Environmental Science and Policy 86 (2018) 1–10

Contents lists available at ScienceDirect

Environmental Science and Policy

journal homepage: www.elsevier.com/locate/envsci

Carbon and material footprints of a welfare state: Why and how governments should enhance green investments

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ARTICLE INFO

Keywords:
Carbon footprint
Material footprint
Welfare state
Carbon equity
Green investments
Carbon pricing

ABSTRACT

Sustainable development and climate change mitigation have become guiding policy principles in many welfare states. However, the traditional role of a welfare state is to guarantee the economic stability, jobs and welfare for its citizens. Sustainable development leans on the idea that we can have economic, social and environmental sustainability at the same time. This would require decoupling of economic growth from environmental degradation. Decoupling should be studied globally, because within nations, the economy can grow while local environmental impacts decrease, but at the same time, global environmental impacts may increase due to international trade. In this study, we examine the consumption-based carbon and material footprints of a Nordic welfare state, Finland. We focus on the environmental impacts of public spending, which has received little attention previously. In welfare states, the reallocation of public funds to services and individuals are at its core. In the study, we examine how this affects the carbon and material footprints of various income groups and household types. We find that the share of public services and investments is 19% of the carbon footprint and 38% of the material footprint per capita. Building of infrastructure plays a major role in composing the material footprint. We also find that the welfare state has important features that improve the carbon equity between the citizens. To achieve absolute decoupling, required to reduce environmental impacts caused by economic activities, we suggest policies promoting public and private green investments. In addition, increased carbon pricing would enhance green investments and drive environmental innovation.

1. Introduction

Sustainable development and climate change mitigation have become guiding policy principles in many welfare states. Welfare states are developing towards eco-states whose goal is to ensure that ecological boundaries are not crossed (Meadowcroft, 2005; While et al., 2010; Gough and Meadowcroft, 2011). However, environmental policies have to be reconciled with many other challenges that welfare states are facing today, such as increasing public debt, unemployment, social and economic polarisation and ageing population (Hellström and Kosonen, 2015). Conventional welfare states see economic growth as a prerequisite to tackle social and economic problems. Sustainable development, as coined by the famous Brundtland report (Brundtland et al., 1987), has been relatively easy for welfare states to adapt, since it does not question the objective of economic growth. However, economists, let alone ecologists, widely disagree on whether economic growth is actually needed to tackle environmental problems (Solow, 1973; Goldin and Winters, 1995; Ekins, 2002) or whether environmentally sustainable growth is an oxymoron (Meadows et al., 1972; Daly, 1990; Kallis, 2011). This has also led to arguments that there may be a contradiction between a conventional welfare state and an eco-state, since the finance of the public sector and high employment rate may be dependent upon environmentally unsustainable economic growth (see discussions by Meadowcroft (2005), and Bailey (2015)).

Sustainable development leans on the idea that we can have economic, social and environmental sustainability at the same time. It has been criticised for being more of an ideology than based on scientific knowledge (While et al., 2010). To materialise, sustainable development requires decoupling of economic growth from environmental burdens. Furthermore, we need to make a distinction between relative and absolute decoupling. Relative decoupling occurs when efficiency increases so that environmental impacts per unit of economic output decrease. To achieve absolute decoupling, the decrease of environmental impacts need to exceed the increase of output. There has been some scepticism about whether absolute decoupling is possible for greenhouse gas (GHG) emissions, for example (Jackson, 2011). Nonetheless, in 2014, global energy-related CO_2 emissions halted, although the global economy increased, which was perhaps the first evidence of

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https://doi.org/10.1016/j.envsci.2018.04.011
Received 15 November 2017; Received in revised form 19 March 2018; Accepted 21 April 2018

absolute decoupling globally (Weiss, 2015; IEA, 2016). Moreover, advocates of green growth, meaning economic growth with decreasing environmental pressure, remind us that what we have done so far is only a fraction of what we could do to achieve green growth (Ekins, 2002). Green growth has been adopted to mainstream policy in the OECD and the EU.

One of the challenges of verifying absolute decoupling within nations is carbon leakage, or in more general terms, the relocation of any polluting action to other countries. Often decoupling is studied by comparing the GDP to the emissions caused within a country to demonstrate that the emissions are declining while the economy is growing. However, it is possible that, at the same time, the increased income is used to buy products from countries that have increasing environmental burdens in absolute terms (Peters and Hertwich, 2008; Giljum et al., 2015; Clement et al., 2017). As a solution to this accounting problem, consumption-based environmental assessments have gained popularity. Recently, Clarke et al. (2017) revealed, with Iceland as their case study, that even practically 100% decarbonised stationary energy production does not guarantee a low consumption-based carbon footprint for affluent countries with high import levels. Giljum et al. (2015) showed similar leakage effects for material consumption: even though domestic material consumption has decoupled from economic growth in some developed countries, the total raw material consumption (including materials embodied in imports) may increase at the same time.

Consumption-based carbon footprinting has been established as a complementary accounting method along with the more traditional territorial GHG accounting (Lenzen et al., 2007; Hertwich and Peters, 2009; Wiedmann, 2009; Minx et al., 2009; Ramaswami et al., 2011). The consumption-based method can be applied to assess other environmental impacts as well, such as energy and material requirements. While territorial accounting allocates the emissions to the geographical place of origin, the consumption-based method allocates the emissions to the final demand.

The purpose of the study is to depict the consumption-based carbon and material footprints of a Nordic welfare state, Finland. The focus of the study is on public spending, which has received little attention in previous studies. In addition, the study reveals how a welfare state improves carbon equity between different income groups. This is also an important and understudied feature of welfare states. Finally, the paper opens discussion on public policy on green investment based on the results of the study and previous literature.

Carbon footprints of households have been studied extensively using household budget surveys that are regularly collected in many countries (Druckman and Jackson, 2009; Wiedenhofer et al., 2013; Jones and Kammen, 2014; Heinonen et al., 2013a; 2013b; Nässén et al., 2015; Ottelin et al., 2015; Ala-Mantila et al., 2016). However, public spending is usually omitted from these assessments. This gives biased results if we wish to compare the households living in welfare states to households living in countries with less public spending. Furthermore, although wide-scoped international carbon and material footprint comparisons usually include public spending, they generally lump public expenditure together with household expenditure and public investments with private investments (Hertwich and Peters, 2009; Lenzen et al., 2012; Wiedmann et al., 2015). Wiedmann and Barrett (2011) have provided a more detailed analysis on the carbon footprint of UK Central Government. The study at hand gives a similarly detailed analysis on carbon and material footprints of total public spending in Finland. In addition, we analyse how the welfare state features affect carbon equity. While Wiedmann and Barret focus on public procurement policies, we participate in the broader discussion of the relationship between the welfare state and sustainable development.

In welfare states, the reallocation of public funds to services and individuals are at its core. The welfare state involves a transfer of funds from the state to the public services provided (i.e., healthcare, education, etc.) and direct income transfers to individuals. This is funded through taxation and usually includes a higher income tax for people with higher incomes. From an environmental perspective, this has implications on both the quantity and distribution of environmental pressure within the population (López et al., 2017). In the study, we examine how this affects the carbon and material footprints of various income groups and household types.

It should be noted that although the carbon and material footprints are presented side-by-side in the study, they are very different environmental indicators. Carbon footprint is an established indicator of global warming potential with a strong scientific basis. Material footprint, however, is more ambiguous. In the study, we use total material consumption (TMC) as the measure of material footprint. TMC is an environmental indicator that treats all natural resources similarly, and expresses them as total mass. It includes direct material input and hidden flows. Direct material input means natural resources that are directly used to produce goods and services. Hidden flows are transformed or moved natural resources that are not directly used by an economy, such as waste rock caused by mining, and materials needed to produce imported products that are not part of the product's mass (Seppälä et al., 2009).

The paper is structured as follows. Next, we present the research material and methods and then the results. The results section is followed by discussion. In the discussion section, we first interpret the empirical results of the study. Then we provide policy implications and discuss the broader theme of the welfare state and sustainable development. In addition, we discuss the main uncertainties of the study. The paper ends with conclusions.

2. Research material and methods

2.1. Research material

The main research material of the study is the Statistics Finland's Household Budget Survey 2012 and its additional part "Welfare services 2012" (Statistics Finland, 2012). In addition, we used the national accounts for year 2012 (Statistics Finland, 2017a) for filling the remaining gaps in public spending.

In the household budget survey that includes the welfare service addition, the public welfare services are allocated to the households using these services. The allocation is based on register information, interviews and administrative unit cost information. For example, the average unit costs of education are allocated to people who are registered in schools (high schools, vocational schools, universities etc. separately). The unit costs are vocation and faculty specific, but regional differences are not taken into account. The costs of basic education are allocated to all 7- to 15-year-olds according to the compulsory education age. Similarly, costs of health care and social services are allocated to households based on register information about the use of these services. The used unit costs for health and social services are national averages.

In the study, we used the national expenditure accounts 2012 that provide the gross domestic production (GDP) of Finland from the consumption perspective. The national expenditure accounts are divided into final consumption expenditure and investments, which are further divided by sector. The sectors include households, government and non-profit institutions serving households, and in the case of investments, also corporations. Government stands for both central and local government. Non-profit institutions include non-governmental organisations (NGOs) and churches. Investments, officially called gross fixed capital formation (GFCF), are divided into (1) dwellings, (2) other buildings and structures, (3) machinery, equipment and vehicles and (4) other GFCF, largely composed of intellectual property products, such as research and development (Statistics Finland, 2017a). The government's final consumption expenditure is divided into individual expenditure that serves households directly (Government individual consumption), and collective expenditure that includes collective