Climate impact of tax reliefs in Switzerland

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The two authors bear full and sole responsibility for the contents of this report.

Summary

This report identifies federal and, subsidiarily, cantonal tax reliefs that indirectly induce large amounts of greenhouse gas emissions. We estimate the extent of these additional emissions as well as the budgetary cost of the tax reliefs. Those with the largest impacts should be further analysed before deciding to amend or even remove them with a view to contributing to reaching the net-zero target and balanced public budgets.

The main tax reliefs that we found to influence choices and behaviours towards greater climate impacts are the exemption of international aviation from mineral oil and value-added taxes, the deductibility of commuting costs, the exemption of light commercial vehicles from the heavy vehicle fee and the insufficient level of that fee for heavy commercial vehicles, the favourable income tax treatment of company cars and free parking, and the reimbursement of the mineral oil tax to licensed transport companies. Eliminating these tax reliefs entirely would lower GHG emissions by 2.5 million tonnes per year and improve federal revenues by 2.8 billion francs, and cantonal and communal revenues by 1.7 billion francs.

Résumé

Ce rapport identifie les allègements fiscaux fédéraux et, subsidiairement, cantonaux qui induisent indirectement de grandes quantités d'émissions de gaz à effet de serre. Nous estimons l'ampleur de ces émissions supplémentaires ainsi que le coût budgétaire des allégements fiscaux. Ceux dont l'impact est le plus important devraient faire l'objet d'une analyse plus approfondie avant de décider de les modifier, voire de les supprimer, afin de contribuer à la réalisation de l'objectif de zéro émission nette et à l'équilibre des comptes publics.

Les principaux allègements fiscaux qui influencent les choix et les comportements en faveur d'un impact plus important sur le climat sont l'exonération de l'impôt sur les huiles minérales et de la TVA pour l'aviation internationale, la déductibilité des frais de déplacement domicile-travail, l'exonération des véhicules utilitaires légers de la redevance poids-lourds et le niveau insuffisant de cette redevance pour les véhicules utilitaires lourds, le traitement favorable des voitures de société et du stationnement gratuit dans le cadre de l'impôt sur le revenu, ainsi que le remboursement de l'impôt sur les huiles minérales aux entreprises de transport concessionnaires. La suppression de ces allègements fiscaux permettrait de réduire les émissions de GES de 2,5 millions de tonnes par an et d'améliorer les recettes de la Confédération de 2,8 milliards de francs et celles des cantons et des communes de 1,7 milliard de francs.

Zusammenfassung

In diesem Bericht werden die Steuervergünstigungen des Bundes und – subsidiär – der Kantone identifiziert, die indirekt grosse Mengen an Treibhausgasemissionen verursachen. Wir schätzen das Ausmass dieser zusätzlichen Emissionen sowie die Haushaltskosten der Steuervergünstigungen. Die Steuervergünstigungen mit den grössten Auswirkungen sollten eingehender analysiert werden, bevor beschlossen wird, sie zu ändern oder gar abzuschaffen, um zur Erreichung des Netto-Null-Ziels und ausgeglichener öffentlicher Haushalte beizutragen.

Die wichtigsten Steuervergünstigungen, die Entscheidungen und Verhaltensweisen zugunsten einer grösseren Klimawirkung beeinflussen, sind die Befreiung des internationalen Luftverkehrs von der Mineralölsteuer und der Mehrwertsteuer, die Abzugsfähigkeit von Pendlerkosten, die Befreiung leichter Nutzfahrzeuge von der Schwerverkehrsabgabe und die unzureichende Höhe dieser Abgabe für schwere Nutzfahrzeuge, die günstige einkommenssteuerliche Behandlung von Firmenwagen und kostenloses Parken, sowie die Rückerstattung der Mineralölsteuer an lizenzierte Transportunternehmen. Durch die Abschaffung dieser Steuervergünstigungen würden die Treibhausgasemissionen um 2,5 Millionen Tonnen pro Jahr gesenkt und die Einnahmen des Bundes um 2,8 Milliarden Franken sowie die Einnahmen der Kantone und Gemeinden um 1,7 Milliarden Franken erhöht.

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Abbreviations

AG	Canton of Aargau
AI	Canton of Appenzell Innerrhoden (Inner Rhodes)
AR	Canton of Appenzell Ausserrhoden (Outer Rhodes)
ARE	Federal Office for Spatial Development
ASCM	Agreement on Subsidies and Countervailing Measures
BE	Canton of Bern
BL	Canton of Basel-Landschaft (Basel-Country)
bn	Billion
BS	Canton of Basel-Stadt (Basel-City)
CER-CE	Committee for Economic Affairs and Taxation of the Council of States
CHF	Swiss francs
CO2	Carbon dioxide
CSI	Conférence Suisse des Impôts
Cst	Federal Constitution
ct.	Swiss cent
DETEC	Federal Department of the Environment, Transport, Energy and Communications
ETH	Eidgenössische Technische Hochschule
EU	European Union
EUR	Euro
FDF	Federal Department of Finance
FDT	Federal direct tax, federal income tax
FFA	Federal Finance Administration
FOCA	Federal Office of Civil Aviation
FOCBS	Federal Office for Customs and Border Security
FOEN	Federal Office for the Environment
FÖS	Forum Ökologisch-Soziale Marktwirtschaft
FOT	Federal Office of Transport
FR	Canton of Fribourg
FSO	Federal Statistical Office

FTA	Federal Tax Administration
FTE	Full-time equivalent
FTO	Federal Transport Office
GDP	Gross domestic product
GE	Canton of Geneva
GHG	Greenhouse gas
GL	Canton of Glarus
GR	Canton of Grisons / Graubünden
GWS	Gesellschaft für wirtschaftliche Strukturforschung
HGV	Heavy goods vehicle
HVF	Heavy vehicle fee
Ju	Canton of Jura
KES	Commission Valeur locative / Changement de système
km	Kilometre
kWh	Kilowatt-hour
LCV	Light commercial vehicle
LHID	Federal Act on income tax harmonisation
LIFD	Federal Act on federal direct tax
LRPL	Heavy vehicle fee Act
LTA	Land Transport Agreement
LU	Canton of Lucerne
MTMC	Mobility and Transport Microcensus
NE	Canton of Neuchâtel
NW	Canton of Nidwalden
OECD	Organisation for Economic Co-operation and Development
ORPL	Heavy vehicle fee Ordinance
OW	Canton of Obwalden
PT	Public transport
RFI	Radiative forcing index
RPT	Regional passenger transport
RS	Classified compilation of Swiss federal laws Fedlex
SFAO	Swiss Federal Audit Office
SFOE	Swiss Federal Office of Energy
SG	Canton of St. Gallen (St Gall)
SH	Canton of Schaffhausen (Schaffhouse)
SO	Canton of Solothurn (Soleure)
SZ	Canton of Schwyz
TCS	Swiss Touring Club
TG	Canton of Thurgau (Thurgovia)
TI	Canton of Ticino (Tessin)
UNEP	United Nations Environment Programme
UR	Canton of Uri
VAT	Value-added tax
VD	Canton of Vaud
VS	Canton of Valais
WSL	Swiss Federal Institute for Forest, Snow and Landscape Research
ZG	Canton of Zug (Zoug)
ZH	Canton of Zurich

1. Introduction

1.1 Project objectives

The group of experts appointed by the Federal Council to review tasks and subsidies published its report on September 5th, 2024 (Group of Experts, 2024). In its appendix 1, it lists 200 tax reliefs at the federal level. These tax reliefs are well known by the administrations in charge of levying the corresponding taxes, but they are not listed in the Database of Federal Subsidies, even though government revenue that is otherwise due but is forgone or not collected is just as much a form of subsidy as any explicit financial contribution.[1] This could be because these subsidies are rather hidden and hard to measure, and because they should not exist.[2]

Some of these tax subsidies encourage choices that could, as a side effect, increase greenhouse gas emissions in Switzerland. The issue of subsidies that could involuntarily harm the environment was noted by the OECD in its latest economic survey of Switzerland (OECD, 2022, p. 44):

> *Reassessing and eventually removing various environmentally harmful subsidies and exemptions would result in a more coherent pricing and incentive system across sectors and provide a clearer market signal as to the societal costs of different activities. Subsidies and tax exemptions have historically benefited particular sectors such as agriculture, forestry and public transport (OECD, 2017) and removing them has proved politically difficult.*

The aim of this project is to identify the tax reliefs with the largest possible side effect on greenhouse gas emissions and to estimate the magnitude of this side effect. Reforming such tax reliefs should be a task of the public authorities based on article 12 of the new Climate and Innovation Act adopted by the Swiss population on June 18, 2023.

In addition, we estimate the budgetary cost of these tax reliefs. We hope to contribute, in this manner, to the current efforts of the Federal Council and some cantonal governments to reduce their budget deficits.

1.2 State of the art

The scientific field of research on subsidies with environmental side effects is not untouched, although it is fragmented. In Germany, for instance, the Forum for an Ecological and Social Market Economy (Forum Ökologisch-Soziale Marktwirtschaft) published a study in 2020 focusing on ten subsidies with particularly harmful side effects for the climate (FÖS, 2020). It was quickly followed by a report proposing how to shrink these subsidies in a socially responsible manner (FÖS, 2021).

More generally, there has been a longer tradition of studies on subsidies that could harm the environment. Since 1998 (OECD, 1998), OECD reports have developed a methodology for identifying and assessing such subsidies, which helps governments determine whether removing them would be environmentally beneficial. The methodology also allows accounting for social and economic considerations, next to the environmental impacts.

[1] C.f. the Agreement on Subsidies and Countervailing Measures under the World Trade Organization, which is also the reference for the OECD's publications on subsidies.

[2] "Aid in the form of tax relief is in principle waived", Federal Act on Financial Aid and Compensation of 1990, art. 7 lit. g (RS 616.1), our translation.

The OECD reports emphasize methodological issues, rather than actually estimating the magnitude of these subsidies and their impacts for the environment, mainly for lack of data. Therefore, the European Union picked up the thread and published several reports sharpening the OECD methodology for the European context, but still without quantitative results. This was left for the national governments to do, e.g., by the German Federal Office for the Environment (Umweltbundesamt, 2021) for all environmentally harmful subsidies, and for the Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, for "climate-counterproductive subsidies" specifically (Kletzan-Slamanig et al., 2022). These studies showed that two stages are necessary for assessing the effects of these subsidies:

1) The impact of a tax relief (the most relevant form of public aid in this context) on input choice (e.g., fossil fuel or pesticide) or activity choice (e.g., mode of transportation) must be quantified compared to a counterfactual without this tax relief;
2) The environmental or climate impact of that choice must be quantified.

These steps are easier to carry out for fossil energy than for many other inputs or activities, which is why the OECD more recently concentrated on developing a methodology for estimating the environmentally harmful effects of subsidies for fossil energy (OECD, 2020). Nevertheless, it only reports the budgetary cost of these subsidies. Thus, it reports a total of CHF 2.174 billion for fossil energy related subsidies in Switzerland in 2022. The bulk of it is for petroleum products (CHF 1.914 bn), mainly in the form of tax reliefs benefitting the transportation sector (CHF 1.792 bn), largest among which the excise tax exemptions for aviation fuels (CHF 1.267 bn), followed by the deduction of commuting costs (CHF 0.372 bn) (OECD, 2023).

In Switzerland, similar reflections emerged in 2006 following the Studer Heiner motion, adopted by Parliament four years later, which requested the Federal Council "to draw up a report and a project on an ecological reform of taxation and subsidies" (motion 06.3190, our translation). This resulted, in 2013, in the publication of a report, which, after examining a selection of ten subsidies, concluded that "the correction of the most inappropriate incentives is either already the subject of other projects or is not feasible due to international legal commitments" (Federal Council, 2013a, p. 25, our translation). Therefore, it turned out that "the potential of taxation to improve the ecological incentive structure is small and, in any case, restricted to transport" (ibid., pp. 25-26, our translation).

This did not discourage Lena Gubler and her co-authors of the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) from publishing a current and comprehensive overview of more than 160 subsidies and incentives that are wholly or partially harmful to biodiversity (Gubler et al., 2020). It was used by the Federal Office for the Environment as a basis for its own report on eight explicit subsidies that harm biodiversity (FOEN, 2022).

A short review of the results of Gubler et al. (2020) will be revealing. In this review, we concentrate on two sectors, transport and agriculture, which FOEN identified as the most problematic. In our own research, we extend the search for tax reliefs with large climate-harming side effects also to other sectors.

With respect to road and air transport, Gubler and her co-authors identified a large number of subsidies. These are mostly indirect (off-budget) or implicit, i.e., non-internalized external costs (pp. 65-67). By way of illustration, international aviation benefits from an implicit subsidy in the form of a tax exemption for kerosene, as shown above. The abolition of this tax exemption would lead to an increase in ticket prices and, consequently, to a decrease in the number of flights and a reduction in emissions. For the other modes of transport, public aid takes the much more indirect form of non-

internalised external costs. The magnitude of these external costs, including the climate impacts, is well known from the periodic assessments made for the Federal Office for Spatial Development (ARE, 2023a). Therefore, analysing all subsidies with large climate-harming effects in the transport sector requires a broad definition of subsidies – which might be problematic in terms of calculation and quantification methods, and also in communicating the results (more on this below).

Regarding the other important sector, agriculture, three types of subsidies identified by Gubler et al. (2020) are of particular interest for their possible climate impact: (1) the contribution to veal meat storage (CHF 3.1 bn in 2016), which resulted in a surplus of veal supply over demand (Dummler and Roten, 2018); (2) the various premiums granted to the dairy industry, for marketed milk, milk processed into cheese, and silo-free milk; (3) the reimbursement of the taxes on mineral oil, which amounts to about CHF 65 million per year (SFAO, 2018).

Gubler et al. (2020) could assess the impacts on biodiversity of the subsidies they identified only in a qualitative manner (mild, medium, strong), as biodiversity is hard to grasp quantitatively. It is easier to quantify the side effects of subsidies on energy consumption, as done by EBP (2024), or greenhouse gas emissions, as we show in this report. The EBP study is broader than ours in scope, as it examines also subsidies that are part of energy and climate policy, which we leave out, considering that they should be assessed in the context of analysing these policies. The EBP study is not only about subsidies, but more broadly about undesirable incentives ("*Fehlanreize*"), which includes prescriptions and their loopholes, or imperfect application of regulation. They identified 112 public measures that could lead to more energy consumption, of which they analysed 7 in greater depth, including a quantification of their impacts on energy consumption and a qualitative listing of other environmental, economic and social impacts. Of these seven, four are energy or climate policy measures. The three that are not – the exemption of light commercial vehicles from the performance-related heavy vehicle fee, the deductibility of commuting costs form taxable income, and the exemption of aviation from fuel and value-added taxes – we also analyse in this report.

A final mention is for an assessment by the Federal Tax Administration of the federal tax reliefs for the taxes that it levies, published in 2011 (Moes, 2011). It estimated that there were 99 tax reliefs costing the federal budget between CHF 17 and 21 billion, depending on the tax norm (Jeitziner and Moes, 2011).

1.3 Scope of "subsidies"

"State aid" (*staatliche Beihilfen*), as it is called in the European Union,[3] can take many forms. Next to the classic direct payments, these are tax relief, regulatory relief, non-internalisation of external costs, public credit at favoured conditions, state guarantees, etc. Only direct payments appear in public accounts, even if the other forms of aid also have budgetary impacts (particularly, tax reliefs). Therefore, measuring and understanding these indirect forms of aid and how they benefit their beneficiaries can be quite challenging for stakeholders.

The main goal of this research is to scrutinize state aid suspected of having particularly large harmful side effects for the climate and that can be easily understood and therefore reformed. We believe that this is more useful than an exhaustive overview. As a consequence, the focus was initially put on classic direct payments (forthwith called "**direct subsidies**") and on tax deductions, rebates, refunds and exemptions (forthwith called "**tax reliefs**"). That tax reliefs are just as important as direct subsidies

[3] <https://competition-policy.ec.europa.eu/state-aid_en>.

is well explained in the report of the group of experts appointed by the Federal Council to review tasks and subsidies (Group of experts, 2024, sect. 3.2.3, our translation):

> *Tax reliefs are derogatory tax regulations that are not justified by fiscal doctrine and, therefore, have a non-taxing purpose. They have the characteristics of a subsidy (financial aid), but with major disadvantages compared with expenditure-based subsidies: less transparency, less political manoeuvrability and, often, less precise targeting of the activity to be promoted and less effectiveness. For this reason, art. 7(g) of the Federal Act of 5 October 1990 on subsidies (LSu; RS 616.1) stipulates that financial assistance in the form of tax reliefs must be avoided in principle.*

As already mentioned, tax reliefs are not reported in the Database of Federal Subsidies. On the other hand, many of the subsidies in that database, such as federal contributions to social security, education and research, or infrastructures (railways, roads), do not qualify as subsidies under standard economic analysis. They are just regular public spending.

We only examined direct subsidies and tax reliefs, not the other forms of state aid. Nor did we consider prescriptions and other forms of public regulation that do not take the form of a payment by a public body or an exoneration from a payment. There are subsidies in the Database of Federal Subsidies that directly address climate change mitigation and adaptation, in particular energy saving and substitution, which we did not want to analyse in this report, as their climate impact is their goal and not a generally ignored side effect. Exemptions from instruments that aim at reducing greenhouse gas emissions (carbon tax, emissions trading system, etc.) could be seen as forms of subsidies. We also left them out of this analysis, because they should be assessed in the context of improving the effectiveness and efficiency of direct climate policy instruments.

We prioritized federal subsidies, but those that correspond to income tax reliefs also have a cantonal dimension, as the cantons apply their own tax rules to some extent. Therefore, they can be considered as cantonal subsidies with potentially climate-harming effects. However, examining in detail the public spending and tax systems of all cantons and municipalities was beyond the scope of this study.

At the end of our investigation, we found that tax reliefs have the greatest indirect impacts on greenhouse gas emissions, much more than the direct subsidies that we had also examined. Therefore, the reminder of this report focuses on tax reliefs. We believe that this is all the more warranted as they often go unnoticed or remain unchallenged.

1.4 Research steps

The first step in the research plan involves identifying tax reliefs with possibly large climate-harming side effects. Next, it must be verified that they qualify as tax reliefs, as not every tax deduction or exemption is contrary to fiscal doctrine. Some deductions are excessive, or some tax bases are underestimated. Estimating the size of the implicit subsidy in a tax relief is the next step, which then leads directly to estimating its budgetary cost.

Tax reliefs have climate-harming effects if they influence choices and behaviours in a manner that leads to more greenhouse gas emissions. Therefore, we try to determine how and by how much they influence choices and behaviours. Next, we estimate the additional emissions of CO_2 or other greenhouse gases attributable to this influence.

The decision to modify, lower or eliminate a tax relief should not be guided only by its budgetary cost and climate impact. Generally, tax reliefs serve some purpose, and changing them could have a string

of economic and social impacts. Although we do not have the resources to assess all those impacts, we discuss them at least qualitatively and provide orders of magnitude when possible.

The analysis of each tax relief occupies a chapter in this report. Each chapter ends with conclusions regarding the assessed tax relief. These are not firm recommendations; our analysis is not thorough and exhaustive enough for that. General limitations and caveats are discussed at the end of this chapter, but they should be kept in mind when reading every concluding section.

1.4.1 Finding relevant tax reliefs

When looking for tax reliefs that could be particularly harmful to the climate, one has to bear in mind that they can take indirect paths, such as tax reliefs for home ownership, which encourage households to occupy larger dwellings on the outskirts of town, thereby increasing their energy needs for heating and mobility.

Our starting points for identifying tax reliefs with potentially large climate-harming side effects are the reports and studies cited in the section "State of the art". Consider for instance the report of the Federal Council (2013a, our translation) on greening the system of taxes and subsidies, both for the definition of environmentally harmful subsidies and a first list of candidates:

> *Inappropriate environmental incentives occur when, in addition to their primary purpose, taxes or subsidies encourage environmentally harmful behaviour. The estimation of environmental impacts has only been carried out from a qualitative perspective. According to this, the way in which the following taxes and subsidies (grouped by areas of influence) are designed has harmful side effects on the environment:*
>
> - *Energy and material consumption and transport: deduction of transport costs for federal direct taxation, exemption of international air transport from mineral oil tax, allocation of mineral oil tax, refund of mineral oil tax and surcharge, exemption of agricultural vehicles from the performance-related heavy vehicle fee (HVF), exemption of light transport vehicles from the HVF.*
> - *Land use and degradation: setting rental values too low for the income taxes, exclusion of rents and rental values from value-added tax, certain subsidies in the agricultural sector (supplements for the dairy industry, contributions for the keeping of animals consuming roughage and for the keeping of animals in difficult production conditions).*

There could be many tax reliefs with potentially large climate-harming side effects. A very exhaustive list with 200 tax reliefs was published by the group of experts appointed by the Federal Council to review tasks and subsidies on September 5th, 2024, too late for this report (Group of Experts, 2024, appendix 1).[4]

1.4.2 Verifying that it is a tax relief

A deduction from taxable income may be justified by tax principles or not. There is often room for appreciation. E.g., to what extent is some cost incurred to earn some income really necessary? Is that size of deductible justified or excessive? In order to answer these questions, we consider economic principles, tax rulings, the literature and practices in other European countries.

[4] The experts rated tax reliefs on whether they are justified by fiscal doctrine and stand in reasonable relation with the goal pursued. These ratings are merely qualitative: no further examination needed / further examination needed / should be removed.

Particularly challenging is the consideration of practical constraints. Often, tax deductibles are set lump sum for simplification purposes. When this is deemed overly generous compared to deducting actual costs, this raises the question of whether actual costs could be identified with reasonable effort, both for taxpayer and tax authority. Similarly, non-monetary incomes are often estimated quite roughly or not at all, partly to limit administrative costs and to avoid erring against the taxpayer, partly to support or promote an activity. In such cases, comparing the practices of the Confederation and the cantons or between the cantons can be quite revealing: if some of them can estimate deductibles or incomes with higher accuracy, that should also be possible for the other ones.

1.4.3 Estimating the amount of subsidy and the potential additional revenue

The budgetary cost of a direct subsidy is quite straightforward, as it appears in public accounts. Tax reliefs do not appear in public accounts, but some budgetary costs have been estimated occasionally by the Federal Tax Administration or cantonal tax administrations. We extrapolate from such estimates when available. When these are not available, we make our own estimates using the best available data.

In the case of a tax relief, it is important to distinguish between the **amount of a subsidy** and the **potential additional revenue** from eliminating the tax relief. To understand, consider a commodity that is exempted from the 8.1 % value-added tax but should not be, e.g., tickets for international flights. Someone buying this commodity for CHF 100 saves CHF 8.10. This is the amount of the subsidy. The full cost of the subsidy is the total value of this commodity sold over one year, say CHF 100 million, times the VAT rate, i.e., CHF 8.1 million. Now, if this commodity were subject to VAT, its price would increase and its sales would decrease, say to CHF 90 million (we shall estimate these behavioural responses to eliminating subsidies). Therefore, the tax revenue would only be CHF 90 million × 8.1 % = 7.29 million. This is the potential additional revenue from eliminating the subsidy, also called **foregone tax revenue** or **budgetary cost** of the subsidy. It is smaller than the amount of subsidy due to a dynamic effect, the taxpayers' behavioural response.

A tax subsidy has climate impacts if it leads to additional GHG emissions, which implies that it has behavioural effects. Reducing or eliminating the subsidy would alter these effects and, generally, lower GHG emissions, but that does not imply that the potential additional revenues are necessarily smaller than the amount of subsidy due to this dynamic effect. To understand, consider an amount that can be deducted from taxable income, e.g., commuting costs. If we assume that this deduction is not justified, commuters enjoy a tax subsidy equal to the deduction multiplied by their income tax rate. Eliminating this deduction altogether would generate this same amount of additional tax revenue, even if commuters were to change their commuting habits. The behavioural response does not matter, because it no longer affects tax revenues.

1.4.4 Figuring the behavioural effects

Before estimating by how much a tax relief influences greenhouse gas emissions, it is necessary to understand how it affects behavioural choices. A tax relief can lower the net cost for consumers of purchasing some commodity, making it possible for them to buy more of that commodity, as if their income had increased (income effect). The tax relief could also render a commodity cheaper than a non-subsidised substitute, inducing buyers to buy more of the subsidised commodity (substitution effect). By making a commodity cheaper, the tax relief could influence the purchases of non-subsidised commodities that are usually purchased or used together with the subsidised commodity (e.g., electricity consumption increases if electric vehicles are subsidised).

Tax reliefs could also operate through less obvious channels, for instance by signalling that the favoured choices are considered as desirable by the authorities.

1.4.5 Estimating the climate impact

In order to assess all the implications of a tax relief for greenhouse gas emissions, the ideal tool is a computable model of the economy, which is capable of describing supply and demand in aggregated markets of the economy, as well as the interactions between these markets, including labour markets (employment, incomes), capital markets (investments, incomes), and foreign trade. Using such models for assessing the effects of explicit incentive taxes, such as carbon taxes, is quite common, see, e.g., our own work (Vielle and Thalmann, 2015; Thalmann and Vielle, 2019). They can also be used for assessing the removal of direct subsidies for fossil fuel purchases, e.g., Durand-Lasserve et al. (2015), or for modelling generic subsidies such as an output subsidy or a capital subsidy, e.g., Heutel and Kelly (2016). For more narrowly defined forms of state aid, computable macroeconomic models tend to be too gross in their sectoral disaggregation. Partial equilibrium models, which represent the behaviour of a single market and how it is affected by outside shocks, are more flexible and can be tailored to the specific design of a given subsidy (e.g., van Beers et al., 2007).

A key parameter of these models is the price elasticity of demand for goods possibly affected by the subsidy. In general, an elasticity measures the sensitivity of some quantity to some determinant in the form of a ratio of the proportional change in the quantity in response to a proportional change of the determinant. E.g., if the elasticity of gasoline demand with respect to income is estimated to be equal to 0.2, this means that a 10 % increase in income would lead to 0.2×10 % = 2 % more gasoline demand. This would also be the difference in average gasoline purchases by people with 10 % higher incomes.

In some cases, when supply is very elastic in the range of variation of demand caused by the subsidy, the elasticity of demand relative to the net price of the good (subsidy deducted) directly determines the impact of the subsidy. To illustrate, suppose that a tax subsidy can be shown to have the same effect on car usage cost as a 10 % decrease in the gasoline price. Using as an estimate of the elasticity of gasoline demand relative to its price the −0.34 estimated by Baranzini and Weber (2013), one can estimate that the subsidy increases gasoline demand by 3.4 %. Such a variation is not expected to lead to significantly higher gasoline price, nor is it expected to trigger significant changes in other markets through income effects. As a result, this is a good approximation of the impact of this tax subsidy on fossil fuel use, and thus, multiplied by the CO_2 factor of gasoline, on CO_2 emissions.

Elasticities are defined for small changes. Removing some tax reliefs can modify prices substantially, so that elasticities cannot appropriately reflect the implications on such changes on demand. A full specification of the demand function would be needed, which is rarely available. One solution, that will be used here extensively, consists in assuming that the demand function is isoelastic, i.e., that its functional form is such that the elasticity is the same at all price levels:

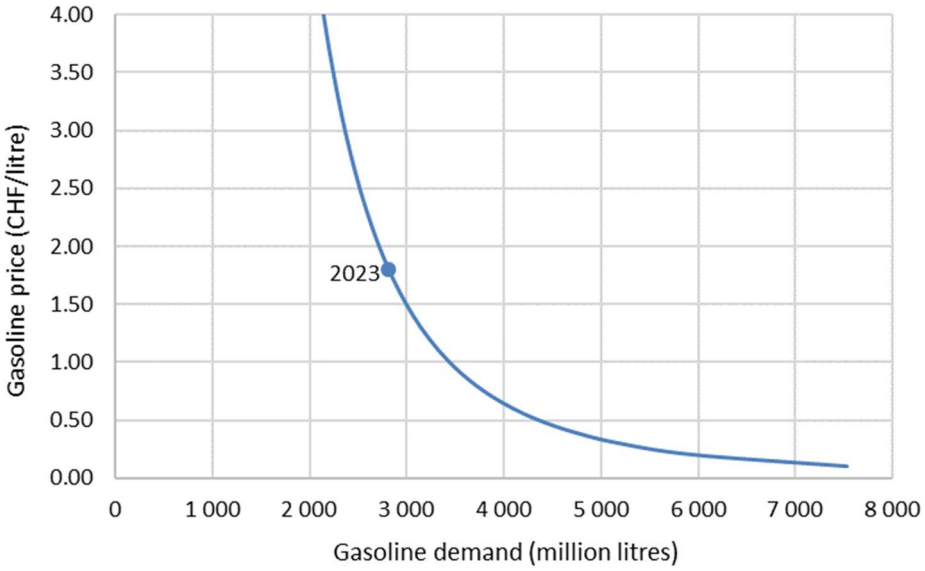
$$Q = Q^* \times P^{\varepsilon}$$

In this equation, Q is the quantity demanded, Q* is a scaling parameter corresponding to the quantity demanded for a price equal to 1, P is the price and ε is the demand elasticity.[5] An isoelastic demand function for gasoline in Switzerland is represented in Figure 1-1, using the data of 2023 – total gasoline

[5] It does not matter how prices are normalized to lie near 1, as we use the equation to compute the variation of demand for a variation of price, which only depends on the new price divided by the old price, see below.

consumption of 2 801 million litres for an average price of CHF 1.83 per litre (SFOE, 2024) – and an assumed demand elasticity of −0.34.

Figure 1-1 Isoelastic demand curve for total gasoline demand in Switzerland



With such a demand equation, the variation of demand when the price changes from P_0 to P_1 is as follows:

$$\Delta Q/Q = (P_1/P_0)^{\varepsilon} - 1$$

To illustrate, consider an increase in gasoline prices by 100 % due, for instance, to the removal of a subsidy, and suppose that the demand elasticity has be estimated at −0.34. Just using this elasticity, one would predict a 34 % decrease in gasoline demand. However, if that demand is isoelastic, the decrease in demand is only of 21 %.

In order to use these approaches with elasticities, a tax relief must be expressed as an equivalent reduction in the price of a related product for buyers or as an equivalent increase of the price for producers. For instance, the reduced VAT rate for accommodation services can be expressed as an increase in the price obtained by providers of such services. Next, estimates for the price elasticity of demand or supply for these services must be found. We searched the national and international literature for elasticities. With them, it is possible to estimate the impact of tax reliefs on consumption and production choices, and thus on GHG emissions associated with them.

When elasticities were not available in the literature, we looked for survey data that could inform us on potential or effective behavioural changes following equivalent policy measures.

Estimating by how much choices are affected by tax reliefs is the hardest part, but there remains to compute de climate impact of this.

In some cases, the CO_2 or GHG emissions of an activity are known and the estimation of behavioural effects indicates how much greater that activity would be in the absence of a tax relief. In these cases, it is easy to apply the proportional change in activity to the current level of emissions. In other cases, CO_2 or GHG emission factors must be used to translate additional activity into corresponding emissions.

1.4.6 Considering other impacts

Next, we estimate the budgetary impact of removing the tax reliefs with their climate-harming effects. FÖS (2021) computes a "reform efficiency" indicator by dividing the emissions triggered through a subsidy by the budgetary cost of that subsidy. We are not convinced that this is a very useful indicator, because a ratio implies a form of opposition: benefit over cost. When tax reliefs with climate-harming effects are removed, the reduction in GHG emissions comes with a budgetary benefit (win-win). One would rather want to add up the benefits, except that adding up tonnes of CO_2 and tax revenues makes no sense.

Before recommending the removal of tax reliefs for the sake of climate protection, it is necessary to consider their initial purpose. Some were created with the goal of promoting desirable behaviour (incentives). If that behaviour is still desirable and needs promotion, one has to consider whether this can be achieved with a form of aid that is less climate-harming. Some tax reliefs were introduced to support underprivileged social groups or regions. Again, we consider whether the support could be given in a form that is less climate-harming.

We also try to give an overview of other potential effects that removing or redesigning a tax relief is likely to have, such as changes in productivity, administrative costs, changes in the use of land or infrastructure as well as environmental or health externalities.

1.4.7 Concluding on tax reliefs, caveats and limitations

At the end of our multi-dimensional assessment of each tax relief, we recall its estimated budgetary cost and climate impact, as well as the other aspects to consider before removing it. We show alternatives, but we do not make recommendations for its redesign or removal, as we did not cover all aspects. In the minimum, one would have to verify whether the tax relief is best designed and effective in attaining the goal for which it was created.

Furthermore, the methods we use to estimate the climate-harming side effects of tax reliefs have shortcomings. An important one is that we cannot take into account the signal sent to citizens when an activity is tax favoured. For instance, when the State takes over part of the cost of using a car, this sends a signal that promotes car culture and strengthens resistance to decarbonisation. Standard estimation of the climate effect of removing such tax reliefs ignores the possibly large gains from eliminating such signals.

A further limitation of our calculations is that they are static, i.e., not taking into account future developments in, e.g., mobility habits and vehicle types.

A main limitation of our work comes from the small resources that we could invest into this research (0.6 FTE for one year) and the limited access we had to data. We strongly recommend that the analysis of tax reliefs we identified with potentially particularly large climate-harming side effects be deepened, with the help of (tax) authorities that have access to large sets of primary data.

2. Income taxes: Deductibility of commuting costs

Transportation is the only sector whose CO_2 emissions did not decrease since 1990 (FOEN, 2024a).[6] Emissions from cars were at the same level in 2022 as in 1990. They even increased from light-duty vehicles (+52 %), heavy-duty vehicles (+4 %), buses (+39 %), and motorcycles (+2 %). Over the same period, total greenhouse gas emissions in Switzerland decreased by 24 %. As cars account for 77 % of road transport emissions, looking at subsidies that could indirectly encourage their use are a natural place to start our analysis of subsidies with possibly climate-harming side effects.

The environmental performance review of Switzerland by the OECD in 2017 pointed at a possible subsidy with such effects:

"[In Switzerland,] expenses related to commuting by car are deductible […] at a rate of about EUR 0.7/km, significantly higher than in other countries with similar deductions: Germany comes second at EUR 0.3/km. […] volumes of personal transport (train and road) have been increasing in Switzerland faster than population and GDP. The tax treatment of company cars and commuting expenses has likely contributed to this trend." (OECD, 2017, p.111)

2.1 Overview

Commuting costs are deductible from taxable labour income. The deductible amounts depend on the mode of travel, as shown in Table 2.1. If one decides to use one's private vehicle despite the availability of public transport, one can only deduct public transport costs for that trip (FDF, 2022).

Table 2.1 Deductible commuting costs

Mode of travel	Rule	Deductible costs
Public transport	Actual ticket cost (up to the price of the monthly- or yearly-subscription for the journey)	19-25 ct./km (2023)[a] 41 ct./km in Vaud (2022)[b]
Car and Motorbike >50 cm^3	Flat rate or documented actual costs, "provided that public transport is not available or that the taxpayer cannot be [reasonably] required to use it" (Art. 5, our translation).[c]	Car: 70ct./km Motorbike: 40ct./km
Bicycles, mopeds and motorbikes of less than 50 cm^3	Lump sum amount regardless of distance covered	CHF 700/year

Source: FDF (2016)

[a] We take 2023 prices of a one-year public transport subscription for a few indicative commuting trips corresponding to the 13.9 km average one-way commute across all modes of transport (ARE, 2020, Tab. 59, p. 195): Buchs-Dällikon to Zürich HB costs CHF 1 150 (ZVV 2 zones), Riddes to Sion costs CHF 1 215 (CFF point-to-point travelcard), Rivaz to Lausanne costs CHF 1 370 (Mobilis 4 zones) and Schwarzwasserbrücke to Bern costs CHF 1 501 (Libero 4 zones). We then divide these by 6 116 km (= 2×13.9×220 days of commute).

[b] Vaud is a particular case where taxpayers can deduct a flat rate according to their commuting distance (Canton de Vaud, 2022, p. 21-22). In VaudTax 2022, the software for submitting tax returns in Vaud, a 14 km one-way commute for 220 days allows for a deduction of CHF 2 481 or 41 ct. per kilometre, which is 181 % of the equivalent one-year pass for 4 zones or 152 % of the cost of 220 half-fare return tickets (CHF 7.40). We are not aware of any such flat rate in other cantons; our search was, however, not exhaustive.

[c] The conditions under which private vehicle costs can be deducted are described in Appendix D.

In 2016, the deduction of commuting costs was capped at CHF 3 000 per year for federal direct tax (FDT) in order to contribute to the Financing and development of rail infrastructure (FAIF/FABI) project (DETEC, 2016). This generated an additional revenue of CHF 224 million (information obtained from

[6] We deducted "sales of motor fuel to non-residents and statistical divergence".

the Federal Tax Administration by Gubler et al., 2020). Fourteen German-speaking cantons followed suit and introduced caps between CHF 3 000 and 7 000 (FTA, 2022b). In Romandie, only Geneva introduced a cap (CHF 507 for tax year 2022),[7] which brought the Canton an additional revenue of CHF 36 million in 2018 (Jeannerat et al., 2019). Vaud has a reduced deductible fare of CHF 35 ct./km for car-kilometres beyond 15 000 km. In Valais, the fare decreases progressively beyond 15 000 km starting at CHF 65 ct./km (FTA, 2022b). In 2023, the cap for FDT was raised to CHF 3 200 to account for inflation (LIFD, art. 26 al. 1 let. a).

In 2020, the Federal Council commissioned the Federal Department of Finance (FDF) to review the deduction of professional costs from taxable income with the triple aim of simplifying the current system, achieving tax neutrality with regards to the different forms of work, and keeping tax revenues constant. In its report, the FDF suggested that each employee should have a choice between a tax revenue neutral lump sum deduction and the deduction of proven actual costs, keeping the existing cap on deductible commuting costs (FDF, 2022).

2.2 Existence of tax relief

2.2.1 Commuting as professional cost or private consumption

Swiss legislation prescribes that "the taxpayer may deduct expenses necessary for generating income and that have a causal relationship with it" (Ordonnance 642.118.1 sur les frais professionnels). The current deduction system considers that commuting costs belong to these "necessary expenses". Kletzan-Slamanig et al. (2022) oppose the following argument: consider two people working in a town; Aziz lives in the town and, therefore, has low (or zero) commuting costs; Bettina lives out of town, has high commuting costs, but lower housing costs than Aziz. Bettina can deduct commuting costs, whereas Aziz cannot deduct her rent premium. Consequently, the deduction subsidises urban sprawl compared to living in urban centres. Along the same line, the Federal Tax Administration argues that commuting should be treated like any other private consumption, since it is the result of personal decisions of residence and workplace location, and of how to commute (Federal Council, 2013a). As such, commuting costs should not be deductible from taxable income.[8]

In practice, only few people are able live right next to their workplace. Kletzan-Slamanig et al. (2022) argue that some commuting can therefore be considered as professionally driven, but that beyond a given distance, personal motives (i.e., choice of place of residence) prevail. Following this argument, commuting costs should be deductible up to this threshold where private choice becomes the main driver. Alternatively, a lump sum deduction could replace the deduction of actual costs. From an economics perspective, this has the advantage of being neutral to individual preferences of how to "allocate" these professional costs, e.g., choosing to pay a higher rent in exchange for lower commuting costs.

[7] 58 % of the population approved the proposal in a vote in 2016. The case of Geneva is particular with its small area and high share of cross-border workers from France or other Swiss cantons: These are mostly affected by the measure, but they could not vote about it (Francey, 2016).

[8] "With regard to their classification as tax relief, commuting expenses in particular are controversial in the specialised literature. In the absence of universal criteria, the FTA has classified travel expenses as a tax relief because, in its view, households are mobile. Thus, according to the FTA, the distance from work is the taxpayer's free decision; commuting expenses are therefore considered private consumption rather than income-earning expenses" (Federal Council, 2013a, our translation).

In a review of the tax treatment of commuting costs in OECD countries, Harding (2014) finds that they are not deductible in 15 of 27 countries covered in the report. In one of these, the Netherlands, only public transport costs are deductible against proof that the home-to-work distance exceeds 10 km (Nalog.nl, 2023).[9]

Redesigning the system in a way that allows for the deduction of a "reasonable amount" of professional costs with the least harmful incentives is perhaps more relevant than finding which part is a subsidy and which is not. Thus, a lump sum deduction for professional costs seems to be a good candidate. Setting the deductible amount can be left to the legislator.

2.2.2 Alternative viewpoints

In the following analysis, we shall consider four viewpoints or "philosophies" as alternatives to the current system. The magnitude of the subsidy, in each case, is the difference between the budgetary cost of the current system and that of the policy corresponding to the philosophy:

1. All commuting is consumption: there should be no deduction for commuting.
2. A certain commuting distance is inevitable, and everything beyond that is private consumption. Under this view, commuting costs are deductible up to a monetary or kilometre cap, and the deduction of commuting costs in excess of that cap are a form of subsidy. The cap adopted for FDT in 2016 is a natural candidate. It amounts to 3 000, periodically adjusted for inflation, which puts it at CHF 3 200 for tax year 2023 (FTA, 2022a). This amount can be interpreted as a cap on deductible commuting distance of 10.4 km one way for 70 ct./km, or 14.5 km for the "best in class" unit cost of 50 ct./km (see below).[10]
3. Only commuting with the cheapest means ("best in class") is necessary, and every expense beyond that is consumption. We consider here the minimum necessary commuting cost (cheapest car or public transport pass) as the reference amount. For the calculations that follow, we assume that the deductible costs for car commuters are reduced to 50 ct./km, which is the TCS estimated kilometre cost for a Fiat 500e car (Allianz, 2023). The deductible costs for public transport users are already those of the cheapest pass, except in Vaud (see section 2.1).
4. Professional costs can take various forms and each worker should be allowed a same, lump sum deductible amount. Thus, the tax system does not discriminate between taking on higher rental costs to live closer to work and deciding to take on higher commuting costs and pay a lower rent. We assume that the lump sum deduction would be tax revenue neutral, thus not affecting the state budget. Since the lump sum deduction is independent from commuting behaviour, it is equivalent in terms of climate impact to entirely removing the deductibility when income effects are ignored.

A fifth alternative, which we do not analyse due to dynamic complexity and lack of data, is the Dutch scenario in which only public transport costs are deductible against proof of usage (see above). This is likely to lead many people to switch from individual motorised transport to public transport (PT) for

[9] Employers can reimburse car commuting costs and deduct these as commercial costs, as long as these do not exceed PT costs.

[10] 10.4 km × 2 commutes per day × 220 days × 70 ct./km = 14.5 km × 2 commutes per day × 220 days × 50 ct./km = CHF 3 200. The maximum CHF 3 200 cap for FDT is currently independent from the numbers of days of commute or from part-time/full-time work (own test with VaudTax 2023, the software for submitting tax returns in the Canton of Vaud). Following the argument above, that cap should be proportional to the number of days of commute to correspond to the inevitable commuting distance.

their commute and deduct the latter, mitigating the tax revenues gains. On the other hand, many of those who commute by car and deduct PT costs (because they could use the PT alternative) may not change their behaviour, but could no longer deduct any commuting costs. As for the climate effect, more people are likely to give up commuting by car than under the "no deductibility scenario". On the other hand, PT commute could strongly increase, and it also emits GHG, although in much smaller amounts than individual motorised transport. As for other considerations, this policy provides no incentive to reduce commuting distance by PT, so that it is likely to increase the problem of peak hour PT demand and the need for PT infrastructure, with its consequences on, e.g., land use and biodiversity.

2.3 Cost of the tax relief

There exist no data on the foregone tax revenue due to the deductibility of commuting costs. Gubler et al. (2020) use estimates by the Federal Tax Administration of foregone tax revenue at the federal level, as well as calculations by Canton Zurich, which they extrapolate accounting for cantonal differences in population and cap on deductible commuting costs. We further develop their model to account for differences in marginal tax rate to estimate foregone tax revenue corresponding to each of the viewpoints listed above.

Altering the deductibility of commuting costs would likely lead some commuters to commute less. This dynamic effect matters when there remains a deduction related to actual commuting costs, as is the case in the "best in class" scenario. Indeed, commuters would pay more income tax not only because they can deduct less per kilometre, but additionally because they would deduct fewer kilometres. As a result, the potential tax revenue of the reform is larger than the amount of subsidy.

In contrast, the behavioural response of commuters does not matter in the case of outright elimination or capping the deductibility of commuting costs, as the (lower) commuting distances become irrelevant for income taxation.

2.3.1 Elimination of the deductibility or general cap

We assume a cap of CHF 3 000 when estimating the subsidy under our "general cap scenario", although the cap for FDT was increased to CHF 3 200 in 2023. The reason is that we use as a basis estimates made by federal and cantonal authorities at a time when the cap for FDT was CHF 3 000. The results of this scenario as well as the scenario that eliminates commuting cost deductibility entirely are shown in Table 2.2. The amount of subsidy is equal to the potential tax revenue in these two cases.

Table 2.2 Estimated additional tax revenue for cantons and municipalities from capping or eliminating the deductibility of commuting costs

Canton	Number of commuters (IMT and public transport, 2021)	Median marginal tax rate (weighted average)	Cap on deductible transport costs	Estimated additional tax revenue with CHF 3000.- cap (million CHF)		Estimated additional tax revenue with entire elimination of deductibility (million CHF)	
				Canton	Communes	Canton	Communes
Zürich (before introduction of cap)	515 695	15.1%		44.5	48.5	118.3	129.0
Zürich	515 695	15.1%	5 000	18.2	19.8	92.0	100.3
Bern / Berne	335 239	20.0%	6 700	20.7	22.5	84.6	92.2
Luzern	145 271	15.2%	6 000	6.1	6.7	27.2	29.6
Uri	11 384	12.0%		0.8	0.9	2.1	2.3
Schwyz	55 761	11.4%	8 000	2.3	2.5	8.3	9.1
Obwalden	13 041	12.1%	10 000	0.7	0.8	2.2	2.4
Nidwalden	14 606	11.7%	6 000	0.5	0.5	2.1	2.3
Glarus	13 988	15.4%		1.2	1.3	3.3	3.6
Zug	40 903	8.7%	6 000	1.0	1.1	4.4	4.8
Fribourg / Freiburg	120 781	21.8%		15.1	16.4	40.1	43.7
Solothurn	96 878	19.5%		10.8	11.8	28.8	31.3
Basel-Stadt	42 461	19.2%	3 000	0.0	0.0	4.8	5.3
Basel-Landschaft	87 929	21.8%	6 000	5.3	5.8	23.6	25.7
Schaffhausen	27 537	18.6%	6 000	1.4	1.5	6.3	6.8
Appenzell Ausserrhoden	19 038	16.8%	6 000	0.9	1.0	3.9	4.3
Appenzell Innerrhoden	5 686	12.2%		0.4	0.4	1.1	1.2
St. Gallen	182 329	19.0%	4 460	5.9	6.5	38.9	42.4
Graubünden / Grigioni / Grischun	61 247	18.0%		6.3	6.9	16.8	18.3
Aargau	249 558	17.2%	7 000	13.8	15.0	54.7	59.6
Thurgau	101 381	16.0%	6 000	4.5	4.9	19.9	21.7
Ticino	101 791	19.0%		11.1	12.1	29.5	32.2
Vaud	265 017	20.5%		31.2	34.0	82.9	90.3
Valais / Wallis	114 735	21.5%		14.2	15.4	37.7	41.0
Neuchâtel	60 267	22.8%		7.9	8.6	20.9	22.8
Genève	120 416	23.4%	507	0.0	0.0	2.8	3.1
Jura	22 806	21.8%		2.8	3.1	7.6	8.3
TOTAL	**2 825 743**			**183**	**200**	**647**	**704**

Sources and explanations:
Number of commuters with individual motorised transport and public transport in 2021: FSO (2023c)
Median marginal tax rate: Average of the marginal tax rates in each municipality minus the marginal FDT rate for a single person, without dependent children and earning between CHF 80 000 and CHF 90 000, weighted by the number of taxpayers paying FDT in that municipality (own calculation using data from FTA, 2023b and <https://swisstaxcalculator.estv.admin.ch/#/taxburden/income-wealth-tax> – see Appendix A for calculation details)
Cap on deductible transport costs: FTA (2022b); cap for Obwald from Kanton Obwalden (2021), "641.412 - Ausführungsbestimmungen über den steuerlichen Abzug von Berufskosten bei unselbstständiger Erwerbstätigkeit", 30 November
Additional tax revenues are extrapolated from estimations by the Confederation and the Cantons of Zurich (purple, white and green cells) or Basel-Stadt (blue cells). The sources and calculations are explained below.

Details of the calculations

Table 2.3 shows the estimates we gathered from external sources and how we used them to estimate proportional changes in tax revenue under different cap scenarios.

Table 2.3 Estimates from external sources of additional tax revenue from capping or eliminating the deductibility of commuting costs

	Introducing CHF 5000 cap (compared to no cap)	Introducing CHF 3000 cap (compared to no cap)	Eliminating deductibility (compared to CHF 3000 cap)	Eliminating deductibility (compared to no cap)
Federal direct tax		224	372	596
ZH Canton	26.3	44.5	73.8	118.3
ZH Municipalities	28.7	48.5	80.5	129.0
BS Canton		2.91	4.83	
BS Municipalities		3.17	5.26	

The numbers in the beige cells come from external sources (see below). The numbers in the other cells are extrapolations based on the numbers in the beige cells assuming equal ratios between two columns for all rows and between Canton and Municipalities tax revenue. The full elimination (column 5) is the sum of two stepwise eliminations in columns 3 and 4.
Sources (for beige cells):
Additional FDT revenue following the introduction of the CHF 3 000 cap: Information obtained from the Federal Tax Administration by Gubler et al. (2020)
Additional FDT revenue from completely eliminating the deductibility: OECD (2023): foregone tax revenue for 2022, figure obtained from the Federal Council and the Federal Tax Administration
CHF 5 000 cap in ZH: Regierungsrat des Kantons Zürich (2017)
Introducing CHF 3 000 cap in ZH: Regierungsrat des Kantons Zürich (2016)
BS: Regierungsrat des Kantons Basel-Stadt (2015)

To extrapolate the estimates from Zurich and Basel to other cantons, we use cross-multiplication to account for differences in the number of commuters and in the marginal tax rate. However, this method cannot be applied to the cantonal differences in the cap on the amount of deductible commuting costs, since assuming a constant ratio would yield the same tax revenue, no matter if the cap is lowered from CHF 10 000 to 5 000, or from CHF 5 000 to 0 (= eliminating the deductibility). This is not the case, as can be inferred from Table 2.3, because the number of people who deduct commuting costs of CHF 5 000 or more is greater than those who deduct CHF 10 000 or more (the former include the latter, but not necessarily vice-versa).

Using the data from Table 2.3 for the Canton of Zurich, we could plot foregone tax revenue for caps of CHF 3 000 and CHF 5 000 as displayed in Figure 2-1. We estimate the slopes for caps above CHF 5 000 assuming that the ratio between the slopes is the same.[11]

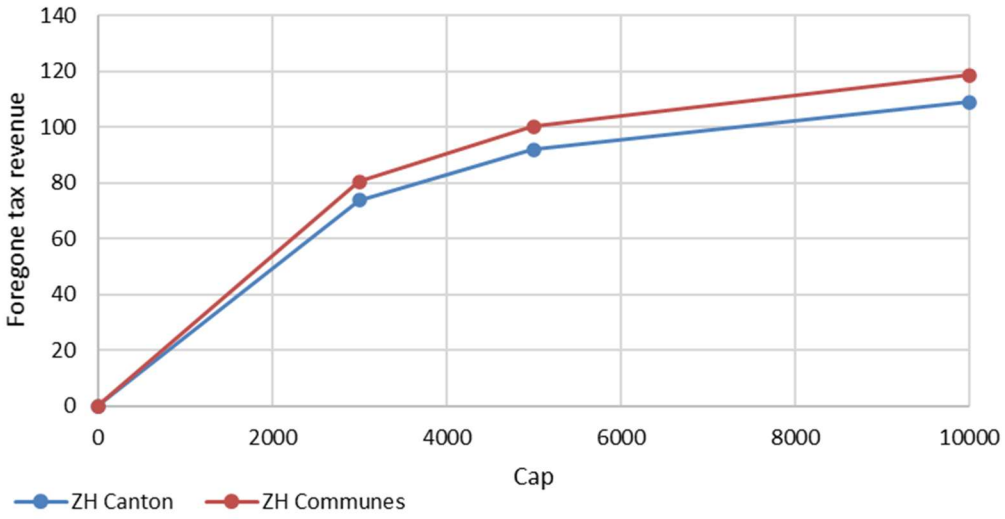
This now allows us to estimate the foregone tax revenue for cantons in which the cap is higher than in Zurich (rows in white in Table 2.2). Here is an example for Bern:[12]

Tax revenue BE = {[tax revenue ZH] + [slope at cap > 5 000] × ([cap BE] – [cap ZH])} × [tax rate BE] / [tax rate ZH] × [commuters BE] / [commuters ZH]

[11] [Slope CHF 3 000 – 5 000] / [Slope CHF 0 – 3 000] = [Slope > CHF 5 000] / [Slope CHF 3 000 – 5 000].
[12] We use the slope for "ZH Canton" for the calculation of additional revenue for the cantons, and the slope for "ZH Municipalities" when calculating for municipalities.

For cantons that do not have caps (purple rows), we extrapolate the numbers for "Zürich (before introduction of cap)". For St. Gallen, the calculation is the same as above except that we use the slope for caps between CHF 3 000 and 5 000. For Geneva, we extrapolate the data from Basel.

Figure 2-1 Foregone tax revenue in the Canton of Zurich as a function of the cap on the deductibility of commuting costs



Sources: Own calculations based on data displayed in Table 2.3.

2.3.2 "Best in class" deductibility

In this subsection, we estimate the additional tax revenue under a scenario in which car commuters can only deduct 50 ct. per kilometre driven.[13] To do this, we need to account for dynamic effects, that is, we need to estimate how many of those who currently commute by car would switch to public transport. The calculations are detailed below.

In Table 2.4, we allocate the total foregone tax revenue from the deduction of commuting costs from Table 2.5 (CHF 1 703 million) to each transport mode. The share allocated to passenger cars is CHF 1 504 million. Then, under a benchmark deductibility of 50 ct./km, we consider that the subsidy is 29 % (= 20ct./70ct) of those CHF 1 504 million. This yields an estimate for the total subsidy for passenger cars of **CHF 430 million**.

However, we have seen in section 2.1 that car commuters who have a public transport option which they can be reasonably required to use must declare public transport costs. We do not have data on the share of passenger car commuting kilometres that are declared as public transport kilometres and thus not impacted by the reduction in the deductibility for passenger car. We therefore estimate a low-end scenario where only 50 % of car commuters deduct car commuting costs. This is simulated by altering Table 2.4 through the attribution of half of the share of commuting distance of passenger cars (34 %) to public transport. Then, applying the procedure described in the previous paragraph yields an amount of subsidy of **CHF 310 million** for those who deduct their car commuting costs.

[13] The TCS estimated kilometre cost for a Fiat 500e car (Allianz, 2023).

Table 2.4 Reduction in tax revenue from the deduction of commuting costs by mode of transportation (ignoring deductions for bicycles)

	A: Share of commuting distance	B: Deductible cost per km (CHF)	A x B	Share of total deducted commuting costs	Total value of deductions (million CHF)
Passenger cars	68%	0.70	0.48	88%	1 504
Public transport	25%	0.22	0.06	10%	174
Motorbikes	2%	0.40	0.01	1%	25
Total	95%		0.54	100%	1 703

Sources: Share of commuting distance from FSO and ARE (2023), G3.4.2.1; deductible costs per km from FDF (2016) and own calculations (see Table 2.1, the deductible cost per km for public transport is a middle value); total foregone tax revenue from own calculations in subsection 2.3.1
Note: We multiply each mode's share of the commuting distance by the deductible cost per kilometre to get column "A × B". Divided by the total for that column, this yields the share of total deducted commuting costs, which we then multiply by the total reduction tax revenue to get the reduction in tax revenue per mode

Those were estimates of the subsidy at the present moment. To estimate the potential tax revenue, we need to account for dynamic effects. Indeed, we estimate that fuel demand decreases by 8 % as a result of the introduction of the "best in class" deduction policy (see subsection 2.5.3 below). Let us assume that this is the result of 8 % of car commuters switching to public transport (we ignore the potential increase in fuel demand from public transport). Hence, for these "switchers", the new deductible cost is 22 ct./km, that is a reduction in deductible cost of 69 % compared to 70 ct./km. We estimate an additional tax revenue of CHF 78 million from these switchers.[14] For the remaining 92 % who would continue commuting by car, the deductible amount decreases by 29 % to 50 ct./km, which yields an additional tax revenue of CHF 397 million.[15] Total tax revenue increases by a total of **CHF 475 million**.

In the low-end scenario where only 50 % of car commuters deduct car commuting costs, we again alter Table 2.4 by moving half of the share of commuting distance of passenger cars to public transport. Then, applying the procedure described in the previous paragraph yields a potential tax revenue of **CHF 341 million**.

2.3.3 Summary

The estimated foregone tax revenue estimated compared to each alternative scenarios is displayed in Table 2.5. The amount of subsidy itself, i.e., how much commuters save under the current deductibility regime compared to each philosophy of what should be deductible, is equal to the foregone tax revenue for the first two scenarios. It ranges between CHF 310 and 430 million for the "best in class" scenario.

[14] CHF 1 504 million × 8 % × 69 % = CHF 78 million.

[15] CHF 1 504 million × 92 % × 29 % = CHF 397 million.

Table 2.5 Cost of tax relief (= foregone tax revenue) under three policy options

Alternative policy	Potential tax revenue
Deductibility entirely eliminated	CHF 352 million (Confederation) + CHF 647 million (cantons) + CHF 704 million (municipalities) = **CHF 1 703 million**
Cap of CHF 3 000 in all cantons	CHF 183 million (cantons) + CHF 200 million (municipalities) = **CHF 383 million**
Best in class deductibility	**CHF 341 million to CHF 475 million**

Sources: Own calculations; Tax revenue for the Confederation from completely eliminating the deductibility from OECD (2023): data for 2022, obtained from the Federal Council and the Federal Tax Administration

2.4 Behavioural effects of the tax relief

Tax deductions influence commuting behaviour, for example by substituting towards more expensive means of transport or increasing the length of the commute. The various incentives are briefly exposed in this section.

Motorised individual transport

The deduction system increases the relative attractiveness of private vehicle usage over other means of transport.[16] To avoid incentivising car usage, the Federal Tax Administration allows the deduction of the costs of using a private vehicle only if using public transport is not an option. Testimonies from the authors' acquaintances suggest that in practice that proof is not difficult to make. Furthermore, this is one more incentive to choose a residence location with poor public transport connection, thus contributing to urban sprawl and more car ownership and usage.

Longer commuting distance

For both public transport and motorised private transport, the deduction reduces the cost of kilometres travelled to go to work.[17] Consequently, "separating the place of residence from the place of work is becoming more attractive, which tends to lead to increased urban sprawl, higher volumes of traffic and therefore higher energy consumption" (Federal Council, 2013a, p. 5037, our translation). Since commuting usually takes place during peak hours, the tax deductibility is likely to lead to higher levels of congestion and relatedly of CO_2 emissions, as well as to increased pressure on infrastructure and thus higher needs for capacity, i.e., more or bigger trains and buses as well as more or larger roads, all of which mean more emissions of CO_2.[18]

[16] This also means that a cap on the deductible amount is likely to impact car users more than, e.g., public transport users since the deductions of the former are more likely to exceed the cap. Also, the maximum deduction for public transport commuters is already capped at CHF 4 080, which is the price of a second-class public transport general subscription for all of Switzerland (Canton de Vaud, 2022).

[17] The flat rate deduction for public transport commuting costs in Vaud, which is somewhere between the actual costs of public transport and those of car usage (see Table 3.1), provides an additional incentive to commute longer distances both for public transport commuters and for car commuters who cannot justify car usage and thus deduct public transport costs.

[18] Working from home is also disincentivised, which is likely to add peak hour traffic. However, more home office could lead to higher housing demand without necessarily an equivalent reduction of office space demand, as well as additional travel to far away "holiday-office" locations.

Car size and carpooling

While the flat kilometre rate incentivises using a low-consumption car, it removes all incentives to carpool (the deduction is only for one person per car). The income effect, i.e., higher income leading to the purchase of larger cars, depends on the recycling of the additional tax revenue.

Conclusion on behavioural effects

Generalising the CHF 3 200 cap on deductible commuting costs only limits the above climate-harming incentives to the distance corresponding to the cap (about 10 kilometres for 220 days of commute); reducing the deductibility for commuting by car to 50 ct./km lessens these incentives, while removing the deductibility or replacing it by a lump sum deduction fully removes them.

2.5 Climate impact of the tax relief

We are not aware of any research on the impact of the deductibility of commuting costs on commuter behaviour in Switzerland. Harding (2014) argues that it is likely to have contributed to the fast increase in the volumes of personal transport in Switzerland (train and road), which has outpaced growth in both population and GDP. In Germany, which is almost ten times more populated than Switzerland, the Office for the Environment simulated a hypothetical removal of the "distance allowance" (neutral to the chosen mode of transport) of EUR 0.3/km in 2005, projecting yearly CO_2 emissions savings of 4.3 million tonnes by 2020 and 4.9 million tonnes by 2030 (Rodt et al., 2010).[19,20] The 20-25 % reduction in the deductible amount per kilometre in Germany between 2003 and 2004 provides an interesting "natural experiment". Weiss (2009), the only study trying to quantify the impact of that policy change, finds that it led to a significant reduction in commuting distance and that the behavioural change was greater the higher the marginal tax rate.

To begin with, we estimate the amount of greenhouse gas emissions potentially subsidised by the deductibility. Passenger cars emitted 10 221 847 tonnes of CO_2 in 2018 (FOEN, 2024a). From the 2015 Mobility and Transport Microcensus, we know that 22 % of the distance covered by passenger cars is for commuting to work (FSO and ARE, 2017, Graph G 3.4.1.4). This yields 2 249 000 tonnes of CO_2. For simplicity, we ignore emissions from motorcycles – about 240 000 tonnes of CO_2 and 30 % of distance for commuting.[21]

[19] German taxpayers can deduct EUR 0.3/km of distance between work and home per workday, regardless of the form of transport used. For example, someone travelling 10 km to go to work in the morning and 10 km back home in the evening can only deduct 0.3 × 10 × number of days of work in the year. Since tax year 2022, taxpayers can deduct EUR 0.38/km from the 21st kilometre of home-work distance (Bundesregierung Deutschland, 2023).

[20] Burger and Bretschneider (2021) quote a figure of 2 million tonnes of CO_2 reduction per year by 2030 had the subsidy been removed in 2021. We could not find the book that was referenced for this figure.

[21] A few comments on our methodology:

- Unlike other studies (EBP/Ecoplan, 2014; EBP, 2024), we consider that company car owners also benefit from the deductibility of commuting costs, since the tax paid by company cars users only covers the in-kind benefit of strictly private use, i.e., commuting costs are considered professional costs. Hence, to respect the principle of tax equality, eliminating the deductibility of commuting costs requires taxing the in-kind income corresponding to the commuting part of company car users.
- CO_2 emissions and distances are from 2018 and 2015 because more recent data are influenced by the COVID pandemic: there was a 19 % decrease in total distances covered by the Swiss population in 2021, and average commuting distances decreased by 7 % (FSO and ARE, 2023, p. 17 and Table T3.4.1.1). However, because working from home is more common today than pre-2020 (Federal Council, 2024a), CO_2 emissions

We now analyse each scenario individually. First, we estimate the impact on commuting costs for the average car commuter of moving from the current deduction system to each of the alternatives proposed above. Next, we estimate how this change in commuting costs affects commuting practices. Last, we estimate what this implies for fuel use and CO_2 emissions.

2.5.1 Deductibility entirely eliminated

We estimate **tax savings for an average car commuter under the current system at 14.8 ct./km**, calculated as follows:

1. **Deductible amount = CHF 4 435.** The average one-way car commuting distance is 14.4 kilometres (ARE, 2020, Table 59, p. 195), multiplied by two and by 220 days of commute yields 6 336 kilometres per year for the average (full-time) commuter at a rate of 70 ct./km.[22]
2. **Tax saving up to CHF 3 200 = CHF 717.** We estimate the average marginal tax rate across all Swiss municipalities for a median worker at 22.4 % (see Appendix A for detailed calculations).[23] This rate is applied to the first CHF 3 200 of commuting costs that are deducted.
3. **Tax saving beyond CHF 3 200 = CHF 219.** A maximum of CHF 3 200 can be deducted from FDT. Given that eleven cantons do not cap the deductibility and that the level of the caps vary widely between those who do (see Table 2.2), we only consider the cap for federal direct tax (FDT) for simplicity and thus assume that all commuting costs are deductible for cantonal and municipal tax. Hence, the marginal tax rate for the remaining CHF 1 235 is the 22.4 % marginal tax rate minus the estimated 4.6 % marginal FDT rate for a median worker (see Appendix A), that is 17.8 % as a median marginal tax rate for cantonal and communal income taxes.
4. This yields a **total tax saving of CHF 937,** or 14.8 ct./km.

This implies that variable costs faced by car commuters increase by 89 % if the deductibility of commuting costs from taxable income is entirely eliminated (see Table 2.6). To come to this result, we use disaggregated costs per kilometre estimated by the Swiss Touring Club (TCS). We deduct per kilometre tax savings from the average variable cost to find the after-tax variable cost with the deduction, that is the actual cost of commuting under the current system. If the deductibility is eliminated, the variable cost faced by commuters is the TCS estimate.

In order to estimate the impact of such an increase in variable cost on the kilometres driven, we need long-term elasticities of car commuting relative to variable costs.[24] What is available in the literature are elasticities of fuel consumption relative to fuel prices. These can be used after we express the increase in variable cost due to the removal of the tax deduction as an equivalent increase in fuel

from commuting are likely to have decreased. These figures therefore need to be updated once more recent data are published.

[22] Assuming that all car commuters commute 220 days a year is likely to overestimate the average commuting distance per year, and thus to underestimate the climate impact, since a lower commuting distance implies a higher average tax saving per kilometre (because of the cap for FDT).

[23] We take the marginal tax rate for a median (rather than average) income, since…

- mostly middle-income earners deduct commuting costs in Switzerland (see section 2.6);
- marginal tax rates cease to increase at the top end of the income distribution;
- this is a more conservative approach.

[24] For an explanation of what an elasticity is, see section 1.4.5.

price. It is not absolutely equivalent, though. Here are some key differences, and the likely implications for the estimation of the effect of the removal of the subsidy on kilometres driven:

- The salience of a fuel price increase is a lot greater than that of the removal of a tax deduction. This causes the use of fuel price elasticities to overestimate the effect of the removal of the subsidy.
- Fuel price increases are often interpreted, generally correctly, as transient, while the removal of a tax deduction would be seen as permanent and trigger a stronger response, particularly regarding long-term decisions such as what car to buy and where to live. This leads to an underestimation of the effect of the removal of the subsidy.
- Higher fuel prices provide an incentive to switch to more fuel-efficient or electric cars, which a removal of the deductibility of commuting costs does not. This makes fuel demand less elastic to the deductibility of commuting costs than to fuel prices and means that we would overestimate the impact of removing the deductibility. On the other hand, if commuters cannot mitigate the impact of the increase in commuting costs by switching to more fuel-efficient cars, they have a greater incentive to switch to other modes of transport or to reduce their commute.
- Elasticities are estimated over small ("marginal") variations in price. A large increase in car costs, as with the removal of the deductibility, is likely to affect personal decisions of where to live or whether to own a car. A small price increase is unlikely to have this effect. This leads to an underestimation.

Overall, it is not clear whether our choice of using the fuel price elasticity under- or overestimates the impact of removing the deduction of commuting costs. We consider that the fuel price elasticity is the best available proxy for the elasticity of commuting demand relative to an increase in variable cost.[25]

Another issue is that elasticities measure the change in demand for small changes in its determinants. In this case, the increase in variable costs due to the removal of the subsidy is quite large. In order to calculate the impact of large price changes, the full demand function is needed and we know only one parameter of this function: its elasticity close to average fuel prices. We therefore assume that commuting demand is isoelastic, i.e., its functional form is such that the elasticity is the same at all price levels (see section 1.4.5).

Under all these assumptions, we find that entirely eliminating the deductibility of commuting costs from taxable income leads to a 22 % reduction in kilometres driven and fuel demand (Table 2.6).

[25] We assume that the fuel price elasticity of commuting is equal to the overall fuel price elasticity. Fuel price elasticity is usually higher for purely private trips, which are less "necessary", and lower for business trips, which are often deemed "necessary". The price elasticity of commuting trips is between these two, hence probably close to the overall elasticity.

Table 2.6 Calculation of the impact on fuel demand from entirely eliminating the deductibility of commuting costs

		ct/km
Kilometre cost (TCS)		
Fixed costs	58.1%	43.6
Variable costs	41.9%	31.4
- fuel	18.2%	13.7
- other	23.7%	17.8
Total km cost pre tax		**75.0**
Tax deduction		
Tax saving		14.8
Total km cost after tax		60.2
Variable cost after tax		**16.6**
Impact of eliminating the tax deduction		
Increase variable cost	89%	14.8
Equivalent increase fuel cost	108%	14.8
Equivalent new fuel cost		28.4
Fuel price elasticity	-0.34	
Variation isoelastic fuel demand	**-22%**	

Sources: Kilometre costs from TCS (2023a)[26], own calculation of tax saving (see just above), long term fuel price elasticity from Baranzini and Weber (2013)[27]

2.5.2 Cap of CHF 3 200 (CHF 3 000) in all cantons

If cantons follow the Confederation and set the maximum deduction of commuting costs at CHF 3 200, variable costs increase only for deductible kilometres driven above that CHF 3 200 cap. We however do not know how many kilometres that is. We therefore use as a proxy the additional tax revenue from removing that cap (Appendix E).[28] This has the advantage of accounting for the already existing caps in some cantons.[29]

We assume a cap of CHF 3 000 in our calculations below, although the cap for FDT was increased to CHF 3 200 in 2023. The reason is that we use as a basis estimates made by federal and cantonal authorities at a time when the cap for FDT was CHF 3 000.

[26] The reference cost per car-kilometre calculated by the Swiss Touring Club (TCS) for an average new car increased from 71 ct./km in 2022 to 75 ct./km in 2023. The FTA, for its part, estimated the actual average car-kilometre-cost at 67 ct. in 2022 (Grand Conseil du Canton de Vaud, 2023). Adding the 4 ct./km increase identified by the TCS for 2023, which is mostly due to the sharp increase in the price of new cars, this amounts to 71 ct./km (TCS, 2023b).

[27] Other studies, e.g., SECO (2024), have estimated lower fuel price elasticities, without being quite comparable. Erath and Axhausen (2010) estimated that the price elasticity of gasoline demand ranges between −0.31 and −0.61, and for diesel demand it ranges between +0.32 and −0.67.

[28] The relationship is linear: Additional tax revenue = Deductible distance × 70 ct./km × marginal tax rate.

[29] We remove the differences in cantonal tax rates. We however do not know if the cantons assume any changes in commuting behaviour in their estimates of additional tax revenue.

The calculation is as follows:

a) Estimated additional tax revenue for cantons and municipalities from introducing a CHF 3 000 cap (assuming a unique tax rate across cantons): CHF 310 million (see Appendix E, bottom)
b) Estimated additional tax revenue for cantons and municipalities from entirely eliminating the deductibility (assuming a unique tax rate across cantons): CHF 1 121 million (see Appendix E, bottom)
c) Ratio of distance driven beyond cap over total commuting distance: 28 %. We derived this from taking the ratio of the estimate listed above under a) over b).
d) CO_2 emissions from commuting beyond the CHF 3 000 cap: 621 000 tonnes. This is 28 % of 2 249 000 tonnes, the CO_2 emissions in scope estimated at the beginning of this section.[30]

Next, using the "fuel price elasticity" method, we estimate in Table 2.7 that, for deductible kilometres beyond the CHF 3 000 cap, the variable cost increases by 66 %. Using the fuel-elasticity method, this yields a 20 % reduction in those kilometres.[31]

Table 2.7 Calculation of the impact on fuel demand beyond the CHF 3 000 cap from eliminating that cap in all cantons

		ct/km
Kilometre cost (TCS)		
Fixed costs	58.1%	43.6
Variable costs	41.9%	31.4
- fuel	18.2%	13.7
- other	23.7%	17.8
Total km cost pre tax		**75.0**
Tax deduction		
Deductible amount		70.0
Marginal tax rate beyond CHF 3 000.-	17.8%	
Tax saving		12.4
Variable cost after tax		**19.0**
Impact of eliminating the tax deduction		
Increase variable cost	66%	12.4
Equivalent increase fuel cost	91%	12.4
Fuel price elasticity	-0.34	
Variation isoelastic fuel demand	**-20%**	

Sources: Kilometre costs from TCS (2023a) (see Table 2.6); own calculation of the marginal tax rate (see Appendix A), long term fuel price elasticity from Baranzini and Weber (2013)

[30] This ignores the fact that some of this CO_2 is emitted by non-deductible commuting, i.e., for distances driven beyond the caps existing in some cantons.

[31] The increase in variable cost is less than in the "deductibility entirely eliminated" scenario due to the lower marginal tax rate used. The marginal tax rate used here is the overall rate minus the marginal FDT rate, since these costs above the cap can already not be deducted for FDT.

2.5.3 "Best in class" deductibility

The same "fuel price elasticity" method is used to estimate the impact of a "best in class" policy. For simplicity, we leave aside the CHF 3 200 FDT cap when estimating tax savings under the new policy.[32] We find that reducing the deduction per car kilometres to 50 ct. leads to an 8 % reduction in CO_2 emissions from car commuters.

Table 2.8 Calculation of the impact on fuel demand from reducing the deduction from 70ct./km to 50 ct./km

		ct/km
Tax deduction (current system)		
Variable cost after tax		**16.6**
Tax deduction (best in class)		
Deductible amount		50.0
Marginal tax rate	22.4%	
Tax saving		11.2
Total km cost after tax		63.8
Variable cost after tax		**20.2**
Impact of reducing the deduction from 70 ct./km to 50 ct./km		
Increase variable cost	21%	3.6
Equivalent increase fuel cost	26%	3.6
Fuel price elasticity	-0.34	
Variation isoelastic fuel demand	**-8%**	

Sources: Kilometre costs from TCS (2023a) (see Table 2.6); own calculation of the after-tax variable cost under the current system (see Table 2.6) and the marginal tax rate (see Appendix A), long term fuel price elasticity from Baranzini and Weber (2013)

2.5.4 Alternative scenarios of who deducts car commuting cost

Although testimonies from the author's acquaintance indicate that it is quite often easy to justify need for commuting by car,[33] car commuters who can be "reasonably expected to use public transport" (see Table 2.1) are required to deduct public transport costs. These will not be equally affected by changes in the deductibility of car commuting costs.

We do not have information on the share of passenger car commuting kilometres that are declared as public transport kilometres. We therefore estimate two scenarios: one in which all car commuters deduct car costs and another where public transport costs are deducted for 50 % of car kilometres. While we believe that it is unlikely that the actual value is close to either of these extremes, this provides a range for our estimations.

We estimate the impact of entirely eliminating the deductibility on commuters who deduct public transport costs in Table 2.9 by assuming the removal of a deduction of 22 ct./km (the middle value for

[32] The average commuter barely reaches this cap (CHF 3 168 deductible costs) due to the much lower deduction per kilometre.

[33] For longer distances, unless one lives and works next to train stations that are directly connected by fast trains, commuting by car easily saves at least half-an-hour per trip (when traffic is fluid). Other justifications the authors collected among their acquaintances, and which were accepted by tax authorities, include "sometimes needing to carry material".

public transport costs for cantons except Vaud in Table 2.1), and applying the "fuel price elasticity" method. For the other alternative policies – cap and "best in class" deductibility – we assume that commuters who deduct public transport costs are not impacted.[34]

Table 2.9 Impact of eliminating the deductibility on fuel demand of car commuters who deduct public transport costs

		ct/km
Kilometre cost (TCS)		
Fixed costs	58.1%	43.6
Variable costs	41.9%	31.4
- fuel	18.2%	13.7
- other	23.7%	17.8
Total km cost pre tax		75.0
Tax deduction		
Deductible amount		22.0
Marginal tax rate	22.4%	
Tax saving		4.9
Variable cost after tax		**26.5**
Impact of eliminating the tax deduction		
Increase variable cost	19%	4.9
Equivalent increase fuel cost	36%	4.9
Fuel price elasticity	-0.34	
Variation isoelastic fuel demand	**-10%**	

Sources: Kilometre costs from TCS (2023a) (see Table 2.6); own calculation of the deductible amount for public transport commuters (see section 2.1) and marginal tax rate (see Appendix A), long term fuel price elasticity from Baranzini and Weber (2013)

2.5.5 Summarizing the impacts of the three scenarios on CO_2 emissions

Reductions in CO_2 emissions under the three scenarios are estimated in Table 2.10 by multiplying emissions in the scope of the subsidy by a factor which reflects the variation in fuel demand. For the scenario under which only 50 % of car commuters deduct car costs, we take half of the "100 % scenario", except when the deductibility is entirely eliminated, in which case we add the 10 % reduction in fuel demand estimated for the half that deducts public transport costs (see subsection 2.5.4).

Table 2.10 Reduction in CO_2 emissions from removing/lowering the subsidy under three alternative policies

Alternative policy	**Reduction in GHG emissions ('000 tons CO_2eq)**	
	if 50 % deduct PT costs	if 100 % deduct car costs
Deductibility entirely eliminated/lump sum deduction	360	497
Cap of CHF 3 000 in all cantons	61	123
Deductibility of 50 ct./km (best in class)	86	171

[34] The average commuter is far from reaching the threshold of CHF 3 000 when deducting 22 ct./km.

As expected from section 2.5, the CO_2 impact of fully eliminating the commuting allowance or replacing it by a lump sum largely exceeds that of the other alternatives. Our estimation of the impact of fully eliminating the deductibility is in the same range as that of Rodt et al. (2010) for the German allowance when correcting for the population size, and this despite the fact that the distance allowance in Germany is much lower than the deductibility in Switzerland (see beginning of this section). We do not account for the potential increase in CO_2 emissions in public transport, which could reduce the gain by some 3 to 5%.[35] Nor do we account for changes in geographic distribution of housing, which are likely to happen in the longer term, but are difficult to quantify (see Erath and Axhausen, 2010).

2.6 Other considerations

2.6.1 Possible societal effects of modifying the deductibility of commuting costs

Removing or replacing the deductibility of commuting costs is likely to have other, non-climate impacts, on the following societal aspects.

Worker productivity

Worker productivity may decrease if deducting commuting costs increases workers' willingness to travel longer distances in order to take higher-paying jobs (assuming that wages reflect productivity). However, this is only true if deducting these costs influences workers' choices of workplace (rather than residence) location. Also, workers may be more productive (and happier) when their commute is shorter and active, i.e., they walk or cycle (Ma and Ye, 2019; Xiao et al., 2021). If commuting as such does not increase productivity, Richter (2006) makes an argument for actively taxing commuting, since keeping income tax revenue constant, such a tax allows for lower income tax rates, which in turn can improve productivity.[36]

Labour force participation

The deductibility of commuting costs mitigates distortions towards leisure activities or non-lucrative work caused by taxation. An effect of removing or reducing the deductibility could be lower labour force participation, particularly of the lower-income population. With an econometric analysis of the 2001 to 2006 German Socio-Economic Panel, Weiss (2009) finds that the reduction in the deductible amount to the tune of 20-25 % between 2003 and 2004 did not have any significant impact on labour force participation. Furthermore, any potential effect depends on the use of the additional tax revenue: according to simulations by Jacob et al. (2016) in Germany, an increase in the lump sum deduction e.g., is likely to increase labour force participation (see discussion at the bottom of this section).

Other external effects

Commuting in motorised vehicles and urban sprawl have other well-documented external costs (Ecoplan/INFRAS, 2024). Air and noise pollution as well as accidents and lack of exercise adversely impact public health, and consequentially reduce labour force participation and productivity. Congestion costs are mostly born by travellers themselves. Biodiversity loss is documented by Gubler

[35] A good part of the commuters who would switch to public transport might just fill up the existing buses and trains. Hence, estimating how many more trains and buses would be needed seems complicated.

[36] "It is simply not efficient to tax the use of non-leisure time if it earns income and not to tax it if it saves costs on housing" (Richter, 2006, p. 690).

et al. (2020). Demand on scarce resources (oil, metals, urban space and other land, …) also has far reaching consequences, such as industrial accidents in the oil and mining sectors, dependency on importations, pollution, conflicts, etc. In contrast, walking and cycling generate external benefits (Ecoplan/INFRAS, 2024). The excess of external costs over benefits could be reduced by removing or redesigning the deductibility of commuting costs.[37]

Administrative costs, fairness and dishonest behaviour

The current deduction system is complicated, costly to the tax administration and to taxpayers,[38] and makes it virtually impossible to verify the compliance of the declared commuting costs. Not only is there a financial incentive to declare costs above those actually incurred, the only risk (if caught) being that of paying the tax difference due to the "mistake", but the added feeling of unfairness leads many people to declaring public transport costs for the distance they actually walk or cycle ("Why should I, because I adopt the pro-social behaviour of cycling or walking to work, pay more taxes?").[39] Conversely, a lump sum deduction has almost zero administrative costs and leaves no room for "cheating". Fairness is however subjective, and those who commute long distances might find it unfair that someone who has low commuting costs can deduct the same lump sum amount. Further research into the public acceptability of different tax regimes regarding commuting costs would prove helpful.

Tax equity

Any reform of the deductibility of commuting costs for employees would require an equivalent change in the taxation of self-employed workers and employees using a company car.

Structurally weak rural-peripheral regions

Limiting or eliminating the deductibility of actual commuting costs might lead workers with purchasing power to migrate from these regions, which would have negative impact on the economic activity in these areas and lead to further concentration of economic activity.

Distributional effects

Federal statistics do not cover the deduction of transport costs, which would be necessary to investigate distributive impacts at the federal level. However, the Federal Tax Administration analysed the impact of entirely eliminating the deductibility of commuting costs for federal direct tax using data collected in the canton of Bern for the year 2005, and the Federal Department of Finance made a similar but less detailed analysis for the introduction of a tax revenue neutral lump sum deduction with 2018 data from three cantons. This gives us some useful information, which we summarise below. We then look at suggestions from the literature to mitigate adverse distributional effects of eliminating or limiting the deductibility of commuting costs.

[37] See, e.g., Roy (2014) for a quantification and discussion of social costs of cars in general and of the tax treatment of commuting and of company cars in particular.

[38] Which is why the Federal Council commissioned the Federal Department of Finance to suggest a reform in the deduction system (FDF, 2022)

[39] Asking a few acquaintances who walk or cycle to work, we observe that most declare public transport costs for these trips.

2.6.2 Cantonal evidence on taxpayers affected

A 2022 report of the Federal Department of Finance examined professional deductions by taxpayers of the cantons of Bern, Basel-Land and Solothurn (FDF, 2022). A cap on deductible commuting costs only affects taxpayers who deducting more than this cap. Who this is, is shown in Table 2.11.

Table 2.11 Deductions from taxable income per income decile in three cantons

	Canton	Valeur moyenne	1er décile	2e décile	3e décile	4e décile	5e décile	6e décile	7e décile	8e décile	9e décile	99e percentile
Frais de déplacement en francs	BE	1679	0	700	700	1100	1576	2222	3000	3000	3000	3000
	BL	1127	0	700	960	960	960	960	960	1132	3000	3000
	SO	1598	0	616	700	869	1456	2156	3000	3000	3000	3000
Frais supplémentaires pour repas hors domicile en francs	BE	1845	0	0	1050	1600	1650	2700	3200	3200	3200	3200
	BL	1470	0	0	0	735	1600	1650	2640	3200	3200	3200
	SO	1372	0	0	0	495	1320	1600	2400	3200	3200	3200
Autres frais professionnels en francs	BE	2291	2000	2000	2000	2000	2000	2000	2209	2576	3246	4000
	BL	2440	2000	2000	2000	2000	2000	2173	2498	2978	3895	4000
	SO	2296	2000	2000	2000	2000	2000	2052	2301	2669	3327	4000
Somme des déductions	BE	5815	2501	3572	4600	5355	6077	6618	7248	8150	8433	10 200
	BL	5037	2636	2960	3600	4292	4940	5600	6160	6664	8022	10 200
	SO	5266	2209	2738	3600	4431	5177	6018	6714	7634	8281	10 136

Source: FDF (2022)

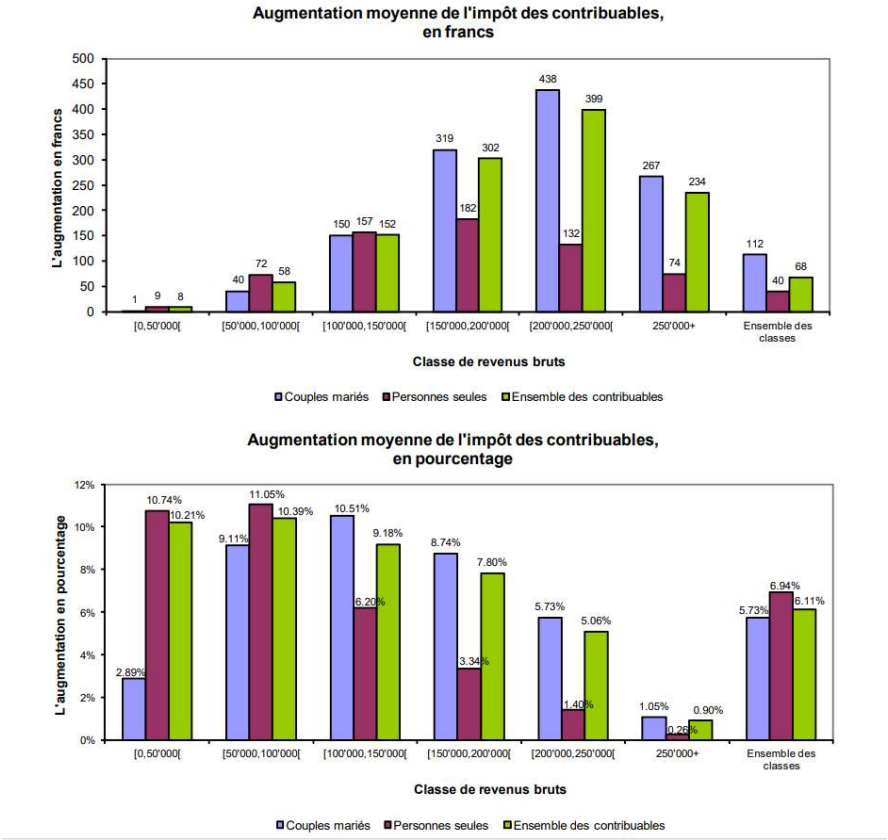
From Table 2.11, we observe that the cap of CHF 3 000 on deductible commuting costs for FDT does not affect between 60 % and 70 % of taxpayers in BE and SO, and between 80 % and 90 % of employees in BL. Similarly, between 60 % and 70 % of employees in BE and SO, and between 80 % and 90 % of employees in BL would benefit from the CHF 2 300 tax revenue neutral allowance for commuting costs calculated by Peters (2009).[40]

Bern is the second largest Swiss canton in terms of population, with 1.04 million inhabitants in 2019 (FSO, 2021). It is both urban and rural and spreads over all three Swiss geographic regions: the Alps, the Plateau and the Jura Mountains. Therefore, its tax data are relatively representative for the whole country. An analysis for the Federal Council (2013b) yields results about who would be most affected by removing the deductibility of commuting costs in terms of income groups and regions.

Federal Council (2013b, p.2) found that, "in absolute terms, the increase in the tax burden [as a result of the full elimination of the deductibility of commuting expenses for federal direct tax] tends to be greater as the taxpayer's income rises, although the slope flattens towards the very top end of the income scale. In percentage terms, the increase in tax tends to be greatest among taxpayers on average or even low incomes".

[40] Peters (2009) calculated this amount with 2005 data. However, the figures have not changed significantly in 2018.

Figure 2-2 Additional income tax to be paid in case of elimination of the deductibility of commuting costs, in CHF and %, for married couples and singles, by class of gross income



Source: Federal Council (2013b), illustration 3

Replacing the deduction of actual costs by a lump sum, tax revenue neutral deduction of CHF 2'300 reduces the tax burden for income groups up to CHF 50 000 and increases it for higher income groups.[41] This confirms that higher income groups deduct, on average, higher commuting costs.

Looking at regions, the impact of fully removing commuting cost deductibility is greatest in absolute terms in "other agglomeration municipalities" (5.6 %, CHF 78). However, residents of rural areas are most impacted in relative terms, with an average 8.46 % increase in tax (CHF 70), compared to 4.48 % (CHF 50) in "cities in the centre of an agglomeration". Nonetheless, many municipalities in remote areas of the canton – Berner Oberland, Berner Jura, Emmental and Oberaargau – are among the least impacted in both absolute and relative terms (see Federal Council, 2013b, illustrations 6 and 7).

2.6.3 Gender effects

Evidence in Switzerland and from other countries is that men commute more and over longer distances than women. They are more likely, for example, to commute between different cities. Their travelling patterns are thus more linear and standard. Women, on the other hand, because they still dominantly take more responsibility for organising family, have more complex and challenging travelling patterns with numerous short trips over the day (Drevon et al., 2021; Pirra et al., 2021; Rérat, 2016; Singh, 2020). Drevon et al. (2021) find that individuals in the 2015 Mobility and Transport Microcensus with the latter travelling patterns are more attached to car usage. However, evidence

[41] The highest increase, as a percentage of the tax burden, is for income groups between CHF 50 000 and 70 000.

indicates that, overall, women in Switzerland and abroad are more likely to use public transport and less likely to have access to a car than men (Ciari et al., 2013; Pirra et al., 2021; Singh, 2019). The differences tend to become smaller, though.

From the above, capping, eliminating of commuting costs or replacing it by a lump sum deduction would overall redistribute income from men towards women. However, limiting the deductibility to public transport costs or to the costs of the "best in class" car could reduce available income for individuals, mostly women, for whom it is very challenging to commute otherwise than by car, respectively with a car sufficiently large to carry children, stroller, etc.

2.6.4 Mitigating adverse social and distributive impacts

Evidence from Bern, Austria and Germany (Kletzan-Slamanig et al., 2022) indicates that eliminating the commuting allowance or replacing it with a lump sum allowance has positive redistributive impacts. This can be explained by the progression of tax rates, i.e., deducting a given amount from the taxable income reduces taxes more, in absolute terms, the higher a person's income, and by the fact that higher income earners tend to have higher commuting costs. While this is true on average, some individuals will be severely impacted. We summarise here suggestions in the literature to mitigate these adverse impacts.

Simulating the removal of the "distance allowance" for Germany,[42] Jacob et al. (2016) found that introducing a hardship clause, whereby employees whose commuting costs are high relative to income could keep deducting some of those, mostly reduces the tax burden for commuters with home to work distances greater than 50 km and for those on the lowest income quintile. The hardship clause adds to the positive redistributive effect of the measures hereafter. Second, using the additional revenue to increase either the tax-free income allowance[43] or the lump sum deductible amount[44] both redistribute income towards lower earners and incentivise labour force participation, whereas a proportional reduction in income tax rates favours higher income earners. Third, the greatest positive redistributive and environmental effects come from using the additional tax revenue to subsidise public transport (reduced ticket prices and increased frequency). However, losers from this measure include inhabitants of smaller municipalities and employed workers, since the subsidies now also benefit the non-working population, including pensioners. It therefore also risks slightly reducing labour participation.

Kletzan-Slamanig et al. (2022) argue that the deduction of commuting costs – whether actual costs or lump sum – should take the form of a tax credit, i.e., an amount deducted directly from paid taxes rather than from the taxable income, to avoid favouring higher income earners through the progressivity of the tax rate. This is partly the case in Austria.[45] However, as seen in section 2.2, the argument for the deduction of commuting costs rests on these being necessary costs for income generation, which therefore must be deducted from income to derive a taxable "net income".[46] Hence,

[42] See footnote 19.

[43] The maximum income up to which the tax rate is zero.

[44] Taxpayers in Germany have a choice between deducting professional costs as a lump sum amount, equal for everyone, from their taxable income or as actual costs.

[45] Austria's multi-level system of deduction of commuting costs includes a tax credit ("Verkehrsabsetzbetrag") ranging from EUR 421 to 1 410 (for tax year 2023), decreasing with income and deductible by all employees. Taxpayers whose income is too low to pay income tax receive it as a negative tax. Calculation: EUR 726 (Erhöhter Verkehrsabsetzbetrag) + EUR 684 (Zuschlag zum Verkehrsabsetzbetrag) = EUR 1 410 (oesterreich.gv.at, 2023).

[46] In the case of child allowances, e.g., there is no direct link to income generation, so there are good reasons for it being a tax credit: a child should get an equal allowance regardless of its parents' income. In the case of

we do not fully see the reasoning behind a tax credit for commuting costs and we believe that, as discussed in the previous paragraph, there are better alternatives when the aim is a more progressive tax system.

Bach (2003) contends that the deductibility of commuting costs should be removed in a stepwise manner to allow for adaptation time. They suggest that the deductibility be maintained for long commuting distances (e.g., 40 km) to support the economy of peripheral areas and, if it is economic stimulus policy, take the form of a tax credit rather than a deduction. In that case, the subsidy could be restricted to inhabitants of targeted areas. The author also makes the case for a time-limited deductibility after a change of workplace, especially for families with children under 16 or dependents, for whom changing neighbourhoods is more difficult.

2.7 Conclusion

Swiss taxpayers deduct expenses incurred for commuting to work from their taxable income. The deductibility provides incentives to commute greater distances and to use costlier forms of transport, which could be individual passenger cars. Both effects are likely to be important drivers of urban sprawl, car usage and demand on road and rail infrastructure, and, accordingly, of higher levels of CO_2 emissions, pollution and land use.

There is no consensus on whether or to what extent commuting is private consumption rather than a necessary professional expense, and thus, on whether the deductibility of commuting costs is a subsidy. We therefore consider three alternative viewpoints: entirely eliminating the deductibility would increase federal and cantonal tax revenues by an estimated CHF 1.7 billion, capping the deduction at CHF 3 000 would increase them by CHF 385 million, and the deductibility of only the costs of a "best in class" car by CHF 340 to 475 million.

The potential additional tax revenue if the last view were adopted is presented as a range. This is because the impact of the modification is not the same for car commuters who deduct car commuting costs and those who deduct the cost of public transportation, as they should when this option is available to them. We do not know how many use either option. The low value of the range assumes that 50 % of car commuters deduct car commuting costs, the high value that all of them do. The truth should lie somewhere in between. There are no ranges for the estimated potential revenues from eliminating or caping the deduction, because these are derived from empirical data from capping deductions for the Confederation and the cantons of Zurich and Basel-Stadt.

The "best in class" view is the only one where the amount of subsidy and the potential tax revenue differ. This is because in that view, commuters would still be allowed to deduct commuting costs, albeit at a lower rate per km, so the change in kilometres driven matters. As they would presumably drive (and deduct) fewer kilometres, the increase in tax revenue would be larger than the amount of the subsidy, i.e., the amount of income tax that they save currently through the higher than "best in class" kilometre rate, with their current commuting practices.

We estimate the impact on CO_2 emissions by using fuel price elasticity as a proxy for the response of the car commuting demand to the increase in cost per kilometre following a redesign of the tax treatment. The various cantonal and federal deduction regimes amount, on average, to a subsidy of CHF 15 ct./km for the average taxpayer, which is a little more than what commuters pay on average for motor fuels. Thus, the deductibility regime amounts in effect in the public sector paying the motor

commuting costs, the link to income generation is close, which is why the deduction exists in the first place. Hence, a deduction from taxable income makes sense.

fuels for the average commuter. When this subsidy is entirely removed or replaced by a lump sum allowance, the reduction in car commuting saves between 360 000 and 495 000 tonnes of CO_2 (between 3.6 % and 4.9 % of all CO_2 emissions from passenger cars in Switzerland in 2022). There is a range of uncertainty, as we do not know how many car commuters deduct publication transportation costs. Capping deductible expenses for commuting to CHF 3 000 would lower CO_2 emissions by between 65 000 and 125 000 tonnes, and reducing the deductible amount for passenger cars from 70 ct./km to 50 ct./km – the kilometre cost of the "best in class" car – saves between 85 000 and 170 000 tonnes of CO_2.

Given limitations in our assumptions due, among other things, to the lack of data on deducted costs, these numbers must be interpreted as orders of magnitude.

When we report these results in the general conclusions (chapter 9), we shall use a middle-of-the-range value, corresponding to 75 % of car commuters deducting car commuting costs.

Table 2.12 Summary of the costs and climate impact of the subsidy analysed in this chapter

Subsidy	**Amount of subsidy** (million CHF)	**Potential tax revenue** (million CHF)	**Climate impact** (thousand tonnes CO_2)
Income taxes: Deductibility of commuting costs			
• Complete elimination	1 705	1 705	360 – 495
• Cap of CHF 3 000	385	385	60 – 125
• "Best in class" deductibility	310 – 430	340 – 475	85 – 170

Eliminating, limiting the deductibility of commuting costs or replacing it with a lump sum allowance removes incentives to "cheat" the tax system and reduces administrative costs, both for individuals filling in the tax form and for the tax administration controllers. Effects on productivity or labour force participation are uncertain but likely to be small. While redistributive effects are likely to be positive on average, the specifics are complex and need further investigation. We provided an overview of measures to mitigate potential negative social and redistributive impacts.

3. Income taxes: Company cars and parking at work

"The under-taxation of company cars is likely to result in a disproportionately large increase in total distance driven, composed of both an increase in the number of cars driven and an increase in distance driven per car. […] It is safe to conclude [that] environmental outcomes across the OECD world would be greatly improved by ending the under-taxation of company cars, in particular, the under-taxation of the distance component" (Roy, 2014, p. 30-31).

"Parking is arguably the most crucial element of car travel. Every car trip starts and ends with walking to and from a parked vehicle and every single car needs to be parked somewhere when not in use" (Tchervenkov, 2022, p. 1).

3.1 Overview

Fringe benefits are labour income given to an employee in kind. Hence, they must generally be declared in the wage certificate, and thus are subject to income tax. In some cases, the value of the benefit is calculated with a flat rate to save administrative costs, such as for company cars. In other cases, there is simply an exemption, e.g., if the value of the benefit is sufficiently low. The Federal Tax Administration provides an exhaustive list of exempted benefits, which the provision of a free (or employer-subsidised) parking space at work is part of (CSI and FTA, 2022).[47]

Employees who can use a company car for private purposes must declare a "private share" of 10.8 % of the car purchasing cost (0.9 % per month) and at least CHF 1 800 on the yearly wage certificate, irrespective of the ratio between private and work-related trips.[48,49] This flat rate covers all costs related to the use of the car except fuel costs "for longer private journeys, on weekends or during vacation". Alternatively, the actual private use can be declared at a rate of CHF 70 ct./km, provided that a logbook has been used to record these. These rules also apply to self-employed workers (CSI and FTA, 2022; Federal Council, 2021a; FTA, 2022d).

The favourable tax treatment of such in-kind benefits makes them popular among employers. According to the Federal Statistical Office, in 2010, 58 % of companies in Switzerland offered free

[47] Exempting an in-kind benefit from taxable income or undervaluing the benefit also implies lower social security contributions, which represents savings for the employer and a foregone revenue for social insurances. The employee benefits from a higher net income but has a lower insured salary.

[48] Until 1. January 2022, employers had to declare 9.6 % of the car's purchasing cost as private share on the employee's yearly wage certificate (0.8 % per month), as well as 70 ct./km for usage of the company car for commuting, which employees could in turn deduct from their taxable income up to the federal (and cantonal) caps discussed in section 0. The change in tax treatment does, in principle, not affect federal direct tax revenues (Federal Council, 2021a).

There are specific rules for "luxury vehicles". In Geneva, the private share is 10.8 % for the first CHF 100 000, to which are added 20 % of the price share exceeding CHF 100 000 per year for five years and 4.8 % of the price share exceeding CHF 100 000 as maintenance costs every year (République et Canton de Genève, 2023). Vaud (Canton de Vaud, 2023, our translation) provides that "if the category of vehicle does not correspond to the activity carried out, the private share should be adjusted upwards or the object should be considered as part of private assets." Valais does not mention specific rules. We did not look into the taxation guides in other cantons.

[49] In 2021, the official VAT guide indicated that the flat rate calculation of the private share can be applied only "if the vehicle is used predominantly, i.e., more than 50 %, for commercial purposes. Otherwise, private use must be calculated on an actual basis" (our translation). This seems to have been removed from the up-to-date version: <https://www.gate.estv.admin.ch/mwst-webpublikationen/public/pages/taxInfos/cipherDisplay.xhtml?componentId=1000747&publicationId=1000609&cipherKeyDate=01.01.2022>.

parking to their employees, and 56 % a company car for private use (FSO, 2012a). In the 2021 Mobility and Transport Microcensus, 51 % of workers declared having a free parking space available at work and 23 % a paid one (FSO and ARE, 2023). Often, paid parking spaces at work are offered to employees at a price below costs. At the University of Lausanne, for example, employees have access to subscriptions for 2024 at prices of CHF 450/year for access to the shared parking lot and CHF 700/year for a guaranteed parking space.[50] There are no official statistics on the number of company cars in Switzerland, but Tchervenkov (2022) finds that for 8.3 % of employees who own a car or motorcycle and commute to work, that vehicle was bought by their employer.[51]

3.2 Existence of tax relief

3.2.1 Company car for private use

A company car can be used for three different purposes: business trips (undertaken for the company), commuting trips and strictly private trips (for leisure, shopping, etc.). Company car uses that are private consumption should be subject to income tax. The Confederation's tax rules consider that strictly private trips as well as all commuting beyond the CHF 3 000 cap are private use.[52]

There is a subsidy if there is under-taxation, i.e., the value of the actual private usage is higher than the value subject to the tax. In 2013, the Federal Council considered that the private share flat rate was not set too low compared to actual usage (Federal Council, 2013a). This view was challenged by a study commissioned by the Federal Office of Energy, which estimated that the private share flat rate should be increased from (at that time) a yearly 9.6 % to 24 % of the car cost to reflect the actual average value to the employee (EBP/Ecoplan, 2014).[53]

Harding (2014) compared the tax treatment of company cars in 27 OECD countries and, for each country, estimated the foregone tax revenue. Within the 22 countries that calculate the taxable value of private use of company cars by applying a flat rate to the car's capital cost, the Swiss rate is one of the lowest. Furthermore, 13 of those countries have rates between 20 % and 33 %, that is two to three times the Swiss rate (Harding, 2014, Table 3). Taking a benchmark situation where the benefit is handed out as wage income and the employee purchases the car themself, the author estimated the foregone tax revenue for Switzerland at EUR 615 million in 2012.[54] While our calculations in section

[50] <https://www.unil.ch/parking/fr/home/menuinst/collaborateurs-unil.html>.

[51] Tchervenkov (2022) conducted a survey on a sample of the Swiss population in May 2021. Cleaning their sample to keep 404 participants who are employed (excluding self-employed), have access to a car or motorbike and commute to work, then weighing it against the Mobility and Transport Microcensus, they find that 10 % of that sample were offered a car by their employer and, of these, 83 % accepted the offer (Table 7.2, p. 96).

[52] See section 2.2. The change of the tax treatment in 2022 was calculated to be tax revenue neutral. Hence, the new private share rate was set to cover commuting up to that cap (see footnote 48).

[53] Federal Council (2013b) does not provide the detail of their calculation and Hobi (2014) seems to make a quick back-of-the-envelope calculation.

[54] Harding (2014) assumes that the average distance driven by company cars for commuting and private trips is 20 000 km – sensitivity testing with an average distance of 15 000 km, keeping other parameters constant, yields an estimate of EUR 558 million – while we estimate a distance of about 14 000 km (see below). The calculation is more sensitive to the assumption that the fixed costs of the car (insurance, depreciation, etc.) should fully be considered as an in-kind salary to the employee. They justify this assumption with the opportunity cost principle: if the employee had to buy the car themself, they would have to bear the entire fixed costs. Relaxing this assumption by attributing 67 % of the fixed costs to the employee (keeping all other parameters constant) yields an estimate of EUR 389 million (see Harding, 2014, Annex D).

3.3 indicate that it is an overestimate, this amount gives an idea of the potential magnitude of the foregone tax revenue.

In Germany, where the tax treatment of the private usage of company cars is similar to Switzerland, with a slightly higher private share flat rate (12 % of the car list price is added to the yearly wage), a study commissioned by the German Environment Agency estimated the subsidy between EUR 3 110 million and EUR 5 260 million, or about 0.1 % to 0.2 % of GDP (FÖS and GWS, 2016).[55] A comprehensive assessment of "climate counterproductive subsidies" commissioned by the Austrian office for the environment estimated that only around 50 % of the monetary value of the private usage of company cars is taxed, which amounts to a subsidy of EUR 500 million. This despite the fact that 18 % to 24 % (depending on the car's CO_2 emission performance) of the company car's purchasing cost is added to Austrian employees' yearly income (Kletzan-Slamanig et al., 2022).

We are not aware of a robust estimate of the actual value to the employee for Switzerland, probably due to the lack of data. In section 3.3, we attempt to estimate the potential gap between the taxed value and actual value of the private use of company cars in Switzerland.

3.2.2 Free or subsidised workplace parking

Harding (2014) finds that, out of 23 OECD countries included in the analysis, ten consider employer-provided parking as taxable income.[56] The taxable value is based on the local market value for most of these countries. In Austria, employers must declare EUR 14.53 per month for the provision of parking as payment in kind, which is far below market price according to Kletzan-Slamanig et al. (2022). France allows an exemption if the employee is required to use a vehicle for work and there are no free parking spaces available nearby. Exemptions in other countries depend on where the parking space is provided.

While employer-provided parking is not taxed in the United Kingdom, its government decided to run an experiment in Nottingham. The city introduced a workplace parking levy in 2011 of £428 a year per parking space, the revenue from which is ringfenced for local transport infrastructure improvement. The scheme has raised £83 million in cumulated revenue since 2005 and is deemed to have contributed to a 33 % reduction in local CO_2 emissions (Friends of the Earth, 2023).

The Federal Tax Administration provides a list of in-kind employee benefits that need not be declared in the wage certificate for "practical reasons" (CSI and FTA, 2022). Most of the benefits on this list are capped, such as Christmas presents (CHF 500) or club memberships (excluding fitness clubs, CHF 1 000). Others are not, such as subsidies to day-care centres offering reductions for employees' children or subsidised membership of professional associations. Hence, the exemption for free workplace parking could be justified if its value were not worth the administrative costs or if it were deemed necessary for work (like memberships of professional associations or day-care costs). We eliminate the first justification, since the yearly taxable value of a parking space exceeds CHF 1 000 and the tax could be levied with low administrative costs (e.g., a lump sum amount per parking space). As for the second argument, if parking is considered a necessary cost, the government will have included it in the deductibility of car commuting costs. Thus, we consider that the non-taxation both of free-parking and of the difference between market price and subsidised parking fees is a subsidy.

[55] Germany's GDP was EUR 3 026 billion in 2015 <https://ec.europa.eu/eurostat/web/main/data/database>.

[56] In one of these, the United States, a tax exemption applies up to USD 240 per month.

3.3 Cost of the tax relief

We define the subsidy as the amount of income tax saved by taxpayers compared to a benchmark scenario under which they are taxed on the actual value of the in-kind benefit. In that scenario, both employees and employers are indifferent between the in-kind benefit or the employee renting the parking space, respectively the company car for private usage, and being paid that amount in monetary wage. We therefore estimate the actual value of the benefit, before comparing it with an estimate of the taxable value under the existing system.

We assume that reductions in in-kind salary resulting from a reduced use of company cars or of free parking spaces would be compensated one-to-one by monetary wage, which is taxed. We therefore do not include dynamic effects in our calculation.

3.3.1 Company car for private use

The data on company cars in Switzerland is scarce. To estimate the foregone tax revenue, we make the following parameter assumptions, each time explaining our reasoning and the data we use as a basis.

Number of company cars available for private use: 247 000

We deduce this from the following results from surveys in Switzerland:

- For 8.3 %[57] of employees who commute and have a car, this car is a company car (Tchervenkov, 2022, Table 7.2).
- 12.8 % of worker population are self-employed (SECO, 2018). We assume that this share is the same among commuters.
- 48.3 % of people who say that their next car purchase is financed by their employer are self-employed (Peters and de Haan, 2006, p. 18).

Thus, we estimate the percentage of commuters who own a company car as follows:

8.3 % × (1 − 12.8 %) / 48.3 % ≈ 15 %[58]

We then multiply this share by 1 645 685 cars commuting to work, which we derive from 1 810 253 workers whose main mode of commuting was a passenger car in 2023 (FSO, 2024a) divided by 1.10 occupants per car driving to work on average (FSO and ARE, 2017).

Average car purchasing cost: CHF 31 500

Metzler et al. (2019) find that the average company car in their German sample is 4.36 years old compared to 7.63 years for privately-owned cars. The situation is likely to be similar in Switzerland, where the average car was 7.4 years old in 2020 (FSO, 2024h). We, thus, use as a basis the average list price of a new car at the beginning of 2019, CHF 35 000 (TCS, 2019),[59] and assume a 10 % discount on the list price.[60]

[57] See 3.1 for the computation of this number.

[58] This has the corollary that about 60 % of the self-employed have a company car for private use.

[59] The TCS uses the average list price, as explained in TCS (2023b).

[60] The purchasing price for companies is often significantly lower than the list price. FÖS and GWS (2016) assume a 20 % difference between the list price and the purchasing price. We assume a 10 % discount to account for the fact that self-employed workers may not get discounts.

Average distance for strictly private trips: 7 500 km

It is difficult to estimate average distances driven by company cars, let alone their private use. We are not aware of any data for Switzerland, and international comparisons are unreliable due to great variation between countries. International research cited in Harding (2014) estimated total distances driven by company cars ranging from 20 000 km to 36 500 km. Probably (slightly) more constant across countries is the ratio of distances driven by company cars versus private cars. International research estimates that company cars available for private use are driven twice to three times as much as private cars (Harding, 2014; Metzler et al., 2019). We know that the average (private or company) car owned by a Swiss household travelled 11 828 kilometres per year in 2015 (FSO and ARE, 2017). Hence, assuming a 15 % share of company cars and that company cars drive twice to three times the distance of private cars, we can solve the following equation: 15 % × [distance multiple for company cars] × [distance for private cars] + 85 % × [distance for private cars] = 11 828 km. Entering 2 or 3 as the "distance multiple for company cars" yields a total distance of 20 570, respectively 27 295 kilometres per year for company cars.

We now move on to estimate strictly private trips. In Germany, Metzler et al. (2019) assume a distance of 10 832 km to 16 248 km for strictly private trips of company cars, whereas the average car in the 2018 German Mobility Panel travelled 23 500 km all trips combined (Karlsruher Institut für Technologie, 2019, Table 6-6, p.64). In Belgium, a survey of company car owners estimated that between 21 % and 35 % of the total distance driven is for strictly private trips (Cornelis et al., 2009, Table 3 p. 51). Applying the "German" ratios above to the 11 828 kilometres travelled by the average Swiss car and the "Belgian" ratios to the total distance travelled by company cars estimated above yield distances ranging from 5 500 to 8 200 kilometres, respectively from 4 300 to 9 600 kilometres. Given the high incentive to use one's company car and that these figures are far below international estimates, we assume an average distance of 7 500 km for strictly private trips, which is slightly closer to the upper bound of the above estimates.

Share of fuel costs for strictly private trips borne by user: 25 %

The tax rule is that "the employer bears all costs, the employee paying only the fuel costs for longer private journeys, on weekends or during holidays" (CSI and FTA, 2022, p.10, our translation).[61] In practice, the enforcement of this rule is difficult to monitor. There is thus an incentive for the car user to let the company pay whenever possible, including for private trips, for example by filling up the tank just before the weekend or vacation, and for the company to turn a blind eye on such practice by de facto considering this fuel as a tax-free fringe benefit. This is confirmed by anecdotal evidence.[62] We therefore assume that users bear only 25 % of fuel costs for strictly private trips.

[61] The template rule for the use of company cars provided by the online portal for SMEs Gryps stipulates that the employee bears fuel costs "for longer private trips" <https://www.gryps.ch/ratgeber/personal/anstellung/reglemente/#reglement-fur-geschaftswagen>.

[62] We also asked two acquaintances. One of them owns their one-person company and makes it bear all fuel costs, including during holidays abroad. The other is employed and confirmed that they are not supposed to use the fuel card for longer trips in Europe, on weekends and holidays. Hence, they fill the gas tank on Fridays so that it suffices for the weekend or for the beginning of the holidays. Further refills during the holidays are from their own pocket.

Taxable value under the benchmark scenario

With these parameters and taking the 70 ct./km allowance for the deduction of car commuting costs from taxable income (see section 2.1), we estimate the taxable value under the benchmark scenario in Table 3.1.

Table 3.1 Taxable value assuming 7 500 km driven yearly for strictly private trips

Car kilometre cost	70	ct.
Fuel cost per km	13.7	ct.
Fuel costs for private use paid by user	25%	
Kilometre cost borne by company	67	ct.
Private use excluding commuting	7 500	km
Taxable value	4 993	CHF

Source: Car kilometre costs from FDF (2016), fuel cost from TCS (2023a)

Under the benchmark scenario, the cost of commuting is declared as taxable income, which company car users can in turn deduct as commuting costs up to the federal (and cantonal) caps (see section 3.1).[63] Hence, only commuting costs beyond the caps are actually taxed. Given that eleven cantons do not cap the deductibility and that the level of the caps vary widely between those who do (see Appendix E), we only consider the cap for federal direct tax (FDT) for simplicity and thus assume that all commuting costs are deductible for cantonal and municipal tax. This means that we knowingly underestimate the subsidy, and sometimes by a large amount, such as in the Canton of Geneva where commuting costs are only deductible up to CHF 507. For an average car commuting distance of 6 336 km/year, we calculate an additional **value subject to FDT tax of CHF 1 235**.[64]

Taxable value with a flat rate private share valuation

In Table 3.2, we use the parameters estimated above to compute taxable values under the existing tax system and under an increase of the private share flat rate to 24 % per year.

One way of estimating the subsidy is to estimate the private share flat rate that reflects the actual value of private use of company cars. A ballpark estimate of 2 % per month (24 % per year) of the car list or purchasing price is often suggested by experts in Germany (see, e.g., Creutzig, 2023 or FÖS, 2023) and used in countries comparable to Switzerland in terms of car usage: 2.08 % per month in Denmark, 1.5-2 % in Austria (depending on the car's CO_2 emission performance) and 1.83 % in the Netherlands. This gives an indication of the value to the employee of a company car for private use.

[63] That was the practice until the private share flat rate was raised in 2022 (see section 3.1).

[64] The average one-way car commuting distance is 14.4 kilometres (ARE, 2020, Table 59, p. 195), which we multiply by 2 and by 220 days of commute. Hence, the deductible amount is 6 336 km × 0.70 CHF/km = CHF 4 435. We subtract the cap of CHF 3 200 to obtain the taxable amount for FDT. This assumes that company car owners work full-time and commute to and from work every day.

Table 3.2 Taxable value with current private share (10.8 %) and 24 % per year scenario

Average car list price	35 000		CHF
Average discount on purchase	10%		
Average car purchasing cost	31 500		CHF
Private share	10.8%	24%	
Taxable value	3 402	7 560	CHF
Marginal tax rate	22.4%		
Tax revenue on private use per company car	762	1 694	CHF

Sources: Average car list price from TCS (2019)

Foregone tax revenue

The foregone tax revenue is the difference in tax revenue between the alternative scenario and the 10.8 % private share. To compute this, we apply the overall marginal tax rate of 22.4 % to taxable values of private usage estimated above and the 4.6 % rate to taxable commuting costs, which are subject to FDT only.[65] Multiplying by 247 000 company cars available for private use, we find **a total foregone tax revenue of CHF 102 million**. With an indicative 24 % private share rate benchmark, the foregone tax revenue is CHF 230 million.

3.3.2 Free or subsidised workplace parking

We make the following parameter assumptions to estimate the workplace parking subsidy.

Average market price of a parking space at work: CHF 120/month

The market price of a parking space varies widely across regions, but also within a small area. For example, observational data suggests that the average monthly price of private off-street parking space is CHF 150 in the city of Zurich, with prices ranging from CHF 40 to CHF 700 (Sarlas et al., 2016). On the online property portal RealAdvisor, there were 9 336 parking spaces listed in Switzerland on 16 November 2023 with a median list price of CHF 120 per month.[66] The Fondation des Parkings estimates the costs to employers of building and operating or renting a parking space at CHF 100 to 400 per month (Métropole Lémanique, 2021). Based on these, we assume CHF 120/month as our benchmark cost to the employer.

Number of free parking spaces at workplace: 874 000

In the 2010 Mobility and Transport Microcensus (MTMC), 68 % of commuters who said they had commuted by car on the day they were surveyed declared enjoying a free parking space at work (FSO, 2012b).[67] Tchervenkov (2022) find in their 2021 survey that 64 % of their cleaned sample of 400 commuters have a free parking option at work, 83 % of which are offered by the employer. We multiply the share of free workplace parking spaces from the MTMC by the share offered by the

[65] See Appendix A for average median marginal tax rates calculations. We use median (rather than higher) marginal tax rates to assess the amount of the subsidy to company car and workplace parking users since, although survey results indicate that disposing of these benefits is positively correlated with income (see section 3.6), the extent to which this is the case is unclear, due to lack of available date, and we thus prefer to remain on the cautious side.

[66] 80 % of listings fell in the range between CHF 50 and CHF 210 <https://realadvisor.ch/en/rent/parking>.

[67] This question was not asked in 2015 edition of the Mobility and Transport Microcensus.

employer from Tchervenkov (2022). Applying these to the 1 645 685 cars commuting to work in 2023, we estimate that there are about 929 000 free parking spaces used by employees.[68]

Number of paid workplace parking spaces: 280 000

In the 2010 MTMC, 17 % of commuters who said they had commuted by car on the day they were asked declared having a paid parking space at work (FSO, 2012b).

Average price of a paid workplace parking space: CHF 80.-/month

In the 2010 MTMC, the average price of paid workplace parking is CHF 76.60 per month (FSO, 2012c). Allowing for inflation increases it to just under CHF 80.- per month in 2023.[69]

Estimated budgetary cost

Multiplying the number of free workplace parking spaces by their market price yields a total yearly in-kind payment of CHF 1 338 million. We proceed similarly for the paid parking space with difference between the market cost and the average price of a paid workplace parking, yielding a subsidy value of CHF 135 million. Taking a marginal tax rate of 22.4 % (see Appendix A), **we estimate total foregone tax revenues of CHF 330 million** compared to a benchmark under which workplace parking is declared as taxable income.

3.4 Behavioural effects of the tax relief

The Federal Council argued that "the incentive is inappropriate if the flat rate charge – which is not based on actual mileage – is lower than the actual share of private usage. Calculations have shown that the private share currently in force is not set too low, which rules out the existence of an inappropriate incentive." (Federal Council, 2013a, p. 5038, our translation). Even if it were true that the private share captures the taxable value of the private use of company cars, the logic does not hold: harmful incentives can exist in the absence of under taxation, as we show in this section.

3.4.1 Predominance of motorised individual transport

The low flat rate private share for company cars creates a double incentive for employers. First, they are encouraged to offer employees a company car for private use to take advantage of the lower tax rate compared to a monetary wage (provided enough kilometres are driven). Second, they have an incentive to offer unlimited free fuel and to turn a blind eye when the employee fills up the tank on Friday evenings: the more fuel the employee uses, the higher the tax-free benefit. Employers, being able to monitor fuel usage over time, can then set a lower monetary wage accordingly. The same logic holds for the self-employed, who can be seen as both employer and employee.

For company car users, the system incentivises higher levels of mileage since marginal costs are zero (or close to zero for longer strictly private trips). They may even feel obliged to drive enough kilometres for the tax paid on the car and the lower monetary wage counterpart of the fringe benefit to make financial sense. Reviewing the literature on changes in transport behaviour due to company cars benefits, Metzler et al. (2019) find that company cars are more likely to make car usage the "self-evident transport choice" (and consequentially to reduce usage of alternative modes of transport or carpooling). They also find that company cars are driven between two and three times more than

[68] 1 810 253 workers whose main mode of commuting was a passenger car in 2023 (FSO, 2024a) divided by 1.10 occupants per car driving to work on average (FSO and ARE, 2017).

[69] The Swiss consumer price index for 2023 (December 2010 = 100) is 104.1.

private cars on average, and that the possession of a company car even affects the transport behaviour of other household members. Shiftan et al. (2012), in their survey of a sample in Israel, find that seventy percent of company car owners owned two or more cars in their household, indicating that the money saved by the company car may be used to buy an extra car.

Shiftan et al. (2012) quantify the impact of company cars on mileage and fuel usage in Israel based on a survey of employees. They estimate that, all things being equal, a company car user drives an extra 3 000 km per year compared to a private car user, plus an additional 7 000 km when fuel and parking expenses are covered by the company. Of the 400 company car drivers surveyed, 44 % said they would make fewer trips if they only had a private car and 42 % would choose an alternative mode of transportation (for some trips?). The Central Bank of Israel finds that company car users use 24 % more fuel than private car users after controlling for household socio-economic characteristics and estimates that company cars increase the average mileage in Israel by 5-8 % (Bank of Israel report, 2008, in Hebrew, cited in Shiftan et al., 2012). Econometric analysis of survey data in Sweden yields a 50 % increase in distance driven for strictly private trips with a company car relative to a private car (Johansson-Stenman, 2002).

The reform process in Britain provides additional evidence: the tax on company cars introduced in 1976 incentivised high levels of mileage.[70] At the turn of the millennium, the taxes for having a company car and receiving free fuel became proportional to company cars' CO_2 emissions. At the same time, the incentives for reaching specific mileage thresholds were removed. While causality cannot be proven, average company car mileage dropped by nearly 40 % between 1995/7 and 2005/7, and company car ownership per person fell by 20 % over that same period (Le Vine and Jones, 2012).

As for free or cheap workplace parking, the exemption from income tax incentivises the offer of such in-kind benefits in place of higher monetary wages. On the user side, evidence shows that parking is a major driver of travel behaviour (see e.g., Tchervenkov, 2022): more parking spaces lead to more cars (McCahill et al., 2016) and more free parking spaces leads to even more cars. Reviewing empirical evidence from North American cities and suburban areas, Willson and Shoup (1990) show that between 19 % and 81 % fewer employees drive to work when they must pay for parking, the effect varying with local conditions such as the availability of alternative modes. Moreover, the authors find that the effect of removing parking subsidies is greater than that achieved by subsidising public transport or carsharing. In a case study of 1 700 employees, Shoup (1997) finds that there were 17 % fewer solo drivers after California introduced a law requiring large employers to offer employees the option of a cash-out benefit instead of free parking. Total car kilometres driven for commuting in the sample decreased by 12 %. In Switzerland, Tchervenkov (2022) finds that having a company car or free parking at work increase the probability of employees commuting by car by 16.1 % and 14.2 % respectively.

3.4.2 "Wasteful" car usage

One is less likely to adopt energy-efficient driving styles when bearing zero or close to zero marginal milage costs (see Metzler et al., 2019, for a references in the literature). Furthermore, flat rate taxation systems can have counterproductive effect, as has been witnessed in Britain, where the employee incurred a fixed tax liability in exchange for free fuel. "Thus, driving high levels of mileage was further

[70] The amount taxpayers were required to add to their taxable income was reduced by half if at least 18 000 miles were driven for business use. In addition, employers could provide unlimited free fuel in exchange of a fixed tax liability, which was only beneficial for the employees if they drove enough miles for their own private purposes.

encouraged, as having fuel paid for by one's employer made financial sense only if enough fuel was consumed to justify the tax liability" (Le Vine and Jones, 2012, p. 96). Similarly, simply increasing the private share flat rate may incentivise driving more kilometres to make sure that the private use of the company car makes financial sense.

3.5 Climate impact of the tax relief

As explained in section 3.3, we take a benchmark scenario under which the tax system taxes the in-kind benefit based on its actual value, so that both employees and employers are indifferent between either payment in kind or an equivalent increase in monetary wage with the possibility to rent the benefit from the employer. Thus, we can assume that, under the benchmark scenario, there are no company cars and only paid parking.[71]

With a company car, the marginal cost of driving goes from some positive number (under the benchmark scenario) to zero or close to zero for some trips (under the existing tax system).[72] Free workplace parking decreases the cost per trip – or per month or year in the more common case of a periodic rent – relative to the benchmark scenario, but it does not change the variable cost per kilometre. Without change in cost per km, price elasticities cannot be used to estimate the impact on distances driven (as we do for the deductibility of commuting costs in section 2.5). We, therefore, make the following assumptions based on estimates from the literature cited in section 3.4:

- **Owning a company car increases the probability of commuting by car by 30 %.** Tchervenkov's (2022) estimates that the probability of commuting by car increases by 16.1 % with a company car compared to owning a private car and by another 14.2 % with free parking at work (we assume that all company car owners have free parking at work).[73]
- **Owning a company car increases distance driven for strictly private trips by 50 %.** We use here Johansson-Stenman's (2002) estimate from comparing owning a company car to owning a private car. As discussed in section 3.4, this seems plausible since a zero marginal cost is a strong incentive to always choose the car over other transport modes.
- **For commuters using a private car, having free workplace parking increases the probability of commuting by car by 14 %** compared to a paid parking option (Tchervenkov, 2022). This is consistent with Shoup's (1997) finding of a 12 % reduction in vehicle-miles driven for commuting when cash-out benefits were introduced as an alternative to free workplace parking in California (see section 3.4). **We assume that a subsidised parking option increases, on average, the probability of commuting by car by 5 %.[74]**

In the above, we assume that the benchmark scenario is equivalent to company car owners owning a private car instead. We believe that this is reasonable, since the company now has an incentive to limit the employee's private (and professional) mileage, since the company bears the marginal cost (except for the tax). Hence, it is likely to impose limits or incentives to make sure that the employees drive as if they were bearing all the marginal costs. Furthermore, the reduction is likely to be greater

[71] The intuition behind this is that employers being indifferent between either option, they will give employees the possibility to choose between in-kind benefit or higher wage. Hence, the employee "pays" for the in-kind benefit by accepting a reduction in monetary wage equal to the actual value of the benefit.

[72] Company car users bear fuel costs for longer holiday or weekend trips (section 3.1).

[73] Tchervenkov (2022) uses a dummy variable for "free parking available", not distinguishing between "no available parking" and "paid parking available".

[74] Since the subsidy is, on average, one third of the market price, we assume that the effect of a subsidised parking space on the probability of commuting by car is one third on that of a free parking space.

for some individuals since, in the absence of a favourable treatment of company cars, we expect some employers to give up the company car and some employees not to replace it by a private car.

In addition to the above, we also use the following parameters for estimating the climate impact of the subsidy:

- Average CO_2 emissions per car: 121 g/km (FSO, 2023b)[75]
- Number of company cars available for private use: 247 000 (see section 3.3)
- Average car commuting distance: 6 336 km/year (ARE, 2020, Table 59, p. 195)[76]
- Average distance driven for strictly private trips per company car: 7 500 km (see 3.3)
- Number of commuters using a private vehicle and having free workplace parking: 627 000[77]

The estimated increase in CO_2 emissions compared to the benchmark scenario is calculated below.

Climate effect of company cars:

121 g/km × 247 000 company cars × (6 336 km × 30 % / 130 % + 7 500 km × 50 % / 150 %) / 1 000 000 = 118 000 tonnes

Climate effect of free parking for private car users:

121 g/km × 682 000 × 6 336 km × 14 % / 114 % / 1 000 000 = 64 000 tonnes

Climate effect of subsidised parking for private car users:

121 g/km × 280 000 × 6 336 km × 5 % / 105 % / 1 000 000 = 10 000 tonnes

We estimate the subsidy to company cars to be responsible for 118 000 tonnes of CO_2 per year, and the subsidy to the provision of free workplace parking for private cars to cause additional emissions of 74 000 tonnes of CO_2 per year.

We do not account for the potential increase in CO_2 emissions in public transport, which could reduce the gain by some 3 to 5%.[78] On the other hand, we also ignore the effects of a likely decrease in the number of company cars (often estimated at 20 %; see Le Vine and Jones, 2012; FÖS and GWS, 2016) on distances driven for business use and on emissions caused by the manufacturing of these cars.

3.6 Other considerations

We consider the impact of redesigning the taxation of company cars and free workplace parking on the following aspects.

Land use and consequences

Manville and Shoup (2005) find that if all parking spaces in central business districts of 44 world cities were spread out (many are in vertical or underground structures), they would cover 31 % of these central areas. More space for parking reduces the space available for uses that contribute to living quality in cities, such as parks, housing or cafés, as well as for productive uses (Tscharaktschiew and

[75] While it used to be the case that company cars were bigger, more expensive and more fuel intensive, evidence indicates that CO_2 emissions of company cars have come close to the average in more recent years (Roy, 2014).
[76] The average one-way car commuting distance is 14.4 kilometres, which we multiply by 2 and by 220 days of commute.
[77] 874 000 free workplace parking spaces (see 3.3) – 247 000 company cars = 627 000.
[78] A good part of the commuters who would switch to public transport might just fill up the existing buses and trains. Hence, estimating how many more trains and buses would be needed seems complicated.

Reimann, 2021). The space used for parking contributes to the spreading out of urban area, which takes over land that could, e.g., have housed biodiversity or food production.

Other external costs

Removing subsidies on company cars and free parking reduces car traffic, especially peak hour traffic, as well as the total number of cars, all of which have important external costs besides climate warming emissions (see 2.6).[79]

Income distribution

As with the deductibility of the commuting costs, the progressivity of the tax rate implies that high income workers benefit more from an equal reduction in taxable income. Furthermore, Tchervenkov (2022) finds that the availability of free parking at work and the provision by the employer of a company car for private use are both positively correlated with income in Switzerland (Tables 6.16 and 7.2). There is however a caveat to the correlation for company cars since the participants in the study were required "not [to] drive in a professional capacity [such as] postal workers or taxi drivers" (p. 51). This excludes, e.g., manual workers who work on customers' amenities (installing and maintenance technicians, cleaners, etc.) and for whom the company car is available for private use, who are likely to be at the lower end of the income scale. Nonetheless, taxing workplace parking and company cars at their full income value is likely to have positive redistributive effects, assuming distributional neutrality of the additional public spending or associated tax recycling measures.

Gender

Tchervenkov (2022) finds that, all other things equal, men are 7 % more likely to have free parking at work. Furthermore, in the survey they conducted, 16 % of men were offered a company car by their employer of which 85 % accepted the offer. The corresponding figures for women are 1.3 % and 47 %. Thus, (higher) taxes on these fringe benefits are likely to increase the tax burden of men relative to women.

Wages

Benefits given in kind are paid for by employees via lower wages. Many employees might prefer higher monetary wages to free parking. This hypothesis seems to be confirmed by Shoup (1997), who found a 12 % reduction in distance travelled for commuting once the new law in California offered a choice between cash and free parking. Furthermore, all employees do not make use of the employer-provided parking.

Administrative costs

A tax neutral treatment of company cars would probably require employees to fill out a logbook, the monitoring of which is virtually impossible. Similarly, the taxation of employer-provided parking creates an administrative load for companies, especially if the market value must be assessed. This

[79] There is a possibility that a less favourable taxation of company cars leads to an increase the total number of cars, resulting in some company cars being used for business trips only and some households buying an additional private car as a result. This is however unlikely since, as argued in 3.3, even when actual private usage is taxed at its value, using a single car for both private and business use so that fixed costs are shared is more economical than buying an extra private car. And in the absence of a favourable treatment of company cars, some employers are likely to give up their company car and some employees not to replace it by a private car.

can be avoided by setting a lump sum value per parking space in urban areas or by employers charging actual costs for the parking space.

Tax equality

As we have shown for Switzerland, fringe benefits are currently taxed less than equivalent wage income, creating a differentiated tax treatment between employees who enjoy fringe benefits and those who do not.

3.7 Conclusion

The flat rate taxation of the private use of company cars set at 10.8 % of the car purchasing price is likely to underestimate the value of the actual private use for most users. Compared to full taxation of this fringe benefit, we estimate the amount of this tax relief at about CHF 100 million. Furthermore, the flat rate structure encourages car usage and high levels of mileage, on top of the coverage of a large part of car costs by the employer. While increasing the flat rate would improve the situation by making company cars less attractive, it does not address the harmful incentive structure and might worsen it for those who decide to keep a company car for private use: their choice only makes financial sense if enough miles are driven to justify the tax liability. The tax treatment should therefore incorporate a distance element.

Similarly, the exemption from taxable income for free and subsidised workplace parking incentivises the provision of such fringe benefits by employers. The availability of parking, and even more so of free or subsidised parking, is an important driver of the choice of a car over alternative transport modes for commuting. In addition, parking space also takes valuable land away from other uses, such as parks, housing, cafés, or land that could have hosted biodiversity or food production. Evidence shows that employees do not necessarily benefit from free workplace parking and that many, including those who currently use the parking spaces, would prefer an equivalent (taxable) wage increase. We estimate the subsidy at about CHF 330 million.

We calculate that the tax treatment of the private use of company cars and of free workplace parking increases CO_2 emissions by respectively 120 000 tonnes and 75 000 tonnes. Due to the lack of available data (especially on company cars), these results are no more than indicative.

Removing these tax privileges would lower car usage, but this behavioural response does not imply that the additional tax revenue is different from the amount of the subsidy, if we assume that employers would replace the in-kind benefits with equivalent taxable income.

Table 3.3 Summary of the costs and climate impact of the subsidies analysed in this document

Subsidy	**Amount of subsidy** (million CHF)	**Potential tax revenue** (million CHF)	**Climate impact** (thousand tonnes CO_2)
Income taxes: Company cars and free parking at work			
• Company cars	100	100	120
• Free parking	330	330	75

4. Heavy Vehicle Fee: Uncompensated external costs

"The group of experts also sees potential for the abolition of tax concessions in the areas of the mineral oil tax, the performance-related heavy goods vehicle charge (LSVA) and the casino levy, combined with additional revenue in the mid double-digit million range." (Group of experts, 2024, our translation)

The heavy vehicle fee (HVF) aims to internalise the external and infrastructure costs caused by heavy goods vehicles (HGVs), but, because of the cap on the HVF in the Land Transport Agreement (LTA) with the EU, the HVF only covers two-thirds of HGV traffic' external non-climate costs, as will be detailed below.

4.1 Overview

In 1994, the Swiss population adopted the "Initiative for the protection of the Alpine region against transit traffic" (Alpine Protection Initiative). The initiative anchored in the Constitution that goods traffic across the Alps be carried by rail (Art. 84 Federal Constitution). This was, however, incompatible with the EU's objectives of liberalisation of road freight. Thus, the federal Act enforcing the initiative set a legally binding cap of 650 000 yearly HGV trips across the Alps to be reached two years after the initial operation of the Lötschberg basis rail tunnel (Art. 1 ancienne Loi sur le transfert du trafic). To this end, the performance-related heavy vehicle fee (HVF) was introduced in 2001, to ensure "that the infrastructure costs and the costs to the community caused by [heavy vehicle] traffic are covered in the long term" with the additional objective of contributing "to improve the framework conditions for rail in the transport market and increase the volume of goods transported by rail" (Art. 1 LRPL, our translation).[80] Despite the cap of 650 000 yearly HGV trips being exceeded by far – the Lötschberg tunnel was opened in 2007 – the measure contributed to reducing the number of HGVs crossing the Alps from 1.4 million in 2000 to less than 1 million in 2022 (ARE, 2015; FOT, 2023).[81] Over the same period, ton-kilometres transported by heavy vehicles increased by 29 % and by rail by 5 % (FSO, 2024e).

The HVF applies to all goods vehicles whose total authorised weight exceeds 3.5 tonnes (Art. 2 al. 1 ORPL).[82] The fee is a function of the vehicle's polluting emissions category (Art. 14 ORPL), its total authorised weight, and the distance driven (Art. 6 al. 1 LRPL). HVF rates for 2024 are 3.10 centimes per ton-kilometre for HGVs in Euroclass polluting emissions categories 0 to 5, and 2.28 ct./tkm for HGVs in Euroclass 6 (FOCBS, 2024c).[83] At the moment, there is no project to levy the fee on electric vehicles (Federal Council, 2024b). While the LRPL requires that the HVF revenue cover HGV traffic's uncovered long-term external and infrastructure costs, the level of the fee is constrained by the Land Transport Agreement (LTA) between Switzerland and the EU, which stipulates that the weighted average of the charge paid by 40-ton HGVs for the 300 km journey from Basel to Chiasso cannot exceed CHF 325 (Art. 40). Tax revenue from the HVF amounted to CHF 1 590 million in 2019 (FSO,

[80] Loi relative à une redevance sur le trafic des poids lourds (RS 641.81).

[81] In the 2008 revision of the "Loi sur le transfert du trafic", the objective of 650 000 HGV trips across the Alps was postponed to 2018/2019, or two years after the commissioning of the Gotthard base rail tunnel. The Act also stipulates that "[this] target must be met on a long-term basis and can only be exceeded in certain years due to the particularly intense development of the economy and of transport" (Art. 3 LTTM, our translation).

[82] Ordonnance relative à une redevance sur le trafic des poids lourds (RS 641.811).

[83] HVF rates increased with the successive implementation phases and the differences that existed between the lower Euroclass vehicles was progressively removed.

2023a), two thirds of which goes to the Confederation and is mostly used to finance rail infrastructure. The remaining third is used by cantons to pay for uncovered road transport costs (ARE, 2023c).

4.2 Existence of tax relief

While the HVF was introduced as part of measures to reduce alpine traffic and transfer freight to rail, the first objective of the HVF as defined by law is the internalisation of uncovered infrastructure and external costs (Art. 1 LRPL). This is further corroborated by the fact that the Federal Council sets HVF tariffs taking account first of the regularly updated calculation of uncovered infrastructure and external costs (Art. 8 al. 3 LRPL) rather than the still largely exceeded legal cap of 650 000 HGV trips across the Alps.[84] Furthermore, both the Constitutional article setting the legal basis for the HVF and the Federal Council's message accompanying the application Act first and foremost stress the internalisation of uncovered costs.[85,86] Hence, we consider that external and infrastructure costs that are not covered by the HVF constitute a subsidy.

Since non-internalised climate costs do not fall in the scope of subsidies as defined in the present report, we only consider non-climate external costs.[87] Thus, we consider as a subsidy the share of non-climate external costs of HGVs that are not covered by the HVF.

4.3 Cost of the tax relief

When deciding what is considered an "external cost", the so-called "heavy traffic category" view prevails when setting the HVF tariffs. Under this definition, costs imposed by heavy traffic on other road users, i.e., mainly congestion costs or the costs of accidents caused upon other road users, also fall under its external cost. However, if other modes of transport must pay an HVF-equivalent, as we propose in chapter 5, the "mode of transport" view is more appropriate for the estimation of external costs of road users since it considers the costs imposed by a category of road users on other road users as internal costs.[88] We, thus, adopt the "mode of transport" view, which yields a lower estimate of external costs, for our benchmark calculation. Table 4.1 shows that the HVF at its current level covers 66 % of external costs under this view.[89,90] **The amount of uncovered non-climate and non-infrastructure external costs, CHF 525 million, can be seen as a subsidy to the operation of HGVs**.

[84] 915 822 HGVs crossed the Alps in 2023 (FEDRO, 2024).

[85] "The Confederation may levy a capacity or mileage-related charge on heavy vehicle traffic where such traffic creates public costs that are not covered by other charges or taxes" (Art. 85 Cst.).

[86] Message du 11 septembre 1996 relatif à une loi fédérale concernant la redevance sur le trafic des poids lourds liée aux prestations.

[87] Nearly all of the costs from upstream and downstream processes are climate costs. Therefore, we also subtract them from the non-climate costs.

[88] A fee levied under the mode of transport view or the user view would have each road user pay for her contribution to congestion costs in addition to bearing herself congestion costs. Thus, road users would bear these costs twice. Such a fee would be needed for sending the appropriate signal, but it requires subtracting the revenues of the congestion part when computing the amount of the subsidy.

[89] At the end of September 2024, when we finished this report, the estimates of the external effects of transportation for 2021 were not yet published. We do not believe that the new results would modify our findings substantially, as the main modifications involved the estimation of the costs related to climate change, which we do not take into account here. The data for 2020 were affected by the COVID-19 pandemic.

[90] ARE (2024d) concludes, with a somewhat different calculation, on a rate of coverage of 63%.

Table 4.1 Heavy traffic's external costs in 2019 ("mode of transport" view, million CHF)

	Private coaches	Non-articulated lorries	Articulated Lorries	Total Heavy Traffic
Air pollution: damage to health	36.1	298.9	203.0	538.1
Air pollution: damage to buildings	2.7	22.1	15.0	39.8
Air pollution: crop failures	1.2	5.0	3.1	9.3
Air pollution: forest damage	1.1	4.6	2.9	8.5
Air pollution: biodiversity loss	1.6	7.0	4.4	13.0
Noise	27.1	341.7	241.4	610.2
Climate costs	15.8	109.8	99.0	224.6
Damage to nature and landscape	5.8	60.2	48.4	114.4
Soil damage	3.0	27.6	19.6	50.3
Costs from up- & downstream processes	7.2	74.8	76.3	158.3
Accident costs	2.2	15.6	6.4	24.1
Costs in urban areas	0.1	0.9	0.9	1.8
Total	**103.9**	**968.2**	**720.4**	**1 792.4**
Total non-climate external costs	80.9	783.6	545.0	1 409.5
Deduction of HVF share				-1 034.2
Uncovered infrastructure costs				150.0
Uncovered non-climate external costs				**525.3**

Source: ARE (2023b)
The deducted "HVF share" is the total revenue from the HVF minus one-third that goes to cantons to cover heavy traffic's infrastructure costs. The uncovered infrastructure costs are from ARE (2023d)

We find in section 4.4 thereafter that the increase of the HVF to cover all these external costs leads to a reduction in fuel use by HGVs by 6.4 %. Therefore, if we want to estimate the potential additional tax revenue from the increase of the HVF, we need to take this reduction in traffic, and hence in external costs, into account. Assuming that external costs are a linear function of fuel use, we estimate **additional tax revenues of CHF 500 million** from the raise of the HVF.

4.4 Behavioural effects and climate impact of the tax relief

A too low HVF leads to more HGV traffic than if the HVF were higher. Indeed, it lowers the cost of goods transportation, leading to more of it. Furthermore, it means a smaller incentive to transfer freight to rail, to better use the vehicles and to switch to less polluting vehicle categories. These are all objectives of the HVF, which are mitigated by its insufficient level.

HGV traffic emitted 1 719 465 tonnes of CO_2 in 2022, or about 13 % of emissions from road traffic (FOEN, 2024a). In what follows, we estimate the impact of raising the HVF on emissions from HGV traffic using price-elasticities. We start by calculating the additional HVF fee per vehicle kilometre that is needed to reach 100 % of HGV traffic's non-climate external costs. Then, taking fuel-price elasticity estimates for freight traffic from the literature, we estimate the impact of such an additional fee on fuel demand, and thus on CO_2 emissions.[91]

[91] For an explanation of what an elasticity is, see section 1.4.5.

The needed increase in the HVF is calculated as follows with 2019 data:

Total subsidy × HGV share of heavy traffic's external costs / Total kilometres by HGVs = CHF 525.3 million × 96 % / 2 226 million kilometres = 23 ct./km

The total subsidy was calculated in section 4.3. The HGV share of heavy traffic's external costs is calculated with the data in Table 4.1. Total kilometres by LCVs are from FSO (2023e).

This is equivalent to a 34 % increase in the average HVF. Greinus et al. (2021), estimate the average variable costs for a HGV, including driver costs, at CHF 2.81/km. Based on Baranzini and Weber (2013), INFRAS (2011) estimate a long-term fuel price elasticity of –0.17 for freight transport.[92] With these and assuming an isoelastic fuel demand (see section 1.4.5), we calculate a 6.4 % reduction in fuel demand from HGV traffic (Table 5.2) and consequently **a reduction of 109 000 tonnes of CO_2**.

Table 4.2 Calculation of the impact of the increase of the HVF on fuel demand from HGV traffic

		CHF/km
Average kilometre costs for a HGV (diesel)		
Variable costs including HVF		2.81
- fuel	17.0%	0.48
Increase of HVF		0.23
Variable cost with higher fee		**3.04**
Impact of the fee		
Increase variable cost	8.1%	0.23
Equivalent increase fuel cost	47%	0.23
Equivalent new fuel cost		0.70
Long-term variable costs elasticity in freight transport	-0.17	
Variation isoelastic fuel demand	**-6.4%**	

Table notes and sources:
Average HGV variable costs and fuel share of those costs are from Greinus et al. (2021), Table 23, p. 142.
Long-term fuel price elasticity in freight transport is from INFRAS (2011) p. 7.

Potential limitations to the use of fuel-price elasticity as a proxy for the elasticity to a kilometre fee include the following:

- A fuel price increase may be more salient. However, in the case of a vehicle fee with a counting device inside the vehicle, a bill coming in every month or year and a business optimising its costs, the driver is likely to be very much aware of the increase in kilometre costs.
- Fuel price increases are often interpreted, generally correctly, as transient, while the introduction of a fee would be seen as permanent and trigger a stronger response, particularly regarding long-term decisions such what HGV to buy.

We cannot conclude whether our results are rather likely to under- or overestimate the impact of the increased HVF.

[92] Freight transport is less elastic than individual motorised transport. The difference generally found in the literature is around a factor two. Explanations include the higher variable costs in freight transport (due to driver costs) and the fact that trips are considered more "necessary". However, on the other hand, one could argue that businesses are likely to look more closely at cost optimisation than private vehicle users and that there is probably still room for load optimisation in HGV transport.

Summary

The data on the reactivity of HGV traffic to cost increases is scarce. Using existing elasticities, we estimate that the HVF should be raised by 23 ct./km to make HGVs fully cover their non-climate external costs. This would lead to a reduction of 109 000 tonnes of CO_2 and additional revenues of CHF 500 million. We ignored CO_2 emissions from private coaches, which are also subject to the HVF. The climate effect is therefore an underestimation.

4.5 Other considerations

Other external costs

As shown in Table 4.1, non-climate external costs of HGV traffic amount to nearly CHF 1.6 billion, including CHF 540 million in health costs due to air pollution and CHF 610 million due to noise. Hence, a fee that reduces HGV traffic has important health, well-being and environmental co-benefits.

Implementation costs and legal barriers

Between the Land Transport Agreement with the EU and the Constitutional rule that "Transalpine goods traffic shall be transported from border to border by rail", the Confederation gave priority to the former. Raising the HVF may require an amendment to the LTA. Assuming that the fee is set at the maximum level permitted by the LTA (see section 4.1), this maximum would need to be increased by 34 %, as calculated in section 4.4.

The LTA allows for a maximum of CHF 325 to be charged for a journey from Basel to Chiasso. However, the Association for the protection of alpine regions estimates that the HVF amount for this journey is below CHF 300 (Initiative des Alpes, 2023). This failure to charge the maximum amount is considered a subsidy by Gubler et al. (2020). In response, the Federal Council (2020a, our translation) argues that "the average rate of the HVF fluctuates constantly with the categories of lorries in circulation; it is also determined by the maximum chargeable amount for the most expensive category (CHF 380) and by the differences in charges between categories, which must not exceed 15 % (art. 40, par. 2 and 4, LTA). The fixed maximum rate of CHF 325 can only be achieved in theory. In making these adjustments, the Federal Council is seeking to exploit the scope for manoeuvre provided by the LTA in order to boost modal shift in Switzerland."

Employment

The early phase of the HVF did not reduce employment in the road transport sector, because road transport operations in terms of ton-kilometres kept increasing (ARE, 2015). However, the reduction in fuel demand from HGV traffic estimated as a response to a higher HVF would go with less traffic, and hence less employment. Not all of that employment loss would concern drivers domiciliated in Switzerland.

Inflation

The early phase of the HVF contributed only slightly to the overall increase in prices of consumer goods. The main reasons are as follows: efficiency gains absorbed a large part of the cost increase, the remaining increase was only partly passed on to consumers and transport costs are only a small part of final costs for most products (ARE, 2015).

4.6 Conclusion

Since January 2001, heavy goods vehicles pay a fee (HVF) proportional to their authorised weight and the distance driven in Switzerland, which aims to internalise heavy traffic's external and infrastructure costs. This largely contributed to curb CO_2 emissions from heavy traffic. However, the HVF does not entirely internalise these costs. There remained **CHF 525 million** in uncovered non-climate external costs in 2019, which can be interpreted as a subsidy to HGV traffic. They could be covered by raising the HVF by 23 ct./km, which would generate additional revenues of **CHF 500 million**. The higher HVF would lower HGV traffic by some 6.4 %, which would save around **115 000 tonnes of CO_2 emissions**. The decrease in HGV traffic would also generate substantial co-benefits for public health, road safety and well-being. Finally, it would bring it closer to the legal cap on the number of vehicles transiting through the Alps. However, increasing the HVF needs to be made compatible with the Land Transport Agreement with the EU.

Table 4.3 Summary of the costs and climate impact of the subsidies analysed in this document

Subsidy	**Amount of subsidy** (million CHF)	**Potential tax revenue** (million CHF)	**Climate impact** (thousand tonnes CO_2)
Heavy Vehicle Fee: Uncompensated external costs	525	500	115

5. Heavy Vehicle Fee: Exemption for light commercial vehicles

"The Federal Council is prepared to create the legal basis so that light vehicles used for the professional transport of goods can be integrated into the HVF system. This work will be coordinated with the development of the HVF and the implementation of Switzerland's transfer policy, as set out in the 2019 transfer report." (Swiss Parliament, 2020, our translation)

5.1 Overview

The performance-related heavy vehicle fee was described in section 4.1. It applies only to goods vehicles whose total authorised weight exceeds 3.5 tonnes. However, equal treatment between heavy and light goods vehicles justifies examining an extension to the latter.

5.2 Existence of tax relief

The Alpine Protection Initiative and the HVF Act target specifically heavy goods vehicles and their nuisances.[93] Hence, the fact that good vehicles weighing less than 3.5 tonnes are not subject to the charge does not represent a "tax exemption" as such. However, as explained in section 4.2, the first objective of the HVF as defined by the HVF Act is the internalisation of uncovered infrastructure and external costs (Art. 1 LRPL). Hence, we consider that the fact that HGVs pay a fee to cover their external costs and that light commercial vehicles (LCVs) do not constitutes a subsidy, which is also the stance taken by the Federal Council (2013a).[94]

Since non-internalised climate costs do not fall in the scope of subsidies as defined in the present report, we only consider non-climate external costs. Complete internalisation calls for a fee on LCVs covering the full amount of their non-climate external costs. In its absence, the revenues of that fee can be seen as a subsidy. However, the HVF makes HGVs pay for only 66 % of their non-climate external costs, as shown in section 4.3. Therefore, and until this is corrected, equal treatment would accept a fee on LCVs covering only 66 % of their non-climate external costs. We shall consider both options in this chapter. We assume that LCV traffic covers its infrastructure costs through the mineral oil taxes.[95]

[93] While the text of the initiative demands that "Goods crossing the Alps from one border to the other are transported by rail" (Initiative populaire fédérale "pour la protection des régions alpines contre le trafic de transit"), the committee behind the initiative explains that the aim is to reduce HGV traffic (Federal Chancellery, "Volksabstimmung vom 20. Februar 1994: Erläuterungen des Bundesrates").

[94] "Transport by vehicles weighing less than 3.5 tonnes is excluded from [the HVF] and therefore indirectly subsidised as they do not cover their costs [such as climate or damage to health and buildings caused by air pollutants]" (Federal Council, 2013a).

[95] The Federal statistical office estimates in the road infrastructure account that motorised road traffic covers 110 % of its infrastructure costs (FSO, 2024h). Unlike for heavy traffic, there is no assessment of the coverage of infrastructure costs at the level of traffic type for LCV traffic. We therefore assume that LCV traffic covers its infrastructure costs.

5.3 Cost of the tax relief

We estimated in section 4.3 that that HGVs cover only 66 % of their external costs through the HVF, even when climate-change related costs and infrastructure costs are not included. Applying this 66 % ratio to LCV traffic's non-climate external costs (Table 5.1) yields **a subsidy of CHF 407 million**.[96,97] On the other hand, the HVF Act prescribes that the fee should cover the infrastructure and external costs of heavy traffic (Art. 1 LRPL). The EU-Switzerland Land Transport Agreement prevents setting the fee at a level that would fully cover those costs. There exists, however, no such barrier to an LCV fee fully covering LCV traffic's external costs. **Hence, another view is to consider that the subsidy to LCV traffic amounts to its entire non-climate external costs, i.e., CHF 617 million.**

Table 5.1 Light commercial vehicle traffic's external costs in 2019 ("mode of transport" view, million CHF)

Air pollution: damage to health	206.3
Air pollution: damage to buildings	15.3
Air pollution: crop failures	7.4
Air pollution: forest damage	6.9
Air pollution: biodiversity loss	10.8
Noise	240.6
Climate costs	132.9
Damage to nature and landscape	67.6
Soil damage	15.7
Costs from up- & downstream processes	77.8
Accident costs	43.1
Costs in urban areas	3.2
Total	**827.7**
Total non-climate external costs	**616.9**

Source: ARE (2023b)

We find in section 5.5 below that the introduction of an LCV fee leads to a reduction in fuel use by LCV traffic. Therefore, if we want to estimate the potential additional tax revenue from the introduction of such a fee, we need to take this reduction in fuel use, and hence in external costs, into account. We find that a fee covering 66 % of external costs reduces fuel use by 7.8 %, and a fee covering all external costs reduces it by 10.6 %. Assuming that external costs are a linear function of fuel use, we estimate **additional tax revenues of CHF 370 million for the 66 %-of-external-costs fee and CHF 550 million for the full-cost fee**.

[96] This considers that, unlike HGV traffic prior to the HVF, LCV traffic already covers its infrastructure costs. The reasoning behind is that LCVs, most of which we assume are registered in Switzerland, pay all relevant vehicle and mineral oil taxes, which, together with taxes paid by other road users, suffice to cover motorised road traffic's infrastructure costs according to the Federal Statistical Office's "Road infrastructure account" (FSO, 2024h).

[97] This subsidy is not to be understood as the expected increase in tax revenue from an introduction of an HVF equivalent for LCVs since it does not account for the impact on LCV ton-kilometres.

5.4 Behavioural effects of the tax relief

LCV traffic

The incentive resulting from the HVF and from the absence of such a fee on LCV traffic can affect LCV traffic in at least two ways: a transfer of goods traffics from HGVs (subject to the fee) to LCVs (not subject to the fee), and, independently from that, a failure to reduce LCV traffic. The number of LCVs grew by 84 % between 2000 and 2022 (FSO, 2024e), and ARE (2007) finds that a given amount of freight transfer from HGVs to LCVs did take place. Many transport companies anticipated the introduction of the HVF by adding LCVs to their fleet, and once the fee was introduced, small businesses such as carpenters and joiners increasingly started to transport their goods themselves, for which they purchased additional LCVs. However, the possibilities of transferring freight to LCVs were overestimated: the capacity of LCVs is, in general, not adapted, and drivers' wages weigh heavier in the balance than savings on the HVF. ARE and the Federal Council (Swiss Parliament, 2006) conclude that the impact of the HVF on LCV traffic was very limited and attribute the steady growth in the number of LCVs since 1990 mostly to other factors.[98] Nonetheless, it remains that the absence of a fee for LCVs disincentivises freight transfer to rail or to larger vehicles (Federal Council, 2013a) and artificially reduces the price of transported goods. The latter distortion is likely to result in overconsumption of goods and to favour goods shipped over local production. The subsidy is thus likely to have contributed to the steep growth in e-commerce in Switzerland, from CHF 6.3 billion sales revenue in 2013 to CHF 14 billion in 2022 (Swiss Post, 2023). Furthermore, due to excessively low kilometre costs, there is little incentive for LCV operators to optimise travel distances and the use of their loading capacities.

Vehicle emission levels

The difference in HVF rates according to vehicle polluting categories (see section 5.1) provided a strong incentive for shippers to shift to less polluting lorries (ARE, 2007). In contrast, the Federal Office of Energy estimates that the measures aimed at reducing CO_2 emission levels of LCVs had little effect: since the introduction, in 2020, of CO_2 targets for newly registered vehicles and of accompanying penalties, CO_2 emissions per kilometre have decreased by 1.8 % annually on average compared to a yearly reduction of 1.6 % between 2005 and 2019 (SFOE, 2023). The ineffectiveness of the measure can be explained in part by the fact that the penalty is based on average emissions of an importer's fleet, which enables importers to compensate CO_2-intensive LCVs with efficient ones.

5.5 Climate impact of the tax relief

LCV traffic emitted 1 198 421 tonnes CO_2 in 2022, or about 9 % of emissions from road traffic (FOEN, 2024a). In what follows, we estimate the impact of an LCV fee on emissions from LCV traffic using price-elasticities. Subsequently, for comparison purpose, we extrapolate the trend in HGV traffic CO_2 emissions since the introduction of the HVF to LCV traffic emissions.

Price-elasticity method

We start by calculating the LCV fees per vehicle kilometre that cover respectively 66 % - the share of heavy traffic's non-climate external costs covered by the HVF (see 5.3) – and 100 % of LCV traffic's non-climate external costs. Then, taking fuel-price elasticity estimates for freight traffic from the

[98] These include the liberalisation of the postal market and the related increase in (express) delivery services and express service offers, the rising trend in overnight transports (related with the night-driving ban for HGVs), the shortage of HGV-drivers and the economic activity (ARE, 2007, pp. 125-126).

literature, we estimate the impact of such fees on fuel demand and thus on CO_2 emissions.[99] The differences in the characteristics of HGV and LCV traffic (share of driver costs, vehicle use, etc.) would call for using elasticities specific to each traffic category. However, we are not aware of available estimates than differentiate between these and therefore use an elasticity for freight traffic overall.

The "HVF-equivalent for LCVs", i.e., the LCV fee per kilometre assuming that the fee covers 66 % of LCV traffic's non-climate external costs, is calculated as follows:

Total subsidy / Total kilometres by LCVs = HVF-equivalent for LCVs
=> CHF 407 million / 4 668 million kilometres = 9 ct./km

The total subsidy was calculated in section 5.3. Total kilometres by LCVs in 2019 are from FSO (2023e).

Greinus et al. (2021) estimate the average variable costs for an LCV, including driver costs, at CHF 2.03/km. Based on Baranzini and Weber (2013), INFRAS (2011) estimate a long-term fuel price elasticity of –0.17 for freight transport.[100] With these and assuming an isoelastic fuel demand (see section 1.4.5), we calculate an 7.8 % reduction in fuel demand from LCV traffic (Table 5.2) and consequently **a reduction of 94 000 tonnes of CO_2.**

Table 5.2 Calculation of the impact of an "HVF-equivalent for LCVs" on fuel demand from LCV traffic

		CHF/km
Average kilometre costs for an LCV		
Variable costs		2.03
- fuel	7.0%	0.14
LCV fee		0.09
Variable cost with fee		**2.12**
Impact of the fee		
Increase variable cost	4.3%	0.09
Equivalent increase fuel cost	61%	0.09
Equivalent new fuel cost		0.23
Long-term fuel price elasticity in freight transport	-0.17	
Variation isoelastic fuel demand	**-7.8%**	

Table notes and sources:
Average LCV variable costs and fuel share of those costs are from Greinus et al. (2021), Table 23, p. 142. We take the costs for a diesel LCV since freight transport is mostly fuelled by diesel (INFRAS, 2011, p. 5)
Long-term fuel price elasticity in freight transport is from INFRAS (2011) p. 7

[99] For an explanation of what an elasticity is, see section 1.4.5.

[100] Freight transport is less elastic than individual motorised transport. The difference generally found in the literature is around a factor two. Explanations include the higher variable costs in freight transport (due to driver costs) and the fact that trips are considered more "necessary". However, on the other hand, one could argue that businesses are likely to look more closely at cost optimisation than private vehicle users and that there is probably room for load optimisation in LCV transport.

Potential limitations to the use of fuel-price elasticity as a proxy for the elasticity to a kilometre fee include the following:

- A fuel price increase may be more salient. However, in the case of a vehicle fee with a counting device inside the vehicle, a bill coming in every month or year and a business optimising its costs, the driver is likely to be very much aware of the increase in kilometre costs.
- The impact of a fuel price increase is partly due to people buying more efficient cars. Again, a differentiated LCV fee depending on vehicle fuel-consumption (as is the case for the HVF) also creates a strong incentive to purchase more efficient vehicles.
- Fuel price increases are often interpreted, generally correctly, as transient, while the introduction of a fee would be seen as permanent and trigger a stronger response, particularly regarding long-term decisions such as which car to buy and where to live.

We therefore conclude that, overall, our results are rather likely to underestimate the impact of the LCV fee.

We saw in section 5.3 that the HVF only covers two-thirds of heavy traffic's non-climate external costs and we assumed above that an equivalent fee on LCVs covers the same share of LCV traffic's non-climate external costs. We now estimate the impact of a fee covering all of LCV traffic's non-climate external costs. This "full-cost LCV fee" amounts to 13 ct./km and increases LCV variable costs by 6.5 %.[101] Using the elasticity method as above, we calculate that the fee leads to a reduction of 10.6 % in LCV fuel demand, or **127 000 tonnes of CO_2**.

Extrapolation of the trend in HGV traffic

CO_2 emissions from both heavy and light goods vehicle traffic were following an increasing trend in the 90s, with HGV traffic emissions growing almost 1.5 times faster than LCV traffic emissions. However, since the introduction of the HVF, emissions from HGV traffic have decreased while LCV emissions kept growing (Table 5.3 and Table 5.4 columns 2 and 3).[102]

Table 5.3 Average yearly growth in CO_2 emissions from road freight pre- and post HVF

Type of traffic	1990 – 2000	2000 –2010	2010 – 2021
Heavy vehicles (> 3.5 tonnes)	+ 1.65 %	+ 0.07 %	− 1.07 %
Light vehicles (< 3.5 tonnes)	+ 1.09 %	+ 0.88 %	+ 1.89 %

Source: FOEN (2024a)

[101] CHF 17 million / 4 668 million kilometres = 13 ct./km.

[102] Interestingly, goods transport services provided by LCVs measured in ton-kilometres grew by an average of 3.79 % per year between 1990 and 2000, compared to a 0.53 % average growth rate between 2000 and 2021 (FSO, 2023d), which indicates that LCVs are often used for other purposes than goods transport.

Table 5.4 CO_2 emissions from HGV and LCV traffic in Switzerland since 1990 and extrapolation of HGV traffic trend to LCV traffic

	HGVs	LCVs	LCVs assuming HGV trend
1990	1 660	790	
1991	1 680	800	
1992	1 710	800	
1993	1 700	790	
1994	1 800	800	
1995	1 810	830	
1996	1 770	830	
1997	1 780	830	
1998	1 820	840	
1999	1 890	860	
2000	1 950	880	
2001	1 900	900	857
2002	1 870	910	844
2003	1 870	910	844
2004	1 900	910	857
2005	1 900	930	857
2006	1 930	930	871
2007	1 960	950	885
2008	1 970	950	889
2009	1 910	950	862
2010	1 960	960	885
2011	1 970	990	889
2012	1 930	1 020	871
2013	1 940	1 040	875
2014	1 920	1 070	866
2015	1 900	1 100	857
2016	1 880	1 120	848
2017	1 850	1 090	835
2018	1 790	1 090	808
2019	1 770	1 120	799
2020	1 730	1 130	781
2021	1 780	1 160	803
2022	1 720	1 200	776

Source: FOEN (2024a)
LCV emissions assuming HGV trend are calculated using cross-multiplication taking year 2000 as a basis

We now consider a counterfactual scenario in which the HVF had been levied on both HGVs and LCVs since 2001. We assume that, as a consequence, CO_2 emissions from LCV traffic follow the pathway of HGV traffic emissions without any impact on HGV emissions, i.e., both HGV and LCV traffic emissions decreased by a total of 11.8 % between 2000 and 2022 (last column of Table 5.4). Under these assumptions, **424 000 tonnes of CO_2 would have been saved in the year 2022 alone**.

This is obviously a very simplified version of reality and should be taken as "the maximum potential climate impact" of the subsidy. There are indeed several reasons for which this scenario is likely to overestimate the impact of the absence of a LCV traffic fee, including the following:[103]

- The HVF raises variable costs for an average HGV by 31 %, compared to the 4.3 % increase in variable costs for an average LCV from an "HVF-equivalent for LCVs" estimated above. Taking the elasticity of −0.17 for fuel price in freight transport, we calculate that the fee reduces fuel demand from HGV traffic by 14 % compared to 7.8 % for LCV traffic. This much smaller difference once we look at the effect on fuel demand is mostly explained by the fact that fuel makes up a larger share of HGV variable costs (17 % vs. 7 % for LCVs).[104]
- While there certainly is potential in LCV traffic for load optimisation,[105] for cutting on empty trips and for transferring freight to larger vehicles as there was (is) in HGV traffic, LCVs usually transport goods over shorter distances – often the last leg of a freight transport journey – and are largely used for functions other than goods transport such as for services provided by craftspeople or for passenger transport (ARE, 2023a). Hence, while it may be relatively easy to transfer HGV freight transport to rail – though, the 5 % growth in rail freight between 2000 and 2022 indicates that there was little modal shift – rail may not be a suitable substitute for the vast majority of LCV trips. Furthermore, some of the reduced CO_2 emissions from HGV traffic in Switzerland may be the result of leakage to neighbouring France and Austria, where HGV traffic has increased between 1999 and 2021. In Austria, the number of HGVs crossing the Alps even increased by 55 % (DG MOVE and FTO, 2023, pp. 20-22). Such leakage is unlikely to happen for LCV traffic.
- Although the reversal of the growth in CO_2 emissions from HGV traffic closely follows the introduction of the HVF, other factors are likely to have contributed it. These include the stepwise increase of the maximum total weight for HGVs from 28 tonnes to 34 tonnes in 2001 and 40 tonnes in 2005 (ARE, 2007), as well as the New Rail Link through the Alps (NRLA) with the opening of the base tunnels of the Lötschberg in 2007, Gotthard in 2016 and Ceneri in 2020 (FOT, 2024).

Summary

The data on the reactivity of LCV traffic to cost increases is scarce and price elasticities estimated in the literature are only for goods traffic in general. Using such elasticities, we estimate that an "HVF-equivalent for LCVs", that is, an LCV fee covering two-thirds of LCV traffic's non-climate external costs (as is the case with the HVF), would lead to a reduction of 94 000 tonnes of CO_2. With an LCV fee covering all non-climate external costs ("full-cost LCV fee"), the price-elasticity method yields a reduction of 127 000 tonnes of CO_2. In comparison, taking the reduction in HGV traffic that followed the introduction of the HVF and extrapolating it to LCV traffic, with all the limitations of this method, yields a reduction of 424 000 tonnes of CO_2.

[103] On the other hand, emissions from HGV traffic were growing 1.5 times faster than those from LCV traffic pre-2001. All other things equal, one might therefore expect LCV traffic emissions to decrease faster than those from HGV traffic with an equivalent fee been applied to both.

[104] For the details of the calculations for LCV traffic, see above in the same section. We applied the same method to the calculations for HGV traffic.

[105] One can think of those parcels delivered by postal services that are many times the size of the parcels' content.

5.6 Other considerations

Other external costs

As shown in Table 5.1, non-climate external costs of LCV traffic amount to nearly CHF 620 million, including over CHF 200 million in health costs due to air pollution, CHF 240 million due to noise. Hence, a fee that reduces LCV traffic has important health, well-being and environmental co-benefits.

Implementation costs and legal barriers

The Federal Council (2013a) had argued that introducing a kilometre fee for LCVs would prove difficult for legal and practical reasons: "The installation of a device comparable to that fitted to heavy goods vehicles over 3.5 tonnes (calibrated tachometer) would entail disproportionately high costs as there are six times as many vehicles in [LCV] category. Technically, alternative solutions would be to use a geolocation system (GPS) or the mobile phone network (GSM). However, these two options raise questions of a legal nature (position of the courts) and a technical nature (prevention of fraud) that have yet to be clarified. The registration of foreign vehicles faces similar problems" (pp. 5026-5027). The new generation of recording devices to come in 2025 will likely be much more affordable and convenient to use (FOCBS, 2024d).

Employment

A large part of the reduction in CO_2 emission is likely to happen through efficiency gains, as observed with HGV traffic: the early phase of the HVF did not reduce employment in the road transport sector, because road transport operations in terms of ton-kilometres kept increasing (ARE, 2015). Nonetheless, Greinus et al. (2021) assume elasticities of −0.1 (short run) and −0.2 (long run) for freight traffic ton-kilometres in response to an increase in variable costs.[106] They further assume that the introduction of a CO_2 tax of whatever amount would lead to a 0.2 % increase in average vehicle load in freight transport, accounting for the reduction in empty trips. Assuming that these assumptions hold for an LCV fee and assuming an isoelastic demand function, the fees calculated in section 5.5 reduce freight traffic vehicle-kilometres between 1 % and 1.5 % compared to the status quo.[107] On the other hand, extending the fee to LCVs might also curb the decline of sales in physical shops associated with the rise in e-commerce, as well as convince delivery services and craftspeople to switch to alternatives such as cargo bikes – which is a more labour-intensive form of transport than LCVs. Overall, we consider that the fee is likely to have a small negative effect on employment if at all.

Inflation

The early phase of the HVF contributed only slightly to the overall increase in prices of consumer goods. The main reasons are as follows: efficiency gains absorbed a large part of the cost increase, the remaining increase was only partly passed on to consumers and transport costs are only a small part of final costs for most products (ARE, 2015).

[106] These are based on a review of the literature. However, in the end, the chosen elasticities for freight transport result from discussions with project partners, including the Federal Office for Spatial Development ARE (Information obtained directly from the authors of the study).

[107] These assumptions seem rather conservative in light of the 8 % to 11 % decrease in fuel demand estimated in section 5.5. While they might indeed be underestimates, explanations for the difference include technological effects and a reduction in distances driven by LCVs for uses other goods transport. The reduction in distances driven by craftspeople and by owners of company LCVs for private use is unlikely to reduce employment.

In summary, a reduction in the CO_2 emissions from LCV traffic would have important health, wellbeing and environmental co-benefits to the Swiss population and the negative impacts on employment and inflation are likely to be small. The LCV fee could be linked with measures to support and train craftspeople and delivery companies in adapting their business and/or career to a low carbon economy. EBP (2024) suggest that there could also be exemptions for some companies or trips, such as craftspeople, garden centres or painters. The technical feasibility of levying a kilometre-fee on LCVs should be much increased in 2025 with the new recording devices. The legal feasibility needs to be assessed.

5.7 Conclusion

Since January 2001, heavy goods vehicles pay a fee (HVF) proportional to their authorised weight and the distance driven in Switzerland, which aims to internalise heavy traffic's external and infrastructure costs. This largely contributed to curb CO_2 emissions from heavy traffic. In contrast, CO_2 emissions from LCV traffic, which does not pay for its external costs, kept increasing. Internalising those LCV traffic costs would create incentives to transfer freight to larger vehicle, reduce the distance over which goods are transported, reduce consumption of material goods, as well as improve vehicle efficiency.

We estimate the subsidy to LCV traffic at CHF 407 million when considering a fee that covers the same share of LCV traffic's non-climate external costs as the HVF does for HGV traffic ("HVF-equivalent for LCVs"), or at CHF 617 million compared to a benchmark scenario in which LCV traffic internalises all its non-climate external costs ("full-cost LCV fee"). Considering that introducing a fee would reduce LCV traffic, we estimate additional tax revenues of CHF 375 million for the "HVF-equivalent for LCVs" and CHF 552 million for the "full-cost LCV fee".

Using fuel price elasticity estimates from the literature, we calculate that the "HVF-equivalent for LCVs" and the "full-cost LCV fee" would reduce CO_2 emissions by around respectively 94 000 tonnes and 127 000 tonnes. For the sake of comparison and considering this as the "maximum potential impact", we then extrapolate the reduction in CO_2 emissions from HGV traffic over the period since the introduction of the HVF to LCV traffic. This yields a reduction of 420 000 tonnes of CO_2.

Table 5.5 Summary of the costs and climate impact of the subsidies analysed in this document

Subsidy	**Amount of subsidy** (million CHF)	**Potential tax revenue** (million CHF)	**Climate impact** (thousand tonnes CO_2)
Heavy Vehicle Fee: Exemption for light commercial vehicles			
• Partial compensation of external costs, like HGVs	405	375	95
• Full compensation of external costs	615	550	125

Charging a performance-related fee on LCV traffic is likely to have important health, wellbeing, and environmental co-benefits while the negative effects on employment and inflation are likely to be small. The new generation of recording devices will likely make it easier to track distance covered by LCVs, though the legal feasibility still needs to be assessed.

6. Mineral oil tax: Reimbursement to licensed transport companies

"In 2026, the Confederation plans to abolish the refund of the [mineral oil] tax in local traffic for concessionary transport companies (40 million). Outside local traffic, such an abolition is only planned for 2030 (30 million). The Confederation could anticipate this abolition, which would then coincide with the proposed elimination of subsidies for new propulsion systems. Public transport would then be subject to the same "relative prices" as private road users." (Group of experts, 2024, our translation)

6.1 Overview

The mineral oil tax is an excise tax encompassing a tax on fossil fuels including engine fuel, as well as a surtax on engine fuels. The tax (including the surtax) is 76.82 cents per litre for unleaded petrol, 79.57 cents per litre for diesel oil and 0.3 cents per litre for extra light heating oil. In 2022, the mineral oil tax and surtax revenue amounted to 7.6 % of the federal budget (FOCBS, 2023a). It is allocated as follows:

Table 6.1 Allocation of mineral oil tax revenues

Tax revenue	Allocation
Tax on engine fuel	Federal treasury (40 %) Tasks associated with road transport and aviation (50 %) National Roads and Agglomeration Traffic Fund (10 %)
Surtax on engine fuel	Tasks associated with road transport and aviation
Tax on combustibles	Federal treasury

Some sectors are subject to a reduced tax rate for the mineral oil tax. For licensed transport companies, the difference between the ordinary rate and the reduced rate is reimbursed as displayed in Table 6.2.

Table 6.2 Rates of reimbursement of the mineral oil tax for licensed transport companies

Vehicle and fuel type	**Reimbursement**
Unleaded petrol	Mineral oil surtax and part of the mineral oil tax (59.24 cents/litre)
Diesel oil vehicle with particle filter or equivalent system[108]	Mineral oil surtax and part of the mineral oil tax (60.05 cents/litre)
Diesel oil vehicle without particle filter or equivalent system	Mineral oil surtax (31.46 cents/litre)

Source: FOCBS (2023b)

[108] "Or vehicles complying with EURO IV, EURO V and EEV [Enhanced environmentally friendly vehicle] standards without a particle filter or equivalent system which, according to the vehicle registration document, were first put into circulation no later than 31 December 2007" (our translation).

6.2 Existence and cost of the tax relief, and behavioural effects

The partial reimbursement of the mineral oil tax is a tax relief. The Swiss Act on subsidies prescribes that "aid in the form of tax relief is, as a rule, dispensed with." (Loi sur les subventions RS 616.1, Art. 7 let. g). Licensed transport companies provide services of general interest. As such, they are subsidised by the Confederation and the cantons. The mineral oil tax and surtax are partially reimbursed to protect subsidised services from being taxed (Swiss Parliament, 2013).

The amount of the subsidy averaged over the past decade (2013-2022) is reported as **CHF 77 million** (FOCBS, 2023c).[109]

The revision of the CO_2 Act adopted by the Swiss parliament in 2024 eliminates the reimbursement of the mineral oil tax (and surtax) for vehicles used in local transport by 2026 and for those used in regional passenger transport (RPT) by 2030. Exemptions are provided if, for topographical reasons, it is not possible to use vehicles that use renewable energy and are CO_2 neutral (Swiss Parliament, 2024).

In summary, the partial reimbursement of the mineral oil tax is a subsidy. It is legitimate in the sense that it subsidises the provision of service of general interest. However, the form of this subsidy provides an incentive for licensed transport companies to buy diesel buses rather than climate-friendlier alternatives.

6.3 Climate impact of the tax relief

On 15 January 2019, the National Council's Commission for Transport and Telecommunications asked the Federal Council to present measures to "financially encourage the replacement of diesel buses with more environmentally-friendly buses using climate-neutral non-fossil energy (e.g., electric buses)" (postulate 19.3000, our translation). This resulted, in 2020, in the publication of a report (Federal Council, 2020b), which, after examining alternative propulsion technologies, finds that the greatest potential to reduce CO_2 emissions from buses lies in battery-powered buses. In cases where these are not suitable, such as mountainous areas, the best alternatives are fuel cell buses – which yield similar results to battery-powered buses in terms of CO_2 emissions but are more expensive – or the use of biodiesel, with the downside that it emits as much local air pollutants as conventional diesel fuel and is only available in limited quantities.[110] The authors predict that, by 2035, a battery-powered bus will cost between 1 % less and 6 % more over its lifetime than a diesel bus without reimbursement of the mineral oil tax, and that, in the longer term, it will be cheaper than a diesel bus.[111]

The authors analyse three scenarios for the replacement of diesel buses by buses powered by an electric battery which they call "maximum potential", "realistic potential" and "progressive replacement". The "maximum potential" scenario assumes the replacement, over the period from 2023 to 2034, of all 5 500 diesel buses used in regional or local passenger transport. While technically feasible, the authors find that replacing all diesel buses does not make sense economically or ecologically: in some cases, this would require acquiring additional vehicles due to the lower autonomy of battery-powered buses. The "realistic potential" scenario, on the other hand, is aligned with public transport companies' current strategy in terms of electrification of their fleets and

[109] Yearly amounts fluctuate significantly due to reimbursement being sometimes made for the previous year. There is no observable decrease in reimbursed amounts over this ten-year period. One third of the amount goes to CarPostal Suisse SA (Swiss Parliament, 2019).

[110] The report only considers biodiesel produced with used edible oil.

[111] The specific charging systems in question are a battery-powered buses with charging system at the bus depot for local transport and, for RPT, battery charging on transfer bases at the terminus station.

accounts for technological progress in batteries, which will lower costs and increase buses' autonomy. It assumes that the replacement rate will be higher in local transport due to shorter routes, less complex topography and partially available overhead contact cables.

Under the "realistic potential" scenario, 1300 buses in RPT and 1 900 buses in local transport are replaced by electric buses by 2034. Furthermore, from 2030 onwards, all new acquisitions in local transport are battery-powered buses. The same applies to RPT from 2032 onwards. This scenario is estimated to cost an additional CHF 922 million over the 10-year period (compared to the cost of diesel buses under the current reimbursement of the mineral oil tax system). Based on the estimates in Federal Council (2020b), we calculate in Table 6.3 that the reimbursement of the mineral oil tax over 2023-2034 under this scenario amounts to CHF 651 million (accounting for the decrease in the number of diesel buses), which is more than two-thirds of the 10-year cost difference (CHF 922 million). Allocating 40 % of the additional revenue from the mineral oil tax to subsidise battery-powered buses would then suffice to equalise costs.[112]

Table 6.3 Additional tax revenue from eliminating the reimbursement of the mineral oil tax for licensed transport companies

	Realistic potential		Progressive replacement	
	RPT	**Local transport**	**RPT**	**Local transport**
2023	55	23	54	22
2024	52	21	51	21
2025	50	19	49	20
2026	47	18	47	18
2027	44	16	45	17
2028	41	15	43	17
2029	39	14	40	16
2030	36	12	38	15
2031	33	10	36	13
2032	31	9	34	13
2033	28	7	32	11
2034	25	6	29	9
Total (2023-34)	481	170	498	192
Total (RPT + local)		651		690

Source and explanations: Federal Council (2020b) assumes that the reimbursement of the mineral oil tax for licensed transport companies stops in 2026 for local transport vehicles and in 2030 for RPT vehicles and estimate the additional revenue from the mineral oil tax starting from those years. Since the estimated decrease in this revenue is linear until 2034, we assume the same linearity to extrapolate it to previous years (grey area). The total additional revenue in 2023 under both scenarios matches the amount of the subsidy estimated above (CHF 77 million). Values may not add to total due to rounding

The "progressive replacement" scenario assumes a longer period for the replacement of diesel buses. By 2034, 1500 buses in RPT and 1000 buses in local transport are replaced at a total cost of CHF 692 million, which matches the additional revenue from the mineral oil tax over that period (Table 6.3). Hence, we can assume that discontinuing the reimbursement of the mineral oil tax and redistributing the additional tax revenue as a lump sum subsidy to licensed transport companies would create all the conditions for this scenario to happen.

[112] Eliminating the reimbursement of the mineral oil tax reduces the cost difference between diesel and battery-powered buses, but it does nothing to reduce the cost of the latter. Hence, eliminating the subsidy implies that licensed transport companies will need additional funding, even if they choose to stick to diesel buses.

The reduction in CO_2 emissions in 2034 under each scenario is estimated in the study and listed below. These are underestimates given that they only consider for the potential of battery-powered buses. Where the latter are not practical replacement options, the authors argue that fuel cell and biodiesel buses provide promising CO_2 reduction potential:

- Progressive replacement: 120 000 tonnes
- Realistic potential: 155 000 tonnes
- Maximum potential: 255 000 tonnes

Comparing the additional revenue from eliminating the reimbursement of the mineral oil tax with the costs of the different scenarios, we find that simply removing the subsidy would lead to somewhere between the "progressive replacement" scenario and the "realistic potential" scenario. **Thus, it would reduce CO_2 emissions by at least 120 000 to 155 000 tonnes.** The highest value corresponds to a case in which at least 40 % of the additional revenue from eliminating the reimbursement of the mineral oil tax is earmarked to support the purchase of electric buses specifically, and licensed transport companies can secure CHF 270 million funding over the next ten years in addition to the remaining 60 % from the former mineral oil tax being paid to them.

6.4 Other considerations

Other external costs

The Federal Office for Spatial Development (ARE, 2023a) estimated the external costs of public transport buses in Switzerland at CHF 268 million in 2020, of which only CHF 42.6 million are attributed to climate impact. Climate-friendlier buses also perform much better on the two greatest external cost factors:

- **Air pollution (CHF 112 million)**. As opposed to diesel buses, battery-powered buses do not emit nitrogen oxides (NOx) and emit 30 % less fine particles (PM10) than diesel buses (Federal Council, 2020b).[113] These are deposited in our lungs where they cause respiratory diseases, especially in children, elderly and people with asthma (FOEN, 2014; FOEN, 2021). Furthermore, NOx emissions, including from road traffic since these can travel long distances, contribute to over fertilisation and acidification of whole ecosystems with harmful effects on biodiversity (FOEN, 2014). The impact of phasing out diesel buses is greatest in densely populated areas, where air pollution is highest. As mentioned above, NOx emissions from biodiesel are similar to conventional diesel (Federal Council, 2020b).
- **Noise (CHF 56.2 million)**. Traffic noise causes sleep deprivation, which impact workers' productivity and children's learning ability, and illnesses such as diabetes and depression (FOEN, 2018). Battery-powered buses are quieter than diesel buses, especially at lower speed and at stop. However, the cooling down of charging stations, when these are being used, can be noisy and may need appropriate sound insulation (Federal Council, 2020b).

Electricity generation

Battery-powered buses will take electricity from the grid in Switzerland, which will require an increase in supply unless the demand is not reduced elsewhere. The climate and environmental effects of electric buses will depend on the energy sources used to produce the electricity. However, considering that battery-powered buses need 34 % less primary energy over their lifetime than diesel buses, the

[113] Fine particles emitted by battery-powered buses do not come from exhaust fumes, but from wear debris from brakes and tires.

climate and environmental damage of the primary energy used to power the former is unlikely to exceed that of the combustion of diesel, except perhaps if it is coal (Federal Council, 2020b).

Production of batteries

Electric buses, especially those that charge only at the bus depot, need large batteries, which are made of metals (mostly lithium, cobalt, graphite and so-called rare-earth metals). It is well-known that extraction of these metals is linked to pollution around extraction site, sometimes on a large scale, and to human rights violations. Furthermore, their availability is limited. However, existing technologies allow for the almost full retrieval of these metals, and given their value, the Federal Council assumes that they will be recycled (Federal Council, 2020b).

Limited battery autonomy

As discussed above, for the longer routes, the use of battery-powered buses would require additional vehicle turnover to allow enough time to charge the battery (Federal Council, 2020b). In these cases, bus companies would need to purchase additional buses and hire additional drivers to make these rotations, with associated costs. However, as discussed above, the "realistic potential" scenario does not include such routes, for which other propulsion technologies, such as biodiesel, might be more appropriate.

In summary, eliminating the reimbursement of the mineral oil tax and thus accelerating the electrification of the public transport bus fleet is likely to significantly reduce local air and noise pollution. The climate and environmental impacts of battery-powered buses can be kept low with a high degree of recyclability of the batteries and the use of "cleaner" energies (include by reducing electricity demand elsewhere) in the production of the buses and of the electricity used to power them.

6.5 Conclusion

Licensed transport companies are subsidised for the service of general interest they provide. As such, they are also reimbursed the mineral oil tax. However, this latter subsidy, amounting to CHF 77 million per year, creates a barrier to the replacement of diesel buses by climate-friendlier alternatives. We show that eliminating the reimbursement of the mineral oil tax is sufficient to accelerate the electrification of the bus fleet along scenarios modelled by the Federal Council. Hence, we estimate that redesigning the subsidy reduces CO_2 emissions by at least 120 000 to 155 000 tonnes per year, depending on the chosen re-affectation of the additional tax revenue. Of course, there would not be any additional net revenue for the Federal government. Additional benefits include reduced air and noise pollution.

Table 6.4 Summary of the costs and climate impact of the subsidies analysed in this document

Subsidy	**Amount of subsidy** (million CHF)	**Potential tax revenue** (million CHF)	**Climate impact** (thousand tonnes CO_2 or CO_2eq)
Mineral oil tax: Reimbursement to licensed transport companies	77	0	120 – 155

7. Mineral oil tax and VAT: Exemption for international aviation

"International air traffic is largely tax-free today – this is clearly a wrong incentive from the perspective of energy consumption. Reducing this incentive would offer great potential for savings, would be associated with highly positive social and ecological effects and would also correct various current tax inequalities. The rising costs for airlines would be reflected in higher travel costs for households and companies – although this would probably also lead to a partial shift towards domestic tourism. The main challenge is the difficult implementation, which would require international coordination." (EBP, 2024, p. 27, our translation)

7.1 Overview

International flights are exempted from the mineral oil taxes presented in chapter 6. This ruling is based on international agreements, as evidenced by the fact that flights operated by companies matriculated in countries with which Switzerland does not have a reciprocal tax-exemption agreement are not exempted from these taxes (FOCBS, 2012). Inland flights are also exempted when they serve as connections flights to international destinations, as are flights that serve training, testing, certification or repairing purposes.

The exemption for international flights is generally justified with reference to the Chicago Convention on international civil aviation, which was established in 1944 with the goal of furthering international aviation (Federal Council, 2019). However, the Convention only states that "Fuel […] on board an aircraft of a contracting State, on arrival in the territory of another contracting State and retained on board on leaving the territory of that State shall be exempt from customs duty, inspection fees or similar national or local duties and charges." (art. 24) This means that fuel on board an aircraft from London landing in Zurich shall not be subject to any Swiss tax. It does not mean that fuel tanked into the aircraft in Zurich must be exempted. This exemption is regulated by bilateral air service agreements only, which can be reviewed, as some countries have already done bilaterally (Faber and O'Leary, 2018). Switzerland is bound by about 150 such agreements (Federal Council, 2019).

International aviation and domestic flights feeding into international flights are also exempted from the VAT.[114] Here, the motivation is that most of the service is carried out outside of the country, therefore, the same principle applies as for exports of goods and services. On the other hand, this service is not taxed abroad, not more than incoming flights are taxed in Switzerland. Therefore, international aviation is VAT-free.

7.2 Existence and cost of the tax relief

Flights subject to the mineral oil tax and surcharge are charged at a rate of CHF 0.7395 per litre of aviation kerosene and a VAT of 8.1 % (FOCBS, 2024a). The cost of the exemption of international aviation from these taxes is equal to the revenues generated if it were not granted them.

In 2023, 2 141 million litres of kerosene were sold at Swiss airports, not counting Basel-Mulhouse (FOCBS, 2024b, Table 3.1). The mineral oil tax and surcharge levied on these sales must have amounted to about CHF 1.58 billion, of which everything up to CHF 59 million was paid back to the airline companies (Avenergy, 2024).

[114] Ordinance on Value Added Tax of 27 November 2009 (status as of 1 July 2024), RS 641.201, art. 41.

To compute the amount of subsidy corresponding to the VAT exemption, we need the valued added of international air transport. No statistic could be found, so we need to go an indirect route, using the fact that fuel costs represented on average 30 % of airlines' total operating costs in Europe (IATA, 2024). We know the quantity of fuel sold, but no statistic of the average price of kerosene in 2023 could be found. In September 2024, kerosene was sold at Swiss airports for a price of about CHF 1.40/litre.[115] If kerosene sales were equal in 2024 to 2023 (they are most likely higher) and if all this kerosene were sold at that price, then the total revenue from kerosene sales would amount to CHF 3.00 billion. The actual charge for airline companies is only CHF 1.41 billion, as they are refunded the mineral oil taxes. If this represents 30 % of their costs, their total costs must amount to about CHF 4.71 billion. A small share of this is for domestic aviation. Not taxing international aviation at the 8.1 % VAT rate of 2024 amounts to a subsidy of CHF 366 million.

Altogether, the exemption of international aviation from mineral oil taxes and VAT saved it CHF 1.89 billion in taxes. Without this exemption, kerosene sales would be smaller. Therefore, taxing international flights like domestic flights would not generate CHF 1.89 billion in additional revenues. We estimate below that the number of flights would actually decrease by 28 %, so that tax revenues would amount to CHF 1.36 billion.

7.3 Behavioural effects and climate impact of the tax relief

If the mineral oil taxes were not refunded for international flights, the cost of kerosene would increase for these flights from about CHF 0.66 to 1.40/litre. This is an increase of 112 %. This increase in fuel costs, representing 30 % of total operating costs before the increase, would increase airlines' operating costs by 34 %. Add 8.1 % VAT, and ticket prices would have to rise by 44 %. The elasticity of demand to ticket prices varies by market segment – personal vs work-related flights, economy vs premium class, short- vs long-haul (Thalmann et al., 2021, table 8). An average value is −0.9, which implies that the 44 % increase in ticket prices would lead to a 28 % decrease in flights if their demand is isoelastic (see section 1.4.5).

Burning one litre of kerosene releases 2.1 kg of CO_2 (FOEN, 2024b). Therefore, the kerosene sales at Swiss airports that were not taxed in 2023 – about 2.05 billion litres – lead to 5.15 million tonnes of CO_2 emissions. The combustion of jet fuel at high altitudes generates various other emissions that together have a net positive effect on radiative forcing. Based on the most recent scientific literature, the CO_2 emissions of aviation ought to be multiplied by a Radiative Forcing Index (RFI) of 3 in order to account for this effect and estimate the full climate impact of flights in CO_2eq units (Neu, 2021). Therefore, the climate impact of international flights from Swiss airports was that of 15.45 million tonnes of CO_2eq. Lowering this by 28 % would save 4.35 million tonnes of CO_2eq. This does not take into account the possibility that some of the avoided flights would be replaced by car trips and flights from airports in neighbouring countries. On the other hand, air ticket taxes are levied in many of these airports and not in Switzerland.

7.4 Other considerations

Legal aspects

Taxing international flights like domestic flights would require renegotiating the about 150 air service agreements that Switzerland concluded with other countries. Since it is perfectly possible to carry out these renegotiations one by one, a start should be made with the member states of European Union.

[115] <https://jet-a1-fuel.com/price/Switzerland> consulted on 24.09.2024.

Financial support to regional airports

Cantons and communes contribute to the costs of regional airports in various ways (deficit guarantees, contributions to operational costs, discounted land etc.) amounting to an estimated CHF 5 million, or 10 % to 15 % of total airport costs. This excludes public contributions to investment costs (Bertschmann et al., 2019).

The Confederation subsidises regional airports for air navigation services through the Special Financing of Air Traffic fund by about CHF 30 million per year (FOCA, 2023). Half of the fund is, however, financed by air traffic itself, through the revenues from the mineral oil tax on inland flights divided as follows: 50-60 % from general aviation and 40-50 % from military aviation (Bertschmann et al., 2019).

Thus, the total subsidy to regional airports amounts to at least CHF 20 million.

The climate impact of that subsidy is, in any case, relatively small. Regional airports are responsible for an estimated 76 000 tonnes of CO_2.[116] Even in a high-end scenario in which some of the smaller airports would close once these subsidies are removed, the reduction would only be of the order of magnitude of 10 000 to 20 000 tonnes of CO_2.

7.5 Conclusion

International aviation is locked in a web of bilateral international agreements, which protect the industry quite effectively from national taxation. This privilege, compared to domestic aviation or international surface travel, is very costly and contributes to making air travel a growing business with a growing impact on the climate. Taxing international aviation like domestic aviation, under the fuel and value-added taxes, would generate CHF 1.36 billion of additional revenues per year, taking into account that such taxation would discourage some air travel. A back-of-the-envelope calculation suggests that air travel from Switzerland could decline by 28 %, which would have avoided 1.45 million tonnes of CO_2 in 2023. Considering that burning kerosene at high altitudes triples its climate impact through the co-products, this is equivalent to 4.35 million tonnes of ground-level CO_2 emissions. It is important to note that neither reduction would contribute to meeting Switzerland's 2030 mitigation targets, as emissions from international air travel are not counted in the inventory of domestic GHG emissions.

Table 7.1 Summary of the costs and climate impact of the subsidies analysed in this document

Subsidy	**Amount of subsidy** (million CHF)	**Potential tax revenue** (million CHF)	**Climate impact** (thousand tonnes CO_2 or CO_2eq)
Mineral oil tax and VAT: Exemption for international aviation	1 890	1 360	1 450 4 350*

* With a radiative forcing index of 3 to account for the other climate impacts of high-altitude kerosene burning

[116] Information obtained from the Federal Office of Civil Aviation FOCA.

8. Income and wealth taxes: Privileges for home ownership

"For all its faults, it should be remembered that the current system of taxing rental value generally involves a tax relief for home ownership. All comparisons of the tax burden of taxpayers who have the necessary equity to be able to choose between renting and owning show that the direct tax burden (income and wealth tax), including property tax, is generally much lower for the owner. The owner's tax advantage increases with income and wealth, as well as with the difference between investment returns and mortgage interest. For middle-class married taxpayers with an income of around CHF 80 000 who buy a home worth around CHF 500 000, the tax relief amounts to at least CHF 2 000 or 25 % per annum, depending on the canton [example calculation shown in the document]. Tax relief on residential property is not only available to new homeowners, but also, and above all, to wealthy homeowners who are able to combine investment instruments and debt to their advantage." (Federal Council, 2001, our translation)

8.1 Overview[117]

8.1.1 Taxation of the rental value as income and deductions

The taxation of income from private home ownership is based on the principle of horizontal tax equity (Morger, 2014; FTA, 2021). This means that taxpayers of equal economic capacity are taxed equally. Under this principle, the Federal court considers that all economic goods and advantages, monetary or not, that accrue to individuals and allow them to satisfy their needs without diminishing their wealth are considered and taxed as income.[118] Thus, owner-occupants, who are *de facto* both landlord and tenant, derive income in the form of a rent that they "pay" to themselves: the imputed rental value.

For the principle of horizontal fairness and economic capacity to be respected, owner-occupants are taxed on their net global income, i.e., income acquisition costs such as maintenance costs and interest payments on mortgage are deductible from the rental value. Thus, just like landlords who lets their property are taxed on the rent that they earn minus the costs related to the property (or any investors on their investments' net financial returns), owner-occupants are taxed on the in-kind net return of their real estate wealth.

The taxation of the rental value is, however, characterized by what could be interpreted as tax advantages, to be discussed in section 8.2, based on the constitutional **principle of encouraging home ownership** (art. 108 Cst.).

- **Undervaluation of the rental value**
    - **Infrequent updating of the rental value.** The frequency with which rental values are updated varies widely across cantons. While some cantons (LU, NW, TG, VD and GE) update rental values every year, many do so only every ten years or more. In the most extreme case, Solothurn, the last update took place in 1999 (FTA, 2021).[119]

[117] This section is based on FTA (2021) when not specified otherwise.

[118] Federal Court judgement of 23 December 1996, in: Der Steuerentscheid (StE) 1997 B 72.11 Nr. 5 E. 3a, as well as Federal Court judgement (ATF) 52 I 214; ATF 71 I 128; ATF 73 I 140 (all cited in FTA, 2021).

[119] Last reassessment of the rental value: 1999 (SO), 2002 (ZG), 2003 (JU), 2007 (SZ), 2009 (ZH), 2014 (FR), 2015 (BE, UR), 2016 (BS, AG). Frequency of the reassessment of the rental value: "in principle" every ten years (AR, AI, SG, GR) or "about" every fifteen years (OW). For the other cantons, the frequency of reassessment is not indicated.

- **Markdown of the rental value.** When (re)assessing the rental value, cantons grant a rebate compared the potential rent on the rental market. The Federal Court set a minimum threshold for the rental value at 60 % of the potential rent. In ten cantons (GL, ZG, TG, NW, AI, SG, GR, UR, AR and GE), the rental value is reduced for primary homes only, second homes being taxed on the full potential rent. When possible, the Confederation uses the rental value set by the canton for FDT. In the cantons where the rental value is below 70 % of the potential value, which is about half of all cantons (AG, AI, BE, BL, BS, GE, GL, GR, JU, NW, OW, SH, SO, SZ, TG and VD), the Confederation uses a higher rental value for FDT. Seven cantons (ZH, OW, SH, GR, LU, SG and VD) allow for an additional reduction of the rental value in cases it exceeds a given percentage of available income (hardship cases).[120]

- **Reduction of the rental value for underuse.** The Confederation and almost half of the cantons reduce the rental value when part of the dwelling is left unused, for example once children have left the parental home.[121] This reduction is not applicable to second homes. The homeowner must prove that the unused part is completely empty and free from any furniture.
- **Lump sum deduction of real estate costs.** The Confederation and all cantons allow taxpayers each year to choose between the deduction of actual costs associated with private real estate wealth[122] and a lump sum deduction (art. 32 al. 4 LIFD).[123] For FDT, the flat rate allowance amounts to 10 % of the gross rental income or of the rental value for buildings up to ten years old and 20 % for older buildings (Art. 3 "Ordonnance sur les frais relatifs aux immeubles"). Most cantons use these FDT rates, but seven cantons use more favourable rates. In the most extreme cases, this results in building maintenance costs being deducted almost twice, for instance if a homeowner deducts the flat rate in almost every year and chooses one year in which to bundle all maintenance works and thus deduct actual costs.
- **Deductibility of refurbishment costs for newly acquired property.** The costs of refurbishing a recently acquired property that had been neglected can be deducted from taxable income (art. 32 al. 2 LIFD) since the scrapping in 2010 of the Dumont practice, which stipulated that such deductions were not permitted during the five years following the acquisition of the property.

Other deductions, which are not specific to owner-occupants, reduce their taxable income of homeowners and could be considered as tax relief:

- **Deductibility of energy-saving investments in housing and of the costs of demolition for a replacement construction.** Since 2020, these costs are considered as maintenance costs and, as such, are deductible from taxable income (art. 32 al. 2 LIFD). The aim is to incentivise energy saving in housing. Cantons may choose to allow the deductibility of these costs (art. 9 al. 3 let. a LHID).[124] All cantons allow the full deductibility of these costs (with some restrictions for five cantons) except for Lucerne, where they are not deductible.

[120] This was challenged by the Federal Court in judgement 2C_605/2021 and may have to change.

[121] The Act prescribes that the level of the rental value must account for the actual use of the taxpayer's residency (art. 21 al. 2 LIFD).

[122] These include maintenance costs, costs of restoring recently acquired property, insurance premia and third-party administration fees (art. 32 al. 2 LIFD).

[123] Loi fédérale du 14 décembre 1990 sur l'impôt fédéral direct (RS 642.11).

[124] Loi fédérale du 14 décembre 1990 sur l'harmonisation des impôts directs des cantons et des communes (RS 642.14).

- **Deductibility of interest expense.** Interest expense is deductible from taxable income up to the gross return of the private wealth increased by CHF 50 000 (art. 33 al. 1 let. a LIFD).[125] Furthermore, in some cantons, interest on construction credits is considered a deductible interest expense, while in others, it is treated as a part of investment costs and, thus, deductible from taxable profit for the property gain tax when the property is sold.[126] The Confederation, which does not tax property gains, considers that construction credit interest is a part of investment costs and, therefore, not deductible.
- **Taxation of preferential rents.** When a property owner lets her dwelling to a related party for a rent substantially inferior to the potential rent, this could be an attempt to escape the taxation of the full rental value, which would be due if the related party owned the dwelling herself. The federal court considered that, for FDT, tax evasion could be assumed when the rent is half of the market rent (Steuerverwaltung Graubünden, 2009). The legal basis in the cantons AI, AR, BE, GR, JU, NW, OW, SG and TG allows for the taxation of the difference when the preferential rent is less than half of the potential rent (Gubler et al., 2020)

The Swiss people voted on and refused proposals to eliminate the taxation of the rental value on three occasions, the last one in 2012. In 2017, the Committee for Economic Affairs and Taxation of the Council of States (CER-CE) filed a parliamentary initiative to change the taxation of housing including rental value. The proposal includes removing simultaneously the taxation of the rental value and the deduction of costs related to the building (interest, maintenance, insurance, etc.) from taxable income. The taxation of the rental value and the deduction of costs other than interest payments would remain for second homes. The proposal aims at simplifying the system and eliminating an incentive for private indebtedness – thus stabilising the financial system – while keeping tax revenue constant, treating owner-occupants and tenants equally, and encouraging home ownership (CER-CE, 2021). Both chambers in parliament approved the project and are, at the time of publishing this report, working on solving the points of disagreement (FTA, 2023e). Should they come to an agreement, then the proposal would still have to win a referendum.

8.1.2 Wealth tax and real estate tax

Real property is also subject to wealth taxes and, in eleven cantons, to real estate tax (FTA, 2019b). Both kinds of taxes are levied by cantons and municipalities only. The tax base, for non-agricultural property, is the market value (art. 14 LHID). The market value is the purchasing price. However, if all or part of the property was obtained for free or if the situation changed significantly, the market value must be re-estimated. This is usually done by taking the average transaction price of similar properties in the same region, or with a combination of the value of the land plus construction cost and the capitalised property yield.

[125] This applies to wealth invested in, e.g., the stock market as well as to real estate investments.

[126] "There are basically three different systems in the cantons:

- Construction credit interest is counted as investment costs and is therefore not deductible (like FDT): LU, UR, NW, GL, FR, BS, GR, VD, NE, GE and JU;
  ditto, but only for properties held as business assets: ZH and SZ;
  ditto, but only until the property is ready for occupancy: OW, SO, SH, AI, SG, TG and TI;
- Construction credit interest can be deducted in full as debt interest: AR, AG and VS;
  ditto, but only for privately owned properties: ZH and ZG;
- The taxpayer can choose whether to deduct the construction credit interest from the current income assessment or as value-enhancing expenses from the property gains tax levied on the sale: BE and BL;
  ditto, but only for privately owned properties: SZ" (FTA, 2021, pp. 22-23, our translation).

Although the Federal court judged that setting a general property valuation target at 70 % of the market value violates the Constitutional principle of equal treatment before the law (Art. 8 Cst), it permits a conservative valuation of the property justified by the inherent uncertainty around the estimation (ATF 124 I 145 of 20 March 1998, consid. 6c). This leads to cantons generally **undervaluing the property**, although they justify this practice mainly by referring to the constitutional mandate of encouraging home ownership (Art. 108 Cst). The tax law in Canton Bern, for example, prescribes that "the official value is set at a moderate level, taking into account the encouragement of retirement saving and home ownership, as well as the burden of property tax." (Art. 56 al. 1 let. d LI).[127] In 2020, the cantonal parliament set a median target for property values at 70 % of the market value.[128]

Furthermore, the official value of properties is usually only updated when a general reassessment is decided by the canton. This is unless a property is sold, in which case the transaction price is the new official value. The longer the time since the last update, the wider the gap between market values and official values. For example, in canton Bern, average transaction prices were almost twice the official value in 2019. The canton's parliament ordered a general reassessment of real estate values in 2020; the last time it had taken place was in 1999 (Canton de Berne, 2024). In canton Zurich, the cantonal court of tax appeal calculated that taxable values set at between 70 % and 90 % of market value at the 2009 general reassessment corresponded to 43.75 % to 56.25 % of market values in 2017 and declared the canton thus in violation of federal legislation.[129] The parliament of the canton, nonetheless, rejected, in 2021, a proposal to automatically update property values on a periodic basis.[130]

8.2 Existence of tax reliefs

Undervaluation of the rental value

Both the Federal Tax Administration (2021) and the Federal Court (cited in FTA, 2021) consider that the gross rental value should be the potential rent that the property owner could earn if she rented out her dwelling at current market conditions, or, equivalently, the rent the owner-occupant would have to pay if she did not own the dwelling she occupies.[131] Thalmann (2007) also shows that the imputed rental value must equal the market rent for homeowners to be taxed on the actual return of their investment and thus respect the principle of horizontal tax equity.[132]

[127] Loi du 21.05.2000 sur les impôts, Grand Conseil du Canton de Berne (RSB 661.11)

[128] Canton de Berne (2020). It seems that setting a median target at 70 % of the market value is different from a general valuation target of 70 %.

[129] Decision 2 ST.2022.9 of Steuerrekursgericht des Kantons Zürich, 11 May 2022.

[130] Unternährer, P. (2022), "Müssen in Zürich nun viele ältere Menschen um ihr Haus zittern?", Tages-Anzeiger, 16 August 2022.

[131] We call this "potential rent" rather than "market rent", as the latter could be confused with the rent charged for new rental contracts (sometimes called the "offered rent"). Indeed, after several years of occupancy, rents charged in ongoing contracts tend to lag behind the rents for new contracts. It is the former that should be used as a reference for the rental value, as this is the rent the owner-occupant would be earning after a number of years of ownership of her property if she did not occupy her dwelling herself; or the rent she would have to pay if she did not own the dwelling in which she lives. The 2022 survey of rents in the city of Zurich found an average rent for a 4-room apartment of CHF 1 590 when it has been occupied for more than 20 years, compared to CHF 2 420 when it was occupied for less than two years (Stadt Zürich, 2022). Corresponding Swiss mean values for 2022 are CHF 1 313 and CHF 1 731 respectively (FSO 2024d).

[132] Thalmann (2007) shows, however, that this tax system is only weakly "tenure neutral", since it reduces the financial advantage of homeownership: choosing homeownership over tenancy leads to higher tax payments in

Since rents follow an overall increasing trend, the longer the interval between each update of the rental value, the more the rental values diverge from the potential rents. The fact that several cantons do update the rental value every tax period shows that it is quite feasible to index the rental value to the development of the rental market.

Reduction of the rental value for underuse

A justification for this practice is that people should not be expected to move house or sublet part of their home after their children moved out. There is, however, little fiscal or economic justification for such a reduction: not making use of this space or not moving house is a private decision, which involves hoarding of a scarce resource. Furthermore, since owner-occupants can deduct costs associated with the unused space (mortgage interest, maintenance), the taxation logic implies that they be taxed on the associated income.

Lump sum deduction of real estate costs

The principle in tax law is that costs are deductible from taxable income when they serve the acquisition of that income and there is a direct causal link between the cost and the income (FDF, 1998). As such, the deduction of costs associated with the maintenance and the letting of the property are justified. Moreover, the high transaction costs of determining maintenance costs and the blurriness of the concept justify the use of heuristics such as flat rates (Baumberger, 2000). Nevertheless, the possibility of deducting maintenance costs twice by alternating between lump sum deduction (in years in which it exceeds actual costs) and deduction of actual costs (bundling works in some years) is not justified.

Deductibility of refurbishment costs for newly acquired property

The refurbishment costs are the counterpart of maintenance costs that the previous owner could have deducted from her taxable income. The deductibility of refurbishment costs is therefore only an income tax neutral deferral of previously non-deducted maintenance costs, and we would expect the transaction price to reflect this deferral. However, the possibility of choosing between a lump sum deduction and the deduction of actual maintenance costs allows the previous owner to neglect the property before selling it while deducting lump sum costs, and the buyer to deduct actual costs of refurbishment. Hence, there is a subsidy only when combined with the possibility of choosing between the deduction of lump sum and actual real estate costs.

Deductibility of energy-saving investments in housing and of the costs of demolition for a replacement construction

These costs are not necessary for income acquisition but, instead, increase the value of the property. As such, their deductibility is a subsidy. Energy saving investments are climate policy measures and, thus, do not fall in the scope of this study. On the other hand, once emissions from the building construction sector are considered (almost 1/4 of CO_2 emissions from the building sector), retrofitting and re-using buildings is preferrable to demolishing and building new ones (UNEP, 2023). We therefore include the deductibility of demolition costs in our analysis.

absolute terms, because homeowners face lower deductible production costs than landlords (smaller management and maintenance costs, no loss of rental income).

Deductibility of interest expense

Interest payments on mortgage serve the acquisition of and are directly linked to the property's income.[133] The deduction of mortgage interest is therefore justified when the income from a property is fully taxed.[134] Moreover, as demonstrated by Baumberger (2000), a negative net rental value after deduction of mortgage interest does not imply a tax advantage, but could be due, e.g., to an increase in interest rates not yet passed into higher rents for ongoing contracts,[135] or a local drop in those rents.

There is a tax advantage when one can deduct, from taxable income, the interest on consumer credit or other loans that serve the acquisition of consumer goods or of income that is subject to a reduced or zero tax rate, thanks, e.g., to the tax exemption for capital gains.[136] However, this advantage is not specific to real estate ownership: any taxpayer earning a return on their wealth can deduct interest from that return.[137]

Taxation of preferential rents

Letting a dwelling at a rent lower than the potential rent to a relative or friend is a form of gift hidden behind foregone income. The transparent way to do this would be for the property owner to charge the potential rent and then return to the beneficiary the gift in cash. Unless, the beneficiary works or provides other services to the property owner, this gift need not be added to her taxable income. However, the property owner should be taxed on the full potential rent, just as any other investor is taxed on her capital income even if she transfers part of it to someone else. Of course, there is a range of uncertainty regarding the potential rent. Nevertheless, accepting for the property owner's income taxation an earned rent substantially below potential rent is a form of subsidy.

Undervaluation of the property

The undervaluation of the property leads to inequality in between taxpayers who invested part of their wealth in their own home and those who did not: whereas tenants pay a wealth tax on the full

[133] Baumberger (2000, pp. 18-19) argues that the deductibility of mortgage interest from income is "difficult to justify from an economic point of view" since the mortgage is whether necessary nor causal to the production of the service output of the property, unlike maintenance costs. The property is merely a security for a loan, which is called a mortgage. Nonetheless, the author concedes that it is justified under the taxation of net global income principle.

[134] As argued above, this is the case for a rental value amounting to 80 % of the market rent.

[135] This is often caused by an inflationary push, as described by Baumberger (2000, pp. 24-25): "This is because the inflation rate is reflected 1:1 in the mortgage interest rate, while rents have only risen gradually (3 per cent inflation rate is reflected in a doubling of current interest payments to 6 per cent at a real interest rate of 3 per cent, while rents only increase by 3 per cent per year). [...] the gradual increase in nominal rents (and thus in imputed rental values) means that the negative balance is constantly shrinking and eventually becomes positive [...]."

[136] Consider for example a taxpayer taking a Lombard loan to invest in securities, the capital gains on which are tax free, who is able to deduct the interest on the Lombard loan.

[137] Gubler et al. (2020) point out that the option of saving into a 3a-account, the payments into which are deductible from taxable income, rather than reimbursing the mortgage, and then withdrawing that money at a later point at a much lower tax rate to reimburse all or part of the mortgage, having deducted mortgage interest payment over the whole period, is a subsidy. However, the consequence of this subsidy is only to disincentivise the repayment of the mortgage compared to other forms of fiscally favoured investments (Morger, 2014). It does not subsidise home ownership as such, as a tenant with the same economic capacity could save as much taxes through similar investments.

value of their wealth, homeowners benefit from favourable taxation of that part of their wealth which is invested in their home.

Furthermore, in most cantons, the taxable value of the property is estimated taking account of both the transaction price and the yield of the property (FTA, 2019b). Thus, rental homes, unlike owner-occupied homes, are more likely to be valued at market value. Assuming the real estate tax is passed on to tenants in form of a higher rent, tenants pay property tax on the full value of their home whereas homeowners pay a tax on a discounted value.

These breaches in the principle of horizontal tax equity are a subsidy.

Conclusion

Many of these subsidies are justified by the principle of encouraging home ownership, established by articles 108 and 111 in the federal Constitution. The former, however, puts owner-occupied homes and rental housing on a par.[138] As to the latter, it prescribes that the Confederation encourages individual pension provision, in particular through the facilitation of homeownership and tax-related measures.[139] As we develop in section 8.4, evidence indicates that the homeownership subsidy is neither effective in facilitating homeownership, in that it does not help people who want to become homeowners but face barriers, nor efficient, as it also benefits many who do not need support. We therefore conclude that there is no constitutional basis for the favourable taxation of owner-occupants compared to tenants.

To summarise, we consider the amount of the subsidy to be the foregone income tax revenue from:

- the undervaluation of the rental value compared to the potential rent, due both to infrequent updating and to marking down;
- the reduced rental value in case of underuse of the property rather than the full rental value of the home;
- the deduction of lump sum real estate costs beyond actual costs;
- the deduction of the costs of demolition for a replacement construction; and
- the non-taxation of the difference between a preferential rent granted to related parties and the potential rent of the property.

We also consider that the foregone wealth and property tax revenue due to the undervaluation of the property compared to the market value is a subsidy.

[138] Paragraph 1: "The Confederation shall encourage the construction of housing, the acquisition of the ownership of apartments and houses for the personal use of private individuals, as well as the activities of developers and organisations involved in the construction of public utility housing."

[139] Paragraph 4: "In cooperation with the Cantons, [the Confederation] shall encourage private pension schemes, in particular through measures relating to taxation policy and the policy of promoting property ownership."

8.3 Cost of the tax reliefs

In this section, we estimate the foregone tax revenue due to the subsidies identified above. For lack of data, we do not calculate the foregone tax revenue due to the current tax treatment of preferential rents.

8.3.1 Undervaluation of the rental value

We are not aware of any publicly available estimate for the foregone tax revenue resulting from the failure, in many cantons, to annually update the rental values for primary homes to the evolution of potential rents. We therefore derive an equation that links the current total rental value for Switzerland, which we know, to the average rental value in each canton had all rental values been updated. We then plug the data in the equations to estimate the undervaluation of the rental value due to the failure to annually update it and to its marking down.

First, for each canton that we know not to update the rental value every year, we estimate the ratio between the current average rental value and the average rental value had all rental values been updated.

- For cantons for which we only have data on the frequency of the updating of the rental value (e.g., 10 years), we assume that the last update dates back to half of that frequency (e.g., 5 years).
- Only the already newly acquired homes are taxed on an up-to-date rental value, that is, the homes that are newly owner-occupied, either because they are new, or converted from rental, or they changed hands in the past year. We assume that the growth rate in the number of owner-occupied housing h is the average growth rate in homeowners. We estimate s, the percentage of homes that changed hands, at 1.5 % and assume that this proportion is the same in all cantons.[140] From this, we have zH_{t-1}, the number of homes whose rental value was (re)assessed in year t, where $z = (h + s)$ and H_t is the housing stock in year t.
- We can write the equation for the sum of rental values in year t as

$$SRV_t = zH_{t-1}\overline{UV}_t + (1-s)zH_{t-2}\overline{UV}_{t-1} + \cdots + (1-s)^{n-1}zH_{t-n}\overline{UV}_{t-n+1} + (1-s)^n H_{t-n}\overline{UV}_{t-n} \quad \text{(Eq01)}$$

  where $\overline{UV}_t$ is the average rental value for year t had all rental values been updated during that year, and n is the numbers of years since the last general update of rental values.

[140] Neither the population of housing units that could be traded is known, nor the number of transactions of such units. The Swiss property price index of the Federal statistical office can draw on about 30 000 transactions per year, a number that has been stable since the first calculations in 2019, but this is only a fraction of all at arm's length transactions, somewhere between 50 % and 90 %. On the other hand, an unknown proportion of these transactions is for new dwellings. Based on Geneva data, it could be 40 %. Therefore, the number of transactions of non-new single-family houses and apartments that can be sold individually could lie between 21 000 and 36 000. The stock of these housing units is not precisely known either. About 1.1 million single-family houses are recorded, but the number of apartments that can be sold individually is not. Internal estimates of the Federal statistical office place it at 0.9 million. Comparing the estimated numbers of transactions with the estimated number of housing units that can be traded individually, we obtain a range of 1.0 % to 1.8 % for the transaction rate of non-new owner-occupied housing units. Hence our choice of s = 1.5 %. Testing for sensitivity with s = 1.8 % reduces the estimated foregone tax revenue due to infrequent updating by 2 %.

- We have:
  - $H_t = (1+h)H_{t-1} = (1+h)^n H_{t-n}$
  - $\overline{UV}_t = (1+r)\overline{UV}_{t-1} = (1+r)^n \overline{UV}_{t-n}$, where r is the average yearly growth rate in rents[141]
  - $\frac{SRV_t}{H_t} = \overline{RV}_t$, the average rental value in year t.

  Substituting these in (Eq01), we can rewrite the equation

$$\overline{RV}_t = \overline{UV}_t \left[\frac{z}{1+h}\sum_{k=0}^{n-1}\left(\frac{1-s}{(1+h)(1+r)}\right)^k + \left(\frac{1-s}{(1+h)(1+r)}\right)^n\right] = \overline{UV}_t \left(\frac{z}{1+h}\sum_{k=0}^{n-1} q^k + q^n\right) =$$
$$\overline{UV}_t \left(\frac{z}{1+h} \times \frac{1-q^n}{1-q} + q^n\right) \quad \text{(Eq02)},$$
$$where\ q = \frac{1-s}{(1+h)(1+r)}$$

We then aggregate rental values from all cantons.

- The sum of rental values across Switzerland is given by

  $SRV_{CH,t} = \sum_{i=canton} SRV_{i,t} = \sum_{i=canton} H_{i,t}\,\overline{RV}_{i,t} = \sum_{i=canton} H_{i,t} m_{i,t} \overline{UV}_{i,t}$ (Eq03),

  where $H_{i,t}$ is the number of homeowners and $m_{i,t} = \frac{z_i}{1+h_i} \times \frac{1-{q_i}^n}{1-q_i} + {q_i}^n$ in canton i in year t.
- We consider rental values for FDT, which the Confederation sets to attain 70 % of the potential rent.[142] We therefore assume that $\overline{UV}_{i,t} = 0.7\,\overline{PR}_{i,t}$ (Eq04), where $\overline{PR}_{i,t}$ is the average potential rent in canton i in year t. Assuming that the ratio of average rents is a proxy for the ratio of average potential rents (an assumption also made by FTA, 2023d), we obtain the following equation for any two cantons a and b:

$$\frac{\overline{PR}_{a,t}}{\overline{PR}_{b,t}} = \frac{\bar{R}_{a,t}}{\bar{R}_{b,t}} \quad \text{(Eq05)},$$

  where $\bar{R}_{i,t}$ is the average rent in canton i in year t, and a and b refers to two cantons. Using equations (Eq04) and (Eq05), we can rewrite (Eq03) as

$$SRV_{CH,t} = 0.7\,\frac{\overline{PR}_{a,t}}{\bar{R}_{a,t}} \sum_{i=canton} H_{i,t} m_{i,t} \bar{R}_{i,t} \text{ (Eq06)}$$

We use equation (Eq06) to calculate the average potential rents $\overline{PR}_{i,t}$ for each canton, since we have data for all the other variables. With equations (Eq04) and (Eq02), we can then estimate $\overline{UV}_{i,t}$, and $\overline{RV}_{i,t}$. The average undervaluation of the rental value in canton i due to the failure to annually update it is $\overline{UV}_{i,t} - \overline{RV}_{i,t}$. The second component of the difference between the potential rent and the current rental value is the average undervaluation due to the rental value markdown in canton i, which is given by $\overline{PR}_{i,t} - \overline{UV}_{i,t}$.

Our choice to first calculate the effect of marking down the rental value relative to potential rents and then to compute the effect of infrequent updating of the rental value from that "updated, marked-down rental value", is arbitrary. Inverting those two steps would increase the foregone tax revenue attributed to infrequent updating of the rental value and reduce that attributed to rental value

[141] We use the average growth rate of the Swiss rental index over the period 2000-2023, which is 1.26 % per year (FSO, 2024g).

[142] The FTA aims to attain 70 % of potential rent on average (FTA, 2019a). It thus applies a correction factor to cantonal rental values which it deems to undercut this threshold. We consider these correction factors to be the most accurate estimates of the ratio of cantonal rental values to potential rent.

markdown. This has two consequences. First, both foregone tax revenue estimates only make sense when considered together. Second, these estimates can be added up without risk of double counting.

Based on estimates provided by the Federal Tax Administration, we calculate a 6.375 % average marginal tax rate for FDT as well as marginal tax rates for each canton (see Appendix B).[143] Applying these rates to our calculations explained above yields the estimates of foregone tax revenues displayed in Table 8.1.[144] Estimates of foregone tax revenue for each canton, parameter data and intermediary steps of the calculation are shown in Table 8.2.

Table 8.1 Estimated foregone tax revenues in 2022 from the undervaluation of rental values

	due to rental value markdown	due to infrequent updating of rental value
FDT	844	119
Cantons and municipalities	2 948	290

[143] This rate is significantly higher than the median marginal tax rate used in chapters 2 and 3, indicating that, as expected, homeowners are mostly found on the higher end of the income scale.

[144] Testing for sensitivity with calculations of average marginal tax rate that exclude large cities, in which the share of homeowners is expected to be low (see Appendix B), reduces foregone tax revenue by 0.7 %.

Table 8.2 Calculation of the foregone tax revenue per canton due to the undervaluation of rental values, 2022

Canton	Last general updating of rental value	h = Average yearly homeowners growth rate, 2010-2014, 2015-2017, 2018-2022	H_{2022} = Number of homeowners, 2022	R_{2022} = Average rent, 2022 (CHF/month)	PR_{2022} = Average potential rent, 2022 (CHF)	UV_{2022} = Average up-to-date FDT rental value, 2022 (CHF)	RV_{2022} = Current average FDT rental value, 2022 (CHF)	Average undervaluation of FDT rental value due to markdown (CHF)	Average undervaluation of FDT rental value due to infrequent updating (CHF)	Ratio: cantonal to FDT rental value	Average undervaluation of cantonal rental value due to markdown (CHF)	Average undervaluation of cantonal rental value due to infrequent updating (CHF)	Marginal tax rate, cantons and municipalities	Foregone tax revenue, Cantons and municipalities (million CHF/year)	
														due to rental value markdown	due to infrequent updating of rental value
ZH	2009	0.99%	191 799	1 654	38 798	27 159	23 759	11 639	3 399	100%	11 639	3 399	15.7%	351.0	102.5
BE	2015	0.66%	185 970	1 259	26 663	18 664	17 237	7 999	1 427	85.5%	10 705	1 220	20.7%	411.7	46.9
LU		0.88%	62 541	1 411	27 071	18 950	18 950	8 121		100%	8 121		16.2%	82.2	
UR	2011	1.59%	7 489	1 222	29 488	20 642	18 446	8 847	2 195	100%	8 847	2 195	12.2%	8.1	2.0
SZ	2007	0.84%	27 851	1 616	37 823	26 476	22 750	11 347	3 726	95.2%	12 608	3 548	11.1%	39.1	11.0
OW	2016	0.75%	7 903	1 364	32 827	22 979	21 451	9 848	1 528	88.4%	12 520	1 351	12.3%	12.1	1.3
NW		-0.32%	7 503	1 495	36 068	25 248	25 248	10 821		93.3%	12 504		12.0%	11.2	
GL		1.43%	8 785	1 215	28 489	19 942	19 942	8 547		85.7%	11 396		15.1%	15.1	
ZG	2002	0.31%	17 600	1 850	44 306	31 014	25 413	13 292	5 601	100%	13 292	5 601	6.6%	15.4	6.5
FR	2014	1.50%	59 301	1 281	29 903	20 932	19 198	8 971	1 734	100%	8 971	1 734	21.0%	111.8	21.6
SO	1999	1.35%	58 951	1 221	28 830	20 181	16 577	8 649	3 604	80.0%	12 685	2 884	19.7%	147.2	33.5
BS	2016	2.27%	15 246	1 379	32 218	22 552	21 126	9 665	1 426	81.3%	13 882	1 159	19.2%	40.7	3.4
BL		0.89%	57 800	1 468	34 387	24 071	24 071	10 316		83.3%	14 328		22.0%	182.5	
SH		0.39%	16 321	1 242	28 708	20 096	20 096	8 613		92.6%	10 101		18.4%	30.3	
AR	2019	1.84%	12 069	1 236	29 245	20 471	19 767	8 773	705	100%	8 773	705	17.3%	18.3	1.5
AI	2019	2.31%	3 604	1 304	31 121	21 785	21 042	9 336	743	87.5%	12 059	650	12.7%	5.5	0.3
SG	2019	1.15%	92 915	1 286	30 098	21 068	20 333	9 029	735	100%	9 029	735	18.6%	156.4	12.7
GR	2019	1.06%	41 075	1 279	30 390	21 273	20 530	9 117	743	87.5%	11 776	650	17.9%	86.7	4.8
AG	2016	1.00%	143 219	1 415	27 472	19 230	17 962	8 242	1 268	85.7%	10 993	1 087	17.2%	270.1	26.7
TG		1.85%	57 108	1 300	34 038	23 826	23 826	10 211		75.0%	16 168		16.2%	149.7	
TI		1.11%	65 614	1 211	28 733	20 113	20 113	8 620		100%	8 620		20.2%	114.2	
VD		1.05%	111 446	1 416	33 315	23 320	23 320	9 994		72.2%	16 472		19.4%	356.8	
VS		1.70%	87 041	1 177	27 612	19 328	19 328	8 284		100%	8 284		23.0%	166.1	
NE		0.76%	25 569	1 056	24 419	17 093	17 093	7 326		100%	7 326		23.3%	43.7	
GE		1.21%	38 947	1 504	35 410	24 787	24 787	10 623		100%	10 623		23.2%	96.2	
JU	2003	-0.53%	16 213	986	22 884	16 019	13 005	6 865	3 013	100%	6 865	3 013	21.3%	23.7	10.4

Tables sources and notes:

"Last general updating of rental values" from FTA (2021). Blue cells: For cantons for which we only have an updating frequency (e.g., 10 years), we assume that the last update took place at half that frequency (e.g., 5 years) ago

"h = Average yearly homeowners growth rate" from FSO (2024c). We estimate the average growth rate over 2010-2014, 2015-2017 and 2019-2022 the FSO warns that methodological changes in 2015 and 2018 affect the comparability of results with previous years

"H_{2022} = number of homeowners, 2022" from FSO (2024c)

"R_{2022} = average rent, 2022" from FSO (2024b)

The calculations for "PR_{2022}", "UV_{2022}", "RV_{2022}" and the undervaluation of rental values are explained above. The FTA estimates the sum of rental values across Switzerland at about CHF 27 770 000 000 for 2019/202 based on data from 10 cantons (data provided by the FTA). Pink cells: For the four cantons that provided microdata on 2019 average FDT rental values (FTA, 2023d), those were used to calculate "PR_{2022}", "UV_{2022}", "RV_{2022}"

"Ratio: cantonal to FDT rental value" from FTA (2019a)

"Average undervaluation of cantonal rental value due to failure to update" = "Ratio: Cantonal to FDT rental value" × (UV_t – RV_t)

"Average underestimation of cantonal rental value" = PR_t – "Ratio: Cantonal to FDT rental value" × UV_t

Foregone tax revenues are calculated with a 6.75 % marginal tax rate for FDT and with the "marginal tax rate, cantons and municipalities" estimated in Appendix B

The ARE recorded 720 000 second homes in Switzerland on 1 January 2024. The FTA, in response to our questions, roughly estimated an average rental value of CHF 10 000 corresponding to 85 % of the potential rent.[145] We use the above-mentioned 6.75 % FDT marginal tax rate and estimate an 18.6 % average cantonal and municipal marginal tax rate for homeowners across Switzerland (see Appendix B). This means that tax revenues of CHF 81 million for FDT and CHF 233 million for cantons and municipalities were not collected.

In total, primary and second homes taken together, the subsidy from underestimating the rental values amounts to about CHF 1 040 million for FDT and CHF 3 470 million for cantons and municipalities. These estimates should be taken as orders of magnitude, as there are important uncertainties around the parameters used in these calculations, especially when it comes to second homes.

8.3.2 Reduced rental value for underuse of the property

In canton Zurich, an estimated 2 000 to 3 000 taxpayers declare a reduced rental value for underuse (Unternährer, 2022). This corresponds to between 1 % and 1.5 % of homeowners. We apply these shares to the cantons that we know to allow for such a reduction (ZH, UR, OW, NW, BL, SH and GR) and to the total number of homeowners in Switzerland for FDT.

Homeowners are allowed a reduction of the rental value proportional to the number of unused rooms, kitchen and washrooms generally counting as two rooms for detached houses respectively one room for apartments (Finanzdirektion Kanton Zürich, 1999). We assume in our calculations that homeowners obtain an 15 % reduction in rental value on average. This corresponds to one unused room in a four- to five-room detached house, respectively in a five- to six- room apartment.

Applying the marginal tax rates for FDT, respectively for cantons and municipalities (see subsection 8.3.1), we estimate a total implicit subsidy of CHF 0.7-1.1 million for FDT and CHF 1.9-2.8 million for the seven cantons and their municipalities (CHF 1.1-1.7 million for Zurich alone).

8.3.3 Lump sum deduction of real estate costs

The data used and the step-by-step results of the calculations described hereafter are displayed in Table 8.3. House owners can choose between deducting actual real estate costs or 10 % of the gross rental income or of the rental value for buildings up to ten years old, and 20 % for older ones. Most cantonal tax laws take over these rates, except seven cantons that have more favourable rates. Applying these to our estimates of FDT and cantonal rental values, we estimate the total potentially deductible amount. The average lump sum deduction across all homeowners in 2019 was CHF 1 462 in Bern and CHF 2 077 in Aargau, including nil deductions from those who chose the deduction of actual costs (FTA, 2023d). We derive from comparing these two figures with the corresponding estimated average lump sum deductible amount for FDT that, in a given year, about 44 % (61 %) of homeowners in Bern (Aargau) choose the lump sum deduction. Based on this, we roughly assume

[145] The Federal Department of the Environment, Transport, Energy and Communications estimated in 2012 that there were about 500 000 second homes in Switzerland, extrapolated from 420 000 temporarily occupied dwellings in the 2000 census (DETEC, 2012). The 200 000 estimate therefore probably underestimates the number of second homes. The FTA also warned us that the uncertainty around the magnitude of the underestimation of the rental value of second homes is greater than for primary homes.

that, in each canton, the deducted amount that exceeds actual costs is equivalent to 25 % of total potential lump sum deductions.[146]

Table 8.3 Calculation of foregone tax revenue from the lump sum deduction of real estate costs in excess of actual costs, 2022

Canton	Share of residential buildings built in 2001-2022	Buildings ≤10 years old	Lump sum deduction rate (%)		Average lump sum deductible amount, cantons (CHF)	Average lump sum deductible amount, FDT (CHF)	Marginal tax rate, cantons and municipalities	Foregone tax revenue, cantons and municipalities (million CHF)
			≤ 10 years old	> 10 years old				
ZH	18%	9%	20%	20%	4 752	4 543	15.7%	35.8
BE	13%	7%	10%	20%	2 849	3 332	20.7%	27.4
LU	22%	11%	10%	20%	3 578	3 578	16.2%	9.0
UR	16%	8%	10%	20%	3 542	3 542	12.2%	0.8
SZ	23%	12%	10%	20%	4 081	4 285	11.1%	3.2
OW	19%	10%	10%	20%	3 609	4 083	12.3%	0.9
NW	20%	10%	10%	20%	4 476	4 796	12.0%	1.0
GL	10%	5%	10%	20%	3 331	3 886	15.1%	1.1
ZG	23%	11%	10%	20%	4 796	4 796	6.6%	1.4
FR	28%	14%	10%	20%	3 573	3 573	21.0%	11.1
SO	18%	9%	10%	20%	2 533	3 167	19.7%	7.4
BS	5%	3%	10%	20%	3 391	4 172	19.2%	2.5
BL	17%	9%	20%	25%	4 929	4 607	22.0%	15.7
SH	17%	9%	15%	25%	4 490	3 844	18.4%	3.4
AR	11%	6%	10%	20%	3 842	3 842	17.3%	2.0
AI	17%	9%	20%	20%	3 682	4 029	12.7%	0.4
SG	18%	9%	20%	20%	4 067	3 889	18.6%	17.6
GR	15%	8%	10%	20%	3 455	3 949	17.9%	6.4
AG	21%	11%	10%	20%	2 916	3 403	17.2%	17.9
TG	23%	11%	10%	20%	3 370	4 493	16.2%	7.8
TI	13%	6%	10%	20%	3 896	3 896	20.2%	12.9
VD	20%	10%	20%	30%	4 713	4 429	19.4%	25.5
VS	21%	10%	10%	20%	3 665	3 665	23.0%	18.4
NE	13%	7%	10%	20%	3 306	3 306	23.3%	4.9
GE	20%	10%	10%	20%	4 713	4 713	23.2%	10.7
JU	17%	8%	10%	20%	2 494	2 494	21.3%	2.2

Tables sources and notes:
"Share of residential buildings built in 2001-2022" from FSO (2024f)
"Lump sum deduction rate ≤10 years old/>10 years old" from FTA (2021) p. 29. These are the rates for the lump sum deductible amount as a percentage of the rental value or gross yield for buildings of less, resp. more than 10 years of age. In Vaud (cells in green), the threshold is 20 years rather than 10 years
"Average lump sum deductible amount, cantons" is calculated by multiplying the average cantonal rental value for 2022 (from Table 8.2) by the lump sum deduction rates and the shares of buildings less respectively more than 10 years old. We assume that the share of buildings of less than 10 years of age is half the share of buildings built in the 2001-2022 period
Foregone tax revenues are calculated by multiplying 25 % of the average lump sum deductible amounts by the number of homeowners in 2022 (from Table 8.2) and the "marginal tax rate, cantons and municipalities" estimated in Appendix B

The not collected tax revenue for FDT is calculated in the same manner, with lump sum deduction rates of 10 % of the FDT rental value (from Table 8.2) for buildings up to ten years old and 20 % for older buildings. We use a marginal FDT tax rate of 6.375 % (see subsection 8.3.1). **We estimate an implicit subsidy of CHF 88 million for FDT and CHF 247 million for cantons and municipalities in 2022**.[147]

[146] Data from Bern and Aargau show that, roughly speaking, about half of homeowners deduct lump sum real estate costs in a given year. We assume that about 50 % of those deducted amounts exceeds actual costs. Furthermore, it seems reasonable to also assume that, in cantons in which homeowners choose the lump sum deduction more (less) than half of the time, proportionately less (more) than 50 % of that amount exceeds actual costs, since they are less (more) able to bundle maintenance works in years in which they deduct actual costs.
[147] We do not estimate the cost for secondary homes due to lack of data and the relatively small size of the amounts.

8.3.4 Deduction of the costs of demolition for a replacement construction

In 2017, the FTA estimated the foregone revenue from the deduction of the costs of demolition for a replacement construction at CHF 10 million for FDT and CHF 25 million for cantonal and municipal taxes (FTA, 2017). The FTA also warns that these estimates are rough approximations based on data that is since outdated.

8.3.5 Undervaluation of real estate property

We estimate the implicit subsidy from not collecting potential tax revenue due to the undervaluation of real estate property in a similar fashion to what we have done in subsection 8.3.1 for the undervaluation of the rental value. In particular, we first compute the taxes saved by homeowners thanks to the policy of systematically marking down the property, by comparing with a situation where the assessment of property values was kept up to date. Then we calculate the implicit subsidy from the fact that properties have often been valued many years ago and that their valuations are therefore not up to date. There are however a few differences in the estimation process:

- We distinguish between apartments and detached houses, since the data allow us to do so.
- The calculation is slightly more straightforward, since we have data on the total market value in Switzerland for both dwelling types.[148]
- We use cantonal differences in average real estate price per square meter (rather than rent) to allocate the total market value of both types of dwelling to each canton.
- We use "intercantonal repartition factors" (CSI, 2018) estimated by tax authorities to compare non-agricultural property values between cantons. These are calculated by comparing gains from property sales with cantonal taxable values. The reference value, 100 %, is for cantons with the lowest difference between the taxable value and the market value (AR and SG). In the absence of additional information, we assume that, in these cantons, the taxable value is equal to the market value. This is unlikely and is therefore likely to lead to an **underestimation** of the foregone tax revenue.
- We use estimated marginal wealth tax rates for a typical homeowner family for a CHF 750 000 to CHF 1 000 000 net wealth bracket. Nonetheless, we estimate the average net wealth of homeowners to reach CHF 1 500 000 to CHF 2 000 000 once the property is assessed at full market value (see Appendix C). This is therefore likely to lead to an **underestimation** of the foregone tax revenue.

[148] The data does not distinguish between primary and secondary homes.

Table 8.4 Calculation of the foregone wealth tax revenue due to the undervaluation of owner-occupied apartments, 2023

Canton	Number of homeowners, 2022	Average real estate price, July 2024 (CHF/m2)	Total market value, 2023 (million CHF)	Intercantonal repartition factor for non-agricultural property	Total taxable value (million CHF)	Undervaluation of taxable value (million CHF)	Wealth tax rate	Foregone wealth tax revenue (million CHF)
ZH	79 380	10 392	210 415	115%	182 970	27 445	0.31%	84
BE	54 605	6 985	97 289	125%	77 832	19 458	0.53%	103
LU	24 216	8 627	53 288	115%	46 337	6 951	0.31%	22
UR	2 150	9 368	5 138	110%	4 670	467	0.20%	1
SZ	10 626	11 168	30 270	125%	24 216	6 054	0.20%	12
OW	2 635	9 193	6 179	195%	3 169	3 010	0.16%	5
NW	3 759	11 036	10 582	140%	7 558	3 023	0.12%	4
GL	1 272	6 940	2 252	115%	1 958	294	0.36%	1
ZG	10 060	15 563	39 935	115%	34 726	5 209	0.26%	14
FR	15 609	6 534	26 015	155%	16 784	9 231	0.73%	68
SO	9 904	5 847	14 771	335%	4 409	10 362	0.22%	23
BS	6 354	10 451	16 938	140%	12 099	4 840	0.67%	32
BL	13 256	8 526	28 829	385%	7 488	21 341	0.86%	183
SH	3 925	6 601	6 609	140%	4 721	1 888	0.60%	11
AR	2 621	7 085	4 737	100%	4 737	0	0.39%	0
AI	488	7 750	965	110%	877	88	0.25%	0
SG	26 145	7 261	48 423	100%	48 423	0	0.40%	0
GR	14 755	12 324	46 383	140%	33 131	13 252	0.35%	46
AG	40 840	7 261	75 640	130%	58 184	17 455	0.38%	66
TG	13 781	7 074	24 866	120%	20 722	4 144	0.29%	12
TI	25 346	8 219	53 137	155%	34 282	18 855	0.51%	97
VD	44 984	10 296	118 139	110%	107 399	10 740	0.77%	82
VS	40 386	6 294	64 837	170%	38 140	26 698	0.65%	174
NE	10 213	6 079	15 836	135%	11 731	4 106	0.87%	36
GE	20 184	13 678	70 420	145%	48 566	21 855	0.68%	148
JU	2 516	4 529	2 907	130%	2 236	671	0.49%	3

Sources et notes:
"Number of homeowners, 2022" from FSO (2024c)
"Average real estate price" from RealAdvisor (2024)
"Total market value" calculated by allocating the total market value of owner-occupied apartments in Switzerland (Wüestpartner, 2023) to each canton proportionally to the number of homeowners in 2022 (FSO, 2024c) and the average real estate price
"Intercantonal repartition factor for non-agricultural property" from CSI (2018)
"Total taxable value" calculated by dividing the total market value by the intercantonal repartition factor
"Undervaluation of taxable value due to systematic underestimation" = "Total market value" – "Total taxable value"

"Wealth tax rate": see Appendix C
"Foregone wealth tax revenue" = "Undervaluation of taxable value" × "Wealth tax rate"

Table 8.5 Calculation of the foregone wealth tax revenue due to the undervaluation of owner-occupied detached houses, 2023

Canton	Number of homeowners, 2022	Average real estate price, July 2024 (CHF/m2)	Total market value, 2023 (million CHF)	Intercantonal repartition factor for non-agricultural property	Total taxable value (million CHF)	Undervaluation of taxable value (million CHF)	Wealth tax rate	Foregone wealth tax revenue (million CHF)
ZH	112 419	10 199	247 969	115%	215 625	32 344	0.31%	100
BE	131 365	6 514	185 066	125%	148 053	37 013	0.53%	195
LU	38 325	8 222	68 149	115%	59 260	8 889	0.31%	28
UR	5 339	6 700	7 736	110%	7 033	703	0.20%	1
SZ	17 225	10 776	40 144	125%	32 115	8 029	0.20%	16
OW	5 268	8 347	9 510	195%	4 877	4 633	0.16%	7
NW	3 744	9 650	7 814	140%	5 581	2 233	0.12%	3
GL	7 513	5 129	8 334	115%	7 247	1 087	0.36%	4
ZG	7 540	15 362	25 051	115%	21 783	3 267	0.26%	9
FR	43 692	6 548	61 874	155%	39 919	21 955	0.73%	161
SO	49 047	5 967	63 295	335%	18 894	44 401	0.22%	97
BS	8 892	10 151	19 521	140%	13 944	5 578	0.67%	37
BL	44 544	8 232	79 304	385%	20 598	58 705	0.86%	503
SH	12 396	6 301	16 892	140%	12 066	4 826	0.60%	29
AR	9 448	6 490	13 261	100%	13 261	0	0.39%	0
AI	3 116	6 706	4 519	110%	4 108	411	0.25%	1
SG	66 770	6 901	99 654	100%	99 654	0	0.40%	0
GR	26 320	6 858	39 038	140%	27 884	11 154	0.35%	39
AG	102 379	7 037	155 811	130%	119 855	35 956	0.38%	137
TG	43 327	6 786	63 588	120%	52 990	10 598	0.29%	31
TI	40 268	6 453	56 198	155%	36 257	19 941	0.51%	103
VD	66 462	9 554	137 328	110%	124 843	12 484	0.77%	96
VS	46 655	6 367	64 244	170%	37 791	26 453	0.65%	172
NE	15 356	6 154	20 438	135%	15 139	5 299	0.87%	46
GE	18 763	13 552	54 993	145%	37 926	17 067	0.68%	116
JU	13 697	3 898	11 547	130%	8 882	2 665	0.49%	13

Sources et notes: see Table 8.4

Eleven cantons levy a real estate tax on physical persons and/or have such a tax at municipal level in their legislation (FTA, 2019b). When it is a municipal tax, cantons often set a range within which municipalities can decide on the tax rate. In these cases, we take the middle point of that range for our calculations, though evidence from Vaud indicates that this is likely to underestimate the actual average tax rate.[149] Applying these rates to the undervaluation of apartments and detached houses yields an amount of subsidy in the form of not collected real estate tax of CHF 320 million for these cantons (Table 8.6). However, in most cantons, real estate tax is deductible from taxable income as a real estate cost.[150] Accounting for this and assuming that it is deductible in all cantons yields a net amount of subsidy of CHF 237 million.

Table 8.6 Calculation of the foregone real estate tax revenue due to the undervaluation of owner-occupied properties, 2023

	Real estate tax rate, physical persons		Estimated tax revenue from homeowners (million CHF)	Foregone tax revenue (million CHF)
	Cantons	Municipalities		
BE		max 0.15%	169	42
FR		max 0.3%	170	94
AI		max 0.1%	2	0
SG		0.02% - 0.08%	74	0
GR		max 0.2%	61	24
TG	0.05%		37	7
TI		0.10%	71	39
VD		max 0.15%	174	17
VS		0.10%	76	53
GE	0.10%		86	39
JU		0.05% - 0.18%	13	4

Sources and notes:
"Real estate tax rate" from FTA (2019b)
"Estimated tax revenue from homeowners" is estimated by multiplying the tax rate by the total taxable value of owner-occupied apartments and detached houses estimated in Table 8.4 and Table 8.5
"Foregone tax revenue" is estimated by multiplying the tax rate by the undervaluation of taxable value of apartments and detached houses estimated in Table 8.4 and Table 8.5

In summary, we estimate the undervaluation of real estate property to lead to implicit subsidies in the form of avoided tax payments of **CHF 3 170 million** for wealth tax and **CHF 320 million** for real estate tax, accounting for the deduction from income tax.

8.3.6 Summary

In this section, we estimated that the cost of **the subsidies to home ownership amount to a total of around CHF 8 375 million**. Of these, around CHF 4 510 million are due to the undervaluation of rental values, CHF 335 million to the lump deduction of real estate costs in excess of actual costs, CHF 35 million to the deduction of the costs of demolition for a replacement construction and CHF 3 million to the reduced rental value granted for underuse of the dwelling. This totals to around CHF 4 880 million foregone income tax revenue, 27 % of which is for FDT and the rest for cantons and

[149] In Vaud, where the rule is that the maximum tax rate is 0.15 %, most municipalities set the rate between 0.10 % and 0.15 % and none is below 0.05 %. The unweighted average of all municipalities is 0.106 % (Etat de Vaud, 2024).
[150] In most cantons, only when the deduction of effective rather than lump sum property costs is chosen.

municipalities. In addition to that, around CHF 3 490 million foregone wealth and property tax revenue for cantons and municipalities can be attributed to property undervaluation.

8.4 Behavioural effects of the tax reliefs

Demand for homeownership

In their 1996 survey of the Swiss population, Thalmann and Favarger (2002) find that 69 % of respondents say that the tax advantages of homeownership are an "important" or "very important" reason behind their desire for homeownership (p. 36).[151] Nonetheless, questions remain as to the extent to which this higher desire for homeownership translates into higher demand for homeownership (e.g., if the limiting factor is not the desire for but the barriers to homeownership), and, secondly, the extent to which a higher demand for homeownership translates into more homeowners (e.g., if the supply of owner-occupied homes is limited).

Regarding the former question, we have part of the answer in the finding by Thalmann and Favarger (2002) that the income level has no statistically significant effect on the probability of success in steps taken to become homeowner, whereas the wealth level does. This indicates that when there is a barrier to homeownership, it is property prices, which is affordable if one has enough wealth, and not annual costs of housing, which are affordable if one has enough income. Thus, the tax advantage does not seem to be the appropriate lever if the aim is to reduce the barriers to homeownership, since its effect is to reduce annual cost at the expense of increasing housing prices, as we will see below.

As to the second question, an indication of the extent to which a higher demand for owner-occupied housing results in more housing construction is the supply elasticity. If the supply elasticity is high, the quantity of housing units can easily adjust to demand pressures, and rents or prices only increase moderately. In contrast, if housing supply is rigid, e.g., because developable land is limited in supply and development takes several years, a small increase in demand might lead to considerable increases in rents and house prices. In the extreme case of a fully inelastic housing supply, the subsidy translates into a one-to-one increase in housing prices. Von Ehrlich et al. (2018) estimate an average long-run supply elasticity for Switzerland of 1.6 and 0.5 with respect to rent and housing prices respectively. An elasticity less than one is considered inelastic. This means that a 10 % increase in housing prices translates into a 5 % increase in the supply of owner-occupied homes. This indicates that the subsidy translates mainly into an increase in housing prices. At municipal level, supply elasticities with respect to housing prices vary between 0.11 and 0.64.

Morger (2017) estimated the degree of capitalisation of tax benefits in property prices, i.e., by how much housing prices increase when income tax decreases by 1 % between two municipalities. They found a degree of capitalisation of about 300 % for the lowest and highest housing price segments, and of about 100 % for the middle price segment.[152]

In summary, the evidence indicates that the tax advantage of homeownership leads to higher demand for homeownership. A small part of that additional demand translates into more homeowners, but

[151] The authors gathered responses from 1563 households, comprising 2 761 people. The results were weighted to be representative of the Swiss population (pp. 18-19).

[152] The property prices are the rents and prices of 430 000 flats in 800 municipalities offered on Homegate between 2004 and 2010. The tax advantage is simply the difference in total income tax between municipalities for typical taxpayers. The author differentiates dwellings by price quintiles and links households with them by taxable income quintiles, then estimates a hedonic model with the tax burden for the category of inhabitant and municipality.

for most it leads to higher property prices, which are likely to hinder access to homeownership for households for whom wealth is the constraint.

Demolishing to build new and building maintenance

The deductibility of demolition costs provides an incentive to favour demolishing to build a new building over retrofitting or re-using the existing building.

The ability to deduct lump sum maintenance costs favours homeowners who do not maintain their property.

8.5 Climate impact of the tax reliefs

Combining data from the Swiss Household Budget Survey with data on energy intensity from life-cycle analysis, Tilov et al. (2019) estimated with regression analysis that, all other things equal but not controlling for dwelling type, homeowners consume about 10 % more embodied energy than tenants, but that there is no significant difference regarding direct energy consumption (Table 3).[153] Using data from the Swiss Household Energy Demand Survey, Farsi and Weber (2024) estimate that, all other things equal, respondents who own an apartment use about 5 % more electricity and heating that respondents who rent an apartment. Furthermore, living in a house rather than an apartment increases electricity expenditures by another 20 %, but reduces heating expenditures by 8 %.[154] Possibly, the increase in apartment size, respectively the move into a detached house is compensated by better insulation. Thus, we assume that moving from tenancy to homeownership increases embodied housing emissions only, and by 10 %. We therefore ignore the large increase in electricity expenditures (and usage) of homeownership and house versus apartment, since the climate impact of electricity consumption is difficult to estimate.[155] We also ignore the increase in energy embodied in consumption goods.

For a newbuilt building, SuisseEnergie (2017) estimated that 35 kWh are used for heating and hot water per square meter and per annum and that 42 kWh/m^{2}a are embodied in the construction of the building. Accounting for emissions from electricity consumption, we assume that about half of CO_2 emissions from the housing sector are embodied emissions. FOEN (2024a) estimates direct housing emissions in Switzerland at 6 412 594 tonnes CO_2. Thus, we assume that same amount for embodied emissions every year. The share of homeowners in Switzerland was 36 % in 2022 (FSO, 2024c). Assuming that the average owned home has 20 % more embodied emissions than the average rented home,[156] we estimate yearly embodied emissions from homeowners at about 2 600 000 tonnes of

[153] Homeowners live in larger homes, often detached houses, but as they invest more in energy saving, they end up not using more energy. On the other hand, these energy-saving measures generated emissions during the production of insulation and appliances, hence the additional embodied energy.

[154] Part of these effects is likely to be due to wealth, which is not available in the survey data. However, the authors control for disposable income.

[155] Electricity in Switzerland is mostly produced by renewable sources, and a homeowner may decide to install solar panels to produce her electricity and/or heat. However, with electricity demand increasing and fossil fuels still being necessary to satisfy demand, one could argue that any additional unit of electricity increases fossil fuel based electricity production.

[156] We assume that homeowners' income is on average 20 % higher than tenants (see the part on distributive effect in the following section). Tilov et al. (2019) estimate an income elasticity of embodied emissions of about 0.5 if we account for non-linear effects (Table 3). We therefore assume that the average homeowner emits about 10 % more embodied energy due to her higher income, which adds to the all-other-things-equal 10 % higher emissions with homeownership.

CO_2. Dividing by the number of homeowners yields 1.8 tonnes of CO_2/year embodied in the average owned home.

Table 8.7 Probabilities of owning one's home and of preferring homeownership

Probability of owning one's home		
if prefers homeownership	38%	Table 5.6, p. 89
if does not prefer homeownership (pp)	6%	
Probability of preferring homeownership		
if highly values the tax advantages of homeownership	87%	Table 5.14, p. 100
if values less the tax advantages of homeownership	83%	
Probability of highly valuing the tax advantage of homeownership	69%	p. 36

Source: Thalmann and Favarger (2002)
These probabilities were estimated for a representative respondent.
The probability of preferring homeownership if highly values the tax advantage of homeownership corresponds to a representative respondent who answered 3 ("important"), on a scale of 0 ("no, not important at all") to 4 ("yes, very important") for "benefitting from a tax advantage" in response to the question "Do you want to become homeowner for these reasons?" (our translations)

We are not aware of any estimates of owner-occupied housing demand elasticity with respect to housing cost in Switzerland. And if that were available, we would need to estimate the impact of the tax advantage on housing cost, taking into account the extent to which it translates into higher housing prices. We therefore use another way to approximate the impact of the subsidy on the number of homeowners. Based on survey results, Thalmann and Favarger (2002) estimate probabilities with respect to the determinants of homeownership. The relevant probabilities are reproduced in Table 8.7. With these, we calculate that the probability of homeownership decreases by 2.6 % (or 1 percentage point) when the tax advantage is eliminated.[157,158] Under the hypothesis that this is the share of new homeowners who would not acquire property in the absence of the subsidy, we estimate that eliminating the subsidy results in 300 households choosing tenancy over homeownership next year compared to the status quo.[159] Multiplying these by our estimates of emissions embodied in the average owned home and the share of emissions "saved" by choosing tenancy over homeownership yields a total reduction compared to the status quo of 50 tonnes CO_2 per year.

[157] The probability of homeownership (abbrev. HO) in the status quo is calculated with conditional probabilities:
$Pr(HO|prefers\ HO)\times[Pr(prefers\ HO|V)\times Pr(V)+Pr(prefers\ HO|not\ V)\times Pr(not\ V)]+$
$Pr(HO|not\ prefers\ HO)\times[Pr(not\ prefers\ HO|V)\times Pr(V)+Pr(not\ prefers\ HO|not\ V)\times Pr(not\ V)] = 33.4\ \%$
where "HO " stands for "homeownership" and "V" stands for "values the fiscal advantages of homeownership"
We assume that eliminating the fiscal advantage of homeownership is equivalent to bringing the preferences of those who highly value that fiscal advantage to the level of those who do not. Thus, the probability of homeownership when the fiscal advantage is eliminated is:
$Pr(HO|prefers\ HO)\times Pr(prefers\ HO|not\ V)+ Pr(HO|not\ prefers\ HO)\times Pr(not\ prefers\ HO|not\ V) = 32.6\ \%$.

[158] Bourassa and Hoesli (2010) estimated the impact of removing both the taxation of the rental value and the deductions and came to the same result of a 1 percentage point decrease in the homeownership rate. The impact of their scenario on income tax is likely to be of much smaller magnitude than the subsidy we estimate here. It is therefore safe to say that their model would find a much larger decrease in the homeownership rate as a result of removing the fiscal advantage of homeownership as we define it. NB: at the time of writing their paper, the imputed rent was on average slightly lower than the deductions.

[159] We take the average increase in the number of homeowners as an approximation for the number of new homeowners, although this is an underestimation. There were 1 420 000 homeowners in 2022 and the average yearly growth rate in the number of homeowners between 2010 and 2022 was 0.80 % (FSO, 2024c).

8.6 Other considerations

Effectiveness and efficiency

The constitutional objective is to facilitate access to homeownership. Our analysis in the above sections indicates that the homeownership tax incentive system is not effective with regard to this objective, though very costly in terms of foregone tax revenues. According to Thalmann and Favarger (2002), the current system of encouragement of home ownership is neither effective nor efficient for the following reasons:

- According to the legal doctrine, using tax law to reach non fiscal objectives is problematic due to the loopholes it creates and the lack of budgetary visibility (Rapport Locher, 1994, cited in Thalmann and Favarger, 2002).
- Timing. The tax advantages are spread over time and increase, in absolute terms, as the household's income grows due to the progressivity of the tax rate. This means, first, that they only help alleviate revenue constraint, when, in fact, the equity needed for the purchase seems to be the most limiting factor, and second, that the help is inversely proportional to the needs of the households.
- The measures are not targeted. Many new homeowners can do without an incentive, while those who have owned their home for a long-time benefit from an incentive they no longer need.
- Most households associate homeownership with living in a detached house. The latter is obviously more costly than living in an apartment. It is not clear that the state should financially support such an "upgrade", which also runs against the preservation of land for agriculture, of the environment and of landscape. The authors therefore argue that the State should rather support the acquisition of apartments.
- Facilitating does not mean "pushing" homeownership. In particular, benefitting from a tax advantage should not be a reason for acquiring a home. In their survey of the Swiss population, Thalmann and Favarger (2002) find that benefitting from a favourable tax treatment comes out as the second most important reason for home ownership.[160] They also find that, when asked to list the costs of home ownership, homeowners responding to the survey only rarely mention taxes. While these answers may seem contradictory at a first glance, the latter result is consistent with the fact that homeownership is seen as a means to save taxes. Furthermore, a high proportion of homeowners should not be an objective per se, not least because it exposes the economy to an increased volatility of consumption.
- Households who could face financial difficulties as a result of home ownership with a high level of debt should not be encouraged to acquire a home.

Thus, an effective and efficient policy of encouraging homeownership needs to:

- Take the most useful form by acting on the most limiting barrier;
- Target households that are closest to acquiring property, that is, who are interested and aim for property that is not too far from their means.

Such as policy would, for example, include using the funds freed by the removal of the tax advantages of home ownership to grant an allowance for the acquisition of a new property. This has the advantage of simplicity and low administrative costs, and the beneficiaries would be better able to assess the

[160] The most important reason, from the survey results, is the ability to freely equip and adapt one's home. The sample size is 2 761 participants.

financial impact of the measure. In order to target those who need it, the allowance could be a function of income and household size, and priority could be given to younger households with children. The allowance could even be logged in the land register and the beneficiaries asked to reimburse it with interest in case of substantial improvement of their financial situation or at the sale of the property. The authors suggest further measures, such as reducing transaction costs on property or encouraging homebuyer savings plans.[161]

Equity

"Rental values that do not correspond to market value are a tax privilege for homeowners, a privilege that extends to a wide range of areas, as many grants and subsidies (scholarships, reductions in premiums, family allowances, etc.) depend on taxable income: homeowners are therefore entitled to undeserved subsidies or subsidies that are higher than necessary.

The group of farmers who occupy their own homes is particularly privileged, as rents in agriculture are not based on market prices but on agricultural yields (hidden subsidies)" (KES, 2000, our translation).

Energy-saving investments in housing

Due to the fact that landlords cannot pass on the costs of energy-saving investments to tenants, homeowners have a greater incentive to make such investments. However, their tighter budget constraints limit their ability to do so. Further research is needed to assess the impact of homeownership on energy-saving investments. Additionally, a targeted measure to incentivise such investments from landlords is likely to be more effective and efficient than measures to increase the number of homeowners.

Administrative costs

General reassessments of house and rental values are costly and tedious undertakings. Furthermore, when cantons carry these out, their tax offices are flooded by oppositions. This argument is used to remove the taxation of the rental value altogether. However, yearly updating rental and property values based on objective indexes is also a way to prevent costly litigation cases, as shown by cantons who do this.

The undervaluation of rental values calls for deductions for rents, which will be hard to refuse in light of the constitutional principle of equality (KES, 2000). Additional deductions imply a more complex, opaque and heavy tax system.

Checking deductions of actual maintenance costs is tedious work. Distinguishing between maintenance costs and investments that increase property value requires expertise which taxpayers and tax authorities often lack. This difficulty leads to costly disputes. Lump sum deductions, thus, lower administrative costs.

Tax optimisation

The current system provides an incentivise to plan housing maintenance works so that these can be deducted in years of high taxable income, to stave off the progressivity of the tax rate, as well as to plan all maintenance works in the same years, so that the lump sum deduction can be chosen in other years. Tax optimisation wastes resources that could be put to productive uses.

[161] For more details and suggestions on policies encouraging the acquisition of property, see, e.g., chapter 12 in Thalmann and Favarger (2002).

Macroeconomic effects

More homeowners means that more people are exposed to housing prices and interest rate fluctuations. Homeowners are particularly vulnerable, because they often invested all their savings in their property and their portfolio is, therefore, not diversified. When the economy slows down, housing prices drop and credit institutions force homeowners to bring their debt down to the new value of the property. Households that are then also affected by unemployment or a drop in income are trapped. Even if they are not, the pressure to pay back their debt depresses consumer demand, reinforcing the downward economic cycle. This could be observed in countries that heavily pushed homeownership during the 1985-1995 and 2008 housing crises (United Kingdom, Ireland, Spain).

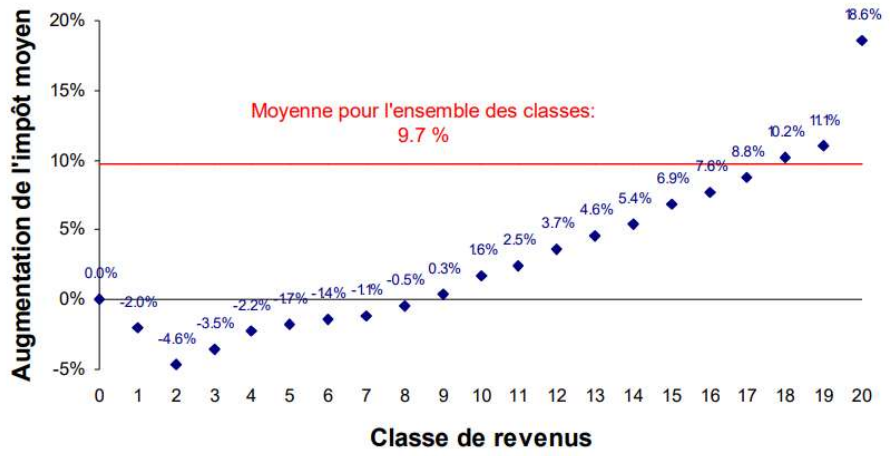
Another detrimental effect of a high number of homeowners, especially of detached houses, is that it could imply an overinvestment in stone at the expense of more productive investments. Even with a relatively low share of homeowners, Switzerland is amongst the top countries in terms of investments in housing as a share of GDP.

Income distribution

Reduced rental values disproportionately favour high-income earners, because of the progressive nature of direct tax scales. The Commission Rental Value / System change (KES, 2000) concluded that the objective of taxing according to ability to pay is thus "clearly not met".

Furthermore, we make two observations based on Peters' (2009) analysis of 2005 data from the canton of Bern. First, unsurprisingly, the share of homeowners increases steadily with income class, from just above 50 % for median income earners to 85 % for the top 5 % income earners. Those who benefit from the favourable taxation of homeownership are, therefore, mostly (very) high income earners. Second, eliminating the taxation of the rental value and all deductions for homeowners decreases the tax burden for income classes among the bottom 40 %, while, for other income classes, the percentage increase in tax burden grows with income class (Figure 8-1). And for the top 5 % income earners, the increase in the tax burden jumps to 18.6 % from 11.1 % for the income class just below. This analysis does not account for the potential redistribution of the additional income. It is very likely that eliminating the tax advantage of homeowners – i.e., the underestimation of the rental value and unjustified deductions – would have a similar effect. Thus, eliminating the subsidy and using the additional tax revenue to reduce income taxes proportionately would have significant positive redistributive effects, probably even reducing the tax burden for low-income homeowners.

Figure 8-1 Increase in mean income tax by income class in case of suppression of rent imputation and all corresponding deductions



Source: Peters (2009, figure 17)

Also, in several cantons (GE, GR, LU, OW, SH, SG, VD and ZH), a hardship clause provides for a reduction of the rental value if it exceeds a given percentage of taxable income (CER-CE, 2021).

8.7 Conclusion

Contrary to expectations, the very favourable taxation of owner-occupied housing cannot be shown to lead to significantly higher CO_2 emissions. The assumed chain of causality – favourable taxation implies a higher proportion of homeowners who occupy larger dwellings and consume more energy, and thus cause greater CO_2 emissions – breaks at several places. The form of subsidy granted to homeowners is actually very ineffective in attaining its goal of increasing their share. Furthermore, the evidence comparing the energy consumption and CO_2 emissions of tenants and homeowners shows that the latter's climate impact is less than 10 % larger than that of the former.

This does not mean that the taxation of owner-occupied housing should not be reformed. It is very costly – over CHF 8 billion of forgone tax revenues for the Confederation, cantons and communes – and quite unfairly allocated, in addition to being ineffective. Furthermore, to the extent that it does lead to more homeownership, it entails are other detrimental environmental impacts such as land use and urban sprawl.

Table 8.8 Summary of the costs and climate impact of the subsidies analysed in this document

Subsidy	**Amount of subsidy** (million CHF)	**Potential tax revenue** (million CHF)	**Climate impact** (thousand tonnes CO_2 or CO_2eq)
Income and wealth taxes: Privileges for home ownership			
• Underestimation of rental values	4 510	4 510	(0)
• Lump sum deduction of costs and other privileges	375	375	(0)
• Underestimation of property values	3 490	3 490	(0)

9. Summary and conclusions

Table 9.1 summarizes the results obtained in the previous chapters. Each result is discussed below. The amount of subsidy is the amount of tax saved by beneficiaries thanks to the tax relief. As eliminating tax reliefs may affect behaviours, this could affect the tax base and, thus, lead to potential tax revenues different from the amount of tax saved (see section 1.4.3). When this dynamic effect does not exist or is negligible, the same amount is given for the two concepts. The climate impact corresponds to the reduction of greenhouse gas emissions if the tax relief were modified or eliminated.

Table 9.1 Summary of the costs and climate impact of the tax reliefs analysed in this document

Tax relief	**Amount of subsidy** (million CHF)	**Potential tax revenue** (million CHF)	**Climate impact** (thousand tonnes CO_2)
Income taxes: Deductibility of commuting costs			
• Complete elimination	1 705	1 705	430
• Cap of CHF 3 000	385	385	95
• "Best in class" deductibility	370	410	130
Income taxes: Company cars and free parking at work			
• Company cars	100	100	120
• Free parking	330	330	75
Heavy Vehicle Fee: Uncompensated non-climate external costs	525	500	115
Heavy Vehicle Fee: Exemption for light commercial vehicles			
• Partial compensation of external costs, like HGVs	405	375	95
• Full compensation of external costs	615	550	125
Mineral oil tax: Reimbursement to licensed transport companies	75	0	140
Mineral oil tax and VAT: Exemption for international aviation	1 890	1 360	1 450
Income and wealth taxes: Privileges for home ownership			
• Underestimation of rental values	4 510	4 510	(0)
• Lump sum deduction of costs and other privileges	375	375	(0)
• Underestimation of property values	3 490	3 490	(0)
TOTAL*	**13 615**	**12 920**	**2 455**
TOTAL without tax reliefs with negligible climate impact	**5 240**	**4 585**	**2 455**

* with complete elimination of deductibility of commuting expenses and a fee on LCVs fully compensating their non-climate external costs

The various cantonal and federal deduction allowances for commuting costs amount, on average, to a subsidy of CHF 15 ct./km for the average taxpayer, which is slightly more than the average commuter's fuel costs. The deductibility is therefore equivalent to the public sector covering the average commuter's fuel costs. As it is controversial to what extent such travel costs should be deductible, i.e., to what extent the current federal and cantonal regulations amount to a subsidisation of commuting by car, three options were examined. Complete elimination is the logical choice when one considers that commuting by car is not a necessary condition for earning one's income. A cap of CHF 3 000 applies for federal direct taxation (indexed today to CHF 3 200), considering that costs beyond that cap are a matter of choice. The last view accepts commuting distances, but considers that commuting with anything other than the most affordable vehicle, which costs 50 ct./km, is a matter of choice. Any change in regime would reduce car commuting and save CO_2 emissions (with the current vehicle parc). The greatest reduction is obtained if deductibility of commuting costs is entirely

eliminated or – which is equivalent in terms of influencing the choice of commuting distance and mode – replaced by a lump sum deduction independent of these choices.

Taxpayers who are allowed to use a company car free of charge for their private mobility are imputed an income in nature of 10.8 % of the car purchasing price. This generally underestimates the value of private use for most users, which encourages car usage and high levels of mileage. The same applies to free or subsidised parking spaces at the workplace, which are not included in taxable income as a fringe benefit.

The heavy goods vehicles fee (HVF) was introduced in 2001 with a view to making heavy goods vehicles (HGVs) pay for all the costs that do not pay for otherwise, namely additional infrastructure costs, climate impacts and other external costs such as pollution and noise. Since we chose to leave out of our analysis taxes and subsidies that should be part of climate policy, there remain the uncovered infrastructure costs and the other external costs. With the current rates of the HVF, HGVs cover only 66 % of these costs, also because of the cap on transit costs for EU HGVs under the Land Transport Agreement. We consider the uncovered non-climate costs of CHF 535 million in 2019 as a subsidy. Full internalisation would have required a higher HVF by 34 %, which would have generated CHF 500 million in additional revenues, considering that HGV transport would have decreased by 6.4 %. This decrease in transport and fuel use would have lowered CO_2 emissions in the same proportion.

Light commercial vehicles (LCVs) do not pay the HVF, even though they also cause non-climate external costs that they do not cover. Correcting this would call for an LCV fee which could either cover 66 % of these costs, as the existing HVF makes HGV only cover this share of their own non-climate external costs, or 100 %, assuming that the HGV will also be raised. Depending on the option retained, the additional revenues and saved CO_2 emissions are, of course, different.

The support granted to licensed transport companies by refunding them the mineral oil taxes could be replaced by support for decarbonizing their vehicle fleet, which would save between 120 and 155 000 tonnes of CO_2, depending on the modalities of this new subsidy. Of course, this climate gain comes at the cost of no net additional federal tax revenues.

International air travel is exempted from mineral oil taxes and VAT because governments wanted initially to favour its development and they made sure that these initial support measures were made permanent through a mesh of bilateral international agreements. Removing these privileges would raise ticket prices by 44% and lead to a 28% reduction in flights. This would generate the second most additional revenues for the federal government and the largest reduction in CO_2 emissions. As the complete climate impact of burning kerosene at high altitudes is estimated to be three times that of releasing the same quantity of CO_2 on the ground, eliminating these privileges would be equivalent to avoiding 4.35 million tonnes of CO_2 emissions at ground level.

Homeowners, i.e., taxpayers who own the house or apartment in which they are living, enjoy substantial privileges with reference to "taxation by the textbook", which means that the full amount of rental income that they could earn if they let their dwelling is added to their taxable income, only actual maintenance and repair costs are deductible, and the market value of their property is added to their taxable wealth. However, these large advantages are quite ineffective in increasing the number of homeowners. For one, because for about a third of people these tax advantages are not a reason to become homeowners, just a welcome windfall gain. More importantly, these tax advantages lead to higher property prices, which makes them unaffordable to many wealth constrained people, despite the income improvement from the tax breaks. We estimate that only about 300 more households become homeowners every year thanks to the preferential tax treatment.

There exists little quantitative evidence of higher greenhouse gas emissions by homeowners compared to tenants, every else being the same (e.g., income levels). There is only some evidence of 10 % more embodied emissions in dwellings purchased by homeowners compared to tenants. This, and the small increase in number of homeowners implies that the subsidies for owner-occupants, large as they be, are responsible for only about 50 tonnes of additional CO_2 emissions per year.

Eliminating all tax reliefs with a significant climate impact would lower GHG emissions by 2.45 million tonnes per year. Using the new estimate of the social cost of carbon used to quantify the external costs of transportation – 430 CHF/tCO_2eq (Ecoplan/INFRAS, 2024) – this would avoid costs of CHF 1.1 billion per year to humanity. Of the 2.45 MtCO_2eq that could be avoided by eliminating the subsidies identified in this report, only 1.1 Mt are currently counted in the Inventory of domestic emissions, which totalled 41.63 Mt in 2022. So, the reduction would amount to 2.4 % of these emissions. However, the full 2.45 Mt would contribute to attaining the net-zero target for 2050, as the Federal Climate and Innovation Act, article 3, includes the emissions from aviation fuels tanked in Switzerland in this target.

In Table 9.2, the potential tax revenues from eliminating the tax reliefs identified are allocated between the Confederation on the one hand, and the cantons and communes on the other hand. This concerns mainly the reliefs from income taxes and wealth taxes, as the other taxes are collected by the Confederation alone. The totals depend on which variants are chosen regarding the deductibility of commuting costs and the new fee on light commercial vehicles. We use the maximum amounts, i.e., those that result from complete elimination of deductibility of commuting costs and full compensation of LCVs' non-climate external costs.

Table 9.2 Allocation of potential tax revenues between federal tiers

Tax relief	**Potential tax revenue** (million CHF)	**… for Confederation** (million CHF)	**… for cantons and communes** (million CHF)
Income taxes: Deductibility of commuting costs			
• Complete elimination	1 705	350	1 355
• Cap of CHF 3 000	385	0	385
• "Best in class" deductibility	410	190	220
Income taxes: Company cars and free parking at work			
• Company cars	100	15	85
• Free parking	330	55	275
Heavy Vehicle Fee: Uncompensated non-climate external costs	500	500	0
Heavy Vehicle Fee: Exemption for light commercial vehicles			
• Partial compensation of external costs, like HGVs	375	375	0
• Full compensation of external costs	550	550	0
Mineral oil tax: Reimbursement to licensed transport companies	0	0	0
Mineral oil tax and VAT: Exemption for international aviation	1 360	1 360	0
Income and wealth taxes: Privileges for home ownership			
• Underestimation of rental values	4 510	1 220	3 290
• Lump sum deduction of costs and other privileges	375	100	275
• Underestimation of property values	3 490	0	3 490
TOTAL*	**12 920**	**4 150**	**8 770**
TOTAL without tax reliefs with negligible climate impact	**4 585**	**2 830**	**1 715**

* with complete elimination of deductibility of commuting expenses and a fee on LCVs fully compensating their non-climate external costs

The sum of additional revenues from eliminating all these tax reliefs could reach about CHF 4.15 billion for the Confederation, or 5.8 % of its total tax revenues in 2022 (FFA, 2024). For the cantons and communes aggregated, the additional revenues could reach about CHF 8.77 billion, or 6.7% of their 2022 total tax revenues (ibid.). The budget impacts are substantially smaller if the privileges for home ownership are not eliminated, arguing that their climate impact is negligible.

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11. Appendices

Appendix A : Marginal income tax rates for a median income

We use the Federal Tax Administration's tax calculator[162] to compute federal, cantonal et communal tax burden in every Swiss municipality in 2020 (most recent year with data for the number of taxpayers paying FDT in each municipality) for different household types and gross incomes, which allows us to compute a marginal tax rate for an income range. This example shows the calculation for the income range of CHF 175 000 – 200 000:

Marginal tax rate = ([total tax for CHF 200 000] – [total tax for CHF 175 000]) / 25 000

We then average across all Swiss municipalities weighted by the total number of working taxpayers. The results are shown in Table 11.1.

Table 11.1 Marginal tax rates (weighted average across all Swiss municipalities) by household composition and gross income range (2020)[163]

	Gross income range (1 000 CHF)		
	125 - 150	150 - 175	175 - 200
Married, two incomes (70/30), two children	19.9%	22.4%	25.7%
Married, two incomes (50/50), two children	20.0%	22.1%	25.7%
Married, two incomes (70/30), one child	20.8%	23.7%	27.4%
Married, two incomes (50/50), one child	20.9%	23.3%	27.3%
Married, two incomes (70/30), no children	21.8%	25.0%	29.0%
Married, two incomes (50/50), no children	21.9%	24.6%	28.9%

	Gross income range (1 000 CHF)			
	70 - 80	80 - 90	90 - 100	100 - 125
Single, two children	12.4%	13.6%	17.1%	19.1%
Single, one child	15.8%	16.9%	18.3%	20.0%
Single, no children	19.8%	21.6%	24.2%	25.4%

Sources: Tax expense from <https://swisstaxcalculator.estv.admin.ch/>, Number of working taxpayers per municipality from FTA (2023b), own calculations
Notes: "70/30" and "50/50" refer to the ratio between both partners' contribution to the couple's income. For the weighting, we consider the number of taxpayers in each municipality that are "normal" cases and that are either employed or self-employed. Special cases are, for example, taxpayers under the regime of "lump sum taxation"

We take the marginal tax rate for a median gross income of CHF 80 000 [164] for household categories at the level of granularity used in tax statistics – married and no children, married or single with children, other (= single without children). Weighing these rates by the share of each category in the working population, we estimate an average **median marginal tax rate of 22.4 %**. The calculation is displayed in Table 11.2.

[162] <https://swisstaxcalculator.estv.admin.ch/#/taxburden/income-wealth-tax>.

[163] A sensitivity analysis taking out large cities (Zurich, Bern, Basel, Winterthur, Lausanne, Geneva, Lucerne and St. Gallen), whose inhabitants are less likely to commute over long distances, yields very similar rates.

[164] The 2020 median gross wage from the Swiss Earnings Structure Survey is CHF 6 665 per month including 1/12 of the thirteenth wage (FSO, 2022).

Table 11.2 Composition of the Swiss population paying federal direct tax (2019) and median marginal tax rate estimates (2020)

	Total taxpayers (thousands)	**Annuitant and without activity taxpayers** (thousands)	**Working taxpayers** (thousands)	**Working taxpayer shares**	**Median marginal tax rate**
Married and no children	1 488	799	689	22%	24.8%
Married with children	844		844	27%	22.7%
Single parent families	97		97	3%	14.7%
Other taxpayers	2 140	654	1 486	48%	21.6%
Total	4 569	1 453	3 116	100%	

Source: Total taxpayers in each category from FTA (2023c), own calculations, marginal tax rates from Table 11.1
Notes:
We take the number of taxpayers in each household category from the 2019 tax statistics because of the higher level of granularity than in the 2020 statistics
In order to have slightly more granularity than the tax statistics, we calculate the number of "married with children" within the "married with children and single parent families" category by dividing the total "deductions for married couples" by the deduction allowed per married couple (CHF 2 600 in 2019). The rest are "single parent families". The same is done to calculate the number of married couples and of singles within annuitant taxpayers. We ignore the fact that some annuitants have dependants because of the lack of granularity and, in any case, the number of dependants per annuitant (0.04) is very small
We multiply the numbers for married taxpayers by two since, in the tax statistics, a married couple counts as one taxpayer. The working population is calculated by deducting the number of annuitants from the total number of taxpayers
For "other taxpayers", i.e. singles without children, we take the marginal tax rate for the CHF 80 000 to CHF 90 000 gross income range since (i) eliminating a tax relief means that the affected taxpayers jump to higher marginal tax rates and (ii) the deductibility of commuting costs, as well as the availability of company cars and free parking, concerns higher income earners more (see sections 2.6 and 3.6)
The "married with children" and "single parent families" have an average of 1.66 children. We therefore weigh as follows: Median marginal tax rate = 0.34 × Marginal tax rate with one child + 0.66 × Marginal tax rate with two children. We then take the average between marginal tax rates for couples with 50/50 income ratios and those for 70/30 ratios

Federal Direct Tax (FDT)

Doing as above for FDT (except that there is no need to average across municipalities), we find an average median FDT tax rate of 4.6 %. The marginal tax rates for various household types and incomes are displayed in Table 11.3 and averaged in Table 11.4, which then allows us to calculate the average over the whole population paying FDT.

Table 11.3 Marginal federal direct tax rates by household composition and gross income range (2020)

	Gross income range (1 000 CHF)		
	125 - 150	150 - 175	175 - 200
Married, two incomes (70/30), two children	3.7%	5.1%	7.2%
Married, two incomes (50/50), two children	3.8%	5.0%	7.1%
Married, two incomes (70/30), one child	4.0%	5.7%	8.5%
Married, two incomes (50/50), one child	4.1%	5.6%	8.5%
Married, two incomes (70/30), no children	4.6%	6.3%	9.9%
Married, two incomes (50/50), no children	4.7%	6.3%	9.9%

	Gross income range (1 000 CHF)			
	70 - 80	80 - 90	90 - 100	100 - 125
Single, two children	0.0%	0.0%	2.5%	3.4%
Single, one child	1.9%	2.6%	2.9%	3.9%
Single, no children	2.6%	3.8%	5.6%	6.1%

Sources: Tax expense from <https://swisstaxcalculator.estv.admin.ch/>
Notes: "70/30" and "50/50" refer to the ratio between both partners' contribution to the couple's income

Table 11.4 Composition of the Swiss population paying federal direct tax (2019) and median marginal FDT rate estimates (2020)

	Working taxpayer shares	Median marginal FDT rate
Married and no children	22%	6.3%
Married with children	27%	5.3%
Single parent families	3%	0.9%
Other taxpayers	48%	3.8%
Total	100%	

Source: Taxpayer shares from Table 11.2, median marginal tax rates calculated from Table 11.3
Notes: See Table 11.2

Appendix B : Marginal income tax rates for homeowners

We believe that homeowners are likely to have a higher median income than the general population. Furthermore, higher income earners are likely to benefit from a greater reduction in available income due to the underestimation of the rental value or to unjustified deductions since they are likely to own more valuable homes. We therefore need to specifically estimate the average marginal tax for that subsidy.

The FTA estimated (in response to our request) that the average federal direct tax marginal tax rate faced by homeowners is 6 % and increases to 6.75 % when the rental value is valued at full market price. We therefore use an average 6.375 % FDT marginal tax rate to calculate the amount of that subsidy. In order to estimate the cantonal and municipal average marginal tax rate for homeowners, we take a married couple with two children and a 70/30 income breakdown between the couple members. For them to face an average marginal tax rate of 6.375 % for FDT on their additional earnings, we calculate, that 39 % of that earning must be in the CHF 150 000 and CHF 175 000 income range and the rest in the CHF 175 000 and CHF 200 000 range (see Table 11.3).[165] We apply these shares to the average marginal tax rates faced by our couple in each canton. These rates are shown in Table 11.5.

[165] These brackets correspond to the granularity that is available in the Swiss Tax Calculator tool.

Table 11.5 Average cantonal and municipal marginal tax rates for homeowners in each canton

Canton	Gross income range (CHF) 150 000 - 175 000	175 000 - 200 000	Average rate for housing subsidies
ZH	14.8%	16.3%	15.7%
BE	19.9%	21.2%	20.7%
LU	15.5%	16.6%	16.2%
UR	12.2%	12.2%	12.2%
SZ	10.8%	11.4%	11.1%
OW	12.3%	12.2%	12.3%
NW	11.9%	12.0%	12.0%
GL	15.1%	15.1%	15.1%
ZG	6.5%	6.7%	6.6%
FR	19.9%	21.7%	21.0%
SO	19.1%	20.1%	19.7%
BS	19.2%	19.2%	19.2%
BL	21.5%	22.4%	22.0%
SH	17.5%	18.9%	18.4%
AR	17.2%	17.4%	17.3%
AI	12.6%	12.7%	12.7%
SG	17.9%	19.1%	18.6%
GR	17.7%	18.1%	17.9%
AG	16.6%	17.5%	17.2%
TG	16.2%	16.2%	16.2%
TI	20.6%	19.9%	20.2%
VD	18.7%	19.9%	19.4%
VS	17.8%	26.4%	23.0%
NE	22.9%	23.6%	23.3%
GE	23.2%	23.2%	23.2%
JU	21.2%	21.3%	21.3%
CH average	17.6%	18.8%	18.4%

Sources and notes:
For "150 000 – 175 000" and "175 000 – 200 000" income ranges, we average the marginal tax rates in each municipality for a married couple with two children and 70/30 income breakdown within the couple, weighted by the number of taxpayers paying FDT in that municipality, minus the marginal FDT rate. The values for all of Switzerland (last range in the table) are calculated in the same way, averaging over all municipalities in the country (own calculation using data from FTA, 2023b, and <https://swisstaxcalculator.estv.admin.ch/#/taxburden/income-wealth-tax> – see Appendix A for calculation details)
"Average rate for underestimation of rental value" = 21 % × [marginal tax rate in income range CHF 150 000 – 175 000] + 79 % × [marginal tax rate in income range CHF 175 000 – 200 000]

We use the number of taxpayers paying FDT to assign a weight to each municipality when computing an average marginal tax rate, since we do not have data on the number of homeowners in each municipality. This gives an excessive weight to large cities in which, with an equivalent income, taxpayers are less likely to own their home. We therefore also compute average marginal tax rates excluding large cities in Table 11.6 to test for sensitivity.

Table 11.6 Average cantonal and municipal marginal tax rates for homeowners without large cities

Canton	Gross income range (CHF) 150 000 - 175 000	175 000 - 200 000	Average rate for housing subsidies	Difference
ZH	14.3%	15.8%	15.2%	-0.5%
BE	20.0%	21.2%	20.8%	0.1%
LU	15.6%	16.7%	16.3%	0.1%
BS	17.4%	17.4%	17.4%	-1.8%
SG	17.6%	18.7%	18.3%	-0.4%
VD	18.5%	19.7%	19.2%	-0.2%
GE	23.1%	23.1%	23.1%	-0.1%
CH	17.5%	18.8%	18.3%	-0.1%

Sources and notes: Same as Table 11.5 except that large cities (Zurich, Bern, Basel, Winterthur, Lausanne, Geneva, Lucerne and St. Gallen) are left out of the average. The "Difference" column displays the difference in the "average rate for housing subsidies" compared to Table 11.5

Appendix C : Marginal wealth tax rate for homeowners

To estimate marginal wealth tax rates faced by homeowners, we proceed in the same as for the estimation of marginal income tax rates in Appendix B: With the FTA's tax calculator, we compute wealth tax payment in each municipality for a married couple with two children and wealth of CHF 750 000 and then of CHF 1 000 000. The average "marginal" tax rate displayed in Table 11.7 is thus the average marginal tax rate on this bracket.

Table 11.7 Average marginal wealth tax rate for a married couple with two children and CHF 750 000 to CHF 1 000 000 net wealth bracket

Canton	
ZH	0.31%
BE	0.53%
LU	0.31%
UR	0.20%
SZ	0.20%
OW	0.16%
NW	0.12%
GL	0.36%
ZG	0.26%
FR	0.73%
SO	0.22%
BS	0.67%
BL	0.86%
SH	0.60%
AR	0.39%
AI	0.25%
SG	0.40%
GR	0.35%
AG	0.38%
TG	0.29%
TI	0.51%
VD	0.77%
VS	0.65%
NE	0.87%
GE	0.68%
JU	0.49%
CH	0.47%

Sources and notes: We average the marginal tax rates in each municipality for a married couple with two children, weighted by the number of taxpayers paying FDT in that municipality. The value for Switzerland (last range in the table) is calculated in the same way, averaging over all municipalities in the country (own calculation using data from FTA, 2023b, and <https://swisstaxcalculator.estv.admin.ch/#/taxburden/income-wealth-tax> – see Appendix A for calculation details)

Our choice of wealth bracket, restricted by the tax calculator's options,[166] is based on microdata on the average net wealth of homeowners provided by four cantons (FTA, 2023d) – CHF 565 346 (AG), CHF 567 369 (BE), CHF 1 260 145 (LU) and CHF 954 824 (TG) – and by our estimation of the average undervaluation of owner-occupied housing at about CHF 1 000 000 (section 8.3.4). Given that wealth tax rates are progressive, our estimated average marginal wealth tax rates are therefore likely to be underestimates.

[166] The next lower and higher options for wealth levels are respectively CHF 500 000 and then of CHF 5 million.

Appendix D Conditions for deducting private vehicle costs

Federal Tax Administration (FTA, 2023a)

The FTA accepts the following justifications for the use of a private motorised vehicle:

- Unavailability of public transport
- Time savings of more than 1 hour per day compared to public transport
- Permanent use of private motor vehicle at the request of and against compensation by the employer (employer's certificate required)
- Impossibility of using public transport due to illness / infirmity (doctor's certificate required)

Canton of Vaud

Vaud (Canton de Vaud, 2022, our translation) specifies that "in exceptional cases, the use of other means of transport (in particular motorised vehicles) may be allowed if the taxpayer can prove that no public transport is available or that he/she is unable to use it (e.g., infirmity, significant distance from the nearest station, numerous changes of vehicles, etc.); the mere saving of time due to the use of a private vehicle is not a sufficient reason".

Canton of Valais

Valais (Canton du Valais, 2010, our translation) provides an exhaustive list of the cases in which the costs of using a private vehicle are deductible:

"- For health reasons.
- Use of the vehicle for professional purposes (employer's certificate required).
- Incompatibility with working hours (proof required).
- The use of a private vehicle is also permitted if:

1. The distance from home to work is less than 5 km per journey (return journey at midday).
2. The taxpayer must change means of transport at least 2 times.
3. The distance from home to the station or from the station to the place of work is greater than 1.5 km and the distance to be covered by train (from the departure station to the arrival station) is less than 20 km (if more than 20 km: park & rail if available).

Appendix E : Calculations of the foregone tax revenue from the deductibility of commuting costs assuming

Additional tax revenue with unique tax rate

Table 11.8 shows the same calculations as Table 2.2 with the difference that a unique tax rate is assumed for all cantons. This is used to estimate the number of deductible commuting kilometres above the CHF 3 000 cap across cantons.

Table 11.8 Estimated additional tax revenue for cantons and municipalities assuming a unique tax rate across all cantons

Canton	Number of commuters (IMT and public transport, 2021)	Median marginal tax rate (weighted average)	Cap on deductible transport costs	Estimated additional tax revenue with CHF 3000.- cap (million CHF)		Estimated additional tax revenue with entire elimination of deductibility (million CHF)	
				Canton	Communes	Canton	Communes
Zürich (before introduction of cap)	515 695	100%		44.5	48.5	118.3	129.0
Zürich	515 695	100%	5 000	18.2	19.8	92.0	100.3
Bern / Berne	335 239	100%	6 700	15.5	16.9	63.5	69.2
Luzern	145 271	100%	6 000	6.1	6.6	26.9	29.3
Uri	11 384	100%		1.0	1.1	2.6	2.8
Schwyz	55 761	100%	8 000	3.1	3.3	11.0	12.0
Obwalden	13 041	100%	10 000	0.9	1.0	2.8	3.0
Nidwalden	14 606	100%	6 000	0.6	0.7	2.7	2.9
Glarus	13 988	100%		1.2	1.3	3.2	3.5
Zug	40 903	100%	6 000	1.7	1.9	7.6	8.2
Fribourg / Freiburg	120 781	100%		10.4	11.4	27.7	30.2
Solothurn	96 878	100%		8.4	9.1	22.2	24.2
Basel-Stadt	42 461	100%	3 000	0.0	0.0	4.8	5.3
Basel-Landschaft	87 929	100%	6 000	3.7	4.0	16.3	17.7
Schaffhausen	27 537	100%	6 000	1.2	1.3	5.1	5.5
Appenzell Ausserrhoden	19 038	100%	6 000	0.8	0.9	3.5	3.8
Appenzell Innerrhoden	5 686	100%		0.5	0.5	1.3	1.4
St. Gallen	182 329	100%	4 460	4.7	5.1	30.8	33.6
Graubünden / Grigioni / Grischun	61 247	100%		5.3	5.8	14.1	15.3
Aargau	249 558	100%	7 000	12.1	13.1	47.8	52.1
Thurgau	101 381	100%	6 000	4.2	4.6	18.8	20.4
Ticino	101 791	100%		8.8	9.6	23.4	25.5
Vaud	265 017	100%		22.9	24.9	60.8	66.3
Valais / Wallis	114 735	100%		9.9	10.8	26.3	28.7
Neuchâtel	60 267	100%		5.2	5.7	13.8	15.1
Genève	120 416	100%	507	0.0	0.0	2.3	2.5
Jura	22 806	100%		2.0	2.1	5.2	5.7
TOTAL	**2 825 743**			**148**	**161**	**537**	**585**

Source and explanation: see Table 2.2