both. Life satisfaction questions ("In general, how satisfied are you with your life at the moment?") elicit a cognitively mediated reappraisal of an individual's situation in life, whereas answers to happiness questions ("how happy are you these days?") elicit a rather affective evaluation. Concepts of "mental well-being" aim to measure a broader assessment of an individual's psychological functioning and mental health. Such differences have to be kept in mind, as different results may be obtained depending on which indicator is used (e.g., Kahneman and Deaton 2010).

Psychological research has progressed to a point where pleasure and pain and its neural correlates are quite well understood and can inform economics by enriching the utility concept with material content: ideally, one should conceive of subjective well-being as the continuous (automatic and often not fully conscious) evaluation of an organism's state in terms of hedonic experience ("enjoyment"), a concept of well-being that is very close to what individuals experience as rewarding (Kahneman et al. 1997; Binder 2010). Since this continuous evaluation of reward is something which is linked to biological functioning and happens automatically and even without conscious attention, such a notion would be quite reliable and a (relatively) stable indicator of value *for an individual*. A further advantage consists in the fact that it is well researched in terms of the underlying brain processes, providing it with a strong empirical basis and, in turn, putting a hedonistic theory of welfare on solid ground. Such a notion of well-being is thus centered on the affective part of experiences, i.e. the hedonic or reward component. Affect is an evolutionary primary whereas cognition is a recent feat of nature, available only to very few creatures (viz. only humans). Positive and negative affect, on the other hand, seem to guide most other creatures as well. The affective process runs on a deeper biological level (it belongs to those brain processes that work automatically, without much cognitive interference). It also seems to be more stable and consistent than other notions of well-being (which can be conjectured to be subject to distorting cognitive influences), and biasing influences are not as pervasive. However, it has to be pointed out that the stream of affective experience is difficult to elicit or measure empirically (but see Kahneman and Sugden 2005) so that cognitive assessments of life satisfaction seem preferable from a practical point of view.

Arguably, any affective notion of enjoyment (partly) also underlies all of our cognitive judgements on how happy or how satisfied we are with our lives.[1]

Meaningful analysis of subjective well-being and it causes and correlates is possible with scientific precision. Satisfactory validity is indicated by many psychological studies: the correlation between answers to satisfaction questions and emotional expressions like smiling is strong (Fernandez-Dols and Ruiz-Belda 1995). The same holds regarding brain activity (Shizgal 1999). Predictive validity is indicated by unsatisfactory behaviours being discontinued (Kahneman et al. 1993; Shiv and Huber 2000). It has been found that individuals are able to predict and recognize satisfaction levels of others quite reliably (Sandvik et al. 1993; Diener and Lucas 1999) and share a common understanding of how to translate internal feelings into a number scale (van Praag 1991), indicating interpersonal ordinal comparability. Krueger and Schkade (2008) find a test–retest reliability between 0.5 and 0.7 over two weeks for affective as well as cognitive indicators. Research on the intertemporal context shows that well-being is partly stable and fixed over time and seems to be determined to some extent by genes (Lykken and Tellegen 1996) and by quite stable psychological personality traits (Diener et al. 1999). But it is also variable to a certain extent, especially in the short- and medium-run, being influenced permanently by such life events as repeated unemployment, marriage or child birth (Headey 2010).

An individual's subjective well-being depends on a complex vector of factors, ranging from individual determinants (e.g., self-esteem, optimism or other personality traits) to socio-demographic (such as gender, age, education, or marital status), economic (such as income, status, or unemployment), situational (such as health, social relationships), and even institutional factors (Frey and Stutzer 2002a, pp. 10–11). Well-researched are the relationships between subjective well-being and income, health, the social domain, as well as the effects of unemployment on subjective well-being. In these domains we find quite well-established relationships between subjective well-being and its covariates. The situation is, however, much less clear with regard to domains such as gender, age or education (Dolan et al. 2008). While education, for instance, has a direct bearing on many domains of life that in turn influence subjective well-being, evidence for direct relationship is sparse and mixed. This could be due to the averaging out of any effect in standard regression frameworks, as there is some evidence that education plays a role for individuals in the extremes of the subjective well-being distribution (Binder and Coad 2011a).

The relationship between subjective well-being and income is a complex one, even when considering that it has been intensively researched since Easterlin's seminal article on the paradox of happiness (Easterlin 1974). While subjective well-being is higher in high-income countries than in low-income countries *on average*, the paradoxical finding of Easterlin was that over time, well-being has not increased substantially in the last decades even though incomes have risen strongly. These findings have been qualified by Stevenson and Wolfers (2008), who argue that there is a significant relationship between subjective well-being and (log) income so that no paradox exists. As Graham (2011, pp. 16–17) argues, paradoxically both views might be correct, as the relationship between subjective well-being and income depends on what countries one assesses and what concept of subjective well-being is measured: a stronger relationship exists between income and life satisfaction than between income and affective measures. Similarly, the relationship

[1] Following the findings of Kahneman et al. (1997), one can conceive of the individual making an effort to more consciously ex post evaluate a temporal interval in retrospective as to its hedonic worth, as is the case with global judgments of life satisfaction. Such a notion of well-being is much more cognitively mediated and thus subject to certain biases and distortions.

between subjective well-being and income is especially strong for low income levels (and the according unhappiness these cause) but much less strong at higher income levels. What can be concluded from recent reviews of the literature on this relationship is that there seems to be some positive association but diminishing effects with increasing income (see Clark et al. 2008b; Dolan et al. 2008). Some of the effects might also be explained by the positive influence happiness has on an individual's performance (Graham et al. 2004) or by individual personality traits, since accounting for fixed effects does diminish the relationship between both variables (Ferrer-i-Carbonell and Frijters 2004). What also seems to have an effect on subjective well-being is relative income or income aspirations (Stutzer 2004; Ferrer-i Carbonell 2005), a relationship that becomes increasingly more important the higher one's level of income already is.

The subjective well-being-health relationship is less contested and the literature does agree on a generally quite strong positive relationship between subjective well-being and health. This is less surprising for measures of mental well-being that incorporate some (mental) health aspects. But the relationship also holds when using life satisfaction as the dependent variable in the regressions. What is less certain is "which way the causal arrow runs: from health to life satisfaction or from life satisfaction to health" (Easterlin 2003, p. 11177). Recent research here converges on a bi-directional causal relationship. A high level of well-being seems certainly relevant also for subsequent good health (Lyubomirsky et al. 2005), with significant positive effects of well-being on health being observed 2 or 3 years later (Binder and Coad 2010). Stronger effects are found the other way round: for example, acute or chronic illness decreases well-being as well as disability (Shields and Wheatley Price 2005; Lucas 2007; Oswald and Powdthavee 2008). Over time, hedonic adaptation to chronic pain or disability also seems limited, being at odds with set point theories of subjective well-being (Frederick and Loewenstein 1999; Oswald and Powdthavee 2008).

Happiness is also associated with fulfilling social relations (e.g., Myers 1999; Bruni and Stanca 2008; Becchetti et al. 2008), with marriage being the most important. Being separated, divorced or widowed (or just alone) is associated with lower levels of well-being than being in a fulfilling, stable partnership (Helliwell 2003; Lucas 2005; Stutzer and Frey 2006). However, it seems that the increase in well-being after marriage might turn out not to be lasting (Lucas and Clark 2006; Clark et al. 2008a). Other social relationships, for example with family and friends, are also positively associated with subjective well-being (Lelkes 2006; Pichler 2006; Baker et al. 2005); nevertheless, the causal arrow might run in the other direction as well, insofar as happy individuals might be socially more agreeable and thus have more friends and more fulfilling relationships.

Lastly, an individual's employment status also plays an important role for subjective well-being. The strongest evidence in this domain is found for unemployment: effects are consistently negative across a wide range of studies (e.g., Clark and Oswald 1994; Di Tella et al. 2001; Helliwell 2003). Moreover, males are comparatively stronger affected by unemployment and there seems to be only incomplete adaptation to continued unemployment for them (Clark 2003; Lucas et al. 2004). Panel studies have established that the relationship is not due to unhappy individuals that self-select into unemployment (Winkelmann and Winkelmann 1998; Lucas et al. 2004; Oswald and Powdthavee 2008).[2]

[2] The relationship between self-employment and subjective well-being is less clear, which might be explained by the very different reasons for which individuals go into self-employment (Binder and Coad 2012).

From an intertemporal point of view, and largely consistent with set-point theory, the studies mentioned above find that individuals, on average, sooner or later adapt to most of these life events to a certain degree. Unemployment among men is a notable exception, with several studies indicating only incomplete adaptation and even negative long-term effects (Lucas et al. 2004). Disability also seems to be associated with moderate to large drops in subjective well-being, not compensated for by subsequent adaptation (see Lucas 2007; Oswald and Powdthavee 2008). Whether adaptation to marriage is complete or not is also controversial (Zimmermann and Easterlin 2006). The prevalence of hedonic adaptation contrasts with findings that a considerable percentage of individuals [14–30 % according to Headey (2010); 24 % according to Fujita and Diener (2005)] have experienced large long-term changes in their subjective well-being scores over a period of about 20 years, which might be explained by personality differences (Diener et al. 2006; Headey 2008). For example, high levels of Extraversion and low levels of Neuroticism seem to be conducive to long-lasting subjective well-being growth (see also Soons and Liefbroer 2009).

3 Subjective Well-Being As Measure of Societal Progress

Using subjective well-being as measure of societal progress allows for the disentangling of social welfare from its traditional measure of income (growth). This will allow a reappraisal of the conventional conjecture that economic growth and rising income translate in a linear way into increases in well-being. While policies often target income as a proxy for welfare as the relevant goal to influence, subjective well-being research can help to assess welfare more directly. As Diener and Seligman put it:

> Money … is a means to an end, and that end is well-being. But money is an inexact surrogate for well-being, and the more prosperous a society becomes, the more inexact a surrogate income becomes. The measurement of well-being has advanced sufficiently that it is time to grant a privileged place to people's well-being in policy debates, a place at least on a par with monetary concerns. After all, if economic and other policies are important because they will in the end increase well-being, why not assess well-being more directly? (Diener and Seligman 2004, p. 2)

Measures of subjective well-being are thus an alternative to the more indirect measures of welfare used in economic policy making. Subjective well-being measures offer a broader picture of human well-being and flourishing than income-based measures can.[3] Societal (and economic) change influences subjective well-being of citizens in many direct and indirect ways that often are ill-captured by solely measuring income: if economic change increases incomes but also increases social isolation, both directly influence subjective well-being, and both factors should be accounted for to assess the progress of a society. While individuals get used to positive changes in income comparatively easily (Di Tella et al. 2010), the resulting well-being from other factors such as (e.g., social relations is less ephemeral). Positive knowledge about these relationships allows to more comprehensively assess individual well-being and its development over time and can make sense of findings why subjective well-being has not nearly as much increased over the last decades as incomes have. Based on these more nuanced assessments of the channels

[3] They are certainly not meant to replace income-based measures, as these do measure economic or material well-being adequately.

through which economic change impacts on human life and subjective well-being, more substantive and relevant policy implications might ultimately be derived. This potential of measures of subjective well-being guiding (economic and public) policy making has only recently become a topic of research (Duncan 2010; Frey and Stutzer 2010; Graham 2011; Dolan et al. 2011). While there are a number of promising advantages of such measures of well-being, several difficulties and challenges still exist of which researchers and policy makers need to be aware. In this section, the general advantages and disadvantages of subjective well-being measures will be briefly assessed before some of them will be put into the context of innovative change in the following section.

As exemplified by the above quote, the "science of happiness" has advanced in recent years to a point, where the direct assessment of individuals' well-being is starting to become feasible. Psychology and the neurosciences here contribute to empirically founding these measures and empirically understanding the causes and correlates of subjective well-being. The orientation towards a broader notion of what it means to enjoy high welfare is reflected in the many domains of life that have a bearing on subjective well-being (as shown in Sect. 2). This allows to incorporate aspects of well-being that are usually ill-captured by monetary measures. With its focus on life domains that influence subjective well-being (of which many are only moderately correlated with income), human well-being is not reduced to solely monetary aspects.

By virtue of asking open-ended happiness or life satisfaction questions, the individual is taken to be sovereign in defining what it understands by subjective well-being (Graham 2011, p. 24), something that mirrors the commitment on individual valuations also present in the orthodox economic view of welfare as preference satisfaction. Making the individual the judge of its well-being does not raise objections of paternalism that objective theories of welfare (such as basic needs approaches or Sen's capability approach) raise. While society will in the end have to find a consensus of what measure of subjective well-being (affective; cognitive or even broader mental well-being notions) will be relevant to assess welfare, it will largely be the individual's judgement that is accorded weight when it comes to assessing that individual's well-being.

By asking about individuals' subjective well-being and correlating it in empirical happiness equations with known determinants and other factors of the individuals' environment, it is also possible to measure activities and institutional arrangements for which individuals can reveal no preferences directly. This relates to preferences for democratic institutions, inequality, freedom, or macroeconomics variables such as inflation, unemployment rates or inequality. Similarly, a hedonic evaluation of public goods such as the level of pollution or environmental quality, crime, corruption is possible that would otherwise be only very badly be captured via individual's stated preferences or the corresponding money equivalents. When accounting for the usual known influences on subjective well-being, adding variables for the above-mentioned factors allows to assess their effects on subjective well-being directly. Within a revealed preference framework it is exceedingly difficult for the individual to express a preference for (e.g.) an institutional regime (short of migration). Here happiness research (with tools such as happiness-measures based cost-benefit-analysis) allows for better welfare estimates of a whole range of otherwise difficult to measure factors.

Finally, the influence of norms, addictions or phenomena of limited self-control are also better amenable to welfare analysis within such a framework. Instead of assuming that (for example) obesity is a matter of optimal consumption of the individual in a rational maximization calculus, subjective well-being measures allow to directly estimate hedonic effects of gaining weight and the influence of norms that mediate individuals' perception of

their situation (Graham and Felton 2005).[4] Not all individual behavior is adequately represented as voluntary utility-maximizing behavior and subjective well-being measures aid in coming to an empirically better informed appraisal of human behavior and its welfare effects.

In general, this information can be used by policy makers in many different ways (e.g., Dolan et al. 2011). First, using subjective well-being measures, policy makers can evaluate policies and the impact these have beyond the income sphere. Secondly, the impact of policies on subjective well-being can be used to legitimize policies before their implementation. Thirdly, while subjective well-being may not be the only value for policy makers, it can be a relevant value that then would figure in a policy context besides income and other concerns. As such, subjective well-being could also play the role of providing a coherent "Leitbild" or guiding principle to guide policy making since it is arguably one very important and basic value for a society (Bruelde 2007; Layard 2005). To the extent that policy goals conflict in some (more instrumental) dimensions, the aggregate impact on subjective well-being would allow to help assess these policies with respect to a more encompassing (final) value. In cases of conflict between many dimensions, the effect on citizen's subjective well-being could thus be considered the final arbiter for different policies. Fourthly, the information about individual's subjective well-being and the causal relationships involved in determining it can be used to inform not only policy makers but also citizens themselves. While this is not meant to imply that citizens are irrational or ignorant and in need of constant protection by benevolent (happiness) researchers, decision making of individuals is not always fully rational and many examples about systematic mispredictions of future happiness abound (Wilson and Gilbert 2005). Some of these mispredictions are prone to be difficult to get rid of due to changing learning environments so that additional information might be considered useful by individuals (Loewenstein and Schkade 1999, p. 99). Whether individuals then actually choose to use this information, e.g., to escape some of the well-known treadmills of happiness, is an entirely different matter.

Happiness scholars seem to largely consent on the potential benefits of subjective well-being measures in the public arena. What they differ in is their assessment of how to make use of this information on individuals' well-being. The "politics of happiness" can largely be conceived along two different paradigms, which could be termed the "welfare economic" and the "constitutional" or ("institutional") approach to happiness politics (see Duncan 2010; Schubert 2012, on this distinction). The former approach is broadly oriented towards the traditional welfare economic paradigm and instead of maximizing a typical social welfare function, proponents suggest to maximize an analogous social happiness function (Veenhoven 2010; Dolan and Peasgood 2008; Dolan et al. 2011). This approach stands in direct tradition of Benthamite thought about the "greatest happiness principle" and other classic economic thinkers such as Edgeworth. Proponents of this paradigm are optimistic that such a welfare function can be measured with precision and indeed maximized by appropriate discretionary policy interventions.

On the other hand, proponents of the constitutional approach to happiness politics are skeptical about the possibility for discretionary policy interventions that maximize

[4] A more nuanced welfare analysis here shows that obesity decreases subjective well-being in individuals when few other individuals are obese. Being in company of many obese individuals (or being low-skilled without much aspirations towards acquiring higher skill-sets), however, leads to less stigma of being obese and hence less decreased well-being. Similarly, smoking affects smokers' well-being negatively and while most smokers would not quit their habit voluntarily, they express approval of higher tobacco taxes (Gruber and Mullainathan 2005).

individuals' subjective well-being. Opposed to direct interventions, scholars stress that there are grave problems with a technocratic maximization of an aggregate subjective welfare measure that stand directly opposed to the ideal of increasing individuals' subjective well-being. Instead of trying to maximize an aggregate index of subjective well-being, the constitutional tradition advocates the sovereignty of citizens' in pursuing their own ideals of happiness. Public policy intervention should here be limited to creating institutional frameworks that are conducive to individual's attempts at pursuing happiness (Frey and Stutzer 2010; Schubert 2012; Graham 2011).

Proponents of this more modest approach justify this with respect to a number of unresolved issues and challenges that make the ideal of maximizing national happiness measures seem problematic. Some of these pertain to problems of measurement (many empirical relationships are still ill understood; data from many countries is lacking or only available for short time spans), but other reasons are more fundamental: whether subjective well-being should actually be considered to be the *one and only* criterion of societal progress is a normative issue that no amount of data can resolve. Other values such as agency (see below) might be necessary to balance subjective well-being against and here the science of happiness has to defer to the decision of citizens as sovereigns in ultimately setting the goals for society. Similarly, the decision about which measure of happiness shall be the measure of welfare is something that cannot be settled empirically. While affective, cognitive and mental well-being constructs are similar on a very broad level, they lead to different assessments of individual well-being and societal progress in some instances (recall the above-mentioned disagreement about the Easterlin paradox, which is in part due to different measures of subjective well-being being used). Which measure to choose is also a normative matter.

A similarly grave objection lies in the yet unsolved problem of hedonic adaptation, which might be the most challenging problem for happiness research in the future (Graham 2011, p. 104). While less a problem from an empirical point of view, hedonic adaptation proves to be a formidable challenge for the assessment of subjective well-being as a benchmark of societal progress: the paradox of "happy peasants and miserable millionaires" (Graham 2009) elucidates the assessment problems: to the extent that individuals can adapt to misfortune and bad conditions this is a positive mechanism for the individuals suffering from bad conditions (a case in point is Afghanistan, where individuals are surprisingly happy despite unrest, crime, corruption and other bad environmental conditions, see Graham 2011, pp. 75–79). Collectively, however, hedonic adaptation can lead to "bad equilibria" that are sustained because the individuals involved have adapted to the situation and are not motivated to change their situation. Additionally, hedonic adaptation could (falsely) prompt policy makers to conclude that no action is necessary as subjective well-being levels are high. From a distributive point of view, this seems problematic. The converse problem exists of course with regard to "miserable millionaires" (or "frustrated achievers", Graham 2011): how is their misery to be evaluated that exists despite their objectively good situation? These questions are still unanswered, yet need to be addressed in order to make anything like the maximization of subjective well-being operable.

Moreover, as Frey and Stutzer (2010) argue, maximizing an index of subjective well-being ultimately reduces citizens to "metric stations" instead of treating them as the sovereigns of a political discourse. As the authors hold, such a view violates elementary principles of democracy where the political deliberation process is meant to guarantee that individuals can voice their preferences and form an opinion through reasoned discourse. A mechanical maximization of individuals' well-being scores would run against this ideal of democratic rule. Finally, if subjective well-being measures became the measure to be

maximized, politicians as well as individuals have incentives to play the system and manipulate these measures.

Given the preliminary nature of many findings from subjective well-being research and the reservations discussed above, an institutional approach towards the politics of happiness seems to be preferable at this juncture. Especially in the context of the continuing innovativeness of economies and the resulting self-transformation of society through novelty (which will be center-stage in the following section), the discretionary maximization of an aggregate happiness measure seems misplaced—if not outright dangerous.

4 Innovations and Subjective Well-Being

The welfare effects of innovations can be manifold. New technologies, products, and services can help to make the production processes more efficient, potentially leading to increased capital intensity, labour-productivity, and per-capita income. They can also result in new consumption opportunities in the form of new goods and services offered for final consumption. While the consequences for economic growth of these applications of new knowledge are well researched (Rosenberg 1976, 1982; Nelson 1993 1996; Romer 1986), the effects of innovativeness on well-being are much less clear (Metcalfe 2001). The consequences of innovations for employment, for the environment, for cultural identity, and for the civil society at large affect subjective well-being, as perceived by the citizens, partly positively, partly negatively. In this section, an argument will be given how measures of subjective well-being are particularly well-suited for a broad assessment of the impact innovativeness has on a society and its citizens. To systematically analyze effects of innovations on welfare it is useful to distinguish several dimensions of analysis (these dimensions are depicted in Table 1). On the one hand, welfare effects can be judged on the level of individuals; but one could also identify, on the other hand, effects innovativeness has on the economic system as a whole. For example, innovative change might make an economy more competitive in comparison with other economies (system-level perspective) but this might come at a cost of (temporarily) decreasing the well-being of individuals in that society. Take for example the heightened requirements in terms of education and high-tech skills, which may exclude many individuals from participating in these developments and benefitting from those innovations. While many contemporary technologies are necessary to sustain an economy's competitive edge on the world markets, these might lead to increased unemployment of citizens and the associated negative impact on subjective well-being. If individuals are resistant to change and conservative regarding their preferences, novelty might be (at first) experienced as welfare-decreasing on the individual level while it nevertheless could be considered necessary from the perspective of maintaining the system's capability to compete in an international perspective. Similarly, it is conceivable that innovations will increase individuals' well-being but have system-level effects that might be considered undesirable. These kinds of trade-offs will be often unavoidable and

Table 1 Dimensions of analysis

	Production (supply-side)	Consumption (demand-side)
Individual-level	Entrepreneur, firm	Individual consumer
System-level	Industries, economic systems	Economic systems, society

the welfare analyst needs to take them into account when analyzing the impact of increasing innovativeness in a society.

The second dimension pertains to the question of whether welfare should be assessed from a production (supply-side) perspective or from a consumption (demand-side) perspective (Binder 2010, p. 7). By supply side perspective, I refer to a focus on firms or industries and how innovativeness transforms them. This perspective is the one usually found within the literature on entrepreneurship and innovativeness, focussing on how innovative firms alter industry structures or the competitiveness of regions or economies and vice versa. The unit of analysis is the firm or the entrepreneur on the individual level and an industry or economic system on the aggregate, system-level.

This supply-side perspective has also been at the focus of many welfare analyses not-related to firms and industries, which has become increasingly obvious in the recent criticism about (income-centred) welfare measures such as GDP. Income measures have a narrow focus for assessing social progress: critics rightly note the shortcomings of GDP measures (and the predilection of those measures on the production side of economies) and demand a shift in focus to the demand side of an economy, i.e. individual's well-being resulting from consumption, individual wealth and so on (Stiglitz et al. 2009; Easterlin 2010).[5] Focussing on the individuals in a society is also in accordance with the principle of normative individualism, something neglected when taking a system-level perspective.

Taking such a demand side view of innovativeness means aiming at understanding how innovations can impact on consumers' well-being and how this impact may change over time. First of all, it has to be pointed out that the largely unforeseeable nature of innovativeness leads to epistemic difficulties in trying to predict any developments of consumers' future preferences. A policy maker trying to outguess consumer preferences and the innovations these might stimulate (or vice versa: outguessing innovations and the consumer preferences these might induce) will by and large have to fail if innovations are only sufficiently novel (Rosenberg 1996). The associated problems also seem to make it obsolete to aim for specific outcomes of policies, but look at developments of welfare and types or patterns of preference change (i.e. taking a process perspective). In this respect, the following distinctions prove useful. Depending on the degree of novelty associated with an invention, one can distinguish macro-inventions from micro-inventions (Mokyr 1990). Macro-inventions are these inventions that involve radically new ideas, having no clear precedents, while micro-inventions are smaller inventions improving on or somewhat modifying existing ideas. Innovations resulting from macro-inventions thus entail much higher levels of (strong) uncertainty. In this sense, macro-inventions might comparatively more often lead to changes in technological paradigms, whereas micro-inventions stay within a technological paradigm, making progress within it along the associated technological trajectory (Dosi 1982). While both types of inventions are spurring economic growth, growth by micro-inventions can be considered subject to decreasing returns and would eventually peter out without the radical changes resulting from macro-inventions (Mokyr 1990).

The associated uncertainty with the unfolding of innovative change (through macro-innovations) over time lends not much plausibility to a welfare economic paradigm to happiness maximization. Subjective well-being measures should rather be used to assess broadly the societal patterns of outcomes resulting from innovative activities. Since subjective well-being measures allow to assess non-market mediated effects of innovative

[5] This criticism is by far not new, but has gained new impetus in the wake of the recent financial turmoil and the associated attempts at reform (Stiglitz et al. 2009; Michalos 2011).

change, they are especially well-suited to come to a broad assessment of the welfare effects of innovations. For many innovations, neither exist markets nor have individuals preferences for them so that the typical way of assessing consumers' welfare resulting from such innovations will not work and other types of valuations are needed. (Macro-)innovations may result in unforeseeable and drastic societal change and technological externalities in the form of effects on the environment, social cohesion, and so on, but these effects can be evaluated in terms of the impact on subjective well-being. While such measurement will be fraught with imprecision of the estimates in some cases, it nevertheless allows a much more precise and broad measure of societal progress than just excluding technological externalities from the welfare calculus by solely focussing on income effects mediated in markets.

Moreover, two distinct evaluation principles can be identified within a subjective well-being view of societal progress, namely the "life domain evaluation principle" as well as the "welfare dynamics principle" (for the latter, see also in more detail Binder 2010, Chap. 6.4). The life domain evaluation principle refers to the empirically established life domains which impact on subjective well-being regardless of context and culture. Empirically well-informed descriptive knowledge about these domains provides a materially specified catalogue of domains in which to consider possible impacts of innovativeness. These domains narrow down relevant areas guiding the welfare analyst in assessing potential innovations' impact on the consumers.

Such partition of relevant areas allows to assess an innovation's impact and the mutual interplay between innovativeness and welfare. The welfare analyst would thus have to research the potential impact of unfolding innovations as regards, for example, impact on health, social domain, work domain etc. While this is still a somewhat coarse distinction, it does offer a certain structure that progresses beyond completely unspecified, purely formal preferences. Within a given technological trajectory, having materially specified life domains of a consumer which in turn influence that individual's subjective well-being might also inspire better informed guesses on the future improvements of innovations that might be conceivable. To the extent that subjective well-being research progresses and identifies further causal relationships between life events/domains and subjective well-being, additional structure can be given to the welfare analysis regarding innovations' impact. To assess the impact of micro-innovations on these life domains and hence on subjective well-being will be comparatively more easy, as the uncertainty about characteristics and properties of these innovations is lower. While it stands to reckon that welfare consequences of macro-inventions and the innovations resulting from them will be, by and large, unpredictable, the above described framework offers guidelines along which to nevertheless analyze potential impacts of innovations and try to assess the welfare consequences of emerging innovations.

The "welfare dynamics principle" on the other hand imposes structure to the welfare analysis over time, by using knowledge about hedonic adaptation dynamics to come to conjectures about how innovativeness will in the medium- and long-run influence subjective well-being. As with the first evaluation principle, descriptive knowledge about which sources of happiness individuals adapt to comparatively more easily provides a more detailed basis to assess the impact of innovativeness. Innovative change that leads to changes in norms towards a more income-fixated goals of society would from this point of view lead to a less favorable assessment than community-oriented goals (with the knowledge that happiness resulting from income gains is much more ephemeral than happiness resulting from social relations). A different example would be innovations that lead to a more entrepreneurial society: to the extent that voluntary self-employment has

lasting positive effects on the self-employed individuals' subjective well-being (Binder and Coad 2012), entrepreneurship might usefully be fostered even if its material consequences on the entrepreneurs are less attractive than often proclaimed (Hamilton 2000).

The highly domain-specific hedonic adaptation patterns here prompt careful and differentiated welfare analysis and are not easily amenable to very general assessment principles. One exception to this rule is the asymmetry between happiness and unhappiness. It is comparatively more difficult for an individual to get adapted to pain than to pleasures (Frederick and Loewenstein 1999; Binder and Coad 2011b) and the sources of pain are much more uniform across individuals than the sources of happiness (e.g., Layard 2005). This knowledge could be used to argue in favor of an asymmetric assessment of unhappiness and happiness, so that a more urgent focus is given to the mitigation of unhappiness resulting from innovative change. Such an asymmetric focus could also be interpreted as qualifying the usual optimistic arguments in fostering innovativeness. If any innovation may bring unhappiness as well as happiness, and the resulting unhappiness is proportionately stronger felt by individuals, society would probably consent on institutional setups and policies that are meant to deal with the negative side effects of innovativeness, e.g., by providing insurance against them, providing institutions to ascertain negative technological externalities are internalized by the causing agents ("internalization mechanisms"), safeguards against locking society into strong unhappiness causing trajectories, and so on. Given the uncertainty about welfare impacts of innovations such an asymmetry would also lead to a less demanding role of the policy maker. Taking the role of novelty and imperfect information seriously seems to call for a reinterpretation of the role of the policy maker as also constantly learning (Witt 2003). Focussing on creating institutions to mitigate negative impacts of innovativeness seems to be a more realistic position than to demand policy makers outguess which innovations would bring the most happiness (something comparatively more difficult as sources of happiness are less uniform than sources of unhappiness).

Mitigating unhappiness related to "the perennial gale of creative destruction" (Schumpeter 1942, p. 84) is necessary given our knowledge about how change und uncertainty impacts on individuals' subjective well-being. Individuals are very badly able to cope with uncertainty (Graham et al. 2010). It seems that uncertainty has much stronger negative effects on subjective well-being than fully certain but negative events have, and individuals do not easily get used and adapt to uncertainty. Considering that innovative change is characterized by high levels of uncertainty, the "restless nature of capitalism" (Metcalfe 2001, p. 561) imposes subjective well-being costs on individuals regardless of the substantive properties of innovations. The very existence of rapid innovative change can be conjectured to impact negatively on individuals' subjective well-being through the associated uncertainty and policy makers need to take this into account as otherwise, citizens might not consent on living in a highly innovative society. How to mitigate these effects of uncertainty best is a question of further research but needs to be taken seriously.[6] Related to this is the "paradox of unhappy growth" that is empirically found in countries that exhibit strong economic growth, such as the transformative economies of Russia or China (Graham 2011). Studies show that these high growth rates initially lead to decreased subjective well-being of the citizens in these economies (Graham 2009; Brockmann et al. 2009). Beside the associated uncertainty, other causes for this unhappiness might exist in raised aspirations of the individuals in these transition economies, as well as raised levels

[6] This finding also qualifies the usually one-sided positive assessment of fostering variety and change persistent in evolutionary economics.

of inequality (Graham and Felton 2006). Measures of subjective well-being here help to assess the non-monetary constraints that accompany growth through innovations. In order to reap the full welfare benefits of growth through innovativeness, policy makers need to take these constraints into account and try to mitigate these through appropriate balancing mechanisms. If economic growth and the transformation of an economy leads to unhappiness, policy makers will have to balance their demand for economic growth with measures to mitigate the negative impact on subjective well-being or otherwise face the danger of loosing citizens' support for their policies. From a longer-term perspective, these well-being losses might be only short dips during excessively quick transformations of society. Or they might be longer-lasting trajectories that keep societies from attaining lasting happiness gains through growth and innovativeness. In the very least, these findings caution the welfare analyst to take a longer-term perspective when assessing the impact of innovativeness on subjective well-being.

Hedonic adaptation poses a related yet also vexing problem in this context: hedonic adaptation might collectively lock-in a society into a "bad equilibrium" (Graham 2011, p. 83). Consider the "happy peasants" in some less developed economies (the example of Afghanistan mentioned above is a case in point). Innovations might increase these persons' agency and their possibilities to lead fulfilling and meaningful lives. But with development and an increase in agency might come decreased levels of subjective well-being (again, it is unclear whether this is a temporary phenomenon). This not only points to the question whether there are cases where societies should be advised to temporarily accept decreases in well-being for long-term gains. It could also be the case that other values (agency!) might have to be traded-off against subjective well-being. A different example is sustainability: shall a subjective well-being view imply that a society's subjective well-being trumps the concerns for the well-being of future generations? Most would probably agree that achieving subjective well-being by the present generation should not come at any cost (NEF 2009; Binder and Broekel 2011), so that again a different value judgement has to be balanced against the value of subjective well-being. Goals of promoting sustainability could also be used to justify a promotion of these sources of happiness, one adapts to less easily. The rationale behind this is that non-adaptive happiness can be reached without increasing the resource input over time (this is the logic behind the manifold happiness treadmills: one has to ever increase resources spent just to maintain a constant level of happiness in cases where there is hedonic adaptation).

Hedonic adaptation also cautions us that a certain amount of unhappiness might be a necessary motivating force for societal progress. Whether a society could actually reach a point of bliss where happiness is so high that it completely foils further progress is an empirical matter, but given the complicated hedonic adaptation structures this seems unlikely. But even if a society should reach such a point, maintaining this in the face of ever-changing environmental conditions seems as big a challenge as reaching this point in the first place. These considerations cannot be further elaborated on in the context of the present paper but hopefully have shown the potential for a nuanced assessment of the relationship between innovativeness and subjective well-being within the suggested framework.

5 Conclusion

Innovativeness has led to sustained growth of per capita income over the last centuries (Mokyr 1990). And yet, the uneven nature of innovativeness, reflected in metaphors such

as Schumpeter's "perennial gale of creative destruction" (Schumpeter 1942, p. 84), brings systematic evaluation problems regarding a society's well-being (see more comprehensively Binder and Witt 2011) and renders the standard economic measuring rod for welfare, preference satisfaction, incoherent (Sugden 2006). In order to come to a better understanding of the welfare impact of innovativeness on societies and to put economic policies on a firm theoretical footing, this paper aimed at elaborating the prospects and pitfalls a hedonistic notion of subjective well-being could play in this context.

Research on subjective well-being and its main correlates were presented. These findings rest on empirically well-founded assumptions about the behavioral foundations of human action and allow for solid ground to be established for the resulting welfare implications. Via insights from psychology and the behavioral sciences, the informational basis of the corresponding welfare concept is considerably broadened. The approach is also decidedly dynamic by a focus on "hedonic adaptation" phenomena, shedding new light on the normative implications of different welfare dynamics. Based on the empirical background on subjective well-being, the prospects and pitfalls of subjective well-being as a concept of welfare were discussed and linked to innovativeness. It was argued that notions of subjective well-being are particularly well-suited to assess innovations and their impact on society. Two evaluation rules, the "life domain evaluation principle" and the "welfare dynamics principle" were suggested to guide such normative assessment. While hedonic adaptation and difficulties in data availability are still posing important challenges for the welfare assessment of innovativeness in terms of subjective well-being, an institutional approach towards the "politics of happiness" offers a broader and more humanistic benchmark of societal progress than income-based measures do.

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