PILLAR 3

Brain-be 2.0

STATE OF THE ART

E4BEL
Equity, Environment, Energy, Economy: An investigation into the equity, efficiency and acceptability of carbon pricing in Belgium.

State of the art on the economic impacts of carbon pricing.

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[Introduction]

Climate policy is getting real. For years, if not decades, the question of what to do about global warming has been the realm of scientists, think thanks and international organisations. But now, as this project is taking shape, the European Union has largely written its Fit-for-55 strategy into law and the draft national energy and climate plans have found their way into Belgian public debate.

As policy is getting concrete, so are facts and figures on the cost of climate action. In Belgium, a flurry of studies by reputable consultancy firms has provided the press with figures showcasing the scale of the required cost to reach our climate targets. For example, VITO/EnergyVille has used a partial equilibrium model, TIMES, to calculate the annual costs needed to reach net-zero for different sectors of the economy.[1] They found that costs increase from 0.5% of GDP in 2030 to 2.7% in 2050. These both entail capital expenditure (discounted at a rather low rate of 3%) and operating costs due to an ambitious carbon price. Recently, McKinsey[2] added its own figures to the discussion, claiming that over 30 years about 415 billion in investment is necessary, of which about half for the residential sector.

Such aggregates, depending on the way they are presented, can either awe or re-assure. Indeed, the EnergyVille study suggests that costs are all together not that prohibitive, especially in the medium run. The McKinsey figures convey quite a challenge, especially in the residential sector, but the authors stress the investment needs as an opportunity for kickstarting growth. Growth and Green can go hand in hand, is the message. Readers acquainted with the double dividend debate will have their reservations.

What is certain, however, is that many of these figures are expressed in terms of macro-economic aggregates, or in the classic sectoral terms[3] at best. As such, they do not fully capture what society seems to be concerned about: the distributional effects. Who will finally pick up the bill and who gets left behind? Since the *gilet jaunes* reference is by now a cliché, we point to the recent debate in Germany. If Chancellor Olaf Scholz declared with confidence that "We have all the money we need, private investors are on board of the transition"[4], he also recognizes that the labour market does not follow suit. All the while influential voices in his social-democratic party keep a wary eye on their voters' mood. Dietmar Woidke, minister-president of mine-rich Brandenburg regularly takes issue with climate activists and Federal policy alike.

In fact, the discord in the German 'traffic light' coalition on how to tackle the transition touches at the heart of the debate. While some parties are all for pressing the accelerator, others worry about how the transition will impact their constituency. The debate is all the more sensitive since climate policy takes place in an environment where these concerns intercede with other societal evolutions. In the German case, 'brown' job losses are situated in an already struggling former GDR, a stronghold of the AfD.

Other policymakers have noticed the correlation with different challenges as well but chose to go on the offense. In a recent speech to the OECDs climate policy forum IFCMA, Heather Boushey, one of the US president's senior economic advisers, showed no *Angst.* She stated bluntly that for the US administration climate policy is also social and economic policy, and that it should redress some of the negative evolutions on the US labour market. She explicitly mentioned the effects of automation and outsourcing to China. The United States wants to subsidize its problems away.

[1] See https://perspective2050.energyville.be/.

[2] See https://www.mckinsey.com/capabilities/sustainability/our-insights/net-zero-or-growth-how-belgium-can-have-both.

[3] In Partial equilibrium energy system models these are: Industry, Power generation, Residential and commercial buildings, Transport, Agriculture, Land Use Land Use Change and Forestry.

[4] See https://www.lesoir.be/505087/article/2023-04-03/comment-lallemagne-compte-reussir-sa-transition-energetique-sans-le-nucleaire.

We give these examples for good reason. In fact, the importance of labour market effects on top of the direct distributional concerns, with larger trends playing at the background, calls for a multi-disciplinary, transversal approach to the analysis of climate policy. That's exactly what E4BEL hopes to offer.

Concretely, our research will investigate whether an equity-efficiency-acceptability trade-off exists in environmental policy. Although we're mindful of the importance of other policy instruments, we focus primarily on carbon pricing, the favourite tool of economists that seems so difficult to implement in practice.

We want to investigate not only whether a double dividend exists, but also whether policy can be designed to ensure an equitable distribution of incomes *and* whether it can pass democratic muster as well. To that end our consortium brings together different economic modelling approaches to chart the distributional impact of a climate tax shift (CTS) and adds to that the sociologist's toolbox to test whether society's preferences as measured by surveys coincide with those revealed by the economic models.[5]

To do so, the economic approach brings together a micro-simulation model with a macro-economic model of the Belgian economy, hard linked to ensure maximal consistency. This setting, for Belgium unique by itself, will allow us to capture and go beyond what we believe to be state of the art in the micro and macro-economic field.

[State of the art]

To reduce carbon emissions, an important tool in the policy-makers toolbox is a carbon tax. The literature on carbon taxation has grown over the last 30 years since the introduction of carbon taxes in the Scandinavian countries in the early 1990s. Timilsina (2022) provides an overview of the by now extensive carbon tax literature.

A first strand of carbon tax literature is related to the optimal carbon tax rate, which inherently depends on the social cost of carbon, i.e. the marginal damage of carbon emission. The estimation of the social cost of carbon is complex due to huge uncertainties in the damages of climate change, and estimates vary widely (Pindyck, 2017; Timilsina, 2022). Moreover, Stern and Stiglitz (2021) show how the traditional economic modelling – especially the strand of integrated assessment models (e.g. Nordhaus, 2019) – is unsuited to capture the economic and societal impacts of carbon emissions, and thus to provide an accurate estimate of the social cost of carbon. Stern and Stiglitz (2021) show how issues related to intergenerational distribution, absent markets and other market failures, and uncertainty and systemic risk, all lead to a downward biased estimate of the social cost of carbon.

They propose an alternative approach for the evaluation of policy related to climate change, namely, to compare the impacts of different emission reduction paths, including their economic costs, without obtaining an estimate of the social cost of carbon. In this approach, the carbon tax rate will be determined by the necessary pricing to obtain the ex-ante fixed reduction path. We will follow this approach, however, elements of the critique on the integrated assessment model of Stern and Stiglitz (2021), are also applicable to our economic modelling approach, e.g. related to the absence of security markets, and other market failures, and related to systemic changes – impacting both the efficiency and equity outcomes of green tax reform.

A second strand of the carbon tax literature takes the carbon price as given and focuses on the economic incidence. In his overview paper, Timilsina (2022), summarizes the overall economic impacts, and the equity or distributional impacts of the introduction of a climate tax. Whereas the introduction of a carbon tax alone will dampen economic activity, and will be regressive, it is the revenue recycling scheme, which will determine whether efficiency and equity will be improved. There is some evidence of a trade-off: using the revenues to lower distortionary income taxes is most efficient but compensates poor households less for the higher energy costs, compared to a lump sum distribution of the carbon

[5] We refer to the complementary note "E4BEL - State of the art on the public acceptability of carbon pricing" for more information on the sociologists' research frontier.

tax revenues. Using revenues to subsidize green investments, is economically costly, and regressive, but creates a double environmental benefit, and might enhance public acceptability of the carbon tax scheme.[6]

Timilsina (2022) identifies a knowledge gap related to the evaluation of revenue recycling schemes combining all three elements, a lump sum transfer, a decrease of existing distortionary taxes and subsidizing green investments. Other questions related to carbon tax implementation that are not sufficiently analysed in economic literature are – according to Timilsina (2022) – the impact of overlap with other climate policies (e.g. renewable energy mandates, and energy efficiency standards) and the impact of sector or fuel exemptions from the carbon tax. Such exemptions are economically nonsensical, but likely to arise in the political implementation of a carbon tax. It is important to highlight the economic and environmental cost of such exemptions to policymakers and the wider public.

The importance of recycling schemes using a mix of different instruments has been noted in another paper, too. Van der Ploeg et al. (2022) investigate, using a micro-simulation model akin to the one we will use, whether creative design of the recycling scheme can overcome what they find as a potential equity-acceptability trade-off. Transfers, while good at ensuring equity, cause people to cut down on labour supply and diminish revenue to be redistributed. But they often fall short in compensating enough households to ensure that winners dominate the losers of such a shift. While the potential existence of such a trade-off does not bode well, the authors do point out that it is by no means absolute and that creative mixes of regressive labour income tax cuts and progressive transfers can be found that reconcile both objectives.

Our project will result in a toolkit that can push the frontier on the research on both trade-offs, by combining the best of two approaches in the field, with a special focus on wage inequality. Calculating winners and losers, and therefore shedding light on equity and acceptability, is traditionally the forte of microsimulation models (MSM). But while these are very good at showing distributional effects and are especially powerful if they capture demand and labour supply, they typically keep commodity prices and – crucially – the wage distribution as given. This void will be filled by a macro-economic (Computable General Equilibrium, CGE) model tailored towards labour market effects.

The direct effects of green tax reform on commodity prices and disposable income will be modelled with an arithmetic tax-benefit microsimulation model running on synthetic data which combine survey data on incomes and expenditures.[7] To capture the indirect effects of green tax reform on the micro-level, we model the households' decisions on the labour market and the commodity market. To do so, we utilize a structural model, estimating preferences over consumption and leisure, and the distribution of labour market opportunities, which are heterogeneous over households. The Random Utility Random Opportunity (RURO) discrete job choice model[8] encompasses both structural elements, and is suited to be amended by commodity preferences, and changes in offered wages and employment opportunities due to general equilibrium effects.

First, to incorporate the commodity market decisions of households, the RURO model is amended with a two-stage budgeting approach, in which commodity price levels, and heterogeneous preferences over commodities are translated in household specific deflators of the nominal wage (Capéau et al., 2018). In such a way, changes in commodity prices will be translated in new labour market choices, accounting for the heterogeneous preferences. With the introduction of an Exact Affine Stone Index (EASI) demand system (Lewbel & Pendakur, 2009) or a quadratic almost ideal demand system (QUAIDS; Banks, Blundell & Lewbel, 1997), we move away from the common CES demand functions implying linear Engel curves. By additionally estimating the demand system conditional on the labour market status, we relax the

[6] On efficiency: Jorgenson et al., 2018; Ross, 2018; Zhu et al., 2018; Caron et al., 2018; Goulder, 1998; Goulder, Parry and Burtraw, 1997; Parry, 1997; Aldy et al., 2010. On equity: Fremstad and Paul, 2019; Callan et al., 2009; Verde and Tol, 2009; Gonzalez, 2012; Renner, 2018; Caron et al., 2018; Williams et al., 2015; Marthur and Morris, 2014; Dissou and Siddiqui, 2014.

[7] See e.g. Akoğuz et al., 2020; Maier & Ricci, 2022; Maier, Amores & Ricci, 2022; and Capéau et al., 2022.

[8] See e.g. Aaberge & Colombino, 2014; Dagsvik et al., 2014; and Capéau et al., 2016 for Belgium.

assumption of weak separability of leisure and consumption in the utility, implied by the two-stage budgeting approach. In doing so, we allow for potential efficiency gains of green tax reform, as described in Jacobs and van der Ploeg (2019) and Jacobs and De Mooij (2015).

Second, since the RURO framework explicitly models the labour market opportunities of households, it is suited for incorporation of labour demand feedback (Capéau et al., 2018, Narazani & Colombino, 2021). Since the model is aimed to capture heterogeneity in preferences and opportunities, also the link with the micromodel should be as heterogeneous as possible. Moreover, one of the major distributional concerns related to the introduction of green tax reform, is precisely this channel. Marin and Vona (2019) describe how the introduction of a green tax reform will harm the labour market opportunities of certain – already vulnerable – occupations, while others will enjoy better labour market perspectives. Capturing the distributional gradient in the heterogeneous labour demand impacts poses some challenges. Detailed linkage of the sector- and occupation-specific wage and opportunity change will numerically be challenging in the RURO-setup, and empirical identification will become questionable. We will follow the example of Dagsvik and Strøm (2006) and Narazani and Colombino (2021) by introducing differentiation in the opportunities based on sector and/or occupation. This differentiation will open the door to the link with the CGE model, which will provide information on changes in wages and job opportunities after the introduction of carbon pricing.

On the macro level, we will use a CGE-model in the role for which it is most suited: as a tool that sends a vector of prices and wages by labour type towards the MSM-model. Since in the hard-linked setting labour supply and commodity demand in the CGE model will effectively be taken over by the MSM, wage outcomes will crucially depend on the way labour demand is modelled. Our main effort will consist of incorporating the most recent econometric estimates of elasticities of energy prices, demand for different labour types and wage formation, and incorporate these often-complex relations in the CGE model.

Traditionally, the econometrically inspired literature distinguishes between two types of elasticities: unconditional elasticities and elasticities conditional on a given output level. Conditional elasticities only capture the substitution effect between energy and labour at the given level of output. Unconditional elasticities also account for the scale effect, i.e. the decrease in employment due to a reduction in the output level caused by higher energy prices (Cahuc et al., 2014). When estimating unconditional elasticities, most of studies find themselves in the following range: a 1% increase in energy prices leads to a 0.01%-0.45% decrease in the aggregate employment level (e.g. Marin & Vona, 2021).[9,10]

While a great deal of work is devoted to evaluating effects on a homogeneous labour demand, another – much smaller – body of literature seeks to identify effects of rising energy prices on various groups of workers. Cox et al. (2014) provided a typical study in the field. Regarding the distinction between blue- and white-collar workers they show that demand for the former actually rises, with both conditional and unconditional elasticities. They also report that employment effects of higher energy prices, conditional on an output level, are positive and the highest for high-skilled workers. Allowing for variation in the output level, their estimates of unconditional energy price elasticities of employment indicate the opposite: they are negative, and high-skilled workers experience the strongest effect.

More recently, Marin and Vona (2019; 2021) attempt to investigate the effects of energy prices on other forms of labour demand heterogeneity. Looking at distinct occupational groups, they show that an increase in energy prices is associated with a higher employment level for technicians in the manufacturing sector. While in many studies the scale effect

[9] See also Deschênes, 2012; Bijnens et al., 2018; Gray et al., 2019; Alatas, 2020; Dussaux, 2020; Bijnens et al., 2021; Bijnens et al., 2022; Bossler et al., 2023.

[10] For Belgium, estimates range between -0.15 and -0.32 (e.g. Bijnens et al., 2018). While accounting for energy intensity, it appears that estimates are bigger for highly energy-intensive industries (e.g. Bijnens et al., 2022). Considering different time horizons, long-term elasticities seem to be double the short-run effects (e.g. Marin & Vona, 2021).

seems to dominate the substitution effect, effectively leading to employment losses across the labour types, this is not always the case.

Still, the manufacturing sector is often found to be one of the biggest employment-losing sectors overall. The empirical literature seems to agree on an employment decrease in some industries: metal, wood product, machinery and transportation equipment, and chemical and petrochemical (e.g. Kahn & Mansur, 2013; Dechezleprêtre et al., 2020). As for labour-absorbing sectors, the service sector often serves as an example (e.g. Dechezleprêtre et al., 2020). Bijnens et al. (2022) distinguish between the knowledge-intensive part of the service sector, which seems to benefit from an increase in electricity prices, and the less knowledge-intensive part whose employment level reacts negatively. More specifically, labour demand in the healthcare industry could increase because of higher energy prices (e.g. Kahn & Mansur, 2013). But such studies for absorbing sectors are rare, as manufacturing seems overrepresented in the literature. This is especially the case for impacts on heterogenous labour demand in the all-important service sector, which will be a focus of our research.

To gain understanding of what happens in absorbing sectors, we need to rely on general equilibrium simulations, such as recently by Weitzel et al. (2023). They use a CGE-model (JRC-GEM_E3) to estimate the labour market impacts of 3 climate policy scenarios, and on wages by skill and occupation levels in particular. While significant job losses in some sectors are found, absorbing sectors can compensate, and in such a way that low-skilled labour, when scale and substitution effects in all sectors play out, has in the end actually more labour market opportunities than medium-and high-skilled workers.

We note, though, that standard CGE models use restrictive assumptions on the way labour demand is determined by wages and prices. Often, the way production is modelled implies that rising energy prices affect all workers within a sector in the same way, and absorbing sectors accept new workers in equal measure, regardless of skill. If there are substitution effects implicit in the chosen functional forms, they are rather naïve. Going beyond these standard practices is one of the major technical challenges of our effort.

CGE models often miss another important effect for the determination of the wage distribution. The work in the task approach of the labour market following Acemoglu and Autor (2011) was inspired by the divergence in wages between high- and low-skilled labour, due to import competition (Autor et al., 2013) and automation (Acemoglu & Restrepo, 2022), making tasks traditionally performed by low-skilled labour redundant. Equally important may be the fact that new tasks absorbing low-skilled labour pay less rents, because they are created in highly competitive sectors. Effectively, this is the story of the decline in unionized jobs in favour of tasks like flipping hamburgers and cleaning offices. If, as Marin and Vona (2019) hypothesize, the green transition could indeed bring about the same labour market effects as automation and globalization, we should think of capturing the origins of rent differences in our model.

Overall, although there is a growing body of literature on the effects of energy prices on employment, it is difficult to reach a consensus, especially on heterogeneous labour demand for which the literature is still sparse. For Belgium, the estimation of the effects of energy prices only considers, to the best of our knowledge, homogeneous labour demand. The lack of Belgian employer-employee administrative data does not help researchers to investigate the specific effects of energy prices on the most important categories of workers and for enough sectors. Also, in the often-used Labour Force Survey for example, the International Standard Classification of Occupations (ISCO) measure of professions does not allow for the differentiation of labour according to the task-based approach. And yet, it is on this dimension that the most interesting effects are probably to be found.

[Policy recommendations]

While we expect that the economic research strand of the E4BEL project will yield various outputs that are of direct policy relevance, our most important contribution will be to amend the results of van der Ploeg et al. (2022). Recall that they use a behavioural micro-simulation model for Germany to simulate a range of climate tax shifts, differentiated by the proportion of revenue recycled through lump sum transfers or linear labour income tax cuts. They examine whether these can yield a majority of households gaining in economic welfare and are therefore acceptable in a democratic setting. Such tax shifts can indeed be found, even though they find that a significant proportion of revenues will need to be recycled through labour income taxes as opposed to transfers. At the core of this result is the negative labour supply reaction of transfers, which erodes the tax base of the labour income tax and reduces the amount of revenue which can be recycled. This introduces to a certain degree an equity-acceptability trade-off, although the trade-off is not clear-cut and potential for smart design reconciling equity and acceptability concerns do exist.

We will build on the work of van der Ploeg et al. (2022) by enriching their environment and test whether the effect of carbon taxes on labour demand, and hence, wages, lowers the odds of finding a tax shift that benefits a majority of households and exacerbates the acceptability-equity trade-off. This would for example be the case if carbon taxes would cause wages for low-skilled labour to fall, creating an additional source of inequity that is not picked up by classic micro-simulation models. By taking labour types into account, we can also test whether smart targeting of tax cuts or transfers along this novel dimension can help overcome the tension between equity, efficiency and acceptability.

While carbon taxation in general terms is the focus of our research, we do not intend to operate in a vacuum. Indeed, climate policy analysis can be understood as "shooting at a moving target", since much of the decisions that will shape climate policy over the next decennium are taken at this very moment. The European Fit-for-55 strategy is being written into law, while at the national level the National Energy and Climate Plans are being drafted. While the latter are very much work in progress, some basic lessons with relevance for this project can already be discerned.

First, carbon pricing in the strictest sense seems to be very much a European affair. The current ETS system is being strengthened, with additional stringency in terms of emission reductions and enlarged sectoral scope. If experts' opinions on the projected carbon price are to be believed, the hike from recent years will not reverse itself and the price is projected to decisively break the 100 euro per tonne mark and increase gradually to 161 euro per tonne by 2050. For industry, the focus of much of our analysis, this is quite relevant. Moreover, from 2027 onwards a parallel extended pricing scheme for transport and heating fuels will be introduced, colloquially named ETS2. Nonetheless, both these schemes remain relatively modest. Not surprisingly given the sensitive nature of taxing households, an ETS2 cap of 45 euro per tonne is expected to be maintained at least before 2030. Also, for the classic ETS, other sources recommend a far higher price needed to achieve net zero than current projections by renown experts suggest.[11] The energy taxation directive (ETD) is another noteworthy European measure, providing minimal excise rates for most fossil fuels.

Second, a cursory look at the draft Belgian Climate and Energy plans reveals that ambitious national carbon pricing schemes and climate tax shift scenarios are off the table. There is some action on restricting professional diesel, on shifting excises from electricity to fossil fuels as well as reforming certain tax expenditure (such as the company car regime). These seem unlikely to address known points of attention in the Belgian tax system, namely the low tax level on household heating fuels and the relative largesse of company car subsidization. Given the modest ambition, on the expenditure side there are no plans for substantial labour income tax cuts or lump sum taxes as grand compensation schemes.

The most substantial action on the part of the Belgian governments, and on the European level too, may lie in regulatory measures. The ban on cars using thermic engines on the European level, and standards for energy efficiency of housing and bans on certain heating technologies on the regional level reveal a preference for command-and-control and regulatory instruments as a tool for environmental policy.

[11] See e.g. the difference in the WAM price recommended by the European Commission, and the price trajectory recommended by the German Environment ministry with Fit-for-55 measures in - (2022), "Rahmendaten fuer den Projektionsbericht 2023", Bundesumweltsambt, Dessau.

As a consortium interested in the potential of carbon pricing, there are some lessons to be learned from the emerging contours of our policy environment. While the European carbon pricing framework exists, it could still be interpreted as a minimal standard, at least for the ETS2 in heating fuels. The European framework does leave scope for national action. As opposed to Germany, which in the transport and heating sector has its own trading scheme planned, the Belgian governments do not seem to be eager to fill the openings left by the EU. Also, the preference of policy makers for rules and regulations should be noted, especially since these measures do not yield revenues that can be distributed. Simulating rules and standards as an additional option, e.g. implemented by a shadow price, alongside a (revenue yielding) carbon tax may be an option for research given the importance of these instruments in the policy package.

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