Deepening the scope of the "economic model": Functionalities, structures, mechanisms, and institutions

Policy Paper no 24

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The WWWforEurope Policy Paper series is a working paper series that is open to policy makers, NGO representatives and academics that are interested in contributing to the objectives of the project. The aim of the paper series is to further the discussion on the development of a new and sustainable growth path in Europe.

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Abstract

By responding to the warning voices about the failure of mainstream economics to provide policy advice to seemingly well-known problems as manifest in the ongoing economic crises, we put forward the proposition that the majority of deficiencies in this discipline results from two self-imposed restrictions. The first restriction refers to the limited scope in the perception of economic activities by focusing mainly on reproducible goods (including services) and a very few resources, as human capital and by production reproducible capital. The second restriction results from the interwoven relationships that describe economic structures and the coordinating mechanisms which operate on these structures by postulating market relationships that quite often turn out to be too simplistic or non-existing. We propose therefore two conceptual extensions. The first extension opens up the scope of economic activity both by introducing the functionalities of well-being and an extended list of stocks and flows of resources. The second extension separates the description of economic structures from the mechanisms that operate on them, which may be market or non-market based. Furthermore we will demonstrate how these extensions can be made operational in the context of analyzing the transition of energy systems.

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"I think that change is really occurring with the young people. My young students overwhelmingly don't understand how people could have believed in the old models. That is good."

Joseph E. Stiglitz (Institute for New Economic Thinking, 2015).

1 Introduction

"What went wrong with economics" asked The Economist (2009) in view of the unfolding economic crisis and illustrated the presented evidence by a book that melts away like a block of ice and carries the title "Modern Economic Theory". By echoing renowned voices of academia with similar concerns Carraro et al. (2014) arrive at the conclusion that "It took the deepest economic and financial crisis since the Great Depression to provoke an open debate amongst macroeconomists as to whether the 'economic model' taught in economics programs is adequate. Without wanting to pretend a full answer to these looming questions about the fading relevance of economics as it seems to be understood inside and outside of institutions ranging from top-rated universities to powerful central banks, we want to fathom at least some directions into which essential contents of the "economic model" could advance.

1.1 What might have gone wrong with economics

Is economics as taught in the mainstream curricula at universities still a place for searching and finding solutions to the pressing problems of this century? This may be questioned if we look at a number of recent self-critical remarks of economists with a standing of Nobel Laureates.

With respect to our understanding of the behavior of individual consumers and companies Daniel McFadden (2006) summarized that "homo economicus, sovereign in tastes, steely-eyed and point-on in perception of risk, and relentless in maximization of happiness, is a rare species". With regards to the macro perspective of our economies Paul Krugman (2009) in his Lectures at the London School of Economics argued that "Most of what we've done in macroeconomics for the past 30 or so years has turned out to be spectacularly useless at best, and positively harmful at worst". With respect to the success of market driven policies Joseph Stiglitz (2009) concluded that "The countries that followed the neo-liberal policies, which focused on market fundamentalism and the idea that markets worked on their own, by and large failed."

Meanwhile these warnings got updates that were underpinned by constructive guidelines. Daniel McFadden (2013) reiterated that economists need to handle their discipline differently and pleads for an overhaul of the microeconomic foundations of economics by opening to other disciplines as psychology, neuroscience and anthropology. Paul Krugman (2015) reminded that the Eurozone is facing an economic crisis with a track record that is worse than during the 1930s and for many paradoxically he advocates slashing the new policy mindset of austerity in favor of seemingly old-time economics of stimulating demand. A similar outspoken advice is given by Joseph Stiglitz et al. (2015) to US policy makers by emphasizing that instead of a piecemeal policy change we must rewrite the rules of our economy.

1.2 Why economics is struggling with the very-long term

The warning voices about the failure of mainstream economics to provide policy advice to seemingly well-known problems as manifest in the ongoing economic crises get surprising support from the rather sobering contribution of economics to a new set of problems that require a time horizon that so far has not been in the scope of this discipline. These are the issues under the heading of climate change and related bio-physical limits of planet earth.

This weakness has become particular evident in Working Group III of the Intergovernmental Panel on Climate Change (IPCC, 2014) in their evaluation of mitigation strategies that might be compatible with a 2°C temperature increase: "Scenarios in which all countries of the world begin mitigation immediately, there is a single global carbon price, and all key technologies are available, have been used as a cost-effective benchmark for estimating macroeconomic mitigation costs … Under these assumptions, mitigation scenarios that reach atmospheric concentrations of about 450 ppm CO_2eq by 2100 entail … an annualized reduction of consumption growth by 0.04 to 0.14 (median: 0.06) percentage points over the century relative to annualized consumption growth in the baseline that is between 1.6 % and 3 % per year." This was presented to the media in a statement that "2 degree mitigation will cost 0.06% of GDP growth, or "nothing" within the margin of error.

Robert Pindyck (2015) summarized the so-called Integrated Assessment models (IAMs) that are used for this kind of economic evaluations of climate policies as "… have crucial flaws that make them close to useless as tools for policy analysis." He arrived at this conclusion by pointing out the arbitrariness of functional forms and parameter values, the rather vague knowledge about the relationship between the atmospheric CO_2 concentration and the resulting temperature increase and in the sequel the similarly uncertain impact on economic activity as measured by GDP.

1.3 How a few conceptual extensions could make economics more useful

Without claiming to provide a comprehensive solution to the inherent problems of economics we put forward the proposition that the majority of deficiencies in this discipline results from two self-imposed restrictions. The first restriction refers to the limited scope in the perception of economic activities by focusing mainly on reproducible goods (including services) and a very few resources, as human capital and by production reproducible capital. The second restriction results from the interwoven relationships that describe economic structures and the coordinating mechanisms which operate on these structures by postulating market relationships that quite often turn out to be too simplistic or non-existing.

We propose therefore two conceptual extensions. The first extension opens up the scope of economic activity both by introducing the functionalities of well-being and an extended list of stocks and flows of resources. The second extension separates the description of economic structures from the mechanisms that operate on them, which may be market or non-market based. Furthermore we will demonstrate how these extensions can be made operational in the context of analyzing the transition of energy systems.

2 Enlarging the scope of economic activities

Mainstream economics increasingly appears to be blinkered by its scope and vocabulary that reflect the GDP-based accounting framework. The limits of this conceptual construct when it is used for evaluating well-being and social progress got new attention with the Stiglitz-Sen-Fitoussi-Report (Stiglitz et al., 2009 and 2010). At least three deficiencies can be identified: first, there is no distinction between good and bad economic activities; second, there is no reporting about the use of many sensitive resources as exhaustible or natural capital; third, there is no information about the distribution of income and products. We want to indicate in the sequel, how at least the first two deficiencies could be addressed and how this would also have a bearing for the third.

2.1 Responding to the issue of well-being by introducing the concept of functionalities

Among the many attempts to arrive at better metrics for welfare that transgress the limits of conventional indicators as gross domestic product or consumption the concept of functionalities, which is related to Amartya Sen's capability approach to welfare (e.g. Sen, 1999), has a high potential for being made operational. For Sen welfare can be described by a set of indicators for beings and doings, as adequate nourishment, housing and avoiding premature mortality.

We suggest extending this reasoning by attaching to every economic activity a functionality that indicates the welfare quality of such an activity. This can be made visible by some self-evident examples: The consumption of food is related to the functionality of nourishment; buildings are related to the functionality of shelter; transport activities provide access to persons and goods; numerous activities serve health, education, and cultural experiences. This, therefore, could be a first itemization of *functionalities relevant for well-being*:

- basic needs (housing, nutrition),
- personal services (education, health) and
- information and communication (access to persons, goods, culture).

These functionalities result from stocks, as buildings and the infrastructure of the internet, and from flows, as energy and human activities. The choice of technologies is a key to the composition of flows and stocks for achieving a specific functionality. Buildings, e.g., can be made self-sufficient as to energy flows; people, e.g., can meet via video conferences without needing resource-intensive travelling. We will show later that this notion of functionalities can be made very specific and operational for some issues, as the design and transformation of energy systems.

This view on functionalities enables valuable insights for the evaluation of economic policies by checking the impact of particular policy measures on the relevant functionalities. Ultimately relevant is, e.g. the desired functionality of a comfortable living space, which means more than just observing the investment costs for a building, or the access to persons and goods, which does not always require a transport activity.

2.2 Responding to the issue of resource use by extending the resource list

Economic activities, both related to production and consumption, have impacts on resources. Mainstream economics, however, is typically considering only a very few resources, above all capital stocks for buildings and machinery that are related to reproducible resources since they can be replenished by production processes. The mounting evidence of a by economic activities induced climate change and loss of species and the increasing conflicts about the availability water triggered alarms that many other important resources have been just neglected in our understanding of economic activities.

As a second extension of the current GDP-based accounting framework, we suggest therefore an *inclusive list of resources***,** categorized e.g. as

- reproducible (goods and services)
- human (skills)
- natural (water, soil, air)
- material (energetic and non-energetic)
- social (trust, cooperation)

This extended list of resources is in particular relevant for the evaluation of long-term perspectives for economic development which obviously call for a high-efficiency use of all resources and for limiting the use of those resources that are crucial for the life-support systems of planet earth.

2.3 Looking for an encompassing modeling framework

Why these extensions of the scope of economic reasoning are so essential becomes evident if we put them into an analytical structure and compare it with a conventional design. We suggest therefore what we coin an *encompassing modeling framework* which essentially supports modeling practices with deepened structural designs and is described by four types of relationships.

Functionalities F are generated by the stock of resources R and the flow of reproducible resources used for consumption c:

(1a) $F = T_F(R, c)$

The total volume of the flow of reproducible resources q is partitioned between consumption c and investment i:

(1b) $c = q - i$

Reproducible resources q originate from the stock R and the flow r of resources from the inclusive list indicated above:

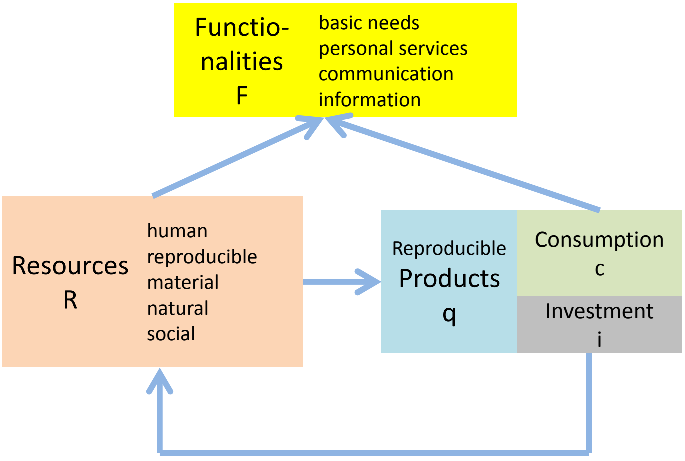
(1c) $q = T_q(R, r)$

The stock of resources R is reduced by the amount of flows r needed for the production of reproducible resources and replenished by investment activities that also include regeneration of natural resources and recycling of materials and cleaning up natural resources $T_R(i)$.

(1d) $R = R_{-1} - r + T_R(i)$

Remarkable for this encompassing modeling framework, as can be seen from Figure 1, is the insight, that a certain level of well-being which is described by the set of functionalities F depends on the choices of three characteristic technologies: those that determine the amount of stocks and flows needed for a specific level of functionalities $T_F(.)$, those that produce similarly with stocks and flows the volume of reproducible resources which are synonymous with our conventional understanding of gross domestic product related flows $T_q(.)$, and those that are relevant for regenerating, recycling and reinvestment $T_R(.)$. These three categories of technologies finally determine the impact on all types of resources contained in the inclusive resource list:

Figure 1 Encompassing modeling framework



Source: Author

The merits of such an encompassing modeling framework (1) become evident when we compare it with a conventional modeling framework (2) which can be obtained just as a degenerate version of the encompassing model with three specific limitations.

First, emphasis is given to the flow of reproducible resources as measured by gross domestic product q, consumption c, and investment i. Well-being is closely tied to these flows:

(2b) $c = q - i$

Second, production of reproducible resources is mainly determined by the flows and stocks of reproducible and of human resources r_q, r_h, R_q and R_h, respectively:

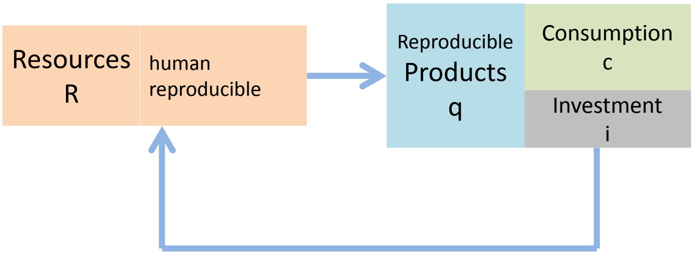
(2c) $q = T_q(r_q, r_h, R_q, R_h)$

Third, only the dynamics of the stock of reproducible resources with subtractions r_q and additions i during a production period are explicitly considered:

(2d) $R_q = R_{q-1} - r_q + i$

The limited scope of the conventional model design becomes evident if we compare the corresponding **Error! Reference source not found.** with the extended framework in Figure 1. It turns out that it is this limited scope of the mainstream perspective that has caused many controversies about "green goals" and "green policies".

Figure 2 Conventional modeling framework



Source: Author

3 Separating mechanisms from structures

Up to now nothing in the modeling approach was said about coordinating mechanism as markets and the related prices. This reflects a very deliberate separation in the modeling design between the representation of the physical structure of the system and the economic mechanisms that might operate on this structure.

The physical structure of our extended modeling approach encompasses the welfare relevant functionalities and the stocks and flows of resources that generate them with taking into account a comprehensive list of those resources. The resulting structure typically reflects effective mechanisms for coordination and incentives.

3.1 Structures may reflect complex mechanisms for coordination

Most conventional modeling approaches rely not only on market mechanisms but even intermingle in the model specification the representation of the structure of an economic activity with the market mechanism. For several reasons this is rather unsatisfactory.

First, because it might be rather impossible to evaluate in such a setting radical technological changes as, e.g. switching from conventional to almost energy-self-sufficient buildings. The complex interaction between the thermal structure of the building and the dependent energy flows for providing a particular thermal functionality requires a deepened structural specification and differentiated treatments of price impacts relevant for the decisions on investing and operating a building. Typically these multifaceted decisions are often summarized in a simple demand function for energy that depends on some price and income components.

There is in addition a second reason that recommends the separation from the specification of structures from the specification of mechanisms. This is related to the fact, that quite often market based mechanisms just don't exist. The choice of location of residential buildings may or may not reflect zoning regulations. The same holds for the thermal quality of those buildings.

3.2 Getting prepared for new institutional settings

Another emerging evidence points at fundamental changes in the traditional role of consumers and companies. Consumers are discovering technologies that enable them to engage in production activities, e.g. by generating electricity from PV panels and selling the surplus electricity via the grid. Companies, on the other hand, are discovering the need to switch to new business models, e.g. by offering the services of a car instead of selling it as they were used to do.

New forms of cooperation and coordination of economic activities are becoming visible already in the most depressed states of Europe based on informal barter trade structures. Other institutional innovations concern the expansion of voluntary non-profit type organizations, in particular for taking care of the senior generation. Fairly established is already the institutional framework of sharing for some activities as services that compete with hotels and taxis.

All these institutional changes might have a major impact in the coming transformations of our economies and underline the need of modeling concepts that are able to separate structural changes from their institutional embedding.

4 A case study: The transformation of the energy system

The merits of this extended modeling design can be demonstrated for analyzing the transition of energy systems to high-efficiency and low-carbon structures (Köppl et al., 2014).

4.1 The deepened structure of an energy system

By deepening the structural specification we discover a cascade four layers that constitute an energy system. The top layer deals with the energy related functionalities of the following types:

- thermal energy functionalities for maintaining buildings at comfortable temperatures and enabling heat-related production processes,
- mechanical energy functionalities for providing mobile or stationary services in all kinds of machinery, and
- specific electric energy functionalities needed for electric motors, lighting and electronics.

These energy functionalities are provided by useful energy which is characterized by its purpose as

- thermal use in low and high temperature processes,
- mechanical use in stationary and mobile applications, and
- specific electric use as in lighting and electronics.

The next layer of the energy system is composed of the energy flows that are metered in households and companies and which comprises final energy consumption for

- heating and cooling for buildings and production,
- fuels for stationary and mobile engines, and
- electricity for machinery, lighting, electronics and electro-chemical processes.

The amount of final energy is determined both by the amount of energy functionalities needed and the qualities of the corresponding application technologies as the thermal structure of buildings, the efficiency of machinery and appliances.

The lowest layer of the energy system concerns the primary energy flows as

- fossil energies (coal, crude oil, natural gas),
- renewable energies (thermal and PV solar, wind, hydro, biomass), and
- uranium for nuclear transformation processes.

4.2 The technology choices

Changing the existing structures of an energy system can be achieved by a wide spectrum of technology options which we classify according to their impact on the position of the energy cascade.

All changes in the layers of the cascade of the energy system are considered as technological changes. These technologies are defined in appropriate units and should be scalable. Some examples are:

- As to energy functionalities, the distances traveled by persons and goods in the mobility system. e.g. 1.000 km of a person or a ton of goods.
- As to final energy consumption, the relevant application technologies, e.g. buildings with a specified thermal rating.
- As to primary energy, the transformation technologies used, e.g. a wind turbine with a specific rated generation capacity.

The technological and economic characteristics of a unit technology are described in a technology evaluation matrix. We deliberately differentiate between the investment and the operating phase for investigating the effects on flows, stocks, emissions and technology spillovers.

4.3 Developing transition strategies

Based on the toolbox of technologies and their economic impacts in a three-step procedure transition strategies can be developed:

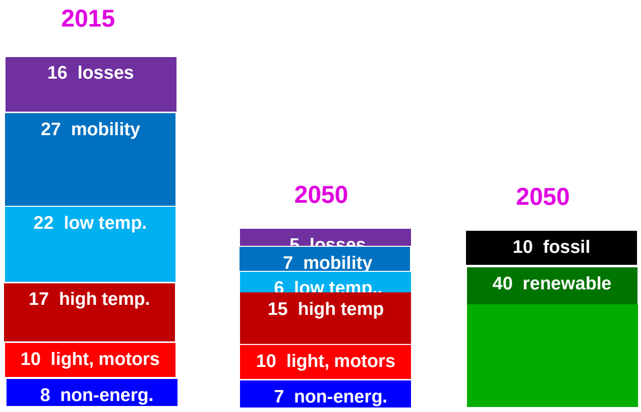
- In a first step the long-term targets are specified, e.g. by 2050 the expansion of thermal functionalities for buildings by 20% and a reduction target for greenhouse gas emissions of 80%.
- In a second step trajectories to the present are specified based on assumptions about dissemination and learning curves.
- In a third step the economic impacts of these trajectories are traced, in particular their implications on investment requirements and the user costs for capital and operating.

4.4 How the transition to a low-energy and low-carbon energy system looks like

There are a number of insights which can be gained from this modelling approach which is based along the cascade structure of the energy system. Figure 3 summarizes the transition to low-energy and low-carbon structures based on such a deepened structural model of the sGAIN modeling family (Köppl and Schleicher, 2014) for Austria. Total energy requirements for 2015 are scaled to 100. Thus currently 16% of the inputs into the energy system are lost in transformation and distribution, 27% are used for mobility, 22% for low-temperature services in buildings and 17% for high-temperature processes in production. Only 10% of total energy supply is sufficient for all electric engines, for lighting and electronics. Finally 8% of the energy requirements is needed for non-energetic use in industrial processes as iron and steel production.

The model-based analysis for the transition to low-energy and low-carbon structures by 2050 reveals the high relevance of improving the energy productivity both in the application and the transformation technologies. This leads to an energy system that will provide substantially higher amounts of energy functionalities with less than half of the current energy flows. The main reductions in the flows can be harvested in the functionalities for low temperature, the building sector, and the functionalities for mobility, the transport sector. For final energy consumption electricity emerges as the leading type of energy. The primary energy mix shifts to renewables but in the case of Austria, which uses already 30% of its energy supply from renewables, only an expansion of about one third of the current volume is needed in order to arrive at a reduction of CO_2 emissions of 80% up to 2050.

Figure 3 Transition to low-energy and low-carbon structures for Austria



Source: Author

The expected radical structural changes in our energy systems are much better supported by this type of modeling which follows the cascade structure of an energy system compared to conventional approaches that don’t look into these layers of the energy cascade. The results obtained are fairly robust for economies with a similar economic structure than Austria. The economic impacts are compatible with long-run GDP growth rates in the range of 0.5% to 1.5% p.a..

5 Some tentative conclusions for policy design

This extended scope of economic activities both with respect to the metric of welfare based on functionalities and a comprehensive view on resource use opens a number of insights for framing transition policies that can cope with break-through technologies and long-term targets as to limiting the use of sensitive resources.

5.1 Supporting the design of transition strategies

First, such an extended view of interactions between welfare-relevant functionalities and an inclusive list of resources opens a better understanding about economic structures in the very-long-term. These insights concern, e.g. the way we want to design the stock of buildings or the infrastructure for mobility. The obvious answer for buildings is to make the already visible pilot projects for energy-sufficient buildings as soon as possible the new normal all the more, since these technologies turn out being not necessarily more expensive than those typically used. A much wider scope of actions is needed, however, for changing the infrastructure which is needed for linking persons and goods and which requires more than just switching the modal split of our transport system.

Second, policy strategies and related incentive mechanisms need to give more attention to the stocks, i.e. the infrastructure for buildings and mobility, than the flows, e.g. the consumption of energy. Even a high price of energy will not speed up sufficiently the switch to zero-energy or even plus-energy building designs. It is rather unconceivable that the big changes required in transport which span from zoning regulations to new urban designs and electric vehicles can be triggered just by a high carbon price. As a key message for policy design we realize the need for rebuilding and reinventing the infrastructure of our economies, ranging from the capital for buildings, transport and production to the human capital that will be needed to cope with these radical transformations. Policy actions will be needed ranging from targeted technology policies to innovative mechanisms for long-term financing (Aghion et al., 2009).

Third, the fundamental insight that we are able to provide in the very-long run the welfare-relevant functionalities of an economy with much lower flows of resources in general and without negative impacts on sensitive natural resources in particular requires decisive policy actions in the short-run that will stimulate for the foreseeable future the conventional economic indicators ranging from gross domestic product to employment.

5.2 Resolving historical “green” controversies

A number of implications follow from the perception that the desired long-term structures for a resource-efficient and low-carbon economy require a major innovation effort visible both in rebuilding the quantity and the quality of existing capital stocks.

Above all a number of historic controversies in the context of environmental policies become redundant. This holds in particular for issues about the so-called double dividend – the potential beneficial impacts of policies both for the environment and conventional economic indicators – or the closely related issue of a trade-off between “green goals” and economic dynamics. These conflicts are resolved by realizing that plenty of opportunities are available for stimulating economic activity now in view of long-term economic structures that provide the functionalities for well-being with much lower resource use in the future.

The challenges for building an infrastructure that matches the targets of a resource-efficient and low-carbon economy are obvious. The next generation of buildings will integrate the functionalities of spaces for work and living but also provide the location for collecting and transforming energy. The current transport system will evolve to a mobility system which will require much less transport activities and will phase-out fossil fuels. Robotics and additive manufacturing, also known as 3D printing, will offer opportunities for a re-localization of production. Finally the energy system will experience a similar transformation as the transition from mainframe computing to personal computing some decades ago.

5.3 Setting new agenda for economic policy

Summarizing the insights for new policy designs that emerge with an enriched "economic model", these could be in a nutshell the agenda for economic policies that are targeted to longg-term viability and prosperity:

- *Re-measuring our economies*.
  Our understanding of the implications of economic policies could be substantially improved by extending the scope of the mainstream paradigm which is focused on GDP-related flows. These extensions concern a better description of economic activities both with respect to well-being by introducing functionalities as the ultimate indicators and with respect to the footprint of economic actions by checking a comprehensive list of stocks that ranges from human and producible to exhaustible and renewable materials but also to natural and social capital.

- *Re-discovering innovation.*
  The rather simple-minded approach of the mainstream paradigm to technological change needs to be challenged by welcoming the phenomenon of upcoming breakthrough-technologies and their implications in particular for those capital stocks which are considered as infrastructure for housing, mobility and production but also for improving human capital over the full life span. These innovations concern new business models, as access instead of ownership, but also societal qualities, as caring and sharing.

- *Re-writing institutions.*
  The still dominating market-driven paradigm is to be exposed to a fundamental reset by checking which institutional design is adequate in the sense of incentive compatibility for supporting the achievement of the desired functionalities and for harvesting innovation potentials. Obvious priorities are the role of financial institutions but also emerging cooperative non-market designs ranging from caring for children and seniors up to incubators for start-up companies.

In such an enriched economic paradigm transition policies will emerge that stimulate in the short-term economic growth as we are used to measure it but in the mid- and long-term will converge to a state with much lower flows, stocks of much higher productivity, and plenty of functionalities for satisficing well-being.

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Project Information

Welfare, Wealth and Work for Europe

A European research consortium is working on the analytical foundations for a socio-ecological transition

Abstract

Europe needs change. The financial crisis has exposed long-neglected deficiencies in the present growth path, most visibly in the areas of unemployment and public debt. At the same time, Europe has to cope with new challenges, ranging from globalisation and demographic shifts to new technologies and ecological challenges. Under the title of Welfare, Wealth and Work for Europe – WWWforEurope – a European research consortium is laying the analytical foundation for a new development strategy that will enable a socio-ecological transition to high levels of employment, social inclusion, gender equity and environmental sustainability. The four-year research project within the 7th Framework Programme funded by the European Commission was launched in April 2012. The consortium brings together researchers from 34 scientific institutions in 12 European countries and is coordinated by the Austrian Institute of Economic Research (WIFO). The project coordinator is Karl Aiginger, director of WIFO.

For details on WWWforEurope see: www.foreurope.eu

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ÖIR	**Austrian Institute for Regional Studies and Spatial Planning**	OIRG	Austria
policy network	**Policy Network**	policy network	United Kingdom
RATIO	**Ratio**	Ratio	Sweden
UNIVERSITY OF SURREY	**University of Surrey**	SURREY	United Kingdom
TU WIEN Technische Universität Wien	**Vienna University of Technology**	TU WIEN	Austria
UAB Universitat Autònoma de Barcelona	**Universitat Autònoma de Barcelona**	UAB	Spain
	Humboldt-Universität zu Berlin	UBER	Germany
	University of Economics in Bratislava	UEB	Slovakia
universiteit hasselt KNOWLEDGE IN ACTION	**Hasselt University**	UHASSELT	Belgium
ALPEN-ADRIA UNIVERSITÄT KLAGENFURT · WIEN · GRAZ social ecology vienna	**Alpen-Adria-Universität Klagenfurt**	UNI-KLU	Austria
DUNDEE	**University of Dundee**	UNIVDUN	United Kingdom
	Università Politecnica delle Marche	UNIVPM	Italy
UNIVERSITY OF BIRMINGHAM	**University of Birmingham**	UOB	United Kingdom
	University of Pannonia	UP	Hungary
Universiteit Utrecht	**Utrecht University**	UU	Netherlands
WU	**Vienna University of Economics and Business**	WU	Austria
ZEW	**Centre for European Economic Research**	ZEW	Germany
Coventry University	**Coventry University**	COVUNI	United Kingdom
IVORY TOWER	**Ivory Tower**	IVO	Sweden
Aston University	**Aston University**	ASTON	United Kingdom