DECREASING PROGRESSIVE TAX RATES WITH BASIC INCOME: THE GOLDEN MEAN?

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ABSTRACT

The paper analyses an interesting innovation from the field of taxation. A progressive tax schedule in which the marginal rates are decreasing is compared with the traditional progressive solution (with increasing marginal rates) and with the case of linear rate. The effects on social inequality and distortion are investigated. To measure these features the applied indices are S80/S20 and relative deadweight-loss. According to the model (calibrated on Hungarian data), progression with decreasing marginal rates and base income is a liminality in a sense that: (1) it is more equitable than linear rate meanwhile less equitable than regular progression and (2) its distortional effect is less than regular progression's but higher than in the linear case.

HYPOTHESIS

A tax system which (1) includes the subvention and (2) its effective tax rate is increasing meanwhile (3) its marginal tax rate is decreasing can be called efficient (as incentive) and fair as well. This system can be a golden mean between the linear and classical (in the paper called as regular) progressive tax systems.

PROGRESSIVE TAXATION IN THEORY

The question of definition

There is a debate about the definition of progression in the economic literature. Blum and Kalven (1963) argue that the marginal tax rate (the increment of the tax when the tax base rise a "little" unit) determines it: the tax schedule is progressive if the marginal rate is increasing. Now, I accept the concept of Atkinson and Stiglitz (2015) and join them in following the more conventional usage. In this paper, a tax is called progressive if its average tax rate (the proportion of the tax and the tax base) is increasing (at least not decreasing) with the tax base. This distinction of the definition will be remarkable as the next chapter proves it.

Optimal income tax rates by an "irregular" progressive schedule

The paper investigates graduated progressive tax schedules in which the subventions are included. The subvention can be interpreted as basic or guaranteed income as well. When the tax base is zero the tax payer get this amount and the tax payment will be negative. The first statement is that: if we add the transfers (as a negative income tax) to the tax schedule the marginal tax rate can be decreasing while the average tax rate is increasing (in case of special assumption). This unusual "decreasing" version can be called as irregular progression. It is important to emphasize that the progression works only if the marginal tax rate above the bracket limit is higher than the average tax rate at the bracket limit (formally see later in Equation (8)). Below the bracket limit, the negative income tax ensures the progression. (See more details in Varga, 2013)

First of all, let us investigate the regular graduated progressive tax schedule with the extension of negative income tax. In case of regular progressive tax system, the marginal tax rate is increasing. In a two-bracket tax system, a lower marginal rate is used in the first (lower) bracket while a higher rate is used in the second (higher) bracket. Let us denote the lower marginal rate by m_l and the higher marginal rate by m_h. So:

$$m_l < m_h \qquad (1)$$

Tax function comes from the following two lines:

$$t_{r1}(Y) = a_r + m_l \cdot Y \qquad (2)$$

$$t_{r2}(Y) = a_r + m_l \cdot BL_r + m_h \cdot (Y - BL_r) \qquad (3)$$

where:

$a_r < 0$ its absolute value gives the amount of transfer in the regular case,
Y is the tax base (now the income),
BL_r is the bracket limit in the regular case.

If the tax base is higher than the bracket limit the amount of tax is defined by equation (3) otherwise by equation (2). Equation (4) shows the total tax function:

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$$t_r(Y) = \max(t_{r1}; t_{r2}) \quad (4)$$

In case of the irregular progressive tax system, the marginal tax rate is decreasing. In a two-bracket tax system, the higher marginal rate is used in the first (lower) bracket while the lower rate is used in the second (higher) bracket. Using the notation above, the tax function comes from the following two lines:

$$t_{ir1}(Y) = a_{ir} + m_h \cdot Y \quad (5)$$

$$t_{ir2}(Y) = a_{ir} + m_h \cdot BL_{ir} + m_l \cdot (Y - BL_{ir}) \quad (6)$$

where:

$a_{ir} < 0$ its absolute value gives the amount of transfer in the irregular case,

BL_{ir} is the bracket limit in the irregular case.

If the tax base is higher than the bracket limit the amount of tax is defined by equation (6) otherwise by equation (5). Equation (7) shows the total tax function:

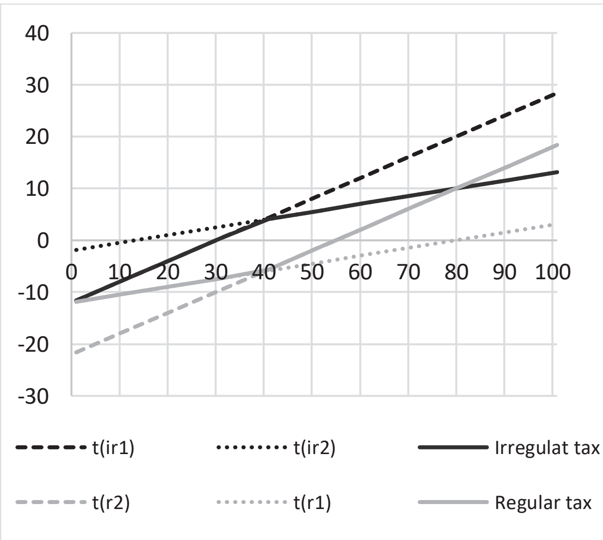
$$t_{ir}(Y) = \min(t_{ir1}; t_{ir2}) \quad (7)$$

Equation (8) gives the condition of progression in the irregular case:

$$m_l > (a_{ir} + m_h \cdot BL_{ir})/BL_{ir} = a_{ir}/BL_{ir} + m_h \quad (8)$$

The left side gives the marginal rate from the bracket limit, the right side equals the average (or effective) tax rate at the bracket limit. Inequality (8) ensures the progressivity of the irregular tax schedule.

Figure 1 shows the relation between regular and irregular progressive taxes when the transfers and the bracket limits are the same ($a_r = a_{ir}; BL_r = BL_{ir}$).



Figures 1: Regular and Irregular Progression

Slemrod et al. (1994) investigated the optimal tax rates in a two-bracket tax schedule. In their model, the social welfare function was maximized subject to the revenue constraint of the state and the utility maximization of individuals. In all of their simulations, the optimal lower-bracket rate was higher than the upper-bracket rate. These results supports the irregular case against the regular schedule. Moreover, the calculated benefit from using two-bracket irregular income tax instead of linear tax was between 0.0002 and 0.2 % of the national income. The main economic consideration behind this result is the fact that lower rate causes greater labour effort.

PROGRESSIVE TAXATION AND NEGATIVE INCOME TAX IN PRACTICE: INTERNATIONAL EXAMPLES

Regular progressive tax rates around the world

Table 1 summarizes the applied tax rates in 8 countries from the world. The last row shows their (unweighted) average.

Table 1: Marginal Rates around the World

China	France	Germany	Italy	Japan	Switzer-land	UK	USA
3%	0%	0%	23%	5%	-	20%	10%
10%	14%	14%	27%	10%	0,77%	40%	12%
20%	30%	42%	38%	20%	0,88%	45%	22%
25%	41%	45%	41%	23%	2,64%		24%
30%	45%		43%	33%	2,97%		32%
35%				40%	5,94%		35%
45%				45%	6,60%		37%
					8,80%		
					11,00%		
					13,20%		
					11,5%*		
24%	26%	25%	34%	25%	6%	35%	25%

*In Switzerland, the marginal rate over the last bracket limit is less than in the previous bracket – this is the only example of irregularity which I found!

The highest rate is 45 % which is applied in 5 countries. The (unweighted) average of the averages is 25 % which is the median and the modus of the averages as well.

Basic income or Negative Income Tax around the world

In the 18th century, the idea of a basic income was born in the United States (where the earned income tax credit is a valid system which works nowadays). The most famous advocate of Negative Income Tax was Milton Friedman (1987) in the 20th century.

In the 21st century, there are many endeavouring in the world to introduce the basic income or negative income tax. See some examples below.

Humphreys (2005) mentioned the opportunity of Negative Income Tax with a flat tax of 30 % over 30 000 $ in Australia.
Finland (Bershidsky, 2018) made a basic income attempt two years ago. 560 EUR was paid monthly per person to 2 000 unemployed citizens for two years. (The project seems to fail.)
According to the Financial Times, the “universal basic income in India is a tantalisingly close prospect”. (Komócsin, 2019)

MODEL

Equivalent versus comparable tax schedules

According to Bond and Myles (2007), two different tax schedules are equivalent if the switching has no economic effect. The condition of equivalence means that the optimal choice of the economic actors remains the same in every situation. Necessarily, in case of equivalent tax schedules, if the tax bases are differing the rates must be differing as well to achieve the equal effect. Equation (9) shows the requirement in linear case for the equivalence of income and consumption tax:

$$t_{income} = t_{consumption}/(1 + t_{consumption}) \quad (9)$$

When we compare the economic effects of two non-equivalent tax schedules, we need to determine the condition of comparability instead of equivalence.

Different tax bases
If we compare tax schedules with different tax bases (like consumption and income) the main requirement is the same revenue. In the linear case, the tax payer’s budget constraint with income tax is shown by Equation (10) and with consumption tax by Equation (11).

$$Income \cdot (1 - t_{income}) = Consumption \quad (10)$$

$$Income = Consumption \cdot (1 + t_{consumption}) \quad (11)$$

From Equation (10) and (11) we get Equation (12) which is sufficient for linear case:

$$1/(1 - t_{income}) = 1 + t_{consumption} \quad (12)$$

Equation (12) is identical to Equation (9) so the comparable rates are equivalent rates as Bond and Myles proved it. But in the progressive case, the consumption and income based tax schedules have different economic effects so the comparable rates won’t be equivalent rates at the same time.
In the progressive case, we need the same revenue requirement as well as in the linear case. Total revenue depends on the marginal rates in brackets and on the bracket limits. In Varga (2014), the comparable tax rates come from the intratemporal budget constraint as in linear case while the bracket limits come from the intertemporal budget constraint. The rates are determined as Equation (12) but the bracket limit depends on the distribution of the income in the society.

Same tax base
Now, we compare different tax schedules with the same tax base. Henceforward, the main principle of comparability is the same revenue. This determines the rate of the linear tax if the total tax base and the required revenue are given.

$$t_{linear} = Revenue/Total\ tax\ base \quad (13)$$

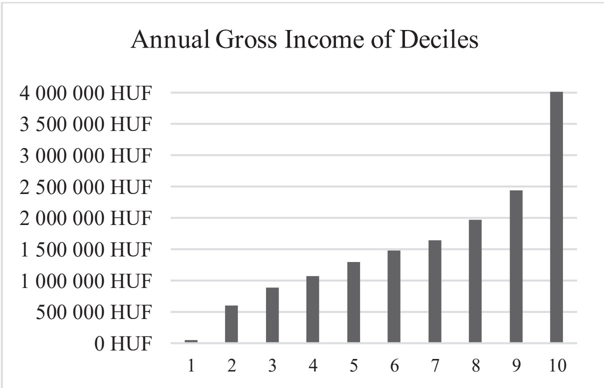
In case of progression the application of comparability principle depends on the distribution of income in the society. There are several opportunities to compare regular and irregular progressive schedules. In this paper, the lower and the higher rates will be the same but their role in the brackets will be differing definitely. To achieve the same revenue, the question will be that: the bracket limit or the transfer will be fixed for the comparison of the two systems? In the calibration, I choose the first one.

Calibration of the Parameters

In Hungary, a linear tax rate is used for income and its actual value is 15 % (now disregarding the tax and tax base exemptions and allowances). I choose this rate for comparison. This determines obviously the desirable revenue of the state if total tax base is known:

$$Revenue = 0.15 \cdot Total\ tax\ base \quad (14)$$

The average incomes of the deciles for year 2017 are available from the homepage of the Hungarian statistical bureau (Központi Statisztikai Hivatal, 2019). Figure 2 shows the personal gross income data excluding the social transfers (such as family and children supplies and unemployment benefit).



Figures 2: Earnings of the Hungarian Deciles in 2017

In the model, the higher (m_h) and lower (m_l) marginal rate of the progressive tax schedules will be 45% and 25 % in order. These amounts are derived from the nowadays used international valid examples as Table 1 shows.

The transfers (a_{ir} and a_r) can be determined if the bracket limit is given and vice versa. In the model, the possible levels of the bracket limit will be the average incomes of the deciles. The schedule will be graduated progressive if and only if the bracket limit is between the 2nd and 9th decade. If the limit equals the 1st or 10th decade the schedule has only one marginal rate so we don't deal with these opportunities now.

The values of a_{ir} and a_r were calculated by excel solver at different levels of bracket limit. Table 2 illustrates the results where:

Y_i = the (average) gross income of the ith decile.

Table 2: The Transfers in the Function of the Bracket Limit

	a(ir)	a(r)
BL=Y_2	-235 864 HUF	-305 206 HUF
BL=Y_3	-270 874 HUF	-269 990 HUF
BL=Y_4	-290 197 HUF	-250 667 HUF
BL=Y_5	-310 452 HUF	-230 412 HUF
BL=Y_6	-323 969 HUF	-216 895 HUF
BL=Y_7	-334 142 HUF	-206 722 HUF
BL=Y_8	-348 805 HUF	-192 059 HUF
BL=Y_9	no solution	

If the bracket limit equals the income of the ninth decile the condition of progression (see Equation (8)) will fail so there is no possible irregular tax schedule. Henceforward, the paper deal with the other 7 opportunities signing the tax schedule by $t\ (BL=Y_i)$ in which the tax bracket limit equals the gross income of the ith decile.

From Table 2, the transfer ($|a|$) is increasing in the irregular case and decreasing in the regular case if the bracket limit become higher. The highest subvention (or basic income) is 348 805 HUF in the irregular case and 305 206 HUF in the regular case. (These amounts are around 1 000 EUR depending on the EURHUF exchange rate.)

RESULTS OF COMPARISON

Equity

The determination of a social welfare function is obviously vulnerable for characterising the equitable effect of the schedules (see Slemrod at al.). Instead of choosing this way, I calculated the S80/S20 rate given by Equation (15).

$$\frac{S80}{S20} = \frac{Y_{10}-t(Y_{10})+Y_9-t(Y_9)}{Y_1-t(Y_1)+Y_2-t(Y_2)} \qquad (15)$$

S80/S20 shows the ratio of net incomes of the richest and poorest people. In linear case this ratio is 9.99. Table 3 summarizes the effect of the irregular and regular tax schedules on the social inequality.

Table 3: Social Inequality

S80/S20	Irregular	Regular
t (BL=Y_2)	5.82	3.76
t (BL=Y_3)	5.24	4.11
t (BL=Y_4)	4.95	4.33
t (BL=Y_5)	4.67	4.60
t (BL=Y_6)	4.49	4.81
t (BL=Y_7)	4.34	4.99
t (BL=Y_8)	4.12	5.31

From Table 3 we find that the S80/S20 is parallel with the amount of transfer. The distinction between the incomes becomes less when the tax base is increasing in the irregular case and decreasing in the regular case. All of them is much more less than the ratio in the linear case. Which deciles do prefer the linear, irregular and regular tax schedules? The answer is shown in Table 4 assuming that the deciles prefer the lowest tax obligation at every level of bracket limit.

Table 4: Best Schedules for the Deciles

Preferences	Linear	Irregular	Regular
t (BL=Y_2)	7,8,9,10		1,2,3,4,5,6
t (BL=Y_3)	7,8,9,10		1,2,3,4,5,6
t (BL=Y_4)	8,9,10	1	2,3,4,5,6,7
t (BL=Y_5)	8,9,10	1	2,3,4,5,6,7
t (BL=Y_6)	8,9,10	1,2	3,4,5,6,7
t (BL=Y_7)	8,9,10	1,2	3,4,5,6,7
t (BL=Y_9)	9, 10	1,2,3	4,5,6,7,8

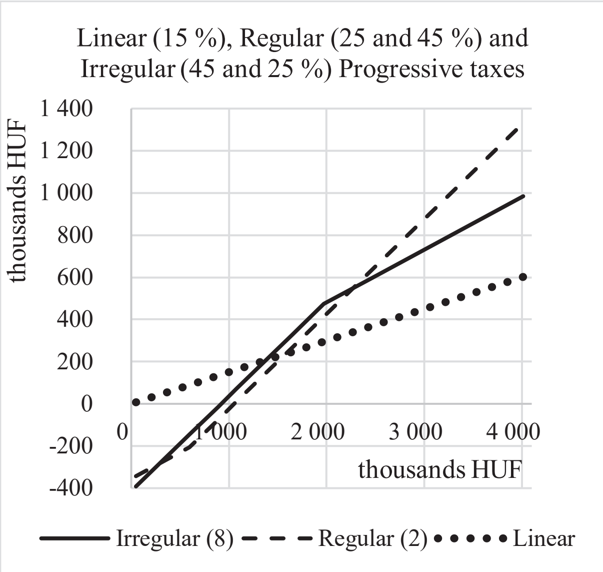
The 9th and 10th (the richest) deciles prefer the linear tax schedule in all of the investigated 7 opportunities.

The choice of 7th and 8th deciles (the "upper middle class") depends on the bracket limit: either the linear or the regular schedule can be the best for them.

The 4th, 5th and 6th deciles (the "lower middle class") would support the regular solution.

The best schedule for the 1st, 2nd and 3rd deciles (the poorest members of the society) can either be the regular or the irregular progression depending on the bracket limit.

Henceforward, I choose the fairest schedules and will investigate the following two alternatives: $t_{ir}(BL = Y_8)$ and $t_r(BL = Y_2)$ comparing with the linear case. These tax functions are shown in Figure 3.



Figures 3: The Most Equitable Irregular and Regular Tax Schedules with Linear Rate

The less value of S80/S20 means higher equity. From this relation, the equity rank is: $t_r(BL = Y_2) > t_{ir}(BL = Y_8) > t_{lin}$. From this aspect, the irregular tax schedule is in the middle.

Efficiency

From our comparability principle, these irregular ($t_{ir}(BL = Y_8)$) and regular ($t_r(BL = Y_2)$) tax schedules ensure the same revenue for the government as the linear rate (at 15 %) if we don't care with the labour incentive factors which mentioned by Slemrod et al. Henceforward, the paper analyses the question of efficiency.

The so-called deadweight loss (DWL) or excess burden measures the distortion effect of a tax. The higher its value the less its efficiency. Equation (16) gives its formula: (Stiglitz, 2000)

$$DWL = 0.5t^2pQ\eta \quad (16)$$

The DWL is proportional to the square of marginal tax rates. It means that: twice the rate, quadruple the deadweight loss. Table 5 shows the square of the ratio of the tax rates. If the deadweight loss is one unit at 15 % then it becomes nine units at 45 %.

Table 5: Relative Deadweight Losses belong to the Tax Rates

$DWL(i)/DWL(lin)$	t	$t/t(lin)$	$(t/t(lin))^2$
$Linear$	0.15	1	1
m_h	0.45	3	9
m_l	0.25	1.67	2.78

Assuming constant elasticity (η), Table 6 gives the values of the deadweight loss at different deciles if the linear case is assumed one unit. The table contains also the total amount of relative DWL of the different tax schedules.

Table 6: Relative Values of the Deadweight-losses of the Tax Schedules

DWL	$B1$	$B2...B7$	$B8...B10$	SUM	$\frac{\sum DWL(i)}{\sum DWL(lin)}$
t_{lin}	1	1	1	10	1
$t_{ir}(8)$	9	9	2.78	71.33	7.133
$t_r(2)$	2.78	9	9	83.78	8.378

From Table 6, the deadweight-loss of irregular progressive tax schedule (7.133) is less than of regular (8.378) but higher than of linear (1). From this result the distortion effect of irregular solution is between the regular progressive and the linear case. The irregular tax schedule is again in the middle.

CONCLUSION

The (irregular) progression with decreasing marginal rates can be a golden mean between regular progressive (increasing marginal rates) and linear tax schedules from both of the aspects of equity and efficiency if the base income is included in the progressive tax systems. In an optimal tax system, there is a trade-off between equity and efficiency. The irregular progression with basic income is a competitive solution when we don't want to sacrifice too much equity in case of linear or too much efficiency in case of regular progressive tax schedules.

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