TAX REFORM EVALUATION USING STATUS QUO BASED WELFARE COMPARISON:

AN APPLICATION TO A CONSUMPTION BASED INCOME TAX

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Abstract

A necessary condition of equitable reforms is the principle of “equal treatment to equals”, which can be tested with the “status quo based social welfare analysis” (Bourguignon, 2011a). This paper reviews the restrictions of such an approach, by applying it on a consumption tax. The comparative analysis reveals that the “status-quo based” welfare analysis shows no dominance in terms of social welfare – which is in contrast to the result of the standard utilitarian approach. This finding confirms the importance to flank the standard utilitarian analysis with a “status-quo based” welfare analysis. Additionally is the approach of Bourguignon (2011a) extended towards a dynamic framework, which allows studying long-term welfare effects.

JEL classification codes: D63, H23, H24.

Key words: welfare evaluation, redistributive effects, consumption based income taxation.

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1. INTRODUCTION

Although the advantages of consumption-based income taxation are widely discussed in economic literature, there is little empirical evidence about the welfare effects, due lacking implementation. Critics of consumption taxes often claim that the move towards a consumption based income tax (henceforth: CT) will increase inequality due to its regressive taxation, and will generate less tax revenues. Hence, it is from a policy viewpoint important, to assess the welfare effects of tax reforms and to develop criteria, which help in designing equitable reform proposals. An equitable reform must meet the principle of “equal treatment to equals” (Musgrave, 1956), whereas people who have the same welfare level in the initial situation must have the same welfare level after the reform. When this principle applies, reforms from the same base situation can be compared in terms of post-reform welfare. However, this concept of horizontal equity raises some difficulty when it does not strictly apply to the reforms being compared. E.g., when people are all unequal in the initial status, or two reform proposals do not treat equals in the same way.

The aim of this article is to examine different redistributive and welfare measures with regard to their applicability in the evaluation of complex tax reforms. In doing so, the 2011 Liechtenstein tax reform – in which the system moved towards a CT – serves as a case study. The analysis is performed by a microsimulation exercise, employing the microdata of tax return files.

The progressivity and redistributive effects of taxes is often measured by the Kakwani (1977) and Reynolds-Smolensky (1977) indices. However, show these indices some limits, when they are used to make normative assessments about non-revenue neutral tax reforms (e.g. Lambert 2001). These shortcomings have been overcome by the Generalized Lorenz curve and the decomposition of changes in the Reynolds-Smolensky index into changes in the average tax rate and variations in progressivity. However have those suggested measures in common that they are based on the anonymity axiom, whereby two distributions are treated as equally good if the overall distribution is the same (Grimm, 2007).

The following case shows that these issues are of particular importance when assessing the welfare impact of a tax reform. If the superiority of a reform proposal is derived upon the criteria of the Generalized Lorenz dominance, the initial distribution of individual welfare is not taken into account. Hence, no statements can be made, whether a person will be worse or better off with the reform. This contradicts to the understanding of equitable reforms, whereas the welfare
level of a person should not be affected by a tax reform. These changes in the relative welfare level can be assessed by “status-quo based welfare comparisons”, which take into account the initial distribution of income and the income trajectories (Grimm, 2007; Bourguignon, 2011a, b).

In this context, the present paper aims to make the following contributions: (1) As contribution to econometric analysis it applies the status-quo based welfare analysis (Bourguignon, 2011 a,b) on a CT. The comparative analysis of the results reveals, how an assessment of the welfare effect of a tax reform may change, depending whether the methods of the standard welfare analysis or the method of a status-quo based welfare analysis is used. (2) As a contribution to theory, it revisits the paper of Bourguignon (2011b) and analyses the conditions of the status-quo based welfare analysis. In a second step is the status-quo based approach extended towards a dynamic framework, which allows studying long term welfare effects.

The paper is organized as follows. The next section (Section 2) recalls the concept of status-quo based social welfare analysis, focusing on the underlying assumptions and restrictions. Section (3) introduces the application of consumption based taxation. Section 4 describes the data and shows the results. Section 5 extends the static concept of “status-quo based” welfare measurement towards a dynamic framework. Section 6 provides policy implications, and section 7 concludes the article.

2. The “STATUS-QUO BASED SOCIAL WELFARE ANALYSIS”

Since most tax reforms entail incremental changes of the tax base and modifications of the tariff structure, the reforms will cause some re-ranking of people, or equivalently, the resulting income gains will be imperfectly correlated with initial ranks in the status-quo distribution. If such a tax reform is evaluated by a welfare criterion whereas individual utilities depend on post-reform income only, changes in individual income situations are not taken into account. Moreover, it must be considered that many measures of the relative progressivity of a tax system compared to another are valid only if there is no re-ranking of individuals (e.g. Lambert, 2001). Several authors have pointed to the difference that it makes to re-rank or not to re-rank income earners, and have shown how different conclusions were obtained when taking into account not only the income distribution, but also the change of income (Jenkins and van Kerm (2006), van Kerm (2009), Grimm (2007)).
To consider both income distribution and income change, Bourguignon (2011b) extended the standard utilitarian social welfare criteria. In doing so, individual utilities are a function of initial after-tax income $y_i^0$ and income change $x_i^j$:

$$ u(y_i^0, x_i^j) = v(y_i^0, x_i^j) $$  \hspace{1cm} (1)

Whereas the income change

$$ x_i^j = y_i^j - y_i^0 $$  \hspace{1cm} (2)

denotes the difference of the initial after-tax income $y_i^0$ for $i=1,2,...,n$ people and the after-tax income $y_i^j$ of the reformed tax systems $j=1,2$.

He further assumes that the marginal utility of an income gain is positive and decreasing that it decreases with initial income and that people with high initial incomes are less sensitive to marginal changes in income gains. In this respect, a social welfare function $V$ can be defined by:

$$ V = \{v; v_x \geq 0, v_{xx} \leq 0, v_{xy} \leq 0, v_{xxy} \leq 0\}. $$  \hspace{1cm} (3)

The first two assumptions state that the marginal utility of income change is required to decline with the income change itself and this decline is supposed to be slower when initial income rises. Thus, utility depends less on income changes as initial income raises. The third term means that the marginal utility of a given income change is lower for higher initial incomes, the forth term extends the idea that richer people are less sensitive to income changes one-step further.

To compare the $j$ reforms, or the distributions $Y^j = \{y_{1}^{j}, y_{2}^{j}, ..., y_{n}^{j}\}$, a “status-quo based social welfare dominance criterion” can be formulated, whereas the utility functions depend on both initial after-tax income and income change. Denoting $V$ the family of functions that satisfy (3) is the “status-quo based social welfare dominance criterion”:

$$ W_v(Y^0, X^1) \geq W_v(Y^0, X^2) \quad \forall v \in V $$  \hspace{1cm} (4)

$$ \text{with } W_v(Y^0, X^j) = \sum_{i=1}^{n} v(y_i^0, x_i^j) \quad j = 1,2,3. $$

In other words, $Y^1$ is said to 3rd order welfare dominate $Y^2$, if utilitarian social welfare is higher with reform 1 for all individual utility functions. Bourguignon (2011b) showed that the preceding welfare dominance criterion is equivalent to the sequential Z-dominance criterion:

$$ Z^1(p,q) \geq Z^2(p,q) \quad \forall p, q \in [0,1] $$  \hspace{1cm} (5)
Where $Z(p,q)$ is the incomplete\textsuperscript{2} mean gain among the $p$ poorest individuals in the initial income distribution and the lowest $q$ income gainers in reform $j$. The Z-dominance criterion compares the distribution of the income changes among people who are the neediest, starting with the neediest group and then adding less and less needy groups. Under the assumption that the marginal utility of income gains is positive and decreasing,

$$V = \{v; v_x \geq 0, v_{xx} \leq 0\}$$

the second order dominance criterion applies. In contrast to the Lorenz dominance applies this criterion to incomplete mean income gain curves rather than incomplete mean income curves for each group of neediest people. Hence, the comparison relies on a ranking that is specific to each tax reform and does not depend any more on the initial income ranking. The initial income ranking is used only to define the needs of tax units for more income.

The initial income ranking serves thus as a starting point when evaluating the $Z^j$ curves. After selecting the $k$-poorest in the initial income distribution $Y^j(i=1,2,...,k)$, are these $k$ individuals ranked by increasing income gains $x^j$ of reform $j$, and the $l$ lowest are considered. If $k$ and $l$ is normalized into $[0,1]$ through the transformation $p=k/n$, $q=l/k$, $Z^j(p,q)$ is simply the mean income gain of all these individuals. If the surface of $Z^j(p,q)$ is above the surface $Z^j(p,q)$ everywhere in the space of $[0,1] \times [0,1]$, reform 1 dominates reform 2.

3. AN APPLICATION TO A CONSUMPTION BASED INCOME TAX

Since the marginal utility of an income gain depends on initial income, is the definition of the initial income crucial for outcome of the analysis. In the subsequent analysis is the taxable income of a CT used as a “benchmarking” pre-tax income, since it reflects closely the notion of a consumption based income definition, from which it is assumed that its corresponding ranking is horizontal equitable (King, 1983, Jenkins, 1988).

Theory of consumption based taxation

Most tax systems in European and OECD countries are influenced by the idea of a comprehensive income tax as proposed by Schanz (1896) and later by Haig (1921) and Simons (1938). According to this approach, each individual should be taxed annually based on its ability-to-pay, which is measured, by the sum of all their global income from capital and labor, regardless of the type, source, and use of the components of that income. In theory, there would

\textsuperscript{2}The word “incomplete” refers here to the fact that only a fraction of $q$ among the $p$ poorest are taken into account.
be no need for a separate tax on corporate income. In practice, however, it is difficult to administer a tax on all the capital income accruing to any individual, including any retained profit held in a company, which is owned by a shareholder. To cope with these administrative difficulties, the personal income tax is supplemented by a direct tax on corporate earnings that serves as a “backstop” to the personal income tax.

In this so-called “classical system”, shareholders and corporations are being considered as different taxpaying entities, which leads to an economic double taxation of income, first at the corporate level on corporate earnings and then at the shareholder level, on dividends, and realized capital gains. Beyond this, the different tax treatment of interest payments and dividends creates distortions in financing structures, since interest payments are deductible when determining taxable profits; dividends paid to shareholders are not. The exemption of only interest from the corporate tax base therefore leads to excessive debt finance.

To avoid double taxation, King (1977) proposed to integrate the corporate and the personal income tax systems. Through the imputation, or credit system, were a fraction of the corporate tax paid by the company on profits intended to be distributed as dividends, is regarded as an advance payment on the tax liabilities of the shareholder, income is taxed only once, preferably at the personal level where the tax rate can better reflect one’s ability to pay. Full integration leads to a taxation of the opportunity cost of capital often referred as “normal profits”. This implies, however that the level of saving and investment would continue to be distorted.

Investment neutrality is achieved by imposing no tax on marginal investment projects; revenue is raised by taxing “pure profits” or “economic rents” earned on infra-marginal investments. Examples of such neutral tax systems are the Johansson-Samuelson tax of true economic profit (Preinreich, 1951; Samuelson, 1964; Johansson, 1969; Schneider 1969), the cash-flow tax (Brown, 1948; King, 1977) and a tax with an allowance for corporate equity (henceforth: ACE) (Boadway and Bruce, 1979, 1984; Wenger, 1983). Under a cash flow tax is a company taxed on the net cash flow received from its real business activities, whereas the ACE provides a deduction for equity, equivalent to interest in computing the company’s taxable profits. In doing so, the ACE is calculated by multiplying shareholders’ funds by the risk-free return of capital.

Thus imposing a marginal effective tax rate of zero, gives rise to the question how capital incomes should be taxed at personal level. In traditional descriptions of cash flow or consumption tax systems, it is proposed that all income from capital is exempt (Mill, 1895; Musgrave, 1959). In those models however assume that investment projects offer a single riskless rate of return. In
this case, the expected rate of return just equals the interest rate - the upfront subsidy provided by expensing just equals the expected future tax payments. Thus the return to capital, which equals the riskless rate of return, is not taxed.

More realistic is however the assumption of Bradford (1996), who splits up capital income into four conceptually separate income: (1) The risk-free return that compensates individuals for deferring consumption; (2) the expected risk premium for investing (the return to risk-taking); (3) inframarginal returns to investing ("economic profit"), and (4) a remainder that reflects realizations differing from expectation. Whereas income based taxation of capital income relies on all kinds of capital income, the risk-free return of capital is exempt in a consumption based tax system (Zodrow, 2006). This might be realized by applying a notional interest deduction on capital income. If the notional interest equals the risk-free rate of return, serves the notional interest deduction (NID) as a tax shield that exempts the risk-free return from taxation.

Formally, the consumption based income tax $T_i^{CT}$ is given by

$$T_i^{CT} = t_i^{CT} (L_i + K_i (r + \rho_K - \varphi))$$

with $t_i^{CT} \geq 0, \rho_K \geq 0, \varphi \leq r,$ (7)

whereas $t_i^{CT}$ denotes the marginal tax rate($t_y \geq 0, t_{yy} \leq 0)$, $L_i$ labor income, $K_i$ wealth, $r$ the risk free return, $\rho_K$ the risk premia, and $\varphi$ the rate of notional interest. It is assumed that the risk premium depends upon the sum which is invested ($\rho_K \geq 0, \rho_KK \leq 0$), stating that more affluent individuals generate a higher return on investment than less wealthy individuals do. The net income $y_i^{CT}$ is then:

$$y_i^{CT} = (1 - t_i^{CT})(L_i + K_i (r + \rho_K)) + t_i^{CT}K_i \varphi,$$

whereas $t_i^{CT}K_i \varphi$ marks the NID tax shield.

Practical implementation of consumption based taxation

The first practical reform proposal for an ACE-based tax system was made in 1991 by the Institute for Fiscal Studies Capital Taxes Group (IFS, 1991), and Devereux/Freeman (1991). Since that, several countries have implemented partial and full ACE systems in practice. Croatia was the first country which applied an interest adjusted income and profit tax until 2001 (Rose and Wiswesser, 1998; Keen and King, 2002), Belgium has introduced an allowance for corporate equity when calculating corporate tax (Gerard, 2006a,b) as well as Latvia (Keen et al., 2010). Italy and Austria have experimented with allowances for corporate equity features in their corporate tax systems, but they applied a reduced rather than a zero rate on the normal return
(Klemm, 2007; Bordignon et al., 1999, 2001; Genser, 2002). Most recently, Italy has re-introduced an ACE, allowing a deduction of 3% for equity formed after 2010 (de Mooij, 2012). Brazil applies a variant of such a system, but allows notional interest deduction only to the extent that it is paid out to the shareholders (Klemm, 2007). Also in Norway are dividend incomes and capital gains above a rate-of-return allowance subject to personal tax (Thoresen, et al, 2012).

Since Liechtenstein has extended the ACE to the corporate level in 2011, it is currently the only country that applies an ACE on personal and corporate level. Beyond this, further elements of a consumption tax have been implemented at personal level: capital incomes are tax exempt, and inheritance tax was abolished. However, the tax system is not equivalent to a consumption based tax system, since the taxation of natural persons is based on the concept of a wealth and income tax (Vermögens- und Erwerbssteuer). Assets are taxed as a part of income taxation by reconciling assets to a special type of income. To integrate the taxation of wealth and income is net wealth multiplied with a notional interest rate $r^{LTA}$ to calculate a notional income. Together with the income from e.g. employment, independent services or business is this notional income subject to income tax. Thus, a notional income – which equals the risk-free return (if $r^{LTA} = r$) – is subject to tax and not tax exempt, as proposed by the theoretical concept. Hence, the tax burden according to the Liechtenstein Tax Act (henceforth LTA) is given by given by

$$ T_i^{LTA} = t_i^{LTA}(L_i + K_i r^{LTA} ) \quad \text{with } t_i^{LTA} \geq 0, \rho_K \geq 0 \quad (9) $$

The net income $y_i^{LTA}$ is then:

$$ y_i^{LTA} = L_i + K_i (r + \rho_K) - t_i^{LTA}(L_i + K_i r^{LTA}). \quad (10) $$

Although a wealth tax is not foreseen in theory, two important objectives of consumption-based tax – investment and financing neutrality – are met under certain assumptions. The ratio of disposable incomes under CT and LTA follows from (8) and (10):

$$ \frac{y_i^{CT}}{y_i^{LTA}} = \frac{L_i + K_i (r + \rho_K) - t_i^{CT}(L_i + K_i (r + \rho_K - \varphi))}{L_i + K_i (r + \rho_K) - t_i^{LTA}(L_i + K_i r^{LTA})} $$

As $t()$ is a convex function, is $t_i^{CT} \geq t_i^{LTA}$ if $r + \rho_K - \varphi \geq r^{LTA}$, even if the tax schedule is the same for both reforms. As a consequence are the disposable incomes per tax unit not equal anymore and reranking takes place, which justifies using the status-quo based welfare comparison (Bourguignon 2011a,b).
3. RESULTS

The analysis is based on the simulation model for the Liechtenstein tax system (microLIE-PIT) using wealth and income tax microdata. The dataset contains the tax return files of all taxpayers of the fiscal year 2005. Since everyone is obliged to file a tax return includes the dataset all income groups. The observations are based on tax units, whereby the number of dependent children, family status, and information about the working income of spouses are contained.

To analyze the redistributive and welfare impacts of the tax reform, the Liechtenstein Tax Act (henceforth: LTA), which was in force until 2010 (hereafter: LTA10) and the LTA which is in effect since 2011 onwards (henceforth: LTA11) was applied. Additionally is a CT is simulated. Table 1 presents the composition of the tax bases of the different scenario. Notional interest income is computed on the base of net wealth, according to the applied notional interest rate of 5% (LTA10), respective 4% for LTA11. To achieve revenue neutrality under the CT, a NID at a rate of 3.2% is applied.

Table 1. Summary statistics of the tax bases

<table>
<thead>
<tr>
<th></th>
<th>LTA10</th>
<th>LTA11</th>
<th>CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour income and pensions</td>
<td>1 696.15</td>
<td>1 656.13</td>
<td>1 656.13</td>
</tr>
<tr>
<td>Notional interest</td>
<td>360.01</td>
<td>315.87</td>
<td></td>
</tr>
<tr>
<td>Estimated earnings from assets</td>
<td>.</td>
<td>.</td>
<td>597.16</td>
</tr>
<tr>
<td>Notional interest deduction (NID)</td>
<td>.</td>
<td></td>
<td>284.33</td>
</tr>
<tr>
<td>Earnings from assets after NID</td>
<td>.</td>
<td></td>
<td>328.81</td>
</tr>
<tr>
<td>Deductions</td>
<td>646.46</td>
<td>559.12</td>
<td>559.18</td>
</tr>
<tr>
<td>Taxable income</td>
<td>1 418.79</td>
<td>1 419.42</td>
<td>1 408.03</td>
</tr>
<tr>
<td>Tax revenue</td>
<td>131.93</td>
<td>115.18</td>
<td>115.08</td>
</tr>
</tbody>
</table>

Notes:
Taxable Income CT: Labor income and pensions + earnings from assets after NID - deductions.

In LTA11 and CT, the deductions were more than 13% lower than in LTA10, since personal allowances from wealth and income are replaced by a threshold applied through zero-rate schedule bracket. However differs the taxable income in LTA11 only slightly from that in LTA10, since a lower notional interest rate – which results in a lower tax base, is applied. Although the taxable income of CT is lower than that of LTA11, is the same level of tax revenues generated under an equal tax schedule, which is a hint that the income of the higher income

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3 Table A1 in the Appendix gives an overview of the different tax scenario.
groups increased, where it is taxed at a higher marginal tax rate and thus raises higher tax revenues.

Since the dataset contains no information about earnings from assets, the simulation of the CT is carried out on the basis of estimated earnings from assets, whereby the expected earnings are estimated separately for every kind of asset (e.g. interest income from bank accounts, income from real estate, shareholder income), based on the interest terms of 2005 (Amt für Statistik, 2011). In total an amount of 597.2 Mio. CHF earnings from assets were estimated, which is in line with the result of the SNA with 595.2 Mio. CHF (Amt für Statistik, 2010). Since net worth (total assets – total outside liabilities) was 9,444.1 Mio. CHF, the average return on net wealth was 6.3% in 2005.

Although the earnings are estimated using wealth data, several data limitations may affect the estimates. First, it must be apologized that earnings from assets are estimated on the base of the interest conditions, whereas interest for some assets like deposits and debt are estimated solely on the base of interest conditions, and earnings from other asset types, like active business or stocks are estimated on the base of the interest conditions plus a markup. Although the total of the estimated earnings corresponds to the SNA, might the estimated interest income be biased for some asset classes.

Second, the earnings from assets are estimated on the same expected rates of return to all households regardless of their level of income and wealth. If affluent households systematically have a higher return from assets than less well-off households do, then the assumption would lead to an underestimation of the interest income of well-off households.  

Third, it must be apologized that incomes form pensions are not interest-adjusted, due to the lack of data. However, pensions benefit from relatively high tax exemptions that might have a similar relieve effect than the NID. Lastly, it must be emphasized that the results obtained in the empirical analysis are static. They do not take into account the effects of the reform upon taxpayer behavior, nor do they comprehend tax-induced changes in wealth compositions. Additionally is assumed that the expected rates of return do not depend on the choice of the tax regime. Further is the impact of the reform of the corporate income tax as well as the abolition of estate, inheritance, and gift tax not taken into account.

\[\text{**4**} \text{ However, generate households that are more affluent a higher return from their assets, since the asset structure differs from less well-off households.}\]
Descriptive Statistics

As table 2 shows, has the reform led to an overall reduction of tax burden. The average effective tax rate dropped from 9.3% of LTA10 to 8.2% of LTA11. This reduction of 1.1 percentage points caused a 12.2% reduction in the revenue raised by LTA11 (table 1). The relative tax reduction diminishes as income levels rises. The reduction of the average effective tax rate ranges from 2.36 percentage points for the 1st decile to 0.1 percentage points for the 9th decile. This finding is also in line for CT, however more accentuated.

Table 2. Average effective tax rates by income levels

<table>
<thead>
<tr>
<th>Quantile group</th>
<th>LTA10</th>
<th>LTA11</th>
<th>CT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Taxable income: limit of decile</td>
<td>% of median</td>
<td>Average effective tax rate (%)</td>
</tr>
<tr>
<td>3</td>
<td>2 166</td>
<td>0.0</td>
<td>2.36</td>
</tr>
<tr>
<td>4</td>
<td>17 904</td>
<td>7.1</td>
<td>1.90</td>
</tr>
<tr>
<td>5</td>
<td>30 725</td>
<td>100.0</td>
<td>4.41</td>
</tr>
<tr>
<td>6</td>
<td>42 050</td>
<td>136.9</td>
<td>5.43</td>
</tr>
<tr>
<td>7</td>
<td>54 154</td>
<td>176.3</td>
<td>6.06</td>
</tr>
<tr>
<td>8</td>
<td>71 711</td>
<td>233.4</td>
<td>6.88</td>
</tr>
<tr>
<td>9</td>
<td>107 219</td>
<td>349.0</td>
<td>12.64</td>
</tr>
<tr>
<td>Total</td>
<td>9 30</td>
<td>8.18</td>
<td>8.17</td>
</tr>
</tbody>
</table>

The distribution of the limit of the taxable incomes according to the deciles of taxable income of the tax base of CT shows the change in the level of taxable income. Whereas the 10th decile has a limit of taxable income of 111 431 CHF (CT), the tax base according to LTA11 is slightly lower, and the tax base of LTA10 even lower. Different is the situation for the 6th income deciles and below: Here lies the limit of the decile of LTA10 above of that of CT. This effect might be caused by the different composition of wealth across the income deciles. It is assumed that the average asset return of less well-off households lies below those of affluent households. This phenomenon is revealed under a CT, when taxable income from interest is defined as all kinds of capital income exempt the risk-free return, which leads to a comparatively low level of income at the income deciles below the 6th, and to a higher income at the upper income levels.

Progressivity and redistributive effects of the reform

The evaluation of redistributive changes requires first the quantification of the degree of income inequality prior to the application of the personal income tax, since the tax bases of the different
scenario varies. Considering the Gini indices in table 3 it can be seen that the tax base of LTA11 shows a greater dispersion than that of CT and LTA10. The Gini indices of the post-tax incomes, which are measured as the difference of the tax base of the CT (which serves as reference pre-tax income) and the tax liability, show a lower variation than the pre-tax Ginis. This indicates that the redistributive effect of the CT is superior of that of LTA11 and LTA10. Progressivity can be measured by the Kakwani (1977) index, which measures the departure from proportionality as the difference between the tax concentration curve $C_{T_i}$ and the Gini of pre-tax income $G_{y^0}$:

$$\Pi^K_j = C_{T_j} - G_{y^0}$$

The Kakwani index $\Pi^K_j$ shows a higher degree of progressivity for CT than LTA11. The redistributive effect of the tax systems can be quantified by the Reynolds-Smolensky (1977) index, which measures the reduction in Gini coefficient resulting from the tax schedule

$$\Pi^{RS}_j = G_{y^0} - G_{y^j},$$

Where $G_{y^0}$ is the Gini index for the pre-tax income and $G_{y^j}$ are the Gini indices for the after-tax income of the tax systems. Since the redistributive effect $\Pi^{RS}_j$ can be expressed as a function of progressivity and the tax level, i.e. total tax as a fraction of net income $(t/(1-t))$

$$\Pi^{RS}_j = \frac{t_j}{(1-t_j)} \Pi^K_j,$$

it can be seen that an increase in average tax rate has a positive effect on $\Pi^{RS}_j$, when the tax is progressive. An increase in progressivity, as measured by $\Pi^K_j$ would have the same effect. Since the average tax rate not only affects the term $t/(1-t)$, but also $\Pi^K_j$, the application of this measure is limited to revenue neutral reforms (de Sarralde et al., 2012).

In addition to revenue effects has re-ranking to be considered. According to Atkinson (1980) and Plotnick (1981), can re-ranking be measured as the difference between the concentration coefficient of net income $C_{y^j}$, and the Gini coefficient $G_{y^j}$. In doing so, the Reynolds-Smolensky index is then an indicator of vertical equity, it measures the total reduction of inequality that

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5 Related to this measure is the Suits (1977) index $S_j$ that measures effective progression. An index of $S_j = 1$ indicates extreme progression, when the richest pays all the taxes. As the Suits index rises through the introduction of CT, a higher share of the tax burden is paid by the richest.

6 De Sarralde et al., 2012 proposed some indicators for non-revenue neutral tax reforms. However, they do not consider re-ranking effects of those reforms.
would occur if there were no re-ranking of income units. The index $D_j = G_j - C_j$ measures how much of this equalizing effect is “undone” by re-ranking. Thus, the Reynolds-Smolensky net redistributive effect (RE) is the result of vertical equity (VE) and a re-ranking effect (RR):

$$RE_j = VE_j - RR_j = \Pi_j - D_j.$$ 

The CT shows the highest RE, whereas the re-ranking effect of the CT converges to zero. This finding is however predetermined, as the tax base of the CT serves as benchmarking pre-tax income. Since the definitions of the tax bases of the LTA10 and LTA11 differ from those of the CT, an apparently “unequal treatment of equals” occurs, as the tax liability of the respective tax system is put in relation with the tax base of the reference system.

### Table 3. Redistribution and progressivity indices (analysis by taxpaying units)

<table>
<thead>
<tr>
<th></th>
<th>LTA10</th>
<th>LTA11</th>
<th>CT</th>
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<tbody>
<tr>
<td>Pre-tax Gini</td>
<td>0.6895</td>
<td>0.6442</td>
<td>0.6519</td>
</tr>
<tr>
<td>Post-tax Gini</td>
<td>0.6419</td>
<td>0.6370</td>
<td>0.6351</td>
</tr>
<tr>
<td>Concentration coefficient of taxes</td>
<td>0.8000</td>
<td>0.8232</td>
<td>0.8415</td>
</tr>
<tr>
<td>Kakwani progressivity index</td>
<td>0.1481</td>
<td>0.1713</td>
<td>0.1896</td>
</tr>
<tr>
<td>Suits progressivity index</td>
<td>0.2890</td>
<td>0.3221</td>
<td>0.3560</td>
</tr>
<tr>
<td>Average tax rate</td>
<td>0.0937</td>
<td>0.0818</td>
<td>0.0817</td>
</tr>
<tr>
<td>$t/(1-t)$</td>
<td>0.1034</td>
<td>0.0891</td>
<td>0.0890</td>
</tr>
<tr>
<td>Reynolds-Smolensky net redis. effect</td>
<td>0.0100</td>
<td>0.0149</td>
<td>0.0168</td>
</tr>
<tr>
<td>Vertical equity (VE)</td>
<td>0.0153</td>
<td>0.0153</td>
<td>0.0169</td>
</tr>
<tr>
<td>Reranking (RR)</td>
<td>0.0053</td>
<td>0.0004</td>
<td>0.0001</td>
</tr>
<tr>
<td>Atkinson-Plotnick horiz. inequity</td>
<td>0.0042</td>
<td>0.0003</td>
<td>0.0001</td>
</tr>
<tr>
<td>Musgrave-Thin redistributive effect</td>
<td>1.0286</td>
<td>1.0428</td>
<td>1.0483</td>
</tr>
</tbody>
</table>

Thus, the standard progressivity and redistributive measures are sensitive to revenue and reraking effects. If re-ranking is considered, the outcome depends crucial on the chosen benchmarking income, which in turn is affected by reform, if the definition of the tax base is modified.

### Standard Utilitarian Approach

Tax reforms that involve changes in tax revenues can be analyzed by employing generalized Lorenz curves (Shorrocks (1983), Atkinson (1970)). The income distribution $Y^2$ is said to 2\textsuperscript{nd} order welfare dominate $Y^1$, if the utilitarian social welfare is higher with reform 2 for all

---

7 This finding is in line with the Atkinson-Plotnick index, which measures horizontal inequity, were it shows that the re-ranking effect of the CT is smaller than that of LTA11 and LTA10.
individual utility functions that are increasing and concave (e.g. Cowell 2000). This dominance is equivalent to generalized Lorenz curve dominance
\[ W_u(Y^2) \geq W_u(Y^1) \forall u: u'(-\infty) \geq 0 \text{ and } u''(\cdot) \geq 0 \quad (11) \]
\[ \iff G^2(k) \geq G^1(k) \quad k = 1, 2, \ldots, n \]
where the generalized Lorenz curve \( G^j(k) \) is defined as total income of the \( k \) poorest individuals with tax reform \( j \) as a function of \( k \):
\[ G^j(k) = \sum_{i \in I^j(k)} y_i^j; I^j(k) = \{ i : y_i^j \leq y_i^m \forall m \notin I^j(k) \}; \text{card}[I^j(k)] = k. \quad (12) \]

The CT welfare dominates LTA11, and LTA11 welfare dominates LTA10, since the net income limits of all quantile groups for the generalized Lorenz curve \( G(k) \) are higher (table 4).

**Table 4. Lorenz curve (L(k)) and Generalized Lorenz curve (GL(k))**

<table>
<thead>
<tr>
<th>Quantile group</th>
<th>Net income LTA10</th>
<th>Net income LTA11</th>
<th>Net income CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>L(k), %</td>
<td>G(k)</td>
<td>L(k), %</td>
<td>G(k)</td>
</tr>
<tr>
<td>1</td>
<td>-0.31</td>
<td>-0.05</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>0.19</td>
<td>0.08</td>
<td>0.13</td>
</tr>
<tr>
<td>4</td>
<td>2.22</td>
<td>2.51</td>
<td>2.59</td>
</tr>
<tr>
<td>5</td>
<td>7.56</td>
<td>7.84</td>
<td>7.95</td>
</tr>
<tr>
<td>6</td>
<td>15.19</td>
<td>15.46</td>
<td>15.58</td>
</tr>
<tr>
<td>7</td>
<td>24.93</td>
<td>25.19</td>
<td>25.33</td>
</tr>
<tr>
<td>8</td>
<td>37.36</td>
<td>37.58</td>
<td>37.72</td>
</tr>
<tr>
<td>9</td>
<td>54.02</td>
<td>54.18</td>
<td>54.32</td>
</tr>
<tr>
<td>10</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Atkinson (1970) linked the social welfare function with the concept of the equally distributed level of income \( y^j_e \). This is defined as the level of income which, obtained by everyone, produces the same level of social welfare as the actual distribution. The Atkinson inequality measure \( A^j \) is defined as the proportional difference between arithmetic mean income \( \bar{y}^j \) and the equally distributed equivalent level: \( A^j = (\bar{y}^j - y^j_e)/\bar{y}^j = 1 - \frac{y^j_e}{\bar{y}^j} \). Based on this can the welfare per person be expressed as an abbreviated social welfare function:
\[ W^j_A = H(\bar{y}^j(1 - A^j)) \]
The term $\bar{y}^j A$ can be interpreted as the “cost of inequality”, whereby a higher level of social welfare can be reached by a more equal distribution of the same total income. To make a normative assessment, it is necessary to specify the concave relationship between $H(y)$ and $y$, which reflects the value judgments of how much an increase in higher incomes contributes less to social welfare than an equal increase in lower incomes. This measure of concavity can be expressed as a measure of relative inequality aversion $\varepsilon$.

Sen (1973) proposed a “pairwise maximin” criterion according to which the welfare of any pair of individuals is equal to the income of the poorer of the two. The average welfare across all pairs is equal to

$$W_o^j = \bar{y}^j \left\{ 1 - G_{y^j} \right\},$$

where welfare is expressed as the product of the arithmetic mean income and the degree of equality (defined as $1 - G_{y^j}$). Yitzhaki (1983) introduced the extended Gini index $G(v)$ that captures the degree of “aversion to inequality” $v$. The higher $v$ is, the greater the preference for equality. If $v = 1, \text{there is indifference for inequality} \ (G(1) \text{ is always } 0). \text{If } v = 2, \text{the standard Gini index is obtained, and if } v \geq 2, \text{there is stronger preference for equality.}$

The welfare level of the Gini-based welfare function increases by income and its equality. This is in contrast to the Atkinson measure, which reflects the wastefulness of inequality (the Atkinson measure depends on the marginal rate of substitution between incomes and not on their absolute levels or their ranks or on the incomes of other individuals). Since the CT leads to a greater degree of redistribution than LTA11 and LTA10, the Gini measure shows for all levels of inequality preference $v$ a higher social welfare. Hence, CT leads to further reduction of inequality than LTA 11 and LTA10 (table 5).

Using the Atkinson inequality preference $\varepsilon = 0.5$ to calculate the equally distributed level of income yields $y_b^{LTA11} = 55,471$. That represents a willingness to sacrifice 23% of mean income in order to achieve full equality in LTA11. The welfare comparison between distributions shows that CT has the highest social welfare, for the inequality preference $\varepsilon = 0.5$ and 1.0. However, for a very strong inequality preference of $\varepsilon = 2$ the social welfare is slightly higher for LTA10, since the cost of inequality becomes comparatively lower (table 5).
The standard utilitarian approaches provide complete orderings of distributions in terms of social welfare. However, neglects the comparison of inequality measures which are solely based on post-reform income distribution the reform induced income changes, and hence the pre-reform income ranking. If reforms cause re-ranking of people, the status-quo and changes in individual income have to be taken into account, since horizontal equity is a prerequisite for fair reforms.

**Status-quo based welfare analysis**

As the comparison of surfaces according to (5) is rather complicated, Bourguignon (2011b) developed simpler dominance criteria to identify “status-quo welfare dominance”.

As the “incomplete mean income curve” \( IM_1(k) \) is derived by dividing the Generalized Lorenz curve (12) by the mean income of the \( k \) poorest

\[
IM_1(k) = G_1(k)/k,
\]

holds that the Generalized Lorenz curve dominance (11) is strictly equivalent to the dominance of the IMI-curves. From the empirical findings above follows

\[
G^{CT}(k) \geq G^{LTA}(k) \quad k = 1,2, \ldots n \quad \Rightarrow
\]

\[
IMI^{CT}(k) \geq IMI^{LTA}(k) \quad k = 1,2, \ldots n \quad \Rightarrow
\]

\[
W_U(Y^{CT}) \geq W_U(Y^{LTA}) \quad \forall u: u_y \geq 0, u_{yy} \leq 0.
\]

Hence, a necessary condition\(^8\) for the CT proposal to welfare dominate the LTA11 reform in the sense of (3) and (4) is fulfilled.

\(^8\) This condition refers to Proposition 2 in Bourguignon (2011b).
Another necessary condition for a tax reform to “status-quo welfare dominate” demands that the mean income gain of the $p$ poorest people in the status-quo distribution is higher than in the other reform for all values of $p$ in $[0,1]$.\footnote{This condition refers to Proposition 1 in Bourguignon (2011b).} According to equation (2) denotes the MIG the difference of the after-tax income of LTA11 and CT and the after-tax income of LTA10, which serves as a benchmark of the “status-quo”.

$$X_{1}^{CT} = \gamma^{TC} - \gamma^{LTA10} = (\gamma^{TC0} - T^{TC}) - (\gamma^{TC0} - T^{LTA10}) = T^{LTA10} - T^{CT}$$

Figure 1 shows the mean income gain (MIG) with respect to the status quo income for the $p$ poorest individuals in the status quo income ranking. Since the MIG of the CT is higher than the MIG of LTA11, CT welfare dominates LTA11. The comparatively lower MIG of LTA11 for the $p$-poorest results from the different taxation of wealth: The tax burden of LTA11, which is based on a notional interest rate $r^{LTA} = 4\%$, leads to a comparatively higher taxation of lower income groups than the CT (which is based on estimated earnings from assets less a notional interest deduction of 3.2%). When the whole population is included the two curves converge towards 677.62 (CT) and 673.77 (LTA11), since the reforms are revenue equivalent.

![Fig. 1. Mean income gain for p poorest in pre-reform income ranking (LTA10)](image)

With $r^{LTA} \geq r + \rho_{K} - \varphi$ is the MIG for the the $p$-poorest under CT above that of LTA11. As the “status-quo based incomplete mean income curve” (sq IMI) is defined as
\[ sq \ IMI^{j(k)} = \sum_{l \in l^0(k)} \frac{y_i^j}{K}; l^0(k) = \{ i : y_i^0 < y_m^0 \ \forall \ m \in l^0(k) \}; \]

and \( \text{card} \ [l^0(k)] = k \),

whereas the individuals are ranked by increasing pre-tax income of CT, so that: \( l^0(k) = \{1,2,\ldots,k\} \), follows:

\[ sq \ IMI^{CT}(p) \geq sq \ IMI^{LTA}(p) \ \forall \ p \Rightarrow \]

\[ W_0(Y^{CT0},X^{CT}) \geq W_0(Y^{CT0},X^{LTA}) \ \forall \ v \in V. \]

Hence is the necessary condition fulfilled, and the CT proposal “status-quo welfare dominates” the LTA11 approach in the sense of (3) and (4).

Additionally requires status-quo welfare dominance that the minimum income gain among all individuals in one reform must not to be smaller than the minimum income gain in the other reform.\(^{10}\)

Figure 2 shows the income gain according to the income gain ranking for the 40 and 80 percent poorest individuals in the reference distribution and the whole population (p=100 percent). Within these groups, people are ranked by increasing income gain for each reform and the comparison relies on the q smallest income gains. The graph shows the mean income gain for theses subgroups when q goes from 0 to 1. As they are drawn, the \( Z(p,q) \) curves start being negative because people are ranked first in term of increasing income gains, and they may have negative income gains.

When considering the 40 percent poorest people in the reference distribution, CT does better than LTA11, since the income gain is higher for CT and the CT-p40 curve lies above that of LTA11. For both p=80% and p=100%, the projections of the \((Z,q)\) plane show a smaller income gain for CT than LTA11. Under these conditions, does CT not dominate LTA11. This is essentially, because the tax burden of CT is higher than that of LTA11 for upper income groups. It turns out; that more affluent households generate higher average returns from their assets than less well-off households, thus the tax base of the CT - which is defined as earnings from assets less a notional interest deduction of 3.2% - is higher than that of LTA11 that assumes a notional income from assets of 4%. Since the tax scale of LTA11 and CT is equal, the resulting tax burden of CT is higher and thus the income gain smaller. As the tax base comprises labor income and income from assets, leads a rising CT tax base also to a higher tax burden on labor income due to the progressive tax schedule.

\(^{10}\)This condition refers to Proposition 3 in Bourguignon (2011b).
Only if \( r^{LTA} = r + \rho_k - \varphi \), the after-tax rate of returns are equal. This cannot be fulfilled for all \( p \) as \( \rho_k(\cdot) \) is a convex function. Hence, is the criterion of sequential dominance not fulfilled by the CT proposal:

\[
Z^{CT}(p, q) \preceq Z^{LTA}(p, q) \quad \forall p, q \in [0,1]
\]

The analysis of the full map of curves shows that it is difficult to design revenue neutral reforms that are “status-quo welfare dominating”. In the present case, the tax rate schedule of the CT must be smoothed so that income losses are lower at the top. Then the CT will raise less revenue, which has to be compensated with a rising tax burden at the bottom, whereas proposition 3 would be violated, too.

5. **Dynamic Extension of the “Status-quo Based Welfare Dominance”**

As welfare dominance in the sense of (3) – (4) requires that the minimum income gain \( x^i \) of all individuals must not be smaller than in the other reform, follows for all individuals the requirement that the tax burden of one reform proposal \( T_i^I \) must not be higher than the tax burden of the other reform proposal. This is a very strong limitation with regard to practical reform
proposals, since a reform only “status-quo welfare dominates” another proposal, if the tax burden is a fraction of the tax burden of the other reform.

**Proposition 1.** A necessary condition for reform 2 to dominate reform 1 in the sense of (3) – (4) is that the tax burden of all individuals in reform 2 is a fraction of tax burden in reform 1.

This proposition can be proven by the following example: As the welfare function (4) is based on the initial income \(Y^0\) and income change \(X^j\), can the income change be defined as the corresponding tax burden: \(X^j = -T^j\), which requires that equals should be treated equally and bear the same tax burden. E.g. with an initial income \(y^0_i = Y^C T_0\) equals the income change the tax burden of a CT: \(x^j_i = Y^C T_0 - (Y^C T_0 - T^C) = -T^C\). For (4) follows:

\[
W_e(Y^C T_0, X^1) \geq W_e(Y^C T_0, X^2) \quad \forall v \in V
\]

with \(W_e(Y^C T_0, X^j) = \sum_{i=1}^{n} v(y^C T_0, x^j_i)\) \(j = 1,2,3\).

According to (16) “status-quo welfare dominates” any CT reform another CT reform, which applies an at least lower marginal tax rate on equal pre-tax income. As proposition 1 requires \(T^2_i \leq b \cdot T^3_i \) with \(b \leq 1\), do only those reform proposals “status-quo welfare dominate” another proposal, if the definition of pre-tax income is equal in both, and a at least equal or lower marginal tax rate is applied in the dominating proposal.

As however the tax burden of alternative reforms fluctuate different over the business cycle, gives this rise to the question about the necessary propositions of “status-quo welfare dominance” in a dynamic perspective.

In a dynamic perspective is assumed that individual utilities are a function of the net present values (NPVs) of initial income \(y^0_i\) and income change \(x^j_i\). Hence follows for (4) in a dynamic perspective:

\[
u\left(\text{NPV}(y^0_i), \text{NPV}(x^j_i)\right) = v\left(\text{NPV}(y^0_i), \text{NPV}(x^j_i)\right)
\]

with \(v_{\text{NPV}_x} \geq 0, v_{\text{NPV}_x, \text{NPV}_x} \leq 0, v_{\text{NPV}_x, \text{NPV}_y} \leq 0, v_{\text{NPV}_x, \text{NPV}_x, \text{NPV}_y} \leq 0, v_t \geq 0\)

whereas the first four assumptions are equivalent to (3), and the fifth assumption states that marginal utility of income decreases with time. Hence, future earnings are less useful than current incomes. The status-quo based welfare dominance criterion can be expressed for a dynamic setting through:
\[
W_\nu(NPV(Y^{CT_0}), NPV(X^2)) \geq W_\nu(NPV(Y^{CT_0}), NPV(X^1)) \quad \forall \nu \in V \tag{17}
\]

with \[W_\nu(NPV(Y^{CT_0}), NPV(X^j)) = \sum_{i=1}^{n} \nu(NPV(y^{CT_0}_i), NPV(x^j_i)) \quad j = 1, 2, 3,
\]
and \[NPV(Y^{CT_0}) = \frac{\sum_{t=1}^{T} y^{CT_0}_t}{(1+i)^t}; \quad NPV(T^j_t) = \frac{\sum_{t=1}^{T} x^j_t}{(1+i)^t}. \quad j = 1, 2, 3; \quad t = 1, \ldots, T.
\]

As \(NPV(x^j_t)\) denotes according to proposition 1 the NPV of the tax payments under reform j, requires (16) that equals should be treated equally and bear the same tax burden in a dynamic perspective. This requires that the NPV of the tax payments among all individuals in reform 2 must not be higher than the NPV of the tax payments in reform 1,\(^{11}\) which implies the following:

**Proposition 2.** For reform 2 to dominate reform 1 in the sense of (16) – (17), the minimum net present value of income gains among all individuals in reform 2 must not be smaller than the minimum net present value of the income gains in reform 1.\(^{12}\)

Hence allows proposition 2 that the minimum income gain of an individual under reform 2 may be smaller in one period, if this is outweigh by higher income gain in another period and the NPV of income gains is not smaller than the minimum NPV of the income gains in reform 1.

With regard to post-reform income \(y^j_t = y^0_t - T^j_t\) follows in a dynamic setting \[NPV(y^j_t) = NPV(y^0_t) - NPV(T^j_t).
\]

From the Generalized Lorenz curve for distribution \(NPV(Y^j_t)\):

\[
G^j(k) = \sum_{i \in I^j(k)} NPV(y^j_i); \quad I^j(k)
\]

\[= \{i: NPV(y^j_i) \leq NPV(y^m_i) \forall m \in I^j(k)\}; \quad \text{card}[I^j(k)] = k
\]

follows according to (13) \(IMI^j(k)\), and so holds that the Generalized Lorenz curve dominance (11) is strictly equivalent to the dominance of the IMI-curves in a dynamic setting.

**Proposition 3.** A necessary condition for tax reform 2 to welfare dominate tax reform 1 in the sense of (16) – (17) is that the incomplete mean income curve (IMI) curve of the post-reform distribution defined according to (18) and (13) be higher with reform 2 than with reform 1 or for the IMI curve for reform 2 to cross the IMI curve for reform 1 the first time from above.\(^{13}\)

---

\(^{11}\)This is in line with the sufficient neutrality criterion \(NPV(y^j_i) = (1 - t)NPV(Y^{CT_0}).\)

\(^{12}\)This corresponds to proposition 3 in Bourguignon (2011b).

\(^{13}\)This corresponds to proposition 2 in Bourguignon (2011b).
Based upon the welfare dominance criterion (17) follows for the sequential $Z$-dominance criterion:

$$Z^1(p,q) \geq Z^2(p,q) \forall p, q \in [0,1]$$  \hfill (19)

Where $Z(p,q)$ is the NPV of the incomplete mean gain among the $p$ poorest individuals in the income distribution of the NPV of initial income and the lowest $q$ NPV income gainers in reform $j$.

**Proposition 4.** A necessary condition for reform 2 to dominate reform 1 in the sense of (16) – (17) is that the NPV of the mean income gain of the $p$ poorest people in the distribution of the NPV of initial income be higher in reform 2 than in reform 1 for all values of $p$ in $[0,1]$.\(^{14}\)

This proposition states that the poorest people in the status-quo distribution are better off with reform 2, if the NPV of their mean income gain is higher than under reform 1.

**6. Policy Implications**

The analysis shows that the introduction of a consumption-based income tax would not increase inequality. However depends the redistributive and welfare effect of a CT – in which the risk-free return of capital is tax-exempt – on the relative height of the returns from assets. In the case of Liechtenstein shows the Generalized Lorenz Curve a dominance of the CT in terms of social welfare, however reveals the “status-quo based welfare comparison” that the CT does not welfare dominate the LTA11. This is essentially, because the tax burden of households with relative high returns from their assets is higher in a CT than under the LTA11. Since households with relative high returns are often more affluent, requires a revenue neutral and status-quo welfare dominating reform that the tax rate schedule of the CT must be smoothed at the top and steeped up at the bottom. Since this will affect the relative welfare level of lower income groups, no revenue neutral and status-quo based welfare dominating CT can be designed.

However, it is not necessary to throw out the baby with the bath water. As returns from assets are more volatile than labor income, the redistributive effect of a CT depends on the economic situation. In a downturn, when returns from assets are just slightly above (or equal to) the risk-free return, the tax burden of a CT on returns from assets is comparatively low *ceteris paribus*. If the tax reform has to be designed revenue neutral, other incomes must be taxed more heavily, and

\(^{14}\) This corresponds to proposition 1 in Bourguignon (2011b).
hence are those income earners worse off \textit{cp}. However, is during an economic upturn the tax burden of a CT on returns from assets comparatively high, which allows a modest taxation of other incomes, and therefore an improvement of the relative position of recipients of other income. If the considered income ordering and reranking effects are evaluated over the economic cycle, countercyclical tax effects may be revealed. As in the example of a CT, whereas the countercyclical effect is a desired characteristic of the tax system, are reranking effects which are induced by business cycles a logical consequence. On the other hand secures the neutrality of a CT, that in multi-period framework, no reranking takes place, and horizontal equity is achieved, which is a strong argument in favor of a CT.

7. CONCLUSIONS
This article assesses the welfare implications of a consumption based income tax system. The analysis shows that the application of progressivity and redistributive measures is limited if tax reforms cause re-ranking or are not revenue neutral. Orderings of distributions in terms of social welfare may be obtained by using the standard utilitarian approaches. However, neglect those measures - which are solely based on post-reform income distribution - reform induced income changes, and hence the pre-reform income ranking. Since the principle of “equal treatment to equals” is a necessary condition of equitable reforms, the concept of horizontal equity, and hence reform-induced re-ranking of people, has to be considered. The “status-quo” welfare analysis, as proposed by Bourguignon (2011a), allows studying the income trajectory, whereas utility depends on the initial income and income change. These kinds of welfare analysis reveals that the proposed CT does not welfare dominate LTA11, although the standard utilitarian approach suggests a dominance of the CT over the LTA11. This finding is in line with previous research that highlighted the impact of reranking on welfare analysis. Thus, it is important to flank the standard utilitarian welfare analysis of complex tax systems with a status-quo based welfare analysis. From a policy viewpoint, this research presents a method that may be used to design welfare dominating tax reforms. However, it must be kept in mind that the redistributive effect of a CT depends on the economic situation. Hence, the entire welfare effects over a business cycle have to be analyzed. This can be performed by the dynamic extension of the “status-quo based” welfare analysis. It would be however interesting to apply this approach empirically.
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## Appendix

<table>
<thead>
<tr>
<th>Characteristics of the tax schedules</th>
<th>LTA10</th>
<th>LTA11</th>
<th>CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single schedule, tax credits for mc, sp</td>
<td>Trial schedule: singles, married couples, single parent</td>
<td>ditto</td>
<td></td>
</tr>
<tr>
<td>86 brackets</td>
<td>8 brackets</td>
<td>ditto</td>
<td></td>
</tr>
<tr>
<td>min. marginal tax rate: n.a.</td>
<td>min. marginal tax rate: 3% (^1)</td>
<td>ditto</td>
<td></td>
</tr>
<tr>
<td>max. marginal tax rate: n.a.</td>
<td>max. marginal tax rate: 21% (^1)</td>
<td>ditto</td>
<td></td>
</tr>
</tbody>
</table>

| Tax object (wealth tax) | Notional income from assets: 5% | Notional income from assets: 4% | Real income from assets are subject to wealth tax, on whereas a notional interest deduction (3.2%) is warranted |

<table>
<thead>
<tr>
<th>Tax object (income tax)</th>
<th>Allowance for corporate equity (5%) on equity capital for commercial active natural persons</th>
<th>Allowance for corporate equity (4%) on equity capital for commercial active natural persons</th>
<th>Allowance for corporate equity (3.2%) on equity capital for commercial active natural persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deduction of personal allowance from taxable wealth (CHF 70T for s and sp, CHF 140T for mc)</td>
<td>Threshold applied through zero-rate schedule bracket (^2)</td>
<td>ditto</td>
<td></td>
</tr>
<tr>
<td>Deduction of personal allowance from taxable income (CHF 4.3 T for s and sp, CHF 6T for mc)</td>
<td>Threshold applied through zero-rate schedule bracket (^2)</td>
<td>ditto</td>
<td></td>
</tr>
</tbody>
</table>

| Consideration of family circumstances | Tax credit for dependent children (CHF 9T for each child) | ditto | ditto |

**Notes:**

s=single person, mc=married couple, sp=single parent

(1) If a local surcharge rate of 200% is applied.

(2) This threshold is CHF 15T for s, and CHF 30T for mc and sp.

(3) This threshold is CHF 25T for s and sp, and CHF 50T for mc.