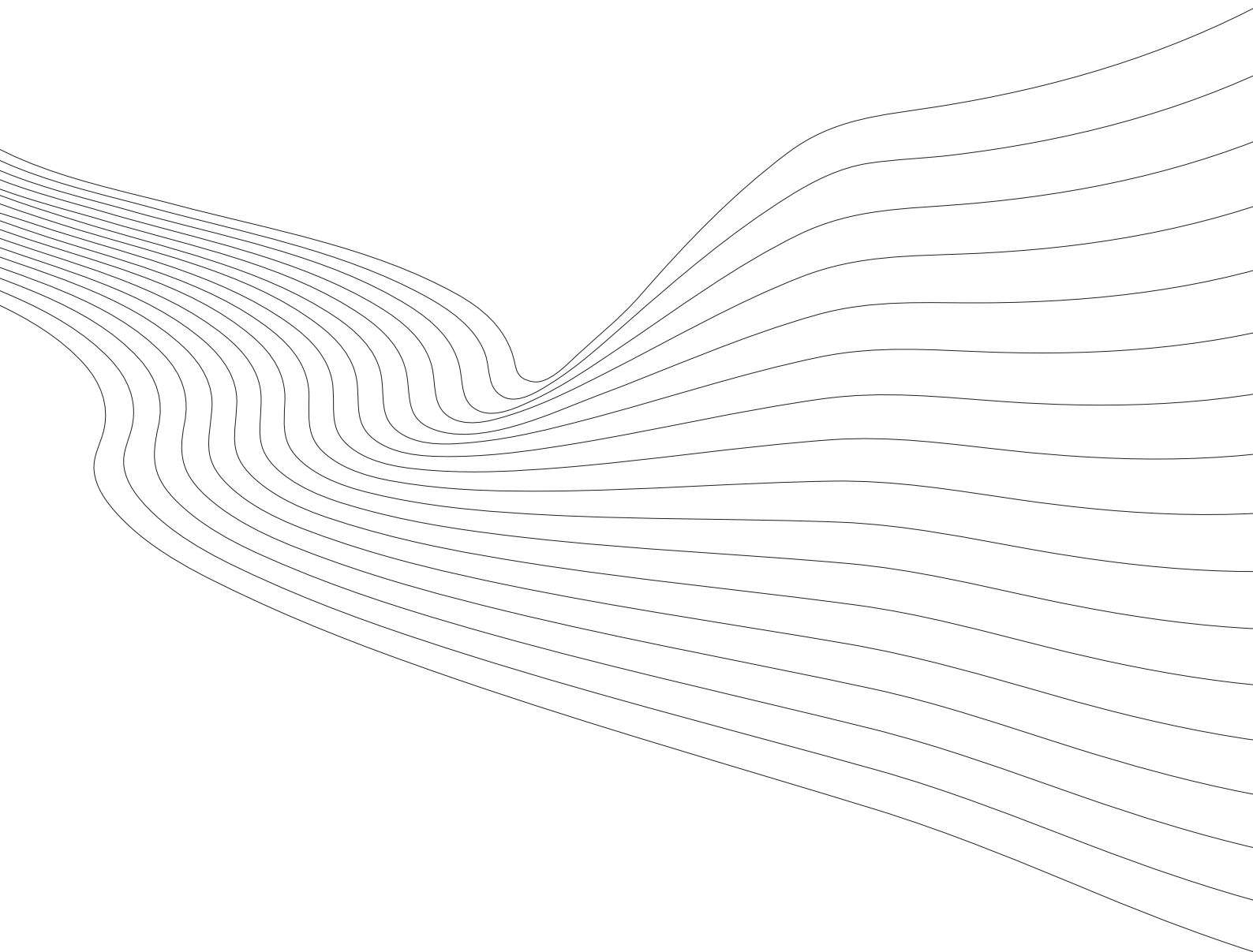


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Quantifying the Effects

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Introducing an IP Licence Box in Switzerland: Quantifying the Effects*

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Abstract

In response to the increasing international pressure on Switzerland to reform the ring-fenced elements in its tax system, the Swiss Government has put forward a comprehensive tax reform package. The proposal comprises, among other things, the introduction of a licence box, a substantial reduction in the 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 licence box, combined with the reduction in the cantonal profit tax, limits the outflow of the tax base of those companies that benefit from the current preferential tax treatment. The reduction in the cantonal profit tax and the fact that regularly taxed companies also benefit from the licence box render the reform package costly, such that the tax revenues will decline after the reform.

JEL Classification: H25, H32, C68.

Keywords: Tax Competition, Licence Box, Corporate Tax Reform, General Equilibrium Model.

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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 awareness of how multinationals take advantage of their international structure to shift their profits towards low-tax jurisdictions and eventually to minimize their tax bill.

Thus, it is not surprising that the taxation of multinational companies is currently one of the most salient issues in tax policy. Lately, 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 as an unacceptable tax practice that must be abolished.

To attract mobile and profitable firms, while complying with the standard of avoiding harmful tax practices, many European countries have started to introduce tax allowances for revenues originating from intellectual property rights (IPR), so-called licence or patent boxes. A similar idea has now also been advocated in the recent reform proposal for Switzerland. It suggests abolishing the existing ring-fencing practices, as requested by the EC, and, instead, introducing a licence box system at the sub-national (cantonal) level. Despite the increasing popularity of the licence box vehicle, its effectiveness may depend crucially on the pre-existing tax scheme. Most European countries have introduced a licence box to discriminate between and compete for differently mobile types of firm profits. Thereby, the countries moved from a rather general definition of the corporate tax bases to a more selective one when introducing a licence box. This is, however, very different in the Swiss case, in which the introduction of a licence box constitutes the transition from a rather selective and targeted corporate tax base with ring-fenced elements to a wider and less specific definition of the tax base. In this paper, we quantify the economic and fiscal consequences for Switzerland when switching from a selective tax system allowing ring fencing to a more general system that grants a licence box to qualifying firms.

In detail, the current Swiss tax system stipulates that the Swiss sub-national jurisdictions, the cantons, may offer preferential tax treatment to so-called special purpose companies (SPCs), that is, holding companies and firms that generate most of their revenues outside Switzerland. Due to the increasing international pressure opposing this tax practice, Swiss authorities have proposed in their first report to abandon the preferential tax status of SPCs at the cantonal level and to allow cantons to grant firms a tax allowance

for revenues from IPR. In addition, the reform proposal recommends that cantons should lower their tax rates on corporate profits by around 6 percentage points and introduce an allowance for excess corporate equity (AECE). In the follow-up report, the introduction of a tax on private capital gains has been added as a further element of the reform.

To quantify the effects of the third Swiss corporate tax reform (CTR III), we apply a computable general equilibrium (CGE) model calibrated to 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 the firms' investment, finance and employment decisions. Besides the detailed insights into the revenue implications for the Government, the model quantifies the reform-induced effect 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 the ring fencing) on the Swiss economy. Thereafter, we show how the different reform elements, in particular the introduction of a licence box, alter the effects originating from the abolishment of the special tax regime for SPCs.

Assuming elasticity of profit shifting of 1.1,¹ our simulations show that the elimination of the preferential tax status for special purpose companies has little effect on output, investment or employment. However, foreign firms that benefited from the preferential tax treatment massively shift their profits outside Switzerland (-71.0 per cent), implying a shortfall of revenue collected from these firms of around 38 per cent. In nominal terms, this loss amounts to a value of about 2 bn Swiss francs. To balance the government budget, the lump-sum transfers to households are adjusted, which 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 licence box, which exempts 80 per cent of the licence income from cantonal taxation, reduces the share of profits shifted abroad from 71.0 to 44.6 per cent. In turn, the shortfall in the government revenue is reduced to 320 m Swiss francs in the short run and only 180 m Swiss francs in the long run after the investments and output have adjusted to their new steady-state values. The growth effect triggered by the introduction of the licence box is sufficient to generate a slight increase in long-run household consumption and to make the overall welfare effect of the reform positive, albeit very close to zero. In the case in which the introduction of the licence box is combined with a reduction in the cantonal tax rate of 6 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 2.6 bn Swiss francs, which has a slight negative impact on private consumption in the short run. Due to positive effects on

¹See Huizinga and Laeven (2008) for an empirical analysis of profit-shifting elasticities. Huizinga and Laeven find that the assumed elasticity value of 1.1 applies to Belgium and the Netherlands, two European countries that already have a licence box in place.

output (+0.8 per cent), investment (+2.1 per cent) and employment (+0.2 per cent), the long-run revenue shortfall is reduced to 1.2 bn Swiss francs and households' consumption increases by 0.77 per cent in the long run. The overall welfare effect is positive and larger than in the scenario in which only the licence box is introduced. Granting an allowance for excess corporate equity in the tax code or introducing a tax on private capital gains has no impact on the amount of profits shifted abroad. The latter is insulated from the two policy changes. Nevertheless, the allowance for excess corporate equity brings about windfall gains for regularly taxed companies as well and thus has a small but positive effect on output, investment and employment. Contrary to that, the introduction of a tax on private capital gains mostly offsets the positive effects on the real economy stimulated by the other elements of the reform. In spite of the additional revenue generated by the tax on capital gains, the total effect on the government budget remains negative both in the short and in the long run. The change in long-run households' consumption and welfare is positive but lower than if no tax on capital gains is introduced.²

The paper is organized 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. Section 5 provides a concluding discussion.

2 The Swiss Corporate Tax Reform (CTR III)

Switzerland is well known as one of Europe's low-tax countries. 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 21.8 per cent if weighted by the cantonal shares in the tax base or 18 per cent in the unweighted case. Households may face a top personal income tax rate between 22.5 per cent in the canton of Zug and 41.7 per cent in the canton of Geneva. The average of the top personal income tax rates lies around 36.6 per cent. Despite these quite competitive tax rates, the Swiss tax law additionally stipulates 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 around 10.1 per cent. The issue of ring fencing, that is, the differential tax treatment of domestic vis-à-vis foreign profits, has been identified as a harmful tax practice, and the European Commission is exerting pressure on Switzerland to abandon the ring fencing system. In response to the increasing international pressure, Switzerland has put forward the third Swiss corporate tax reform (CTR III), which replaces the discriminatory tax system with uniform tax treatment of domestic profits and the profits of SPCs.

²Note that all the results presented are sensitive to the value of the elasticity of profit shifting applied. Since no precise empirical estimate of this elasticity is available for Switzerland, we conduct the simulations for different values of this elasticity to assess the sensitivity of the results.

The most important tax reform elements proposed by the steering committee for the attention of the Swiss Federal Department of Finance (FDF, 2013) are the introduction of a licence box at the cantonal level in combination with a reduction in the cantonal profit tax rates. In addition, the committee proposes the introduction of an allowance for excess corporate equity (AECE), that is, the deduction of a notional return on excess corporate equity holdings from the corporate tax base.³ One additional reform element proposed in the latest report of the Swiss Federal Department of Finance and the Swiss Federal Tax Administration (FDF and FTA, 2014) is the introduction of a tax on capital gains in combination with adjustments to the existing imputation system for capital income.^{4,5}

Introduction of a Licence Box

The introduction of a licence box is seen as a promising substitute for the current tax privileges granted to the SPCs at the cantonal level.⁶ Licence boxes are nowadays a common tax instrument available in many European countries, such as Ireland, the United Kingdom and the BeNeLux countries as well as France and Italy.⁷ The widespread use of licence boxes can additionally be taken as a signal for the conformity of this instrument with the OECD and EU guideline against harmful tax practices. From an international perspective, the licence box is a politically feasible instrument for securing the competitiveness of Switzerland in fiscal competition.⁸ As stipulated in the latest reform proposal (FDF and FTA, 2014), a legal entity may qualify for the licence box if it owns or is the beneficiary of an intangible property right (predominantly patents). The licence box grants a tax exemption from the cantonal profit tax of a maximum of 80 per cent of the profits from IPR that are eligible for the licence box. With regard to the comprehensiveness of the licence box, its definition should be such that, on average, about one-third

³While the definition of the licence box is still vague in the first report (FDF, 2013), we follow the definition of the licence box as stipulated in the second, joint report of the Swiss Federal Department of Finance and the Swiss Federal Tax Administration (FDF and FTA, 2014).

⁴The taxation of capital gains is mostly motivated by the shortfall in tax revenues associated with the tax reform and the budgetary need to compensate for it fiscally.

⁵The exposition of the reform elements follows the latest report by the Swiss Federal Department of Finance and the Swiss Federal Tax Administration (FDF and FTA, 2014).

⁶Special purpose companies have the particular feature of being a holding company, having their main business activity outside Switzerland or providing financial services to a firm conglomerate. The level of cantonal taxation of these firms is around 2 to 3 per cent on average.

⁷Tax-motivated transfer pricing has received increasing research attention in recent years. A review of the recent 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.

⁸Nidwalden is the first and only Swiss canton already to have introduced a licence box at the cantonal level. The current tax law in Nidwalden stipulates that only 20 per cent of the corporate income qualifying for the licence box is subject to the cantonal tax rate, ensuring an effective tax burden of below 10 per cent (inclusive of the federal profit tax) for income from intangible assets.

of the profits of SPCs may benefit from it.⁹ In line with the cantonal tax autonomy, the applicable tax rate for income qualifying for the licence box is decided upon by each canton. At the federal level, the licence box provides no preferential tax treatment.

Under the current tax legislation, the effective tax burden on corporate profits amounts to about 21.8 (= 7.83 + 13.97) per cent on average across cantons. This figure includes the federal profit tax of effectively 7.83 per cent and an average cantonal profit tax burden of 13.97 per cent. Abandoning the preferential tax treatment of SPCs increases the effective tax burden for these firms from the current 10.1 per cent to the regular rate of 21.8 per cent. The introduction of the licence box, however, would limit the rise in the effective tax burden for SPCs to about 18.1 per cent, instead of 21.8 per cent, if the maximum amount of 80 per cent of licence income is tax exempt at the cantonal level.¹⁰ The substantially higher tax burden for SPCs under the licence box system (18.1 per cent) vis-à-vis the current system (10.1 per cent) is due to the fact that only about one-third of SPCs' profits qualify for the licence box. Under the current system, all SPCs' profits benefit from the preferential tax treatment at the cantonal level.

It is important to note that, following the non-discriminatory nature of the reformed tax system, not only SPCs benefit from the introduction of the licence box, but also regularly taxed companies. Following the assumption made by the steering committee (FDF and FTA, 2014), on average 5 per cent of the profits of regularly taxed companies become eligible for the licence box, as well. As a consequence, regularly taxed companies face a slight windfall gain as their effective tax burden drops from 21.8 per cent initially to about 21.24 per cent ($= 0.05 * (0.2 * 13.97 + 7.83) + 0.95 * 21.8$).

Reduction in the Cantonal Profit Tax Rate

In addition, the steering committee proposes a substantial reduction in the effective corporate tax burden from the current 21.8 per cent across cantons to about 16 per cent (both figures are inclusive of the federal profit tax). This measure should, on the one hand, limit the increase in the tax burden for SPCs after the abolishment of their special tax status. On the other hand, it should increase Switzerland's standing as an investment location. Keeping the level of the federal profit tax rate fixed at effectively 7.83 per cent, the effective cantonal tax rate has to decline by almost 6 percentage points, from 13.97 per cent initially to about 8.17 per cent, to ensure an effective tax burden of just 16 per

⁹The initial report of the steering committee considered two different types of licence boxes: a narrow one and a broad one. The former (latter) covers about one-third (two-thirds) of SPC's profits. Since it became clear at an early stage that the broad type of licence box would not gain any political support, we focus our analysis on the narrow type.

¹⁰The effective tax burden of 18.1 per cent for SPCs under the licence box regime comprises the federal profit tax of effectively 7.83 per cent and an effective average cantonal profit tax burden of 10.24 ($= 1/3 * 0.2 * 13.97 + 2/3 * 13.97$) per cent. That part of income qualifying for the licence box is subject to an effective tax burden of 2.8 per cent ($= 0.2 * 13.97$).

cent.

Taken together, the introduction of the licence box and the reduction in the cantonal profit tax rate imply a decline in the effective tax burden for SPCs from 21.8 per cent (after the abolishment of their special tax status) to about 13.82 per cent ($= 1/3 * (0.2 * 8.17 + 7.83) + 2/3 * (8.17 + 7.83)$). Thus, the effective tax burden for SPCs after the introduction of the licence box and the reduction in the cantonal profit tax rates is only slightly higher than in the current situation with an effective tax burden of around 10.1 per cent.

The main beneficiaries of the reduction in the cantonal profit tax rate are not the SPCs but the companies subject to the regular tax treatment under the current system. For these firms, the effective tax burden drops from 21.8 per cent initially to about 15.67 per cent ($= 0.05 * (0.2 * 8.17 + 7.83) + 0.95 * (8.17 + 7.83)$) after the introduction of the licence box and the reduction in the cantonal profit tax rate.

Table 1: Reform-Induced Changes in the Effective Corporate Tax Burden

	Status Quo	Abol. STS	Lic.Box ^{a)} (1)	TaxRed ^{a)} (2)	AECE ^{b)} (3)	LB&TR (1+2)	CTR III (1+2+3)
Special Purpose Companies (SPCs)							
Cantonal Level	2.27	13.97	10.2	8.17	2.27	5.99	5.99
Federal Level	7.83	7.83	7.83	7.83	7.83	7.83	7.83
Eff. Tax Burden	10.1	21.8	18.1	16.0	10.1	13.82	13.8
Regular Taxed Companies (RTCs)							
Cantonal Level	14.0	14.0	13.4	8.17	13.7	7.84	7.57
Federal Level	7.83	7.83	7.83	7.83	7.53	7.83	7.53
Eff. Tax Burden	21.8	21.8	21.2	16.0	21.2	15.7	15.1

^{a),b)} Change in effective tax burden with respect to ^{a)} the abolition of the special tax status for SPC, or with respect to ^{b)} the status quo.

Source: Own calculations.

Table 1 summarizes the changes in the effective profit tax burden for SPCs and regularly taxed companies (RTCs) under the different reform elements. The column ‘Status Quo’ depicts the effective profit tax burden on the cantonal and federal levels under the current tax system. The neighbouring column ‘Abol. STS’ reports the effects resulting from the abolishment of the special tax status for SPCs. The next two columns report the changes in the effective profit tax burden following the introduction of the licence box and the reduction in the cantonal tax rate. The joint effect arising from the two measures together is shown in the 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. The latter is defined by the amount of equity capital exceeding a company’s ‘core’ equity endowment necessary for the financial viability of the firm’s long-run business activity. Different types of equity capital that are not eligible for the tax deduction include, for instance, 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, is not eligible for tax deductibility either.¹¹ The notional return deductible on excess equity should be based on the interest rate of 10-year government bonds including a surcharge of a maximum of 50 base points. As such, this 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 (see Institute for Fiscal Studies, 1991).¹² While the ACE grants the tax deductibility of a notional return on the entire corporate equity, the Swiss reform proposal entails several corrections to the amount and type of corporate equity eligible for the tax deduction.

One of the main reasons for implementing the AECE instead of the ACE system is the loss in tax revenues associated with the latter system. 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 cost issue, the AECE system additionally allows 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 endowed with only equity capital and, in addition, they would face only a low core equity capital requirement. The latter is justified by the fact that receivables and payables net out in intra-group financing. With internal debt payments, the financial risk for the 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, by construction, the financial centres of multinational enterprises become those firms with the largest stock of excess equity and therefore will benefit most from the tax privileges granted by the AECE system. In essence, the AECE turns out to be a suitable substitute for the current tax benefit granted to Swiss finance branches of multinational companies, which currently enjoy the same special tax status as SPCs.¹³ As

¹¹In practice, the differentiation between excessive equity capital not indispensable for business activity and excess or security capital, exceeding the core equity endowment, seems to be a complex task and one of the major challenges associated with this reform element.

¹²The ACE tax system provides tax deductibility of the cost of investment finance irrespective of the source of finance. Thereby, 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.

¹³Swiss finance branches benefit from a special tax status similar to that of SPCs, that is, a tax burden of just 2 to 3 per cent at the cantonal level or about 11.0 per cent inclusive of the federal profit tax. To

such, the AECE enables Switzerland to remain an attractive location for financial centres of multinational companies even if the special tax status for Swiss finance branches is abolished.

Contrary to the Swiss finance branches, regularly taxed companies face higher core capital requirements to ensure the financial viability of the firm's long-run business activity. Therefore, the tax benefit arising from the AECE is only limited for regularly taxed companies. Based on the estimates of the FDF and FTA (2014), the total tax relief for regularly taxed companies due to the AECE system can be approximated by about 282 bn Swiss francs.¹⁴ For ease of comparability of the different reform elements, we re-compute the tax relief associated with the AECE system into a reduction in the effective profit tax rate. For regularly taxed companies, the estimated tax relief translates into a reduction in the effective tax rate of around 0.57 per cent vis-à-vis the status quo (see Table 1). Since the AECE has no direct impact on statutory tax rates, it also has no impact on the effective corporate tax burden of SPCs.

The last column in Table 1 shows the effective tax burden for SPCs and regularly taxed companies arising under the complete tax reform proposal at hand. After the annulment of the special tax status of SPCs, the introduction of the licence box, the reduction in the cantonal tax rate and the AECE system, the tax burden for SPCs increases slightly by 3.7 percentage points from 10.1 per cent initially to 13.8 per cent. With regard to the regularly taxed companies, the reform proposal brings about a substantial reduction in their tax burden from 21.8 per cent initially to 15.1 per cent.

Tax on Capital Gains

The last but no less crucial reform element is the introduction of a tax on private capital gains in combination with an alteration to the existing (partial) imputation system for capital income. Capital gains are largely tax exempt under the current system, except for those arising from immobile property or occurring to unincorporated firms. The reform proposal stipulates that capital gains in general should become subject to the personal income tax. A distinction, however, is made with regard to capital gains arising from firm ownership, which should benefit from an imputation rate of 30 per cent at the federal and cantonal levels. Capital gains arising from any other type of assets are not eligible

become eligible for the special tax status, the Swiss finance branch ruling requires foreign multinational firms to endow their Swiss financial centre with at least 100 m Swiss francs of equity and that at least three-quarters of the branch profits originate from finance activities.

¹⁴About 334 m Swiss francs of the total cost of the 610 m Swiss francs associated with the AECE system may be recovered by the tax revenues of the Swiss finance branches (see FDF and FTA, 2014). This implies a tax subsidy of about 328 m Swiss francs ($= 334 * [\frac{0.218}{0.11} - 1]$) for the Swiss finance branches, assuming that these firms face an average competitive tax rate of 11.0 instead of 21.8 per cent thanks to the AECE system. The implicit tax relief for regularly taxed companies then amounts to about 282 m Swiss francs ($= 610 - 328$).

for any tax privilege. Thus, the reform is accompanied by an increase in the tax burden on capital income at the personal level. For instance, in the case of a taxpayer facing the maximum personal income tax rate of 36.6 per cent, the tax burden on capital income increases from around 4.9 to 17.2 per cent ($= 0.67 * 0.7 * 36.6$) for corporate equity and from about 9.7 to 12.8 per cent ($= 0.5 * 0.7 * 36.6$) for unincorporated equity.¹⁵

The adjustment in the imputation system affects not only the taxation of capital gains but also that of dividend income. While the federal and cantonal levels grant an imputation of capital gains of 40 and around 50 per cent, respectively, the reform proposal stipulates a uniform imputation rate of 30 percent. The change thus implies an increase in the personal tax burden on dividend income from 19.4 per cent initially to about 25.6 per cent.¹⁶

The introduction of the capital gains tax has no direct impact on the effective tax rate of SPCs or regularly taxed companies. Nevertheless, the taxation of private capital gains (and dividends) constitutes double taxation of corporate profits and thus distorts the decision on investing either in firm equity or in the capital market, that is, interest-bearing assets (Auerbach, 2002).¹⁷ Thus, the reform proposal again creates a tax distortion that, as one of its major aims, was mostly blocked by the previous (second) Swiss corporate tax reform (CTR II).¹⁸ Given that the taxation of private capital gains affects the tax burden at the personal but not the corporate level, this reform measure is not reflected in Table 1.

¹⁵Even though corporate capital gains are largely tax exempt under the current system, we follow Keuschnigg (2006) and assume that 20 per cent of corporate capital gains are subject to taxation, given the various exemptions from the non-taxability of capital gains. Further, capital gains are taxed on 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. Contrary to that, unincorporated capital gains are generally subject to taxation, but, similar to dividend income, they 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 ($= 0.5 * (0.6 * 11.0 + 0.5 * 25.6)$) per cent.

¹⁶The calculation is based on income facing a top tax rate of 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 ($= 0.5 * 25.6 + 0.6 * 11.0$) under the current imputation system and an effective tax burden of 25.6 per cent ($= 0.7 * (25.6 + 11.0)$) after the reform.

¹⁷For instance, with retained earnings as the marginal source of investment funds, which implies dividend tax neutrality, capital gains taxes increase the cost of capital and distort corporate investment (Auerbach, 2002).

¹⁸For an in-depth analysis of the second Swiss corporate tax reform (CTR II), see Dietz and Keuschnigg (2003).

3 The CGE Model Applied

We apply a computable general equilibrium (CGE) model to quantify the economic effects and the economy-wide repercussions of the third Swiss corporate tax reform (CTR III). The model resembles an empirically implemented neoclassical growth model with in-depth modelling of the firm sector. Hence, the model is ideally suited to analysing the short- and long-run adjustment processes triggered by any fundamental corporate tax reform against both a theoretical and a quantitative background. In addition, the dynamic feature of the model allows us to capture tax capitalization effects. The model consists of four building blocks, the firm and 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 on various international dimensions, such as cross border goods and capital flows, as well as the international tax avoidance behaviour of firms and households.

The firm sector is modelled in great detail and accounts for firms with different legal forms, including incorporated and unincorporated firms, which differ with regard to their inherent characteristics, such as the capital intensity or the debt equity ratio, as well as their tax treatment. In its basic set-up, the firm sector represents a neoclassical investment model. While accounting for all the relevant Swiss taxes levied on the federal, cantonal and municipal levels, firms maximize their profits by optimizing their investment, method of finance and labour input. Thus, the model allows us to identify the repercussions of fundamental changes in the Swiss tax code for the investment, finance and employment decisions of Swiss firms. The 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 the 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 income of SPCs. The amount of mobile profits of foreign firms shifted into Switzerland is endogenous to the model and depends crucially on the tax differential between the two countries and the value of the elasticity of profit shifting. The theoretical analysis identifying the effects of the reform on firm behaviour is found in Subsection 3.1 and 3.2.

The household sector consists of a representative agent who decides on the 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 the household savings and thus the size of the optimal 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 hence in international capital interdependencies

due to the re-optimizing portfolio choices of domestic (and foreign) households.

The Government levies taxes on firms and households and incurs debt. 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 on the federal, cantonal and municipal levels as represented by 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 kept constant at its long-run average. In general equilibrium, the present value of all future tax income equals government spending plus government debt to ensure that the inter-temporal budget constraint holds and to 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 and household sector and the foreign government. To exploit the difference in corporate taxation across countries, part of the foreign firm profits is shifted to the domestic economy. In line with the existing literature, the amount of profits shifted abroad depends on the size of the tax differential between the two countries and on the concealment costs.

Each sector is calibrated to capture in detail the characteristics of the Swiss economy. The most important behavioural parameters applied and the calibration of the model are explained in the Appendix.

Given the importance of the firm sector, we will review the formal modelling of corporate 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 Stimmelmayer (2010) or Stimmelmayer (2007).

3.1 Corporate Firm Behaviour

Corporate firms produce a homogeneous good. The production technology, $Y = F(K, \bar{L}, E)$, with $F(0) = 0$ and $F' > 0$, $F'' < 0$, is linearly homogeneous and utilizes capital, K , a labour composite, \bar{L} , consisting of different skill types, and a fixed factor, E , as inputs.¹⁹

The choice of investment finance is endogenous and includes retained earnings, $(\pi - \chi)$, and external bank debt, BN .²⁰ The flow of funds equation takes the form

$$I_t = (\pi_t - \chi_t) + BN_t. \quad (1)$$

Retained earnings are defined by profits, π , less dividend distributions, χ . External debt

¹⁹The fixed factor determines the importance of the sector specific economic rent that can be realized by operating in that sector.

²⁰New share issues are considered as an additional source of funds in the model. Their fraction, however, is kept constant throughout the simulations and for the sake of convenience left out of the subsequent exposition.

incurs interest costs, i , and convex agency cost, $m(b)$, which depend on the debt-asset ratio, $b = B/K$. The agency cost increases in b at an increasing rate, that is, $m'(b) > 0$ and $m''(b) > 0$.²¹ Firms behave competitively and maximize net of corporate tax profits:

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

where τ^P denotes the corporate profit tax rate, $J(I, K)$ represents adjustment cost of investment, $w^c \bar{L}$ are wage costs and $(i + m(b))B$ are the cost of debt finance. Besides the tax deductibility of each of the three cost types, an imputed return on equity capital, $i^E(K - B)$, is tax deductible at a rate of $z \in [0, 1]$, where i^E is the imputed return on equity.²²

Denoting $G = 1 + g$ as the growth factor related to labour productivity, financial arbitrage ensures

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

That is, a capital market investment that generates a net-of-tax return of $r = (1 - \tau^I)i$ is equally profitable as an investment in the firm that yields net-of-tax dividends of $(1 - \tau^D)\chi$ and net-of-tax capital gains of $(1 - \tau^G) [GV_{t+1} - V_t]$. τ^I , τ^D and τ^G denote the tax rates related to interest income, dividend income and capital gains.²³

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

$$\begin{aligned} V_t^e(K_t, B_t) &= \max_{\bar{L}_t, I_t, BN_t} \left[\frac{1 - \tau^D}{1 - \tau^G} (\pi_t + BN_t - I_t) + \frac{GV^e(K_{t+1}, B_{t+1})}{1 + \frac{r_t + 1}{1 - \tau^G}} \right] \\ \text{s.t.} \quad & GK_{t+1} = I_t + (1 - \delta)K_t, \\ \text{and} \quad & GB_{t+1} = BN_t + B_t. \end{aligned} \quad (4)$$

The maximand is expressed in terms of end of period firm values, $V_t^e = (1 + \frac{r_t}{1 - \tau^G}) V_t$, as indicated by the superscript e . The constraints reflect the equation of motion for 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 new debt incurred, BN , to the existing stock of debt, B .

²¹The convex agency cost function implicitly implies that banks charge an additional fee of $m(b)$, which is dependent on the firm's debt-asset ratio, to insure against the higher risk of default associated with more indebted firms.

²²Straightforwardly, in a corporate tax system in which the deductibility provision only applies to excess equity, the tax subsidy is $z i^E (K - B - CE)$, provided $K - B - CE > 0$, where CE denotes the amount of core equity.

²³Solving forward, (3) yields an explicit expression for the firm value that is determined by the discounted sum of all future tax adjusted distributions to firm owners, that is,

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

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

$$\begin{aligned}
\text{(a)} \quad \bar{L}_t &: w_t = F_{\bar{L}_t}, \\
\text{(b)} \quad I_t &: q_{t+1}^e = \left(1 + \frac{r_{t+1}}{1-\tau^G}\right) \frac{1-\tau^D}{1-\tau^G} [1 + (1-\tau^P)J_I], \\
&\Rightarrow q_{t+1} = \frac{1-\tau^D}{1-\tau^G} [1 + (1-\tau^P)J_I] \quad \text{with: } q_{t+1} = q_{t+1}^e / \left(1 + \frac{r_{t+1}}{1-\tau^G}\right), \\
\text{(c)} \quad BN_t &: \lambda_{t+1}^e = -\left(1 + \frac{r_{t+1}}{1-\tau^G}\right) \frac{1-\tau^D}{1-\tau^G}, \\
&\Rightarrow \lambda_{t+1} = -\frac{1-\tau^D}{1-\tau^G} \quad \text{with: } \lambda_{t+1} = \lambda_{t+1}^e / \left(1 + \frac{r_{t+1}}{1-\tau^G}\right).
\end{aligned} \tag{5}$$

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.²⁴ The optimal labour demand is determined by the equality between the marginal product of the labour composite and its corresponding cost, w^c , as indicated by (5a). 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 using debt, that is, $\frac{1-\tau^D}{1-\tau^G}$, 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.

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

$$\begin{aligned}
\text{(a)} \quad q_t^e &= \frac{(1-\tau^D)(1-\tau^P)}{1-\tau^G} [F_K - J_K + m'b^2] - \left(\frac{\tau^P(1-\tau^D)}{1-\tau^G}\right) \delta + \frac{q_{t+1}^e}{1 + \frac{r_{t+1}}{1-\tau^G}} (1-\delta), \\
\text{(b)} \quad \lambda_t^e &= \frac{(1-\tau^D)(1-\tau^P)}{1-\tau^G} [-(i+m) - m'b] + \frac{\lambda_{t+1}^e}{1 + \frac{r_{t+1}}{1-\tau^G}}.
\end{aligned} \tag{6}$$

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

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

A reduction in the profit tax rate reduces firms' cost of capital and hence stimulates cor-

²⁴The 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.

porate investment, provided that the tax deductibility of the cost of equity is insufficiently high, that is, $i^E z < r_t/1 - \tau^G$. Otherwise, the deductibility provision exactly neutralizes 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:

$$\frac{\partial(F_K - \delta)}{\partial z} = -\frac{\tau^P i^E}{(1 - \tau^P)}(1 - b) < 0. \quad (8)$$

Straightforwardly, in a corporate tax system in which 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 thereby the firm increases its excess equity when financing investment through retained earnings.²⁵ Finally, the stipulated increase in the capital gains tax rate increases the firm's cost of capital and thus produces a counteracting effect on investment:

$$\frac{\partial(F_K - \delta)}{\partial \tau^G} = \frac{r_t}{(1 - \tau^G)^2}(1 - b) > 0. \quad (9)$$

3.2 Special Purpose Companies (SPCs)

Following the legal requirements, SPCs are allowed to have neither substantial employment 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

$$\begin{aligned} V_t^{e,F}(K_t^F) &= \max_{L_t^F, I_t^F, S_t^F} (1 - \tau^{P,F}) [Y(K_t^F, L_t^F, E_t^F) - J^F(I_t^F, K_t^F) - w_t^F L_t^F] - I_t^F \\ &\quad + (\tau^{P,F} - \tau^{P*}) S_t^F - \phi(S_t^F) + \frac{GV^{e,F}(K_{t+1}^F)}{1+r_{t+1}^F} \\ \text{s.t.} \quad & GK_{t+1}^F = I_t^F + (1 - \delta)K_t^F, \end{aligned} \quad (10)$$

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

$$\frac{\partial V_t^{e,F}}{\partial S_t^F} : \quad \left(\tau_t^{P,F} - \tau_t^{P*} \right) = \phi'(S_t^F). \quad (11)$$

Condition (11) implies that the optimal amount of foreign profits shifted abroad is determined by equating the profit tax differential, $\tau^{P,F} - \tau^{P*}$, to the marginal concealment cost,

²⁵Otherwise, retaining profits for investment increases the core equity capital and the deductibility rate, z , does not influence investment, that is $\partial(F_K - \delta)/\partial z = 0$.

$\phi'(S^F)$. τ^{P^*} denotes the statutory profit tax rate relevant to SPCs, while τ^P and $\tau^{P,F}$ are the regular statutory profit tax rates at home (Switzerland) and abroad, respectively. Applying a constant-elasticity functional form to the concealment cost

$$\phi(S_t^F) = \frac{\gamma_s^{-\frac{1}{\epsilon_s}}}{\frac{\epsilon_s+1}{\epsilon_s}} (S_t^F)^{\frac{\epsilon_s+1}{\epsilon_s}}, \quad \epsilon_s, \gamma_s > 0, \quad (12)$$

the optimal amount of foreign profits shifted into Switzerland is

$$S_t^F = \gamma_s \left(\tau_t^{P,F} - \tau_t^{P^*} \right)^{\epsilon_s}. \quad (13)$$

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; and Hong and Smart 2010, among others). Further, profit-shifting incentives increase in the elasticity of profit shifting with regard to the tax rate differential, ϵ_s , and the parameter γ_s .

It becomes evident from (13) that the abolition 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 notation of the model, the preferential tax rate, $\tau_t^{P^*}$, becomes equal to the ordinary profit tax rate, τ_t^P , after the abolition of the special tax status. In contrast, the reduction in the cantonal profit tax directly reduces the statutory tax rate, τ_t^P , and this 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 these and other reform elements.

4 Simulation Results

To gain a better understanding of the implications of the different reform elements of the third corporate tax reform (CTR III), we quantify the effects of the different elements of the CTR III separately. We start out with the abolition of the preferential tax treatment for SPCs. In the next step, we evaluate the impact arising from the introduction of the licence box, the reduction in the cantonal profit tax and the joint effect arising from the two measures. Thereafter, we turn to the effects of an allowance for excess corporate equity (AECE), which grants tax deductibility only for the imputed return on excess corporate equity. The joint effect resulting from these first three measures is presented in Table 5, while Table 7 reports the effect of the complete tax reform proposal in which the taxation of private capital gains is additionally considered.

4.1 Abolishment 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 around 10.1 per cent, inclusive of the federal profit tax of effectively 7.83 per cent. If the special tax treatment is abolished for these companies, as requested by the OECD and the EU, the effective tax burden of these firms rises from 10.1 per cent initially to 21.8 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. Since the abolition of the preferential tax treatment of SPCs diminishes the tax differential between the foreign country and Switzerland, which is relevant to profit-shifting incentives (see Haufler and Schjelderup 2000, or Mintz and Smart 2003, for instance), SPCs lose significantly on their taxable income. The amount of profit shifted depends on the elasticity of profit shifting, for which empirical estimates are available (see Huizinga and Laeven, 2008, for instance). We analyse the effects resulting from the CTR III for a series of different values of this elasticity. As the lower bound for the elasticity, we apply a value of 0.4, which corresponds to semi-elasticity of about 1.07. A similar value is, for instance, reported for Austria (Huizinga and Laeven, 2008). As the upper bound, we apply a value of 1.5, which is slightly larger than the respective elasticities of 1.13 (semi-elasticity of 2.75) found for Belgium or 1.05 (semi-elasticity of 2.92) found for the Netherlands by Huizinga and Laeven (2008).²⁶ The latter countries have already implemented a licence box, which might explain the relatively high values for the respective elasticities and might justify the use of a similar value for Switzerland.

The simulation results for the different elasticity values are reported in Table 2. For an elasticity value of $\epsilon_S = 1.1$, the tax base of SPCs decreases by 71.2 per cent due to the abolition of the special tax regime. In aggregate, the vast reduction in the tax base dominates the effect arising from the increase in the tax rate, implying that the tax revenues collected from SPCs decline by about 38 per cent. The short-fall in tax revenue equals an amount of about 1.95 bn Swiss francs while the total drop in the Government's budget amounts to about 2.1 bn Swiss francs. The larger drop in the total government revenue is mainly explained by the behavioural response of households. Given that the government budget is balanced by means of lump-sum transfers, the short fall in tax revenue retrenches household consumption (-0.59 per cent in the short run) and thus causes an additional decline in consumption tax revenue. The shortfall in household consumption makes the welfare effect associated with the abolition of the special tax status

²⁶The interpretation of the reported elasticity values is that the amount of foreign profits subject to taxation in Austria decreases by 10.7 per cent if the corporate tax rate in Austria is increased by 10 percentage points. Similarly, the decline in foreign profits subject to taxation in Belgium or the Netherlands amounts to 27.5 and 29.2 per cent if the corporate tax rate is increased by 10 percentage points in the respective countries.

for SPCs negative. Welfare is measured by the equivalent variation and declines by 0.65 or 0.37 per cent when expressed in terms of household wealth or GDP, respectively. Thus, the abolition of the preferential tax treatment of Swiss SPCs implies a reform-induced loss of wealth of Swiss households that is as large as 0.65 per cent of the 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 the case in which the respective elasticity is set to 1.5 and is thus even larger than that found for Belgium or the Netherlands, the loss of wealth of Swiss households rises above 1 per cent. The rationale for the larger loss of welfare refers to the even larger reduction in the tax base of SPCs. If the elasticity takes a value of 1.5, the loss of taxable foreign profits exceeds 80 percent, which implies a loss of 60 percent (or 3.1 bn Swiss francs) of tax revenues collected from SPCs.

Table 2: Abolishment 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	0.001	0.001	0.000	0.000
HH-Consumption (Short Run)	0.570	-0.041	-0.591	-0.941
HH-Consumption (Long Run)	0.588	-0.025	-0.577	-0.929
Tax Base SPCs	-36.44	-54.75	-71.23	-81.72
Tax Revenues SPCs	37.20	-2.328	-37.91	-60.53
Tax Revenues SPCs ^a	1.912	-0.120	-1.949	-3.112
Short-Run Budget Effect ^a	2.128	-0.100	-2.107	-3.384
Long-Run Budget Effect ^a	2.116	-0.111	-2.117	-3.392
Welfare in % of HH Wealth	0.658	-0.031	-0.651	-1.046
Welfare in % of GDP	0.377	-0.018	-0.373	-0.599

ϵ_S denotes the elasticity of shifted profits w.r.t. top tax rate; ^aChanges in bn Swiss franc.

Source: Own calculations.

To the contrary, if the elasticity is much smaller, that is 0.4, such as the estimate that is reported for Austria for instance, the abolishment of the preferential tax treatment of SPCs would be beneficial in terms of welfare. Under the lower value of elasticity, the decline in the tax base of SPCs is only moderate (-36.4 percent) and hence the increase in the tax rate (from 10.1 per cent initially to 21.8 per cent) dominates the effect on tax revenues. In total, the tax revenues collected from SPCs increase by more than 37 per cent which implies a value of about 1.9 bn Swiss francs. Since the additional tax revenues are passed on to households, the consumption increases by almost 0.6 per cent in the long run. The higher level of consumption has positive repercussions for the government budget, since the consumption tax revenues increase in response to the higher level of

consumer spending. Interestingly, if the value of the elasticity is 0.7, the negative tax base effect (-54.75 per cent) and the positive impact of the tax rate increase almost cancel out their effect on tax revenues. In consequence, the tax revenue collected from SPCs amounts to a loss of ‘just’ 2.3 per cent, or equivalently 0.12 bn Swiss francs.

With respect to economic growth, Table 2 shows that the abolishment of the preferential tax treatment has only a negligible effect 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 are allowed to have neither extensive business activity nor a high level of employment in Switzerland.

To summarize, the abolishment of the preferential tax treatment for SPCs has a strong negative impact on welfare if foreign firm profits are rather mobile - which they presumably are. Thus, to counteract the negative welfare consequences of the elimination of the special tax status of SPCs, the proposed licence box might be an adequate instrument.

4.2 Introduction of the Licence Box

According to the latest reform proposal (FDF and FTA, 2014), the licence box should be designed to capture about one-third of profits of the SPCs but only about 5 per cent of the profits of regularly taxed companies. Only 20 per cent of the profits, that qualify for the licence box are subject to the cantonal profit tax, while the remaining fraction of 80 per cent is exempted from cantonal taxation. At the federal level, the licence box grants no special tax treatment. Hence, the introduction of the licence box reduces the effective tax burden for SPCs from 21.8 per cent initially (after the abolition of the special tax status for SPCs) to 18.07 per cent. Due to the limited eligibility of profits of regularly tax firms for the licence box, the windfall gains associated with the licence box are only small for those firms. This implies a decline in the effective tax rate for regularly taxed firms from 21.8 per cent initially to 21.24 per cent.

The economic effects emerging from the isolated introduction of the licence box are presented in Table 3. The results are again reported for different values of the elasticity of profit shifting (the parameter ϵ_S in section 3.2). Comparing the results presented in Table 2 and Table 3, it becomes evident that the introduction of the licence box is an effective instrument to limit the outflow of foreign firm profits after the abolition of the special tax treatment of SPCs. Given a value of 1.1 for the elasticity of profit shifting, the outflow of taxable foreign profits is reduced from -71.2 to -44.6 per cent which, in combination with the higher tax rate for SPCs, almost stabilizes the tax revenues collected from SPCs (-0.9 per cent). Even though the adjustment process causes a decline in short-run consumption (-0.04 per cent) and in overall government revenues (-315 bn Swiss francs), the long-run outcome shows a very small but positive welfare effect (+0.02 per cent).

For lower values of elasticity, such as 0.4, the elimination of the special tax status of

SPCs turns out not to be severe. The increase in tax revenues due to the higher tax rate for SPCs more than overcompensates for the decline in the tax base of these firms. As a consequence, household consumption expands in the short and the long run, facilitating a positive welfare outcome. In detail, the introduction of the licence box limits the outflow of foreign firm profits by almost 50 per cent, meaning that the tax base of SPCs declines by just -19.3 instead of -36.4 per cent; hence, the tax revenues from SPCs rise by 44.3 instead of 37.2 per cent, which equals an amount of 2.28 instead of 1.91 bn Swiss francs. The additional tax revenues enable household consumption to increase by 0.76 instead of 0.59 per cent and in turn welfare, measured in terms of household wealth, rises by 0.82 instead of 0.66 per cent.

Table 3: Abolishment of the Special Tax Status and Introduction of the Licence Box

All Changes in %	$\epsilon_S = 0.4$	$\epsilon_S = 0.7$	$\epsilon_S = 1.1$	$\epsilon_S = 1.5$
GDP	0.077	0.077	0.077	0.077
Investment	0.195	0.195	0.195	0.195
Labour Demand	0.019	0.019	0.019	0.019
HH-Consumption (Short Run)	0.664	0.322	-0.035	-0.331
HH-Consumption (Long Run)	0.756	0.423	0.055	-0.242
Tax Base SPCs	-19.33	-31.32	-44.60	-55.30
Tax Revenues SPCs	44.34	22.87	-0.878	-20.03
Tax Revenues SPCs ^a	2.279	1.175	-0.045	-1.030
Short-Run Budget Effect ^a	2.234	1.024	-0.315	-1.395
Long-Run Budget Effect ^a	2.365	1.155	-0.182	-1.262
Welfare in % of HH Wealth	0.815	0.441	0.027	-0.307
Welfare in % of GDP	0.467	0.252	0.016	-0.176

ϵ_S denotes the elasticity of shifted profits w.r.t. top tax rate; ^aChanges in bn Swiss franc.

Source: Own calculations.

If the relevant elasticity of profit shifting is above the value of 1.1, that is, if the foreign firm profits shifted into Switzerland are more mobile than the ones shifted into Belgium or the Netherlands, the isolated introduction of the licence box is not sufficient to guarantee a positive welfare effect after the elimination of the special tax treatment of SPCs. Assuming a value of 1.5 for the elasticity of profit shifting, the outflow of foreign firm profits is indeed reduced from -81.7 to -55.3 per cent. The loss of tax revenues is limited from -60.5 to -20.0 per cent, that is, from -3.1 to about -1.0 bn Swiss francs. Nevertheless, the financial cost associated with the reform implies a decline in household consumption and hence generates a negative welfare effect.

In contrast to the results presented in Table 2, we infer from Table 3 that the introduction of the licence box has a certain (but only marginal) effect on the real economy. Only a small fraction of the regularly taxed companies benefits from the introduction of

the licence box.²⁷ In response to this slight tax stimulus, the positive effects on output (+0.08 per cent), investment (+0.2 per cent) and employment (+0.02 per cent) are small.

4.3 Reduction in the Cantonal Profit Tax Rate

To warrant a competitive tax burden on foreign firm profits after the elimination of the special tax status for SPCs, the proposed CTR III entails a reduction in the cantonal profit tax rate in addition to the introduction of the licence box (FDF and FTA, 2014). The committee expects that several cantons will reduce their profit tax rate significantly to ensure an internationally competitive effective tax burden of around 13 per cent (inclusive of the federal profit tax). In contrast to that, several other cantons are more likely to compete only nationally and thus will maintain higher cantonal profit taxes. For the latter cantons, an effective tax burden of around 20 per cent inclusive of the federal profit tax is assumed to hold. On average across cantons, the cantonal profit tax rate is supposed to decline by around 6 percentage points, implying an effective tax burden of 16 per cent (inclusive of the federal profit tax) across cantons. Accounting for the tax benefit associated with the introduction of the licence box, the reduction in the cantonal tax rate yields an effective tax burden of 13.8 per cent for the former SPCs and 15.67 per cent for the regularly taxed companies.

In the simulation, we additionally consider a scenario in which the reduction in the cantonal profit tax is less pronounced and amounts to just 4 percentage points on average across cantons. As a consequence of the smaller tax reduction, the effective tax burden of former SPCs amounts to 17.8 per cent on average across cantons, or 15.14 per cent, if the tax benefit associated with the licence box is additionally taken into account. Regularly taxed companies are subject to an effective tax burden of 17.4 when accounting for the smaller reduction in the average cantonal profit tax and the tax advantage arising from the license box.²⁸

Independently of the size of the applied elasticity, the larger reduction in the cantonal profit tax results in more pronounced growth effects in the real economy. In the case that the reduction in the profit tax amounts to 6 percentage points on average across cantons, the GDP grows by 0.8 per cent, investment by almost 2.1 per cent and labour demand by 0.2 per cent. If the reduction in the respective cantonal tax is on average 4 percentage points, the changes in GDP, investment and labour demand are significantly lower and amount to 0.59, 1.49 and 0.15 per cent, respectively. However, the larger growth effect

²⁷Note that the FDF and FTA (2014) assume that only about 5 per cent of the profits of regularly taxed companies might become eligible for the licence box.

²⁸The reduction in the current cantonal profit tax of 13.97 per cent ($= 21.8 - 7.83$) by 4.0 percentage points implies an effective tax burden of 17.8 per cent ($= 13.97 - 4.0 + 7.83$), inclusive of the federal profit tax, across cantons. Accounting additionally for the tax benefit arising from the introduction of the licence box, the effective tax burden of former SPCs is reduced to 15.14 per cent ($= 1/3 * (0.2 * 9.97 + 7.83) + 2/3 * 17.8$) and that for regularly taxed companies to 17.4 per cent ($= 0.05 * (0.2 * 9.97 + 7.83) + 0.95 * 17.8$).

under the 6 percentage point reduction in the cantonal profit tax does not guarantee a larger welfare effect of the reform per se.

In the case of a value of $\epsilon_S = 1.1$ for the elasticity of profit shifting, the larger reduction in the tax rate leads to a less severe outflow of taxable foreign profits. The latter amounts to about 20 and 27 per cent under the 6 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 for by the higher tax rate, leading to additional tax revenues of about 10.1 and 9.5 per cent, which equal about 0.52 and 0.49 bn Swiss francs, respectively. Even though the larger tax rate reduction is more expensive in relative terms in the short run - it limits the household reduction by -0.07 instead of -0.01 per cent - the growth effects allow long-run consumption to increase by almost +0.8 instead of +0.6 per cent. As a consequence, welfare expressed in terms of household wealth rises by 0.51 and not just 0.42 per cent when the cut in the cantonal profit tax is 2 percentage points higher (6 instead of 4 percentage points).

Table 4: Abolishment of the Special Tax Status, Introduction of the Licence Box and Cantonal Profit Tax Reduction

All Changes in %	6% Tax Reduction		4% Tax Reduction	
	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$
GDP	0.806	0.806	0.586	0.586
Investment	2.060	2.060	1.490	1.490
Labour Demand	0.201	0.201	0.146	0.146
HH-Consumption (Short Run)	0.180	-0.072	0.363	-0.011
HH-Consumption (Long Run)	1.019	0.765	0.976	0.600
Tax Base SPCs	-7.611	-19.56	-10.80	-26.96
Tax Revenues SPCs	26.42	10.07	33.72	9.487
Tax Revenues SPCs ^a	1.358	0.517	1.733	0.488
Short-Run Budget Effect ^a	-1.676	-2.596	-0.357	-1.722
Long-Run Budget Effect ^a	-0.259	-1.180	0.680	-0.685
Welfare in % of HH Wealth	0.797	0.512	0.843	0.421
Welfare in % of GDP	0.456	0.293	0.483	0.241

ϵ_S denotes the elasticity of shifted profits w.r.t. top tax rate; ^aChanges in bn Swiss franc.

Source: Own calculations.

The simulation results show a different picture when a lower elasticity value of 0.4 is applied. In the case of less mobile foreign firm profits, the extent to which the cantonal profit tax is reduced has a crucial impact on tax revenues. Under low mobility of foreign firm profits, the reduction in the profit tax is relatively more expensive as it triggers a smaller adjustment in the respective tax base. Thus, it is less likely that the positive tax

base effect will be strong enough to compensate for the loss of tax revenues due to the reduction in the tax rate. The tax revenues rise by 33.7 per cent (1.73 bn Swiss francs) instead of only 26.4 per cent (1.36 bn Swiss francs) when the reduction in the cantonal profit tax is limited to 4 instead of 6 percentage points. The larger amount of tax revenues collected enables short-run household consumption almost to double, specifically by 0.4 instead of 0.2 per cent. Even though the more pronounced reduction in the profit tax rate generates a larger economy-wide growth effect (0.81 instead of 0.59 per cent), the expansion of long-run consumption (1.0 vis-à-vis 0.98 per cent) is not sufficiently large to dominate the welfare effect of the reform. Expressed in terms of household wealth, welfare rises by 0.80 instead of 0.84 per cent, indicating that the less pronounced reduction in the cantonal profit tax rate (that is, 4 instead of 6 percentage points) is preferable in terms of welfare when the elasticity of profit shifting is relatively low.

In summary, the simulation results presented in Table 4 show a possibly surprising result. In general, lower profit taxes reduce the deadweight loss and thereby increase the efficiency of resource allocation. The results show that for a low value of the elasticity of profit shifting, the less pronounced reduction in the cantonal profit tax rate is welfare superior, while for a higher value of the elasticity, the more pronounced tax cut results in a more beneficial welfare outcome. The finding is related to tax-exporting incentives. With an internationally mobile profit stream, part of the local tax burden can be exported to foreign firm owners and the tax-exporting incentive prompts governments to prefer a higher profit tax rate (see Huizinga and Nielsen, 1997, for instance).²⁹ Still, the optimal tax rate is determined by the tax-exporting incentive and the incentive to generate tax revenues, which explains why 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), that is, the tax deductibility of a notional return on excess corporate equity. As discussed, the main motivation for this reform element is to have an instrument to grant tax benefits selectively 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 so-called Swiss finance branches. Beside the tax benefits for these financial centres, the AECE additionally provides some minor windfall gains for regularly taxed companies, which also enjoy a tax relief for their excess corporate equity holdings. As reported in Table 1, the tax benefit associated with the AECE is comparable with a reduction of 0.57 percentage points in the effective corporate tax rate for regularly taxed companies. For the latter firm type, the model structure is

²⁹Straightforwardly, when the profit stream is domestically owned, a lower tax rate continues to increase efficiency and the welfare measure used in the paper.

rich enough to implement the tax measure directly. Therefore, we do not have to resort to the reduction in the effective profit tax in the simulations. For SPCs, the AECE system is of no consequence, since neither the elasticity of profit shifting nor the statutory tax differential between the foreign country and the home country is directly affected by the introduction of the AECE system (c.f. (13)).

The simulation outcome presented in Table 5 is qualitatively similar to the one resulting from the reduction in the cantonal tax rate. That is, the more pronounced reduction in the cantonal tax rate is only welfare dominating when the elasticity of profit shifting is relatively large. For a low elasticity of profit shifting, a less pronounced reduction in the cantonal tax rate is preferable in terms of welfare. This finding also holds when the AECE system is introduced.

Independently of the magnitude of the reduction in the cantonal tax rate, the introduction of the AECE facilitates an additional positive but only small effect on economic growth. However, the growth impact arising from the AECE system is more pronounced under the 4 vis-à-vis the 6 percentage point reduction in the cantonal profit tax rate. This is due to the fact that the tax advantage of the subsidy on excess equity, and thereby the reduction in the cost of capital, is increasing in the profit tax rate.

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

All Changes in %	6% Tax Reduction		4% Tax Reduction	
	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$
GDP	0.861	0.861	0.647	0.647
Investment	2.201	2.201	1.647	1.647
Labour Demand	0.215	0.215	0.161	0.161
HH-Consumption (Short Run)	0.165	-0.087	0.347	-0.027
HH-Consumption (Long Run)	1.059	0.805	1.022	0.646
Tax Base SPCs	-7.611	-19.56	-10.80	-26.96
Tax Revenues SPCs	26.42	10.07	33.72	9.487
Tax Revenues SPCs ^a	1.358	0.517	1.733	0.488
Short-Run Budget Effect ^a	-1.886	-2.807	-0.588	-1.953
Long-Run Budget Effect ^a	-0.373	-1.294	0.559	-0.806
Welfare in % of HH Wealth	0.819	0.534	0.870	0.447
Welfare in % of GDP	0.469	0.306	0.498	0.256

ϵ_S denotes the elasticity of shifted profits w.r.t. top tax rate; ^aChanges in bn Swiss franc.

Source: Own calculations.

Comparing the simulation results in Table 4 and table 5, the introduction of the AECE raises the long-run increase in GDP, investment and employment by approximately 6.8

per cent under the 6 percentage point reduction in the cantonal tax rate and by even more than 10 per cent in the case in which the cantonal tax rate is reduced by only 4 percentage points. Despite these substantial effects, the absolute increase in GDP, investment and employment amounts to only around 0.06, 0.15 and 0.01 percentage points, respectively. This very tiny growth effect is explained by the very limited tax relief for regularly taxed companies that follows the introduction of the AECE system.

The tax base of SPCs and thus the tax revenues collected from SPCs are not affected by the introduction of the AECE system. The cost of introducing the AECE system amounts to about 220 m Swiss francs in the short run and about 120 m Swiss francs in the long run. Thus, due to the positive real effects of the AECE on the economy, the short- and long-run costs of the AECE system are lower than the tax relief of initially 282 m Swiss francs that is granted to regularly taxed companies.³⁰

Thus, the introduction of the AECE system restricts short-run consumption possibilities slightly but allows for a higher long-run consumption level due to the growth stimulus of the AECE. This increase in long-run consumption possibilities exerts a positive impact on welfare. Expressed in terms of household wealth, the increase in welfare is roughly 3 per cent (0.025 percentage points) larger when the AECE is implemented.

4.5 Taxing Private Capital Gains

Finally, we consider additionally the taxation of private capital gains and the proposed changes in the imputation system in the simulations. Under the current tax law, capital gains from corporate equity holdings are largely untaxed (with the exception of professional trading companies). The reform proposal stipulates the taxation of capital gains while granting an imputation of 30 per cent of realized capital gains at the cantonal and federal levels.³¹ Accounting for the tax advantage of capital gains that accrue during the holding period, the effective tax burden on corporate capital gains increases from about 2.81 per cent currently to 9.85 per cent and that for unincorporated capital gains rises from 5.38 to 7.35 per cent.³² The adjustments in the existing imputation system additionally affects the effective tax burden on dividend income, which rises from the current 10.76 per cent to about 14.7 per cent after the reform.

These changes increase the cost of capital for firms, and, as shown in Table 6, the full implementation of the Swiss CTR III, inclusive of the tax on capital gains, features a negative effect on the real economy. If the cantonal tax rates are reduced on average by 6 percentage points, the negative effect is, however, very close to zero. Comparing the simulation results presented in Table 5 and Table 6, it becomes evident that the

³⁰See footnote 14.

³¹Capital gains arising from other securities than corporate holdings do not benefit from any imputation.

³²For a detailed discussion of the effective tax burden on capital gains, see Section 2 of the paper.

introduction of the tax on private capital gains completely offsets the positive growth effects of the other reform elements. In the case in which the cantonal profit tax rate is decreased by only 4 instead of 6 percentage points on average, the reform-induced effect on GDP, investment and employment is negative and amounts to -0.22, -0.55 and -0.05 percent, respectively.

Table 6: Swiss CTR III Including a Tax on Private Capital Gains (Median Tax Rate)

All Changes in %	6% Tax Reduction		4% Tax Reduction	
	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$
GDP	-0.002	-0.002	-0.215	-0.215
Investment	-0.007	-0.007	-0.545	-0.545
Labour Demand	-0.001	-0.001	-0.054	-0.054
HH-Consumption (Short Run)	0.882	0.629	1.060	0.685
HH-Consumption (Long Run)	0.651	0.397	0.607	0.232
Tax Base SPCs	-7.611	-19.56	-10.80	-26.96
Tax Revenues SPCs	26.42	10.06	33.72	9.487
Tax Revenues SPCs ^a	1.358	0.517	1.733	0.488
Short-Run Budget Effect ^a	-0.077	-0.845	1.265	-0.101
Long-Run Budget Effect ^a	0.850	-0.071	1.775	0.410
Welfare in % of HH Wealth	0.769	0.485	0.815	0.393
Welfare in % of GDP	0.440	0.277	0.467	0.225

ϵ_S denotes the elasticity of shifted profits w.r.t. top tax rate; ^aChanges in bn Swiss franc.

Source: Own calculations.

Given that the tax on capital gains and the adjustment of the imputation system affect the tax burden on the household and not the firm level, this reform element has no direct impact on the tax base of SPCs or on the tax revenues collected from these firms. Therefore, the changes in these variables are the same as those presented in Table 5.

As a consequence of the missing growth stimulus of the reform, the welfare outcome turns out to be inferior to that in the case of no taxation of private capital gains (see Table 5). The explanation for why the reform nevertheless shows a positive welfare outcome, despite the missing growth performance, is related to the additional tax revenues collected from the adjustment in the imputation system and the taxation of capital gains. The additional tax revenues contribute substantially to the financing cost of the reform and thus enable short-run household consumption to increase noticeably. Considering the 6 (4) percentage point reduction in the cantonal tax rate, short-run household consumption increases by 0.63 (0.68) per cent instead of declining by -0.09 (-0.03) per cent, as in the previous case in which capital gains remain untaxed. For long-run household consumption, though, the picture is reversed. Due to the negative impact of the capital gains tax on the long-run economic performance, the major increase in short-run household consumption is

not sustainable in the long run. Independently of the assumed elasticity of profit shifting and the reduction in the cantonal tax rate, the increase in long-run consumption turns out to be approximately 0.4 percentage points lower when private capital gains are subject to taxation. Consequently, the welfare impact of the reform shows a positive sign, but it is lower than in the case in which all the reform elements except for the taxation of capital gains are implemented.

Table 7: Swiss CTR III Including a Tax on Private Capital Gains (Top Tax Rate)

All Changes in %	6% Tax Reduction		4% Tax Reduction	
	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$	$\epsilon_S = 0.4$	$\epsilon_S = 1.1$
GDP	-0.702	-0.702	-0.914	-0.914
Investment	-1.741	-1.741	-2.257	-2.257
Labour Demand	-0.176	-0.176	-0.229	-0.229
HH-Consumption (Short Run)	1.297	1.042	1.450	1.072
HH-Consumption (Long Run)	0.200	-0.053	0.132	-0.244
Tax Base SPCs	-7.611	-19.56	-10.80	-26.96
Tax Revenues SPCs	26.42	10.07	33.72	9.487
Tax Revenues SPCs ^a	1.358	0.517	1.733	0.488
Short-Run Budget Effect ^a	1.092	0.170	2.248	0.881
Long-Run Budget Effect ^a	1.574	0.653	2.344	0.979
Welfare in % of HH Wealth	0.589	0.304	0.605	0.182
Welfare in % of GDP	0.337	0.174	0.346	0.104

ϵ_S denotes the elasticity of shifted profits w.r.t. top tax rate; ^aChanges in bn Swiss franc.

Source: Own calculations.

Note that the results in Table 6 are based on the assumption that capital gains are subject to the income tax rate of the median income taxpayer. Thus, the scenario implicitly assumes that most capital gains are realized by middle-class taxpayers or that capital gains are relatively evenly distributed across taxpayers. The biggest share of capital gains might well be realized by taxpayers earning a high income. Due to the progression of the personal income tax schedules at the cantonal and federal levels, capital gains would then be subject to a much higher effective tax rate than the one assumed in Table 6. To check the robustness of our results, we conduct an additional simulation in which we assume that capital gains are mostly realized by taxpayers in the highest personal income tax bracket. In this case, the effective tax burden on corporate capital gains increases from about 4.9 per cent currently to 17.2 per cent.³³ Additionally, the effective tax burden on dividend income rises due to the adjustments in the imputation system from the current 19.4 per cent to about 25.6 per cent after the reform. The respective simulation results

³³Given 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 initially to 12.8 per cent.

are presented in Table 7 and show a substantial negative effect on the real economy but not necessarily on welfare.

In the case of the 6 (4) percentage point reduction in the cantonal tax rate, the inclusion of capital gains in the personal income tax leads to a reduction in the total output by 0.70 (0.91) per cent. Investments decline by more than 1.7 (2.2) per cent and employment drops by 0.18 (0.23) per cent. Thus, the negative effects on the real economy turn out to be more severe when the reduction in the cantonal tax rate amounts to only 4 percentage points.

Despite the distinct negative effect on the real economy, the additional tax revenue collected from personal capital income taxation is now sufficient to balance the government budget and to ensure a revenue surplus in the short and the long run. This holds independently of the size of the elasticity of profit shifting and the reduction in the cantonal profit tax rate. Similar to the results presented in Table 6, the revenue surplus emerging from the taxation of personal capital gains enables household consumption to rise substantially in the short run. For a low value of the elasticity of profit shifting, the short-run increase in household consumption is between 1.3 and 1.5 per cent, while in the case of a higher value of the elasticity, the respective short-run increase still amounts to about 1 per cent. This hike in consumption is, again, not sustainable, and the long-run change in consumption is substantially smaller or even negative in the case foreign firm profits are highly mobile, specifically if the assumed value for the elasticity of profit shifting is high. The benefit arising from the significant increase in short-run consumption is nevertheless sufficient to make the welfare effect of the reform positive, even though it is much smaller than in the case in which capital gains remain untaxed.

5 Conclusion

In response to the increasing international pressure to reform its tax system, Switzerland has launched a plan to reform its corporate tax system and to abolish 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 licence box, which grants 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 in other European countries, the licence box and the AECE can be interpreted as a second-best attempt to discriminate tax between 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 abolition of the preferential tax status for SPCs implies a substantial outflow of foreign firm profits and thus a strong negative impact on tax

revenues. These adverse effects can be moderated when the abolishment of the preferential tax treatment of SPCs is combined with the introduction of a licence box and a reduction in the cantonal profit tax rate by at least 4 percentage points on average. The simulation results show that when foreign firm profits are less mobile, a rather small reduction in the cantonal profit tax rate is preferable in terms of welfare. Contrary to that, when foreign firm profits are highly mobile, a more pronounced reduction in the cantonal profit tax rates is required to prevent foreign firm profits from dissipating. The findings might be unexpected. In general, lower profit taxes reduce the deadweight loss and thereby increase efficiency as measured by the welfare metric used in the paper. However, tax-exporting incentives call for a higher profit tax rate. The optimal tax rate is determined by the interplay between tax-exporting incentives and the incentive to generate tax revenues, which explains the inverse relationship between the preferred level of taxation and the degree of tax base mobility. Further, the windfall gains for regularly taxed companies arising from the AECE system feature an additional, although small, growth stimulus that reduces the financing costs that are associated with the AECE. Finally, the suggested taxation of private capital gains increases the cost of capital for firms and completely offsets the growth effects in the real economy arising from the other reform elements, which from that perspective appears to be counter-productive.

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Appendix

Behavioural Parameters

From a technical point of view, the CGE model is a comprehensive non-linear equation system that represents the supply and demand sides on the factor and goods markets. All 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 8 lists the empirical findings from the literature applied in the model.

One parameter of particular importance for the quantification of the effects of the CRT III is the elasticity of profit shifting. This elasticity measures the sensitivity of the tax base benefiting from the special tax regime to a change in the tax differential between Switzerland and the rest of the world. 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 value of 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 classified as small open economies; in addition, Belgium and the Netherlands have already anchored a licence box in their tax code.

Another crucial parameter is the elasticity of intertemporal substitution. This parameter steers the intertemporal consumption pattern and thus affects the welfare outcome of any reform implicitly. The empirical literature provides many different estimates for this behavioural elasticity. The value of 0.48 applied is only slightly lower than the mean estimate of 0.5 reported by Havranek et al. (2015).

Table 8: Behavioural Elasticities and Economic Parameters

Parameter	Applied Value
Elasticity of profit shifting ^{a)}	0.4,1.1
Elasticity of intertemporal substitution ^{b)}	0.48
Elasticity of factor substitution ^{c)}	0.60
Elasticity of capital demand ^{d)}	-1.0
Elasticity w.r.t. the debt-asset ratio ^{e)}	0.43
Half-life of capital accumulation ^{f)} (in years)	8.0
Average Labour supply elasticity ^{g)}	0.2
Labour supply elasticity ^{g)} (low-, medium-, high-skilled)	0.5,0.2,0.1
Rate of trend growth ^{h)}	0.020
Gross return firm bonds ^{k)}	0.033
Gross return equity capital ^{k)}	0.079

^{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).

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 increase in the user cost of capital causes a decline in the capital stock of 1 per cent. The elasticity of the debt-asset ratio with respect to the profit tax rate measures the increase in a firm's debt 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 a period of 8 years. Finally, another important elasticity that has a substantial impact on the general equilibrium effects is the elasticity of the labour supply. In the model specification, 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. The most important economic variable is the long-run trend growth of the economy (set to 0.02), for which we use as the measure the output capacity indicator computed by the KOF macroeconomic model. 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).

Macroeconomic Equilibrium of the Swiss Economy

The model is calibrated to replicate the steady-state equilibrium of the Swiss economy in the year 2010. The pre-reform tax system serves as the initial steady-state equilibrium. Table 9 reports the relevant macroeconomic indicators of the Swiss economy, the ones replicated by the 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 goodness-of-fit level between the initial equilibrium as replicated by the model and the economic indicator in 2010. The replicated equilibrium even fits well with the moving average value for 2010, which includes the financial crisis.

Table 9: 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.