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Author(s):
Chatagny, Florian; Köthenbürger, Marko (iD); Stimmelmayr, Michael (iD)

ETH zürich

KOF Swiss Economic Institute

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Florian Chatagny, Marko Koethenbuerger and Michael Stimmelmayr

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Introducing an IP license Box in Switzerland: Quantifying the Effects[*]

Florian Chatagny[†]
ETH Zurich

Marko Koethenbuerger[‡]
ETH Zurich
and CESifo

Michael Stimmelmayr[§]
ETH Zurich
and CESifo

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Abstract

In response to mounting international pressure to reform the ring-fenced elements of its tax system, the Swiss government has put forward a comprehensive tax reform package. The proposal comprises the introduction of a license box, a substantial reduction in cantonal profit tax rates, and an allowance for excess corporate equity. We apply a computable general equilibrium model to quantify the economic effects of this reform. Our results reveal that the license box, combined with the reduction in the cantonal profit taxes, limits the outflow of the tax base of those companies that benefit from the current preferential tax treatment. The reduction in cantonal profit taxes and the fact that regularly taxed companies additionally benefit from the license box render the reform package costly, such that tax revenues might well decline after the reform.

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Keywords: Tax Competition, license Box, Mobile Firm Profits, Corporate Tax Reform, Dynamic General Equilibrium Model.

[†]KOF Swiss Economic Institute, ETH Zurich, Leonhardstr. 21, CH-8092 Zurich, Phone: +41 44 632 25 66, Email: Chatagny@kof.ethz.ch.

[‡]KOF, Department of Management, Technology and Economics, Leonhardstr. 21, CH-8092 Zurich, Phone: +41 44 632 54 46, Email: Koethenbuerger@kof.ethz.ch.

[§]Department of Management, Technology and Economics, Leonhardstr. 21, CH-8092 Zurich, Phone: +41 44 632 85 41, Email: Stimmelmayr@kof.ethz.ch.

1 Introduction

In many countries, governments are showing increasing concern about the tax avoidance practices of multinational firms. Recent tax avoidance cases, involving multinational firms such as Starbucks or Apple, have raised the public's awareness of how multinationals take advantage of their international structure to shift their profits towards low-tax jurisdictions and eventually minimise their tax bill. Profit shifting might occur through the strategic pricing of intermediate inputs, the use of internal debt financing, or the flow of royalty payments to low-tax jurisdictions (Hines and Rice, 1994; Huizinga and Laeven, 2008; and Dharmapala, 2014, for instance). In response to this profit shifting, governments have an incentive to offer more favourable tax treatment by lowering profit taxes and possibly to introduce preferential tax regimes by levying differentiated profit tax rates on more mobile and less mobile tax bases (Keen, 2001; Keen and Konrad, 2014). Straightforwardly, the strategic behaviour of multinational firms as well as governments leads to a redistribution of tax bases with internationally conflicting implications for tax revenues.

Against this background, it is not surprising that the taxation of multinational companies is currently one of the most salient issues in international tax policy. For instance, several initiatives, such as the OECD/G20 action plan on tax base erosion and profit shifting (BEPS, see OECD, 2013), have been established to identify and ban the most harmful international tax avoidance practices. The European Commission (EC) has also put the corporate tax practices of its member countries and those of non-member countries, such as Switzerland, under scrutiny. Among other things, the explicit discrimination between domestic and foreign profits in the Swiss tax code (so-called 'ring fencing') has been identified by the EC and the OECD as an unacceptable tax practice that must be abolished. In particular, the current ring-fenced system stipulates that Swiss cantons may offer preferential tax treatment to so-called special purpose companies (SPCs), holding companies and firms that generate most of their revenues outside Switzerland.[1]

While an explicit preferential taxation is deemed to be a harmful tax practice, countries try to indirectly grant favourable tax treatment to mobile tax bases. Many European countries have started to introduce tax allowances for revenues originating from intellectual property (IP), so-called license or patent boxes to attract mobile and profitable firms, while complying with the standard of avoiding harmful tax practices (Evers et al., 2015).[2] Multinational firms, in particular, benefit from such tax provisions by locating patents

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[1]Since the OECD report on harmful tax practices (OECD, 1998) member countries have been periodically reviewed to identify harmful tax practices. Preferential tax regimes due to different tax rates or tax base definitions for domestic and foreign-source income have been identified in several countries' tax codes.

[2]For instance, the Benelux countries, as well as the United Kingdom and France, have introduced license boxes, albeit using different tax base definitions and tax rates. Other countries, such as Germany and the U.S., are considering the introduction of a license box.

and, thereby, patent income in jurisdictions which offer a patent box.[3] A similar idea has been advocated in the reform for Switzerland. It suggests abolishing the existing ring-fencing practices, as requested by the EC, and, instead, introducing a license box system at the sub-national (cantonal) level. In addition, the reform entails that cantons should lower their tax rates on corporate profits by around 5 percentage points and introduce an allowance for excess corporate equity (AECE).[4]

In this paper, we quantify the economic and fiscal consequences when switching from a selective tax system that allows ring fencing to a more general system that grants a license box to firms. We apply a computable general equilibrium (CGE) model calibrated for the Swiss economy. The firm sector, consisting of different types of firms, is modelled in great detail and accounts for the most important behavioural responses of firms to taxation, including firms' investment, finance, employment, and profit shifting decisions. Besides the detailed insights into the revenue implications for the government, the model quantifies the reform-induced effects on households' consumption and welfare.

We apply the model first to evaluate the effect resulting from the elimination of the preferential tax status for SPCs (i.e. abandoning ring fencing) on the Swiss economy. Thereafter, we show how the different reform elements, in particular the introduction of a license box, alter the effects originating from the abolishment of the special tax regime for SPCs. Our simulations show that the elimination of the preferential tax status for SPCs has little effect on output, investment, or employment. However, in our simulations foreign firms that have benefited from the preferential tax treatment massively shift their profits away from Switzerland. For instance, assuming an elasticity of profit shifting of 1.1,[5] the tax base would shrink by more than 65 per cent, implying a shortfall of revenue collected from these firms of around 28 per cent. In nominal terms, this loss amounts to a value of about 1.4 bn Swiss francs. To balance the government's budget, the lump-sum transfers to households are adjusted, which in turn has a negative impact on private consumption. Therefore, the abolishment of the preferential tax treatment of SPCs also has an overall negative effect on households' welfare. Introducing an IP license box, which exempts 90 per cent of the licensing income from cantonal taxation, reduces the share of profits shifted abroad from 65 to roughly 40 per cent. In turn, the shortfalls in government revenue is reduced to 120 m Swiss francs in the short run and a 14 m Swiss francs surplus in the long run after the investments and output have adjusted to their new steady-state

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[3]See Karkinsky and Riedel (2012), Griffith et al. (2014) and Koethenbuerger et al. (2016) for empirical analyses in line with the notion that patent location is sensitive to taxation.

[4]The AECE is a variant of the Allowance for Corporate Equity (ACE) which offers a tax deductibility of the cost of equity and debt finance (Boadway and Bruce, 1984; Devereux and Freeman, 1991). See Auerbach et al. (2010) for a literature review. The AECE restricts the deductibility of the cost of equity finance to the amount of equity in excess of the core equity of a corporation. See Section 2 for a more detailed description of this reform element.

[5]Huizinga and Laeven (2008) find that an elasticity of 1.1 is an appropriate estimate for small open economies, such as Belgium and the Netherlands. We provide a more detailed discussion of elasticity values in Subsection 4.1.

values. The adjustment is sufficient to generate a slight increase in long-run household consumption and welfare. In case the introduction of the license box is combined with a reduction in the cantonal tax rate of 5 percentage points, the amount of profits shifted abroad is reduced even further to about 20 per cent of its initial value. The reduction in the cantonal tax rate, however, causes a major shortfall in revenues, amounting to 2.1 bn Swiss francs. Due to positive effects on output (+0.66 per cent), investment (+1.7 per cent) and employment (+0.2 per cent), the long-run revenue shortfall is reduced to 0.9 bn Swiss francs which ultimately has a positive effect on households' consumption and welfare in the long run. Since no precise empirical estimate of the elasticity of profit shifting is available for Switzerland, we conduct simulations for different values of this elasticity to assess the sensitivity of the results. For instance, for an elasticity value of 0.4, tax revenues collected from SPCs rise after the abolishment of the special tax regime, an effect that is reinforced by the introduction of the license box.[6] The consumption and welfare effects turn out to be positive after the phase in of these two reform elements. However, the reduction in cantonal tax rates lowers domestic welfare which reflects an inverse tax exporting effect. The tax relief is granted to foreign owners of SPCs while domestic tax payers have to finance the tax rate reduction. For an elasticity value of 1.1, the inverse tax exporting effect is also present, but is dominated by the higher tax base inflow and the induced positive effect on tax revenues and welfare.

Despite its focus on Switzerland, the analysis has relevance for other countries, both in terms of fiscal spillovers and general implications of the reform. First, the simulation results indicate that the proposed tax reform will not fully neutralise the increase in tax burden that is associated with the elimination of the preferential tax status for SPCs. The net rise in the tax burden is likely to lower the tax base that SPCs will deposit in Switzerland. As such, the reform generates positive fiscal externalities and hence positive welfare effects in other countries that host affiliates of the SPCs' network.

Second, non-preferential taxation of firm profits most likely generates gains in smaller countries (defined in terms of population) that engage in fiscal competition (Wilson, 1991; Bucovetsky and Haufler, 2007).[7] In these countries, the share of relatively immobile tax bases vis-à-vis mobile tax bases is small and so is the drop in tax revenues when lowering profit tax rates, given that the tax advantage must also be granted to relatively immobile tax bases.[8] Still, the findings reveal that the drop in taxes revenues is non-negligible

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[6]For this elasticity, the economy would start on the upward sloping part of the tax revenue hill. It 'overshoots' in the sense that it operates on the 'wrong' side of the Laffer curve after the elimination of the special tax status, but at a higher tax revenue level. The license box moves the economy even closer to the peak of the revenue hill.

[7]Wilson (1991) and Bucovetsky and Haufler (2007) consider models of tax competition without license boxes. License boxes tend to put smaller countries at an advantage vis-à-vis larger countries. This follows from the fact that multinational companies locate internationally mobile income based on tax differentials rather than size differences. An equal-yield inflow of tax base generates a larger per-capita revenue effect in smaller countries.

[8]SPCs account for 42 per cent of the overall corporate tax base and for 33 per cent of corporate tax

in relative terms.[9] Uniformly lowering taxes is quite costly, suggesting that the non-discriminatory tax provision of the OECD model tax convention that underlies the BEPS initiative puts a binding constraint on the ability to compete over taxes in smaller countries such as Switzerland, as well.

Third, despite the increasing popularity of the license box, the tax revenue changes associated with its implementation are ambiguous and may depend crucially on the pre-existing tax scheme. Most European countries have introduced a license box to discriminate between and compete for differently mobile types of firm profits (Evers et al., 2015). Compared to the starting situation these countries' fiscal experiences are mixed at best; a finding that might be related to the missing inflow of patent income necessary to fiscally neutralise the tax rate reductions that are granted to license income (Griffith et al., 2014). All these countries moved from a rather general definition of corporate tax bases to a more selective one when introducing a license box. This is, however, different in the Swiss case, where the introduction of a license box constitutes the transition from a selective and targeted corporate tax base with ring-fenced elements to a wider and less specific definition of the tax base. In the past, mobile income, including patent income has been located in Switzerland and the design of the license box is intended to offer a competitive tax treatment vis-à-vis other countries.[10] As such, compared to the initial situation Switzerland might well continue to significantly benefit from inflowing patent income that will receive a preferential tax treatment after the reform.[11]

Fourth, a general insight from models of tax competition is that competing governments find it profitable to shift the tax burden from source-based taxes that are levied on mobile resource to residence-based taxes that are levied on more immobile resources such as households (Zodrow and Mieszkowski, 1986; Bucovetsky and Wilson, 1991; Keen and Konrad, 2014). The Swiss tax reform appears to follow this rationale by considering higher dividend taxes and capital gains taxes to partially cover the fiscal costs of lower corporate taxes. In the context of the Swiss tax reform, dividend taxes indeed serve this goal. Differently, capital gains taxes introduce distortions that more than neutralise the real reform effects that are associated with lower corporate taxes. As such and contrary to the general insight that underlies many tax reform discussions, using residence-based capital taxes to engage in fiercer tax competition might be undesirable from a national

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revenues.

[9]At least in the short run, the overall budgetary effect of the reform turns out to be negative, even after increases in household capital taxes have been considered, c.f. Table 6.

[10]The projected effective tax on patent income is below 9 per cent which is comparable to the effective tax rate in other European patent box regimes (Evers et al., 2015) and to the preferential tax rate in the existing preferential tax regime.

[11]The reasoning applies to revenues that qualify for the license box. Overall, the tax base SPCs might locate in Switzerland will drop due to the reform whose effect on tax revenues, however, might well be fully neutralised by the higher corporate tax rate (rising from 10 per cent to 16 per cent) that is levied on the non-qualifying tax base of SPCs.

perspective.[12,13]

Finally, the introduction of an allowance for excess corporate equity (AECE) parallels attempts in other countries to balance the tax treatment of debt and equity finance. For instance, among the few countries that have introduced variants of an allowance for corporate equity (ACE) are Croatia (1994), Italy (1997), Austria (2000), and Belgium (2006). The ACE appears to have two Achilles' heels: First, revenue shortfalls due to the applicability of the ACE to historical and future equity injections might hinder governments from adopting such a scheme. Second, once implemented, the economic effects and possibly the political salience of tax rate changes (as opposed to changes in the definition of the corporate tax base) might contribute to the abolition of the ACE. In fact, some of the aforementioned countries abolished the ACE as part of a tax-cut-cum-base-broadening tax reform (Keen and King, 2002; Devereux and de Mooij, 2011).[14] The Swiss reform entails only an allowance provision for equity capital in excess of a firm's core equity which limits the revenue shortfalls associated with the reform. Furthermore, incentives to renege on this part of the tax reform might be less pronounced than in previous cases because highly mobile financial centres of multinational firms stand to benefit most from this provision (FDF, 2013). Eliminating it would erode the corporate tax base significantly, preserving incentives not to renege on this element of the tax reform (Kehoe, 1989).[15]

The remainder of the paper is organised as follows. Section 2 provides an overview of the different reform elements under discussion, Section 3 details the set-up of the CGE model, and Section 4 presents the simulation results. Lastly, Section 5 provides a concluding discussion.

2 The Swiss Corporate Tax Reform (CTR III)

Compared to most European countries, Switzerland levies a low level of corporate taxes. Corporations may face an effective tax burden as low as 13.3 per cent in the canton of Schaffhausen but 29.3 per cent in the canton of Geneva. On average, the effective tax burden for corporations amounts to 21 per cent (weighted by the cantonal shares in the tax base) or an unweighted 18 per cent. Further, the current Swiss tax law stipulates

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[12]This implication is related to the finding that, when firms use retained earnings to finance new investments, dividend taxes are neutral for investment choices while capital gains taxes are distortionary (Auerbach, 2002).

[13]A similar finding has been reported for the 2008 German tax reform; however, there a shift to residence-based capital taxation and away from sourced-based corporate taxes entailed tax revenue losses due to the foreign ownership of assets (Stimmelmayr, 2015).

[14]Since statutory tax rates govern the transfer pricing behaviour of multinational firms, governments might find it optimal to engage in such tax-cut-cum-base-broadening policies to attract mobile income (Haufler and Schjelderup, 2000). Issues of corporate agency contribute to the demand for tax-cut-cum-base-broadening policies (Koethenbuerger and Stimmelmayr, 2014).

[15]The reasoning builds on the insight that the mobility of tax bases limits the so-called capital levy problem when governments compete fiscally and helps sustain a tax system over the long haul.

preferential tax treatment for holding companies and firms that earn most of their income abroad. These so-called special purpose companies (SPCs) face an effective tax burden of only 9.92 per cent. The issue of ring fencing, namely, the differential tax treatment of domestic vis-à-vis foreign profits, has been identified as a harmful tax practice and the European Commission is pressuring Switzerland and countries with similar systems to abandon the ring fencing system. In response, Switzerland has put forward the third Swiss corporate tax reform (CTR III) to replace the discriminatory tax system and apply a uniform tax treatment to SPCs profits (Schweizerische Parlament, 2016).[16] The core elements of the tax reform are the introduction of a license box at the cantonal level, in combination with a reduction in the cantonal profit tax rates, and the introduction of an allowance for excess corporate equity (AECE), i.e. the deduction of a notional return on excess corporate equity holdings from the corporate tax base. To cover some of the expenses associated with the reform, adjustments in the existing imputation systems for dividend income are additionally stipulated in the reform package.

The Swiss tax reform proposal follows a general, European, and world-wide trend recently observed, namely towards the elimination of what the OECD and the EU deem to be harmful tax practices. This increasing concern limits the (member) countries' scope in differentiated taxation and thus forces countries to find other approaches of selective taxation in order to maintain their competitive edge. The notion of tax competition is thus no longer mirrored in the sheer size of (corporate) tax rates but is becoming more specific through customised tax relief for particular types of mobile income. Against this background, it is less surprising that several countries, such as Ireland, the United Kingdom, the BeNeLux countries as well as France, Italy, and China, have introduced licenses box systems to provide a low, competitive tax treatment for highly mobile income originating from intangible assets.[17] The widespread use of this tax instrument can be taken as a signal for the conformity of this instrument with the OECD and EU guideline against harmful tax practices.[18]

In the same vein, the AECE, in particular, provides tax benefits to MNEs' financial centres targeting highly mobile profits. Thus, the license box and the AECE in combination selectively grant tax privileges to activities that face significant tax privileges under the existing ring-fenced system and are highly tax-sensitive.

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[16]The corporate tax reform has been approved by the Swiss national parliament in June 2016 but a referendum is going to be held in February 2017.

[17]Nidwalden is so far the only Swiss canton to have introduced a license box at the cantonal level. Nidwalden's current tax law stipulates that only 20 per cent of the qualifying corporate income is subject to the cantonal tax rate, ensuring an effective tax burden below 10 per cent (inclusive of the federal profit tax) for income from intangible assets.

[18]Tax-motivated transfer pricing has received increasing research attention in recent years. A review of the empirical and theoretical literature is provided by Dharmapala (2014) and Schön and Konrad (2012), respectively. Griffith et al. (2014) evaluate the implications of the use of patent boxes in the BeNeLux countries, and the United Kingdom. Their findings suggest that patent boxes attract new intellectual property but reduce tax revenues from income derived from patents.

Introduction of a license Box

The introduction of the license box is seen as a promising substitute for the current tax privileges granted to SPCs at the cantonal level, as these companies provide management, financial, and licensing services to the conglomerate. Additional other business activity would deprive the SPC of its holding company status and therefore of its preferential tax treatment. A legal entity (both corporate and non-corporate) may qualify for the license box if it owns or is the beneficiary of intellectual property (IP), classified as a patent or an IP asset equivalent to a patent. Further, the Swiss license box stipulates that IPs only qualify for the preferential tax treatment if the underlying research and development expenditure has been incurred by the tax payer. The law thereby builds on the modified nexus approach that has been advocated by the OECD to fight tax base erosion and profit shifting.[19] However, the modified nexus approach still faces several hurdles before it can be implemented. First, historical research and development expenditure data for existing patents might not be readily available since this information was not systematically needed for tax purposes and therefore not collected. This problem has been acknowledged by the OECD but its recommendations on possible transition rules for existing IPs are pending (OECD, 2015). Second, the geographic scope of the modified nexus approach is generally limited to the country level, granting tax relief to domestically produced IP, a practice that violates the European Union's principles of non-discrimination and freedom of movement (Evers et al., 2015). In fact, none of the existing IP license boxes in the European Union currently follow the nexus approach. To address these ambiguities, we provide a sensitivity analysis with respect to the shares of SPCs' income that qualify for the Swiss IP box.

The comprehensiveness of the license box is defined so as to capture about one-third of the profits of SPCs.[20,21] IP profits that are eligible for the license box benefit from a maximum 90 per cent exemption from the cantonal profit tax. In line with cantonal tax autonomy, the applicable tax rate for the income qualifying is then decided at the cantonal level. At the federal level, the license box provides no preferential tax treatment.

Under the current tax legislation, the effective tax burden on corporate profits amounts to about 20.71 per cent ($= 0.1397 + 0.0783 * (1 - 0.1397)$) on average across cantons. This figure includes the average cantonal profit tax of 13.97 per cent, the effective federal profit tax of 7.83 per cent, and accounts for the fact that the cantonal tax is deductible from

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[19]The OECD guidelines stipulate that license boxes introduced prior to 2015 must comply with the modified nexus approach by 2021. License boxes introduced after 2015 need to comply with the approach right away.

[20]The initial report of the steering committee (FDF, 2013) considered two different types of license boxes: a narrow and a broad one. The former (latter) covers about one-third (two-thirds) of an SPC's profit. The tax reform as approved by the Swiss national parliament applies the narrow-type license box.

[21]The Swiss ministry of finance conducted a survey to arrive at the estimated share of one third of qualifying profits of SPCs (FDF, 2013). As this measure might be (downward) biased for several reasons, we conduct a sensitivity analysis (see Table 8) assuming that a larger fraction of profits of SPCs and regularly taxed companies qualify for the license box.

the federal tax base. Abandoning the preferential tax treatment of SPCs increases their effective tax burden from currently 9.92 per cent to the regular rate of 20.71 per cent. However, the introduction of the license box would limit the rise in the effective tax burden for SPCs to 16.84 per cent if the cantonal tax exemption applies to the maximum of 90 per cent of license income.[22] The substantial tax increase for SPCs vis-à-vis the current system (16.84 vs. 9.92 per cent) is based on the fact that only about one-third of SPCs' profit will generally qualify for the license box, while under the current system all SPCs' profits benefit from the preferential tax treatment at the cantonal level.

It is important to note that, given the non-discriminatory nature of the reformed tax system, not only SPCs will benefit from the introduction of the license box. Following the assumptions made by the steering committee and the final reform proposal (FDF and FTA, 2014; FTA, 2015), on average 5 per cent of the profits of regularly taxed companies will become eligible for the license box as well. As a consequence, regularly taxed companies face slight windfall gains as their effective tax burden drops from initially 20.71 per cent to approximately 20.13 per cent.[23]

Reduction in the Cantonal Profit Tax Rate

The proposed reduction in the effective corporate tax burden from 20.71 per cent to about 16.0 per cent (both inclusive of the federal profit tax) limits the increase in the tax burden for SPCs after the elimination of their special tax status. Keeping the level of the federal profit tax rate fixed (effectively 7.83 per cent), the policy change implies that the effective average cantonal tax rate has to decline by roughly 5 percentage points, from 13.97 per cent to 8.86 per cent, to ensure an effective tax burden of 16.0 per cent.

The introduction of the license box and the reduction in the cantonal profit tax rate jointly imply a decline in the effective tax burden for SPCs from 20.71 per cent (after the elimination of their special tax status) to about 13.55 per cent which is only moderately higher than in the current situation with an effective tax burden of 9.92 per cent.[24] The main beneficiaries of the reduction in the cantonal profit tax rate are not SPCs but companies currently subject to the regular tax treatment. For these firms, the effective

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[22]The effective tax burden of 16.84 per cent ($= 0.0978 + 0.0783 * (1 - 0.0978)$) for SPCs under the license box regime is composed of an average cantonal profit tax rate of 9.78 per cent ($= 1/3 * 0.1 * 0.1397 + 2/3 * 0.1397$), the federal profit tax of effectively 7.83 per cent and accounts for the deductibility of the cantonal tax from the federal tax base. The qualifying portion of income is subject to an effective tax burden of 1.4 per cent ($= 0.1 * 0.1397$) at the cantonal level or 9.12 per cent ($= 0.1 * 0.1397 + 0.0783 * [1 - (0.1 * 0.1397)]$) when accounting for the federal tax burden in addition.

[23]The effective tax burden of 20.13 per cent ($= 0.1343 + 0.0783 * (1 - 0.1343)$) of regularly taxed companies is composed of an average cantonal profit tax rate of 13.43 per cent ($= 0.05 * 0.1 * 0.1397 + 0.95 * 0.1397$), the federal profit tax of effectively 7.83 per cent, and accounts for the deductibility of the cantonal tax from the federal tax base.

[24]The effective tax burden for SPCs of 13.55 per cent ($= 0.0620 + 0.0783 * (1 - 0.062)$), after the introduction of the license box and the reduction in the cantonal tax rate, is based on an effective cantonal tax rate of 6.20 per cent ($= 1/3 * 0.1 * 0.0886 + 2/3 * 0.0886$).

tax burden drops from 20.71 per cent to 15.63 per cent after the introduction of the license box and the reduction in the cantonal profit tax rate.[25]

Table 1: Reform-Induced Changes in the Corporate Tax System

	Status Quo (1)	Elim. STS (2)	License Box[a] (3)	Tax Reduc.[a] (4)	LB & TR (3+4)	AECE[b] (5)	CTR III (3+4+5)
Special Purpose Companies (SPCs)							
Cantonal Level	2.27	13.97	9.78	8.86	6.20	2.13	5.82
Federal Level	7.83	7.83	7.83	7.83	7.83	7.39	7.39
Eff. Tax Burden	9.92	20.71	16.84	16.0	13.55	9.33	12.77
Regularly Taxed Companies (RTCs)							
Cantonal Level	13.97	13.97	13.34	8.86	8.46	13.59	8.23
Federal Level	7.83	7.83	7.83	7.83	7.83	7.62	7.62
Eff. Tax Burden	20.71	20.71	20.13	16.0	15.63	20.17	15.22

[a],[b] Change in the tax burden [a] relative to (2), i.e., the elimination of the special tax status for SPCs, [b] relative to (1), i.e., the status quo.

Source: Own calculations.

Table 1 summarises the changes in the effective profit tax burden of SPCs and regularly taxed companies (RTCs) under the different reform elements. The column 'Status Quo' depicts the effective profit tax burden at the cantonal and federal levels under the current tax system.[26] The neighbouring column (Elim. STS) reports the effects of eliminating the special tax status for SPCs. The next two columns (License Box and Tax Reduc.) report the effects of the changes in the effective profit tax burden following the introduction of the license box and the reduction in the cantonal tax rates. The joint effect arising from the two measures is shown in the neighbouring column (LB&TR).

Tax Allowance for Excess Corporate Equity (AECE)

The third reform element is the tax deductibility of a notional return on 'excess' or 'security' equity capital that is necessary for the viability of firms' long-run business activities. The reform element is similar in nature to the well-known concept of the allowance for corporate equity (ACE), first elaborated by the IFS Capital Taxes Group

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[25]The effective tax burden for regularly taxed companies of 15.63 per cent ($= 0.0846 + 0.0783 * (1 - 0.0846)$), after the introduction of the license box and the reduction in the cantonal tax rate, is computed using an effective cantonal tax rate of 8.46 per cent ($= 0.05 * 0.1 * 0.0886 + 0.95 * 0.0886$).

[26]The stated tax burden at the cantonal level accounts for the deductibility of federal and cantonal taxes, whereas the stated tax burden at the federal level accounts only for the deductibility of the federal tax. The additional deductibility of the cantonal tax from the federal tax base is accounted for in the effective tax burden measure.

(see Institute for Fiscal Studies, 1991) and subsequently discussed and tried by different countries.[27] While the ACE grants tax deductibility to a notional return on total corporate equity, the Swiss reform proposal entails several corrections to the amount and type of corporate equity eligible for the tax deduction.[28]

The main motivation for implementing the AECE instead of the ACE system is to limit the loss in tax revenues associated with narrowing the tax base. The expected cost of the pure ACE system is estimated to exceed 2 bn Swiss francs, while the cost of the AECE system is estimated to be around 610 m Swiss francs. Despite the fiscal incentives, the AECE system additionally allows for the differentiation between various types of equity capital and thus the selective granting of tax benefits. This makes the AECE system particularly attractive for financial or treasury centres of multinational firms, the so-called Swiss finance branches. By legal requirement, these financial centres are only endowed with equity capital and, in addition, face only a low core equity capital requirement. The latter is justified by the fact that accounts receivable and accounts payable net out in intra-group financing. With internal debt payments, the financial risk to a multinational firm is also 'internal' to the firm, which implies a low demand for core equity capital to cushion any risk associated with lending. Thus, the AECE turns out to be a suitable substitute for the current tax benefit granted to the Swiss finance branches of multinational companies, which currently enjoy the same special tax status as SPCs.

Contrary to SPCs, RTCs face higher core capital requirements to ensure the financial viability of firms' long-run business activities. Therefore, the tax benefit arising from the AECE will be more pronounced for SPCs than RTCs. For ease of comparability of the different reform elements, we re-compute the estimated tax relief emerging from the AECE according to the respective reductions in the cantonal and the federal tax rates and the resulting change in the effective tax burden. Since the AECE reduces taxable profits, it affects the effective tax burden at the cantonal and federal level. For the group of SPCs, the reduction in the cantonal and the federal tax rates amounts to roughly 6 per cent and the one for the RTCs to about 2.7 per cent.[29]

Following the tax benefit granted to the Swiss finance branches of MNEs, the AECE reduces the tax burden for SPCs by 0.6 percentage points on average vis-a-vis the status quo and by 0.8 percentage points vis-a-vis the situation where the license box is introduced

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[27]The ACE tax system is desirable in terms of efficiency since it ensures investment and finance neutrality. See Auerbach et al. (2010) for a review of the literature and Devereux and DeMooij (2011) for simulation results for European countries.

[28]Different types of equity capital that are not eligible for the tax deduction include, among others, equity stakes in other companies because the income received from these stakes is also not taxed at the level of the holding company. Further, equity in the form of foreign-held property or equity that is dispensable for the business activity are also not eligible for tax deductibility.

[29]The computation of the tax relief associated with the AECE is based on the estimated revenue loss of 610 m Swiss francs (FDF and FTA, 2014). Further, the AECE is only designed to secure the current tax base of the Swiss finance branch and, hence, the tax benefit for RTCs emerging under the AECE is determined residually.

and the cantonal tax rates are reduced.[30] For RTCs, the estimated tax relief from the introduction of the AECE system translates into a reduction in the effective tax burden of around 0.54 percentage points vis-à-vis the status quo and by about 0.41 percentage points vis-à-vis the implementation of the license box and the reduction in cantonal tax rates (see Table 1).

The last column in Table 1 shows the effective tax burden for SPCs and RTCs arising under the complete tax reform proposal. After the elimination of the special tax status of SPCs, the introduction of the license box, the reduction in the cantonal tax rate, and the implementation of the AECE system, the tax burden for SPCs increases only slightly by 2.85 percentage points from the initial 9.92 to 12.77 per cent. With regard to RTCs, the reform proposal leads to a substantial reduction in their tax burden from 20.71 per cent initially to 15.22 per cent.

Alterations to the Imputation System for Dividend Income

To limit the financial costs of the tax reform, the reform package also includes an alteration of the existing imputation system for dividend income. The current system grants an exemption of 40 (50) per cent of dividend income from the federal tax if a private (corporate) investor holds a stake of at least 10 per cent in the company. At the cantonal level, this exemption is subject to cantonal autonomy and currently ranges from 30 per cent in the canton of Vaud to 80 per cent in the canton of Glarus. Across cantons, about 50 per cent of dividend income is tax exempt for equity stakes of at least 10 per cent. The tax reform stipulates a partial harmonization of the imputation rate across cantons, requiring that at least 60 percent of the dividend income is taxed at the cantonal level. On average, the change implies an increase in the personal tax burden on dividend income from 19.4 per cent to about 22.0 per cent.[31]

The alteration in the imputation system has no direct impact on the effective tax rate of SPCs or RTCs. Nevertheless, the taxation of capital income (dividends) constitutes double taxation of corporate profits and thus potentially distorts the investment decision of firms, depending on the way investments are financed (see Auerbach, 2002).[32] The

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[30] The tax relief associated with the AECE is proportional to the tax rate. Therefore, the tax benefit of the AECE increases for SPCs because these firms face an increase in their tax burden after the introduction of the license box and the reduction in cantonal tax rates. For RTCs, the reverse is true.

[31] The calculation is based on income facing a top tax rate of 36.6 per cent (11.0 and 25.6 per cent at the federal and the cantonal level, respectively), yielding an effective tax burden of 19.4 per cent ($= 0.6 * 11.0 + 0.5 * 25.6$) under the current imputation system and an effective tax burden of 21.96 per cent ($= 0.6 * (25.6 + 11.0)$) after the reform.

[32] The discussion on the effects of dividend taxes centres around the New and Old View of dividend taxation. The two views differ in the way marginal investments are financed. Under the Old View, assuming new share issues are the marginal source of investment funds, dividend taxes increase the cost of capital and distort corporate investment, while capital gains taxes are neutral. Differently, if retained earnings are the marginal source of funds (New View), dividend taxes are neutral for investment behaviour, while capital gains taxes are distortive (Auerbach, 2002).

reform proposal thereby creates tax distortions for investments that are financed by new share issues.[33] Given that the taxation of private capital income (dividends) affects the tax burden at the personal, but not the corporate level, this reform measure is not reflected in Table 1.

In addition to the alteration in the imputation system for dividend income, an earlier version of the reform proposal (FDF and FTA 2014) stipulated the taxation of private capital gains with an imputation rate of 30 per cent at the combined federal and cantonal level. This tax measure would have increased the effective personal tax burden on capital income from 4.9 to 17.2 per cent for corporate equity and from about 9.7 to 12.8 per cent for unincorporated equity.[34] For completeness and policy interest, we also conduct a simulation for the introduction of taxation of private capital gains (see Table 9).[35]

3   The CGE Model Applied

We apply a computable general equilibrium (CGE) model to quantify the dynamic effects and economy-wide repercussions of the third Swiss corporate tax reform (CTR III). The model resembles an empirically implemented neoclassical growth model and consists of four building blocks: the firm sector, the household sector, the government and the foreign economy (i.e. the rest of the world). Due to the two-country set-up, the model enables us to analyse the impact of corporate taxation along various international dimensions, such as cross border goods, capital flows, and the international tax avoidance behaviour of firms and households.

To comprehensively evaluate the different proposed changes in the corporate tax system, we resort to a model that accounts for a variety of corporate decision margins. The firm sector accounts for firms with different legal forms, including incorporated and

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[33]Interestingly, this reform element counteracts one of the major aims of the previous (second) Swiss corporate tax reform (CTR II) to lower the dividend tax-induced distortions. For an analysis of the second Swiss corporate tax reform (CTR II), see Dietz and Keuschnigg (2003).

[34]Even though corporate capital gains are largely tax exempt under the current system, Keuschnigg (2006) suggests that about 20 per cent of corporate capital gains are nevertheless subject to taxation due to the various exemptions from the non-taxability of capital gains. Further, capital gains are taxed upon realization and not on an accrual basis, which results in a significant tax benefit during the holding period of capital gains. In the case of an average holding period of 10 years for corporate equity, the effective tax burden on corporate capital gains is reduced to about 0.67 per cent of the statutory tax rate (see Keuschnigg, 2006; OECD, 1991), giving rise to an effective tax burden of 4.9 per cent ($= 0.2*0.67*36.6$) on corporate capital gains at the personal level under the current system and 17.2 per cent ($= 0.7*0.67*36.6$) under the proposed system. However, while unincorporated capital gains are generally subject to taxation, they, similar to dividend income, benefit from an imputation rate of 40 per cent at the federal level and around 50 per cent at the cantonal level. Assuming a top marginal income tax rate of 11.0 and 25.6 per cent at the federal and cantonal levels and accounting for the tax benefit of around 0.5 arising from an assumed holding period of 20 years for unincorporated equity, the effective tax burden on unincorporated capital gains amounts to roughly 9.7 per cent ($= 0.5*(0.6*11.0+0.5*25.6)$) under the current system and 12.8 per cent ($= 0.5*0.7*36.6$) under the proposed system.

[35]See Chatagny et al. (2015) for a more detailed analysis of this reform element.

unincorporated firms, which differ with regard to their inherent characteristics, such as capital intensity, debt equity ratio, or the applicable tax treatment. In its basic set-up, the firm sector represents a neoclassical investment model, in which firms maximise profits by choosing their investment, method of finance, and labour input. Firms' financial behaviour is endogenous with regard to the choice between equity and debt, while the amount of new share issues is kept constant throughout all simulations. Furthermore, the mobile profits of foreign firms that, due to the tax differential between home and abroad, are shifted into Switzerland constitute the main source of SPCs' income. The amount of mobile foreign profits shifted into Switzerland is endogenous and depends on the tax differential between the two countries and the elasticity of profit shifting. The theoretical analysis identifying the effects of the reform on firm behaviour is found in Subsections 3.1 and 3.2.

The household sector consists of a representative agent deciding her optimal labour supply and consumption in the presence of a progressive wage tax schedule and a value-added tax (VAT). The agent's optimal consumption choice implicitly determines household savings and, thus, the optimal size of the portfolio investments. The embedded endogenous portfolio choice framework allows the household to invest savings in different types of imperfectly substitutable assets, comprising firm equity, firm bonds, and domestic or foreign government debt. The latter feature enables us to capture the tax-induced distortions in international capital flows and international capital interdependencies due to the re-optimisation of portfolio choices by domestic (and foreign) households.

The government levies taxes on firms and households and can incur debt. Domestically, the government's income is spent on public consumption and the budget balances via lump-sum transfers to households. The different tax rates considered include profit taxes at the federal, cantonal, and municipal level, represented in the effective profit tax burden, a tax on capital income, a progressive wage tax schedule, and a value-added tax. The debt-to-GDP ratio is maintained at its long-run average. In general equilibrium, the present value of all future tax income amounts government spending plus government debt to ensure that the inter-temporal budget constraint holds and rule out Ponzi games.

The foreign country is identical in structure to the domestic economy, but it is modelled in less detail. It also consists of a representative firm, a household sector, and a government. To exploit the difference in corporate taxation across countries, part of the foreign firm profits are shifted to the domestic economy. In line with the existing literature, the amount of profits shifted internationally depends on the size of the tax differential between the two countries and concealment costs.

Each sector is calibrated to capture the characteristics of the Swiss economy in detail. We relegate the explanation of the most important behavioural parameters and the calibration of the model to Appendices A.1 and A.2.

Given the importance of the firm sector, we will review the formal modelling of corpo-

rate firms and SPCs in the following two subsections. Comprehensive documentation of the other main building blocks of the CGE model, such as unincorporated firms, households, and the government sector, can be found in Radulescu and Stimmelmayr (2010) or Stimmelmayr (2007).

3.1 Corporate Firm Behaviour

In our set-up, corporate firms produce a homogeneous good. The constant returns to scale production technology $Y = F(K, \overline{L}, E)$ utilises capital, K, a labour composite consisting of different skill types, $\overline{L}$, and a fixed factor, E.[36] It satisfies $F(0) = 0$ and $F' > 0 > F''$.

The choice of investment finance is endogenous and includes retained earnings, $(\pi - \chi)$, and external bank debt, BN.[37] The flow of funds equation takes the form

$$I_t = (\pi_t - \chi_t) + BN_t. \tag{1}$$

Retained earnings are defined by profits, π, less dividend distributions, χ. External debt incurs interest costs, i, and convex agency cost, $m(b)$, which depend on the debt-to-asset ratio, $b = B/K$. The agency cost increases in b at an increasing rate, such that $m'(b) > 0$ and $m''(b) > 0$.[38] Firms behave competitively and maximise after-tax corporate profits:

$$\pi_t = (1 - \tau^P) \left[Y(K_t, \overline{L}_t, E_t) - J(I_t, K_t) - w_t^c \overline{L}_t - (i_t + m(b_t))B_t - i^E z(K_t - B_t) \right], \tag{2}$$

where τ^P denotes the corporate profit tax rate, $J(I, K)$ represents adjustment cost of investment, $w^c \overline{L}$ is wage costs, and $(i + m(b)) B$ is the cost of debt finance. In addition to the tax deductibility of each of the three cost types, an imputed return on equity capital, $i^E(K - B)$, is tax deductible at rate $z \in [0, 1]$, where i^E is the imputed return on equity.[39] Denoting $G = 1 + g$ as the growth factor related to labour productivity, financial arbitrage then ensures

$$r_t V_t = (1 - \tau^D)\chi_t + (1 - \tau^G) \left[GV_{t+1} - V_t \right]. \tag{3}$$

A capital market investment that generates a net-of-tax return of $r = (1 - \tau^I)i$ is therefore as profitable as an intra-firm investment that yields net-of-tax dividends of $(1 - \tau^D)\chi$ and net-of-tax capital gains of $(1 - \tau^G) \left[GV_{t+1} - V_t \right]$. τ^I, τ^D, and τ^G denote the tax rates on

---

[36] The fixed factor determines the importance of the sector-specific economic rent that can be realised in that sector.

[37] New share issues are considered an additional source of funds in the model. Their fraction, however, is constant throughout the simulations.

[38] The convex agency cost function implies that banks charge an additional fee of $m(b)$, which is dependent on the firm's debt-to-asset ratio, to insure against the higher default risk of more indebted firms.

[39] Plainly, in a corporate tax system where the deductibility provision only applies to excess equity and CE denotes the amount of core equity, the tax subsidy is $zi^E(K - B - CE)$, provided that $K - B - CE > 0$.

interest income, dividend income, and capital gains.[40]

Starting from (3) and accounting for (1), the firm's maximization problem states

$$V_t^e(K_t, B_t) = \max_{\overline{L}_t, I_t, BN_t} \left[\tfrac{1-\tau^D}{1-\tau^G} (\pi_t + BN_t - I_t) + \tfrac{GV^e(K_{t+1}, B_{t+1})}{1 + \frac{r_{t+1}}{1-\tau^G}} \right]$$

$$\text{s.t.} \quad GK_{t+1} = I_t + (1-\delta)K_t,$$

$$\text{and} \quad GB_{t+1} = BN_t + B_t. \tag{4}$$

The maximand is expressed in terms of end-of-period firm values, $V_t^e = \left(1 + \frac{r_t}{1-\tau^G}\right) V_t$, as indicated by the superscript e. The constraints reflect the equation of motion of the stock variables capital and debt. Capital accumulates by means of investment, I, less capital depreciation, δK. The next period's stock of debt is obtained by adding the amount of newly incurred debt, BN, to the existing stock of debt, B.

The first-order conditions of the firm's optimization problem are

(a) $\quad \overline{L}_t : \quad w_t^c = F_{\overline{L}_t},$

(b) $\quad I_t : \quad q_{t+1}^e = \left(1 + \frac{r_{t+1}}{1-\tau^G}\right) \frac{1-\tau^D}{1-\tau^G} \left[1 + (1-\tau^P)J_I\right],$

$\quad \Rightarrow \quad q_{t+1} = \frac{1-\tau^D}{1-\tau^G} \left[1 + (1-\tau^P)J_I\right] \quad \text{with:} \quad q_{t+1} = q_{t+1}^e / \left(1 + \frac{r_{t+1}}{1-\tau^G}\right), \tag{5}$

(c) $\quad BN_t : \quad \lambda_{t+1}^e = - \left(1 + \frac{r_{t+1}}{1-\tau^G}\right) \frac{1-\tau^D}{1-\tau^G},$

$\quad \Rightarrow \quad \lambda_{t+1} = -\frac{1-\tau^D}{1-\tau^G} \quad \text{with:} \quad \lambda_{t+1} = \lambda_{t+1}^e / \left(1 + \frac{r_{t+1}}{1-\tau^G}\right).$

The shadow price of capital, $q_t^e \equiv \partial V_t^e / \partial K_t$, and debt, $\lambda_t^e \equiv \partial V_t^e / \partial B_t$, determine the change in the value function. It is positive for capital but negative for corporate debt.[41] The optimal labour demand, (5a), is determined by the equality between the marginal product of the labour composite and its corresponding cost, w^c. Optimality condition (5b) states that the shadow price of capital equals the marginal cost of investment consisting of the tax cost, $\frac{1-\tau^D}{1-\tau^G}$, and the adjustment cost, $\frac{(1-\tau^D)(1-\tau^P)}{1-\tau^G} J_I$. Optimality condition (5c) implies that external debt is the preferred source of finance as long as the marginal cost of debt, $\frac{1-\tau^D}{1-\tau^G}$, is smaller than the loss of firm value, λ_{t+1}^e, that follows from the obligation that each unit of debt has to be repaid in the future inclusive of interest.

---

[40]Solving (3) forward, yields an explicit expression for the firm value that is determined by the discounted sum of all future tax adjusted distributions to firm owners,

$$V_t = \sum_{k=t}^{\infty} \frac{\frac{1-\tau^D}{1-\tau^G} (\pi_k + BN_k - I_k)}{1 + \frac{r_k}{1-\tau^G}} \prod_{u=t}^{k+1} \frac{1+g}{1 + \frac{r_u}{1-\tau^{G,f}}}.$$

[41]The shadow price of capital is positive, indicating that any additional unit of capital increases the value of the firm. Conversely, the shadow price of debt is defined as a negative variable, since each unit of debt incurred has to be repaid, inclusive of interest, in the future.

The envelope conditions associated with the maximand in (4) state

$$
\text{(a)} \quad q_t^e = \frac{(1-\tau^D)(1-\tau^P)}{1-\tau^G}\left[F_K - J_K + m'b^2\right] - \left(\frac{\tau^P(1-\tau^D)}{1-\tau^G}\right)\delta + \frac{q_{t+1}^e}{1+\frac{r_{t+1}}{1-\tau^G}}(1-\delta),
$$

$$
\text{(b)} \quad \lambda_t^e = \frac{(1-\tau^D)(1-\tau^P)}{1-\tau^G}\left[-(i+m) - m'b\right] + \frac{\lambda_{t+1}^e}{1+\frac{r_{t+1}}{1-\tau^G}}.
$$

(6)

Combining (6a) and (6b) while accounting for (5b) and (5c) yields an expression of the firm's cost of capital, weighted by the debt-to-asset ratio b:

$$
F_K - \delta = \frac{1}{1-\tau^P}\left[\frac{r_t}{1-\tau^G} - z\tau^P i^E\right](1-b) + (i_t + m)b. \tag{7}
$$

Differentiating (7) with regard to τ^P yields

$$
\frac{\partial(F_K - \delta)}{\partial \tau^P} = \frac{1}{(1-\tau^P)^2}\left[\frac{r_t}{1-\tau^G} - i^E z\right](1-b)\left\{\begin{matrix}>\\=\end{matrix}\right\}0 \quad \text{if} \quad i^E z\left\{\begin{matrix}<\\=\end{matrix}\right\}\frac{r_t}{1-\tau^G}. \tag{8}
$$

A reduction in the profit tax rate reduces the firms' cost of capital and hence stimulates corporate investment, provided that the tax deductibility of the cost of equity is sufficiently small, $i^E z < r_t/1-\tau^G$. Otherwise, the deductibility provision exactly neutralises the effect of the profit tax on investment and the level of investment is undistorted by the profit tax.

An increase in either the deductibility rate, z, which determines the amount of corporate equity eligible for the tax deduction, or the imputation rate, i^E, reduces the firm's cost of capital. This increases corporate investment:

$$
\frac{\partial(F_K - \delta)}{\partial z} = -\frac{\tau^P i^E}{(1-\tau^P)}(1-b) < 0. \tag{9}
$$

Thus, in a corporate tax system where only excess corporate equity qualifies for a tax subsidy, a higher deductibility rate, z, increases investment, provided that the firm's equity exceeds the core equity and the excess equity rises when the firm finances investment through retained earnings.[42] Finally, a rise in the capital gains tax rate increases the firm's cost of capital and thus produces a negative effect on investment:

$$
\frac{\partial(F_K - \delta)}{\partial \tau^G} = \frac{r_t}{(1-\tau^G)^2}(1-b) > 0. \tag{10}
$$

---

[42]Otherwise, retaining profits for investment increases core equity capital and the deductibility rate, z, will not influence investment and $\partial(F_K - \delta)/\partial z = 0$.

3.2 Special Purpose Companies (SPCs)

Following the legal requirements, SPCs are allowed to have neither substantial employ-
ment nor economic activity within Switzerland. Therefore, we model SPCs as 'pure' profit
centres of foreign firms, which shift an amount S of foreign profits into Switzerland to
benefit from the preferential tax regime. Using superscript F for the foreign firm and
starting from the foreign firm's maximand

$$
\begin{aligned}
V_t^{e,F}(K_t^F) \quad = \quad & \max_{L_t^F, I_t^F, S_t^F} \quad (1 - \tau^{P,F}) \left[Y(K_t^F, L_t^F, E_t^F) - J^F(I_t^F, K_t^F) - w_t^F L_t^F \right] - I_t^F \\
& \qquad\qquad + (\tau^{P,F} - \tau^{P*}) S_t^F - \phi(S_t^F) + \frac{GV^{e,F}(K_{t+1}^F)}{1 + r_{t+1}^F} \\
& \text{s.t.} \qquad GK_{t+1}^F = I_t^F + (1 - \delta) K_t^F,
\end{aligned}
\tag{11}
$$

the optimal amount of foreign profits, S, shifted into Switzerland follows from the foreign
firm's first-order condition

$$
\frac{\partial V_t^{e,F}}{\partial S_t^F} : \qquad \left(\tau_t^{P,F} - \tau_t^{P*} \right) = \phi'(S_t^F).
\tag{12}
$$

Condition (12) implies that the optimal amount of foreign profits shifted abroad is deter-
mined by equating the profit tax differential, $\tau^{P,F} - \tau^{P*}$, to the marginal concealment cost,
$\phi'(S^F)$. τ^{P*} denotes the SPC's statutory profit tax rate, while τ^P and $\tau^{P,F}$ are the regu-
lar statutory profit tax rates at home (Switzerland) and abroad, respectively. Applying a
constant-elasticity functional form to the concealment cost

$$
\phi(S_t^F) = \frac{\gamma_s^{-\frac{1}{\epsilon_s}}}{\frac{\epsilon_s+1}{\epsilon_s}} \left(S_t^F \right)^{\frac{\epsilon_s+1}{\epsilon_s}}, \qquad \epsilon_s, \gamma_s > 0,
\tag{13}
$$

the optimal amount of foreign profits shifted into Switzerland is

$$
S_t^F = \gamma_s \left(\tau_t^{P,F} - \tau_t^{P*} \right)^{\epsilon_s}.
\tag{14}
$$

Profit shifting depends on the statutory profit tax rate differential, $\tau_t^{P,F} - \tau_t^{P*}$ (see Haufler
and Schjelderup, 2000; Mintz and Smart, 2003; Hong and Smart, 2010). Further, profit-
shifting incentives increase in the elasticity of profit shifting with regard to the tax rate
differential, ϵ_s, and the multiplier γ_s.

It becomes evident from (14) that the elimination of the special tax status for SPCs
reduces the tax differential between the foreign country and the home country and thus
the amount of foreign profits shifted into Switzerland. Using the model's notation, the
preferential tax rate, τ_t^{P*}, is equal to the ordinary profit tax rate, τ_t^P, after the elimination
of the special tax status. In contrast, the reduction of the cantonal profit tax directly
reduces the statutory tax rate, τ_t^P, and widens the tax differential, $\tau_t^{P,F} - \tau_t^P$. We will

now turn to the simulation results to quantify the magnitude of the responses that are associated with this and the other reform elements.

4   Simulation Results

To gain a better understanding of the implications of the different reform elements, we quantify the effects of the different elements of the CTR III sequentially. We start out with the elimination of the preferential tax treatment for SPCs. In the next step, we additionally consider the license box, the reduction in the cantonal profit tax, and the allowance for excess corporate equity (AECE). In a last step, we turn to the personal capital income tax system and consider the proposed changes in the imputation system for taxing dividend income followed by the initially planned adjustment in capital gains taxation.

4.1   Elimination of the Special Tax Status for SPCs

Under the current tax legislation, SPCs enjoy a major tax exemption from the cantonal profit tax, which grants these firms an effective tax burden of 9.92 per cent, inclusive of the federal profit tax of effectively 7.83 per cent. If the special tax treatment for these companies is eliminated, the effective tax burden of these firms rises from 9.92 per cent to 20.71 per cent, provided that no compensating measures are introduced. Due to the particular prerequisite of SPCs to conduct their main business activity outside Switzerland, the income earned by these firms originates predominantly from foreign sources. The elimination of the preferential tax treatment of SPCs diminishes the tax differential between the foreign country and Switzerland, which is relevant to firms' profit-shifting incentives (see Haufler and Schjelderup 2000, or Mintz and Smart 2003, for instance). As a consequence, SPCs' taxable income declines and the exact magnitude of the decline depends on the elasticity of profit shifting. We analyse the effects resulting from the CTR III for different values of this elasticity. We apply a lower bound elasticity of 0.4, which corresponds to a semi-elasticity of about 1.07. A similar value is, for instance, reported for Austria (Huizinga and Laeven, 2008). At the upper bound, we apply an elasticity of 1.5, which is slightly larger than the respective elasticity of 1.13 (semi-elasticity of 2.75) for Belgium or of 1.05 (semi-elasticity of 2.92) for The Netherlands in Huizinga and Laeven.[43] Even though more recent empirical evidence points to even lower values for the profit shifting elasticity (see for instance, Dharmapala 2014), there might be good reasons

---

[43]Given the reported elasticity for Austria, foreign profits subject to Austrian taxes decrease by 10.7 per cent if the corporate tax rate in Austria is increased by 10 percentage points. Similarly, foreign profits subject to taxation in Belgium and the Netherlands decline by 27.5 and 29.2 per cent, respectively, if the corporate tax rates are increased by 10 percentage points in these countries.

for using higher elasticity values in the simulations as well. These more recently reported elasticity values apply to income shifting behaviour averaged over different MNEs, each of which might more or less aggressively engage in income shifting. Due to sorting, SPCs might well be MNEs with a higher propensity to shift income for tax reasons and thereby closer to the upper portion of the empirical distribution of income shifting elasticities.[44] To address this parameter uncertainty, we implement different values of the profit shifting elasticity without prioritizing one over the other.

Table 2: Elimination of the Special Tax Status for SPCs

All Changes in %	$\epsilon_S = 0.4$	$\epsilon_S = 0.7$	$\epsilon_S = 1.1$	$\epsilon_S = 1.5$
GDP	0.002	0.002	0.001	0.001
Investment	0.005	0.004	0.004	0.003
Labour Demand	0.000	0.000	0.000	0.000
HH-Consumption (Short Run)	0.633	0.091	-0.426	-0.777
HH-Consumption (Long Run)	0.649	0.106	-0.412	-0.765
Tax Base SPCs	-32.01	-49.09	-65.38	-76.46
Tax Revenues SPCs	41.95	6.29	-27.72	-50.86
Tax Revenues SPCs^a	2.118	0.318	-1.400	-2.567
Short-Run Budget Effect^a	2.352	0.377	-1.507	-2.789
Long-Run Budget Effect^a	2.341	0.367	-1.516	-2.797
Welfare in % of HH Wealth	0.727	0.110	-0.466	-0.863
Welfare in % of GDP	0.416	0.067	-0.267	-0.494

ϵ_S denotes the elasticity of shifted profits w.r.t. top tax rate; ^{a}changes in bn Swiss francs.

Source: Own calculations.

The simulation results for the different elasticity values are reported in Table 2. For an elasticity of $\epsilon_S = 1.1$, the tax base of SPCs decreases by 65.4 per cent due to the elimination of the special tax regime. In aggregate, the economy appears to be on the downward sloping part of the tax revenue hill for SPCs after the tax increase.[45] The vast reduction in the tax base dominates the increase in revenue due to the higher tax rate, implying a decline by 27.7 per cent in the tax revenues collected from SPCs. The short-fall in tax revenues amounts to about 1.4 bn Swiss francs while the total drop in the government's budget amounts to about 1.5 bn Swiss francs. The larger drop in total government revenues is mainly explained by the behavioural response of households. Given that the government budget is balanced by means of lump-sum transfers, the shortfall in tax revenues retrenches household consumption (-0.43 per cent in the short run) causing an additional decline in consumption tax revenues. The reduction in household consumption

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[44]Relatedly, there is a recent literature that looks into the importance of non-tax reasons for income shifting. For instance, accounting for non-tax-related internal debt financing, the results in Egger et al. (2014) points at much higher tax-sensitivity of internal debt shifting compared to previous findings.

[45]Evidently, before the tax increase the economy might have operated on the upward sloping part of the revenue hill, but at a higher value of tax revenues.

makes the welfare effect associated with the elimination of the special tax status for SPCs negative. Welfare is measured by the equivalent variation and declines by 0.47 or 0.27 per cent when expressed in terms of household wealth or GDP, respectively. Thus, the elimination of the preferential tax treatment of Swiss SPCs implies a reform-induced loss of wealth in the order of 0.47 per cent of Swiss households' total wealth.

As shown in Table 2, the wealth effect for Swiss households depends largely on the value assumed for the elasticity of profit shifting. In case the respective elasticity is 1.5, the loss of wealth to Swiss households rises to 0.86 per cent. The larger welfare loss is driven by the even larger reduction in the tax base of SPCs. The loss of taxable foreign profits amounts to 76.5 per cent, which implies a loss of 51 per cent (or 2.6 bn Swiss francs) of tax revenues collected from SPCs.

In contrast, if the elasticity is 0.4, such as the estimate reported for Austria, the elimination of the preferential tax treatment of SPCs would be beneficial in terms of welfare. The decline in the tax base of SPCs is only moderate (-32 per cent). Before the tax hike, the economy appears to operate on the upward sloping part of the revenue hill for SPCs. The increase in the tax rate (from 9.92 per cent to 20.71 per cent) dominates in its effect on tax revenues, resulting in a 42 per cent increase in tax revenues collected from SPCs, or roughly 2.1 bn Swiss francs. Welfare rises in response. If the value of the elasticity is 0.7, the economy is moving closer to the peak of the tax revenue hill for SPCs and tax revenues collected from SPCs increase by 6.3 per cent, or 0.32 bn Swiss francs.

Plainly, the elimination of the preferential tax treatment has only minor effects on the real economy. The change in GDP, economy-wide investment, and labour demand are very small. This finding is consistent with the legal requirement that SPCs have neither extensive business activity nor a high level of employment in Switzerland.

4.2   Introduction of the license Box

The license box selectively provides tax relief to highly mobile components of profits and is intended to counteract the tax base outflow that follows from the elimination of the special tax regime for SPCs. The Swiss license box is designed to capture about one-third of SPCs' profits, but only about 5 per cent of RTCs' profits.[46] 10 per cent of qualifying profits are subject to the cantonal profit tax, while the remaining 90 per cent are exempted from cantonal taxation. At the federal level, the license box grants no special tax treatment (FTA 2015).

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[46]The license box is estimated to capture roughly one third of SPC profits and 5 per cent of profits of RTCs. The numbers are provided by the Swiss ministry of finance. As politicians might have had an incentive to understate the tax benefits of the license box and understate the cost of reform to move it though parliament more easily, we also conduct a sensitivity analysis assuming that 50 per cent of SPC profits and 7.5 per cent of profits of RTCs are eligible for the preferential tax treatment of the license box. The simulation results are presented in Table 8.

The economic effects of the introduction of the license box are presented in Table 3. The results are again reported for different values of the profit shifting elasticity (the parameter ϵ_S in section 3.2). Comparing the results in Table 2 and 3, it becomes evident that the introduction of the license box is effective in limiting the outflow of foreign firms' profits after the elimination of the special tax treatment of SPCs. For instance, when $\epsilon_S = 1.1$, the outflow of taxable foreign profits is reduced from 65.4 to 39.4 per cent which, in combination with the higher tax rate for SPCs, more than stabilises the tax revenues collected from SPCs (+2.8 per cent). The overall budgetary effect is negative only in the short run due to the leakage effect resulting from RTCs benefiting from the license box as well.[47] Still, the tax reduction granted to RTCs raises investment and employment, elevating consumption and welfare.

Table 3: Elimination of the Special Tax Status and Introduction of the license Box

All Changes in %	$\epsilon_S = 0.4$	$\epsilon_S = 0.7$	$\epsilon_S = 1.1$	$\epsilon_S = 1.5$
GDP	0.079	0.079	0.079	0.079
Investment	0.199	0.199	0.199	0.199
Labour Demand	0.020	0.020	0.020	0.020
HH-Consumption (Short Run)	0.608	0.333	0.021	-0.239
HH-Consumption (Long Run)	0.699	0.424	0.111	-0.150
Tax Base SPCs	-16.67	-27.32	-39.43	-49.53
Tax Revenues SPCs	41.46	23.34	2.82	-14.32
Tax Revenues SPCs[a]	2.093	1.181	0.142	-0.723
Short-Run Budget Effect[a]	2.018	1.017	-0.121	-1.071
Long-Run Budget Effect[a]	2.152	1.152	0.014	-0.934
Welfare in % of HH Wealth	0.751	0.441	0.089	-0.204
Welfare in % of GDP	0.430	0.253	0.051	-0.117

ϵ_S denotes the elasticity of shifted profits w.r.t. top tax rate; [a]changes in bn Swiss francs.

Source: Own calculations.

A similar qualitative pattern emerges for lower values of ϵ_S, while the overall tax revenue effects are positive due to the higher amount of tax revenues collected from SPCs.[48] It is only for the highest elasticity ($\epsilon_S = 1.5$) that, given the significant tax base outflows on the part of SPCs, the change in tax revenues from SPCs and overall tax

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[47]As explained above, about 5 per cent of the profits of RTCs are assumed to be eligible for the license box (FDF and FTA, 2014).

[48]Interestingly, for larger elasticities of profit shifting, the economy generally operates on the wrong side of the tax revenue hill for SPCs after the elimination of the special tax regime; however, such a conclusion cannot be drawn for the lower elasticity values (c.f. Table 2). For instance, for $\epsilon_S = 0.7$, the elimination of the special tax status (which results in a rise in tax rate for SPCs) increases tax revenues collected from SPCs. Surprisingly, the reduction in the effective tax rate following the introduction of the license box further increases SPC tax revenues. Thus, it appears that the economy starts on the upward sloping part of the tax revenue hill, but 'overshoots' in the sense that it operates on the wrong side of the Laffer curve after the elimination of the special tax status. The license box moves the economy closer to the peak of the revenue hill.

revenues is negative. This in turn significantly reduces consumption and welfare.

Griffith et al. (2014) show that license boxes have increased the number of patents registered in a country, but that tax revenues generated from patent income might well have dropped in response to the introduction of the selective tax relief. To put the simulation results in relation to those in Griffith et al. (2014), it is instructive to evaluate the amount of revenues that the license box generates and compare to the tax revenues that such income generates prior to the introduction of the license box, but after the elimination of the ring-fenced tax system. This allows us to single out the effect of the license box regime. Such a decomposition follows from a comparison of Table 2 and 3. As intended by the license box, the effective tax on income that qualifies for the license box is lower than the tax rate that prevails after the elimination of the special tax regime. In fact, the latter tax rate is 20.71 per cent and the former is 9.23 per cent[49], thus the amount of income shifted into the license box will increase. Since the tax rate levied on the non-qualifying income components is still 20.71 per cent, tax revenues collected from SPCs will increase[50] and it is the amount of tax revenues generated from patent income that accounts for this rise.

4.3   Reduction in the Cantonal Profit Tax Rate

To ensure a competitive tax burden on foreign firm profits and in particular for those income components that do not benefit from the license box, the CTR III entails a reduction in the cantonal profit tax rate in addition to the introduction of the license box (FDF and FTA, 2014). On average, the cantonal profit tax rate is expected to decline by around 5.1 percentage points, implying an effective tax burden of 16 per cent (inclusive of the federal profit tax). Accounting for the tax benefit associated with the introduction of the license box, the reduction in the cantonal tax rate yields an effective tax burden of 13.55 per cent for the former SPCs and 15.63 per cent for RTCs.[51]

In the simulation, we additionally consider a scenario where the reduction in the cantonal profit tax rate is less pronounced and amounts to just 4.1 percentage points on average across cantons. In consequence, the effective tax burden of former SPCs amounts to 16.93 per cent on average across cantons, or 14.20 per cent if the license box tax benefit is additionally taken into account. Regular taxed companies are subject to an effective

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[49]Since 90 per cent of income that qualifies for the license box is tax exempt at the cantonal level, the effective tax rate on license income levied after the elimination of the special tax regime and the introduction of the license box is $(0.1 * 13.97 + 7.83 =)$ 9.23 per cent (c.f. Table 1).

[50]Note that, from Table 2 and 3, tax revenues collected from SPCs increase (decrease) more (less) strongly following the introduction of the license box.

[51]For instance, the canton Vaud already reduced the aggregate ordinary corporate tax rate (federal and cantonal) to 13.8 per cent from the year 2019 onwards, compared to the current 21.65 per cent. Similarly, the cantons of Fribourg and Geneva announced plans to reduce their corporate tax rates by roughly 6 and 11 percentage points, respectively, which corresponds to a new aggregate ordinary corporate tax rate (federal plus cantonal) of approximately 13.5 per cent.

tax burden of 16.52 per cent when accounting for the smaller reduction in the average cantonal profit tax and the tax advantage of the license box.[52]

Table 4: Elimination of the Special Tax Status, Introduction of the license Box, and Cantonal Profit Tax Reduction

All Changes in %	Tax Reduction: 5%-p.		Tax Reduction: 4%-p.	
	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$
GDP	0.662	0.662	0.550	0.550
Investment	1.690	1.690	1.403	1.403
Labour Demand	0.165	0.165	0.137	0.137
HH-Consumption (Short Run)	0.204	-0.047	0.296	-0.013
HH-Consumption (Long Run)	0.894	0.641	0.872	0.561
Tax Base SPCs	-7.763	-19.93	-9.323	-23.60
Tax Revenues SPCs	25.99	9.374	29.71	9.292
Tax Revenues SPCs[a]	1.312	0.473	1.500	0.469
Short-Run Budget Effect[a]	-1.172	-2.091	-0.507	-1.636
Long-Run Budget Effect[a]	-0.003	-0.923	0.469	-0.661
Welfare in % of HH Wealth	0.720	0.435	0.742	0.393
Welfare in % of GDP	0.411	0.249	0.425	0.225

ϵ_S denotes the elasticity of shifted profits w.r.t. top tax rate; [a]changes in bn Swiss francs.

Source: Own calculations.

When $\epsilon_S = 1.1$, the larger reduction in the tax rate leads to less severe outflows of taxable foreign profits. The latter amounts to 19.9 and 23.6 per cent under the 5 and 4 percentage point reduction in the cantonal profit tax. In terms of collected tax revenues, the change in the respective tax base is largely compensated by the higher tax rate, leading to additional tax revenues of about 9.3 per cent, or about 0.47 bn Swiss francs, in each of the two scenarios. However, since the RTCs also benefit from the tax rate reduction, leakage is larger under the 5 percentage point reduction with more severe effects on the short-run government budget and short-run consumption. However, the larger tax rate reduction has a stronger stimulating effect on GDP, investment, and labour demand which enables higher long-run consumption and thus a more beneficial welfare outcome.

The tax revenue and welfare consequences differ when $\epsilon_S = 0.4$. The less pronounced tax rate reduction leads to more tax revenues collected from SPCs and smaller leakage effects, given that the reduction uniformly applies to SPCs and RTCs. In response, the budgetary and welfare effects are larger (even positive in the long run) with the smaller

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[52]The reduction in the current cantonal profit tax of 13.97 per cent by 4.1 percentage points ($0.0987 = 0.1397 - 0.041$) implies a total effective tax burden of 16.93 per cent ($= 0.0987 + 0.0783 * (1 - 0.0987)$). Additionally accounting for the tax benefit arising from the introduction of the license box reduces the effective tax burden of former SPCs to 14.20 per cent ($= 1/3 * (0.1 * 0.0987) + 2/3 * 0.0987 + 0.0783 * (1 - (1/3 * 0.1 * 0.0987 + 2/3 * 0.0987))$) and to 16.52 per cent for RTCs ($= 0.05 * 0.1 * 0.0987 + 0.95 * 0.0987 + 0.0783 * (1 - (0.05 * 0.1 * 0.0987 + 0.95 * 0.0987))$).

tax rate reduction.

However, the simulation results are possibly surprising. Generally, lower profit taxes reduce the deadweight loss and thereby increase the efficiency of resource allocation. The results show that for a low profit shifting elasticity, the smaller reduction in the cantonal profit tax rate is welfare superior, while for a higher elasticity, the larger tax cuts result in a more beneficial welfare outcome. This finding is related to tax-exporting incentives. With an internationally mobile profit stream, part of the local tax burden can be off located to the foreign firms' owners and governments tend to prefer a higher profit tax rate (see Huizinga and Nielsen, 1997, for instance).[53] Nevertheless, the optimal tax rate is jointly determined by tax-exporting and revenue-generating incentives, which means it is inversely related to the degree of tax base mobility.

4.4 Introduction of the Allowance for Excess Corporate Equity

The third measure of the reform is the introduction of an allowance for excess corporate equity (AECE), – the tax deductibility of a notional return on excess corporate equity. As discussed above, the main motivation for this reform element is to grant selective tax benefits to different kinds of equity capital. In doing so, the AECE is designed to ensure a competitive tax environment for financial centres of foreign multinational companies in Switzerland, the Swiss finance branches. In addition to the tax benefits for these financial centres, which in the aggregate drive down the effective tax burden for SPCs, the AECE also provides minor windfall gains for RTCs. The RTCs also enjoy a tax relief on their excess corporate equity holdings.

As reported in Table 1, the tax benefit associated with the AECE is comparable with a reduction of 0.81 and 0.41 percentage points in the effective tax burden for SPCs and RTCs, respectively. For regular taxed companies, the model structure is rich enough to implement the tax measure directly; therefore, we do not resort to a reduction in the effective profit tax in the simulation of the AECE's effects.

Comparing the simulation results in Table 4 and 5, in the long run, the introduction of the AECE will raises GDP, investment, and employment by approximately 9.2 per cent and 12 per cent under the 5 and 4 percentage point reduction in the cantonal tax rate. However, in absolute terms, GDP, investment, and employment only increase by around 0.06, 0.16 and 0.02 percentage points, respectively. These tiny growth effects are due to the very limited tax relief for RTCs following the introduction of the AECE system. Further, the growth impact of the AECE system is more pronounced under the 4 vis-à-vis the 5 percentage point reduction in the cantonal profit tax rate. This is due to the fact that the tax subsidy on excess equity, and thereby the reduction in the cost of capital, is

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[53]When the profit stream is domestically owned, a lower tax rate continues to increase efficiency and welfare.

increasing in the profit tax rate. Still, akin to the findings reported in Table 4, the more pronounced reduction in the cantonal tax rate is only welfare dominating, even with the inclusion of the AECE, when the elasticity of profit shifting is relatively large. For a low profit shifting elasticity a less pronounced reduction in the cantonal tax rate is preferable.

Table 5: Elimination of the Special Tax Status, Introduction of the license Box, Cantonal Profit Tax Reduction, and AECE

All Changes in %	Tax Reduction: 5%-p.		Tax Reduction: 4%-p.	
	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$
GDP	0.723	0.723	0.616	0.616
Investment	1.848	1.848	1.570	1.570
Labour Demand	0.180	0.180	0.154	0.154
HH-Consumption (Short Run)	0.130	-0.070	0.226	-0.029
HH-Consumption (Long Run)	0.881	0.679	0.867	0.611
Tax Base SPCs	-6.338	-16.48	-7.835	-20.10
Tax Revenues SPCs	22.18	8.953	26.17	9.381
Tax Revenues SPCs[a]	1.126	0.452	1.321	0.474
Short-Run Budget Effect[a]	-1.622	-2.357	-0.954	-1.882
Long-Run Budget Effect[a]	-0.343	-1.075	0.140	-0.789
Welfare in % of HH Wealth	0.678	0.452	0.708	0.421
Welfare in % of GDP	0.388	0.259	0.406	0.241

ϵ_S denotes the elasticity of shifted profits w.r.t. top tax rate; [a]changes in bn Swiss francs.
Source: Own calculations.

The outflow of SPC tax base is further limited under the AECE. This holds independent of the assumed elasticity of profit shifting. However, for a low elasticity, tax revenues collected from SPCs decline, indicating that the tax benefit granted to the Swiss finance branch dominates the tax base effect. This renders the introduction of the AECE rather costly. The additional costs of the AECE amount to roughly 450 m Swiss francs in the short run and between 340 and 330 m Swiss francs in the long run. For a larger elasticity, the reduced outflow of SPC tax base coincides with larger tax revenues collected from these firms and, consequently, the additional cost of the AECE amounts to roughly 250 m Swiss francs in the short run and about 140 m Swiss francs in the long run. Due to the positive real effects of the AECE on the economy, the additional shortfalls of the short- and long-run budgets stay far below the initial tax relief of 610 m Swiss francs, granted under the AECE.

4.5 Alterations to the Imputation System for Dividend Income

Finally, we consider the proposed changes in the imputation system for dividend income in the simulations. Under the current tax law, the dividend income of individuals faces

a tax benefit at both the federal and the cantonal level in the form of a 40 per cent and an average 50 per cent exemption, respectively. The reform proposal stipulates that a minimum of 60 per cent of the dividend income to be subject to taxation at the cantonal level. This alteration in the imputation system implies an increase in the effective tax rate on dividend income from 19.4 per cent to roughly 22.0 per cent (for the top income bracket).

The inclusion of this reform element is consistent with the general insight on how national governments behave under tax competition (Zodrow and Mieszkowski, 1986; Bucovetsky and Wilson, 1991; Keen and Konrad, 2014). Competing governments typically shift the tax burden from source-based taxes on mobile resource (like firms or capital) to residence-based capital taxes on less mobile resources (like households). Such a shift in the tax structure reduces the distortions perceived by each competing government at the possible expense of even higher distortions (due to higher taxes) at the household level. By increasing dividend taxes to partially cover the fiscal cost of the corporate tax rate reductions, the CTR III follows this line of reasoning.

In the context of dividend taxes, the level of tax-induced distortions may, however, not necessarily rise when the tax rate increases. Dividend taxation is neutral with regard to the investment decision under the so-called *New View* of dividend taxation, which assumes that investments are financed by retained earnings at the margin (King, 1974; Auerbach, 1979; Bradford, 1981). The latter is also the dominant source of investment funds of Swiss companies and implies that to a large extent the dividend tax might turn into a lump-sum tax which only capitalises in firm value, but leaves firm decisions unaffected.[54] Contrary to the New View, the dividend tax will distort investment decisions under the *Old View* of dividend taxation, where new investments are assumed to be purely financed by new share issues (Poterba and Summers, 1985).[55] Therefore, the alteration in the imputation system is expected to have only a small deteriorating effect on the growth stimulus of the reform but also to enhance welfare significantly, given the additional revenues generated by the increased tax levy. The results reported in Table 6 confirm these conjectures.

The additional alteration in the imputation system for dividend income reduces the growth of GDP, investment, and labour demand by approximately 0.09, 0.24, and 0.02 percentage points, respectively, independent of whether the reduction in the corporate tax rate amounts 5 or 4 percentage points (see Table 5). The small dampening effect on economic growth reflects the financing behaviour of firms, assumed to finance 12 per cent through new investments by share issues. For these investments, the dividend tax is distortionary. Despite these efficiency costs, the dividend tax generates additional tax revenues that increase short- and long-run overall tax revenues by about 340 m and 800

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[54]See Alstadsæter et al. (2015) and Yagan (2015) for empirical evidence on the investment neutrality of dividend taxes.

[55]See Auerbach (2002) for a review of the two competing views.

m Swiss francs, respectively. In response, household consumption rises and the increased consumption possibilities translate into larger welfare gains with the change in the imputation system. For instance, assuming an elasticity of 1.1 and a reduction in the cantonal tax rate of 5 percentage points, the welfare gains amount to 0.78 instead of 0.45 percent of household wealth.

Table 6: Swiss CTR III, Including Alterations to the Imputation of Dividend Income

	Tax Reduction: 5%-p.		Tax Reduction: 4%-p.	
All Changes in %	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$
GDP	0.631	0.631	0.524	0.524
Investment	1.605	1.605	1.329	1.329
Labour Demand	0.157	0.157	0.131	0.131
HH-Consumption (Short Run)	0.545	0.344	0.639	0.384
HH-Consumption (Long Run)	1.120	0.919	1.105	0.849
Tax Base SPCs	-6.338	-16.48	-7.835	-20.10
Tax Revenues SPCs	22.17	8.951	26.17	9.380
Tax Revenues SPCs[a]	1.120	0.452	1.321	0.474
Short-Run Budget Effect[a]	-1.286	-2.018	-0.612	-1.540
Long-Run Budget Effect[a]	0.461	-0.271	0.930	0.001
Welfare in % of HH Wealth	1.004	0.778	1.033	0.745
Welfare in % of GDP	0.575	0.445	0.591	0.427

ϵ_S denotes the elasticity of shifted profits w.r.t. top tax rate; [a]changes in bn Swiss francs.
Source: Own calculations.

Since the alteration in the imputation system affects the tax liability of individuals but not of corporations, this tax measure has neither an effect on the tax base of nor on the tax revenues collected from SPCs. All figures related to these measures coincide with the ones presented in Table 5.

5   Additional Simulation Analyses

In the last section we sequentially introduced the different elements of the CTR III and Table 6 summarises the overall effect of the final reform proposal as agreed to by the Swiss parliament. In this section, we provide two additional simulation analyses where we change the share of SPCs income that qualifies for the license box and where we additionally consider capital gains taxation, as had been discussed at an initial stage of the reform process.

5.1 Sensitivity Analysis

The Swiss license box regime will be the first to comply with the modified nexus approach, linking the income qualifying for the preferential tax treatment to the geographical origin of the underlying research and development. As a consequence, income originating from foreign (possibly non-EU) IPs will not qualify for the preferential tax treatment granted under the license box and thus it will reduce the income base entering the patent box. The magnitude of the latter effect is, however, particularly hard to estimate, given the lack of historical data on domestic or foreign research and development expenditures for existing patents (OECD, 2015). To account for this ambiguity, we conduct a sensitivity analysis assuming that only 1/6 instead of 1/3 of SPC profits and 2.5 instead of 5.0 per cent of RTC profits are eligible for the preferential tax treatment under the license box regime. This corresponds to a situation in which fewer IPs comply with the nexus approach, compared to the baseline scenario.

Table 7: Swiss CTR III, Restricted Eligibility of license Box Tax Benefit
1/6 of SPC and 2.5% of RTC Profits Eligible for the license Box

All Changes in %	Tax Reduction: 5%-p.		Tax Reduction: 4%-p.	
	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$
GDP	0.609	0.609	0.499	0.499
Investment	1.549	1.549	1.267	1.267
Labour Demand	0.152	0.152	0.125	0.125
HH-Consumption (Short Run)	0.663	0.356	0.760	0.378
HH-Consumption (Long Run)	1.218	0.910	1.202	0.819
Tax Base SPCs	-9.248	-23.42	-11.24	-27.96
Tax Revenues SPCs	29.54	9.308	33.67	8.488
Tax Revenues SPCs[a]	1.491	0.470	1.700	0.429
Short-Run Budget Effect[a]	-0.783	-1.902	-0.090	-1.483
Long-Run Budget Effect[a]	0.922	-0.198	1.403	0.009
Welfare in % of HH Wealth	1.123	0.777	1.153	0.722
Welfare in % of GDP	0.643	0.445	0.660	0.413

ϵ_S denotes the elasticity of shifted profits w.r.t. top tax rate; [a]changes in bn Swiss francs.
Source: Own calculations.

As expected, the smaller the amount of SPC income entering the patent box, the larger is the increase in the effective tax burden of SPCs and the larger the drop in SPCs' taxable profits. In quantitative terms, the additional reduction of the tax base of SPCs amounts to between 45 and 40 per cent of the initial reduction.

With regard to GDP, investment, and labour demand, the results in Table 7 show slightly smaller numbers compared to Table 6. This does however not hold for the effect on the government budget, household consumption, and welfare. For these measures, the

simulation results in Table 7 show much more positive outcomes under the low elasticity but only minor improvements or even a slight worsening under the high elasticity of profit shifting. These findings imply that, in a situation of less mobile SPC profits, the restrictions accompanying the modified nexus approach may increase welfare, augmenting tax revenues and household consumption in the short and long run. Contrary to that, in a situation of highly mobile SPC profits (high elasticity of profit shifting), the outflow of SPC profits associated with the modified nexus approach has the potential to affect SPC tax revenues negatively and thus impede household consumption and welfare.

To increase the chance that the reform will be passed, politicians might have an incentive to understate the tax benefits of the license box and understate the actual cost of the reform. We therefore conduct a sensitivity analysis assuming that 1/2 instead of 1/3 of SPC profits and 7.5 instead of 5.0 per cent of RTC profits are eligible for the license box. Relative to the baseline scenario, the tax base that SPCs locate in Switzerland is predicted to rise by between 45 and 40 per cent, a mirror image of the change reported in Table 7. Tax revenues collected from SPCs decrease relative to the ones in Table 6, irrespective of the assumed profit shifting elasticity or the drop in the cantonal profit tax rate. While SPCs certainly benefit from the reduced tax payment, households may not welcome this development. Their welfare drops in response to the rise in the share of firm income that qualifies for the license box. A summary of the simulation results is presented in Table 8.

Table 8: Swiss CTR III, Generous Eligibility of license Box Tax Benefit
1/2 of SPC and 7.5% of RTC Profits Eligible for the license Box

All Changes in %	Tax Reduction: 5%-p.		Tax Reduction: 4%-p.	
	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$
GDP	0.652	0.652	0.549	0.549
Investment	1.661	1.661	1.395	1.395
Labour Demand	0.163	0.163	0.137	0.137
HH-Consumption (Short Run)	0.411	0.303	0.498	0.353
HH-Consumption (Long Run)	1.007	0.898	0.988	0.843
Tax Base SPCs	-3.625	-9.655	-4.726	-12.47
Tax Revenues SPCs	13.77	6.647	17.36	7.831
Tax Revenues SPCs[a]	0.695	0.336	0.877	0.395
Short-Run Budget Effect[a]	-1.848	-2.242	-1.210	-1.738
Long-Run Budget Effect[a]	-0.058	-0.451	0.382	-0.146
Welfare in % of HH Wealth	0.867	0.745	0.891	0.728
Welfare in % of GDP	0.496	0.427	0.510	0.414

ϵ_S denotes the elasticity of shifted profits w.r.t. top tax rate; [a]changes in bn Swiss francs.

Source: Own calculations.

5.2 Capital Gains Taxation

In a previous version of the reform proposal, the alterations to the imputation system were intended to also apply to capital gains. 70 per cent of the income originating from capital gains was intended to be subject to taxation at the federal and cantonal level. Such a measure would have increased the effective tax burden on capital gains from 4.9 to 17.2 per cent.[56] In the following, we simulate the effects of the change in the capital gains tax. Although this tax policy change is not part of the final reform agreed upon by the Swiss parliament, the simulation illustrates why the decision not to include it might be justified based on efficiency considerations.

Table 9: Swiss CTR III Including a Tax on Private Capital Gains (Top Tax Rate)

All Changes in %	Tax Reduction: 5%-p.		Tax Reduction: 4%-p.	
	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$
GDP	-0.710	-0.710	-0.817	-0.817
Investment	-1.760	-1.760	-2.021	-2.021
Labour Demand	-0.178	-0.178	-0.205	-0.205
HH-Consumption (Short Run)	0.680	0.478	0.763	0.507
HH-Consumption (Long Run)	-0.310	-0.512	-0.338	-0.594
Tax Base SPCs	-6.338	-16.48	-7.835	-20.10
Tax Revenues SPCs	22.18	8.948	26.17	9.382
Tax Revenues SPCs[a]	1.120	0.452	1.321	0.474
Short-Run Budget Effect[a]	0.359	-0.374	0.940	0.010
Long-Run Budget Effect[a]	0.557	-0.175	0.979	0.050
Welfare in % of HH Wealth	-0.010	-0.237	0.005	-0.283
Welfare in % of GDP	-0.006	-0.126	0.003	-0.161

ϵ_S denotes the elasticity of shifted profits w.r.t. top tax rate; [a]changes in bn Swiss francs.

Source: Own calculations.

The simulation results presented in Table 9 show that the additional taxation of capital gains would have more than offset the positive stimulus of the proposed reform. On the one hand, the additional revenues collected from taxing capital gains may, depending on the assumed elasticity for profit shifting and the reduction in the cantonal tax rate, reduce the shortfalls in the government budget and allow household consumption to increase in the short run. On the other hand, the increase in current consumption is not sustainable since the negative growth effect depletes future consumption possibilities. Therefore, the welfare measure shows its weakest amplitude of all simulations, if capital gains are taxed

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[56]The computation of the effective tax burden on capital gains accounts for the tax benefit accruing during the holding period of capital gains, i.e., we assume that the effective tax burden on capital gains amount to about 60 per cent of the statutory tax rate, in addition to all other legal definitions of the capital gains tax base. Given that the changes in the imputation system affect unincorporated capital gains as well, the tax burden for this type of capital gains increases from 9.7 per cent to 12.8 per cent.

in addition to all the other reform elements. The negative efficiency effects of the capital gains tax are related to the financing behaviour of firms. Capital gains taxes have the inverse effect on efficiency than dividend taxes. As discussed above, under the New View, capital gains distort investment choices, while they are neutral for investment choices under the Old View (Auerbach, 2002). Since a large share of investments is financed by retained earnings, the capital gains tax has a significant distortionary effect on investment, GDP, and welfare. Lowering the corporate tax burden would reduce the perceived distortions, while the capital gains tax hike would introduce distortions that more than neutralise any real reform effects. As such, using capital gains taxes as a residence-based tax instrument to finance the fiercer competition in source-based capital taxes might undermine national welfare and, contrary to the general insight, provides an example where a shift from source-based to residence-based taxation under fiscal competition might not be desirable. The finding offers an explanation for why the CTR III does not include this reform element.

Similar to the alteration to the imputation system for dividend income, the increase in the effective tax burden on capital gains has no direct impact on the tax base of SPCs and the tax revenues collected from SPCs. As before, this follows from the fact that the capital gains tax affects the tax burden at the household but not the firm level.

6 Discussion and Concluding Remarks

In response to the mounting international pressure to reform its tax system, Switzerland has launched a plan to reform its corporate tax system and eliminate the explicit tax discrimination that is embedded in the special tax regimes. One of the main elements of the reform proposal is the introduction of a license box, granting preferential tax treatment for income from intellectual property rights. In addition, a substantial reduction in the cantonal profit tax rates has been proposed. In line with the tax systems of other European countries, the license box and the AECE can be interpreted as a second-best attempt to discriminate by tax differently mobile firm profits without violating the guidelines against harmful tax practices put forward by the European Commission and the OECD.

Our analysis shows that the elimination of the preferential tax status for SPCs implies a substantial outflow of foreign firm profits and, thus, has a strong negative impact on tax revenues. These adverse effects can be moderated when the elimination of the preferential tax treatment of SPCs is combined with the introduction of a license box and a reduction in the average cantonal profit tax rate by at least 4 percentage points. The simulation results show that when foreign firms' profits are less mobile, a smaller reduction in the cantonal profit tax rate is preferable in terms of welfare. However, when foreign firms' profits are highly mobile, a more substantial reduction in the cantonal profit tax rates is

preferred. These findings might seem rather unexpectedly. In general, lower profit taxes reduce the deadweight loss and thereby increase efficiency as measured by the welfare metric used in the paper. This holds independently of the elasticity of profit shifting. However, tax-exporting incentives call for a higher profit tax rate. The optimal tax rate is determined by the interplay between the tax-exporting and the revenue-generating incentives which explains the inverse relationship between the preferred level of taxation and the degree of tax base mobility. Further, the windfall gains for RTCs from the AECE system feature an additional, although small, growth stimulus that reduces the financing costs associated with the AECE. Interestingly, resorting to residence-based capital gains taxes rather than dividend taxes to finance the reduction in source-based corporate taxes is very undesirable. Capital gains taxes introduce distortions that more than offset the real effects and efficiency gains of lower corporate taxes.

Finally, the Swiss license box builds upon the modified nexus approach that has been advocated by the OECD (OECD, 2015). It is thereby the first license box that links the qualifying income to the geographical origin of the underlying research and development activity (Evers et al., 2015). As explained above, implementing the modified nexus approach faces different challenges. It requires a complete history of the cost of research and development associated with the IP, not generally available for existing IPs. A precise quantification of the induced fiscal consequences requires detailed information on transition rules on how missing information on cost expenditures will be treated under the nexus approach, rules that are still pending. Furthermore, it requires precise information on how the principle will be implemented within the European Union, i.e., on a country basis, which appears to go against current European law, or on an European Union-wide basis. In this paper, we address the implementation problems by providing extensive sensitivity analyses. A more detailed analysis, building on more precise information, must be left to future research.

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A Appendix

A.1 Behavioural Parameters

The CGE model is a comprehensive, non-linear equation system that represents the supply and demand sides of the factor and goods markets. All model parameters and behavioural elasticities are selected in line with the relevant empirical findings to ensure that the model maps the underlying economy as closely as possible. Table 10 lists the choice of behavioural elasticities and parameters.

One parameter of particular importance for the quantification of the effects of the CTR III is the elasticity of profit shifting. This elasticity measures the sensitivity of the tax base of SPCs to a change in the tax differential between Switzerland and the rest of the world (in relative terms). Since no specific empirical estimate of this parameter is available for Switzerland, we performed our simulations using different plausible values for this elasticity, ranging from 0.4 to 1.5. The lower-bound value of 0.4 is consistent with the elasticity estimated for Austria by Huizinga and Laeven (2008). The upper-bound of 1.1 (and 1.5) is similar to (slightly higher than) the value found by Huizinga and Laeven for Belgium (1.13) and the Netherlands (1.05). Similar to Switzerland, these countries are small open economies.

Another important parameter is the elasticity of intertemporal substitution. This parameter steers the intertemporal consumption pattern of households. The empirical literature provides many different estimates for this behavioural elasticity. The applied value of 0.48 is only slightly lower than the mean estimate of 0.5 reported by Havranek et al. (2015).

The elasticity of factor substitution is taken from Mohler and Müller (2012), who provide a series of estimates for different versions of nested CES production functions for Switzerland. With regard to the elasticity of substitution between capital and labour, the authors report varying values slightly below 0.6 for the different sectors of Swiss manufacturing. The variation in the long-run capital stock due to an increase in the user cost of capital is determined by the elasticity of capital demand. We apply an estimate of -1 for the semi-elasticity (see Chirinko, 2002), indicating that a 1 percentage point

Table 10: Behavioural Elasticities and Economic Parameters

Parameter	Applied Values
Elasticity of profit shifting[a]	0.4,0.7,1.1,1.5
Elasticity of intertemporal substitution[b]	0.48
Elasticity of factor substitution[c]	0.60
Elasticity of capital demand[d]	-1.00
Elasticity w.r.t. the debt-asset ratio[e]	0.43
Half-life of capital accumulation[f] (in years)	8.00
Average Labour supply elasticity[g]	0.20
Labour supply elasticity[g] (low-, medium-, high-skilled)	0.5,0.2,0.1
Rate of trend growth[h]	0.02
Gross return firm bonds[k]	0.03
Gross return equity capital[k]	0.08

[a] Huizinga and Laeven (2008), [b] Havranek et al. (2015), [c] Mohler and Müller (2012),
[d] Chirinko (2002), [e] Gordon (2010), [f] Cummins et al. (1996), [g] Mueller (2004),
[h] KOF, [k] Pictet (2014).

increase in the user cost of capital causes a decline in the capital stock by 1 per cent. The elasticity of the debt-to-asset ratio with respect to the profit tax rate measures the increase in a firm's debt-to-asset ratio due to a change in the profit tax and thus the change in the tax benefit associated with debt finance. In line with Gordon (2010), we set the value for this elasticity to 0.43. Hence, in response to a 5 percentage point increase in the profit tax rate, the firm raises its debt level by 2.2 $(= 0.43 * 5)$ percentage points. The speed of convergence towards the new steady state depends crucially on the half-life of investments. In accordance with the existing literature (see Cummins et al. 1996, for instance), we assume a value of 8.0 for this parameter. Thus, half of the reform-induced long-run variation in the capital stock will have taken place after 8 years. Finally, another elasticity that influences general equilibrium effects is the labour supply elasticity. In our model specifications, we distinguish between three skill-categories of workers. The estimates by Mueller (2004) suggest an elasticity of the labour supply of 0.1, 0.2 and 0.5 for low-, medium- and high-skilled employees. Weighted by the size of the different skill groups, the figures translate into a rather low value for the average labour supply elasticity of about 0.2. Aside from the behavioural elasticities, several other economic parameters have to be set ex ante. The most important economic variable is the long-run growth trend of the economy (set to 0.02), proxied by a measure of output capacity computed by the macroeconomic model of the Swiss Economic Institute, KOF. Finally, we use the performance indices computed by Pictet (2014) to compute the rate of return on firms' bonds (0.033) and equity (0.079).

A.2 Macroeconomic Equilibrium of the Swiss Economy

The model is calibrated to replicate the steady-state equilibrium of the Swiss economy in 2010. The pre-reform tax system serves as the initial steady-state equilibrium. Table 11 reports the relevant macroeconomic indicators of the Swiss economy, the estimations produced through our model (column CH-Mod), as well as the 2010 point value and 6-year moving average value of these indicators. The table shows a high level of goodness-of-fit between the initial equilibrium as replicated by the model and the observed economic indicators in 2010. The replicated equilibrium also fits quite well with the moving average values for 2010, which includes the years of the recent global financial crisis.

Table 11: Macroeconomic Equilibrium of the Swiss Economy

In bn Swiss franc	Year 2010[a]	MA 2007-12[a] [b]	CH-Mod
Gross Domestic Product[*]	572.66	573.76	574.36
Compensation Employees	339.61	342.16	344.39
Capital Depreciation[*]	103.40	103.33	95.46
Gross Consumption[*]	331.82	329.3	332.03
Capital Formation	116.16	120.91	117.83
Capital Stock	1'321.5	1'321.4	1'136.46
Government Debt[*]	208.21	216.85	217.04
Total Tax Revenues[*]	160.23	159.8	160.09
Tax Corporate Firms[*]	11.00	11.02	11.01
Tax Revenues SPC[*]	5.13	5.14	5.14

[a] in prices of 2010 [b] 2010 value of a 6-years moving average. [*] calibrated in the steady state

Source: State Secretariat for Economic Affairs SECO, Federal Finance Administration (FFA), Federal Tax Administration (FTA), own calculations.