ECONOMIC INSTRUMENTS FOR THE ENERGY TRANSITION; CARBON TAXES TO MAXIMIZE SHORT-TERM HEALTH BENEFITS

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Overview

The energy transition can radically lower greenhouse gas emissions, reduce energy dependency and create market opportunities for energy technology innovations. By drastically lowering greenhouse gas emissions, a strong climate change with spread of tropical diseases, heat-related deaths and other long-term health consequences can be avoided.

Although the health benefits of climate policy are very important, the health costs from the current energy system remain staggering. We argue that the ongoing energy transition can also generate important short-term health benefits. In order to do so, these health benefits should be explicitly included in discussions on the cost of the energy transition. Short-term health benefits from energy and environmental policies depend on policy priorities and the selected instruments. A high, general carbon tax has different health consequences than a subsidy for biogas electricity in an environment without a price on CO_2. A general carbon tax influences not only short-term energy decisions but also decisions on transportation, housing, leisure, as well as food choices. In this paper, we explore the impact of (a combination of) climate and energy policy instruments on household expenditure in categories such as energy consumption, transportation and nutrition.

We start by identifying the health costs of the current energy system and hence the potential for short-term health benefits. We focus on air pollution and selected chronic diseases. Firstly, the European Environmental Agency (EEA, 2015) estimates that air pollution is responsible for over 430 000 premature deaths across Europe[1], which implies an annual health cost of € 330-940 billion. Estimates from the OECD show that outdoor air pollution causes over 3 million premature deaths per year in OECD countries; conventional air pollution generates yearly health costs of USD 1.7 trillion. In China, the cost of the health impact of air pollution was about USD 1.4 trillion in 2010, and about USD 0.5 trillion in India.[2] According to the International Energy Agency (IEA, 2014) the cumulative upfront investment cost to facilitate an ambitious energy transition by 2050 amounts to USD 43 trillion or approximately USD 1.7 trillion per year.[3]

Secondly, we consider the interaction between environmental factors – including nutrition and lifestyle choices – and the prevalence of chronic diseases. Anand et al. (2008)[4] state that 90 to 95% of all cases have their roots in environmental factors and lifestyle choices; Sagner (2014)[5] argues that lifestyle changes could prevent 93% of diabetes (Type 2), 81% of heart attacks, 50% of strokes and 36% of cancers. Several authors focus on the health consequences of excessive meat consumption. As the production of meat is very energy and CO_2-intense – FAO (2006) estimates the share of livestock emissions in global greenhouse gas emissions at 18%[6], the IPCC (2014) estimates it at 14.5% [7] - there is a direct link between carbon pricing and food prices with potential health benefits.

After identifying these issues, we assess the short and medium-term health consequences of policy instruments such as a carbon tax to meet climate policy goals. On the one hand, a carbon tax would impact air pollution through its effect on the energy sector, industry and transportation; on the other hand it would impact environment and lifestyle diseases through its effect on the cost of livestock production and energy-intense nutrition.

We focus on the effect of the constructed carbon tax on household expenditure in the categories of transportation and nutrition (livestock products). These potential expenditure changes can lead to health benefits that we quantify in order to increase our understanding of the benefits of ambitious energy transition policies. A broad literature exists on the impact of carbon taxation on the energy sector, industrial activity and transportation (with a focus on freight transportation). This literature includes aspects of the impact on conventional air pollution, however we are not aware of detailed assessments of the impact of food choices and its potential health benefits. Our goal is to complement the existing literature (without reproducing the well documented impact of carbon taxation and other policy instruments). We argue that ambitious energy transition policies crucially depend on societal acceptance. The debates on the high cost of renewable support schemes and the increasing risks for energy poverty are very illustrative. Quantifying the wide health gains from the energy transition can be crucial to increase public acceptance of ambitious targets.

Methods

Based on the existing literature on carbon taxation, we model the expected health benefits from lower levels of air pollution. For the health benefits from a change in transport choice, we base ourselves on previous literature. For the health benefits from a change in food choices, we start by looking at studies estimating the relative risk on a type of NCD depending on the diet pattern (mainly diets varying in share of meat consumption). Based on these relative risks, we compare the risk of the Belgian population on selected NCDs before and after the diet change. From this comparison we can calculate the potential health care savings this diet change could bring us because of the decreasing health risk. In order to estimate consumer behaviour after the carbon tax, we specify a Partial Equilibrium model for food demand which is simulated through an Almost Ideal Demand System (AIDS). In this model the budget shares of the goods in question are the dependent variables, and the logarithms of price and real expenditure determine the independent variables. Our model uses data on meat consumption (beef, pork and poultry) in Belgium from 1980 until 2010. After calculating the price elasticities of demand for these meat products, we assess the impact of various carbon taxes. The carbon tax levels are based on the Social Cost of Carbon (SC-CO_2 - developed by the EPA in order to estimate economic damages associated with a small increase in CO_2)[8] and on the CO_2 emission intensities for each meat product.[9] We set the SC-CO_2 at a range of € 0.045 to € 0.053 per kg CO_2, which results in a higher carbon tax on beef (€ 1.13 - 1.33 per kg) than on poultry (€ 0.19 - 0.22 per kg), and a carbon tax on pork close to poultry (€ 0.05 - 0.06 per kg). As the carbon tax can alter the food composition and eventually lead to a lower consumption of unhealthier food categories and a higher consumption of vegetables and fruits, we approximate the health benefits that follow from the change in expenditure.

Results

The health benefits from lower air pollution levels are high enough to motivate ambitious transition targets. Also health benefits of changes in food choices are significant: we find that potential healthcare savings in Belgium amount up to €1 billion if diet patterns would be less energy-intensive. We find that a carbon tax on food has a significant negative effect on the demand for beef (± 7-9%) and pork (± 4-5%) while effect on demand for poultry is positive (± 9-11%). Since especially red meat is associated with the development of chronic diseases, this shift towards poultry triggers significant health gains. We find that ambitious carbon taxes and supportive policy measures can generate high short-term health benefits.

Conclusions

Translating our model results to short-term health benefits indicates that a stronger emphasis on the social benefits from changing the current energy system is an essential element in the public debate on climate policy. The energy transition will lower air pollution and improve food choices; which in turn leads to lower health invoices.

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