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PERSPECTIVES ON CLIMATE POLICIES

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Perspectives on climate policies

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Abstract
The purpose of this article is twofold: First to discuss three misconceptions in the debate on climate policies: i) that de-growth is necessary, ii) that the market economy is part of the problem rather than part of the solution to climate change, and iii) that the only policy tool needed is to price carbon emissions. Second, to argue that climate change cuts across traditional policy areas and that a wide set of different policy tools is required to reduce emissions. I also call for sequential policies that begin by enabling decarbonization before focusing on phasing out emissions.

Key-words: climate change; policy; carbon tax; economic development; growth
Jel-codes: Q50; Q54; Q56; Q58; E6

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1. Introduction

Reducing greenhouse gas emissions to combat climate change is an important societal and policy goal. Though drastic reduction of emissions is possible, the social and economic consequences would be severe if the reduction was made too quickly. On the other hand, not reducing emissions quickly enough would also severely threaten our economic and social welfare in the future. Consequently, there is a trade-off between welfare today and welfare in the future. Designing climate policies that find the right balance between present and future welfare is not easy.

The purpose of this paper is twofold. First, I discuss three common misconceptions in the debate on climate policies: i) that de-growth is necessary and even desirable to decarbonize the economy, ii) that the market economy is part of the problem rather than the solution to climate change, and iii) that the only policy tool needed to achieve decarbonization is a price on greenhouse gas emissions. Second, I argue that climate change cuts across traditional policy areas and that a wide set of different policy tools traditionally not associated with environmental policies is required to decarbonize the economy. Here, I also argue that climate policies should be designed to be sequential, focusing initially on enabling decarbonization of the economy before fossil fuels are phased out. Phasing out fossil technology without technological or social alternatives is likely to cause political resistance, which, in a worst case scenario, might derail any serious attempt to reduce greenhouse gas emissions.

The rest of the paper is set out as follows. The three misconceptions are discussed in Section 2. The question of how to design climate policies is discussed in Section 3, and the paper is summarized in Section 4.

2. Three common misconceptions in the debate on climate policies

The question of how to design climate policies is a widely discussed topic with many different perspectives. In my view, some of the literature is based on three common misconceptions, which leads to wrong conclusions on how to design climate policies. *The first misconception* is the view that de-growth is necessary to solve the climate problem. The argument for de-growth is that it is necessary to reduce the size of the economy to reduce emissions, i.e., we must become poorer to solve the climate problem. It is true that climate change is caused by economic activity and that radical change is necessary to break the dependence on fossil fuels. It is still dependent on non-renewable energies (Stern, 2011). However, not all economic activity is directly coupled with greenhouse gases. The size of the economy is measured using GDP, which is a measure of value added. Economic growth can be separated into two components: extensive growth and intensive growth. Extensive growth is caused by greater consumption of materials, capital, labor, and energy. In the long-run, the level of extensive economic growth is clearly limited. Intensive growth, on the other hand, is caused by either more productive production processes or the introduction of new products with a higher value, ceteris paribus. For example, most smartphone apps have a higher economic value than does a carrot. Reducing the production of carrots and using those resources to produce apps would increase the value-added in the economy with no additional direct environmental impacts. The level of intensive growth is not limited by the physical world, only our imagination and ability to innovate limits how much intensive growth we can have.

Among developed countries, growth has shifted gradually from being primarily extensive to becoming increasingly intensive ever since the first industrial revolution during the 1800s. Since the year 2000, the US economy, the EU economy, and the Japanese economy have all grown by between 20 and 40 percent in real terms, whereas production-based greenhouse gas emissions have declined by between 5 percent (Japan) and 15 percent (EU). In part, the decline

is due to some outsourcing to dirty production countries, such as China, but the effect is limited (Andersson, 2018). Mostly, the decline is caused by investments in new cleaner energy sources. And from the late 1970s/early 1980s a shift toward growth from Information and Communication technologies (ICT) as the main driver of economic growth.

From an environmental point of view, there is no environmental reason to limit the level of intensive growth. In fact, a moderate rate of intensive growth is desirable as it increases the amount of resources to invest in making the economy sustainable, and makes conflicts for scarce resources less likely. De-growth is all about making ourselves economically poorer. The poorer we are the greater the fight among the population for the few scarce resources that are available. Such a conflict-ridden society becomes more difficult to govern. Stagnating economies and economies in decline have often been a major factor behind growing populism and sometimes even wars (Eichengreen, 2018).

There are also additional questions, unanswered by the de-growth literature, as to what will happen to savings and innovation when the economy is shrinking. Negative growth rates imply negative interest rates and, thus, less saving, preventing investments in new housing and infrastructure needed to reduce emission levels. Negative growth also implies declining profit levels, thus reducing incentives to develop and invest in innovations needed to reduce emission levels. Rather than arguing for de-growth, we should embrace intensive growth while recognizing the environmental problems with extensive growth.

The second misconception is the argument that the market economy is the problem causing, and not part of the solution to, climate change. Often this argument is linked to the de-growth literature (see, e.g., Weiss and Cattaneo, 2017). The market economy has its strengths and weaknesses. Its strengths include its ability to distribute economic resources in an economically efficient way, assuming that there is a high level of competition, and its ability to fosters new innovations, again assuming high levels of competition. Economic efficiency

implies that resources are used to create the highest level of economic welfare possible. Research shows that economic efficiency also implies relative environmental efficiency, as resources are not wasted (Andersson et al., 2018). A shift away from market principles when distributing resources is likely to lead to more economic and environmental inefficiency. The market economy has also demonstrated its superior ability to foster new innovations compared to other economic systems that have been tried in the past. It is unlikely that proposed alternatives to the market economy, that commonly rely on a large share of government planning, would produce an economically more efficient outcome given the poor historical record of government planned societies.

Policy makers have an important role in regulating the market economy, but the modern economy is too complex to be planned by either one or a few individuals. The government should focus its attention on incentivizing markets to reduce emissions. Here, the government can have a major role to play in steering investment and innovation resources in certain directions, as it has done throughout history (Mokyr, 1990; Perez, 2002; Andersson and Karpestam, 2013; Mazzucato, 2014). In other words, the government should enable a transition by incentivizing markets. It should not aim to abolish the market in favor of a government planned economy.

The *third misconception* is that a price on carbon emissions is more or less the only policy that is required to set the right market conditions for decarbonization (see, e.g., Nordhaus, 2007). Pricing emissions is important, and higher prices of fossil fuels do reduce emission levels (Andersson and Karpestam, 2013). It may also drive innovation. However, the price mechanism works "on the margin", i.e., for relatively small changes within existing incentive structures. Most innovations are incremental, i.e., what Mokyr (1990) calls micro-innovations. Other groundbreaking innovations offer a radical re-think compared to the past. Mokyr calls these innovations macro-innovations. A new macro-innovation inspires a new set of micro-

innovations related to the macro-innovation. Macro-innovations are rare, but they have a profound effect on the economy and shape economic development for decades (Perez, 2002; Devezas et al., 2005). Examples of macro-innovations are the steam engine, the combustion engine, electricity, and ICT (Perez, 2002; Devezas et al., 2005).

History offers two important lessons when it comes to macro-innovations. First, they are not all about technology. They also affect energy-use, life-styles, infrastructure, and what, in the economic literature, is called formal institutions, i.e., laws, regulations, welfare systems, and taxation (Mokyr, 1990; Berry, 1991; Andersson and Karpestam, 2012, 2013). Second, most macro-innovations have received government support, either directly or indirectly, in their initial phases through either direct economic support or the creation of new markets (Mokyr, 1990; Mazzucato, 2013; Andersson and Nilsson, 2016). Once a macro-innovation becomes economically viable it receives indirect support through specific government investments in infrastructure and updating of institutions to fit with the new socio-technological paradigm that the macro-innovation has created. Countries that have failed to adjust institutions to the new paradigm have fallen behind economically, as their economies have struggled to benefit from the innovations when indirect government support has been lacking (Balta-Ozkan et al, 2013; Molinari and Kordas, 2017).

Greenhouse gas emissions affect our environment. However, addressing climate change requires more than incremental change. Radical change is called for in e.g. the energy system, transportation system, and many industrial sectors, such as the energy-intensive and material-producing sectors. Here, new macro-innovations are needed. Based on the historical lessons, we need to do more than to price carbon emissions to achieve such radical change. A wider set of policies is needed.

3. A broadly-based set of climate policies

Let us consider a few examples of broader climate policies than a price on carbon emissions. The chosen examples below are far from being an exhaustive list. I begin with sectors where a carbon price may have a relatively large effect before discussing sectors where more radical change and, thus, a broader policy agenda is called for. Sectors where a carbon price is likely to be most efficient are those where decarbonization can occur within existing legislative and infrastructure frameworks, and where there are economic co-benefits from a reduction in emissions. Consider the manufacturing industries. For many manufacturing industries, the amount of emissions emitted during the production process is relatively small compared to the economic value these industries produces. Fossil fuel–free production technologies are often available (Andersson and Nilsson, 2016). In addition, there are commonly economic co-benefits, such as innovating new products and moving into new markets (Åhman and Nilsson, 2015; Andersson and Nilsson, 2016; de Pee et al., 2018; Åhman et al., 2017; Bataille et al., 2018). Such co-benefits contribute to making decarbonization economically feasible. Here, a carbon tax is the potential catalyst that may get the decarbonization process going.

In other sectors, such as the transportation system, more radical change is necessary, and this requires more active government involvement (Watson, 2012; Andersson and Nilsson, 2016). Changing fuels in the transport system is one component in decarbonizing the system, but it is not enough. Changes to city planning and radical re-thinking of mobility needs is necessary (Hickman et al., 2013; Zawieska and Pieriegud, 2018). Here, the policy makers have a much more direct role to play in how cities are planned and which mobility solutions the market will develop. Similar to manufacturing industries, there are co-benefits from decarbonization of the e.g. transportation system through radical innovations around mobility. These benefits include less pollution, less noise, improved health through more walking and bicycling, less congestion, and potentially fewer accidents if there are fewer vehicles. These

benefits mostly occur at the societal level, and some of them are difficult to monetize. Because they are difficult to monetize, the market will not consider these potentially positive effects. They will only materialize if policy makers take action to make them happen.

A third example are the energy-intensive, and often material-producing, sectors, such as steel and cement. These industries have large missions per produced unit of economic value. For these industries, reducing emissions is possible through new technology, but alternative production methods are more expensive (Palm et al., 2016; Åhman et al., 2017; Vogl et al., 2018). Unlike the manufacturing firms, there are few if any co-benefits from a transition (Åhman and Nilsson, 2015). The material-producing sectors are faced with more or less producing the same product as before but with an alternative and more expensive production method. Further complicating the transition is the fact that it requires large investments in new production units. Some sectors, such as steel, may reduce their output if there is an increase in circularity of the already existing materials (OECD, 2018), in which case the increased investment cost must be carried by a sector in economic decline. And finally, a greater shift to non-fossil energy sources, such as electricity, will have a large impact on, e.g., national electricity consumption and, thus, the demand for fossil fuel–free electricity. Here, the government clearly must have more direct involvement in choosing a decarbonization pathway and contribute to handling the economics risks and costs (Nilsson et al., 2017).

These previous examples are of various economic sectors. Another area of interest is the technological clusters, such as ICT. Economic growth in the future is likely to be centered around ICT innovations in, for example, digitalization and artificial intelligence (Brynjolfsson and McAfee, 2014; Andersson and Nilsson, 2016), enhancing economic welfare in the future through intensive growth. Under the right conditions, ICT can also contribute to reducing emissions by making production processes in the manufacturing sector more efficient, improving the use of existing transportation networks, and contributing to building a new

energy system based on renewable sources such as wind and solar (Arnold, 2011; OECD, 2010; Riedl et al., 2011; Gungor et al., 2013; Kramers et al., 2014; Molinari and Kordas, 2017). Estimates at the EU level suggest that emissions may fall by between 20 to 30 percent in the manufacturing sector alone through new ICT solutions (Hilty et al., 2006; Filos, 2010). However, there are barriers preventing investments in ICT aimed at improving efficiency and lowering emissions. The biggest barriers are lack of demand and experience. Markets for applying ICT to reduce emissions are not yet fully developed. Thus, investments in such ICT innovations are relatively small. Markets may emerge in the future, but, as people and firms are not yet fully used to using ICT to reducing emissions, market development is slow. Here, the government has a role to play to create demand and create markets through, e.g., public procurement. Historically, public procurement has been a major source of innovation support and market creation that, in the end, has led to sustained economic development (Andersson and Nilsson, 2016; Kaiser and Kander, 2013). As the technology becomes more and more wide-spread so does the experience of using the technology. Further reducing the hurdles such technology may face in its initial development stages.

The purpose of these few examples is not to provide definitive policy guidance but to highlight the varying implications of a transition to a fossil free society for different parts of society. There are nuances and variations in all sectors, which makes a transition even more difficult. The complexity is also one of the key arguments for engaging all of society in the transition work through the market economy with the right incentives and the right institutions and infrastructure.

A sequential climate policy

Accepting that a price on carbon emissions is insufficient to fully decarbonize the economy naturally makes it more difficult to design appropriate climate policies. The level of complexity

is made even greater by the fact that there is a need for climate policies to be sequenced appropriately. Phasing out fossil fuels is essential. However, before emissions are reduced fossil-free alternatives must be developed; these alternatives can be either technical or social. One of the greatest threats to a successful climate policy is an aggressive policy aimed at phasing out fossil fuels without having enabled a transition to alternatives. Without alternatives, political resistance to decarbonization is likely to grow and could threaten the entire transition. The case of the Australian carbon tax serves as a dangerous example. The tax was introduced in 2012, but it was abolished in 2014 following the election of a new government. The tax resulted in, e.g., higher electricity prices (Robson, 2014). The purpose of the tax was to reduce the use of energy and enable investments in alternative sources. However, it takes a long time to phase in new energy sources, whereas the tax mostly increased the cost of electricity without households having an alternative to paying the higher prices as there were no alternative energy sources available. In other words, the failure to enable a shift to alternative energy sources contributed to the resistance to the tax.

To avoid political setbacks that prevents us from reaching the global temperature targets more emphasis should be put on enabling a transition by first setting the right institutional framework for new technological and social innovations, followed by incentives to begin to use the new alternatives that are developed, before the old fossil-based solutions are fully phased out in a third and final phase. In a sequential policy, different policy tools should be emphasized at different stages. A carbon price, for example, is most likely to be most efficient in the two final steps.

4. Summary

Our economic welfare has increased dramatically since the first industrial revolution. The challenge for the future is to maintain a high level of economic welfare while not just reducing emissions of greenhouse gases but completely decarbonizing the economy. Making ourselves poorer through either de-growth or abandoning the market economy for a planned economy is not the path forward to maintaining a high level of economic prosperity. Nor is simplifying the decarbonization problem to only being about a price on carbon emissions the way forward to achieve complete decarbonization of the economy.

To decarbonize the economy, we should learn from history how technological and, social change have gone hand in hand with the development of new infrastructure and new or updated formal institutions. Thus, complete decarbonization of the economy requires major institutional reforms that eliminate the indirect advantage old fossil fuel–based technologies and life-styles currently enjoy. In addition, sustainable innovations require direct governmental support in their initial phases and indirect support through adjustment of infrastructure and institutions to fit their characteristics. Here, a price on carbon is only part of the solution but not the solution; a wider set of policies are needed. Thus, rather than viewing decarbonization as an environmental problem we should view it is a development issue similar to the industrialization policies that we once pursued on many different fronts.

The government has been involved, throughout our modern economic history, in setting the stage for various technological and social innovations. Often, the government has acted in response to changes that were already occurring. Now, the government has to be involved in the first phase in setting the right institutional and infrastructure conditions for a new sustainable high welfare economy. The question the future has to answer is whether the government is capable of taking such a leading role.

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