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Røpke, Inge

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Sustainability transitions in the perspective of ecological macroeconomics

Inge Røpke

Center for Design, Innovation and Sustainable Transition, DIST

Aalborg University, Copenhagen

ir@plan.aau.dk

Abstract

Globally, societies are facing a number of serious environmental, economic and social crises. Although the multiple crises are interrelated, research communities tend to be organised around specific complexes of problems. This paper is intended to contribute to the development of an ecological macroeconomics that addresses multiple crises by including insights from different, partly overlapping research communities. The main idea is to explore the usefulness of combining three different system perspectives in the study of sustainability transitions: socio-technical provision systems, distributional systems and macroeconomic systems. First, the theoretical concept of sustainability and the different system perspectives are outlined, and then the perspectives are brought together in the discussion of a specific topic that is key to sustainable transition: the need for considerable resources to invest in the transformation of provision systems.

1. Introduction

Globally, societies are facing a number of serious crises, including environmental problems like climate change, biodiversity loss, ocean acidification, and chemical pollution, problems related to the provision of sufficient food and water for a growing population, economic crises leading to widespread unemployment, the dismantling of welfare states, and social unrest, and problems related to changing global power relations. Increasingly, it is acknowledged that the multiple crises are interrelated and need to be dealt with in combination, but this is a challenge for research communities that tend to be organised around specific complexes of problems. Some transdisciplinary fields try to face the challenge and have the ambition of bringing together at least some of these multiple crises. For instance, the emerging field of ecological macroeconomics combines environmental, distributional and macroeconomic concerns (Jackson 2009, Victor 2008, Kallis et al. 2012), and the research network focusing on sustainability transitions extends their interest in provision systems to include macroeconomic issues (van den Bergh 2013). This paper is intended to contribute to this development of approaches that consider multiple crises by combining insights from different, partly overlapping research communities.

The starting point of the paper is an ecological economic understanding of sustainability. At a macro level, ecological economics provides interpretations of what is meant by sustainability and

some directions for what is needed to promote a more sustainable development, but these directions also have to be 'translated' into guidelines for various sub-systems of global, national and local societies. Thinking in terms of systems is a characteristic of ecological economics, but there is no axiomatic identification of which systems society can be said to include. Some research communities take their starting point from the perspective of resources and focus on, for instance, the management of ecosystems or more broadly socio-ecological systems, while others start out from a societal perspective and consider systems for production and consumption, such as socio-technical systems of provision of energy, mobility, and food. These systems are central to the studies of the sustainability transitions research network. In addition, the economic crisis has increased the interest, also among environmentalists, in various economic subsystems like those related to trade, money, finance, taxation, labour market, social security, and pensions. These issues are central to discussions in the degrowth community. In this paper, it is explored how three kinds of system perspectives can be combined in analyses of sustainability transitions: macroeconomic systems, distributional systems, and socio-technical provision systems. As illustrated in Figure 1, each system approach can be considered as a particular take on the complexity that strategies for sustainability transitions must cope with, and the perspectives are then combined. At the same time, they are themselves part of the complexity.

The paper is structured as follows. Section 2 elaborates on the ecological economic understanding of sustainability, and section 3 explains the three system perspectives, focusing in particular on the distinction between socio-technical provision systems and distributional systems. In section 4, it is discussed whether and how the macro interpretation of sustainability can be 'translated' into guidelines for the development of socio-technical provision systems and distributional systems, respectively. Then in section 5, the system perspectives are brought together in the discussion of a specific topic that is key to sustainable transition: the need for considerable resources to transform provision systems. Whether these investments are undertaken in a reasonable way depends on both the general macroeconomic conditions and the distributional systems of society. The brief concluding remark in section 6 emphasises the usefulness of bringing together the three perspectives.

2. Sustainability in an ecological economic perspective

The concept of sustainability has been defined and redefined in so many different ways that it has basically lost any meaning – it simply tends to mean all the good things that we can all agree on. In ecological economics, however, the concept can be assigned a meaning that is relatively narrow and straightforward, although not necessarily so easy to operationalise. Based on the idea that the global human society (or economy which means the same in this context) can be seen as a metabolic organism that has a size or a scale in relation to the biosphere, it is argued that this scale must stay within certain limits in order not to undermine the basic living conditions of humans. To operationalise the idea, the scale of the economy must be measured and the limits must be assessed. The measurements and assessments in relation to greenhouse gas emissions can be seen as an example of such an operationalisation. Several other measures are applied, like ecological footprint, human appropriation of net primary production (the product of photosynthesis not used by the plants themselves), and measures based on economy-wide material flow accounting (Krausmann et al. 2009, Haberl et al. 2009, Wackernagel & Rees 1996). In some cases, it makes sense to define a limit, while in other cases, it is only possible to indicate

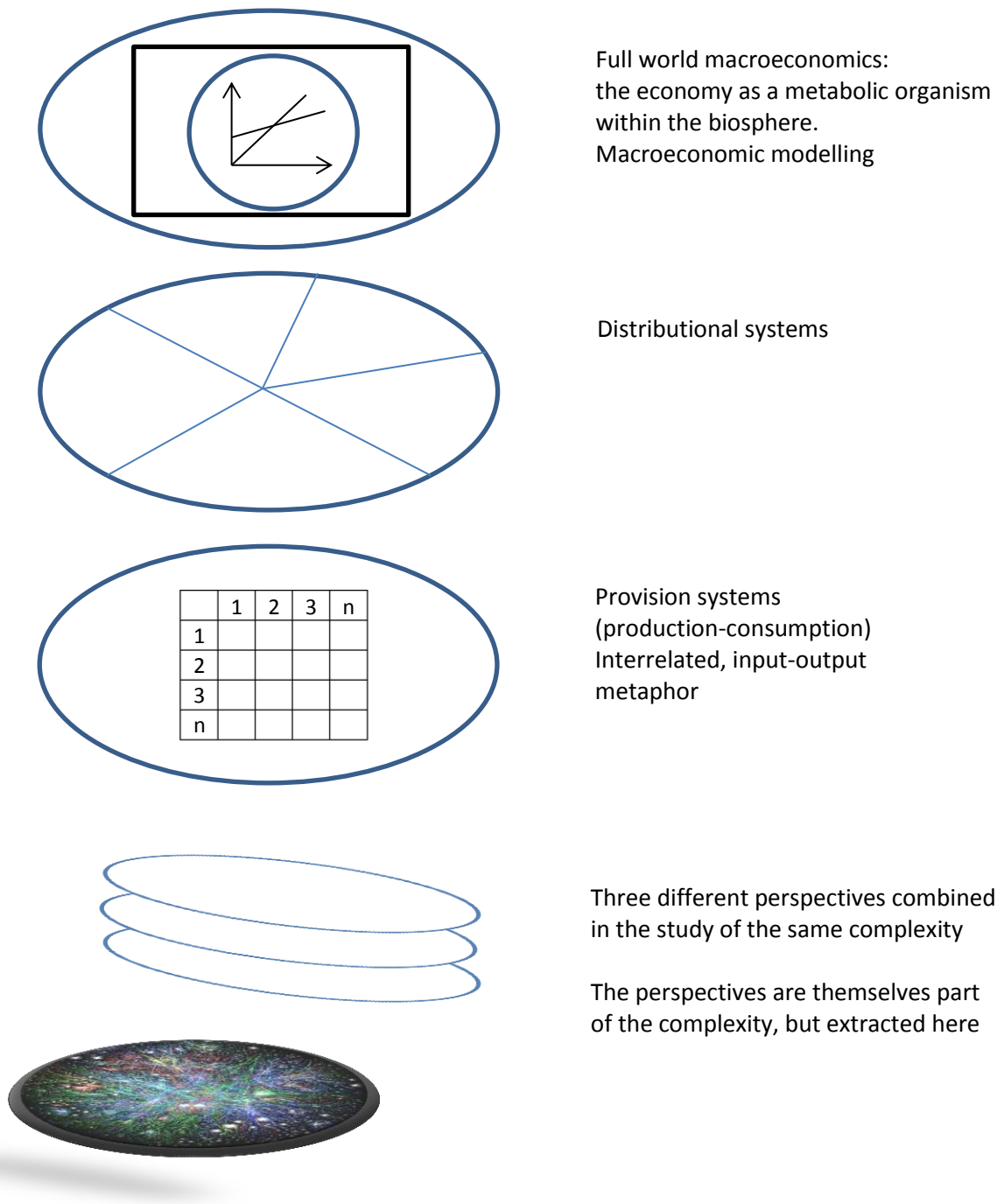


Figure 1. Three different system perspectives combined

whether or not the development goes in the right direction. Anyway, there is general agreement within ecological economics that the scale has become far too large: the appropriation of energy, land and materials by the global metabolic organism far exceeds the safe limits and threatens to undermine the basic living conditions of humans. This statement is supported by Rockström et al. who apply the term planetary boundaries and argue that several boundaries have already been exceeded, while others are rapidly approaching (Rockström et al. 2009).

These measures of scale can be transferred to the national level and provide an interpretation of whether a national economy develops in a more or less sustainable direction. The basis for this interpretation is a combination of a biophysical perspective on the economy and an ethical consideration. In biophysical terms, resources of energy, land and materials – and the capacity for absorbing the pollution related to their use – are limited. Over time, technical change can increase the benefits that humans can extract from the resources, but basically, there are limits implying that when one person appropriates a resource, another person cannot have it (except for the real public goods where one person's use does not impact others' possibility of using it). Therefore, large problems of poverty cannot be solved by economic growth, and sharing becomes an ethical claim. An ecological economic understanding of sustainability thus includes a demand for a development towards equalisation over time. Applying various measures of scale, this means that a rich country's final consumption (private and public) of resources – directly and indirectly, based on production at home or abroad – should be reduced over time to make space for higher living standards in poor countries. As Jackson has demonstrated for greenhouse gas reductions, it is really this demand for equalisation that makes the challenge very tough (Jackson 2009). The need for applying a consumption perspective – rather than a production perspective as in the Kyoto agreement – is emphasised by the trend towards outsourcing the production of many products. For instance, territorial-based greenhouse gas emissions in the UK fell by 19 % from 1990 to 2008 (the production perspective), while consumption-based emissions showed a 20% increase (Energy and Climate Change Committee 2012): p. 8).

For historical reasons, statistics are gathered at a national basis, which makes it possible to provide sustainability measures at a national level. These measures make sense because political power is still, at least to some extent, concentrated at the level of the nation state, including the power to influence distributional issues both between nations and within the nation itself. Globalisation, however, challenges the relevance of this conceptualisation: since the radical liberalisation of capital flows across borders from the 1980s onwards and the formation of ever larger transnational corporations and financial networks, resources are increasingly concentrated in the hands of small elites, and inequality in wealth and incomes has increased dramatically in many countries (Stiglitz 2012). A trend that is strengthened by failed states, tax havens, intertwinement between the criminal economy and the political establishment, corruption, business funding of election campaigns, and so on. It would be interesting and relevant to develop sustainability measures that capture these trends, for instance, by emphasising the need for reducing the resources available to the elites.

3. The foci of sustainability transitions

Based on the idea that the way towards sustainability in an affluent country implies an absolute reduction of resource appropriation for consumption and a development towards equalisation

nationally and internationally, the next question is how to promote such a transition and to do it at a relatively high speed. The widely shared macroeconomic response is to change the relative prices through ecological tax reforms and removal of perverse subsidies: energy and materials should become much more expensive relative to labour. No doubt, this is necessary and should be combined with redistribution to counteract the ensuing fall in real wages for low income groups. However, there are limits to what can be achieved by this strategy in isolation. The challenge is that technical infrastructures, social institutions, cultural expectations, and daily practices have evolved over long historical processes where relative prices have favoured the substitution of labour by energy. For the last nearly 200 years, prices of energy and materials have not reflected the social costs of using them, and these “false assumptions” have been built into, for instance, the socio-technical structures as “accumulated externalities”. To change these structures by relying mainly on price signals would take far too long time, and the transition process would be very painful. A more smooth transition requires that price signals are combined with active planning and specific strategies targeted at different systems and institutions. It is necessary to pick the challenges and sometimes even the winners to ensure coordination between transitions in different parts of socio-technical structures.

Which parts of society should then be in focus for sustainability transformations? What should the planning and specific strategies be targeted at? Different research communities focus on different aspects. Within the broad field of ecological economics and related fields of common property and political ecology, relatively large groups focus on exploring the management and conflicts related to either the use of particular resources, including biological resources like land, forests, and marine resources (often referred to as socio-ecological systems), and resources like energy and minerals, or the abatement of particular pollution problems. Obviously, such studies are important, but the dynamics behind the use of resources and the related pollution problems often emerge far away from the actual problems and the direct management of resources or pollution. To uncover such dynamics, it is necessary to consider social processes that only in a more indirect way influence the environment. Many different perspectives are offered as the key focus for sustainability transformation: the fundamental functioning of the capitalist economic system, technological change, historically specific institutions that promote economic growth, drivers related to consumption and lifestyles, dominant cultural understandings, reductionistic science, political systems, etc. Among the many offers, this paper first zooms in on the idea that it is particularly interesting to consider how the socio-technical systems of provision can be transformed, because most production and consumption in society is organised in such systems. Consumption and production are interwoven in socio-technical systems, and the dynamics of these systems are decisive for resource use and thus form obvious targets for sustainability measures. Later in the paper, the interplay between provision systems and a few of the other aspects are brought in.

A socio-technical system of provision is usually “defined” in relation to a “societal function” such as the provision of energy, transportation, or housing (Geels 2002) – an approach inspired by Hughes’ idea of a seamless web of elements combined in order to achieve functionalities. Such a system includes not only an industry or a production sector, but also the users and their activities, the regulatory authorities, professionals, standards, etc. The system is a recognised area of institutional life with a community of interacting groups and can thus be seen also as an

organisational field and a network of heterogeneous elements that are configured and aligned by a semi-coherent rule-set – a socio-technical regime – that coordinates the activities (Geels & Schot 2007). It is a matter of controversy how to delimit a socio-technical system: the participants may have different ideas of what system they consider themselves to be part of, and which rules to consider relevant, and it is not obvious that researchers have a privileged access to define the system (Jensen 2012). This calls for a flexible interpretation of provision systems.

Another issue concerns the scope of the concept: when does it make sense to talk about a provision system, and when are other concepts needed for economic subsystems? As mentioned, the focus has been on “societal functions” in relatively tangible areas like energy, transportation, housing, and food. This is not surprising when it comes to sustainability transitions, since these areas are usually considered to be the most resource-intensive. In consumption studies, food, mobility and housing (including heating and energy-intensive appliances) come out as the most resource-demanding consumption categories. Although it has attracted less interest in relation to sustainability transitions, the concept of provision system seems relevant to apply also in relation to less tangible private and public consumption areas like entertainment, communication, health, and education. Maybe the provision of services like insurance and banking can also be seen in the same perspective, since there is a sort of final consumption, but at the same time, these services may be considered more in terms of “lubrication” activities that cut across all provision systems. In this perspective, insurance and banking would rather belong to a “family” of economic subsystems like the tax system, the labour market, pension systems, social security systems, national and international trade regulations, exchange rate regimes, and financial markets.

It is not, however, so easy to distinguish between provision systems on the one hand, and cross-cutting systems on the other. Basically, all systems are cross-cutting: energy and transportation are used in all other systems, and all other systems are dependent on the reproduction of labour based on food, housing, education, and so on (as it could be illustrated in something like a system-based input-output table). It can also be argued that all these systems are comparable in the sense that they are socio-technical systems. Still, it seems to me that some sort of distinction between provision systems and another category of partial economic systems would be useful when discussing sustainability transitions. The idea is that provision systems are mainly concerned with the transformation of energy and resources to make them useful for human consumption, while the other partial economic systems are mainly concerned with the distribution of access to the results produced by the provision systems. In this perspective, the category of other economic systems could be called distributional systems, and they are considered to be cross-cutting in the sense of framing all the provision systems in a more general way than each of the provision system does. It should be noted that this distinction differs from the traditional distinction between allocation systems or modes of provision, divided into market, state, communal, and domestic. For instance, both categories of systems can be organised as markets.

The two categories of systems are seen as dealing with the two different aspects of sustainability: the overall resource use and the distributional aspect, respectively. Surely, this distinction is far from clear-cut: the distributional systems also transform resources, and the provision systems also have distributional aspects (as can be illustrated by the concept of “energy poverty”). Furthermore, some systems are not easily categorised, like the education system that provides

competent labour and is also key to distribution. Anyway, if the distinction is accepted as indicative, it can work as an organising device. Three foci of sustainability transitions are thus considered in the following, including their interplay: macroeconomic systems, provision systems, and distributional systems.

4. Sustainable systems

After pinning down three foci of sustainability transitions, the next step is to consider *whether and how the ecological economic understanding can be 'translated' into guidelines for sustainability in relation to these systems*. As argued above, the ecological economic understanding of sustainability is formulated and can be operationalised for macroeconomic systems at global and national levels, and some have applied the same reasoning for local areas and cities (Kennedy et al. 2007). For social and environmental reasons, it also seems important to develop macroeconomic systems that are less prone to costly instability. While “creative destruction” is very popular with innovation economists, it may not be the best way to sustainability, at least not in fast and dramatic ways including whole national economies.

With regard to distributional systems, two obvious guidelines follow directly from the ecological economic understanding. First, systems should be transformed in order to reduce large inequalities. Second, system transformation in rich countries should aim at promoting a no-growth society. As Seidl and Zahrnt have argued, many systems and institutions in modern societies are based on economic growth and contribute to growth, and it is decisive to transform institutions in ways that make them compatible with a no-growth society (Seidl & Zahrnt 2010).

When it comes to provision systems, the question is whether it makes sense to formulate general guidelines for sustainability transitions, or whether the environmental problems are specific for each system. It is easy to drown in specific problems. Take, for instance, the food system that can be seen as comprising the interplay between a large number of heterogenous elements, like agricultural production methods, global supply chains, industrial processing of food, distribution systems, cooking, diets, agricultural policies, and so on. This system exhibits a large catalogue of environmental and social problems: homogenization of landscapes and loss of biodiversity, net use of energy in agricultural production (which is absurd in a process involving photosynthesis), diffusion of phosphorus, eutrophication, maltreatment of animals, diffusion of pesticides, destruction of ground water and water courses, resistant bacteria due to overuse of antibiotics, bad working environment, food-related health problems, obesity, hunger, outselling poor farmers in developing countries, enormous food waste, and so on. If these problems are addressed at all, they tend to be addressed with separate policies (except for part of the movement for organic agriculture that tries to develop an integrated perspective), and improvements in relation to each problem in isolation is considered a step towards sustainability. This approach does not open for any common sustainability criteria across provision systems.

However, many specific problems can be seen as signs of general problems, not the least, the historical availability of cheap fossil fuels that have turned into “accumulated externalities” across provision systems. The need for a low carbon transition, which includes the need to prepare for a radical change in price relations and for increased scarcity of land, is thus obvious across systems, but the next question is whether such a transition is best achieved in ways that are similar across

systems. Degrowth proponents tend to argue that localisation is a relevant guideline across systems: the length of supply chains needs to be reduced to save transport, to ease recycling of nutrients and other materials, to reduce the appropriation of resources from others, and to ensure greater transparency of provision systems, enhancing the basis for better consumer understanding of the environmental impacts of consumption (Rees 2006). Similar guidelines suggest complexity reduction as well as improved possibilities for engagement of civil society as key to sustainability transitions. Others would focus more on efficiency improvements and argue that a widespread international division of labour provides the largest output (Daily & Ehrlich 1992). The co-evolution of allocation and distribution questions the strength of this argument from an ecological economic perspective, because a widespread international division of labour often co-develops with large inequalities.

Another general feature behind different environmental problems across provision systems is the “scientification” of production that continuously generates new problems – in the process of solving old ones (Harremoës et al. 2001). It is not obvious how this could be translated into a guideline for sustainability, and this is unfortunate because it implies a risk of giving a too low priority to chemical pollution, nuclear risks etc.

Anyway, it is important to combine the focus on general guidelines with a focus on problems that are system-specific and cannot be reduced to signs of general problems. Still, it is worth considering the many problems in a system perspective rather than just addressing each of them in isolation. The problems may relate to key features of the specific system and their solution may depend on breaking a systemic lock-in.

Summing up, sustainability transitions are about reducing the biophysical scale of an economy, both from a production and a consumption perspective, reducing inequalities internationally and nationally, reducing dramatic macroeconomic instabilities, transforming distributional institutions to make them compatible with a no-growth economy, and transforming provision systems towards reduced use of fossil fuels and less appropriation of land, combined with addressing system-specific problems and maybe guided by a vision of increased localisation, reduced complexity and more public engagement.

5. From consumption to transition investment: the interplay between systems

Although there are many possible scenarios for sustainable transformations of provision systems, one key requirement is shared: transitions involve considerable resources for investment (Jackson 2009, Harris 2009, Harris 2013). Obvious examples include investments in renewable energy systems, public transport, renovation of the housing stock, new systems for recovery of waste, and nature restoration. To fulfil the sustainability criterion calling for redistribution in favour of poor countries, consumption in rich countries has to give way to these investments, since in the biophysical economy, the same resources cannot be spent at two different places at the same time. Whether these investments can be undertaken in a reasonable way depends on the interplay between all three kinds of systems considered here – provision systems, macroeconomic and distributional systems. In the following, some of the issues emerging in this interplay are explored, setting out from the need for transition investments in provision systems and for moving

resources from consumption to investment. Surely, the systems differ considerably between countries, but in this paper the discussion is kept at a general level.

The need for public planning

As a start, the need for active public planning should be emphasised. Historically, government has played a role in many transformations of provision systems (e.g. the sewage system, electrification, broadcasting, automobility), also when key system builders have emerged from business and professional societies. Also today, in spite of the proclaimed adherence to neoliberal ideas, the state is active under the banner of national competitiveness, for instance, when it comes to promoting the broadband society (Mazzucato 2011, Røpke 2012). The role of government goes far beyond the influence on price signals and involves active planning, investment, research, education, regulation, and so on. The sustainability transitions differ in some respects from the historical examples: the urgency of change is strong and cuts across nearly all provision systems at the same time. This calls for a particularly active role of government as a key system builder at various levels (Steward 2008). The need is reinforced by the fact that several new technologies must be coordinated within, for instance, the energy system, and that several provision systems are strongly interdependent (like electricity, heating and transport) (Lund 2009)(Lund 2009). Reasonable coordination requires active public intervention, sometimes including picking the winners.

There are two key challenges related to transition investments in an economic perspective. First, a large part of investments are not easily funded because they cannot be expected to be profitable for business, and second, the multiplier and rebound effects have to be dampened to keep the resource use within limits, implying that employment and distributional problems need to be addressed in another way than through growth policies.

Private funding

Take first the question of funding. Traditionally, private investments are motivated by the profits that can be expected from increased productivity (lowering unit costs), from increased production capacity (widening the market) and/or from the production of new products. Furthermore, the profitability has to be competitive with other investment opportunities. Presently, these conditions are not easy to fulfil for sustainability investments, and policies are needed to change the conditions. In some cases, investments in sustainability transitions can be made profitable for business through economic instruments like taxes and subsidies (not the least the reduction of perverse subsidies): for instance, when fossil energy becomes more expensive, investments in renewable energy and energy savings become more profitable. But, as argued above, there are limits to this strategy.

An important complementary strategy aims at reducing the profitability of other investment opportunities. This is where the need for radical reforms of the financial sector comes in. For a long time, it has been possible to reap much larger profits through speculation in financial assets than by investing in the real economy (Kallis et al. 2009). Some of the measures proposed to change this situation include a financial transactions tax (to reduce high volume trading), a prohibition of some of the non-transparent financial products, and a split between ordinary banking and investment banking to make less money available for speculation.

Increasingly, funding comes from institutional investors like pension funds. Because of their long-term perspective these investors could be interested in transition investments, but again profitability is a key issue. For years, until the outbreak of the financial crisis in 2008, the expectations regarding the annual returns were rather high, although pension funds are subject to regulation that emphasises security. Some funds have started to take ethical considerations into account, for instance, avoiding investments in weapon and tobacco production, but active promotion of sustainability is more complex, and while regulation accepts “negative lists”, pension funds in some countries are not allowed to give priority to sustainability investments if they can be expected to have lower returns. Regulatory reform could be useful to improve the opportunities for sustainability investments and even to introduce obligations to contribute to high-priority investments.

Public funding – the economic crisis

While regulatory reforms may increase the contributions from private sector investors, no doubt, some public funding will be necessary. Here is a key meeting point between transition of provision systems and the macroeconomic situation: what does the current economic crisis imply for public funding of transition investments? This is a very complex question that requires at least a brief outline of the course of the crisis. The most immediate political response to the outbreak of the financial crisis in 2008 was to save the banking system by enormous infusion of capital to avoid a complete breakdown of the system. Although this was successful (and unfortunately done in ways that maintain large inequalities and power concentrations), it did not hinder the diffusion of the crisis to the real economy. When unemployment increased, governments in many countries initiated expansionary policies, and some used the opportunity to include programmes for green investment (green stimulus) (Geels 2013). However, the modest expansionary measures turned out to be insufficient to counter the credit crunch following the financial crisis and to counter the fall in private consumption due to increased insecurity, and thus unemployment continued to rise. Automatically, this meant falling tax revenues and increased expenses for unemployment benefits and other social compensations, and government budget deficits rose dramatically within a short period of time. Increased deficits quickly led to more contractive fiscal policies that further increased unemployment and thus public deficits, and so on. In this situation public funding of transition investments fell, and the relatively lively discourse on green growth and Green New Deal died away.

In Europe, the development is aggravated by the Euro crisis. The Euro was established in an area that is far from what economists would characterise as an optimum currency area. The participating countries have very different economic and social structures, fiscal policies, trends in productivity development, and so on, and these differences were deepened because of the Euro (Jespersen 2012). The trade balances between the Euro partners became increasingly unbalanced, and there were, and still are, no mechanisms to counter these imbalances. On the contrary, the focus has been on government budgets and public debt, and the resulting deflationary policies tend to make it even more difficult for countries in Southern Europe to improve their competitive position, and the debt continues to grow. Soaring debt makes refinancing more expensive, implying that government bonds with high returns offer more interesting opportunities for the financial sector than investments in the real economy – in particular, as long as the financial sector

still expects that national bankruptcy will be avoided. In spite of all the bailout packages from the troika of EU, ECB and IMF to the distressed countries, there are few signs of recovery.

Why has the austerity policy been so dominant in addressing the challenge of the economic crisis so far? As a very simplified answer, I will suggest the combination of three aspects: the dominant understandings of the economy, powerful economic interests, and globalisation. Across theoretical dividing lines, there is general agreement that the financial crisis was triggered by the burst of the housing bubble in the USA where sub-prime loans had been packed into obscure financial products. The background was the deregulation of the financial sector that led to an explosion in creative lending, speculation and increased risk-taking, encouraged by a reward system of bonuses. The agreement, however, stops when it comes to the question of the depth and character of the ensuing crisis and what should be done about it. The dominant New Classical / New Keynesian macroeconomic understandings consider the crisis to be a result of an exogenous shock that government and central banks can cope with by lowering interest rates for a while, and then market forces will take over and restore equilibrium. The key mechanism for restoring macroeconomic equilibrium is based on the downward pressure on wages due to the recession, which is expected to lead to increased employment. It may take some time, but in this approach there is no problem of effective demand and no problem of feedback mechanisms that aggravate the economic problems. As I will return to below, this understanding is increasingly challenged.

The dominant understandings can be said to be in line with the interests of powerful economic groups: the financial sector that wants to avoid restrictions on their profitable activities (and has been very successful in lobbying for a toothless Basel III), businesses that profit from the weakening of labour organisations and the resulting lower wages and less attention to a decent working environment, and businesses that exploit the opportunities to buy up public property that is sold to fill the gap in public coffers (Klein 2007, Kallis 2012). Increasingly, strong economic interests intervene in the political processes through lobbying and by funding election campaigns for politicians, think tanks, organisations, and media that promote their interests.

The third aspect is globalisation that currently imposes serious limitations to national economic policies. The free movement of capital implies a new meaning of national competitiveness. When capital was mainly national, competitiveness was an issue concerning the trade balance, and it was important to ensure that a given country had something to trade for necessary imports. Wages, competences, productivity etc. were relevant parameters, but it was possible to compete also by accepting a lower profitability of capital. With globalisation, competitiveness increasingly becomes an issue of attracting capital, and the task of the “competition state” is to make it attractive for capital to stay or settle in the country. This task goes far beyond simple economic parameters and tends to permeate all aspects of life from the development of the school system to the streamlining of the public sector. The neoliberal state is thus not one of laissez faire, but an organisation for fight that intervenes intensively in citizens’ life to make them effective soldiers in the global combat (Pedersen 2011). In this political environment, economic policies turn into “necessities”: “there is no alternative” to the intense focus on competitiveness, and in the dominant understanding this calls for austerity policies. Although these policies are at odds with the traditional priorities of centre-left politicians, the pressure of globalisation seems to be so strong that they are in a stalemate position.

Until now, austerity policies have implied serious limitations to the public funding of sustainability transitions, but the dominant understandings and policies are increasingly challenged. First of all, policies are challenged by the real-world feedback: the lack of success in achieving the proclaimed aims and the social unrest, particularly in Southern Europe, which is not taken into account in the more narrow economic reasoning. Secondly, dominant macroeconomic understandings are challenged by critique from within: empirical studies demonstrating that the models are seriously flawed (Colander 2011, Colander et al. 2009). These trends call for different theoretical interpretations like the Keynesian / Post Keynesian perspective, which suggests more expansionary policies.

The Keynesian (and Marxist, e.g. David Harvey) account of the economic crisis emphasises that the roots must be seen in a much longer time perspective and that increasing inequality played a key role in the build-up to the crisis. During the long post-war boom period in the industrialised countries, low unemployment strengthened the position of labour, increased the share of labour in the functional income distribution, and co-evolved with the development of welfare states. However, the model ran into problems with inflation, the funding of welfare, and imbalances in the international economy that undermined the Bretton Woods system, and in the early 1970s, the burst of a speculative bubble triggered a crisis that was considerably aggravated by the steep rise in oil prices in the mid 1970s. Keynesian policies were discredited by the difficulties in coping with the crisis, and this formed part of the basis for the neoliberal take-over. In the 1980s neoliberal policies suppressed the labour movement and reduced taxes for high incomes, and the functional income distribution started to develop in the opposite direction. This development was strengthened by outsourcing that depressed wages for low-income groups (simultaneously, the cheap imports from the foreign sweatshops made it easier to make ends meet for low-income groups in the USA (Schor 2005)) and by the deregulation of the financial sector that led to unprecedented profits for small groups. At the same time, the deregulation made it possible for the middle classes to make up for their stagnant incomes by turning to credit. Increasing debt thus ensured that effective demand was kept up, but it also implied the build-up of substantial vulnerability in the system. When the housing bubble burst, the house of cards came down, and the lack of effective demand became apparent. This account exposes the crisis as much deeper than the dominant account, and the main culprits are the development of an extremely lop-sided income distribution that tends to reduce effective demand and the deregulation of the financial sector that increased the vulnerability of the economy (in addition, many other aspects could be included in the account, like the high-frequency trading made possible by new technology, the dubious role of the rating agencies, and various positive feedback mechanisms as described by Soros in relation to his reflexivity concept).

Following the Keynesian perspective, the cure should turn the tide: austerity should be replaced by expansionary fiscal policies, the financial sector regulated more effectively, the rich pay higher taxes, and tax havens be controlled. In the Euro zone, the specific Euro-crisis should be addressed through greater solidarity (e.g. Euro bonds) and more focus on obligations for countries with a trade surplus. The expansionary approach can be combined with increased public investments in sustainability transitions, also because an interventionist state 'picking the winners' is usually more acceptable to Keynesians. In general, the challenge of globalisation is accepted by the

Keynesians, but the strategies to cope with the competitive pressure may include more inspiration from innovation economics.

Multiplier and rebound effects

While the Keynesian approach to the economic crisis improves the possibilities for funding sustainability transitions (as well as unsustainable investments in motorways etc.), it is not ingrained in the approach to consider how to avoid the ensuing growth-related environmental impacts. On the contrary, the purpose is to ensure full employment and economic growth, and sustainability investments can be expected to have both multiplier and rebound effects. The ordinary opposition between New Keynesian and (Post) Keynesian positions thus needs to be supplemented by a third position that incorporates the sustainability perspective – an ecological macroeconomics. Surely, an ecological macroeconomics will have more in common with Keynesian perspectives than with New Keynesians, but it has to bring in sustainability as an overall concern.

As a simple measure, the expansionary effects of sustainability investments can be counteracted by contractive policies, even green ones like ecological tax reforms that increase the cost of resources and pollution and decrease the relative cost of labour. But although the change in the relative prices of labour and resources will favour increased employment at any given level of economic activity, growth-dampening policies can be expected to make it more difficult to maintain full employment – in particular, if green taxes significantly exceed levels in other countries and are not balanced by border tax adjustments. In addition, the funding of the welfare state may be called into question. Ecological macroeconomics needs to develop responses to these challenges.

This is where the distributional systems come in. Sustainability transitions ought to be combined with a reasonable sharing of costs and the avoidance of large unemployment. Some suggest worksharing as a key component in a strategy (Kallis et al. 2013), and the funding of the welfare state could draw on elements like the social appropriation of ground rent and taxes on inheritance, fortunes and high incomes. Obviously, such policies would meet with problems of capital flight and maybe even flight of rich people (Victor 2008). In general, it is difficult to see how more radical national sustainability policies can be implemented without reforms of the international financial system in order to reduce capital flight. Reforms can either involve common international governance structures based on a higher degree of solidarity (avoiding the race to the bottom) or higher barriers between national economies. A trend towards re-nationalisation may fit with the need for more localised provision systems and for increased reliance on bottom-up approaches.

6. Concluding remark

The main idea of this paper is to explore the usefulness of combining three different system perspectives in the study of sustainability transitions: socio-technical provision systems, distributional systems and macroeconomic systems. These systems tend to be the objects of study for different research communities, but it is difficult to imagine more radical sustainability transitions in one kind of system without significant changes in the other two. The elements of the systems are intertwined in intricate networks and can be seen as different perspectives on a

common and evolving complexity. However, it seems relevant to make the distinctions between the three kinds of systems, because the concepts help to widen the analysis and make it more comprehensive. The approach may thus serve to remind the transition community of the need to include macroeconomic and distributional aspects more effectively in the analysis of sustainability transitions of provision systems – and to remind macroeconomists that investments are not just investments, but have to be considered in real terms as actual changes of provision systems.

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