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Frode Brevik and Manfred Gärtner

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Department of Economics University of St. Gallen

Editor: Prof. Jörg Baumberger
University of St. Gallen
Department of Economics
Bodanstr. 1
CH-9000 St. Gallen
Phone +41 71 224 22 41
Fax +41 71 224 28 85
Email joerg.baumberger@unisg.ch

Publisher: Department of Economics
University of St. Gallen
Bodanstrasse 8
CH-9000 St. Gallen
Phone +41 71 224 23 25
Fax +41 71 224 22 98

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Frode Brevik• and Manfred Gärtner

Author's address:

Prof. Manfred Gärtner
Forschungsgemeinschaft für Nationalökonomie
Bodanstrasse 1
9000 St. Gallen
Tel. +41 71 224 2308
Fax +41 71 224 2874
Email manfred.gaertner@unisg.ch
Website http://www.fgn.unisg.ch/gaertner/index.html

Abstract

We analyze a multi-country model in which a small group of countries adopts banking secrecy (BS) laws and a withholding tax. The other group doesn't. BS countries benefit in all relevant macroeconomic variables, including taxes and the provision of public goods. In non-BS countries most of the same variables deteriorate - when tax evasion is exogenous or its tax elasticity is moderate. When this elasticity is high, BS may drive these countries' tax rates down also, and income, consumption and wealth may rise. However, public-goods provision always deteriorates and welfare falls. We also argue that this case does not appear to be relevant empirically.

Keywords

Banking secrecy, tax evasion, withholding tax, welfare effects

JEL Classification

E2, E62, F42, H2

1 Introduction

Pairing a strictly enforced banking secrecy law with an attractive withholding tax on capital incomes is bound to have serious repercussions on both the national and international economies. The suspected gravity of such spillovers has ignited an intensive international debate and tug of war between countries that feature banking secrecy laws on one side and the rest of the international community on the other. Among the most serious critics of banking secrecy, in addition to a series of individual countries and many non-governmental organizations, are the OECD (who is engaged in a crusade against what it calls unfair tax practices) and the European Union (who considers the Swiss banking secrecy law one of the major unsolved problems on the continent).

In an effort to cut through the moralizing and judgmental mist of this debate, Brevik and Gärtner (2005) provide a positive general equilibrium analysis of how banking secrecy affects the domestic and international distribution of income, wealth and welfare.[1] Working with a computable n-country overlapping generations model this paper shows that when a small group of countries implements banking secrecy laws and withholding taxes, it benefits in many ways, such as through higher GNP and wealth, higher consumption, higher wage rates, or a better provision of public goods despite lower tax rates. This goes at the expense of all these variables changing in the opposite direction in foreign countries. In particular, banking secrecy is found to drive up income tax rates abroad while leading to an inferior provision of public goods.

The latter result is particularly noteworthy, as it contradicts the claim frequently made in policy circles and the popular press that the competition from banking secrecy countries benefits foreign countries also, by forcing their high-spending governments to lower tax rates and reduce an overblown public sector. This paper takes a closer look at this argument by studying the sensitivity of the results presented and discussed in Brevik and Gärtner (2005) to efforts to endogenize tax evasion by making the share of financial wealth kept in countries with banking secrecy responsive to tax differentials. In order to single out the consequences of endogenizing tax evasion, the remaining parts of our model will be the same as in Brevik and Gärtner (2005).

As regards endogenizing tax evasion, we consider two ways of doing this:

The first one is mechanical and, therefore, simple. Tax evasion is postu-

[1] For partial equilibrium analyses with a strong game theoretic flavor, see Bacchetta and Espinosa, 1995, 2000; Kollintzas et al., 2000; Huizinga and Nielsen, 2003; Marchand et al., 2003; or Eggert and Kolmar, 2004.

lated to be a linear function of pecuniary incentives, as given by differences in applicable income tax rates. The simplicity of this version provides the flexibility to determine thresholds at which the response of crucial macroeconomic variables to the introduction of banking secrecy may change direction.

As a major drawback, this mechanical approach does not permit welfare judgments. This is because it lacks an explicit micro foundation and, thus, remains alien to the rest of the model. Our second approach, therefore, is to model tax evasion as the result of an optimizing decision on the part of tax payers.

The paper is organized as follows: Section 2 starts by introducing the model and setting it up for the extensions to be made in this paper, with subsections 2.1 analyzing the behavior of the two generations of households and subsection 2.2 deriving optimal government behavior for the general case of potentially endogenous tax evasion. For easy reference and comparison, section 3 replicates the results derived in Brevik and Gärtner (2005), which can be done by setting the appropriate response parameter in the tax evasion equation equal to zero. Section 4 endogenizes tax evasion and, thus, permits this response parameter to become positive. Subsection 4.1. does this in a mechanical way, by simply postulating a linear relationship between the fraction of financial wealth held abroad and the incentives offered by international differences in tax rates. The purpose of this exercise is to find out which variables are affected in what manner when the tax elasticity of tax evasion changes, and to identify crucial elasticity thresholds at which macroeconomic effects switch directions. Subsection 4.2 proposes an optimizing approach and broadens the perspective to include welfare effects. Section 5 offers a discussion of the obtained results, gauges their relevance against an empirical benchmark, and sums up.

2 A multi-country model with bank secrecy and withholding taxes

The model is an extension of the international OLG model discussed in Brevik and Gärtner (2005). We first present and discuss a comprehensive general formulation that sets the stage for specific ways to endogenize tax evasions. Specific versions regarding the treatment of tax evasion will be analyzed below.

2.1 Building blocks and household behavior

The global economy comprises a large number of countries that fall into two types, subscripted *eu* and *ch* for easy reference. The two types differ in preferences and legal setting: 1) *eu*-type countries have a stronger preference for government spending and 2) *ch*-type countries offer foreign and domestic investors access to secret bank accounts and levy a withholding tax on interest income from such deposits. Each individual country is so small that it ignores any responses its own saving and tax decisions may draw from other countries.[2]

The world population L is given by the sum of the populations of the two types of countries, $L = L_{eu} + L_{ch}$; and each type's world population share is denoted by lower case letters l_{eu} and l_{ch}. As we will later associate the *ch*-type countries with tax havens, their share is assumed to be small.

In all countries output per unit of labor (y) depends on capital per worker (k) according to

$$y = k^{\alpha}.$$

The world capital market is fully integrated, which implies that the same amount of capital per head will be available to workers in both countries. Perfect competition ensures that pretax interest and wage rates are given by the net marginal product of capital and labor, respectively,

$$\begin{aligned} r &= \alpha k^{\alpha-1} - \delta \\ w &= (1-\alpha)\, k^{\alpha}, \end{aligned} \tag{1}$$

where δ denotes the depreciation rate and α is capital's share of output. Individuals live for two periods. During the first period of their lives, they supply a fixed amount of labor, which we normalize to one. During the second period of their lives, they are rentiers, living off whatever wealth they accumulated during the first period of their lives, a, and the net interest income derived from this wealth. For simplicity, we assume that the two periods are of equal length and that there is no population growth. Agents' lifetime utility U is determined by the logarithmic utility function

$$U = \log c_y + \beta \log\ c'_o + \psi_i(1+\beta)\log g, \qquad \text{with } i \in \{eu, ch\}. \tag{2}$$

[2]The assumption that every country is small compared to the aggregate is natural, but does not seem widely adopted in the literature, where the typical modeling approach is—following the seminal work of Buiter, 1981, 1987; Dornbusch, 1985; Persson and Svensson, 1985; and Persson, 1983—a partial equilibrium analysis with one country or a general equilibrium analysis with two large countries

Thus, individuals derive utility from consumption when young, c_y, and consumption during retirement, c'_o, as well as from the level of government spending per capita, g.[3] (c'_o is primed to avoid confusion with the consumption of the current old generation.) We capture *eu* citizens' stronger preference for government spending by letting $\psi_{eu} > \psi_{ch}$. Individuals enter the workforce without wealth and leave no bequests. Each country is populated by a large number of individuals. So, from the perspective of the individual households, the level of government spending and wage, interest, and tax rates are exogenous.

There is perfect competition in the political market also. This makes governments set the tax rate so as to maximize the utility of the representative individual of its constituency. Given the long period length implied by an OLG model with two generations, we assume that governments are constrained to balance the budget on a period by period basis. Labor and (declared) interest income is taxed on the basis of residency at a uniform rate t_i; unreported interest earned on funds kept in secret bank accounts are taxed on a uniform withholding tax rate t_f. Withholding taxes are not repatriated to the country of residence. We denote per capita assets that *eu* citizens hide abroad by F and let f be their share of *eu* citizens total assets a (i.e., $f = F/a$). The fraction f is a function of the difference between the domestic income tax rate and the withholding tax rate, and any costs incurred by transferring and keeping parts of their assets abroad and retrieving earned interest, $C(f, F)$.

$$f = f\left(\left(t_{eu} - t_f\right), C\left(f, F\right)\right). \tag{3}$$

Without loss of generality, we assume that costs $C(f, F)$ are incurred up front. Denoting per capita tax revenues from labor, capital income, and withholding taxes by T_i^w, T_i^a, and T_i^f, respectively, public spending per capita in the two types of countries is given by

$$g_{eu} = T_{eu}^w + T_{eu}^a = \frac{1}{2} t_{eu} w + \frac{1}{2} t_{eu}(1-f) r a_{eu}$$
$$g_{ch} = T_{ch}^w + T_{ch}^a + T_{ch}^f = \frac{1}{2} t_{ch} w + \frac{1}{2} t_{ch} r a_{ch} + \frac{1}{2} t_f f \frac{1 - l_{ch}}{l_{ch}} r a_{eu}$$

The weight 1/2 that precedes all revenue sources reflects the fact that each generation makes up half the population. Given our logarithmic utility function, the young generation in a *ch*-type country maximizes lifetime utility by saving a fraction $s = \beta/(1+\beta)$ of their labor income and consuming the

[3] Including government spending directly in the utility function is a standard practice in the optimal taxation literature, dating back to Mirrlees (1971).

rest. Likewise, *eu* citizens maximize lifetime utility by consuming the fraction $s = \beta/(1+\beta)$ of their labor income *net of costs of hiding parts of their wealth abroad*. For given assets hidden abroad, this implies for *eu* citizens that

$$\begin{aligned} c_{eu,y} &= (1-s)\big((1-t_{eu})w - C(f,F)\big) \\ a_{eu} &= s\big((1-t_{eu})w - C(f,F)\big) \\ c'_{eu,o} &= \Bigg(\underbrace{\big((1-f)(1-t_{eu}) + f(1-t_f)\big)}_{\bar{t}}\, r + 1\Bigg) a_{eu}. \end{aligned} \tag{4}$$

The term $\bar{t} = ((1-f)t_{eu} + f t_{ch})$ gives the effective tax on capital income for *eu* citizens. Assuming *ch* citizens declare all their capital income gives[4]

$$\begin{aligned} c_{ch,y} &= (1-s)(1-t_{ch})w \\ a_{ch} &= s(1-t_{ch})w \\ c'_{ch,o} &= \big((1-t_{ch})r + 1\big)a_{ch}. \end{aligned} \tag{5}$$

2.2 Government behavior

Governments set the income tax rate such that the marginal benefits of an increased rate (through higher government consumption) is exactly balanced by its marginal costs (lower private consumption).

$$\frac{dU_i}{dt_i} = \frac{d\log c_{y,i}}{dt_i} + \frac{\beta d\log c_{o,i}}{dt_i} + \frac{\psi_i(1+\beta)d\log g_i}{dt_i} = 0. \tag{6}$$

Each country is small relative to the global economy, so it expects that a change to its tax rate has no effect on either the gross wage rate or the gross interest rate, since it has no impact on the global capital stock. For *ch*-type governments the individual terms of equation (6) are given by

$$\begin{aligned} \frac{d\log c_{y,ch}}{dt_{ch}} &= -\frac{1}{1-t_{ch}} \\ \frac{d\log c_{o,ch}}{dt_{ch}} &= -\frac{1}{1-t_{ch}} - \frac{r}{(1-t_{ch})r+1} \\ \frac{d\log g_{ch}}{dt_{ch}} &= \frac{1}{t_{ch}}\left(1 - \frac{T^f_{ch}}{g_{ch}}\right) - \frac{1}{1-t_{ch}}\frac{T^a_{ch}}{g_{ch}}. \end{aligned} \tag{7}$$

A one percentage-point increase in the *ch* tax rate lowers net wages and hence consumption by a factor of $1/(1-t_{ch})$. The impact on the consumption of

[4]This is the case as long as the withholding tax rate exceed the income tax rate that results for *ch*-type preferences.

the old is larger, since it reduces both their accumulated wealth (the first term on the right hand side) and its net return (the last term). Finally, the direct effect of higher tax rates on government revenues is proportional to how much of the tax base is affected ($1 - T^f_{ch}/g_{ch}$), while its negative impact on the tax base itself (through less domestic savings) is proportional to the fraction of capital income taxes to total taxes (T^a_{ch}/g_{ch}). The corresponding terms for the *eu* countries reflect the fact that *eu* citizens are using bank secrecy for tax evasion. Ignoring for the moment any costs of tax evasion, it follows that

$$\begin{aligned}
\frac{d\log c_{y,eu}}{dt_{eu}} &= -\frac{1}{1-t_{eu}} \\
\frac{d\log c_{o,eu}}{dt_{eu}} &= -\frac{(1-f)r}{\bar{t}r+1} + \frac{df}{dt_{eu}}\frac{t_{eu}-t_f}{\bar{t}r+1} - \frac{1}{1-t_{eu}} \\
\frac{d\log g_{eu}}{dt_{eu}} &= \frac{1}{t_{ch}} - \frac{1}{1-t_{ch}}\frac{T^a_{ch}}{g_{ch}} - \frac{df}{dt}\frac{1}{1-f}\frac{T^a_{eu}}{g_{eu}}
\end{aligned} \tag{8}$$

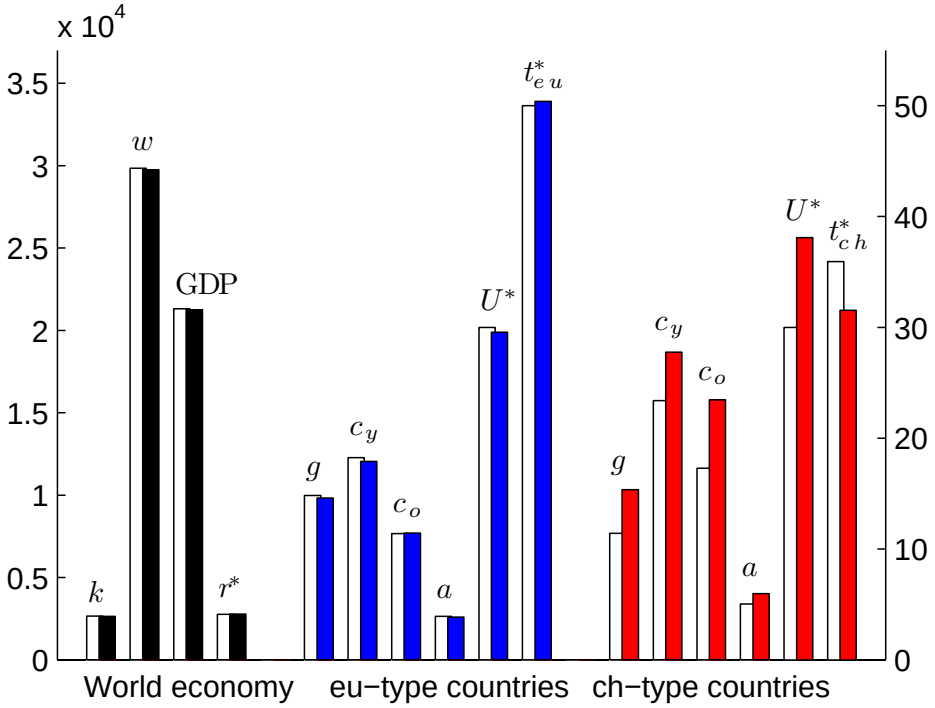
For given tax rates, the influence of tax changes on the consumption of the young is the same in *eu* countries as in *ch* countries. This is also true for the assets they accumulate, which is reflected in the last term of the second equation. The direct influence of tax rates on the consumption of the old is dampened both by the fact that only a fraction of capital income is declared domestically (nominator in the first term) and by the fact that *eu* citizens increase their use of off-shore bank accounts (second term). This use of off-shore bank accounts also spills over into the effect of tax increases on government revenues in the last equation. The immediate, positive influence of tax increases on the government revenues (first term) is dampened not only by its adverse effect on wealth accumulation (second term), but also by a shift of savings to tax havens (last term).

3 Results with exogenous tax evasion

The model is calibrated to match an annualized real interest rate of 4 percent (average annual pre-tax return to capital in the US national accounts [MacGrattan and Prescott, 2003]), an income tax rate in *eu* countries of 50 percent and a government ratio in *ch*-type countries of 36 percent (figures for Switzerland and the Eurozone from OECD, "Economic Outlook" and ECB, "Statistics Pocket Book", respectively). Capital's share of output α is set to 0.3; the relative size of *ch* type countries (l_{ch}) to 1/30.

Figure 1 shows results with exogenous tax evasion. Up to small differences in calibration, these results state those presented in Brevik and Gärtner

Figure 1: Impact of bank secrecy with unelastic tax evasion



White bars indicate the value of variables before and dark bars the value after the adoption of banking secrecy laws. The scale on the right measures interest rates, tax rates and utility, which has been indexed to a value of 30 for the case without banking secrecy. The scale on the left measures all other variables.

(2005). White bars show the situation without banking secrecy and thus reveal how differences in the intensity of preferences for public goods affect national economic outcomes. Dark bars depict the situation with banking secrecy. Comparing adjacent white and dark bars reveals the changes that have been triggered by the implementation of banking secrecy laws and withholding taxes in *ch*-type countries.

Since we are assuming a fixed labor supply, the only channel through which banking secrecy can influence gross variables (GDP, net wages, and interest rates) is the capital stock. What happens in the version of the model with exogenous tax evasion is that *eu*-type governments increase their tax rates to compensate for the loss of revenues they experience as *eu*-residents use banking secrecy to lessen their tax burden. For a given level of gross labor income, this tax hike reduces disposable income, the pool from which young *eu*-residents save. The windfall withholding tax revenues received by

ch-type countries allow them to reduce the tax rate on wage income, thus stimulating *ch* savings. Though the drop in the *ch* tax rate is greater than the hike in the *eu* tax rate, the much larger share of *eu* residents in the world population make overall savings fall.

Lower savings translate into a slightly lower equilibrium capital stock with banking secrecy (first bars from the left). This leaves the global economy with less capital per worker, reducing global GDP, driving down wages, and increasing the interest rate.

eu residents lose on most fronts: The higher *eu* tax rate and the lower gross wage rate depress both consumption and wealth accumulation for the young generation (second and fourth columns in the cluster). The old *eu* generation is left with less wealth, but earns a higher post-tax rate of return. (Since the effective capital tax rate is a weighted average of the official *eu* tax rate and the withholding tax rate they pay on the capital they have shifted abroad.) For this calibration, the net effect is an increase in the consumption of the old, but this is not very robust. Both generations are left with a lower level of public good provision.

ch residents gain on all fronts, and substantially so. The lower *ch* tax rate more than compensates the fall in the gross wage rate, leaving the young generation with both higher consumption and higher savings. The old generation starts off with more wealth and earns higher rates of return, as the gross interest rate increases and the domestic income tax rate falls. The withholding tax revenues allow the government to increase its public good provision nevertheless.

4 Endogenizing tax evasion

The assumption that the dishonesty of *eu*-type tax payers, as measured by the fraction f of their wealth they conceal from domestic tax authorities, is exogenous simplifies the analysis, but may not be very realistic. Having laid down the implications of this special case for reference in section 3, we now drop this assumption and make f endogenous. In a first step we do so in an ad-hoc fashion, by simply postulating f to be a linear function of the benefits expected from evading high domestic income tax rates. In a second step we provide explicit micro foundations for the decision whether and to what extent to evade taxes, and extend the model accordingly.

4.1 A mechanical approach

Suppose *eu*-type individuals hide a larger fraction of wealth in the bank vaults of *ch*-type countries when the difference between domestic income tax rates and the withholding tax rate increases. Let this tax evasion function be linear, so that

$$f = a + b(t_{eu} - t_f) \tag{9}$$

With this specification the derivative of f with respect to t_{eu} is exogenous. Whether *eu*-type governments respond to banking secrecy with raised or lowered taxes depends on how elastic f responds to income tax changes. If f is unelastic to the tax rate, the government will raise the tax rate to recapture some of the lost revenues, even if it means reduced consumption for both generations. The higher the elasticity of f, the less attractive raising tax rates becomes, because the higher tax revenues on declared income will be increasingly offset by more tax evasion.

For a given constant term a each b translates into a specific elasticity of f with respect to $(t_{eu} - t_f)$. It is this *tax elasticity of tax evasion* ϵ_t^f that must be expected to be a crucial determinant of *eu* tax rates:[5] if it is high enough, the *eu* governments will lower their tax rates in response to the introduction of secret bank accounts. Figure 2 shows the numerical results.

Bold solid lines show how the *eu*-type countries' response of the indicated variable to the introduction of banking secrecy varies with the tax elasticity of tax evasion. They are measured on the left vertical axis. Bolds dashed lines show the respective response in *ch*-type countries as measured on the scale given on the right vertical axis. Thin solid lines show global averages (where each type of country is weighted by its relative size).

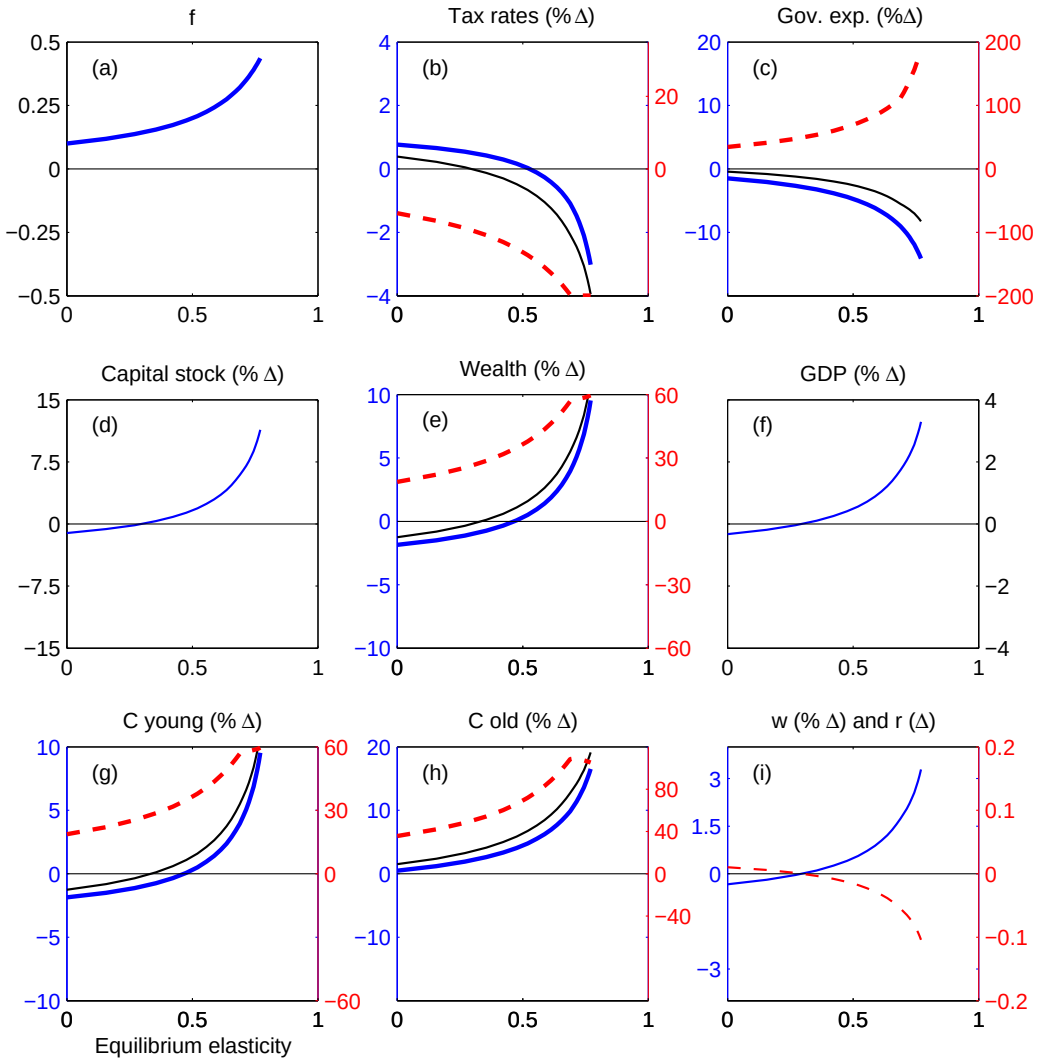
In all nine panels the values measured at the left vertical axis, reflecting the case where f has zero tax elasticity, coincides with the results shown in figure 1, where f was exogenous. Panel (a) shows that this fraction of 10 percent of *eu*-type wealth being held abroad increases at an accelerating pace as the the tax elasticity of f increases.

One general result to note before we look into details is that the direction in which crucial macroeconomic aggregates respond in *ch*-type countries is independent of ϵ_t^f. When this elasticity rises, it makes the consequences from the introduction of banking secrecy stronger, but it never changes direction.[6]

[5] The employed definition is $\epsilon_t^f \equiv \frac{df}{f}\frac{t_{eu}-t_f}{dt_{eu}} = -\frac{df}{f}\frac{t_{eu}-t_f}{dt_f}$

[6] To be more precise, this only holds for those variables that are not equalized across borders by perfect competition. The direction in which those variables change, which are identical in all countries (capital stock per capita, per capita GDP, pre-tax interest and wage rates), is the same as in eu-type countries and thus may depend on ϵ_t^f.

Figure 2: Mechanical changes to the elasticity of tax changes



Bold solid lines indicate the response of the respective variable to the adoption of banking secrecy laws at different income-tax elasticities of tax evasion in eu-type countries. Bold dashed lines indicate the response in ch-type countries. Thin lines indicate global averages.

This does not apply to *eu*-type countries, however.

Panel (b) shows how *eu*-type governments adjust income tax rates in response to the erosion of their tax base due to the introduction of banking secrecy abroad. It turns out that when the tax elasticity of f is small or moderate, the response is to counter the erosion of the tax base by raising the income tax rate. This response becomes more moderate, however, as this elasticity increases, and it even turns negative once the tax elasticity of f passes a threshold of about 0.3 for most variables. As the amounts transferred to *ch* accounts increase with the elasticity of f, so do withholding-tax revenues of *ch* governments. Some of the revenues are passed on to the population in the form of lower income tax rates until these hit a bottom at the lower bound of zero.

The direction of the impact of banking secrecy on global savings depends on whether the tax elasticity of tax evasion is below or above the intersection point of the thin line in panel (b) and the horizontal axis. If the elasticity is lower than at the point of intersection, the average tax rate paid by the young generation increases. This leaves fewer resources for savings and depresses the steady state capital stock.

Panel (c) shows that the provision of public goods in *eu*-type countries always deteriorates when *ch*-type countries implement banking secrecy laws. While this effect remains relatively moderate when ϵ_t^f is small, it becomes stronger and stronger as ϵ_t^f rises. The only other effect that never changes direction as we vary the tax elasticity of tax evasion is the consumption of the old generation [panel (h)]. This is always affected positively, in both countries, and more strongly as ϵ_t^f becomes larger.

Panel (d) is quite interesting, reporting the consequences for the global capital stock. Since capital is perfectly mobile, global per capita values are the same as capital per capita in each individual country. The graph shows that the response of the capital stock (and global wealth, which is the same) crucially depends on ϵ_t^f. As long as tax payers' dishonesty is relative robust to changes in tax incentives, the introduction of banking secrecy makes the global capital stock shrink. Beyond the threshold for ϵ_t^f we already encountered above this effect is reversed. Banking secrecy then encourages capital accumulation on a global scale. Reflecting our assumption of a given labor supply, the response of global and national GDP per capita, shown in panel (f), is identical, except for magnitude, to what happens to productive capital.[7]

We look at panel (e) in order to see where changes in the global capital

[7]The same threshold applies to the effect on other global variables (such as wage and interest rates) or averages (such as the average tax rate shown in panel (b)).

stock originate. Wealth in *ch*-type countries always benefits from the implementation of banking secrecy. Wealth in *eu*-type countries typically suffers, until a critical value of ϵ_t^f is reached beyond which wealth effects turn positive as well.

Panels (g) and (h) show the consequences for consumption. The robust positive effect on retirement-age consumption has already been noted above. The working generation always benefits in *ch*-type countries. This generation usually looses in *eu*-type countries, except for scenarios with rather high tax elasticities of tax evasion.

The last panel (i) shows the effect on factor prices, which are identical in both groups of countries. These effects mirror each other. Initially, when ϵ_t^f is zero, the implementation of banking secrecy laws boosts interest rates most and has the severest negative effect on wage rates. This is, of course, being due to the capital stock being driven down, which makes this factor of production scarcer and, thus, more productive at the margin, and the other factor of production less productive. As higher values of ϵ_t^f make the capital stock drop less, the response of w and r is muted. When ϵ_t^f reaches the threshold where the capital stock is not affected by banking secrecy, wages and interest rates are not affected either. Beyond that threshold, wages and interest rates respond with the opposite sign of their response at low elasticities.

4.2 An optimizing approach

We now make tax evasion part of the optimization decisions households need to take. When households decide what share of their wealth to keep in foreign bank accounts they weigh benefits against costs, but take income and withholding tax rates as given. So each household figures that its allocation of financial wealth will not trigger a government response in the form of tax changes. On the other hand, when governments set income tax rates, they do anticipate household responses.

4.2.1 Preliminary considerations

The representative household's *benefits of tax evasion* are straightforward. They are simply the taxes saved and, thus, reflect those parameters that determine tax savings. For a given amount of wealth, these parameters are: the fraction of wealth held in tax haven countries, the interest rate, and the difference between income tax rates at home and the foreign withholding tax. Thus total benefits B are given by

$$B = r(t_{eu} - t_f)f, \tag{10}$$

which, for a given interest rate and tax differential, may be drawn as a straight line through the origin in a diagram with benefits on the vertical and the tax evasion fraction f on the horizontal axis (see figure 3).

The *costs of tax evasion* are a lot more complex:

To begin with, there are fixed costs involved that are very much independent of f—at least as long as f is rather moderate. These costs include setting up and maintaining an account or depot with a foreign bank, and of repatriating (part of) the return and the invested amount during retirement, for which regular bank connections would be too risky to use. In figure 3 these fixed costs can be represented by a horizontal line.

A second type of costs varies with the fraction of ones wealth concealed abroad. These variable costs derive from two major sources. One relates to the expected value of sanctions, which reflects the probability of being caught and the applicable fine or punishment when caught. Both these variables rise with the amount of wealth hidden abroad and with the related capital income one attempts to retrieve and spend in one's country of residence. Secondly, costs go up when f rises because the gap widens between the consumption pattern and lifestyle that fits ones declared income and the lifestyle potentially supported by one's actual income. Efforts will be required to keep this discrepancy from growing too blatant. But this will involve costs. Some of these will be direct expenditures for bank commissions, trips or legal counsel. Others will be indirect in the sense that an increasing proportion of capital income from abroad must be put to inefficient use in order not to raise red flags with tax authorities.[8]

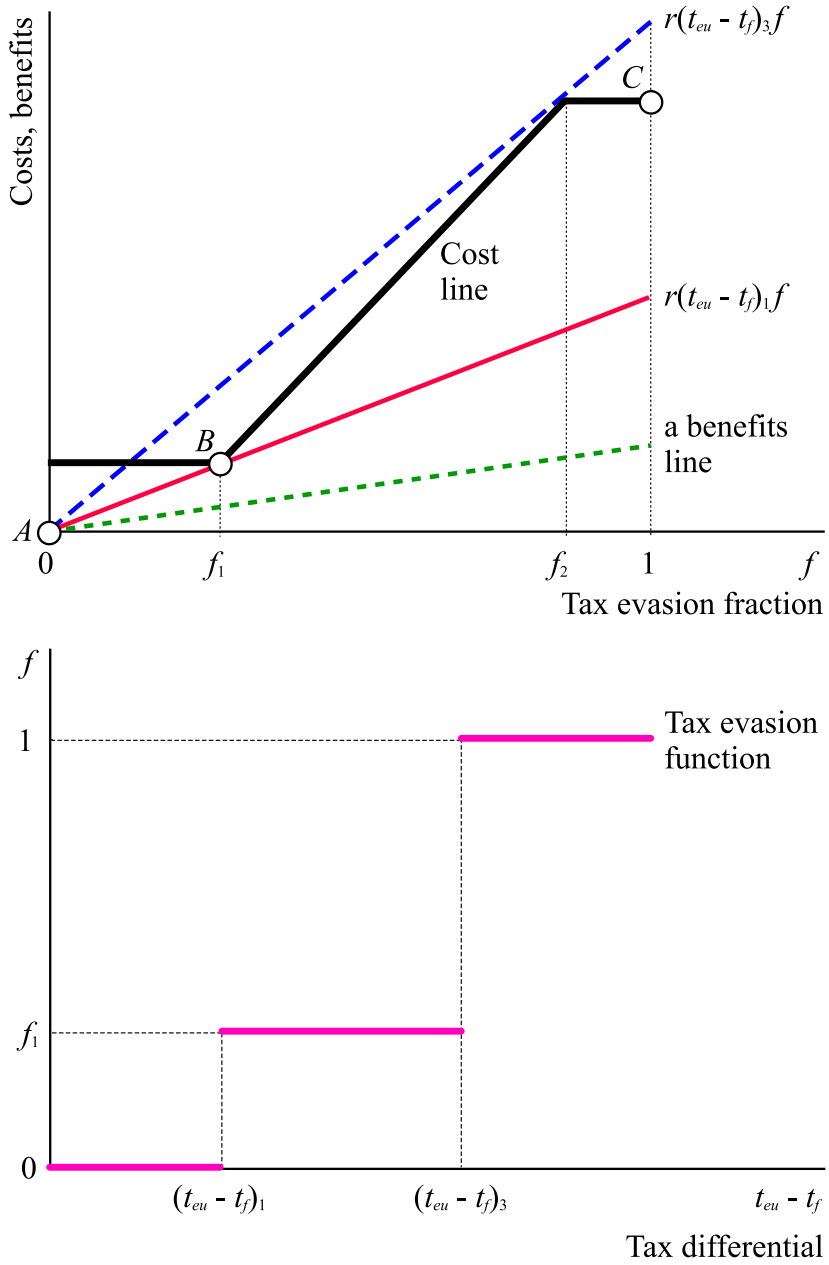
In terms of a diagram such as Figure 3, top panel, costs rise as f increases. It is the specific nature of this cost line that determines how the optimal value of f responds to changes in the tax differential, however. Since we can only speculate about the details of the shape of the cost line, we look at a few plausible cases that may occur in order to develop a feel for likely outcomes:

One possibility is that variable costs only kick in beyond a threshold f_1, increase linearly with f for a while, until they hit a maximum at a second threshold f_2. Combined with our linear benefits line this produces a stepwise tax-evasion function that is composed of three horizontal segments which indicate three corner solutions for f as displayed in the lower part of figure 3:

As long as the tax differential is small and, for a given interest rate, the benefits line is not steeper than the solid straight line that touches the cost

[8]For instance, one may not dare to live in the house one could actually afford, keep the children in public schools though one would be quite happy to pay for a better private institution, or prefer to keep one's most expensive works of art in a secluded room rather than exhibiting them for all visitors to see.

Figure 3: Costs, benefits, and optimal tax evasion I



The two panels show that a stepwise tax evasion function results when the cost line consists of linear segments as shown in the upper panel.

line at point B, households do not transfer financial wealth abroad, since costs exceed benefits. Therefore, the optimal value for f is zero. Once the benefits line turns steeper than the solid line, net benefits are maximized by setting $f = f_1$. Because of the kink in the cost line, this fraction remains optimal even if the tax differential rises still further. Only after it turns even steeper than the dashed line (then the vertical distance between point C and the benefits line starts to exceed the vertical distance between point B and the benefits line), net benefits from hiding financial wealth in foreign bank accounts are maximized at a value of $f = 1$.

Two of the encountered solutions occur are at the empirically implausible values of $f = 0$ and $f = 1$. Ruling these out as they do not appear to be relevant in real life, f would be stuck at $f = f_1$. There, locally, for a range of tax differentials, tax evasion is inelastic with respect to international tax differences. So, the results presented in section 3 apply.

Another plausible shape of the cost function, shown in figure 4, upper panel, is that beyond the threshold f_1 marginal costs rise, until costs hit a ceiling at f_2. If the segment of the cost function between these crucial values is quadratic so that the cost function reads

$$C = \begin{cases} C_0 & \text{if } 0 < f \leq f_1, \\ C_0 + c_1(f_1 - f)^2 & \text{if } f_1 < f \leq f_2, \\ C_2 & \text{if } f_2 < f, \end{cases} \tag{11}$$

the first-order condition for maximum net benefits $B - C$ in the segment where the quadratic cost relationship applies yields the tax evasion function

$$f = 0.5r(t_{eu} - t_f) + 2c_1 f_1 \tag{12}$$

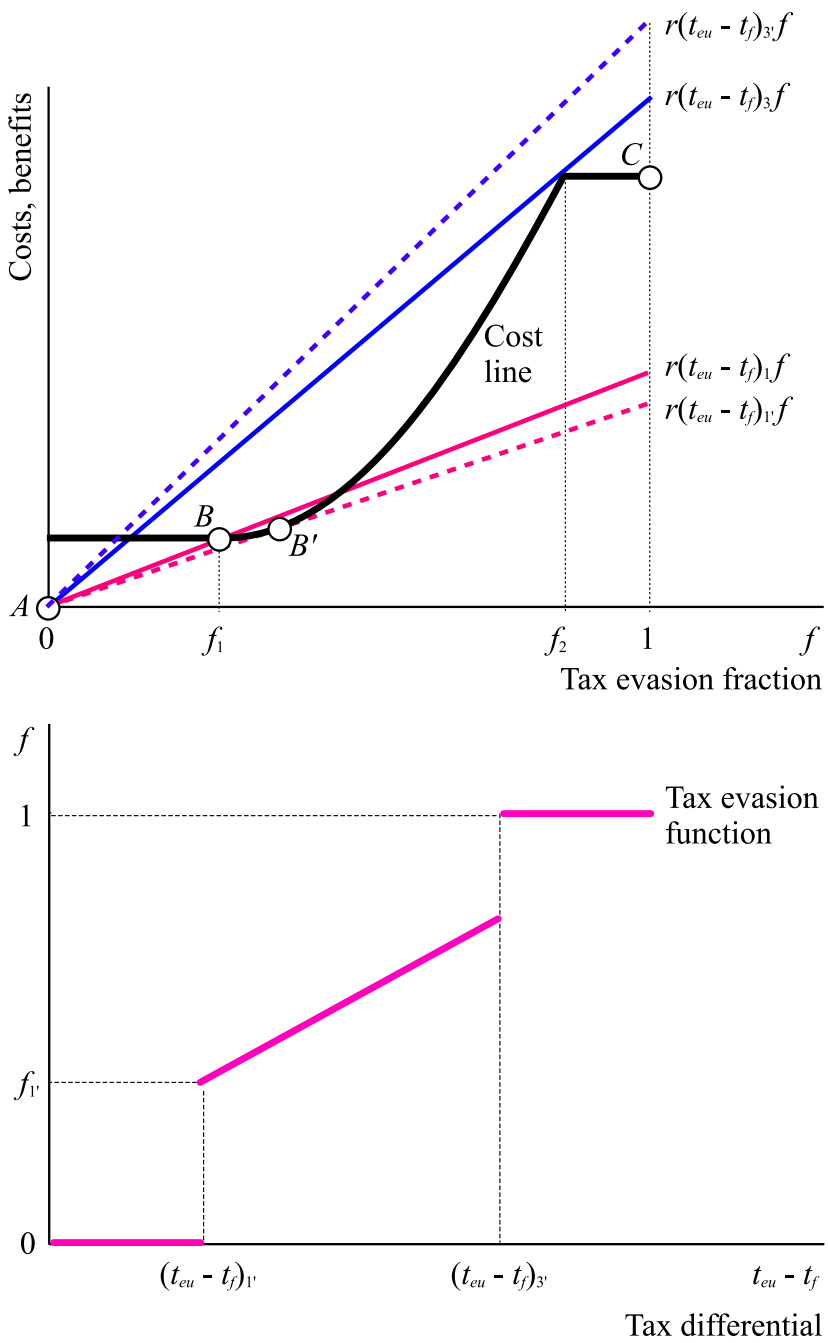
This is a straight line (shown in the lower part of figure 4), as was the relationship postulated in our mechanical approach of section 4.1. Therefore, the results derived there apply.

The discussion in this section has argued for some general properties the cost function should have. We have also seen that for some specific cost lines, as proposed in figures 3 and 4, tax evasion functions that had already been analyzed previously. These are special cases however. In general, other cost functions are viable and should lead to more complex tax evasion functions, and a potentially richer set of results. We now turn to such options and integrate them into our model.

4.2.2 A general specification and a numerical solution

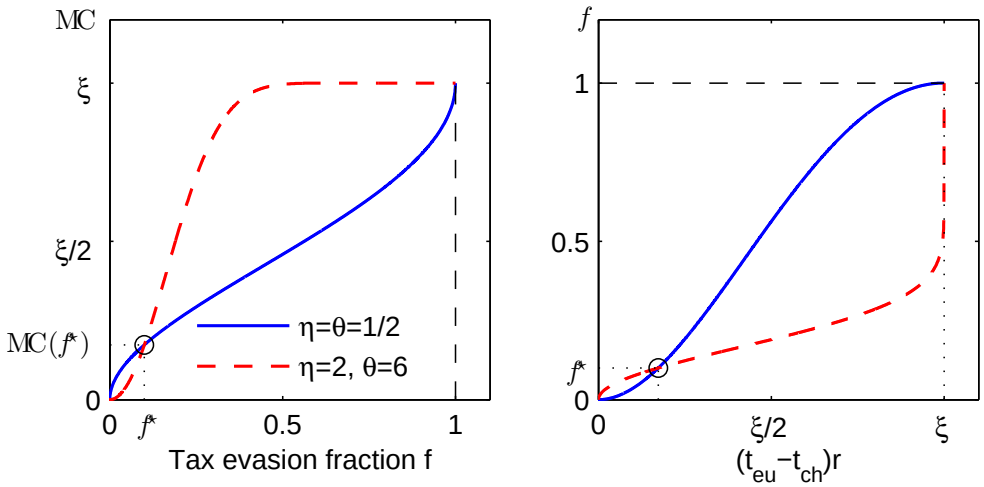
As a very general specification, assume that the marginal cost of evading one dollar of taxes is the following nonlinear function of the fraction of wealth

Figure 4: Costs, benefits, and optimal tax evasion II



The two panels show that any quadratic segment in the cost line implies an upward-sloping linear segment in the tax evasion function.

Figure 5: Marginal costs and optimal tax evasion



The two panels show how different parameterizations of a general marginal cost function (left panel) imply different tax evasion functions (right panel) with different elasticities of tax evasion at a targeted point of intersection.

already hidden from tax authorities

$$MC = \xi \left(1 - (1 - f^{\eta})^{\theta}\right) \tag{13}$$

Two numerical specifications of this function are shown in the left-hand panel of figure 5. The solid line has both parameters η and θ set to 0.5. This yields an s-shaped marginal cost function starting at zero when no taxes are evaded and reaching ξ when no interest income is declared. The shape is meant to capture both the increasing transaction costs involved in repatriating secret funds for consumption and the increasing effort necessary to avoid detection from the tax authorities. When only a small fraction of wealth is transferred abroad, both costs are negligible, as a small reduction in declared wealth is unlikely to raise red flags with the tax authorities and keeping a small portion of wealth abroad may also make sense from a portfolio perspective.

Costs of avoiding detection might be explosive as the declared capital incomes goes to zero and ever more intricate schemes are needed to ward off suspicious authorities. This justifies the steep slope toward the end of the curve. The marginal shoe-leather costs involved in turning around secret capital income in consumption is also likely to be increasing as consumption patterns has to be adjusted to allow for spending out of undeclared income, but there is no reason to think these should be explosive.

Combining the explosive marginal costs of detection avoidance with increasing, but non-explosive, marginal shoe-leather costs yields the postulated

s-shaped curve.

The dashed line results when the function is parametrized with $(\eta, \gamma) = (2, 6)$. There marginal cost increase quickly at low levels of f, then peak early and remain constant thereafter.

While the marginal costs of tax avoidance are increasing, the marginal benefits are constant, as argued above. Optimality involves setting the fraction of undeclared wealth to the level where, at the margin, the costs of leaving more wealth undeclared exactly match marginal benefits. Solving this condition for the optimal fraction $f^\star$ yields

$$f^\star = \left(1 - \left(1 - \frac{(t_{eu} - t_f)r}{\xi}\right)^\theta\right)^\eta. \tag{14}$$

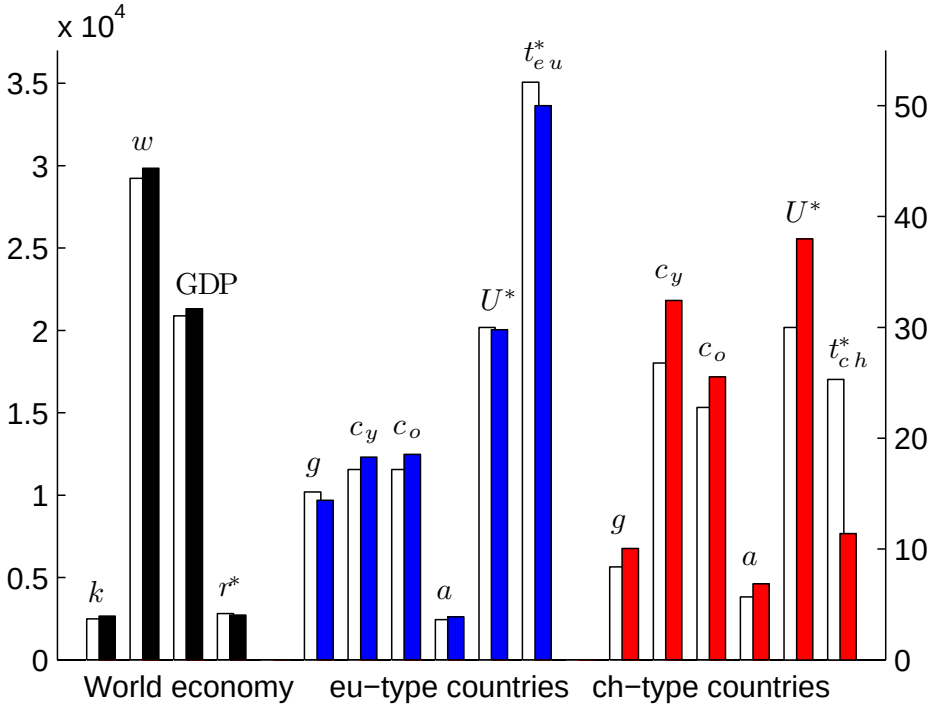
The tax evasion function, derived from benefits given by equation (10) and costs given by equation (13) and plotted in the right hand panel of figure 5 is also s-shaped. Both parameterizations of the tax evasion function intersect where f=0.1, which is the evasion fraction to which we have calibrated the model. The dashed line is rather flat when it passes through this point and, thus, implies a low tax elasticity ϵ_t^f. The solid line is noticeably steeper and harbors a much higher tax evasion elasticity of ϵ_t^f.

5 Discussion and conclusions

Our analysis suggests that the consequences of bank secrecy laws and withholding taxes for countries that have adopted such laws, and for those countries that have not, can be reliably derived under the simplifying assumption that the share of financial wealth held abroad is exogenous. Endogenizing this share refines and complicates matters, but does not lead to any qualitative changes as long as the income-tax elasticity of tax evasion remains small to moderate: countries implementing bank secrecy benefit in the form of lower income tax rates, better provision of public goods, higher income and wealth, and improved consumption. Those countries without banking secrecy laws pay for this: the provision of public goods deteriorates, despite a hike in income tax rates, and income and wealth falls. The only variable to improve is retirement-age consumption.

There is a critical value for the income-tax elasticity of tax evasion, however, beyond which the response of certain variables changes direction. This does not hold for ch-type countries, though. They always benefit in the way sketched above, no matter how high the tax elasticity of tax evasion is. But the governments of eu-type countries now need to lower income tax rates in

Figure 6: Impact of bank secrecy with very elastic tax evasion



White columns indicate the value of variables before and dark columns the value after the adoption of banking secrecy laws. The scale on the right measures interest rates, tax rates and utility, which has been indexed to a value of 30 for the case without banking secrecy. The scale on the left measures all other variables.

order to minimize the negative repercussions from banking secrecy on their country's tax income and the provision of public goods. This is an interesting case, since it could support the argument that banking secrecy serves a wider, unselfish purpose by keeping taxes and government spending in check abroad.

Since these results only obtain when tax evasion is very elastic with respect to changes in tax rates, the relevance of the case of banking secrecy making income tax rates fall in other countries needs to be judged on empirical grounds. A number of empirical studies exist that may be of help.[9] A recent and probably one of the most comprehensive pertinent studies is Huizinga and Nicodème (2004). These authors do not directly estimate the elasticity we are looking for. But we may use their coefficient estimates to

[9]Examples are Grilli (1989), Alworth and Andresen (1992), Fornari and Levy (2000) and Huizinga and Nicodème (2004)

compute the income-tax elasticity of tax evasion indirectly. Proceeding as described in footnote 3, the tax elasticity of international capital flows implied by the regression results reported in Huizinga and Nicodème's table 9, equation (1) is about 0.03.[10] This is very low, certainly much smaller than the thresholds reported in figure2 above, and does not recommend the side-effect of falling tax rates abroad as an empirically compelling case.

On the other hand, data on international portfolios may not be considered sharp and comprehensive enough to generate much trust in empirical estimates derived from them. With such reservations, it may still be possible that income tax rates in countries without banking secrecy would be higher if banking secrecy was dropped. Even if that was correct, however, our analysis would not support the conclusion typically associated with such a scenario, namely that banking secrecy was good for other countries. Our analysis says that even when foreign countries feel compelled to reduce income tax rates and enjoy a boost to economic activity in the private sector, their welfare, the ultimate measure of how well its people are doing, suffers. This happens through three channels: first, when tax rates are lower, public spending is lower, below the level desired by households. Second, part of the taxes its citizens effectively pay end up in the purses of foreign governments, and eu citizens get nothing in return. Third, tax evasion is costly. At least part of these costs must be considered dead-weight loss that has to be conducted from the resources potentially available for private and public consumption.

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[10]Making the relevant segment explicit, Huizinga and Nicodème's equation (1), table 9, reads $\ln F = 0.035r \times t +$ other factors, where F denotes external non-bank liabilities. The elasticity of F with respect to t depends on the magnitudes of r and t. In order to gauge the elasticity near the mean of rt, which is reported as 0.9, let $r = 0.45$, $t_{eu} = 50$ (percent), and $t_f = 30$. Now raise the tax differential by 1 percent to 20.2, which raises rt to 0.909. Via the estimated coefficient this raises the endogenous variable $\ln F$ by $0.035 \times 0.009 = 0.000315$. Since the dependent variable is expressed in logs, this effect measures the percentage change of F. So a one-percent increase in the income tax rate makes external non-bank liabilities go up by 0.0315 percent.

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