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STEFANO BARTOLINI

Beyond Accumulation and Technical Progress: Negative
Externalities as an Engine of Economic Growth

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Abstract - The traditional explanation of growth based on the *primum* and *secundum* movens of accumulation and technical progress, faces two major empirical anomalies. Why do people work so much i. e. why do they strive so much for money? The growth literature provides no answer to these question, nor to the further and very important one of why people are so unhappy. Moreover, finding a joint answer to the two questions seems particularly puzzling. Why do people strive so much for money if money cannot buy happiness? I argue that the solution to this ‘paradox of happiness’ can be provided by including in the theory a *tertium* movens of growth: negative externalities. These externalities can be of two kinds. The first are positional externalities, i. e. those due the fact that individuals may be interested in relative not absolute position. The second kind of negative externalities are those which reduce free goods. Some recent models, both evolutionary or with optimising agents, show the role of these externalities as an engine of growth. This approach emphasises that the growth process generates extensive negative externalities which reduce the capacity of the social and natural environment to furnish free goods. In these models individuals have increasingly to rely on private goods in order to prevent a reduction in their well-being or in their productive capacity due to decline in social and natural capital. This generates an increase in output which feeds back into the negative externalities, giving rise to a self-reinforcing mechanism whereby growth generates negative externalities and negative externalities generate growth. According to these models, growth appears to be a substitution process whereby free final (or intermediate) goods are progressively replaced with costly goods in the consumption (or production) patterns of individuals. From the point of view of this GASP (Growth As Substitution Process) models the two anomalies of growth theory are two sides of the same coin. People strive so much for money because they have to defend themselves against negative externalities: they work so much in order to substitute free goods with costly ones. But an increase in income does not improve their happiness because it involves a process of substitution of free goods costly ones. Some implications for environmental economics are drawn.

Keywords: happiness, growth, labor supply, negative externalities, accumulation, technical progress, sustainable development, endogenous growth

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Stefano Bartolini, Dipartimento di Economia Politica, Università di Siena

Introduction^{*}

The overall thesis of this work is that the erosion of social and environmental capital due to negative externalities may not be a limit to growth but may instead stimulate it. Hence negative externalities may be an engine of growth.

This statement is entirely at odds with the theory of endogenous growth, which emphasises the role played in growth by positive externalities. And it is also at odds with two other bodies of literature of relevance to this study, those on sustainable development and on social capital.

The concept of sustainable development revolves around the doubts that began to arise in the second half of the last century concerning the limits to growth imposed by the finiteness of natural resources. Such doubts can be summed up by the question: does the limits of the world in which we live impose limits on the expansion of economic activity, and how stringent are those limits? The imprinting of this question on the sustainable development literature, and therefore on models of growth with environmental resources, has impeded exploration of the possibility that the depletion of natural capital may be a stimulus for growth rather than hampering it.

Nor has the literature on social capital ever considered the possibility that the erosion of the latter may be not a limit on growth but an engine for it. In fact, such literature generally considers endowment of social capital to be an important factor in determining growth, and that its erosion may damage the prospects of growth itself. This may perhaps be due to the imprinting of the concept of social capital, which have been developed to take account of the importance of socio-cultural factors for development, enabling explanation of why the market system performs so differently in countries similar from the point of view of endowments and technology.

Although they will come as a surprise to the main bodies of literature referred to above, the ideas set out in this article have a long and interdisciplinary history. Here I shall mention only Polanyi and Hirsch, as the authors who have made the most outstanding contribution to shaping this view.

The paper is organized as follows. Section 1 sets out some theoretical problems concerning growth theory, while sections 2 and 3 are devoted to some empirical problems. Section 4 argues that negative externalities may be the engine of growth that growth theory has overlooked and which may solve its theoretical and empirical

^{*} I am especially indebted to U. Pagano, , A. Leijonhufvud and L. Punzo for their useful

problems. Sections 5 and 6 analyse the two different kinds of negative externality that may operate as engines of growth: positional negative externalities, and those which reduce the availability of free goods as final or intermediate goods. Section 7 deals with the aspects of growth that have been neglected by current growth theory. Section 8 examines the growth mechanisms driven by negative externalities affecting productive capacities. Section 9 compares the policy implications of the two different kinds of negative externality that may act as engines of growth. Section 10, 10.1 and 10.2, outlines the implications for environmental economics of the growth theory based on negative externalities which reduce free goods. Section 11 deals with the possibilities of improving the human condition while section 12 summarizes the theses set out in the paper.

1. Theoretical problems of current growth theory

Current growth theory is founded on the idea that growth is driven by increased labor productivity. Two causes are identified for this increase – physical and human capital accumulation and technical progress – which are therefore the engines of growth, its *primum* and *secundum movens*. However, this explanation of the long-term dynamics of per-capita output suffers from serious theoretical and empirical problems..

The theoretical problem is that an increase in labor productivity is not a sufficient condition to generate growth. Individuals may in fact devote a substantial part of increased productivity to increasing their leisure, thereby reducing the return on their investments in capital and new knowledge. This may slow growth down and in the long run bring it to a complete halt. Hence explaining why an economy grows indefinitely means also explaining, besides an increase in productivity, why individuals do not choose to devote a substantial part of this increase to augmenting their leisure. Yet it is exactly this feature that endogenous growth models are unable to explain: once the labor supply is made endogenous, they tend to predict that individuals will use the long-term increase in the labor productivity to augment their leisure, not their output. In fact, perpetual growth tends to disappear in these models when the choice between work and leisure is made endogenous, and this comes about

comments. The usual caveats apply.

for the following reason: individuals tend to react to increased productivity by reducing their labor supply (particular hypotheses on preferences aside).¹

The vulnerability of endogenous growth models to the endogenization of the labor supply implies that they fail to explain why an economy follows a perpetual growth path. Even less an explanation may be provided by the majority of growth models which assume a fixed labor supply, and therefore assume what they are supposed to explain, namely that the increase in labor productivity is preponderantly devoted to increase output rather than leisure.

Likewise, the fact that the marginal productivity of capital does not decrease (as in models of endogenous growth) is not a sufficient condition for the saving rate to be sufficiently sustained over time to ensure perpetual growth. In economies that grow ever richer, in fact, individuals may choose to reduce their efforts to accumulate. Indeed, it is precisely this prediction that endogenous growth models tend to make when the labor supply is endogenized. Perpetual growth also flags because individuals reduce their saving rate: agents tend to respond to increased wealth by reducing their work effort devoted to accumulation (Bartolini and Bonatti 2003).

In short, the result of perpetual growth seems rather vulnerable to inclusion of a work/leisure choice in models. The plausible mechanisms emphasised by endogenous growth models which ensure a non-decreasing marginal productivity of capital over the long period are insufficient to generate perpetual growth. In order to generate it, individuals must work and accumulate i. e. must be interested in money, more than endogenous growth models predict. According to these models, in fact, individuals react to a long-period increase in labor productivity by enjoying life more than is necessary to ensure perpetual growth.

This is as regards the theoretical problems. I now turn to the empirical ones, which consist in the difficulty of explaining why the promises held out by growth of more freedom from work and greater happiness have not been fulfilled.

¹ Bartolini and Bonatti 2003 show that if a Ramsey-Rebelo AK model is augmented by treating the units of time devoted to work, h , (“capital operating time”) as a choice variable, the resulting Akh model does not generate endogenous growth in the absence of negative externalities. Duranton 2001 shows in an endogenous growth model with overlapping generations, that when the labour supply is made endogenous production remains bounded if leisure and consumption are (gross) substitutes.

2. Empirical problems: Why do people strive so hard for money?

Keynes predicted that by 2030 the average working week in Britain would amount to only fifteen hours. In reality, the initial promise of industrialism that it would progressively free mankind from its Biblical condemnation to a life of drudgery seems to have been largely betrayed. In the advanced societies, work continues to take up most of people's vital energies.

The evidence shows that industrialism is associated with a huge utilization of labor . The beginning of growth processes – the transition from a rural to an industrial economy – has always been associated with a mobilization of human resources taking the form of explosive growth in the participation rate, in working time, and so on (Williamson 1995, Krugman 1995, Bartolini and Bonatti 2002a, Antoci and Bartolini 2002). Moreover, as regards the long-period trend of industrial economies to reduce the labor input, the evidence shows that this, in the best of hypotheses, is weak and non-monotonic.² Nor does the post-industrial economy seem to encourage optimism as to any increase in leisure. In fact, a large body of data on working hours in the USA seem to indicate that they have increased in the last decades (Schor 1991, Robinson and Godbey 1999, Bluestone and Rose 2000, see Figart and Golden 2000 for a critical review of the controversy on this argument).

Why “industrialism is biased toward producing goods rather than leisure”? (Cross 1998, p. vii). What are the reasons for the signal failure of growth to maintain its promise of increasing leisure? Why is ‘time pressure’ a typical problem of contemporary society? Why do surveys invariably find that people suffer from a ‘time squeeze’? Why have new categories of the socially deprived like the ‘time poor’ appeared? What is it that induces people to work so hard in economies which grow ever more productive?

The difficulty of growth theory in answering these questions is the obvious empirical correlate of the theoretical problem discussed in the preceding section. Since the inclusion of the work/leisure choice in endogenous growth models yields the counterfactual prediction that working time will be highly responsive in the long

² See Bartolini and Bonatti 2003b. While working hours seemingly exhibit a century-long tendency to decline in Western countries, with the debatable exception of the USA, per-capita labour input displays a much weaker tendency to diminish, with major and prolonged reversals of tendency. The reason for this is that per-capita labour input (annual average working hours x total employment / total population) is influenced by the historical trend for the participation rate to increase.

run to technological advances, such models are unable to explain these empirical patterns of growth either the sudden increase in the labor supply during industrial revolutions, or the weak and non-monotonic decline in the input of labor over the very long run, or the increase of working hours in the greatest post-industrial economy on the planet.

As regards the saving rate, too, endogenous growth models seem to predict its greater reactivity to increased wealth and productivity than is actually the case. In fact, also the tendency for the saving rate to decline is doubtful, and in any case weak if compared to the long-period increase in wealth.³

In conclusion, people in real economies seem to be much more interested in money than endogenous growth models predict. We do not know what prevents them from enjoying life more by working less and accumulating less. Current models seem to lack an engine of growth – a *tertium movens* of growth which induces people to be so interested in money. “Why do people strive so hard for money?”

3. *Why are people so unhappy?*

The second empirical anomaly is the betrayal by growth of its promise of greater well-being. A man of the nineteenth century would probably be astonished that Western societies emancipated from mass poverty would be populated by a mass of dissatisfied individuals. And the billions of human beings who still suffer from poverty would probably find it just as astonishing.

But this seems to be what is happening. The empirical evidence concerning rich countries overwhelmingly demonstrates that growth has betrayed its promise of well-being. A great quantity of data, both subjective – i.e. relative to the degree of satisfaction with their lives expressed by individuals⁴ – and objective as regards suicides and mental illnesses, induce scholars in various disciplines to conclude that

³ Also a matter of controversy – like working hours in the United States during recent decades – is whether the trend in the saving rate is increasing or decreasing. Whilst in the case of working hours the dispute mainly concerns what the most reliable data are, the debate on saving rate centres on what should be considered the ‘right’ variables to measure. For example, if we include capital gains in saving, the 1995-98 saving rate in the United States was the highest since the 1960s (Gale and Sablehouse 1999). After the recent crisis of the stock market, the personal saving rate has begun to rise again in the United States.

⁴ “Classical” papers on the topic are for instance Easterlin 1974 and 1995 and Oswald 1997

there is no correlation between income and happiness and if one exists it is negative. Whether one considers the post-war decline in the number of Americans who report themselves as being ‘happy’ (Lane 2000 p. 3), or the contemporary epidemic of depression, anxiety and panic, or the increase in suicides among the young, growth has evidently failed to increase happiness.

Why are people so unhappy? What needs to be explained is the paradox pointed out by Lane: 2000 “the economic (...) institutions of our time are products of the utilitarian philosophy of happiness but seem to have guided us to a period of greater unhappiness” (p. 13).

It is for this reason that the theme of happiness and the explanation of the malaise of rich societies have recently been the subject of intense debate which, besides generating a recently flourishing economic literature (the “happiness economics”), has also involved sociologists (Baumann 2002, Venhoven 1993), psychologists (Kanheman 1999 and 2000, Argyle 1987) and political scientists (Lane 2000).

It is evident that current growth models, in which well-being depends entirely on what is transacted in the market, are wholly unable to explain the paradox of Lane. Any one-good model is unable to explain it because it assumes that individual well-being improves as more output becomes available for consumption.

4. Negative externalities as the tertium movens of economic growth

The explanation of this latter anomaly complicates explanation of the former one: “Why do people strive so much for money if money cannot buy happiness?”. This is what the literature on the topic refers to as a ‘paradox of happiness’. Any joint explanation of the two empirical anomalies must in practice satisfy the requirement of explaining this paradox.

In its present state the theory of growth seems entirely unable to handle issues of such importance. A growth mechanism exclusively based on accumulation and technical progress –the *primum* and *secundum movens* of growth- fails to explain why growth has not fulfilled its promises of greater leisure and greater happiness. I argue that this inability may be because growth theory overlooks a *tertium movens* able to explain the above paradox: negative externalities.

The three trends discussed – in work, saving and happiness – have never been connected, and discussion on them has remained confined to the respective disciplinary areas, receiving no attention in the debate on growth. In the next two

sections I argue that these three trends may be the consequence of the same cause: the negative externalities generated by the growth process. These negative externalities may be of two kinds: positional ones, and those which reduce the availability of free goods as final or intermediate goods.

5. Explanation based on positional externalities

An economy is positional in nature when individuals are interested in their relative positions rather than their absolute ones. Let us suppose that individuals are interested in relative not absolute income (or wealth). In an economy of this kind, an increase in one person's income generates a positional negative externality in the sense that it reduces the well-being of someone else.⁵

The capacity of the hypothesis that relative income matters to explain the empirical anomalies of growth theory should be intuitive. Individuals are induced to work hard and to accumulate much by positional competition. The fact that the position of people with constant incomes worsens if others increase their incomes is a powerful incentive for the former to be interested in money.⁶ But, a general increase in income which leaves the relative positions unchanged cannot improve general well-being. In an economy of this kind the well-being of everyone cannot improve by definition. Hence the hypothesis of negative positional externalities is consistent with explanation of the happiness paradox. Positional negative externalities may be the *tertium movens* which explains the empirical anomalies of growth theory.⁷

6. Explanation based on externalities reducing free goods: the GASP models

⁵ The main precursors of the idea that relative position matters are Veblen 1899/1934 and Hirsh 1976. According to Hirsh, well-being in the rich economies depends increasingly on positional goods. The clearest definition of pure positional good has been provided by Pagano 1999, according to whom consumption by an individual of a positive amount of a positional good involves the consumption of an equal negative amount by someone else. Examples of pure positional goods are power, status, prestige. This definition implies that increased consumption of a positional good by someone produces a negative externality on someone else.

⁶ Bowles and Park 2002 show the importance of relative position effects in determining manufacturing work hours in ten countries over the period 1963-1998. Schor 1998, using a U. S. sample shows that the impact of these effects on saving decision is significant.

⁷ The role of relative wealth effects as an engine of growth is shown in Corneo and Jeanne 2001, Among the growth models including the concern of individuals for their relative

The other explanation of these anomalies – the one based on negative externalities which reduce social and environmental capital– has been presented in a number of recent articles (Antoci and Bartolini 1997 and 2002, Bartolini and Bonatti 2002a, 2002b, 2003, 2003a and 2003b) According to this approach, the theoretical and empirical difficulties of growth theory are due to the fact that it fails to consider that well-being and productive capacity depend largely on goods that are not purchased in the market but are furnished by the social and natural environment. The growth process generates extensive negative externalities which reduce the capacity of the environment to furnish such goods. These negative externalities may be the *tertium movens* of growth given the capacity of the market to supply costly substitutes for the diminishing free goods. If agents can purchase substitutes for free resources they will react to the decline in their well-being or in their productive capacity by increasing their use of goods purchased in the market. Negative externalities force individuals have increasingly to rely on private goods in order to prevent a decline in their well-being or productive capacity. In this way they contribute to an increase in output. This feeds back into the negative externalities, giving rise to a further diminution in free goods to which agents react by increasing output, and so on. A self-reinforcing mechanism thus operates whereby growth generates negative externalities and negative externalities generate growth. Hence growth takes the form of a process of substitution whereby free final (or intermediate) goods are progressively replaced with costly goods in the consumption (or production) patterns of individuals.⁸

position see for instance (Fershtman, Murphy, Weiss 1996, Corneo and Jeanne 1999), which focus on the impact of the initial distribution of wealth on the growth rate.

⁸ Antoci and Bartolini 1997 and 2002 show, under various conditions concerning pay-offs and negative externalities, how the latter act as a *tertium movens* of growth. In two evolutionary games without accumulation and technical progress, they demonstrate that negative externalities can generate growth of per capita output because of their simple impact on the labour supply. In Bartolini and Bonatti 2003b these results are obtained in a world with optimizing agents. Consequently, the proposition that negative externalities can generate growth does not depend on assumptions about the bounded, or otherwise, rationality of agents. These three papers show the mechanism of substitution between free and costly consumption in the pure state; that is, they demonstrate the logical possibility of obtaining an increase in per capita output in models without accumulation and technical progress. These three models therefore imply that the presence of accumulation and/or technical progress is not a necessary condition for growth. Bartolini and Bonatti 2002a analyse, in the version with optimizing agents of this framework, the conditions that generate multiple equilibria and the role played by the cultural attitudes prevalent in a society in selecting of the growth path. Bartolini and Bonatti 2003a and 2003 incorporate the mechanism of substitution between free and costly consumption into the main paradigms of growth theory: exogenous and

According to these GASP (Growth As Substitution Process) models, the two anomalies of growth theory are two sides of the same coin. People strive so much for money because they have to defend themselves against negative externalities: they work so much and save so much in order to substitute – in the present and in the future – free goods with costly ones. But an increase in their income does not improve their happiness because it involves a process of substitution. These negative externalities are the factor motivating people to strive so much for money that growth theory has failed to identify. But they are also the factor that explains why people's efforts are not rewarded with increased well-being.

On this view, the dynamics of the labor supply and accumulation depends on the magnitude of social and environmental cleavages. Industrial revolutions are the paradigmatic example of this mechanism: they are the most striking processes of labor supply and accumulation increase because they are the most striking processes of social and environmental devastation recorded by economic history.

The trend of the saving rate depends on social and environmental cleavages because in this framework social wealth also includes social and environmental capital besides private capital, but agents can accumulate only the latter. Hence agents react to the progressive degradation of commons by keeping their saving rate high. At any point along a growth path, agents are poorer than appears if we consider their private wealth

endogenous growth. Bartolini and Bonatti 2003a introduce this mechanism into an exogenous growth model *à la* Solow-Ramsey, finding that negative externalities boost the labour supply and accumulation and consequently the steady-state level of activity. Bartolini and Bonatti 2003 show that if the labour supply is endogenized in a Ramsey-Rebelo AK model of endogenous growth, the resulting model does not generate perpetual growth in the absence of negative externalities. Accumulation and technical progress are not a sufficient condition for endogenous growth to come about, unless negative externalities are introduced into the model. These negative externalities engender a process of substitution between free and costly consumption which gives rise to unbounded growth. The feature shared by all six of these models is that the substitution mechanism takes place in consumption. Social and environmental capital enter utility functions alone, and growth is fuelled by its substitution with produced final goods. Bartolini and Bonatti 2002b show that the substitution mechanism may also operate in production. Using an exogenous growth model in which social and environmental capital enter only the production functions and the labour-leisure choice is included, they show that, under certain conditions, the erosion of social and environmental capital may enhance growth, i. e., increase the steady-state level of activity. Hence growth can be a process whereby not only final goods but also intermediate free goods are substituted with costly ones. The possibility of growth as a substitution process is generalized from the case in which negative externalities affect consumption to the case in which they affect production. On this point see also Smulders 2000.

alone. The decline in common resources produces a negative wealth effect which boosts accumulation despite the increasing private wealth.

In this framework economic prosperity does not increase happiness. Individuals are unable to enjoy the opportunities for greater well-being offered by increased labor productivity because they are forced into over-work and over-accumulation by negative externalities. Growth thus appears to be a coordination failure.

7. The dark side of growth

The idea behind GASP models is that one way to motivate people to accumulate money is to create a society in which increasingly less can be obtained for free; a society in which opportunities to acquire well-being in ways which do not pass through the market become increasingly scarce, and in which well-being can therefore only be purchased.

According to this approach, the theory of growth based on accumulation and technical progress is unable to explain the paradox of happiness because it tells only part of the story of growth – the story, that is, in which goods are luxury goods for one generation, standard goods for the next, and absolute necessities for the one after that. The history of economic growth is obviously full of examples of this process. But the other side of this story is that of free goods which become scarce and costly ones for the next generation and luxury goods for the one after that. Urbanization is widely associated with phenomena of this kind. A world in which silence, clean air, swimming in clean seas or rivers, or pleasant strolls become the privilege of uncontaminated places and tropical paradises is a world which tends to spend considerable resources to evade the unliveable environments that it has constructed. The periodic mass migrations known as summer holidays that one observes in the rich countries, or the fact that tourism from the rich countries has become an important resource for many poor ones, may not be indicative of higher living standards but rather a response to a deterioration in the quality of life.

Of especial importance in explaining growth's betrayal of its promises of well-being is interpretation of social capital as "relational goods", a term which denotes the contribution to well-being made by human relations (see Ulhaner 1989). That the quality of relations is of crucial importance for happiness is an assertion supported by a quantity of studies in the social sciences, as well as by evolutionary principles (Lane 2000). From this point of view, the rich societies are experiencing a gigantic

relational failure. Loneliness is regarded as a great social and personal problem, and so too is the poor quality of relations (Lane 2000, p. 85). The progressive spread of market relations, exclusively based on personal advantage, seems to be associated with relational desertification (Polanyi 1968, Hirschman 1982, Hirsch 1976, Bartolini and Palma 2002). For that matter, since its beginnings in the Industrial Revolution, the market society has been accompanied by a critique of its destructive impact on social relationships and cohesion (see the romantic and socialist critiques of the Industrial Revolution).

Urbanization, too, plays a role in determining the availability of relational goods. The urban evolution of the industrialized countries establishes the city as the centre of aggregation, but only as far as production is concerned. Cities are environments constructed for the purposes of work and not as places where people can meet. The urban environment is a paradigmatic example of the poverty of relational occasions and of low-cost meeting places, and in parallel, of the abundance of costly opportunities for leisure activity. The urban distress of social groups with the most free time, most relational needs and least money – namely young people and the elderly – testify to this situation. It may be for these reasons that “the city is the engine of growth” (according to the World Bank) and also the crux of the mass dissatisfaction of the rich societies.

However, independently of the variety and complexity of the causes of the relational failure of the market societies, the point is that a world of relational poor individuals may seek out numerous forms of compensation in material goods – even less obvious ones like those exemplified by the enormous growth of home entertainment or drugs, the evasion *par excellence* from an unsatisfactory reality. The enormous accumulation of produced goods and the worship of everything that is private which characterizes market societies may be reactions to the erosion of everything that is common to people.

In conclusion, the time pressure and the relational and environmental failure of market societies, may be at the core of explanation of both the capacity of those societies to generate growth and of the latter’s betrayal of its promise of happiness.

8. Defensive expenditures in production

The previous section discussed the processes by which the free goods entering the utility functions are substituted. But it is likely that environmental capital, and

especially social capital, are also of great importance in determining the system's productive capacities.⁹ Does the consideration that social capital also enters production functions, and that negative externalities may therefore affect productive capacities, alter the assertion that negative externalities can be an engine of growth, and the explanation of the paradox of happiness offered thus far based on the substitution of free goods by costly ones?

The GASP model presented in Bartolini and Bonatti (2002b) shows that also in the case in which social (and/or environmental) capital enters the production function, negative externalities may give rise to a substitution process whose result is an increase in output. The reason is that individuals may undertake expenditures to defend themselves against negative externalities also when these affect their productive capacities. Many transaction costs, in fact, are intrinsically a defence against opportunism. The erosion of social capital may lead to a spread of opportunism and therefore to an increase in many transaction costs. Social capital can be viewed as a historical heritage: trust, the perception of shared social norms, values like honesty or business ethics etc. are cultural traits deriving from a historical sediment which tends to be eroded by the diffusion of market relationships. Their decline greatly complicates transactions (Fukuyama 1995, Hirschman 1982, Hirsh 1976, Polanyi 1968). The important point is that agents may react to their decline by shifting to transactional modes which employ private goods rather than public ones. For example, one may substitute trust in someone else with security cameras that monitor his behaviour. If a firm's trust in its business partners diminishes, it can purchase legal assistance to draw up contracts that protect it. The increased output consequent on the possibility to purchase defence against negative externalities produces a further decrease in social capital which feeds back into the mechanism. Hence, if individuals react to the erosion of social capital by expanding the production of private goods, the unintended result will be a further erosion of social capital, and this may trigger a process of self-fuelling growth.

Hence, even when social (and environmental) capital enter the production function, negative externalities may generate a growth process. In this case, the increase in output may comprise intermediate goods whose use is made necessary by the growth

⁹ Natural capital tends to have a significant productive role only in economies which rely largely on traditional agriculture. Industrial economies instead mainly use the environment as

process. One can easily imagine examples of this kind: expenditures on business and legal advisors, on the enforcement of property rights, of industrial secrets, on protection against crime, the costs of monitoring, of writing and enforcing contracts, information costs like expenditure on personnel recruitment or the search for commercial partners, the acquisition of personal knowledge to defend oneself against opportunism (living in a world of sharks may be very costly, and not only psychologically). Expenditure of this kind may not be a sign of the ‘modernization’ of transactions but instead a response to the decline in social capital.

This mechanism confirms that it is possible to explain the happiness paradox in terms of a substitution process. The need to defend productive capacities against the erosion of social capital may boost the labour supply and the level of activity. But the growth of output overestimates the increase in final goods and therefore in well-being, given that the output also comprises intermediate goods. The difference from the GASP models in which social and environmental capital enters utility functions is that in that case growth overestimates the well-being because it does not take account of the destruction of final goods.

9. Policy implications: the two explanation compared

In this sect. I compare the policy implications of the two explanations provided here for the paradox of happiness: the one based on positional negative externalities and the one relying on the externalities that affect free goods, as in GASP models.

First note that the latter explanation does not refer to anything positional: an increase in others’ incomes induces individuals to work hard and accumulate much because it worsens their absolute and not relative position. The inability of growth to increase happiness is due to the fact that the erosion of free resources worsens that absolute positions of agents, not their relative ones. The interest of individuals in money, and their inability to improve their happiness, are due to negative externalities which have nothing positional.

Why should positional negative externalities be kept distinct from externalities that erode social and natural capital? Because they have very different policy implications.

In their turn, the policy implications of the hypothesis of positional externalities differ greatly depending on how the positional psychology of agents – that is, their

a repository for waste, so that it is unlikely that resources depletion will restrict production.

interest in positional goods – is founded. There are two motivations that may explain the interest of individuals in the relative position: envy and emulation. A biological or a cultural explanation can be given for each of them.

According to the biological explanation, the degree of satisfaction that individuals feel with their lives depends on the extent to which they are able to satisfy their needs. These needs depend on what individuals consider to be possible. Hence happiness is modelled on what is deemed to be reasonably obtainable. The evolutionary psychologist Steven Pinker 1997 writes: “How do we know what can reasonably be attained? A good source of information is what other people have attained. If they can have it, perhaps so can you” (p. 390). Happiness is therefore intrinsically relative. In this set-up the positional psychology of individuals is therefore biologically founded in the cognitive processes that plot the horizon of the possible in the human species.

Of course, the policy implications of this set-up are entirely discouraging. In the envy-ridden or emulative world of the human species, growth inevitably engenders a senseless and exhausting rat race. Given that individuals’ interest in positional goods is biologically founded, and therefore intrinsically bound up in human nature, it is impossible to increase the happiness of everyone.

The policy implications of the assumption that relative position matters are different if the positional psychology of individuals is culturally-founded. According to numerous authors, a society based on competition tends to generate a system of values which are by their nature relative, such as success, power, etc.. The values generated by a market society produce a change in preferences which makes a generalized increase in happiness impossible.

The policy implications of a cultural explanation for the interest of individuals in positional goods are less pessimistic. There is a way to increase general happiness, but it is reached along the arduous road and long-drawn-out time scale of cultural policy (for example educational policy).

Instead, in GASP models, the inability of growth to improve happiness derives from an institutional problem, and not a biological or cultural one. The price system does not receive signals about the importance of fundamental needs which do not pass through the market. Individuals are unable to control resources crucial for their happiness. The fact that money does not buy happiness stems neither from biology

Instead, social capital plays a productive role of great importance in the rich economies.

nor from culture; money is unable to buy happiness amid a pattern of growth with excessively high social and environmental costs.

10. Implications for environmental economics

It is curious that the stagnation/decline of happiness over the very long period in the industrial economies has never been cited as evidence for the argument that current patterns of growth are not sustainable. However the literature on sustainable development would seem to be a candidate to explain a disappointing trend in well-being, interpreted as an unsustainable well-being.

Let us examine the answers furnished by this literature to the following question: on what depends the fact that a generation does or does not consume crucial resources whose depletion in some sense restricts the possibilities of future generations to satisfy their needs? The conventional environmentalist wisdom tells us that the sustainability of a given pattern of growth depends (i) on the level of the discount rate present in the economy; (ii) on the degree of substitutability between natural capital and output.

Both these answers are questioned by the results of the GASP models. This is the argument of the next two sections.

10. 1. Discount rate and sustainability

The environmentalist literature treats the problem of sustainability as a problem of (intertemporal) ethics – that is, of intergenerational equity. The problems of sustainability are attributed to the excessively high discount rate of present generations. Individuals, it is argued, give insufficient importance to the future of subsequent generations to be ensured an equal level of possibilities, whatever this means (possibilities in terms of income, well-being, consumption, or whatever ‘sustainability’ may mean). The propensity of present generations to exploit resources crucial for the future exceeds their right to do so defined on the basis of some plausible criterion of intergenerational equity. According to this approach there is an ‘ethical’ discount rate which is lower than that of individuals. Note that the possibility of posing the problem of sustainability in ethical terms rests entirely on the assumption that the dynamic of economic systems reflects the discount rate of the individuals

This explanation runs into a major difficulty: the incompatibility between high discount rates and the presence of substantial saving rates. Why do agents save so much if they have high discount rates? Why do they accumulate so much if their interest in the future is so low as to consign subsequent generations to a threatening and difficult future (see Vercelli, 1992)?

Some GASP models may provide an explanation for the problem of sustainability which resolves the above-mentioned difficulty. They may do so because explanation of the problem of sustainability is based on the idea that the behaviour of economic systems does not reflect the discount rates of individuals (see Bartolini and Bonatti 2003a and 2003).

These models predict that the long-term welfare of individuals tends to decline the higher their rate of time preference is: the greater the concern of living individuals for their descendants, the more they worsen the prospects of the latter.¹⁰ This apparent paradox can be understood if we analyse the structure of the intertemporal allocation decision problem that individuals must resolve. In these models there are two assets of importance for present and future well-being: output accumulated and the environmental and social resource. Only the former can be accumulated privately, given that the latter is a common. Hence individuals can defend their future well-being against decline in the common resource by accumulating the only asset that they are able to accumulate: the private good.

In this context the dynamic of the economic system does not reflect the temporal preference of agents. The more that individuals are concerned for the well-being of their descendants, the more they will save, given that they anticipate the depletion of free resources. But this greater accumulation of privately owned assets does not compensate for lesser social and environmental quality that it unintentionally causes, and it thus produces a decline in long-term well-being. Hence, in GASP models the decline in long-term well-being is due to a coordination failure, not to the intertemporal greed of each generation.

These models depict a world of people interested in their own well-being and that of their descendants, people who clearly perceive that well-being also depends on things

¹⁰ In Bartolini and Bonatti 2003a and 2003, infinitely lived dynasties are assumed. Under this assumption the discount rate expresses the interest of individuals in both their own futures and those of their descendants.

that cannot be bought, primarily the quality of the environment and of human relationships. In short, they perceive the importance of living in a better world, where the expression 'better world' denotes an improvement in social and environmental quality. Because they are interested in the well-being of their children, and perhaps also their grandchildren, they want to bequeath a better world to them. But they do not know how to do so; that is, they feel it to be impossible. Being unable to leave them a better world, they try to leave them money. As individuals seek to acquire the money that enables them and their descendants to escape an unliveable world, each of them makes her/his small contribution to worsening the world – that is, to produce a decline in long-term well-being.

Accordingly, the more individuals are concerned about their descendants, the more willing they will be to make sacrifices to leave them a better world. Being unable to do so, they will make more efforts to leave them money. Consequently, their small personal contribution to worsening the world will be greater, and the future will be that of a worse world. This explains why it is that the greater the efforts made by agents to improve the future of their descendants, the more the unintentional result of their intertemporal defensive actions will be a worsening of the well-being of their descendants.

According to this approach, the problem of sustainability does not arise from intergenerational conflict but from a failure among individuals belonging to the same generation to coordinate their efforts. The negative impact on long-period well-being of this coordination failure is the more severe, the more the problem of intertemporal allocation problem is important for individuals – that is, the stronger their preference for the future.

This argument should not be confused with a claim for a higher discount rate. I am simply claiming that respect for the discount rate of individuals may suffice for sustainability; long-term decline in well-being may arise from the inability of the economic system to reflect the time preference of agents. Individuals may have a rate of time preference that is lower than the one exhibited by the economic system, and a signal of this preference may be precisely the fact that they have substantial saving rates.

The traditional environmentalist claim for a lower discount rate is misleading if the dynamics of the economic system do not reflect the time preference of individuals. In the view put forward here the problem of sustainability is a problem not of ethics but

of efficiency. In other words, it is an institutional problem. A coordination failure generates inefficiencies in the intertemporal allocation of resources. By claiming that sustainability is not an ethical question, I do not wish to argue that present generations have the right to compromise the future; rather, that they might have not the desire to do so. The problem of the sustainability of an economic system may therefore be solved by changing its institutions.

This explanation of the problems of the sustainability of well-being contains a policy message very different from the traditional environmentalist account based on the intertemporal selfishness of human beings. The paternalistic appeal of Calvinist stamp to the virtues of abstinence implicit in the traditional explanation is misleading because the problem lies not in human nature – that is, in its alleged intertemporal greed – but in the economic system. There is no intrinsic conflict in human nature between generational interest and species interest. It is the economic and social organization that should be changed.¹¹

10. 2. Substitutability and sustainability

One of the key results of growth models with environmental resources is that the sustainability of a given pattern of economic growth depends on a technological problem: the degree of substitutability between ‘man-made’ goods and natural resources; the higher this is, the greater the welfare for future generations.¹² The overall finding of this literature is therefore that the conditions which an economy must respect in order to be sustainable are the more stringent, the more pessimistic are assumptions about the degree of substitutability between produced goods and environmental goods.

¹¹ For a presentation of the “right-based approach” to sustainability see Bromley 1998, who argues that this approach implies a claim for an institutional change (“an environmental regency”) “that will protect the interest of future persons”. Hence, asserting that the interest of future generations must be protected against the voraciousness of present ones, as implied by the right-based approach, or arguing that an economic organization should be created which is able to reflect the interest of the present generations for future ones, as implied by GASP models, may lead to policy options that are similar yet founded on profoundly different motivations.

¹² In this literature, the degree of substitutability between ‘man-made’ capital and natural capital is considered crucial for sustainability. If they are perfect substitutes, the condition for sustainability is that the aggregate stock of capital (‘man-made’ plus natural) should not decline (‘weak’ sustainability) (see, for instance, Hartwick, 1986). If they are not perfect

In contrast, GASP models show that the possibility of substituting man-made goods for environmental assets can trigger a self-reinforcing process of growth in output that leads to a worsening of individual well-being. In fact, the growth process is described as a process of substitution of environmental and social goods with produced goods in which growth ‘goes too far’.

The main implication is that the sustainability of well-being may not be a technological problem but instead an institutional one. A coordination failure may induce agents to over-exploit the possibility of substituting social and environmental resources, thereby fuelling the deterioration of those resources and generating undesired growth. In these models, substitutability guarantees the sustainability of growth, but not of well-being. The implication is that high substitutability provides no guarantee that well-being can be sustainable in the absence of policy.

11. On the possibilities of improving the human condition

The gradual decline in Western culture of trust in progress has probably been influenced by economic growth’s betrayal of its promises. To what extent is there justification for the idea that it is possible to improve the human condition?

From the policy point of view, the GASP models imply a call for collective action that may assume different forms: for example, it may support the view that rich economies are over-worked and the demand for legislation to reduce working time. It may also support the view that a pure market economy is characterized by an excessive depletion of environmental assets, and then support demand for extensive environmental policy.¹³ Given the emphasis on the importance of relations for human happiness, this approach further suggests that social policies intended to improve relations should be introduced. In short, the GASP models suggest that collective

substitutes, sustainable development requires that there be no net damage to environmental assets ('strong' sustainability) (see, for instance, Pearce et al. , 1990).

¹³ This claim for collective action is perfectly compatible with the existence of an ‘environmental Kuznet curve’ i.e. the inverted U-shaped relation between per-capita income and environmental degradation. In fact, I agree with those who maintain that explanation for this relation lies in the progressive extension of the environmental policies normally observed in rich countries (Grossman and Krueger (1995), Arrow et al., (1995), Ayres (1995), De Bruyn et al., (1998)). Since a reduction in the depletion of the environment is due to policy responses, to proclaim that growth is a substitute for environmental policy is a dangerous misunderstanding.

action is important for control of the inefficiencies generated by the economies described.¹⁴

The policy implications of the various strands of argument put forward in this paper all lead in the same direction. According to the GASP models, current experience and the future risk of diminished well-being are neither a biological problem nor a cultural, ethical or technological one; they are an institutional problem.

The questions to be asked when assessing the possibilities of improvement in the human condition do not concern the extent to which the competitive or emulative spirit of individuals is due to biological or cultural conditioning; nor do they concern the ethical limits to the right to exploit resources of each generation or the origin of the intertemporal greed of human beings, nor the limitations of technology in devising substitutes for environmental resources. Rather, they concern the extent to which human societies are able to generate the institutional change necessary to improve the relational and environmental conditions of individuals.

It is probable that many of the problems to which GASP models allude could be greatly alleviated by focusing social policies on the humanization of relations among people, and between people and the environment. To what extent is this likely to happen?

It is anything but obvious that optimism is justified when answering the question. In general, there is no guarantee that the mechanisms that shape collective consciousness and choices do not impose particular interests to the detriment of those of broad social strata. Neo-institutionalist historiography is replete with examples of societies whose decline has been due to collective decisions serving the interests of the few at the expense of the interests of the many (North and Thomas 1973, North 1981). The “logic of collective action” (Olson 1973) tends systematically to distort collective

¹⁴ Obviously, also the definition of property rights which enables the formation of a market for resources is a collective action. In fact, it requires institutions that define the new rights and institutions that enforce them. The property rights solution is the one that requires the least amount of collective action, compared to any other institution, for example a public regulatory authority. However, as often noted, environmental policy may require extensive public intervention due to high transaction costs which render the market solution costly and inefficient. Moreover, the GASP models are consistent with an interpretation that emphasises the role of the enlargement of market relationships in causing a deterioration of relational goods. They suggest that these two trends may be driven by a self-propelling mechanism. From this point of view, it is difficult to view the formation of markets as a general solution for the loss of well-being treated by these models.

choices with respect to interests of great importance. The laws that regulate the pressure capacity of interest groups on collective consciousness and choices tend systematically to bias collective action with respect to objectives of enormous public interest.

Hence, the crucial questions regarding the likelihood of an improvement in the human condition largely concern the success of the market democracies in representing the interests of broad strata of the population – interests coincident with the creation of institutions for the maintenance and expansion of social and environmental resources.

12. Summary

Current models of endogenous growth face two major empirical anomalies. The first is that once the labor/leisure choice is included, they lead to the counterfactual prediction that the labor supply will be highly responsive to technological advances in the long-run. Individuals will tend to allocate the increase in labor productivity due to accumulation and technical progress preponderantly to increasing their leisure. However, this does not seem to be supported by the empirical evidence. In the industrial economies the overwhelming majority of increased productivity has been allocated to increase output, and the weak tendency for leisure to increase seems to be declining or indeed has gone into reverse in the USA in recent decades. The second empirical anomaly is that endogenous growth models predict that the well-being of agents will increase as more output becomes available. Also this prediction is counterfactual. A large body of empirical evidence shows that the rich countries are experiencing a veritable betrayal of the promises of happiness held out by growth.

Why, then, do people work so much? Why do they strive so much for money? Growth literature provides no answer to this question, nor to the other very important one of why people are so unhappy. Moreover, providing a joint answer to the two questions seems particularly puzzling. Why do people strive so much for money if money cannot buy happiness? How can one explain the above ‘paradox of happiness’? Why growth has reneged on its promise to increase leisure and happiness? The silence of economic theory on these questions is deafening. I argue that the empirical difficulties of growth theory are due to the fact that it ignores the role of negative externalities as an engine of growth. In fact, growth theory identifies a *primum* and *secundum movens* of growth – accumulation and technical progress –

but it omits the *tertium movens* of negative externalities. These externalities can be of two kinds. The first are positional negative externalities, i. e. those due the fact that individuals may be interested in relative not absolute position. In an economy of this kind, an increase in one person's income generates a positional negative externality in the sense that it reduces the well-being of someone else. Individuals are induced to work hard and to accumulate much by positional competition. Simultaneously, a general increase in income which leaves the relative positions unchanged cannot improve general well-being. Hence positional negative externalities may be the *tertium movens* which explains the empirical anomalies of growth theory.

The second kind of negative externalities are those which reduce free goods. Some recent models, both evolutionary or with optimising agents, show the role of these externalities as an engine of growth. This approach emphasises that the growth process generates extensive negative externalities which reduce the capacity of the social and natural environment to furnish free goods. In these models individuals have increasingly to rely on private goods in order to prevent a reduction in their well-being or in their productive capacity due to decline in social and natural capital. This generates an increase in output which feeds back into the negative externalities, giving rise to a self-reinforcing mechanism whereby growth generates negative externalities and negative externalities generate growth. According to these models, the two anomalies of growth theory are two sides of the same coin. People strive so much for money because they have to defend themselves against negative externalities: they work so much in order to substitute free goods with costly ones. But an increase in income does not improve their happiness because it involves a process of substitution whereby free final (or intermediate) goods are progressively substituted with costly goods in the consumption (or production) patterns of individuals. For this reason these models are labelled GASP models.

The policy implications of both views are compared. The policy implications of the presence of positional negative externalities depend on the way in which the interest of agents in relative position is founded. A biological or cultural explanation may be provided. In the former case the policy implications are entirely discouraging. In the envious and/or emulative world of the human species, the happiness of all can never be increased. In the case where the interest of agents in relative position is given a cultural foundation the policy implications are less depressing, but an increase in

general happiness has to be reached along the arduous road and long-drawn-out time scale of cultural policy.

Instead, in GASP models the inability of growth to improve happiness derives from an institutional problem, and not a biological or cultural one. The price system does not receive signals about the importance of fundamental needs which do not pass through the market. Individuals are unable to control resources crucial for their happiness. The fact that money does not buy happiness stems neither from biology nor from culture in these models; money is unable to buy happiness amid a pattern of growth with excessively high social and environmental costs.

I finally draw implications for environmental economics. The conventional environmentalist wisdom poses the problem of sustainability in ethical and technological terms: the sustainability of a given pattern of growth depends (i) on the level of the discount rate present in the economy; (ii) on the degree of substitutability between natural capital and output. Both these answers are questioned by the results of the GASP models.

According to the first answer, the excessively high discount rate of present generations may be responsible for the problems of sustainability. The question of the discount rate is an ethical issue; that is, it concerns intergenerational equity, because the voraciousness of present generations in their consumption of resources is prejudicial to the rights of future generations in terms of their ability to satisfy their needs. Of course, the possibility of posing the problem of sustainability in ethical terms rests entirely on the assumption that the dynamic of economic systems reflects the discount rate of the individuals.

In contrast, according to some GASP models the problem of sustainability does not arise from intergenerational conflict but from a failure among individuals belonging to the same generation to coordinate their efforts for accumulation. These models depict a world of people interested in their own well-being and that of their descendants; people who clearly perceive that well-being also depends on things that cannot be bought, primarily the quality of the environment and of human relationships. In short, they perceive the importance of living in a 'better world' Because they are interested in the well-being of their descendants they want to bequeath a better world to them. But they do not know how to do so (because the proper institutions are missing); that is, they feel that it is impossible. Being unable to leave their descendants a better world, they try to leave them money. As individuals

seek to acquire the money that enables them and their descendants to escape an unliveable world, each of them makes her/his small contribution to worsening the world; that is, to producing a decline in long-term well-being. Hence in GASP models the dynamics of economic systems do not reflect the discount rate of individuals: the decline in long-term well-being is due to a coordination failure, not to the intertemporal greed of each generation. The problem of the sustainability of an economic system may therefore be solved by changing its institutions. There is no intrinsic conflict in human nature between generational interest and species interest. It is the economic and social organization that should be changed

As regards the second of these two points, the technological possibilities of substituting environmental and social resources, the GASP models, in contrast with the conventional wisdom on the argument, show that if man-made goods can substitute for environmental assets a self-reinforcing process of growth in output may be triggered which leads to a worsening of individual well-being. The main implication of this is that the sustainability of well-being may not be a technological problem but rather an institutional one. A coordination failure may induce agents to over-exploit the possibility of substituting social and environmental resources, thereby fuelling the deterioration of those resources and generating undesired growth.

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