Federal Planning Bureau
Economic analyses and forecasts

WORKING PAPER 7-17

Tax Expenditure and the Cost of Labour Taxation

An application to company car taxation

June 2017

Benoit Laine, bl@plan.be,
Alex Van Steenbergen, avs@plan.be

Avenue des Arts 47-49 – Kunstlaan 47-49
1000 Brussels

E-mail: contact@plan.be
http://www.plan.be

Federal Planning Bureau

The Federal Planning Bureau (FPB) is a public agency that carries out, in support of political decision-making, forecasts and studies on economic, social-economic and environmental policy issues and examines their integration into a context of sustainable development. It shares its expertise with the government, parliament, social partners, national and international institutions.

The FPB adopts an approach characterised by independence, transparency and the pursuit of the general interest. It uses high-quality data, scientific methods and empirical validation of analyses. The FPB publishes the results of its studies and, in this way, contributes to the democratic debate.

The Federal Planning Bureau is EMAS-certified and was awarded the Ecodynamic enterprise label (three stars) for its environmental policy.

url: http://www.plan.be
e-mail: contact@plan.be

Publications

Recurrent publications:
Outlooks

Planning Papers (latest publication):
The Planning Papers aim to diffuse the FPB's analysis and research activities.

115 Les charges administratives en Belgique pour l'année 2014 /
De administratieve lasten in België voor het jaar 2014
Chantal Kegels, Dirk Verwerft - February 2016

Working Papers (latest publication):

6-17 Accrued-to-date pension entitlements in Belgium
Yves Brys - May 2017

Responsible publisher: Philippe Donnay
Legal Deposit: D/2017/7433/16

Federal Planning Bureau
Avenue des Arts - Kunstlaan 47-49, 1000 Brussels
phone: +32-2-5077311
fax: +32-2-5077373
e-mail: contact@plan.be
http://www.plan.be

Tax Expenditure and the Cost of Labour Taxation

An application to company car taxation

June 2017

Benoit Laine, bl@plan.be, Alex Van Steenbergen, avs@plan.be

Abstract – The goal of this paper is to estimate the efficiency cost of one additional euro of revenue through the personal income tax system, considering its simultaneous effects on the labour market and the transport market. More precisely, we seek to derive estimates of the Marginal Excess Burden of marginal personal income tax rates in Belgium considering the subsidization of company cars. We find that taking into account of welfare losses in the transport market adds 5-7 cents to the welfare cost of an additional euro of tax revenue, compared to models that consider only the effects on the labour market. The cost of raising the top marginal tax rate rises by 28% to 58% depending on the model assumptions. As an aside, we estimate tax expenditure on the transport sector via the personal income tax system to be 1.9 billion euro. We conclude that there is scope for welfare improving by base broadening and rate cutting. The framework is applied to analyse the merits of cash-for-car proposals.

Jel Classification – H21, H23, H24, R41
Keywords – Efficiency, Optimal Taxation; Externalities, Redistributive Effects; Personal Income Tax and Subsidies; Transportation: Demand, Supply and Congestion

Acknowledgements – The BELDAM Survey has been realised by GRT (Université de Namur) in cooperation with IMOB (UHasselt) and CES (FUSL). Financial Support by BELSPO and FPS Mobility and Transport is gratefully acknowledged. Special thanks go to FPS Finance for a micro-simulation exercise with the SIRe model. All remaining errors are our own.

Table of contents

List of tables

Executive summary

In 2012, transport related tax expenditure in Belgium are estimated to amount to 1.9 billion euro, of which 1.5 billion is due to the company car regime. This is 4.3% of personal income tax revenue. Such large subsidies strongly influence the transport market, as has been shown in previous work (Laine and Van Steenbergen, 2016a).

In this paper, we study the company car regime in Belgium in a broader context. We calculate the societal cost of an extra euro of revenue raised through the personal income tax, taking into account the negative effects on different markets that are influenced by this tax. We discuss the labour market and the transport market taken together.

Taxes cause an income loss for those people that continue to participate in the market, and cause other people to forcibly alter their behaviour or to disappear from the market altogether. Typically, the loss of the latter cannot be compensated for by simply recycling the revenue of the tax back to households. Hence, for every additional euro that is being raised, people adapt their behaviour and the efficiency cost continues to increase.

Subsidies cause a similar efficiency cost. People are stimulated to consume a good in quantities they would not purchase if they were to receive the budgetary cost in freely disposable cash income.

In the personal income tax, statutory marginal rates are for a large part responsible for influencing the behaviour of economic agents, and therefore for its efficiency cost.

If tax expenditure takes the form of deductions and exemptions, the impact of marginal rates in the personal income tax is twofold. First, they influence the labour market through the classical channel of labour supply. Rising marginal rates to finance additional revenue will decrease the reward of work, causing people to supply less hours. Second, they influence the implicit subsidy of exempted expenditure, such as company cars. By raising marginal rates, such income-in-kind becomes more attractive compared to ordinary wages, putting more cars on the road. In addition to negative labour market effects, marginal rates cause an overconsumption of cars with negative effects on the environment and congestion.

To evaluate these twin impacts, we construct empirically implementable formulas on the marginal efficiency cost of labour income taxes, in the presence of tax deductions. The model incorporates behavioural reactions on the choice of hours worked and the participation in the labour market and allows for differentiating households by income category.

Given plausible hypotheses, the additional impact on the transport market raises the efficiency cost of one euro of additional revenue through the personal income tax system by 5 to 7 cents, or an increase by 24-39% compared to models that only take the labour market impact into account. The cost of raising marginal rates for the top decile increase by 28 to 58% due to the additional impact on the transport market.

We deduce that the cash-for-car principle, which allows current beneficiaries of a company car can exchange their vehicle for cash equivalent, addresses the transport market distortion, but leaves the labour market distortion of marginal rates intact.

Synthese

In 2012 waren transportgerelateerde fiscale uitgaven in de personenbelasting goed voor ongeveer 1,9 miljard euro. Daarvan is 1,5 miljard euro toe te schrijven aan het regime voor salariswagens. Dat laatste cijfer komt neer op 4,3 % van de totale ontvangsten van de personenbelasting. Dat een dergelijke omvangrijke subsidie sterke welvaartsverliezen op de transportmarkt genereert, is in eerder werk (Laine en Van Steenbergen, 2016a) al aan bod gekomen.

In deze paper bekijken we het regime van salariswagens in een bredere context. We vragen ons af wat de kost is aan de maatschappij van een extra euro inkomsten via de personenbelasting, wanneer we rekening houden met verstoringen op de verschillende markten die door deze belasting worden beïnvloed. In deze studie bekijken we de arbeidsmarkt en de transportmarkt.

Belastingen hebben enerzijds tot gevolg dat mensen die in de markt blijven participeren hun beschikbaar inkomen zien dalen, en anderzijds dat mensen hun gedrag noodgedwongen gaan aanpassen of uit de markt gaan verdwijnen. Typisch is dat het verlies van deze laatsten – in het jargon efficiëntiekost genoemd – niet kan gecompenseerd worden door de opbrengsten van de belasting eenvoudigweg terug te sluizen. Dus, bij elke euro die extra wordt geheven, passen mensen hun gedrag verder aan en neemt deze efficiëntiekost verder toe.

Net als belastingen hebben ook subsidies een efficiëntiekost. Mensen worden aangezet een goed te consumeren in hoeveelheden die ze niet zouden aankopen wanneer ze in de plaats over een vrij beschikbaar inkomen zouden beschikken.

In de personenbelasting zijn marginale aanslagvoeten grotendeels verantwoordelijk voor het beïnvloeden van het gedrag van de economische agenten, en dus voor de efficiëntiekost van deze belasting.

Als fiscale uitgaven de vorm aannemen van aftrekposten of vrijstellingen, is de impact van de marginale aanslagvoeten in de personenbelasting tweeledig. Ten eerste beïnvloeden ze de arbeidsmarkt door het klassieke kanaal van het arbeidsaanbod. Wanneer marginale aanslagvoeten toenemen om nieuwe middelen te financieren, brengt extra werk minder op en zullen mensen minder uren gaan werken. Ten tweede beïnvloeden ze ook de impliciete subsidievoet voor aftrekbare bestedingen zoals salariswagens. Door de marginale aanslagvoeten te verhogen, wordt een dergelijk inkomen in natura dus aantrekkelijker tegenover een gewoon loon en zullen er meer salariswagens op de baan verschijnen. Naast negatieve effecten op de arbeidsmarkt, leiden marginale aanslagvoeten dus tot een overconsumptie van auto's met alle negatieve gevolgen op het verkeer en het milieu van dien.

Om deze tweeledige impact te evalueren, construeren we empirisch implementeerbare formules over de marginale maatschappelijke kosten van lasten op arbeid wanneer aanzienlijke aftrekposten bestaan. Het model incorporeert arbeidsaanbodreacties via keuze van uren en participatie in de arbeidsmarkt en laat differentiatie in huishoudens met betrekking tot inkomen toe. Dit laat een gedetailleerde omschrijving van de efficiëntiekost in de arbeidsmarkt én de transportmarkt toe.

Als er rekening wordt gehouden met aannemelijke hypothesen, heeft de impact op de transportmarkt tot gevolg dat de efficiëntiekost van een euro extra middelen via de personenbelasting in haar geheel met 5 cent à 7 cent stijgt. Dat komt neer op een stijging met 24 % à 39 % ten opzichte van modellen die alleen rekening houden met de verstoring van de arbeidsmarkt. De kosten van extra inkomsten via het verhogen van de marginale aanslagvoeten van het hoogste deciel stijgen met 28 % à 58 % door de impact op de transportmarkt.

We leiden af dat het cash-for-car principe, waarbij de huidige bezitters van een salariswagen hun auto mogen omwisselen tegen een cash-equivalent, de verstoring van de transportmarkt aanpakt maar de invloed van de personenbelasting op de arbeidsmarkt ongemoeid laat.

Synthèse

Les dépenses fiscales à l'impôt des personnes physiques liées au transport représentaient en 2012 environ 1,9 milliard d'euros, dont 1,5 milliard imputable au régime des voitures de société. Ce dernier montant correspond à 4,3 % des recettes de l'impôt sur les personnes physiques. La perte de bien être sur le marché des transports occasionnée par une subvention d'une telle importance a déjà été mise en évidence dans une précédente étude (Laine et Van Steenbergen, 2016a).

Dans cette étude, nous abordons le régime fiscal des voitures de société dans un contexte plus large. Nous étudions les coûts sociétaux liés à la levée d'un euro supplémentaire au travers de l'impôt des personnes physiques, compte tenu des distorsions occasionnées sur les différents marchés concernés directement ou indirectement par cet impôt. Nous nous intéressons plus spécifiquement au marché du travail et au marché du transport.

L'impôt sur le revenu du travail a deux conséquences pour les acteurs privés. D'une part, les personnes qui participent encore au marché du travail après la mise en place d'un tel impôt voient leur revenu disponible diminuer. D'autre part, certaines personnes vont adapter leur comportement d'offre de manière contrainte et choisir de travailler moins, voir cesser de participer au marché du travail. Typiquement, les pertes de bien-être correspondant à ce deuxième effet – les "coûts d'efficience" dans le jargon économique – ne peuvent être compensées par le recyclage des revenus de l'impôt. Pour chaque euro supplémentaire ainsi levé, les individus adaptent d'avantage leurs comportements, et ces coûts d'efficience augmentent.

Pour les mêmes raisons, les subventions également ont un coût d'efficience. Les agents sont incités à consommer un bien subventionné dans des quantités supérieures à celles qu'ils auraient choisies s'ils avaient pu disposer d'un revenu disponible librement utilisable en lieu et place de la subvention.

Dans le cadre de l'impôt des personnes physiques, les taux marginaux d'imposition sont le paramètre déterminant de l'impact sur le comportement des agents, et donc des coûts d'efficience de cet impôt.

Lorsque les dépenses fiscales prennent la forme de postes de déduction, l'impact des taux marginaux de l'impôt des personnes physiques est double. Premièrement, ces taux influencent le marché du travail via le canal classique de l'offre de travail. Les taux marginaux allant croissant pour financer des nouveaux fonds publics, les revenus plus élevés sont davantage imposés. Ces taux marginaux croissants constituent donc un incitant à travailler moins. Deuxièmement, ces taux influencent aussi le taux implicite de subventionnement des dépenses déductibles comme celles liées aux voitures de société. Le relèvement des taux marginaux d'imposition augmente donc l'attrait d'un tel revenu en nature par rapport à la rémunération ordinaire et, partant, contribue à accroître le nombre de voitures de société sur nos routes. Ainsi, outre les effets négatifs sur le marché du travail, les taux marginaux entraînent une surconsommation de voitures, avec toutes les incidences négatives sur la mobilité et l'environnement qu'on connaît.

Pour évaluer ce double impact, nous avons dérivé des formules, applicables de manière empirique, exprimant le coût sociétal marginal engendré par les charges sur le travail lorsque des postes de déduction importants existent. Le modèle tient compte de l'impact sur l'offre de travail par le biais de l'effet sur le choix individuel du nombre d'heures travaillées et sur la décision individuelle de participation au marché du travail et permet de différencier des ménages au niveau du revenu du travail.

Si l'on tient compte d'hypothèses plausibles, l'impact supplémentaire sur le marché des transports entraîne une augmentation de 5 à 7 centimes du coût sociétal d'un accroissement d'un euro des recettes fiscales levées via l'impôt des personnes physiques, ce qui représente une augmentation de 24 % à 39 %, en comparaison avec des modèles qui ne tiennent compte que des perturbations sur le marché du travail. Les recettes supplémentaires engrangées par le biais du relèvement des taux marginaux d'imposition dans le décile le plus élevé voient leur coût d'efficience augmenter de 28 % à 58 % lorsque l'on tient compte des effets sur le marché des transports.

Nous concluons que le principe du 'cash for car', qui permet aux bénéficiaires actuels d'une voiture de société d'échanger leur véhicule contre un équivalent en cash, traite le cas des distorsions induites sur le marché des transports, mais n'apporte aucune amélioration pour les distorsions sur le marché du travail induites par l'impôt des personnes physiques.

1. Introduction

This Working Paper seeks to clarify how tax expenditure in the form of deductions and exemptions influence the societal cost of labour income taxation. We will mainly focus on the treatment of employer provided cars through the personal income tax system in Belgium.

Tax expenditures serve, among other things, to implicitly subsidize the consumption of certain preferred goods above others. In many cases, this is exactly what policy seeks to achieve. Deductions for pension saving, mortgage payments or charitable gifts are examples of such policies. In other cases, subsidization is rather a side effect of other policy goals. In the case of company cars, the initial main goal seems to have been to provide for an escape to high marginal tax rates on labour income, rather than to explicitly subsidize the car market.

The use of tax expenditure as a policy instrument in Belgium, as in other countries, is quite important. Tax expenditures in Belgium come in different forms. First are the traditional deductions, which are directly applied to income before the marginal schedule is applied. Most mortgage payments still fall under this category. Deduction is typically done at marginal rate. Second are so-called 'tax reductions' which are applied after the tax liability is determined. Deduction is done at a predetermined rate, which needs not be the average or marginal tax rate. Deductions for pension saving are an example. In both cases, deductions or reductions, some amount of taxable income or tax liability must be available to qualify for a benefit. This is not the case in the third type, tax credits, which effectively enable negative tax rates.

In Belgium, policy is moving away from granting deductions and is awarding reductions and credits instead.[1] Some reductions have been reformed so as to further sever the link between tax expenditures and the general parameters of the personal income tax.[2]

For transport-related goods however, tax expenditure comes in the guise mostly[3] of special rules for the tax treatment of earned income in kind. For example, different exemption rules apply to commuting reimbursements, depending on the mode of transport chosen. Typically, commutes by bike and public transport are favoured over the use of a private car. (See Laine and Van Steenbergen (2016b))

Also, income earned in the form of employer provided cars are treated differently, and favourably, compared to cash earnings. As we will see, the imputation rules for company cars do not add up to the full value of the benefit in kind so that they are effectively, and heavily, subsidized.

---

1 For example, after regionalisation of this competence, expenditure on mortgage contracts after 2015 are treated in Flanders as 'tax reductions', so that the deduction scheme is effectively phased out over time. The same is done in Wallonia after 2016, while in Brussels the benefit is simply abolished.

2 This has been the case for pension saving, whose parameters used to depend on the average income tax paid. This has been reformed to one single percentage of the expenditure (30%).

3 In theory, commuting expenses incurred by the employee are deductible too, but most employees opt for the standard notional deduction of work related expenses. Since the link with actual commuting behaviour of the notional formula is almost non-existent, we will ignore the deduction of commuting expenses in this paper.

For our purposes, the exemption and imputation rules related to the transport sector have the same effect on the tax bill as standard deductions at marginal rates so in what follows we will treat them as such.

Table 1 shows the most important tax expenditure items related to the consumption of specific commodities for fiscal year 2012[4].

Table 1 Tax expenditure on specific goods through the personal income tax system in Belgium, taxable year 2012
Million euro

Mortgage payments	2 052
Company cars	1 495
Energy saving expenditure	669
Private Pension saving	512
Commuting reimbursements	351
Long term saving (life insurance)	266
Household services	258
Child care	140
Contributions to pension funds	106
Charitable gifts	58
Fire prevention and anti-theft	34
Total	5 941

Source: Kamer van Volksvertegenwoordigers (2016) and own calculations.

Based on our own estimates (see section 3 below), the preferential treatment for company cars is second only to mortgage payments. Combining this with the ordinary exemption for commuting reimbursements, the transport sector as a whole seems to receive about 1.85 billion euro through the personal income tax system, accounting for some 4.3% of personal income tax revenues.

Crucially, the size of these tax expenditures depends not only on the cost of the good in question, but also on the reference tax rate at which it is being evaluated. In the case of pure deductions, this is the marginal tax rate from the progressive schedule.

(Marginal) labour income tax rates have therefore two effects. On the one hand, they influence the labour supply decision. But on the other hand, because the subsidies need to be financed, marginal rates also influence the rate of subsidization of deductible expenses and as such will influence outcomes on the market of these goods. This is even more important if consumption of these goods generates significant externalities, which can be expected from transport related goods.

Typically, the cost of labour income taxation is only analysed from the first behavioural margin, namely through reduced labour supply. When fiscal expenditure gets important, it is also conceivable that marginal tax rates generate an additional cost due to distortions in goods markets, by inducing excessive consumption of effectively subsidized goods.

Quantifying the size of these additional costs due to the company car regime is the goal of this paper. To achieve this, we generalize the model of Parry (2002). That paper analysed the efficiency costs of tax

[4] Note that the total amount of tax expenditures in the personal income tax, as defined by the FPS Finance is far higher, or about 23 700 million euro in FY 2012. However, these imply mostly schemes like tax free minimum income (12 400 million), exemptions of social transfer income (6 891 million) and notional work-related expenses (4 558 million), and marriage allowances (573 million) which have hardly any link to particular goods and services and should be considered as part of general income policy. Information on other specific tax expenditure, such as real work-related expenses and employer-provided parking costs are not known. (see: Kamer van Volksvertegenwoordigers (2016))

deductions in the US personal income tax system, and found that the marginal efficiency cost of labour income taxation rises by 77% when tax deductions are taken into account. His model considered deductions for housing, medical expenditure, and charitable gifts and did not consider goods with negative externalities. Moreover, his behavioural model did not distinguish among income class. Labour supply reactions were modelled as a weighted sum of the intensive (hours of work) and extensive (participation) margins of response.

In this paper, we include externalities to consumption in the model, and allow for heterogenous households. This follows the insight of Kleven and Kreiner (2006), who found that estimates of the welfare costs of taxation from aggregate models differ greatly from models that introduce heterogeneity. Since we expect that the use of deductions differs greatly among income classes, we derive formulas that allow for heterogeneity.

In the second section, we develop the concepts of marginal cost of public funds and marginal excess burden that will be used to evaluate the twin impacts of marginal rates in the personal income tax in a formal way. In a third section, we provide a numerical illustration using currently available data on company cars. Lastly, apply the framework to current cash-for-car proposals.

2. The Marginal Excess Burden of Taxation in the Presence of Tax Expenditures

In order to analyse the simultaneous effects of labour income taxes described above, we will resort to time-honoured marginal excess burden analysis. We will ask ourselves what the impact on welfare and market outcomes is of a marginally small change in the parameters of the personal income tax system, with or without the additional effect on transport markets.

First, we will explain the theoretical framework in an intuitive manner. Next, we derive the formulas formally, to arrive at empirically implementable formulas which will be used for the numerical illustration in the previous section.

2.1. The conceptual framework

In the simplest textbook model a tax on a commodity, whether cars or hours worked, influences welfare of consumers or workers in two ways. First, it takes income away from those that continue to buy the commodity, or continue to supply labour. Their welfare loss is measured by the tax revenue that accrues to the government. Second, it will cause some people to leave the market and stop buying commodities or supply labour.

The loss in welfare by these people is commonly referred to as the excess burden of a tax. It captures the loss in welfare since people are forced to change their behaviour because of taxation.

Typically, simply recycling the tax revenue back in the form of cash transfers cannot compensate for the loss to both types consumers/workers, because they had to forcibly change their behaviour.

Like for taxes, subsidies to products cause excess burden as well. Subsidies cause people to buy more of a product they would not have bought in the absence of the subsidy. With normal preferences, the gain to those additional consumers does not measure up to the value of the tax revenue that is needed to pay for the subsidy. In other words, just as people dislike altering their behaviour due to a tax, they like to spend money freely rather than to be pushed to buy goods they would not otherwise buy. This has been the rationale behind our previous calculation of the *total* welfare losses from the company car regime on the transport market through excessive consumption of transport goods. (Laine and Van Steenbergen, 2016a). So, abolishing the subsidy and recycling the revenue back would result in a welfare gain for consumers, since they now get freely disposable income.

With the concept of excess burden now explained, we can now introduce the concepts of Marginal Cost of Public Funds (MCPF) and Marginal Excess Burden (MEB), around which the analysis in this paper revolves.

Suppose the government would like to levy one extra euro of funds, which it plans to spend on public goods that do not substitute for disposable income, so that households are not compensated for the income loss they incur.

In this case, the change in welfare of the private sector can be stated very simply as the sum of extra tax revenue, and an increase in the excess burden.

$$\Delta\, Loss\ in\ private\ sector\ welfare = \Delta\, Tax\ Revenue + \Delta\, Excess\ Burden$$

Dividing through by the change in tax revenue yields a straightforward definition of the MCPF as a function of the MEB:

$$MCPF = 1 + MEB \cong \frac{1}{1 - MEB}$$

This simple definition of the MCPF states that the cost of one euro of additional revenue spent on public goods, equals one plus the marginal increase in the excess burden. It can be interpreted as the cost of transferring one euro from the private to the public sector, which causes a marginal increase in excess burden, or a loss which cannot be compensated for by simply returning the tax revenue back to households. Essentially, the MEB can be seen as the amount of money that ‘leaks’ away by trying to raise funds through distortionary taxation. Note that the MCPF can be calculated for different tax instruments, or for the entire tax and benefit system.

The concept of the MCPF turns up frequently in applied cost benefit analysis where it serves to value the tax revenue that is needed to finance a project[5]. If the benefit of the project exceeds the tax revenue corrected for the MCPF, it should be accepted. Note that in this interpretation, the MCPF serves as a *limit to the size of the public sector*.

This standard definition will be the focus of the analysis that follows. However, it is worth noting that other definitions of the MCPF and MEB exist, depending on the thought experiment that underpins them.

One definition of the MCPF that is particularly interesting includes a measure of the distributional gains that are caused by the tax change. When society values equality, the MCPF may contain a correction factor that lowers the welfare cost for tax changes that lead to a more equal distribution of resources. Thinking this over, this interpretation seems very attractive, since achieving various degrees of equality is in general the most important reason to raise distortionary taxes in the first place. Indeed, if one would wish to avoid the MEB of taxation altogether, a simple poll tax[6] would suffice.

In this case, the MCPF will have the form:

$$MCPF = \frac{1 - \xi}{1 - MEB} <=> 1$$

Where ξ captures the marginal distributional benefit of a tax change. The MEB can then be interpreted as the price of having to resort to distortionary taxation, or *the price of equality*. Keeping the MEB[7] as low

5 In Belgium, it used e.g. in the Federal Planning Bureau’s PLANET model (Mayeres e.a., 2008).

6 A tax levied equally per head of the population.

7 Note that in this context, the MEB will be written in compensated elasticities, whereas the simple model we developed is expressed in uncompensated elasticities. For an application in environmental taxation, see Jacobs and De Mooij (2015)

as possible for the same distribution of resources is then one of the tasks for the discipline of public economics.

As for partial equilibrium cost best analysis, Jacobs (2016) argues forcefully that researchers should apply a MCPF of 1, assuming that society has already made an optimal choice between equality and efficiency. We second this position, and note that our choice for the simpler definition of the MCPF is largely done for convenience.

The general point of the analysis does not change in any case. Whatever the interpretation that one wishes to give to the concept of MEB, we will argue that the company car regime adds to the cost of the personal income tax system, by distorting two markets at a time, namely the transport market *and* the labour market. It follows that either the provision of public goods of achieving an equitable distribution of resources can be done in a more efficient manner.

2.2. The model assumptions

The representative household derives utility U from consumption of a tax favoured good x, other goods y and leisure $\bar{L} - L$, where L is labour supply and $\bar{L}$ is the time endowment. The household also derives utility from public good G^P and incurs negative externalities $E(x)$.

$$U = u(x, y, \bar{L} - L) + \varphi(G^P) - \vartheta(E)$$

Both $\varphi'(G^P)$ and $\vartheta'(E)$ are positive functions.

The household maximizes utility subject to a budget constraint:

$$wL - T(wL, z) = (1 - s)x + y$$

In this equation w is the wage rate, s the subsidy rate of tax favoured good x and $T(wL, z)$ are taxes paid, which depend on earned income and a shift parameter z capturing changes in the tax system. The wage rate is fixed, implying perfectly elastic labour demand. Note that this is essentially a long-term assumption, which contrasts with the approach used in the HERMES model used for medium term forecasting, where labour supply is fixed.

We define $m = \frac{\delta T(wL,z)}{\delta wL}$, the marginal income tax rate and assume $s = s(m)$ so that the subsidy rate depends on marginal tax rates. This is consistent with an interpretation of tax expenditures as traditional deductions if $s = s'm$.

This maximization programme yields the indirect utility function $V(m, Y, G^P, E)$:

$$V(m, Y, G^P, E) = \max u(x, y, \bar{L} - L) + \varphi(G^P) - \vartheta(E)$$

The Lagrangian of the programme, with μ as the marginal utility of income, writes:

$$\Lambda(w, z, G^P, E) = u(x, y, \bar{L} - L) + \varphi(G^P) - \vartheta(E) + \mu\{wL - T(wL, z) - (1 - s)x - y\}$$

This yields Marshallian demand functions:

$$x = x(w,z); y = y(w,z); L = L(w,z)$$

Finally, the government budget constraint equals:

$$G^P = T(wL, z) - sx$$

Or, government consumption equals gross tax revenue less tax expenditures.

2.3. The Marginal Excess Burden formula

Now define (following Parry (2002)) the marginal excess burden of marginal tax rates as the welfare loss arising from equilibrium quantity changes in markets that are distorted by the tax system, due to an extra dollar of tax-financed spending, following a reform dz.

In the case of revenue spent on public goods we define:

$$MEB^P = \frac{-\frac{1}{\mu}\frac{dV}{dz}}{\frac{dG^P}{dz}} + \left(\frac{\varphi'}{\mu} - 1\right)$$

By virtue of the envelope theorem, derivatives with respect to parameters of the indirect utility function V are equal to the derivatives of the Lagrangian Λ taken at the optimum. This allows to derive the numerator of the MEB by total differentiation:

$$-\frac{1}{\mu}\frac{dV}{dz} = -\frac{1}{\mu}\frac{d\Lambda}{dz} = \left(\frac{\delta T}{\delta z} - \frac{\delta s}{\delta m}\frac{\delta m}{\delta z}x - \frac{\varphi'}{\mu}\frac{dG^P}{dz} + \frac{\vartheta'}{\mu}\frac{dE}{dz}\right)$$

Doing the same with the revenue constraint of the government yields:

$$\frac{dG^P}{dz} = \left[\frac{\delta T}{\delta z} + mw\frac{\delta L}{\delta m}\frac{\delta m}{\delta z} - s'\frac{\delta m}{\delta z}x - s\frac{\delta x}{\delta m}\frac{\delta m}{\delta z}\right]$$

This equation says that a tax reform, apart from marginal revenue effects evaluated at the initial equilibrium (i.e. the first and the third term), influences the government budget through the classical labour supply channel and the demand for the subsidized good (the second and the fourth term). Both quantity effects are evaluated at initial tax rates and serve to decrease the amount of tax revenue that can be collected (since $\frac{\delta L}{\delta m}$ is a negative number). Both these effects influence the efficiency cost of the reform.

Next, we define $\frac{\delta a}{\delta z} = \frac{\delta T}{\delta z}\frac{1}{wL}$ as the change in average tax rates, less behavioural responses. We also note that $\frac{\delta L}{\delta m} = -\frac{\delta L}{\delta(1-m)}$ and $\frac{\delta x}{\delta m} = -s'\frac{\delta x}{\delta(1-s)}$. This allows us to write the change in the government constraint in elasticity terms as:

$$\frac{dG^P}{dz} = \left[\frac{\delta a}{\delta z} - \frac{m}{(1-m)}\varepsilon_L^u\frac{\delta m}{\delta z} - s'\pi\left(1 + \frac{s}{(1-s)}\varepsilon_x^u\right)\frac{\delta m}{\delta z}\right]wL$$

Note that $\varepsilon_x^u = -\frac{\delta x}{\delta(1-s)}\frac{(1-s)}{x}$ is the uncompensated price elasticity of good x and $\varepsilon_L^u = \frac{\delta L}{\delta(1-m)w}\frac{(1-m)w}{L}$ and the uncompensated elasticity of labour supply.

Dividing through with $\frac{\delta a}{\delta z}$ and noting that $\aleph = \frac{\delta m/\delta z}{\delta a/\delta z}$ is a measure of the progressivity of the tax reform we get:

$$\frac{dG^P}{dz} = \left[1 - \frac{m}{(1-m)}\varepsilon_L^u\aleph - s'\pi\left(1 + \frac{s}{(1-s)}\varepsilon_x^u\right)\aleph\right]\frac{\delta T}{\delta z}$$

From this equation, it can be shown that the change in government revenue, and therefore the efficiency cost of the reform, depends as usual on the uncompensated elasticity of labour demand ε_L^u. Also, we find that the uncompensated elasticity of demand for good x negatively influences the revenue effects of labour income tax reform. Both effects depend positively on the progressivity of the reform. The comparative effect of increased product subsidy depends on the size of the product market compared to the labour market $\pi = \frac{x}{wL}$.

Doing the same with $\frac{dV}{dz}$ and assuming proportional tax reforms (i.e. $\aleph = 1$), then we can arrive at an implementable formula for the MEB.

$$MEB^P = \frac{\frac{m}{(1-m)}\varepsilon_L^u + s'\pi\frac{(s + MEC_x)}{(1-s)}\varepsilon_x^u}{\left[1 - \frac{m}{(1-m)}\varepsilon_L^u - s'\pi\left(1 + \frac{s}{(1-s)}\varepsilon_x^u\right)\right]}$$

This adds a new element, namely the presence of marginal external costs $MEC_x = \frac{\vartheta'}{\mu}\frac{\delta E}{\delta x}$ in the numerator. This indicates that the marginal external costs of consumption of the subsidized good (expressed in percentages of the product price) add to the economic distortions of labour and product markets. Note that we do not allow for feedback of external costs on labour supply, even though this is likely in the case of time costs.

Allowing for heterogeneity of households turns out to be straightforward, and for the extensive labour supply response is straightforward (see Kleven and Kreiner, 2006). If one assumes equal weights of different households *i* in the social welfare function, the MEB is just:

$$MEB^P = \frac{\sum_i \left[\frac{m_i}{(1-m_i)}\varepsilon_{Li}^u + s_i'\pi_i\frac{(s_i + MEC_x)}{(1-s_i)}\varepsilon_{x_i}^u + \frac{a_i}{(1-m_i)}\eta_{Li}\right]\beta_i}{\sum_i \left[1 - \frac{m_i}{(1-m_i)}\varepsilon_{Li}^u - s_i'\pi_i\left(1 + \frac{s_i}{(1-s_i)}\varepsilon_{xi}^u\right) - \frac{a_i}{(1-m_i)}\eta_{Li}\right]\beta_i}$$

Where β_i equals the share of household i in the increase of the tax average tax burden ($\beta_i = \frac{\delta a_i}{\delta z}w_iL_i/\sum_j\frac{\delta a_j}{\delta z}w_jL_j$) and η_{Li} the elasticity of labour force participation with respect to the net wage rate.

Note also that the labour supply elasticity ε_{Li}^u can be interpreted as a broad tax base elasticity, for example when the tax base depends on both labour supply and tax evasion or avoidance towards sheltered income, if such income is taxed at zero rate. This is important, since the optimal tax literature has recognized the importance of other behavioural reactions next to the traditional labour supply reaction. This holds especially for higher incomes. (See Saez, Slemrod and Giertz, 2012). In fact, the model that has developed above is an instance of income-shifting behaviour towards sheltered income in kind.

3. Numerical illustration: the company car regime

In this paragraph, we will attempt to provide plausible estimates of the MEB for Belgium taking into account tax expenditures related to the transport market, applied to the company car regime[8].

To provide reliable estimates for the MEB, we need extensive data on the company car market, as well as on the Belgian tax system. Also, plausible estimates of relevant behavioural elasticities are needed. Since we use a model based on heterogeneous households, we would like to have as much information on distributional characteristics as well.

As for the rate of subsidization of company cars, we rely on a multitude of sources.

We consider two subsidized goods: the capital component or leasing value of the car itself, and the number of kilometres driven. This is necessary since according to the tax system, both are treated in a different way. Fuel expenditure and therefore kilometres driven are from the viewpoint of the employee essentially free: no taxable income is imputed based on mileage. The imputation formula for the benefit in kind depends solely on the purchase value of the car and a coefficient based on CO_2 emissions per 100 km.

The marginal subsidy rate s' for mileage is thus 100%. For the capital component, we make use of a recent survey by CRB (2016a). They estimate the yearly leasing value to be 6 420 per annum. They also dispose of an estimate of the average yearly imputed taxable income, based on a database from Belgium's largest human resources provider. According to that dataset, the average yearly imputed value is 1869 euro per annum. This implies a marginal subsidy rate of about 70.9%.

We derive the value of mileage driven from the BELDAM survey of 2012. From that survey, we know that the average annual amount of vkm driven by a company car is about 35 908. (Laine and Van Steenbergen, 2016a). From this, we need to subtract the number of kilometres driven for work related purposes. We do include commuting kilometres in the value of the benefit in kind, which boils down to postulating that the location of residence/work is the result of the choice of the worker. Note that this is common practice in the literature on company car taxation (see e.g. Harding (2014), Van Ommeren and Gutierrez-i-Puigarnau, 2012)).

From the Beldam survey, we know that the use of company cars for business trips is quite common. About 94.5% of people with a company car state that they regularly make business trips. Some 80.8% also use the employer provided car for that purposes. From the trip dairy of that questionnaire, we find that average daily kilometres driven for business purposes is about 18.5 km, of 6 739 km yearly. This would leave some 29 169 kilometres for private purposes, commuting included. This is indeed significantly larger than the 20 000 kilometres that are commonly assumed. Assuming an average fuel cost of 9.3 euro per 100 vkm[9], we get a yearly benefit of 2 712 euro. We will assume that 93% of those receiving a company car, also receive a fuel card enable free refuelling. (De Borger and Wuyts, 2011)

---

8 Note that we analyse the rules in place at the time of writing, i.e. mid-june 2017. Currently a debate on a thorough reform of the tax regime for company cars is taking place of which the precise parameters are not known.

9 For an average diesel car, from the PLANET database, year 2012.

As for marginal external costs M_x we take 20.3 euro per 100 vkm, from Delhaye e.a. (2017). This is a comprehensive measure including congestion, environmental, accidents, noise and infrastructure costs. As far as company cars are more intensively used during rush hour, this estimate is conservative.

For tax data, we make use of publicly available figures and a microsimulation exercise using the FPS Finances SIRe model. That simulation increased the imputed value by 100 euro per household, so that an implicit marginal income tax rate can be deduced. Also, it yields the number of households with at least one company car. Both data are available by decile of taxable income. The results are given in table 2 below. Total taxable wage income by decile is also provided.

Table 2 Simulation imputed value +100 euro, results for taxable year 2014

	Number of affected households	% of population	Implied marginal income tax rate	Average taxable wage income (mio euro)	Total value of company cars (mio euro)
No taxable income		0.0%			
Decile 1 (poorest)	0	0.0%		794	
Decile 2	2 200	0.4%	28%	1 769	21
Decile 3	2 500	0.4%	36%	1 476	24
Decile 4	4 800	0.8%	41%	2 890	47
Decile 5	12 350	2.0%	45%	5 535	120
Decile 6	20 650	3.4%	45%	8 777	201
Decile 7	28 250	4.6%	45%	10 604	275
Decile 8	49 750	8.1%	47%	14 532	485
Decile 9	83 550	13.6%	49%	22 218	815
Decile 10 (richest)	208 600	33.9%	52%	41 952	2033

Source: Micro-simulation exercise with the SIRe model (FPS Finance, 2017) and own calculations based on STATBEL (2017) and BELDAM. The value of company cars comprises car leasing value and distance driven

These figures are helpful in providing the remaining parameters to the model. Before we proceed, we note the drawbacks of our approach. First, the simulation adds 100 euro to household taxable income, if a company car is present. If there are a significant number of households with more than one company car, we obviously underestimate the distortion caused by the subsidization scheme. Second, we work with taxable (wage) income from the personal income tax system, after deductions such as notional work-related expenditure, etc. This ignores the fact that subsidization is also done through the social insurance system. Company cars are exempt from employee contributions, while employers pay a CO_2 based contribution that is far less than the standard contribution rate. Third, the simulation is done at the household level. We know that 9% of households having access to a company car have access to more than one. Using this knowledge to correct for the number of company cars, we get a count of about 449 000 cars. This is somewhat more than the count by CRB (2016b), who estimate about 436 000 cars for the year 2015.

That said, table 3 summarizes the parameter values for the MEB estimation. The subsidy rate s_i is simply the marginal tax rate m_i times the marginal subsidy rate s_i', which is taken to be a constant fraction equal to the proportion of the benefit in kind that is exempted. Only due to rising marginal rates it is rising in income. The size of the subsidized good relative to the labour market π_i is constructed using the average value of the yearly real benefit-in-kind, the number of company cars and the size of taxable income. For both 'goods', the car and distance component, they are clearly rising in income. The capital cost accounts for a greater proportion of the overall benefit than mileage. Note that this estimate of the value of company cars is used to derive the size of the tax expenditure in table 1.

Table 3 Fiscal parameters and external costs

				Capital cost				Mileage			
	m_i	a_i	y_i	π_i	s_i	s_i'	M_x	π_i	s_i	s_i'	MEC_x
Decile 1 (poorest)	28%	-2%	0.7%	0.0%	20%	71%	0.0%	0.0%	28%	100%	218%
Decile 2	28%	0%	1.6%	0.9%	20%	71%	0.0%	0.3%	28%	100%	218%
Decile 3	36%	2%	1.3%	1.2%	26%	71%	0.0%	0.5%	36%	100%	218%
Decile 4	41%	8%	2.6%	1.2%	29%	71%	0.0%	0.5%	41%	100%	218%
Decile 5	45%	14%	5.0%	1.6%	32%	71%	0.0%	0.6%	45%	100%	218%
Decile 6	45%	18%	7.9%	1.6%	32%	71%	0.0%	0.6%	45%	100%	218%
Decile 7	45%	20%	9.6%	1.9%	32%	71%	0.0%	0.7%	45%	100%	218%
Decile 8	47%	23%	13.1%	2.4%	33%	71%	0.0%	0.9%	47%	100%	218%
Decile 9	49%	27%	20.1%	2.6%	35%	71%	0.0%	1.0%	49%	100%	218%
Decile 10 (richest)	52%	34%	37.9%	3.5%	37%	71%	0.0%	1.4%	52%	100%	218%

Source: own calculations and STATBEL (2017)

Legend: m_i = marginal tax rate by decile (see Table 2), a_i = average tax rates, y_i = share of decile i in income, π_i = benefit-in-kind as a percentage of the wage bill, s_i = total subsidy rate, s_i' = marginal subsidy rate, MEC_x = marginal external costs

We now only need estimates for the relevant behavioural elasticities. The central demand elasticity for cars is based on Van Ommeren and Gutierrez (2011), who found an elasticity for -2 for company cars. This is higher than the elasticity implied by Laine and Van Steenbergen (2015), whose behavioural reactions for the value of company cars imply an elasticity of -1.7. However, their measure is based on car size and vehicle age only and does not take into account all the options and models that may influences prices. The choice of an elasticity of -2 is in line with the literature, with Train and Winston (2007) finding elasticities between -1.7 and -3.2. The fuel price elasticity is taken to be -0.27, consistent with the parameters of the PLANET model. Due to lack of information, we assume that elasticities do not vary across income categories.

For labour supply elasticities, we will resort to scenario analysis given the uncertainty surrounding the exact level of the relevant elasticities. In choosing the basic scenario (S1), we follow Adams (2005) by respecting three 'stylized facts':

- Labour supply responses are concentrated on the extensive margin, so that the average $\eta_L > \varepsilon_L^u$.
- Extensive responses are high towards the bottom end of the distribution, and very low towards the top.
- Intensive elasticities are higher at the very top of the income distribution. This may be due to larger tax base elasticities because of higher avoidance opportunities, rather than labour supply elasticities.

Since considerable uncertainty remains, we perform sensitivity analysis focused mainly on the behaviour of top incomes. Table 4 summarizes.

Table 4 Labour supply elasticities on the intensive and extensive margin: scenarios

		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Average
S1	ε_L^u	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.182	0.10
	η_L	0.417	0.417	0.333	0.333	0.250	0.250	0.167	0.167	0.083	0.083	0.25
S2	ε_L^u	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.10
	η_L	0.400	0.400	0.300	0.300	0.200	0.200	0.100	0.100	0.000	0.000	0.20
S3	ε_L^u	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.273	0.11
	η_L	0.417	0.417	0.333	0.333	0.250	0.250	0.167	0.167	0.083	0.083	0.26
S4	ε_L^u	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.09
	η_L	0.417	0.417	0.333	0.333	0.250	0.250	0.167	0.167	0.083	0.083	0.24

Legend: ε_L^u the uncompensated elasticity of hours wrt. wages, η_L the participation elasticity wrt. wages

Table 5 shows the estimates of the marginal excess burden MEB. We give values for a model based on heterogenous households for a proportional reform that hits all income categories according to their share in taxable income. We also give estimates for a reform that raises marginal rates for the upper decile only. In every case, we give values for the MEB, based on the labour supply reaction only, one with added good market demand distortions, and one with marginal external costs.

S1 is the central scenario described above. Scenario S2 is based on the assumptions of Immervoll e.a. (2004) (IKKS). S3 and S4 present a high and low scenario with respect to the behavioural response of the 10th (richest) decile. The low scenario seems more likely in the case where only genuine labour supply reactions affect the government revenue. The high elasticity scenarios can be interpreted as stemming from sizeable evasion and avoidance opportunities other than company cars, if the tax rate on sheltered income is zero.

Table 5 shows that taking into account of additional distortions on the transport market may matter greatly for a correct estimate of the efficiency cost of labour income taxation. For a wholesale reform, the MEB rises by 23-32%, depending on the hypotheses. In other words, the efficiency cost of labour income taxation rises by 5-7 cents per euro of additional revenue. Even in the model where labour supply elasticities are the greatest, considering additional distortions adds 23% to the distortion of the income tax.

Table 5 Marginal Excess Burden estimates
Euro per euro of revenue

	Heterogenous households (wholesale reform)	Heterogenous households (top marginal rate only)
S1 (Central)		
Only labour supply (I)	0.22	0.35
Labour supply and car demand (II)	0.27	0.44
Labour supply, car demand and externalities (III)	0.28	0.46
(III/I - 1)	27%	32%
S2 (IKKS)		
Only labour supply (I)	0.13	0.12
Labour supply and car demand (II)	0.16	0.18
Labour supply, car demand and externalities (III)	0.18	0.20
(III/I - 1)	39%	58%
S3 (High)		
Only labour supply (I)	0.28	0.56
Labour supply and car demand (II)	0.33	0.69
Labour supply, car demand and externalities (III)	0.35	0.72
(III/I - 1)	24%	28%
S3 (Low)		
Only labour supply (I)	0.17	0.19
Labour supply and car demand (II)	0.21	0.25
Labour supply, car demand and externalities (III)	0.22	0.27
(III/I - 1)	32%	44%

Source: own calculations
Car demand encompasses type of vehicles and mileage.

The difference between the full and the restricted model is greatest for hikes in the top marginal income tax rate, since company cars tend to be concentrated in the highest decile, and because higher marginal rates tend to increase the reference subsidy rate. The MEB rises by about 8-16 cents per euro, or by about 28%-58%.

Next, we perform some sensitivity analysis with respect to the assumptions on the transport market. We vary in turn the elasticities of car and mileage demand and marginal external costs, using the assumptions of S1 as a benchmark.

For car demand, we use the extreme values of Train and Winston (2007), namely -1.7 and -3.2. For mileage, we use 0.12 and 0.35, which is the average elasticity of mileage with respect to the fuel price for commuting and other motives from the PLANET model respectively (see Mayeres e.a. (2008)). For marginal external costs, we use 24.65 euro and 13.25 euro per 100 vkm at peak and off-peak based on Delhaye e.a. (2017).

The following table shows again the MEB based on the labour supply reaction only, one with added good market demand distortions, and one with marginal external costs. The reference values for S1 are given, along with the sensitivity analysis.

Table 6 Marginal Excess Burden estimates: sensitivity analysis wrt. transport market assumptions
Euro per euro of revenue

	Labour supply (I)	Labour supply and car demand (II)	Labour supply, car demand and externalities (III)	I/III - 1
Central (S1)	0.22	0.27	0.28	27%
Car Demand				
El = -1.7	0.22	0.26	0.28	25%
El = -3.2	0.22	0.29	0.30	37%
Mileage Demand				
El = -0.12	0.22	0.26	0.27	22%
El = -0.35	0.22	0.27	0.29	30%
Marginal External Costs				
24.65 euro/100 vkm	0.22	0.27	0.29	25%
13.25 euro/100 vkm	0.22	0.27	0.25	29%

Source: own calculations

The results show that the main results are rather insensitive to reasonable variation in the main assumptions about transport sector. The added cost varies from 5-8 cents depending on the assumptions, which is not far from the central estimated of 6 cents.

4. Discussion

The framework presented in this paper can be used to analyse the desirability of different policy options aimed at removing the negative effects of subsidizing company cars. In turn, cash for car proposals and base-broadening/rate-cutting operations are discussed. In each case, we ask ourselves whether the marginal efficiency cost of the personal income tax system can be lowered, while leaving revenue *and* the distribution of the tax burden across income deciles unchanged.

As an alternative to the company car regime, an alternative policy ('cash-for-car') has been proposed that would allow current company car users to exchange their company car for a cash equivalent taxed at the same implicit rate. The basic idea is that two cash wages would exist, ordinary wages taxed at statutory rates and an alternative, taxed at a lower average rate equivalent to the current implicit tax rate of a company car. This second wage component would be sheltered from the general tax system, as is done for other fringe benefits in Belgium, such as 'restaurant cheques' and 'eco-cheques'.

Let us assume in what follows, that the ideal typical cash-for-car scheme is indeed a one-off reduction of the average tax burden on a certain amount of cash income for *current* company car holders, at *current* rules leaving average tax burdens, redistribution across income categories and government revenue unchanged. In essence, it seeks to 'freeze' the tax advantage enjoyed by current company car users.

The framework developed in this paper can be used to evaluate the merits of the general idea behind the scheme. Basically, if successful, 'cash-for-car' will incentivize company car users into abandoning their vehicle. In doing so, the distortion of marginal rates on the product market will cease to exist while the average tax burden remains the same, but statutory marginal rates remain in place. In our MEB formula, the term associated with the transport market distortion will disappear:

$$MEB^{CASH4CAR} = \frac{\sum_i \left[\frac{m_i}{(1-m_i)}\varepsilon_{Li}^u + \frac{a_i}{(1-m_i)}\eta_{Li}\right]\beta_i}{\sum_i \left[1 - \frac{m_i}{(1-m_i)}\varepsilon_{Li}^u - \frac{a_i}{(1-m_i)}\eta_{Li}\right]\beta_i}$$

Of course, this MEB is lower than the MEB at current rules showing an efficiency gain:

$$MEB^{CASH4CAR} < MEB^P$$

An alternative to 'cash-for-car' would be to simply abolish the subsidy to the company car regime, and use the proceeds to lower marginal rates so that the average tax burden again remains the same. This is for the population by decile taken together, since such a classic base broadening-rate cutting shift would distribute the tax advantage accruing to company car users across the whole of the working population.

As a result of such a tax shift the MEB would be lowered due to lower marginal rates m_i' *and* the absence of the transport market distortion:

$$MEB^{SHIFT} = \frac{\sum_i \left[\frac{m_i'}{(1-m_i')}\varepsilon_{Li}^u + \frac{a_i}{(1-m_i')}\eta_{Li}\right]\beta_i}{\sum_i \left[1 - \frac{m_i'}{(1-m_i')}\varepsilon_{Li}^u - \frac{a_i}{(1-m_i')}\eta_{Li}\right]\beta_i}$$

As such we can rank the different measures according to their marginal efficiency cost.

$$MEB^{SHIFT} < MEB^{CASH4CAR} < MEB^{P}$$

$MEB^{CASH4CAR}$ is simply equal to the marginal excess burden estimates from table 5 without the negative transport market effects. We leave the calculation of MEB^{SHIFT} for further work.

5. Conclusion and further work

This paper has sought to analyse the company car regime within a broader context. We sought to quantify the efficiency cost of the personal income tax in Belgium, taking into account the negative impacts of marginal rates on society through reduced labour supply and subsidization of cars and car use. We found that considering the impact on the transport market raises the efficiency cost of one additional euro of revenue significantly, compared to models that take into account of the traditional labour supply channel only.

From here, we see three avenues for further research.

First, we considered only the personal income tax system, which admittedly is a large portion of labour income taxation in Belgium, but not the only one. Indeed, the analysis could be enhanced by considering the broader tax-and-transfer system, such as social contributions, earned income tax credits, income related transfers, etc. This would enhance the analysis, not only because it would present a full picture of the impact of labour income taxation on the labour market, but also because company cars are also subsidized as well through social security contributions.

Second, the marginal excess burden resulting from a rate-cutting/base-broadening operation could be calculated. This would necessitate embedding the company car regime in a microsimulation model of the personal income tax system, by imputing the real benefit into the model. Then a reform could be simulated that abolishes the company car regime and uses the proceeds to cut marginal income tax rates so as to leave the distributional properties of the tax system intact.

Third, going yet another notch further, the company car regime could be embedded in a full model of optimal nonlinear income taxation. The parameters of the regime could be seen as a constraint given to a planner seeking to maximize a social welfare function by choosing the optimal nonlinear income tax schedule. The welfare gain (and different income tax schedule) resulting from removing the subsidy scheme can then be calculated.

Bibliography

Adam, S. (2005), '*Measuring the Marginal Efficiency Cost of Redistribution in the UK*', Institute for Fiscal Policy WP05/14

CRB (2016a), 'I*nventaris van de secretariaten met informatie en cijfergegevens die beschikbaar zijn om de huidige kostprijs van het woon-werkverkeer in België te berekenen*', CRB-CCE 2016-2150

CRB (2016b), '*Werkgeverstegemoetkomingen in de kosten van het woon-werkverkeer*', CRB-CCE 2016-2595

De Borger, B. and B. Wuyts (2011), *'The Tax Treatment of Company Cars, Commuting and Optimal Congestion Taxes'*, Transportation Research Part B Methodological 45(10), pp 1527-1544

Decoster, A., De Swerdt, K. and G. Van Camp (2010), *'Modelling Labour Supply and Policy Reform in the Belgian Tax Benefit Model'*, Taxes on Labour and Modelling Labour Supply – Report 2

Delhaye, E., De Ceuster, G., Vanhove, F. and S. Maerivoet (2017),*'Internalisering van Externe Kosten in Vlaanderen: Actualisering 2016'*, Studie uitgevoerd in opdracht van de Vlaamse Milieumaatschappij, MIRA, door Transport and Mobility Leuven

Desmet, R., Hertveldt, B., Mayeres, I., Mistiaen, P. and S. Sissoko, (2008), *'The PLANET Model: Methodological Report'*, FPB WP 10-08

Gutierrez-i-Puigarnau, E. and J. van Ommeren (2011), *'Welfare Effects of Distortionary Fringe Benefits Taxation: The Case of Employer Provided Cars'*, International Economic Review, 52(4), pp. 1105-1112

Harding, M. (2014), '*Personal Tax Treatment of Company Cars and Commuting Expenses: Estimating the Fiscal and Environmental Costs*', OECD Taxation Working Papers, No. 20

Immervoll, H., Kleven, H., Kreiner, C. and E. Saez, *'Welfare Reform in European Countries: A Microsimulation Analysis'*, Economic Journal 117, pp. 1-44

Jacobs, B. and R. De Mooij (2015), *'Pigou meets Mirrlees: on the irrelevance of tax distortions for the second-sest Pigouvian tax'*, Journal of Environmental Economics and Management, 71 pp. 90-108

Jacobs, B. (2016), '*The marginal cost of public funds is one at the optimal tax system*', mimeo: Erasmus Universiteit Rotterdam

Kamer van Volksvertegenwoordigers (2016),'*Inventaris 2014 van de vrijstellingen, aftrekken en verminderingen die de ontvangsten van de staat beïnvloeden*', annex tot de Middelenbegroting 2016.

Kleven, H. and C. Kreiner (2006), *'The Marginal Cost of Public Funds: Hours of Work versus Labour Force Participation'*, Journal of Public Economics 90 (2006) pp. 1955-1973

Laine, B and A. Van Steenbergen (2016a),'*The Fiscal Treatment of Company Cars in Belgium, Effects on Car Demand, Travel Behaviour and External Costs*', FPB WP 03-16

Laine, B and A. Van Steenbergen (2016b),*'Commuting Subsidies in Belgium'*, FPB WP 11-16

Parry, I. (1999), '*Tax Deductions, Consumption Distortions, and the Marginal Excess Burden of Taxation*', Resources for the Future DP 99-48

Parry, I. (2001), '*Comparing the Marginal Excess Burden of Labour, Petrol, Cigarette, and Alcohol Taxes: An Application to the United Kingdom*'. Resources for the Future DP 00-33REV

Parry, I. (2002), *'Tax Deductions and the Marginal Welfare Cost of Taxation'*, International Tax and Public Finance', 9(5), pp. 531-552

Saez, E. (2001), *'Using Elasticities to Derive Optimal Tax Rates'*, Review of Economic Studies, 68(1), pp. 205-229

Saez, E., Slemrod, J. and S. Giertz (2012), *'The Elasticity of Taxable Income with Respect to Marginal Tax Rates: A Critical Review'*, Journal of Economic Literature 50(1), pp. 3-50

Train, K.E. and C. Winston, *'Vehicle Choice Behavior and the Declining Market Share of U.S. Automakers'*, International Economic Review 48(2007), pp. 1469-96