The delusion of decoupling, and policy options for mitigating the rebound effect and the environmental impact

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The delusion of decoupling, and policy options for mitigating the rebound effects and the environmental impact.

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KEYWORDS

Decoupling, Rebound effect, In-direct energy, Labor input, Work time, IPAT.

NARRATIVE STEP

The current financial and environmental crises call for an open view on the measures available for approaching a degrowth economy, including lower production, work sharing, low birth rates, and more equity, nationally as well as globally. Financial policies must adapt to these developments, allowing for degrowth 'without tears'.

SUMMARY

When analyzing environmental problems, it is useful to apply the following simple equation for the environmental impact 'I', (here representing *energy consumption)*:

$$I = P \cdot A \cdot T,$$

With 'P' representing population, 'A' affluence per capita, and 'T' resource intensity, i.e. energy per affluence unit 'A'. All three factors are through the equation coupled to 'I', and in general we should avoid using the misleading terminology of *decoupling* environmental impact (energy consumption) from the economy, represented by 'P·A'. So far essentially all policies towards lowering 'I' has been devoted towards technical increase in energy efficiency, i.e., lowering 'T'. The relief thereby obtained on 'I', however, tends to be *rebounded* by increasing both 'P' and 'A', which pull 'I' upwards.

In a future *degrowth economy*, aiming at reducing 'I' significantly, focusing only on 'T' will not suffice. We must also reduce, or at least limit, 'P' and 'A', including their rebound growth from the 'T' decrease. The paper suggest this to be achievable in affluent countries, by letting 'P' decline through low birth rates, and encouraging 'A' to decline in exchange for lowering labor input to the economy, partly as shorter work time, and/or more satisfactory work conditions. A rather painless way to reduce 'A' can be to gradually extend the life time of durable goods, i.e. slowing down their repetitive replacement. The measures are in line with some trends in *public* preferences in Western Europe, but totally incompatible with the prevailing financial growth policy pursued by most governments.

INTRODUCTION

As a starting point for analyzing the environmental impact and the options for mitigating it, it is useful to remember the following simple equation for the impact 'I',

$$I = P \cdot A \cdot T,$$

developed by Erlich and Holdren (1971). To make this paper more clear and manageable 'I' is here simplified to represent not all environmental impacts, but in general just *energy consumption.* 'P' stands for population, 'A' for affluence per capita, and 'T' for environmental impact intensity, i.e. in this case energy consumption per affluence 'A'. This simple equation represents a stationary case, where the three right side factors are *assumed independent* of each other. So far essentially all political efforts towards lowering 'I' has been devoted towards increasing energy efficiency, i.e., lowering 'T'. This reduction has, however, through the *Rebound Effect*, enabled and tempted people economically, sociologically, and psychologically to increase both 'P' and 'A', and hence the general economy, which pulls 'I' upwards and thereby eat up some of – or all - the 'I' gains from lowering 'T'. This rebound effect exposes that the right side factors in this simple equation are *inter*dependent, so more correctly the equation should be written as I = f(P,A,T), (Alcott, 2010). This makes the equation more general, but still also valuable as a memo.

For affluent economies aiming at significant *degrowth* in 'I', it is not sufficient to lower only 'T'. Measures to reduce or at least confine 'P' and 'A' should also be in play, including their rebound from 'T' reduction. Such measures seem to be achievable and acceptable by the majority of people in affluent countries, where *voluntary* low birth rates point towards declining population, 'P', and where surveys often indicate *public preferences* for more relaxed work patterns over more income and consumption, i.e. lower 'A'. These trends are, however, *counteracted* in present growth guided economic policy. But in a society aiming at degrowth, such options for lowering, or at least stabilizing, 'P' and 'A' should obviously be encouraged. This could also 'release' a substantial potential for *indirectly* reduction of 'I', through longevity and sharing of durable goods. These options have been shelved or 'frozen' during the present consumerism and economic growth structure.

THE DELUSION OF DECOUPLING

The notion of *decoupling* economic activities from energy consumption (environmental impact) has often been used to describe a situation where the two parameters do not grow at the same rate, usually when 'I' is growing slower than the economy 'P·A'. The fact is, however, that the economy and environmental impact probably never have 'happened to' grow at just the same rates, since the

economic structure develops over time. *Linguistically* decoupling implies *no coupling at all*, and since *physically* there seems to be no economic activity without an environmental impact (and the reverse), the commonly used term 'decoupling' does not make much sense, no matter whether called *relative* or *absolute* decoupling (Nørgård, 2009).

This is not just a finicky discussion on terminology. The trouble is that the use of the term *decoupling* is distorting the debate, because it gives the public and politicians the false impression and even confidence, (often sub-consciously) that it is possible to have economic growth forever without any environmental impact. Numerous examples from *real life* statistics indicate clearly a coupling between economic activities and energy consumption, both when the economies go up and down.

Instead of talking about a decoupling, a better *aim for* environmental progress is to accentuate *declining eco-intensity, 'T', of the economy.* But the most appropriate indicator to report on and aim for is a *reduction in absolute environmental impacts 'I',* since nature doesn't care to give us any credit for the growth in our 'P' and 'A'.

POPULATION FACTOR, A DECISIVE TABOO

It is not by accident that 'P' for population is the first right side factor in the equation for environmental impact 'I', considering that we are talking about *man made* impact. At the time the equation was established in the late 1960s, population 'P' was the dominating factor in the environmental debate, and in the equation it was multiplied by *per capita* impact 'F' (Erlich and Erlich 1972:260). Soon it was found appropriate to recognize the impact's susceptibility to *technological changes* by splitting up 'F' into two, affluence 'A' times the *impact intensity* of the technology, 'T', applied to provide 'A'. (Erlich and Holdren 1971).

When later the environmental debate really came on the political agenda in the wealthy countries, population was fading away in the debate to now being close to *a taboo,* even by most environmentally dedicated NGO's. Apparently, it has become too sensitive an issue, both privately and politically. When today population issues are debated in Europe, it is mostly because *the low birth rates* of around 1.6 children per woman are *rightfully* seen as a threat to the economic growth, (and hence a highly important issue in planning for degrowth !)

In the previous centuries Europe had been facing overpopulation, but it was 'solved' by millions of Europeans emigrating overseas, taking control of around four quite 'empty' continents: North America, South America, Australia and parts of Africa and Asia. This development has a scaring parallel today in the outlook for the world as a whole, illustrated by the ecological footprint, 'I'. Today

the World is overpopulated in the sense that the population's environmental impact 'I' is exceeding the capacity of the Earth by 50% (Global Footprint Network 2014). There are, however, *no more empty continents* to emigrate to. Unless the world society is drastically and fast reducing its impact, 'I', the world's total environmental deficit will soon amount to a couple of empty *planets* to supplement the beautiful, but crowded Earth. The situation calls for courageous steps to seriously include also the population factor 'P' in the environmental politic.

China has through its drastic population policy since 1970s implemented the world's most successful environmental project by lowering birth rates, sparing next generation for environmental impact of about half a billion people, while through a kind of *rebound effect*, enabled those Chinese born to enjoy a decent life. Many other Asian countries have in recent decades followed suit and achieved remarkable progresses in lowering birth rates from around 6 to 2, even with softer measures than China's.

Today dense populated Europe is on the right track with low birth rates, about 1.6 children born per woman, which can soon relieve Europe's environmental pressure through a gentle decline in population. If from now on this became the worldwide birth rate, global population would in 150 years be reduced to only half the present (Population Council 1998). Except for some temporary and manageable transition problems of distribution, it is hard to see any global problems, which would not be a lot easier to solve with only half as many people.

Despite such positive trend in many regions, World population is still growing (though today not exponentially, but rather linear) by around 80 million per year, due to the dynamic of age distribution, etc. This implies that if these newcomers should live on European standard, an extra equivalent to Germany would have to be established every year.

Because population growth today is highest in poor countries, there is now a pressure towards *reversing* the earlier migration *out* of Europe, which was driven by shortage of land and resources. But today's emigrants *towards* Europe will not, as did earlier outbound Europeans, find an 'empty' continent, with abundance of physical resources. Rather will they come to a relatively resource poor and dense populated Europe. These immigrants are attracted by the physical wealth built up in Europe by financial, social and technological capacities adding value to the *natural resources*, *often imported from immigrant's home regions.* A policy towards equalizing the living standard in the world could be to move population from poor countries to more wealthy countries and/or to move the financial and technological capacities the other way.

THE BASIC POLICY CONFLICT

Recognizing the above mentioned rebound effect from reducing 'T' should not lead to the conclusion that increasing resource efficiency, i. e. lowering 'T', is a problem per se and should be abandoned. Improving technological resource efficiency is, and should be, part of the solution. But it should be *only part* of the solution and always implemented in coherence with mitigating the other two factors, 'P' and 'A'.

The real problem appears in the basic conflict between an *economic growth policy* encouraging increases in the 'P' and 'A' factors of the equation, and an *environmental policy* aimed at reducing 'I'. Combining the two is often suggested in a policy, termed 'green growth'. Such policy, however, stands and falls with a technological reduction *rate* in energy intensity, 'T', which is forever outbalancing the economic growth rate. If for instance, a conventionally anticipated growth in GDP (or 'P·A') of 3-4% should be combined with an environmental target of reducing the environmental impact 'I' to one tenth of present, as suggested for the affluent countries (Schmidt-Bleek 2001) this would within a few decades require an eco-efficiency around 100 times higher than present, i.e. an eco-intensity 'T' of only around one per cent of todays' (Nørgård, 2009; Jackson 2009).

It seems shortsighted to count on such technological fixes alone do the job, but politicians and business people have become so conceited by the modest environmental progress achieved by technology over the past 50 years, that they seem blind for including the easier and anyway necessary options of a coherent effort in dealing with 'P', 'A', and 'T'.

INDIRECT IMPACT FROM DURABLE GOODS

People's material affluence 'A' can be divided into 1) *flows* of *non-durable goods,* defined as consumption of goods the value of which lies in actually being consumed, such as food, water, electricity, heat etc., and 2) *stocks* of *durable goods*, defined as the physical goods, e.g. houses, clothes, and cars, the basic physical value of which lies in *having a stock of them at disposal* (Nørgård 2006). These concepts and the following considerations can be applied not only to private consumption, but to the economy as a whole.

Most awareness on energy saving options has been devoted to the non-durable flow of *direct energy* used for providing services like transport, light, comfort, meals, etc. by operating energy consuming durables like cars, lamps, houses, refrigerators, TVs, etc.

However, investigating also *indirect energy* consumption, defined as the energy used to *produce the durable goods,* opens up for much more reduction in 'I', involving 'A' and 'T'. The potentials for these savings lies in 1) improving energy efficiency in producing the durables, 2) reducing the number of

durable goods people purchase to have at disposal, e.g. by more *sharing* of the goods (cars, houses, clothes etc.), and finally 3) by *extending the useful lifetime,* i.e. the time in which the product is providing the physical service it was intended for, before being scrapped. In the following focus is on the latter.

The useful lifetime of durable goods is determined by the following factors (Nørgård 1979):

1) Technological obsolescence (durability), expressing the situation where the products are physically worn-down. This can be extended by making it easily repairable, etc.
2) Functional obsolescence, as when new products can fulfill the purpose in a better way, including for instance by being more energy efficient.
3) Psychological obsolescence, or out of fashion and novelty.

Obviously, the first occurring obsolescence of a product determines the factual useful lifetime of the product. There is little meaning in extending 1), durability, if the product is discarded earlier because of 2) or 3). On the other hand, 1) durability sets the ultimate limit to longevity.

Henry Ford, the pioneer in mass production of automobiles, stated in 1922 (Slade, 2006): "We want the man who buys one of our cars never to have to buy another.. ". This seems to reflect a sound view on a real economy, but after having dominated the market till the 1930s, Ford had to adapt to an obsolescence business strategy. This symbolizes what has ever since been a business dilemma between increasing people's *stock of durable goods* – or – their *flow of durable goods*. The latter contributes most to GDP, and on a national scale the dilemma was manifested in 1933, when F.D. Roosevelt made a quick U-turn towards a growth policy, spurring public as well as private spending (see later). In this turmoil, part of the growth measures was the inclusion of the concept of *planned obsolescence* (London 1932), a business strategy of *deliberately* making the products obsolete faster in all the ways listed above, became part of this growth policy.

REVERSING OBSOLESCENCE STRATEGY

During the 1900s considerable knowledge in technology, marketing, financing, etc. has been accumulated, predominately applied towards boosting growth in GDP, including various forms of planned obsolescence as mentioned above. Switching towards pursuing a degrowth economy aimed at lowering energy consumption and environmental impacts 'I', we ought not to be surprised by finding a large backlog of options *left behind*. These include extension of longevity of goods as different as clothes, electronics, furniture, cars, houses, plastic items, etc.

Example 1. Electronics. Development of solid state components to replace vacuum tubes has made it *technologically* possible to build TVs, computers, and other electronic items, which can be designed with no moving part and serving its original purpose, probably for about a century. But the technology also made the production cheaper, and electronic businesses soon rebounded the components' durability by moving into functional and psychological obsolescence business, urging or forcing people into replacing equipment every few months or years. But the knowledge of making them last for many decades is still available.

Example 2. Clothes. More durable textile fibers can keep people warm and beautifully dressed for decades. But temptation from fashion changes leads to repetitive replacement every few months, so in real life not many clothes are worn out. (When looking at the different styles, which advertisement has convinced people to wear it seems like a very flexible obsolescence!).

Example 3. Plastic is characterized by being a very durable material, but ironically much of it is used to produce disposable goods ranging from cameras to packaging, which *because* of its durability are ending up as very persistent waste, causing serious pollution problems at land as well as at sea.

Let us assume that we dedicated aimed for a *gradual* decline in environmental impact 'I'. In that case it would be ridiculous to ignore the 'fallacies' developed during our 'buy and throw away' culture, a culture with no role to play in a sustainable economy. We could then use the advertising experts to explain to *consumers,* little by little, the benefits of focusing more on the physical services provided by the car, the clothes, and the other durable goods, and less on fashions and novelty. Manufacturers could use their technical expertise to followed suit by designing more durable products with longer intervals between functional and fashion changes. This would put us on the track towards a target of extending the useful life time of durable goods to say four times present and hence to reduce the amount of indirect energy and other resources to produce these goods, which in some cases amounts to about half of all energy consumption -, to only a quarter of present.

The main obstacle for beginning the path towards such indirect energy saving is not the technology, which is readily available, but the changes in economic and financial targets, including work pattern, see later. There seems to be some public reaction against the throw away business towards preferring to keep and repair some of the durable goods.

REDUCING REBOUND AFFLUENCE BY TAXING?

Taxing resources, pollution, etc. or consumption in general (VAT) has been advocated – or even implemented – to mitigate environmental impact, including the rebound effect from lowering 'T'. This would no doubt reduce people's incentives to consume, but the question is where does the tax *revenue* go? One option for governments is to use some of the revenue to lower income taxes, but

this would leave people with more disposable income, which might then be spend on increasing normal, marginal consumption, including energy intensive activities. Another option is for the governments to spend the extra revenue on some environmentally benign activities. For a while this could be investment in energy saving technologies. Or the revenue could be spent on activities with low energy intensity like some social purposes with more care and less materials than average.

The dilemma is here that when the tax economic revenues are spent productively, some output is *inevitable,* and like for all other affluences 'A', it will pull 'I' upwards, more or less. While there are many meaningful purposes in which to invest around the world, the obvious long term solution is *to produce less,* as illustrated below.

Production is expressed by 'A' = f(L, R), where L is the total labor input into the formal economy, and R represents the use of nature's resources. Production factor equations often also include capital, which, however, can be considered as *stored labor input*, so in a long term perspective only labor and nature is required to generate 'A'.

A degrowth economy will require a declining 'A' = f(L,R). To some extent the resources and labor can be mutually substituted as typically been the case during industrialization when human labor increasingly has been replaced by fossil fueled machinery. This historical trend can in some cases be reversed, increasing the use manpower to replace fossil fuels. But more important, the two are interdependent in a diabolic way, where a lot of energy resources are spend in production with the main purpose of generating work to keep people busy and employed. Degrowth production will call for reducing labor input.

REDUCING LABOR INPUT IN PRODUCTION

Labor, L, as a production factor in the professional or formal (money) economy can be split up into the following sub-factors:

L = Population × Labor force fraction × Working time × Employment rate × Labor productivity.

Lowering 'L' can be achieved by reconsidering five factors, all of which offer rewards such as *more leisure and freedom* as compensation for the loss of income and consumption:

1) Reducing population in a country obviously has a double effect on the country's 'I' , since it reduces consumers as well as worker. As discussed earlier, Europe is here on the right track with low birth rates of 1.6 children per woman, which point towards a soon declining population in Europe.

2) Reducing the fraction of the population engaged in the workforce. In some industrialized countries, around 80 % of women in the working age have joined the work force and thereby contributed to the high growth in the professional economy in the last half of the 20th century. Lower pension age and longer educations are possible measures to reduce work force fraction.
3) Reducing average working time per year. Sharing the work more evenly could be achieved by lowering the average or standard work time per year. This was the philosophy behind the US-proposal on solving unemployment by cutting the over 40 hours' work week to 30 hours, strongly advocated by F.D. Roosevelt during his presidential campaign (Hunnicutt 1988; Cross 1993; Beder 2000, Nørgård 2013). After he took office as president in 1933, a 30 hours' bill was passed by the Senate, but a few weeks' later business people convinced Roosevelt to completely switch policy from *sharing the work* towards *increasing work and consumption* instead.
4) Reducing employment rate (increasing unemployment rate). The usual way to adjust employment in Western societies is to hire or fire according to the need in the various businesses and public institutions. The *threat* of 10% unemployment is a more powerful tool for employers when negotiating with employees than is the 'threat' of the 10% lower work week and income, if eliminating unemployment by work sharing.
5) Reducing productivity. This option might appear insane for mainstream economists or politicians, because the growth in labor productivity has since early industrialization been the main driver for the economic growth. Nevertheless there are examples of abandoning some potential productivity gains in return for better work conditions. Another way to achieve lower productivity is by moving some production in the very productive *professional economy* back to the *amateur economy,* defined as the activities driven voluntary by affection. People might decide to work less hours for money and spending the extra leisure time doing more what they really like to do, maybe with their family and friends, with cooking, repairing things, etc. This would usually be much less productive, but in return give a higher work satisfaction (Nørgård 2013).

There are many indications in the affluent countries that some of the above options would be acceptable if offered and organized by the public.

Increasing leisure time is often claimed to increase consumption, which immediately doesn't make sense. If people choose more leisure i*nstead of* more consumption they won't have both. The question is how the leisure in general is spent, and this might be regulated by tax policies.

CONCLUDING REMARKS

It is a general, although not surprising, observation that many political measures required for aiming at a *degrowth economy* are opposite those prevailing in our mainstream *growth economy.* As an example in affluent countries, low birth rates are usually entering as a problem, contrary to the view from a degrowth perspective. Similarly, in our growth economies, projects are judged more by how many jobs and how much money circulation, GDP, they create, and *less by how much human satisfaction or how little environmental impact they cause.*

It appears that in affluent countries, especially those with high equity, the *general public* seems to be more ready and receptive for the transition towards degrowth than are those engaged in the *political and economic system*. This shows up as a clear preference for less work over more consumption, a quite remarkable attitude in light of the massive efforts from commercial advertisements and from governments to convince people to increase their consumption. Furthermore, these satiation trends do *not* appear to be much guided by people's environmental concerns, which should even add to this preference.

Basic changes are needed in the economic structures for transition to a degrowth society. But rather than just waiting for a 'perfect' economic system to come about, it is important to look for leverage points, i. e. points in the system, where individuals, groups, local governments and companies can *initiate and spur* the transition, for instance by keeping consumption relatively low and pushing for lower work time in the professional economy.

Abandoning growth in GDP as the guiding principal in affluent regions, will bring a substantial degrowth of environmental impact 'I' within reach without any *real cost* in the form of declining general well-being and happiness, if economic and financial structures are adapted appropriately.

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