Sustainable development and social justice : the tool of the reduction in income inequalities

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Abstract

Based on Georgescu-Roegen's works on entropy and Rawls's works on social justice, a double theoretical reflection is essential, showing that a long-term development strategy environmentally and socially sustainable is only meaningful as long as productivity gains are primarily used to generate an everlasting production and consumption growth but in order to reduce all individals' working time. We put forward a link between the concepts of equity and solidarity both between and within generations.

In order to give our approach a theoretical basis, we propose a simple mathematical model for the reduction in the income scale, making an unemployment decrease possible while protecting ecological balances from the threats of a too high economic growth. Then the model can function in two ways. First, for a given unemployment rate, it allows either the determination the scale of reductions in inequalities requiered to cut down unemployment within a given period. Second, the time necessary to reduce unemployment can be calculated according to a decision about the socially desirable and/or sustainable income hierarchy.

We test our model on the French economy by following three stages. First we apply it on the current distribution of household incomes. Then we carry out the same type of work on wage distribution alone. In both cases, we show that unemployment elimination is a distributional problem and not one due to wealth level. Finally we perform a third simulation in order to reduce the consequences in terms of consumption growth of a too high rise of low and average incomes, whose marginal propensity to consume is higher than that of people whose incomes are penalized by inequalities reduction. We reduce the period of time necessary to cut down unemployment, and the improvement of the standard of living of the lower classes depends to a small extent on raising their purchasing power and to a large extent on shortening working hours.

In conclusion, we indicate that instead of suffering from the effects of a moderate growth, it is possible to take advantage of this situation to trigger off social and cultural changes in the ways we consider the improvement of welfare.

At the end of the 20th century, development encounters two limits: the first is environmental, because there is no endless economic growth that is materially possible, the second is social and cultural because, both on the planet level and within industrialized countries, such phenomena as poverty, unemployment, inequalities and acculturation are growing in a worrying way. Economic growth should, it is said, reduce the scarcity which is hitting humanity like the plague. But it seems that, far from the reducing it, it is renewing it by forever extending the limits of need. Moreover, the logic of accumulation of capital encourages selective satisfaction of these needs by maintaining deep social injustices. In undeveloped countries, the majority of the population are exclued from the economic world having seen the annihilation of their culture and traditions which gave a meaning to their way of life. At first, in developed countries, it was the least qualified wage-earners who suffered the consequences of the redeployment of world scale productive activities, but progressively all the remaining salaried groups are undergoing the same phenomenon. Thus, belief in an economic development, which will automatically create social consequences of a positive nature (trickel down effect), can be seen today as an ill-founded ideology, whose " raison d'être " is to make believe in an improvement in general material well-being while leaving the relative place of individuals and social groups unchanged. To expect the return of high economic growth to solve phenomena such as poverty and unemployment is to overlook the problem of distribution and to leave the reduction in inequalities solely to the distribution of the mythical fruits of growth, when in fact the structure of total product distribution would remain almost unchanged.

In the same way, the environmental crisis, laxism over major risks (nuclear energy, the greenhouse effect, climatic changes), the dwindling of vital non-contaminated resources (water, air), the programmed depletion of fossil fuel energy supplies, the extinction of certain animal and vegetable species (F.A.O., 1993) make the serious realization of sustainability an urgent matter. But what sort of sustainability? That of development? If it were a question of assuring the durability of development which has existed for two centuries, it would be contrary to the " principle of responsibility " (JONAS, 1979). The folly of a seemingly rational economic system has been responsible, in the name of profitability, for the plundering of nature and the exclusion from society of a growing mass of indiviuals who have become unemployable both for productive and consumer ends.

Can we content ourselves then with confining theoretical reflexion to the narrow framework of the *weak/strong sustainability* alternative? Weak sustainability wholly retains the promethean dream according to which, it will always be possible, thanks to technical progress, to substitute depleted natural resources by produced capital. Strong sustainability refuses this dangerous gamble and subordinates the growth of economic activities to the possibility of preserving the supply of natural resources over the years. However, one must go a step further, because even in the second case, economic growth continues to be considered as the principal aim, admittedly subject to additionnal contraints, but which is not in itself called into question.

The credibility of the concept of sustainability depends therefore on the ability to reopen discussions in various directions on economic growth:

- Economic theory can not ignore the work of Nicholas Georgescu-Roegen which shows that economic activity lies within a physical universe subject to the law of entropy. According to him, economic development is founded on inconsiderate use of accumulated world energy supplies over the years. " That which enters into the economic process consists of *valuable natural resources* and (...) that which is discharged consists of *valueless waste*. (...) From the thermodynamic point of view, energy matter which is absorbed into the economic process is in a state of *low entropy* and comes out in a state of *high entropy*. " (GEORGESCU-ROEGEN, 1995, p. 55).

- The accumulation of capital which is at the origin of development has provoked the falling apart of global society (POLANYI, 1944). This phenomenon must not be seen as a simple parallel evolution of the economy and other forms of life in society, but as an ever widening gap which is becoming less and less bearable. Social unsustainability built on increased inequalities, exclusion and acculturation can be considered as a form of *entropy of capital* (LATOUCHE, 1986) symmetrical to the entropy of matter. Therefore the economic machine and the " megamachine " (LATOUCHE, 1995) transform " *usable* or *free* energy " into " *unusable* or *tied* energy " (GEORGESCU-ROEGEN, 1995, p. 56), and, at the same time, enslave man by forcing him into a task whose end result is market exchange while depriving him of his powers of establishing the level of his own needs and the quantity of effort that he is prepared to supply. Economic rationality is always pushing the limits of necessity further and further into the distance. The result is an irresistible development explosion inherent in economic rationality which capitalism has been able to free from all hinderances.

Environmental and social crises are linked. One must therefore strive for sustainability along these two lines. Environmental and social sustainability implies the reinstating of the concept of " enough " (GORZ, 1988) and the adoption of a " renunciation code" (JONAS, 1990); that is to say a progressive renunciation of economic growth in industrialized countries. Hence, this reversal of perspective places the question of the distribution of natural resources between the generations, incomes drawn from economic activity and the means to produce goods and services (work) into the bosom of the present generation.

This pre-eminence of the question of distribution of wealth means that the theory of sustainability only exists within a theory of justice. John Rawls (RAWLS, 1971) has renewed the terms in which the problem of social justice in the utilitarian and Pareto approaches was traditionally raised (or rather suppressed). Unable to define collective well-being other than from a sacrificial point of view, the utilitarian conception of justice came up against a contradiction (DUPUY, 1992). Therefore, by reasoning under a " veil of ignorance ", it is possible, according to Rawls, to define a social contract instituting operating rules for a just society which would respect two principles, one of non-negotiable freedom and the other of difference, which would itself be subject to two conditions: chances must be equal and inequalities should only be allowed if they obtain better efficiency which would improve the conditions of the most needy. Rawls departs from utilitarism when he underlines the importance of basic assets which he calls *primary social assets* of natural origin (strength, intelligence) and stemming from social organization (rights, liberties, power) to insure equal chances, as opposed to assets which are merely useful. He does not accept a conception of social well-being arising from the increase in per capita consumption and a concept of equity between generations which would amount to an intertemporal preference.[1] But Rawls stops at the point where it would be necessary to move on from the *definition* of a just society to a *method* of justice in a yet unjust society, a method which would impose a *categoric imperative* of the Kantian type (BIDET, 1995). For this reason, the " abusive " use (MERAL,

[1] . " Finally, the last stage is not characterized by great abundance. (...) It is possible for greather wealth not to be useless as a means of reaching several objectives; in fact, average income is perhaps not very high in absolute terms. Justice does not require the present generation to economize simply to enable future generations to be richer. Economizing becomes a condition whereby fair institutions and equal liberties can be fully achieved for everyone. To add a supplementary build up of capital can only serve others aims. It is a mistake to believe that a just and honest society should go hand in hand with a high standard of living. Man is in need of work with a meaning, work in open association with the framework of fairly based institutions. An abundance of wealth is not necesssary in order to reach this goal. In fact, beyond a certain level, this could be more of an obstacle, at the best, a meaningless distraction, at the worst, a temptation to accept facility and emptiness. (...) Unlike the principle of equality, intertemporal preference has not intrinsic ethical interest. It is introduced in a purely *ad hoc* manner to lighten the consequences of the utility criterion. " (RAWLS, 1987, p. 331-337, my translation).

1996, p. 306) of Rawlsian principles within the utilitarian paradigm has been made easier. By reducing justice to a mere summing up of individual interets, the sharing out of produced wealth and resources down played while the principle that one must have endless economic growth, even though it is known to be impossible, hinders the struggle for equity between the generations (NORTON, 1989[2]). Consequently, the coexistence of material progress and sustainability is no longer self evident: this explains the resistance which the idea of sustainability faces in western societies (TOMAN, PEZZEY, KRAUTKRAEMER, 1994).

What would the implications be of extending the notion of primary social assets to natural resources[3] and the right to be employed, while considering intergenerational and intragenerational equity? At any given time, within any particular society, two series of circumstances are rare: pooled resources of physical or stored expertise and opportunities to increase these resources, that is to say, employment in which man's efforts can be put to use, taking socio-technical organization into account. Equity requires these resources to be shared out equally, while making sure that access to these natural resources will be guaranteed for future generations. If, at any given time, all energy supplies and opportunities for pooled human resources (jobs) were unavailable to even a fraction of the population, then, a further sharing out would be necessary. Take, for example, the case of employment: the sharing out of available jobs between all members of society likely to fill them also implies the sharing out of corresponding primary incomes for these jobs, in other terms, the reduction in inequalities of these incomes. This proposition clashes with one of universal subsidy (VAN PARIJS, 1991; BRESSON, 1993; FERRY, 1995) which acts as a counterbalance to the impossibility or lack of willingness to redeploy energy supplies or opportunities for pooled resources. It is a matter of asserting the priority of the right to work which corresponds to a *primary social asset* in constrast with the *palliative of its non-compliance*[4]. While universal subsidy aims to create a new citizenship because the former one is not respected, it is our opinion that a trend towards equity arises from relation ships within solidarity which is constantly and simultaneously redeploying jobs and income.

Since the environmental crisis and the social crisis are combined, how could a renunciation of economic growth be initiated in industrialized countries, which are top the list of those responsible for environmental damage, from the very moment when essential needs were being satisfied and how could the demands of social justice be met, now and over the years to come? A strategy such as this comes up against capital interests to which economic growth supplies constant opportunities to put itself to the fore and for which concern for the environment simply represents a timely market development. In addition, a strategy such as this implies a deconstruction of collective make believe where " better living " is made out to mean " having more " (PASSET, 1985, p. 833). Lastly, a strategy such as this is the opposite extreme of the most widely held ideas about sustainability. Nevertheless, " the expression "sustainable development" is correct if applied to economy, that is to say a *physically stable qualitative improvement* maintained under stable conditions defined by the limits of ecosystems " (DALY, 1992, p. 10).

A long term environmentally and socially sustainable development strategy is only meaningful as long as the primary use of the productivity gains is not to generate an everlasting production and consumption growth, but to reduce working hours for everyone in

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[2] . Norton differentiates four possible strategies concerning natural resources: exploitationism, conservationism, and two variants of preservationism: naturalist and extensionist. This classification partially tallies with the distinction between the anthropocentric and ecocentric approaches of sustainability (HATEM, 1990).

[3] . Certains authors have emphasized that natural resources are conditions for the acquisition of primary social assets (PEARCE, 1987) or that equality should be considered in terms of " basic capabilities " (SEN, 1993).

[4] . This point is developed in HARRIBEY, 1996-a and 1996-b.

such a way as to give apportunities of employment to all those wishing to find work and to give everyone the chance of experiencing other forms of well-being besides eternal consumption growth. Concepts of equity and solidarity both between and within generations should thus be harmonised.

In the short term, in order to solve rapidly the unemployment problem in industrialized countries, while considering the need to deliberately give up high growth because of the risk of draining nonrenewable resources and the responsibility of planning a fairer distribution between all the planet's inhabitants, we have made a study of the funding of job creation through the reduction in income inequalities.

In order to give our approach a theoretical basis, we propose a simple mathematical model for the reduction in the hierarchical income scale which would make a decrease in unemployment possible while protecting ecological balance from the threats of an excessively high economic growth. This model can function in two ways: for a given unemployment rate, it allows either to determine the scale of the reduction in inequalities to be achevied in order to cut down unemployment within a given period, or to determine the time necessary to reduce it pending a decision about socially desirable and/or sustainable income hierarchy.

We test our model on the French economy by following three stages. Firstly, we apply it to existing distribution of household incomes and then on wage distribution alone. In both cases, it turns out that the elimination of unemployment is a distributional problem and not one due to wealth level. Finally, we perform a third simulation to reduce the consequences in terms of consumption growth of an excessively high rise in low and average household incomes whose marginal propensity to consume is higher than that of people whose incomes are penalized by inequalities reduction: in this case, the period of time necessary to cut down unemployement is reduced and improvement in the standard of living of the lower classes depends to a small extent on raising their purchasing power and to a larger extent on a reduction in working hours.

I- The model for a reduction in income inequalities with the aim of financing a reduction of working hours

Given that N is the active working population divided in n income classes; as the classes contain the same number of employees, then the proportion of these employees in each income class is: $q = 1/n$.

The total of incomes paid to households is$W$.

The hierarchy between the average income of each income bracket is expressed by the relative differences: $a_1, a_2, a_3, ..., a_n$, with the conditions $a_1 = 1 < a_2 < a_3 < ... < a_n$.

The proportion of unemployed in each class[5] in relation to the total number of unemployed is: $h_1, h_2, h_3, ..., h_n$, with $h_1 + h_2 + h_3, ..., + h_n = 1$.

The unemployment rate in relation to the active working population is h^*. If the active working population increases by a rate $h = h^*$, unemployment disappears.

Take the case of a restricted hierarchy defined thus: $a'_1, a'_2, a'_3, ..., a'_n$, with $a'_1 = 1 < a'_2 < a'_3 < ... < a'_n$, and $a'_1 \leq a_1$, $a'_2 \leq a_2, ..., a'_n < a_n$.[6]

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[5] . Assuming that if these unemployed people found a job, they would be split into the income classes in proportion $h_1, h_2, h_3, ..., h_n$.

[6] . At least one of the hierarchical differences in the new distribution must be strictly inferior to the corresponding hierarchical differences in the former distribution for there to be any restriction of the income hierarchy.

Average incomes of the first income class before and after restriction of income hierarchy are respectively called *R* and *R'*.

I-1. We first consider that the production and the total of all distributed incomes have not varied between the two situations

So, before restriction of the income hierarchy:

$$W = q\,N\,R + a_2\,q\,N\,R + a_3\,q\,N\,R + ... + a_{\mathrm{n}}\,q\,N\,R \;= qNR\sum_{i=1}^{n} a_i\,,$$

$$R = \frac{W}{q(1 + a_2 + a_3 + ... + a_n)N} = \frac{W}{qN\sum_{i=1}^{n} a_i} = \frac{n}{N}\frac{W}{\sum_{i=1}^{n} a_i}\,.$$

After restriction of the income hierarchy:

$$W = [q\,(1 + a'_2 + a'_3 + ... + a'_{\mathrm{n}}) + h\,(h_1 + a'_2\,h_2 + a'_3\,h_3 + ... + a'_{\mathrm{n}}\,h_{\mathrm{n}})]\,N\,R'\,,$$

$$R = \frac{W}{\left[q\left(1 + a'_2 + a'_3 + ... + a'_n\right) + h\left(h_1 + a'_2\,h_2 + a'_3\,h_3 + ... + a'_n\,h_n\right)\right]N}$$

$$= \frac{W}{\left[\left(q\sum_{i=1}^{n} a'_i\right) + \left(h\sum_{i=1}^{n} h_i a'_i\right)\right]N}\,.$$

The variation of the basic average income in the first income class is expressed thus:[7]

$$\frac{R'}{R} = \frac{q\sum a_i}{q\sum a'_i + h\sum h_i a'_i}\,.$$

We shall set down this expression $\frac{R'}{R} = 1 + r$ and call $1+r$ the *multiplying coefficient of soldarity*.

By calling a'_2/a_2 , ..., $a'_{\mathrm{n}}/a_{\mathrm{n}}$, the coefficients of the reduction in inequalities applied to each the *n* - 1 last income classes,

the variation of the average income in the 2nd income class is: $\frac{a'_2\,R'}{a_2 R} = \frac{a'_2}{a_2}(1 + r)$; etc;

the variation of the average income in the *n*th income class is: $\frac{a'_n\,R'}{a_n R} = \frac{a'_n}{a_n}(1 + r)$.

We thus obtain the *n* multiplying coefficients of the average income of each class and are then able to extract the income necessary for payment to the *hN* newly employed active workers. The variation rates are immediately deducted.

If the output, the total of distributed incomes and the hourly work productivity do not vary then the per capita working hours will vary on average: $1 + t = \frac{1}{1 + h}$.

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[7]. Remark: it is not indispensable for the population to be divided into equal fractions; if they were different such as: q_1, q_2, q_3,..., q_n, then the coefficient of solidarity would be expressed as follows: $1 + r = \frac{\sum q_i a_i}{\sum q_i a'_i + h\sum h_i a'_i}$.

I-2. We now suppose that, between the two situations, before and after restriction of the income hierarchy, out put had been multiplied by 1+*y*

We put forward the following hypotheses:

- the sharing out of distributed household incomes and social surplus does not change;
- the wages and other individual incomes all vary at an equal rate *z*; irrespective of the variation of incomes linked to the reduction in inequalities;
- hourly productivity varies at a rate *x*;
- per capita working hours vary at a rate *t*;
- the number of jobs varies at a rate *h*.

We would either have: $(1 + y) = (1 + x)\ (1 + t)\ (1 + h) = (\ 1 + z)\ (1 + h)$,
or: $(1 + z) = (1 + x)\ (1 + t) = (1 + y)\ /(1 + h)$.

Average income in the 1st income class as shown above could therefore vary thus:

$$\frac{R'}{R} = (1 + r)(1 + z) = \frac{(1 + r)(1 + y)}{1 + h}\ ;$$

in the 2nd income class: $\frac{a'_2 R'}{a_2 R} = \frac{a'_2}{a_2}(1 + r)(1 + z) = \frac{a'_2}{a_2}\frac{(1 + r)(1 + y)}{1 + h}$; etc.;

in the *n*th income class: $\frac{a'_n R'}{a_n R} = \frac{a'_n}{a_n}(1 + r)(1 + z) = \frac{a'_n}{a_n}\frac{(1 + r)(1 + y)}{1 + h}$.

In each income class the average income can only increase if the product of the multiplying coefficient of solidarity and the multiplying coefficient of individual incomes is higher than the inverse of the coefficient of reduction in inequalities in the income class *i* thus shown:

$$(1 + r)\ (1 + z) > a_i\ /a'_i.$$

Individual working hours vary on average by:

$$1 + t = \frac{1 + y}{(1 + x)(1 + h)} = \frac{1 + z}{1 + h}\ .$$

II- Application of the model

II-1. Application of the model as applied to all incomes

We apply the model of existing household incomes distribution of which the hierarchy ranges from 1 to more than 17 between the outer decils with an exponential widening of the gaps from the 5th decil onwards (table 1): we simulate the impact that a restriction of the income hierarchy would have on jobs thus making this hierarchy an extension of the trend to have wider gaps for the first four decils (table 2). The prevalant trend in the first four decils is estimated by the relation $y = 1{,}84335\ \mathrm{Ln}\ x + 0{,}95712$ (*x* being the décils and *y* the hierarchical

differences, with a coefficient of linear correlation 0,998). The restricting process is then spread over four years at a stable rate.

The unemployed represent $h^* = 3\ 114{,}7/21\ 798 = 14{,}29\%$ of the active working population. Starting from the division of registered job seekers into socio-professional categories (table 3), we shall assume that each job seeker would find a job in his category with the exception of former farmers, craftsmen, commercial traders and business managers, and lastly those who have never been employed (table 4)[8].

Table 1: The taxable income in France in 1990

1 Décils	2 Highest limit of the class (in francs)	3 Average taxable income (in francs)	4 Income hierarchy	5 Cumulation of distributed income (en %)
		24 900	1	
D1	43 141			1,68
		54 200	2,18	
D2	63 773			5,33
		72 600	2,92	
D3	81 143			10,22
		89 500	3,59	
D4	98 277			16,25
		107 800	4,33	
D5	117 336			23,51
		128 000	5,14	
D6	139 109			32,13
		152 300	6,12	
D7	165 614			42,39
		182 900	7,35	
D8	203 013			54,71
		230 800	9,27	
D9	267 230			70,26
		301 500	17,72	
95th centil	347 953			80,42
		581 000		
				100
Together		148 500		

Source: INSEE, 1995-a, extract of table 2p. 14, except the 4th and 5th colomns which we calculated.

Table 2: Timing for the reduction in income inequalities

Décils	Existing real hierarchy	Progressively restricted hierarchy			
		1st year	2nd year	3rd year	4th year
D1	1	1	1	1	1
D2	2,18	2,18	2,18	2,18	2,18

[8] . We divide out the job seekers into income classes: - workmen and employees: 10% in the 2nd household décil, 40% in the 3rd, 40% in the 4th and 10% in the 5th; - intermediary professions: 10% in the 4th décil, 40% in the 5th, 40% in the 6th and 10% in the 7th; - senior executives and higher intellect professions: 10% in the 6th décil, 20% in the 7th, 32% in the 8th and 38% in the 9th; - farmers, craftsmen, commercial traders and business directors: 20% in the 2nd décil, 50% in the 3rd, 20% in the 4th and 10% in the 5th; - job seekers having never worked: 10% in the 2nd décile, 20% in the 3rd, 20% in the 4th, 20% in the 5th, 15% in the 6th, 10% in the 7th, 4,5% in the 8th and 0,5% in the 9th.

D3	2,92	2,92	2,92	2,92	2,92
D4	3,59	3,59	3,59	3,59	3,59
D5	4,33	4,27	4,21	4,16	4,10
D6	5,14	4,96	4,78	4,61	4,45
D7	6,12	5,74	5,39	5,06	4,75
D8	7,35	6,68	6,06	5,51	5,00
D9	9,27	8,03	6,96	6,03	5,23
D10	17,72	13,18	9,81	7,30	5,43

Table 3: Unemployment by CSP (march 1994)

CSP	Effectives (in thousands)
Farmers	3,5
Craftsmen, com. traders, busin. dir.	66,0
Exec. and higher intell. professions	159,5
Intermediary professions	363,8
Employees	1 094,1
Workers	1 098,9
Those who have never had a job	328,9
Total	3 114,7

Source: INSEE, TEF, 1995-96, p. 73.

Table 4: Intégration of the unemployed into the income receiving population

Déciles	Farmers, Craftsmen, Comm. traders, busin. directors	Executives and higher intellect professions	Intermediary professions	Workers, employees	Unemploy. never had a job	Total	Proportion
D1							
D2	13 900			219 300	32 890	266 090	0,08543
D3	34 750			877 200	65 780	977 730	0,31391
D4	13 900		36 380	877 200	65 780	993 260	0,31889
D5	6 950		145 520	219 300	65 780	437 550	0,14048
D6		15 950	145 520		49 335	210 805	0,06768
D7		31 900	36 380		32 980	101 170	0,03248
D8		51 040			14 800	65 840	0,02114
D9		60 610			1 645	62 255	0,01999
D10							
Total	69 500	159 500	363 800	2 193 000	328 900	3 114 700	1

Let us suppose that this plan were to be put into effect over a period of four years. During each of the first three years, one third of the existing unemployed would find a job, and during the fourth year, an equivalent number (corresponding to a fourth third) would become newly registered job seekers who would find jobs. To say that the cutting down of unemployment is equal to the creating of jobs for four thirds of the existing number of unemploymed comes down to supposing that the number of unemploymed never goes down in proportion to the number of jobs created. The multiplying coefficient 1,33 adopted is higher than that retained by the General Plan Commission[9] in order to make allowances for

[9] . The General Plan Commission indicates that if working hours had continued to drop after 1986 at the rate of 0,8% a year as from 1970 to 1986, and in view of productivity gains, 312 000 jobs would have had to be created which would have reduced unemployment by 250 000; the coefficient is therefore 1,25 (Commissariat General du Plan, 1993, p. 268).

the fact that, in reality, the reduction in working hours does not mean a proportionally higher number of jobs since the absolute value of employment elasticity in relation to the number of hours is often lower than the unit.

We have chosen not to be hindered by a coefficient of specific elasticity coming into play in the matter of softening the consequences of reduced working hours because the main obstacle for a reduction in the latter, in firms, is put forward in our simulation which is developed by distributing a constant overall income, the only possible increase arising from a prospective economic growth.

Precisely, we can suppose that the spreading out of the abolition of unemployment and the reduction in inequalities over a four years period would bring about an average annual growth rate of hourly productivity of 2,5%. In order to soften the social impact brought about by the lowering of income in the penalized social groups by the reduction in inequalities, economic growth is supposed to be used to raise individual incomes at a uniform annual rate of 1,5%, the sharing out of *distributed income/social surplus* will remain unchanged.

Table 5: Récapitulation of the simulation of the reduction in income inequalities over 4 years

1 Classes[1]	2 Multiplying coefficient of average income	3 Variation rate of average income	4 Multiplying coefficient of working hours	5 Variation rate of working hours	6 Multiplying coefficient of income in units of work (2)/(4)	7 Variation rate of income in units of work
1	1,3967	+ 39,67%	0,961543	- 3,85%	1,45256	+ 45,26%
2	1,3967	+ 39,67%	0,827139	- 17,29%	1,68859	+ 68,86%
3	1,3967	+ 39,67%	0,601745	- 39,83%	2,32108	+ 132,11%
4	1,3967	+ 39,67%	0,597976	- 40,20%	2,33571	+ 133,57%
5	1,3225	+ 32,25%	0,758521	- 24,15%	1,74353	+ 74,35%
6	1,2062	+ 20,62%	0,851709	- 14,83%	1,41621	+ 41,62%
7	1,0837	+ 8,37%	0,905474	- 9,45%	1,19683	+ 19,68%
8	0,9501	- 4,99%	0,924272	- 7,57%	1,02794	+ 2,79%
9	0,7880	- 21,20%	0,926283	- 7,37%	0,85071	- 14,93%
10	0,4280	- 57,20%	0,961543	- 3,85%	0,44512	- 55,49%

1. In so far as each class of the population has assimilated an unequal number of unemployed, the population is no longer divided into decils but as follows for the 10 classes respectively: 8,4%; 9,8%; 13,4%; 13,5%; 10,6%; 9,5%; 8,9%; 8,7%; 8,7%; 8,4%.

At the end of four years the active working population receiving income will have increased to 4 152 933 or 19,05%.

The average reduction in per capita working hours over four years would be:

$$1{,}015^4 / 1{,}1905 \,.\, 1{,}025^4 \; - 1 = \; - 19{,}23\% \,.$$

The reduction in working hours is not equal for everybody. The reason for this is that the structure of the unemployed population does not correspond to the structure of the active working population, the less qualified categories being over represented. From then on, the reduction in working hours for those already employed (which would be necessary for the integration of the registered job seekers) should be as intense as the number of the unemployed in the corresponding categories is high. When all the job seekers have found satisfaction, the reduction in working hours could be carried out in an equal manner between all the groups of workers progressing alongside productivity gains.

II-2. Application of the model for wages

The application of the model for wage-earned income alone does not aim at abandoning the objective of linking all incomes to the funding of job creation (made possible by the reduction in working hours) but to put an end to an ambiguity which weighs heavily on debates concerning this latter question: for many, the reduction in working hours would not be possible without imposing a reduction in wages for most wage-earners, sparing not even those of the most modest means. We refute this assertion and shall show that discussions on compensation or non compensation of wages stemming from the reduction in working hours can easily be clarified.

We start with the distribution of wages after tax corresponding to the full-time wage-earning workforce in the private, semi-public and public sectors. By applying the same method as for all incomes, we shall seek to mesure the impact of a reduction in wage inequalities on employing the unemployed. We shall use the same hypotheses as before, knowing that productivity increases, on average, by 2,5% a year and that an annual economic growth of 1,5% helps to raise all wages at a uniform rate, while a third of the unemployed will find jobs each year; lastly, we can presume that the creation of jobs will incite an influx of additional job seekers equivalent to a fourth third finding work during the fourth year.

Table 6: Distribution of net wages in 1992

Wage classes	Distribution of wage-earners	Upper limit of the class (in francs)	Average wage of the class (in francs)	Hierarchy of average wages
			60 000	1
1	0,0851	62 900		
			67 300	1,122
2	0,0886	71 700		
			75 900	1,265
3	0,0906	80 100		
			84 050	1,401
4	0,0937	88 000		
			92 400	1,540
5	0,0979	96 800		
			102 000	1,700
6	0,1022	107 200		
			114 250	1,904
7	0,1074	121 300		
			132 600	2,210
8	0,1185	143 900		
			167 650	2,794
9	0,1141	191 400		
			278 000	4,633
10	0,1019			
	1			

Sources: For the information on wages in the private and semi-public sectors: INSEE, TEF, 1995-96, p. 83; for those on wages in the public sector: QUARRE D., 1995, p. 245. We have grouped together information concerning all types of wages in this table (for the methodology, cf. HARRIBEY, 1996-b).

The progression of hierarchical differences between income classes (table 6) is almost perfectly linear up to the fifth wage class (adjustment: $y = 0{,}1359\ x + 0{,}8579$, with a coefficient of correlation of 0,99972). Above that, the progression takes on an exponential shape. For this reason, we shall test the impact that a restriction of the wage hierarchy would have on employment so that this hierarchy would be brought down to the level it would have

if the progression of hierarchical differences continued at a linear rate beyond the 5th wage class (table 7). Jobs seekers would then be integrated into the different income classes[10] (table 8).

Table 7 : Restriction of the wage hierarchy

Classes	Existing hierarchy	Restricted hierarchy at the end of the 1st year	Restricted hierarchy at the end of the 2nd year	Restricted hierarchy at the end of the 3rd year	Restricted hierarchy at the end of the 4th year
1	1	1	1	1	1
2	1,122	1,122	1,122	1,122	1,122
3	1,265	1,265	1,265	1,265	1,265
4	1,401	1,401	1,401	1,401	1,401
5	1,540	1,540	1,540	1,540	1,540
6	1,700	1,6932	1,6864	1,6797	1,673
7	1,904	1,8798	1,8559	1,8323	1,809
8	2,210	2,1405	2,0733	2,0081	1,945
9	2,794	2,5956	2,4113	2,2401	2,081
10	4,633	3,8533	3,2049	2,6656	2,217

The last colomn (classes 6 to 10) is obtained by applying the relation $y = 0{,}1359\ x + 0{,}8579$. Starting from the 6th class, the fourth roots of the divisions of the last and the 2nd colomns give the annual multiplying coefficient of the new hierarchical levels (3rd colomn); for example for the 10th class: $(2{,}217/4{,}633)^{1/4} = 0{,}8317$ which we multiply by 4,633 to obtain 3,8533, etc.

Table 8: Intégration of the unemployed into the active wage-earning population

Classes	Farmers, Craft smen, Comm. traders, busin. directors	Executives and higher intellect professions	Intermediary professions	Workers, employees	Unemploy. never had a job	Total	Proportion
1	6 950			328 950	32 890	368 790	0,11840
2	13 900			438 600	49 335	501 835	0,16112
3	20 850		18 190	657 900	65 780	762 720	0,24488
4	17 375		54 570	438 600	49 335	559 880	0,17975
5	6 950		90 950	219 300	39 468	356 668	0,11451
6	3 475	31 900	109 140	109 650	32 890	287 055	0,09216
7		39 875	54 570		26 312	120 757	0,03877
8		39 875	36 380		16 445	92 700	0,02976
9		31 900			11 511	43 411	0,01394
10		15 950			4 934	20 884	0,00670
Total	69 500	159 500	363 800	2 193 000	328 900	3 114 700	1

At the end of the four years, the simulation of a reduction in wage inequalities shows (table 9) a rise in wages for 70% of wage-earners and a rise in the hourly wage for more than 80% of wage-earners, as unemployment is relieved by the reduction in working hours. Thus, the only professions who would be penalized by a sharp reduction in wage inequalities would

[10] . We divide out the job seekers as follows: - workmen and employees: 15% in the 1st class, 20% in the 2nd, 30% in the 3rd, 20% in the 4th, 10% in the 5th and 5% in the 6th; - intermediary professions: 5% in the 3rd class, 15% in the 4th, 25% in the 5th, 30% in the 6th, 15% in the 7th and 10% in the 8th; - senior executives and higher intellect professions: 20% in the 6th class, 25% in the 7th, 25% in the 8th, 20% in the 9th and 10% in the 10th; - farmers, craftsmen, commercial traders and business directors: 10% in the 1st class, 20% in the 2nd, 30% in the 3rd, 25% in the 4th, 10% in the 5th et 5% dans la 6°; - job seekers having never worked: 10% in the 1st class, 15% in the 2nd, 20% in the 3rd, 15% in the 4th, 12% in the 5th, 10% in the 6th, 8% in the 7th, 5% in the 8th, 3,5% in the 9th and 1,5% in the 10th.

be the higher paid among senior executives and intellect professions. Only about 10% or less of wage-earners situated immediately below the better paid senior executives on the wage scale would have a reduction in their working hours which would not be compensated by a rise in the hourly wage or, more explicitly, would suffer a drop in wages which would be more than compensated by a reduction in their working hours. Wage inequalities and, even more blatently, income inequalities are so great in France that their reduction would safeguard the maintenance and even the progression of purchasing power for the great majority of wage-earners as working hours are reduced.

Table 9: Récapitulation of the reduction in wages inequalities simulation in 4 years

1 Classes	2 Multiplying coefficient of average wage	3 Variation rate of average wage	4 Multiplying coefficient of working hours	5 Variation rate of working hours	6 Multiplying coefficient of unitary wages (2)/(4)	7 Variation rate of unitary wages
1	1,0567	+ 5,67%	0,69224	- 30,78%	1,52650	+ 52,65%
2	1,0567	+ 5,67%	0,63743	- 36,26%	1,65775	+ 65,78%
3	1,0567	+ 5,67%	0,54765	- 45,24%	1,92952	+ 92,95%
4	1,0567	+ 5,67%	0,62583	- 37,42%	1,68847	+ 68,85%
5	1,0567	+ 5,67%	0,72457	- 27,54%	1,45838	+ 45,84%
6	1,0400	+ 4,00%	0,76791	- 23,21%	1,35431	+ 35,43%
7	1,0040	+ 0,40%	0,87338	- 12,66%	1,14955	+ 14,96%
8	0,9300	- 7,00%	0,89845	- 10,16%	1,03512	+ 3,51%
9	0,7871	- 21,29%	0,92980	- 7,02%	0,84653	- 15,35%
10	0,5057	- 49,43%	0,94418	- 5,58%	0,53560	- 46,44%

The putting into practice of a sharp reduction in income inequalities would lead to a rapid and substantial rise in lower incomes and this, all the more so, since the bulk of incomes would be used and not only wages; if the principle of solidarity is applied only to wages, the scope of the rise in lower and average wages would be very small, but if the principle is applied to all incomes, the scope would be much greater. Thus, the marginal propensity to consume of those with modest incomes is greater than those whose incomes would be cut down by the reduction in inequalities. It is therefore very probable that the increase in low incomes would be followed by a significant increase in consumation and that, by means of a phenomenon of multiplication, a much greater economic growth than has been seen, on average, for the last two decades would be triggered off. The rapid cutting down of unemployment, the rise in lower and average wages and the return of economic growth could therefore run the risk of being in contention with the search for environmental sustainability. Is it possible to go beyond this contradiction?

II-3. Towards a sustainable model

We test our model for the last time, hoping to bring together the maximum number of guarantees in relation to environmental sutainability while re-establishing conditions of social solidarity:

- an intermediary reduction in inequalities situated between the maintenance of status quo and the reduction corresponding to the first two tests of the above model;
- a progression in the taxation on higher incomes and capital which would be all the more substantial as the reduction in direct income inequalities would be small;
- a progression in the taxation on low and average incomes which would be all the smaller as the reduction in direct income inequalities would be small
- at the least, a preservation of purchasing power for all low and average incomes and, at the most, a progression of purchasing power all the smaller as the reduction in working hours would be large; this comes down to dividing out the bulk of income made disposable by the reduction in inequalities on a number of unemployed people who have been integrated into the wider working population, or in other words, an equivalent to the shortening of the integration period for the unemployed.

By referring to the freezing of wages and purchasing power which began in France in 1982, the GDP increased by 27,56% from the beginning of 1982 to the end of 1994 while the purchasing power of the " SMIC " increased by only 19,9%.[11] By setting as a deadline the increase of the average income of the lowest income class for the two year period for which we can now test our model for the reduction in inequalities, this deficit (accumulated by the increase in purchasing power) versus to the progression of the GDP (the necessary catching up), is given by the division progression of GDP/progression of SMIC: 1,27564/1,16898 = 1,09124. Presuming that a moderate economic growth insures an additional average annual increase of 1,5%, the global progression of the lowest average income is:

$(1 + r)(1 + z) = 1{,}09124 \cdot 1{,}015^2 = 1{,}12422$, or sligthly more than 6% during each of the two years (+ 6,029% a year).

We shall test the model while insuring a decreasing progression of average incomes. The latter be decrease by one percentage point for each decil from the first to the seventh: 2: 5%; 3: 4%; 4: 3%; 5: 2%; 6: 1%; 7: 0%. For the last three decils the reduction in average incomes will be such that they will reach the level corresponding to the restriction of the income hierarchy already applied in the colomn for the 2nd year of table 2. The choice of only cutting down average incomes beyond the 7th decil is aimed at not penalizing more households than in the preceding estimations. The resultts arrived at are summed up in table 10.

It appears then that it is possible to reduce the deadline for cutting down unemployment to two years provided that the rise in lower and average incomes, made possible by the reduction in inequalities, is limited.

- The multiplying coefficient of solidarity shows that the bulk of income made disposable by the reduction in inequalities does not entail a rise (at the least, equal) in basic income as was the case in the preceding simulations; in fact, this multiplying coefficient $(1 + r)$ is higher than that of the basic income even though the latter includes the rise which stems directly from economic growth:

$$1 + r = 5{,}961/5{,}28888 = 1{,}12708 ;$$

[11] . Sources: INSEE, 1987, p. 93, 1993-1994, p. 89, 1995-1996, p. 101, for the GNP; INSEE, 1995-b, table 03.06, p. 59, for the productivity; INSEE, 1995-1996, p. 87, for the progression of purchasing power of the gross " SMIC " (minimum hourly wage in France).

$r_2/r = 1{,}12422 = (1 + r)(1 + z)$, and $1 + z = 1{,}12422/1{,}12708 = 0{,}99746$.

In other words, the increase in basic income of 12,71% which would result from applying only the multiplying coefficient is diminished by about 0,25%. This drop can be analysed as the combination of a rise resulting from economic growth gains and from a more significant rise in taxes; if *y* is the economic growth rate and *f* the growth rate of tax burden:

$(1 + z)(1 + f) = 1 + y$, and $1 + f = 1{,}015^2/0{,}99746 = 1{,}032847$.

- The average reduction in working hours over a two year period is:

$t = 1{,}015^2 / 1{,}190533 \ . \ 1{,}025^2 - 1 = -17{,}63\%$.

Table 10: The sharing out of incomes and jobs over two years

1 Population recieving incomes ivided into ecils at the beginning of 1st year	2 Hierarchy of average incomes at the beginning of 1st year	3 Total distributed income within each decil (1).(2) R	4 Division of unemployed in proportion to the total during the 2 years	5 Population recieving incomes after the employment of the unemployed (1) + (4) hN	6 Multiplying coefficient of average incomes over a 2 year period for the three last (7).1,12422/(2)	7 Restricted income hierarchy at the end of the 2nd year (2).(6)/1,12422 except for the three last	8 New distributed income (5).(7) R_2	9 New average income (7) R_2 = (7)(1+r)(1+z)R	10 Variation rate of working hours[12]	11 Variation rate of income by unit of work[13]
0,1 N	1	0,1 NR	-	0,1 N	1,12422	1	0,1 NR2	1,12422 R	- 1,94%	+ 14,65%
0,1 N	2,18	0,218 NR	0,113907	0,116277 N	1,10250	2,14	0,24883 NR2	2,40583 R	- 15,67%	+ 30,73%
0,1 N	2,92	0,292 NR	0,418544	0,159810 N	1,08160	2,81	0,44907 NR2	3,15906 R	- 38,64%	+ 76,27%
0,1 N	3,59	0,359 NR	0,425192	0,160760 N	1,06090	3,39	0,54498 NR2	3,81111 R	- 39,00%	+ 73,93%
0,1 N	4,33	0,433 NR	0,187305	0,126766 N	1,04040	4,01	0,50833 NR2	4,50812 R	- 22,65%	+ 34,50%
0,1 N	5,14	0,514 NR	0,090241	0,112895 N	1,02010	4,66	0,52609 NR2	5,23887 R	- 13,14%	+ 17,44%
0,1 N	6,12	0,612 NR	0,043309	0,106189 N	1,00000	5,44	0,57767 NR2	6,11576 R	- 7,66%	+ 8,39%
0,1 N	7,35	0,735 NR	0,028185	0,104028 N	0,92691	6,06	0,63041 NR2	6,81277 R	- 5,74%	- 1,67%
0,1 N	9,27	0,927 NR	0,026650	0,103808 N	0,84407	6,96	0,72250 NR2	7,82457 R	- 5,54%	- 10,64%
0,1 N	17,72	1,772 NR	-	0,1 N	0,62238	9,81	0,981 NR2	11,02860 R	- 1,94%	- 36,53%
N	59,62	5,962 NR	1,333333	1,190533 N		46,28	5,28888 NR2			

[12]. The multiplying coefficients of working hours are calculated as follows: $1{,}015^2/[$(5° colonne du tableau/1° colonne du tableau) $1{,}025^2]$.

[13]. The multiplying coefficients of income by unit of work are calculated as follows: multiplying coefficients of average incomes/multiplying coefficients of working hours.

Conclusion

We have made our model work for a new sharing out of employment and income by adopting certain values for the economic growth rate, productivity growth and the deadline for the cutting down of unemployment. How can we justify these hypotheses?

The annual rate of production growth of 1,5% corresponds on average to the downward trend of economic growth experienced by most western countries in the last two decades. This rate is thus considered by most observers to be the *intolerable minimum threshold* above which one must rise in order to relive the " Trente Glorieuses " (FOURASTIE, 1985) through " Vingt Merveilleuses " (IZRAELEWICZ, 1994). We have chosen it deliberately as the tolerable maximum threshold because it is amply sufficient for covering the needs arising from the demographic growth in industrialized countries and secondly because it has a much greater probability of long-term achievement than would a higher rate.[14]

The hourly productivity growth of 2,5% that we set down corresponds to the existing trend in Europe. Its lower level in opposition to the post-war period must be linked to the slightest economic growth. The maintenance of moderate economic and productivity gains are therefore, in our opinion, hypothetically linked.[15]

In the different simulations which we have carried out, we adopted a deadline of two to four years for cutting down unemployment in France. Is this a reasonable deadline? Could our conclusion be discredited by its briefness? We notice that it falls into line with those that are always heralded (but never respected) by those in charge of economic and political matters.[16] We deemed it necessary to test its realism by means of an alternative approach to those already tried. Moreover, this deadline corresponds to that adopted by parallel simulations carried out elsewhere and confirmed by our own studies.[17]

The model presented here simply aims to show that the funding of the job creation necessary for a substantial cutting down of unemployment is possible even in the absence of sharp economic growth. Problems arising from economic development, those from exclusion as for those arising from the damage done to ecosystems can not be solved within this form of development. Sustainability is only meaningful if it is conceived as a disribution issue: distribution of limited natural resources between generations, distribution of work and produced wealth within the present generation. Instead of living in the throes of a moderate economic growth, it is possible to profit from this situation and trigger off social and cultural changes in the ways we comprehend the improvement of well-being. Thus, the principle of *responsibility* toawards life, the principle of *solidarity* between individuals of the same generation and with those of future generations, and the principe of *sparing* limited resources and manpower, spell out sustainability ethics. If these principles were to be pushed aside, we should fear a situation in which durable development would only be a durable growth, " a provoking slogan " (DALY, 1992, p. 11) and thus simply a " concept alibi " (LATOUCHE, 1994). On the other hand, if they were adopted, a serious research programme should be set up concerning the notion of needs that economic theory has never be able to characterize

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[14] . We refer to the very recent Maddison's study which indicates an average annual growth rate of GDP of Western Europe of 2,2% for the period from 1820 to 1992 just as from 1973 to 1992, and a per capita growth rate of GDP of 1,5% from 1820 to 1992 and of 1,8% from 1973 to 1992. The average growth rate of GDP for France from 1973 to 1992 is 1,7% a year, that of a cross section of 12 western european countries is 1,8%. (MADDISON, 1995, p. 62 and 64).

[15] . Maddison provides the following average annual growth rate of hourly productivity for the period from 1973 to 1992: 2,7% in France and 2,3% in 12 western European countries. (MADDISON, 1995, p. 80).

[16] . To take an example outside France, in the course of negociations for a new " employment pact " which took place in January 1996 between German management and Trade Unions, the aim was to reduce unemployment by half (then 4 million in number) by the year 2000.

[17] . See especially NIKONOFF, 1995.

otherwise than by the simplistic statement " they are (almost by nature) unlimited " which justifies in advance the pursuit of an endless economic growth. Finally, the obstacles along the path of sustainability and justice are less economic than social, political and cultural.

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