SUSTAINABLE GLOBALISATION

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Abstract

Though the recent process of globalisation of international markets succeeded in sustaining the economic growth of the countries that actively participated in this process, empirical evidence suggests that it was accompanied by stagnating poverty and a world-wide increase of environmental degradation and economic inequality. Therefore, there is a growing concern that these features of the globalisation process may jeopardise its social and environmental sustainability.
Both environmental and social dimensions of sustainability played a central role in the definition of sustainable development as originally suggested by the Brundtland Commission. Surprisingly enough, however, the ensuing literature focused almost exclusively on the environmental aspects of sustainability.
This paper intends to develop the original, more comprehensive, approach to sustainable development in order to get a deeper understanding of the role that globalisation played and could play in achieving social and environmental sustainability. In particular, it is here investigated how the process of globalisation may affect the relationship between per capita income on one side and inequality (Kuznets curve) or environmental deterioration (environmental Kuznets curve) on the other side.
From the analysis carried forward in the paper, some remarks are drawn on a few basic conditions for sustainable globalisation.

1 Introduction

World markets have become more and more integrated in the last decades. This process, that started long ago (at least since the Industrial Revolution), has experienced a strong acceleration in recent years by profiting of new ICT infrastructures such as TV channels, communication satellites, Internet and so on. However, empirical evidence suggests that the rapid growth of global markets has been accompanied by stagnating poverty and a world-wide increase of inequality and environmental degradation. This trend raises the question whether the process of globalisation may have detrimental effects on sustainable development, in terms of both social and environmental sustainability. As a matter of fact, these two dimensions of sustainability played both a central role in the definition of sustainable development as originally suggested by the Brundtland Commission (WCED, 1987, p.43): "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: (i) the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given and (ii) the idea of limitations imposed by the state of technology and social organisation on the environment's ability to meet present and future needs." Alleviating poverty and protecting the environment are here conceived as complementary objectives for a sustainable future. As the Brundtland Commission pointed out, moreover, sustainable development implies an ethical concern for the distributional equity between generations that must logically be extended to the distributional equity within each generation (ibidem). In the original definition of sustainable development, therefore, poverty, inequality and environmental deterioration are conceived as equally important and interdependent obstacles to sustainability that must be removed, or at least mitigated, in order to achieve it.

In the ensuing debate on sustainable development the focus concentrated on the environmental obstacle as if it were fully independent of the social condition of sustainability. In particular, although environmental sustainability has been analysed in terms of intergenerational distribution, its relationship with intra-generational distribution and poverty has been almost completely neglected.

In this paper we intend to develop the original, more comprehensive, approach to sustainable development by applying it to a special, though very broad, issue: the influence of the recent process of globalisation on inequality, poverty and environment deterioration. This may contribute to get a deeper understanding of the role that globalisation may play in achieving social and environmental sustainability. Since both the approach and the theme to which it is applied are very broad, in this paper we only aim to suggest a conceptual framework that may be utilised to address these crucial and complex issues in order to hazard a few tentative conjectures consistent with the available evidence on a few basic conditions that could make the globalisation process sustainable.

To this end, we have to distinguish between direct and indirect effects of globalisation on poverty, inequality and the environment. The former effects follow directly from the specific features of each phase of the world market

integration. The indirect effect of globalisation on social and environmental sustainability operates through enhanced growth in per capita income. Recent empirical evidence shows, in fact, that open economies grow faster than closed ones and that the growth rate tends to increase with the degree of openness. Market integration, therefore, tends to foster per capita income growth, that affects in turn poverty, inequality and environmental degradation through several channels (Borghesi, 1999).

We then investigate how the process of globalisation may affect the relationship of poverty, inequality and environmental degradation with per capita income. In this regard, we argue that both the original Kuznets curve and the environmental Kuznets curve, that have attracted much attention in the literature on inequality and environmental degradation, respectively, are unstable relationships as they tend to change shape and position over time. We advance the hypothesis that the process of globalisation may affect the relationship between per capita income on one side and inequality (the so-called Kuznets curve) or environmental deterioration (the so-called environmental Kuznets curve) on the other side.

The structure of the paper is as follows. Section 2 aims at clarifying the rational foundations of the growing concern for inequality, poverty and environmental deterioration, pointing out that similar ethical and economic arguments underlie the concern for these three problems. We then analyse how globalisation may affect social and environmental sustainability. In particular, we examine the impact of globalisation on poverty and inequality (section 3) and on environmental degradation (section 4) by devoting particular attention to the Kuznets curve and the environmental Kuznets curve, respectively. Section 5 discusses the analogies between the Kuznets curve and the environmental Kuznets curve, investigating how globalisation may affect the two curves. From the analysis carried forward in the paper, some concluding remarks are tentatively drawn in the last section on a few basic conditions for sustainable globalisation.

2 The ethical and economic foundations of sustainability

The recent growing concern for inequality, poverty and environmental degradation has sound ethical and economic foundations. From the ethical viewpoint, the worries for inequality, poverty and environmental degradation have a common root to the extent that each of them violates the crucial ethical principle of equal ex ante opportunities for each citizen. Ex post inequality is not necessarily a problem *per se*: in a meritocratic society it is in principle acceptable that more active and productive people have higher rewards. Rich people, however, often had higher opportunities than poor people did (e.g. easier access to higher education), so that the difference in productivity (and earnings) was affected by the difference in initial opportunities. The social planner, therefore, should address the inequality and poverty issues when income gaps reflect differences in ex ante opportunities. An egalitarian society is not expected to give everyone the same income level, but to ensure everyone the same initial opportunities. Similarly, as proposed by Chichilnisky (1997), sustainable development should be interpreted in its broadest sense as development that gives "equal opportunities" to all generations. This does not mean that we have to guarantee every generation the same income level, but the same set of initial

options (Vercelli, 1998). Both inequality and environmental degradation, therefore, can be criticised from the ethical point of view, as they violate the fundamental equity principle of *giving every agent the same opportunities*. This argument applies also to the concern for poverty. The concept of (consumption) opportunity set plays a crucial role, in fact, in the poverty identification problem, that is, the choice of the poverty line that allows identifying the poor. A poor person is generally defined as someone who fails to satisfy a set of minimum needs (e.g. quality food, housing, clothing, transports, suitable medicaments to avoid a disease etc…). According to this notion, the poverty line should be given by the purchased consumption basket necessary to meet these needs. As Sen (1979) pointed out, however, individual preferences or cultural factors might largely influence the actual consumption of these goods. Therefore, one needs to look at the consumption opportunity set of an agent rather than at her effective consumption of these basic commodities. If we then take the consumption opportunity set as the relevant measure to define poverty, the poverty line should be fixed at the minimum income level at which all the specified minimum needs could be satisfied. Alleviating poverty, therefore, implies *ensuring everyone a set of minimum consumption opportunities*.

The increasing level of inequality, poverty and environmental degradation, however, may be a matter of concern also for economic reasons, since they all have potential adverse consequences on the performance of an economy. There are compelling theoretical arguments that strongly support the preceding assertion. In particular, the actual performance of a rational agent strictly depends, ceteris paribus, on the extension of her opportunity set. A wider opportunity set may include superior options that improve the utility of the decision-maker as well as her performance. Since poverty restricts the opportunity set of the decision-maker, it reduces also her potential contribution to social economic efficiency and wealth. In addition, the condition of equal initial opportunities is a necessary condition for fair competition that implies more efficiency and a better performance for the economy as a whole. It is clear that poverty excludes from market competition people that may have superior specific skills whose exploitation would improve the performance of the market. It is well known that among poor people who could not afford a good education there are potentially excellent scientists, technicians, managers, etc.; no doubt a proper valorisation of these under-exploited resources would improve the efficiency and the performance of the economy. Apart from this general argument, there are further specific reasons for believing that poverty, inequality, and environmental deterioration worsen the performance of a market economy.

As several works have pointed out (e.g. Alesina and Perotti, 1996, Benhabib and Rustichini, 1996), high levels of inequality may cause social and political tensions that often have negative effects on income growth.[1] Socio-political unrest, in fact, threatens property rights, and therefore tends to discourage investment in the country. Anger about inequality, moreover, may lead to riots and strikes that tend to reduce the average number of working hours and thus the total production of the economy. It is interesting

[1] Social and political instability is only one possible way in which inequality may affect economic growth. See Barro (1999) for a discussion of other theoretical effects of inequality on economic growth.

to note that anger about inequality and the consequent social tensions are more likely to rise in a period of recession than of prosperity. When the economy grows, in fact, the poor may be also better off, but in a recession they are likely to suffer relatively more than the rich. The poor, in fact, lose less money than the rich, but they may lose their jobs. Hence, poverty may somehow enhance the negative effects of inequality on economic growth: the higher the number of the poor and the lower their living conditions, the higher will be their anger about inequality.

Similarly, environmental degradation might have adverse effects on production by increasing workers' health problems and thus reducing their productivity. Ecological degradation, moreover, reduces land productivity in the long run. This may give rise to a "poverty-environment trap" since the poor often rely on natural resources as their only source of income: environmental degradation tends to worsen the conditions of the poor, which -in turn- leads them to exploit natural resources even more to secure their day-to-day survival. Like in the case of inequality, therefore, poverty may enhance the negative effects of environmental degradation on economic growth.

Summing up, both ethical and economic reasons should induce public opinion and social planners to worry about social and environmental problems. But does current globalisation enhance these problems, or it potentially lowers them? To answer this question, the next two sections examine the impact of globalisation first on inequality and poverty, and then on the quality of the environment.

3 Globalisation, inequality and poverty

The world economy has become more integrated in the last decades. As Lindert and Williamson (2001) point out, world market integration is not a new phenomenon, but it has steadily increased since the 1820s, if we exclude the period between the two World Wars. After World War II and particularly in the last few years, however, globalisation has experienced an impressive acceleration that nurtured a hot debate on its new features and implications. We start their analysis from a brief survey of the observed correlation between the recent process of globalisation on one side and the recent behaviour of poverty and inequality indexes on the other side. Empirical evidence suggests that the rapid market integration has not been correlated with an unambiguous reduction of social exclusion and poverty.[2] Although the share of population living on less than 1$ a day decreased from 28.3 to 24 percent in the period 1987-'98, the total number of people in this group increased over the same period because of population growth (World Bank, 2001). Almost one fifth of the world's population lives on less than 1$ a day and about half of the world population lives on less than 2$ at present. Poverty indicators performed very differently across world's regions in the last decade, shifting poverty towards South Asia and Sub-Saharan Africa. The number of poor people, for instance, fell rapidly in East

[2] Social exclusion is one of the multiple dimensions of poverty. The notion of social exclusion, proposed by Townsend (1979) as a relativist criterion to set the poverty line, has gained renewed interest in recent studies. As underlined by the last World Development Report (World Bank 2001), social barriers lead to the exclusion of women, ethnic and racial groups that are unable to influence key decisions affecting their lives and do not receive the benefits of public investment in education and health.

Asia, but it increased dramatically in other regions (Southern and Central Asia, Sub-Saharan Africa, Latin America and the Caribbean, even Europe). Similarly, while social indicators such as infant mortality and illiteracy rates improved on average in developing countries over the past three decades, they kept on worsening in Africa (World Bank, 2001). This makes most of the world poverty indicators diverge from the poverty reduction targets set by the international community for 2015.

At the same time, world income distribution has also become more unequal in the last decades. Combining inequality within and across countries, Bourguignon and Morrisson (2000) have observed that the Theil coefficient of global inequality has risen since 1960. Similar results apply to other measures of inequality: Dikhanov and Ward (2001) have found that the Gini coefficient for the world income distribution has increased by about 6% between 1988 and 1993. Milanovic (2001), moreover, finds a polarisation between those at the top end of the world distribution (with more than $11,500 a year) and those at the bottom (less than $1,500 a year) with relatively few people in between.

To examine how globalisation may affect inequality, we have to distinguish between inequality within and between countries. The two components of world inequality, in fact, may depend on different factors (e.g. exchange rates are likely to affect more inequality between countries than within them) and require therefore different policy responses. The observed recent rise in world inequality seems to depend mainly on the increasing income divergence between countries rather than within them. This rise of inequality between countries is mainly due to lower economic growth and faster population growth in developing countries than in OECD countries (Wade, 2001). Income inequality, however, has also risen within many industrialised countries, such as the U.S.A. and Great Britain where it has reached the highest level since several decades.

The correlation between increasing globalisation of markets on one side and increasing inequality or stationary poverty on the other side does not imply the existence of a clear causal nexus nor its inevitability. In order to assess these issues it is useful to consider the indirect effects of globalisation on inequality and poverty mediated by the effects of globalisation on aggregate and per capita income. Most economists agree that the progressive liberalisation of international trade and the consequent market globalisation tend to enhance income growth. Frankel and Romer (1999), for instance, estimate that the elasticity of per capita income with respect to the trade-GDP ratio ranges between 0.5 and 2 percent. Dollar and Kraay (2001) find that developing countries that increased trade to GDP over the past twenty years experienced an acceleration of their growth rates, whereas developing countries that reduced the trade-GDP ratio had on average a decline in their growth rates. Lindert and Williamson (2001, p.71) show strong empirical evidence that open economies grow faster than closed ones and that growth rates increase with the degree of openness. Globalisation, therefore, seems to have contributed not only to foster growth in the participant countries but also to increase inequality between countries that liberalised their trade and those who followed autarkic policies. Casual observation supports this conclusion: Baltic countries, for instance, used to have similar income levels as Denmark before implementation of anti-trade policy by their governments after the 2nd World War. Lindert and Williamson (2001) also

claim that globalisation may have reduced the gap between countries that took part in it. This seems to be confirmed by the reduced income gap between OECD countries after World War II: post-war trade liberalisation was, in fact, mainly intra-OECD rather between OECD and the rest. Participation to the market integration process might explain, therefore, the polarisation in world income distribution that we observe today: countries isolated or excluded from globalisation remain behind, while those who participate to it join a sort of "convergence club".[3]

A similar description seems to apply to the impact of globalisation on intra-national inequality. Lindert and Williamson (2001) argue that income distribution became more unequal after liberalisation in four huge countries that account by themselves for much of the world population: China, India, Indonesia and Russia. Interestingly enough, inequality increased mainly in those regions that were cut off from the globalisation process, such as rural and hinterland China or rural India. In some cases the access to trade reforms and benefits was limited to an extremely small minority, as in Russia where only a few oligarchs took part in the internationalisation process (Flemming and Micklewright, 2000). These arguments seem to suggest that it was not globalisation per se, but the differential access to it that increased inequality both within and between countries.

Some could argue that the increase of intra-national inequality that followed trade liberalisation in the aforementioned countries should be conceived as a temporary consequence of globalisation that may vanish as growth goes on. As Kuznets (1955) first observed, in fact, inequality tends to increase at early stages of growth and then decreases later on, describing an inverted-U shaped relationship between per capita income (on the horizontal axis) and income inequality (on the vertical axis). This relationship, called "Kuznets curve" after the name of the author, was very popular during the 1970s when it was taken as an empirical regularity of the economy (Ahluwalia 1976, Robinson 1976). Later contributions, however, have started to question the evidence in favour of the curve. Some authors (Papanek and Kyn, 1986) have argued that income explains only a small part of the variance of inequality across countries.[4] Anand and Kanbur (1993) have found that the Kuznets curve (henceforth KC) relationship has weakened over time and that different inequality indices may give different results. Several works (Clarke, 1992, Li, Squire and Zou, 1998) have argued that the KC applies well to cross-country studies, but not to time-series analysis, therefore it does not necessarily describe the evolution of single countries over time. Despite these critiques to the initial empirical evidence, the KC hypothesis is still attracting much attention in the literature after about half a century from its first appearance and more research may be expected on this topic in the future as econometric techniques become increasingly sophisticated.

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[3] The idea that inequality falls between countries that participate to globalisation relies on the traditional opinion that relatively poorer countries gain most of the benefits from trade liberalisation. Trade liberalisation, in fact, "should have a bigger effect on the terms of trade of the country joining the larger integrated world economy than on countries already integrated" (Lindert and Williamson, 2001, p.35). See Lindert and Williamson (2001) for a more thorough discussion of who gains from trade liberalisation.

[4] Fishlow (1995) argues that a better fit of the data can be obtained by introducing development-related explanatory variables such as secondary school attendance.

The analysis developed so far has examined mainly the impact of globalisation on inequality devoting particular attention to the literature on the KC as it gives useful insights on the indirect relationship between globalisation and inequality. But what about the indirect effects of globalisation on poverty? The findings of some empirical studies that recently investigated this issue seem to suggest that globalisation may help the poor through its positive impact on aggregate income notwithstanding the negative influence on income inequality. Chen and Ravallion (2000) estimate that during the period 1993-98 the number of absolute poor (living on less than 1$ a day) decreased in developing countries that substantially opened up to trade in the last two decades, while the number of poor increased in the rest of developing countries. This seems to suggest that participation to the globalisation process may play a crucial role to fight not only inequality, but also poverty. Dollar and Kraay (2001), moreover, have found that income of the poor (measured by the bottom quintile of the population) changes in the same proportion as overall income in a panel of 92 countries over the period 1950-1999. The authors draw two main conclusions from this result. First, globalisation has a positive indirect effect on poverty through income growth since it raises the income of the poor. Second, globalisation-led growth does not benefit the rich more than the poor since the share of income that goes to the poor is unchanged during growth. This leads Dollar and Kraay (2001) to conclude that inequality is not related to income, casting further doubts on the existence of a Kuznets curve.[5] In our opinion, however, this conclusion does not follow immediately from their empirical result that considers only the bottom quintile of the population. Income growth, for instance, might have redistributive effects from the middle class to the top end of the distribution. If so, inequality would rise with growth even if the share of income to the lowest quintile keeps constant. Moreover, the use of a purely relative poverty line such as the lowest quintile of the population may have some conceptual drawbacks. While recognising the merits of the relativist approach,[6] if we evaluate deprivation only in terms of contemporary standards (i.e. the income distribution of the community one belongs to), then poverty becomes only an issue of inequality, while the two notions should be kept separate. If not, poverty cannot be eliminated as there will always be people below the average. Considerations of absolute and relative deprivation should be combined, therefore, in defining a notion of poverty as well as in quantifying it. The notion of capability introduced by Sen (1983) goes in this direction as it may help to solve the dispute on the absolutist versus the relativist approach to the definition of poverty. In our opinion, therefore, future research on the poverty impact of growth and globalisation should be directed to define operational measures of capability that is difficult to implement empirically for its level of generality. In particular, the notion of capability (what one can do) is akin to that of consumption opportunities set (what one can consume), therefore the latter could be taken as leading criterion to define the poverty line, as we argued above.

[5] This result seems consistent with findings of other recent studies (Deininger and Squire, 1996, Chen and Ravallion, 1997, Bruno, Ravallion and Squire, 1998, Easterly, 1999).

[6] As Sen (1979, p.293) has claimed "any person's poverty cannot really be independent of how poor the others are".

4 Globalisation and environmental degradation

A long-term correlation between the modern process of globalisation of international markets and environmental degradation is quite evident. The globalisation of markets brought about also a globalisation of the environmental problems. Global warming, the thinning of the ozone layer, the loss of biodiversity, the depletion of natural resources, the widespread deforestation and desertification are examples of global environmental deterioration that emerged and worsened while the process of globalisation accelerated after the 2nd World War. We believe that the existence of a general correlation of this kind is so uncontroversial that, for the sake of brevity, we do not need to document it here. However, since correlation does not imply causation, we have to discuss to what extent it is possible to identify specific causal mechanisms triggered and supported by well-defined phases of the process of globalisation that explain specific aspects of the process of global environmental deterioration. This goes beyond the scope of this paper. However, to this end we need a preliminary clarification on a few logical issues neglected in the literature that we intend to discuss in this section.

Generally speaking, we may identify four basic causal mechanisms: technological, economic, demographic and cultural mechanisms. The diffusion of mechanisation since the industrial revolution increased the exploitation of natural resources utilised as inputs in the industrial production, as well as the deterioration of their quality as a consequence of pollution. Afterwards, new waves of technological innovation have raised new environmental problems along with new opportunities for solving them.[7] The ensuing acceleration of economic growth progressively increased the size of industrial activity that determined a progressive environmental deterioration but also in many cases a progressive increase of per capita income. This allowed also a progressive increase in the world population that proved to be a crucial factor of environmental deterioration. Finally, the new cultural values introduced by the industrial revolution and progressively spread all over the world together with free markets considered nature as a mere means for satisfying human needs rather than a value in itself as in many pre-industrial cultures.

The logical nexus between these four causal mechanisms may be clarified by means of two elementary identities. The basic identity is the following:

$$(1) \qquad D = P\, y\, d_y$$

where D measures the global environmental degradation,[8] P measures the world population, $y = Y/P$ measures per capita income, and $d_y = D/Y$ measures the intensity of environmental degradation. The last two factors may be summarised by a fourth factor through the following identity

[7] For the last wave under the heading of New Economy see Vercelli (2001).

[8] We define D as an index that aggregates the environmental conditions of sustainability that jointly assure that pollution should not exceed the assimilative capacity of the environment and the exploitation of renewable resources should not exceed its natural growth (Atkinson et al., 1999).

(2) $d_p = y\, d_y$

where d_p measures per capita environmental deterioration. These two identities define four factors that help to understand the nexus between the four causal mechanisms mentioned above: P represents the demographic factor, y (given P) the economic factor, d_y the technological factor, and d_p the nexus between the economic and the technological factor. The cultural factor mentioned above is implicit in these indexes and may be made explicit only through a structural analysis that goes beyond the scope of the present paper.

The above identities, by definition, are unfit for a causal analysis but fix important constraints that any causal analysis has to comply with. A proper causal analysis could start from an equation of the following kind:

(3) $D = aP + by + cd_y + dz$

where the variables are here measured in their logarithms and z represents a vector of relevant exogenous variables, while a, b, and c are empirical coefficients that may be different from one because of the introduction of exogenous factors.

An empirical causal analysis of this kind requires extensive evidence on the empirical correlations between the above indexes in order to assess to what extent they may be interpreted in genuine causal terms. This empirical background analysis is almost completely absent in the literature. A partial exception may be found in the recent debate on the Environmental Kuznets Curve (from now on EKC) that studies the empirical relationship between per capita income y, generally interpreted as a proxy of the stage of development, measured on the horizontal axis, and environmental deterioration that is measured on the vertical axis by different indexes: total environmental deterioration D, or more often its per capita value d_p or its value per unit of income d_y. The debate concentrated so far on whether the existence of an inverted-U curve (called EKC by analogy with the classical KC discussed in the preceding section) is corroborated by the available evidence or whether a different pattern emerges from the available data. Unfortunately, the interpretation of the results obtained in the literature played down the different implications that arise from the use of the above indexes, and ignored the constraints posed by the identities set above.

Let's consider first the available evidence in a cursory way (for an extended critical survey, see Borghesi, 1999). Most empirical contributions are cross-country studies that consider pollution indicators. In the case of air-quality indicators the existence of an EKC found a good support for local air-pollutants, such as sulphur dioxide, suspended particulate matters, carbon monoxide and nitrous oxides (Grossman 1995, Barbier 1997, Cole et al. 1997) but not for global pollutants (such as CO_2) that have a limited direct impact on population (Cole et al., 1997). For water quality the evidence is more mixed. There is some corroborating evidence from some indicators but not from others, while there are conflicting results on the shape, position and peak of the curve. A few contributions, e.g., find a much less optimistic N-shaped pattern rather than the inverted-U shape (Grossman and Krueger 1994, Shafik 1994, Grossman 1995). As for the other indicators of environmental degradation, the EKC hypothesis receives very little

corroboration. Environmental problems that have direct and strong impact on the population (such as access to urban sanitation and clean water) tend to improve steadily with the process of development, while environmental problems that can be transferred elsewhere (as municipal solid wastes) do not exhibit any clear tendency to diminish with development. Very weak corroboration seems to arise from the case of deforestation, traffic volume and energy use, but the hypothetical turning points are estimated at values of per capita income far beyond the observed ranges. Whatever degree of corroboration seems reasonable to attribute to the EKC hypothesis on the basis of cross-country studies, single country studies reach very sceptical results even in the case best supported by cross-country studies (see, e.g., Vincent, 1997). In any case, whenever the existence of a single-country EKC is not fully rejected by the empirical evidence, its shape, position and behaviour through time is strongly affected by national features.

Since the scope of this paper is limited to global environmental deterioration, we do not need to address here the issues relative to the existence and meaning of individual-country EKCs. Let's therefore concentrate on what we have called the global EKC.

In order to understand whether the observed pattern of correlation between environmental degradation and per capita income reveals some effective causal mechanism we have first to clarify the deep ambiguities looming in the literature for the insufficient clarification of the nexus between the variables involved in the analysis. It is clear from the identities (1) and (2) that, if the empirical evidence is consistent with the EKC hypothesis for a category of indexes, this does not imply that it is also consistent with it for another category of indexes. In particular, the evidence corroborating the existence of an EKC with d_p on the vertical axis does not necessarily corroborate the existence of an EKC with d_y on the vertical axis. Let's assume that we have an EKC in d_p that according to the usual specification in its simplest version is represented by the following equation:

$$(4) \qquad d_p = ay + by^2 \quad \text{where } a>0,\ b<0.$$

Multiplying both sides of (4) by P/Y we get the correspondent relationship between d_y and y, namely:

$$(5) \qquad d_y = a + by$$

From (4) and (5) it follows that if the EKC fits well the relationship between d_p and y, this implies a linear downward sloping relationship between d_y and y that is inconsistent with an EKC in d_y.

The partial inconsistency between EKCs measured with different indexes together with the mixed evidence briefly surveyed above, suggests that the evidence for a global EKC is at the moment rather weak.

Among the three versions of the EKCs (in terms of d_y, d_p and D) the one in terms of total environmental degradation is by definition (see footnote 8) the most consistent also in the long run with global sustainability, that is, with a development process that does not risk to violate the carrying capacity of the earth as a whole. As D increases at least some of the components of the index sooner or later is bound to violate the conditions of environmental sustainability, either because it exceeds the specific assimilative capacity of

the environment or because the exploitation of a certain renewable resource exceeds its natural growth.[9]
In order to realise a sound process of sustainable globalisation, therefore, total environmental degradation D should not increase over time. To this end we may derive from the identity (1) the following identity:

$$(6) \qquad D' = y' + d_y' + P'$$

where x' designates the logarithmic derivative, i.e. the rate of growth, of the variable x. It is clear from this identity that the global environmental deterioration tends to increase ceteris paribus with per capita income unless the sum of demographic growth and degradation intensity is negative. Therefore, we may set the following condition of long-run global sustainability:

$$(7) \qquad y' \leq - (d_y' + P')$$

In other words, global environmental deterioration does not increase if and only if degradation intensity and/or the demographic growth are sufficiently negative to offset the (ceteris paribus) negative effect of per capita income growth. Since we know that both the world aggregate per capita income and the world population tend to increase within the post-war process of globalisation, the only chance of realising a process of sustainable globalisation relies on a reduction of deterioration intensity sufficient to offset the negative implications of demographic growth and of rising per capita income. This is what already happens in many countries and economic sectors as a consequence of technological change and cultural evolution that reshape the structure of economic activity in a direction more consistent with economic sustainability. However, the velocity of reduction of degradation intensity is, generally speaking, clearly insufficient to stabilise environmental degradation and must be accelerated through apt policies. These policies would shift downwards, i.e. in a more favourable direction, the relationship between D and y. This may be clarified through equation (3) where D depends on y and

$$aP + cd_y + dz$$

are shift factors. A reduction of demographic pressure and/or of degradation intensity would shift downwards the relationship between D and y, and thus also the EKC.[10]
The relationships examined above may shed some light also on the conditions of sustainable globalisation within a more disaggregated approach. In particular, we may better understand why industrialised countries rather than developing countries seem to follow an EKC. In the industrialised countries demographic growth is about zero, and the

[9] The condition of stationarity of D is not as rigid as it seems at first sight. Since some of its components are already beyond the threshold of sustainability its necessary prompt reduction allows some further deterioration in other components that are still safely distant from the threshold.
10 Observe that equation (3) can be considered as a restriction of the EKC that is obtained by setting equal to zero the coefficient of the quadratic term in y.

technological and cultural mechanisms that tend to reduce degradation intensity may be sufficient –for certain indexes- to reduce aggregate degradation. In the developing countries, on the contrary, demographic growth is typically quite sustained while the reduction of environmental degradation is rather slow for technological and cultural reasons, and this may help to explain why empirical evidence is unable to find in these countries the negative correlation between per capita income and environmental deterioration necessary to assure sustainability.
We may now try to summarise the main effects of globalisation upon the sustainability of the process of world development. The process of globalisation:

- increases the rate of growth of income and per capita income of the countries that actively participate in this process. This tends to increase ceteris paribus the environmental deterioration in these countries and at global level.
- spreads the technological knowledge and know-how of the most advanced economies and this may contribute to reduce the environmental deterioration intensity.
- spreads the cultural values of the most industrialised countries. This may have negative effects as it may encourage consumerism and an indiscriminate exploitation of natural resources, and positive effects as it may encourage the adoption of measures of demographic control and more concern for the environmental implications of economic activities.

We may conclude that the causal relationship between globalisation and global environmental degradation is quite complex and ambiguous. While so far there was a clear prevalence of negative causal effects for most indexes of environmental degradation, especially in developing countries, it is possible to reinforce the positive effects and reduce at the same time the negative effects of globalisation on the environment through appropriate policies meant to implement a robust process of sustainable globalisation.

5 Globalisation and the Kuznets curves[11]

As mentioned above, several studies have found a similar bell-shaped relationship between inequality and environmental degradation on the one hand and per capita income on the other hand. The analogy between the Kuznets curve and the environmental Kuznets curve concerns not only their shapes, but also the methodology used in the empirical studies and the theoretical explanations underlying the curves. As to the empirical methodology, the shortage of long time-series for measures of inequality and environmental degradation has led most studies to follow a cross-country approach. As some studies on the EKC have underlined (Roberts and Grimes 1997, Vincent 1997), the bell-shaped EKC that arise in cross-country analyses often derives from the juxtaposition of two opposite trends: an increasing relationship between pollution and per-capita income in the developing countries and a decreasing one in the developed nations. Mutatis mutandis, replacing pollution with inequality, the same consideration applies to the KC. We should, therefore, be cautious in

[11] This section hinges partly on Borghesi (2000).

interpreting the regularities suggested by the two curves. The existence of bell-shaped curves in cross-country analyses does not imply per se that currently developing countries will be able to follow the evolution of developed nations and run the decreasing portion of the curves in the future. Beyond the use of a cross-country approach, other limitations of the empirical analysis (e.g. data reliability, use of reduced form models) cast doubts on the evidence in favour of the curves even when the KC and the EKC fit well the data. This should induce policy makers to be extremely careful to draw policy implications from the two curves.

As to the theoretical foundations of the curves, two arguments have been proposed to explain both relationships: structural changes that occur during the stages of economic growth and public opinion pressure for intervention. The first argument states that both curves are determined by the sector shift typical of a growing economy. As Kuznets (1955) pointed out, inequality first rises during the initial phases of urbanisation and industrialisation that produce new sectors in which income is both higher and more unequal than in agriculture. However, inequality starts decreasing when the economy shifts from industry to services and technological progress spreads through the economy so that more people take advantage of the new technologies. Similarly, environmental degradation tends to increase in the first stages of growth as the economy changes from rural to urban, from agricultural to industrial. However, it will eventually fall with the second structural change as the economy shifts from energy-intensive heavy industry to services and environmental-friendly technologies. The second explanation argues that at low-income levels people care mainly for the satisfaction of their basic needs. During the early stages of economic growth, therefore, environmental degradation and inequality tend to rise since people are willing to accept increasing environmental degradation and inequality in exchange for higher consumption. However, as individuals achieve higher living standards, they care increasingly more for the quality of the environment and the level of inequality of the societies they live in. Therefore, at sufficiently high income levels, the government is induced to introduce egalitarian and environmental policies under the pressure of public opinion (e.g. egalitarian movements like trade unions or ecological movements such as green parties). This intervention tends to reduce inequality and pollution in the country, thus determining the decreasing portion of the KC and the EKC. If this argument is correct, democracy is a crucial requirement to address inequality and ecological problems. A democratic system, in fact, gives agents a chance to express their preferences affecting government decisions on inequality and pollution through the vote.

Globalisation may affect this mechanism and thus also the shape of the two curves. The increasing mobility of information that characterises the current phase of globalisation, in fact, rapidly spreads images of social injustice, poverty and environmental disasters that may occur even in much distant countries. This phenomenon, that is likely to make people more aware of social and ecological problems world-wide than in the past, tends to create a "global" public opinion pressure for intervention. It has been noted, in fact, that while most of the people concerned with these issues come from industrialised countries, they express concern for inequality, poverty and environmental problems occurring in the South of the world. Globalisation, therefore, may create a pressure for egalitarian and ecological policies even

in countries where lack of democracy hinders people to express their preferences on such issues. This "global" pressure, therefore, takes place also when a country is still relatively poor and might lead to intervene on inequality and environmental degradation at an earlier stage of growth than predicted by the two curves.[12] If so, their turning points may occur at a much lower income level (i.e. they may have a lower value on the x-axis) than it happened with industrialised countries in the past. The turning points, moreover, might also be lower (i.e. they might correspond to a lower value on the y-axis) since an earlier intervention may prevent inequality and environmental degradation from growing as much as in the past. Globalisation, therefore, might lower the KC and the EKC when they exist, thus changing their shape and position over time and improving social and ecological conditions.

In the case of the EKC, moreover, public opinion can influence environmental quality not only through the voting system, but also through the market: a "greener" consumer demand contributes to shift production and technologies towards more environmental friendly activities. Globalisation, by increasing competition, provides another channel to public opinion pressure for environmental quality. In a more competitive market, in fact, consumers are likely to have more alternatives to polluting products and thus more chances to express their demand for a better environment. This positive impact of globalisation on the environment, however, crucially depends on the actual capacity of globalisation to increase competition. If higher concentration comes along with globalisation (as occurs in some sectors), then the previous reasoning might be reversed and environmental-friendly consumers might end up with less opportunities to express their preferences. In general, however, globalisation might enhance the impact of public opinion pressure on government and market decisions and thus contribute to a more sustainable development by shifting the KCs downwards.

6. Concluding remarks on a few basic conditions for sustainable globalisation

When the KCs are consistent with the empirical evidence, this seems to suggest prima facie that the process of globalisation may render the world development more sustainable by pushing the world economy towards the decreasing part of the bell-shaped curves, and by shifting the curves downwards. The empirical evidence examined in the preceding sections, however, seems to be on the whole inconsistent with these optimistic conclusions. In particular:

- The process of globalisation pushes developing countries upwards along the rising part of an hypothetical KC and EKC, i.e. in the direction of diminishing sustainability, while it does not emerge clearly from the empirical evidence that it is possible to rely on a peak beyond which a healthy descent may start. Even when the existence of a peak is not

[12] Note that "global" public opinion pressure can concern Northern governments that are asked to intervene in the South. The recent Bonn agreements for implementation of the Kyoto Protocol, for instance, have established that some industrialised countries may bear the burden of introducing ecological policies in developing countries.

excluded by empirical evidence, it emerges at values much beyond the range of existing values, and that in any case –in the absence of radical modifications of the process induced by efficient policy interventions– may be reached only after a long spell of time.

- In developed countries the intensity of environmental deterioration diminishes in many cases, mainly when environmental damages cannot be transferred elsewhere, but this is generally insufficient to diminish also the aggregate value of environmental deterioration.
- The recent evolution of the rules that regulate the globalisation process did not help to corroborate its sustainability (see Vercelli, 2001). The progressive emphasis on an indiscriminate deregulation of world trade that is progressively sweeping away also the environmental and social constraints introduced by international institutions, countries and multilateral agreements (Wallach-Sforza, 1999) contributed to accelerate the rate of growth of the participant countries but undermined its sustainability.

Summing up, empirical evidence suggests that the current process of globalisation is eventually unsustainable unless we introduce new institutions and policies able to govern it. For this purpose, it is necessary to encourage the participation to the market integration process of countries and regions that were cut off from the globalisation process so far. Recent studies, in fact, find that countries that followed autarkic policies or were excluded from international trade experienced increasing inequality and poverty. This phenomenon is particularly evident in developing countries that account for much of the world population where large regions did not have any access to the global market (e.g. hinterland China and rural India). Among the active policies that may extend participation to the globalisation process, we recall here those that promote higher education levels. These policies are extremely important to reduce inequality and poverty, particularly in the recent phase of globalisation that is characterised by increasing mobility of information and unparalleled speed of its world-wide diffusion. Inadequate education (e.g. lack of digital know-how) may prevent access to such information and thus also to the opportunities that it creates.[13] Education, therefore, is a crucial requirement to participate to globalisation and thus avoid the increasing income gaps and poverty levels suffered by those agents and countries that lagged behind. Lowering or removing the trade barriers of developed countries to the imports from developing countries would also contribute to favour effective participation of the latter to the globalisation process. While some developing world regions (e.g. Eastern Asia, Eastern Europe, Mexico) have increased their market share in the industrialised countries, this share has halved between the 1980s and 1990s for the 48 world least developed countries (mainly African and Southern Asiatic countries). The reduction of Northern trade barriers is particularly important in two specific sectors, agriculture and textile industry, that account respectively for about 15 and 20 percent of developing countries' exports. These sectors represent, in fact, important sources of economic growth for developing countries that still lack

[13] Thus, for instance, people who are not able to use computers or have no access to the world-wide web are excluded from the job opportunities that Internet creates. Inequalities in education thus generate inequalities in participating to the globalisation opportunities that eventually lead to income inequalities.

sufficient capital and technology to shift their production towards high-technology products. A more generalised and consistent deregulation of world trade, however, is insufficient to assure the sustainability of world development. The regulation rules of international markets should be radically reformed by empowering a few accountable international Agencies, managed in a non-bureaucratic way by soliciting the active and democratic participation of all countries, able to govern the international markets in an active way, whenever necessary. In any case, the process of deregulation should respect the environmental and social constraints that buttress the sustainability of world development.

In this paper, however, we did not examine the nature and characteristics of the new institutions and policies necessary to make the process of globalisation fully sustainable even in the long run, but we only tried to clarify a few basic conditions to be respected in order to realise it. Therefore, the policies briefly instanced above are just tentative examples of policies that may contribute to implement the conditions of sustainability that we tried to clarify in the paper. In particular:

- the rate of reduction of environmental deterioration must be sufficiently strong to offset the negative impact on sustainability of demographic and economic activity growth (see retro condition (7)). This is very difficult whenever demographic growth is sustained, as is typical in developing countries, and/or the rate of growth is strong. The process of globalisation has a complex influence on this condition. Generally speaking, empirical evidence suggests that it tends to increase the rate of growth of developing countries participating in the process of globalisation, and may increase their demographic growth spreading better sanitary practices (that is in any case highly desirable) or reduce it by spreading a culture more oriented towards demographic control. In addition, we have seen that it tends eventually to increase concern for the environment as well as the technical knowledge and know-how necessary for reducing the intensity of environmental deterioration. However, empirical evidence suggests that the net positive effects are in general insufficient to comply with this crucial condition of sustainability.
- The peak of KCs may be reached, and a healthy descent pursued, if and only if the average income growth is higher than the average population growth for a sufficiently long time. Since the average income growth is relatively low in most countries, this implies that their demographic growth must be kept under strict control.
- Both KCs may be shifted in a favourable direction, i.e. downwards. In the case of the EKC this may be obtained by transferring technological knowledge and know-how from more advanced to less advanced countries.

We may conclude by observing that a process of globalisation consistent with these requirements of social and environmental sustainability is possible but requires a radical reform of some of the features that have characterised the recent process of globalisation.

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