The welfare effects of flat income tax reform: the case of Bulgaria

Aleksandar Vasilev,PhD
Assistant Professor
Department of Economics
American University in Bulgaria

April 4, 2014

Motivation

- This study is a first formal attempt to quantitatively evaluate the effect of the introduction of flat income taxation in Bulgaria in 2008. In 2008, a flat tax rate of 10% on personal income was introduced.
- The focus is on the growth effects of flat income tax rate, and the corresponding welfare improvement as a result of that.
- Other countries that have adopted flat tax rates are Abkhazia, Albania, Anguilla, Belize, Belarus, Bolivia, Bosnia and Herzegovina, East Timor, Estonia, FYROM (Former Yugoslav Republic of Macedonia), Greenland, Grenada, Guernsay, Guyana, Hungary, Jamaica, Jersey, Kyrgyzstan, Kuwait, Kazakhstan, Latvia, Lithuania, Madagaskar, Mauritus, Mongolia, Nagorno-Karabakh, Poland, Romania, Russia, Saint Helena, Saudi Arabia, Serbia, Seychelles, South Osetia, Transnistria, Trinidad and Tobago, Turkmenistan, Tuvalu, Ukraine.

The Facts

- Until Dec. 31, 2007, Bulgaria applied progressive income taxation on individual income:

Table: Progressive Income Taxation in Bulgaria until 2007

Annual taxable income (in BGN)	Tax owed
0-2400	Zero-bracket amount (min. wage)
2400-3000	20 % on the amount earned above BGN 2400
3000-7200	BGN 120 + 22% on the excess over BGN 3000
$>$ 7200	BGN 1044 + 24% on the excess over BGN 7200

Source: Petkova (2012)

The Facts

- In 2008, a flat tax rate of 10% on personal income was introduced. This represented a considerable decrease in the marginal tax rates. In addition to the progressive scale removal, the non-taxable minimum, and the existing tax incentives and tax deductions were also abolished.

Table: Revenue from personal income taxation

Fiscal year	2007	2008	2009	2010	2011
% of tax revenue	9.40	8.90	10.20	10.70	10.60
% of GDP	3.00	2.90	3.00	2.90	2.90

Source: Petkova (2012)

- As seen from Table 2, the importance of personal income tax revenue has increased, both in terms of total revenue raised, and relative to the size of the economy. In addition, the relative share of the revenues from taxed personal income as a share in output has been relatively stable. As suggested in Petkova (2012), the absence of any increase in that component might be due to the financial crisis.

The Facts

Table: Composition of Personal Income Tax Receipts

Fiscal year	2007	2008	2009	2010	2011
Labor income	77.56%	78.96%	82.30%	83.41%	81.15%
Business activities (sole proprietors, etc.)	16.80%	15.47%	12.19%	10.64%	12.57%
Lump-sum tax	2.00%	1.52%	1.02%	0.94%	0.78%
One-off tax	3.65%	4.06%	4.49%	5.02%	5.50%

Source: Petkova (2012)

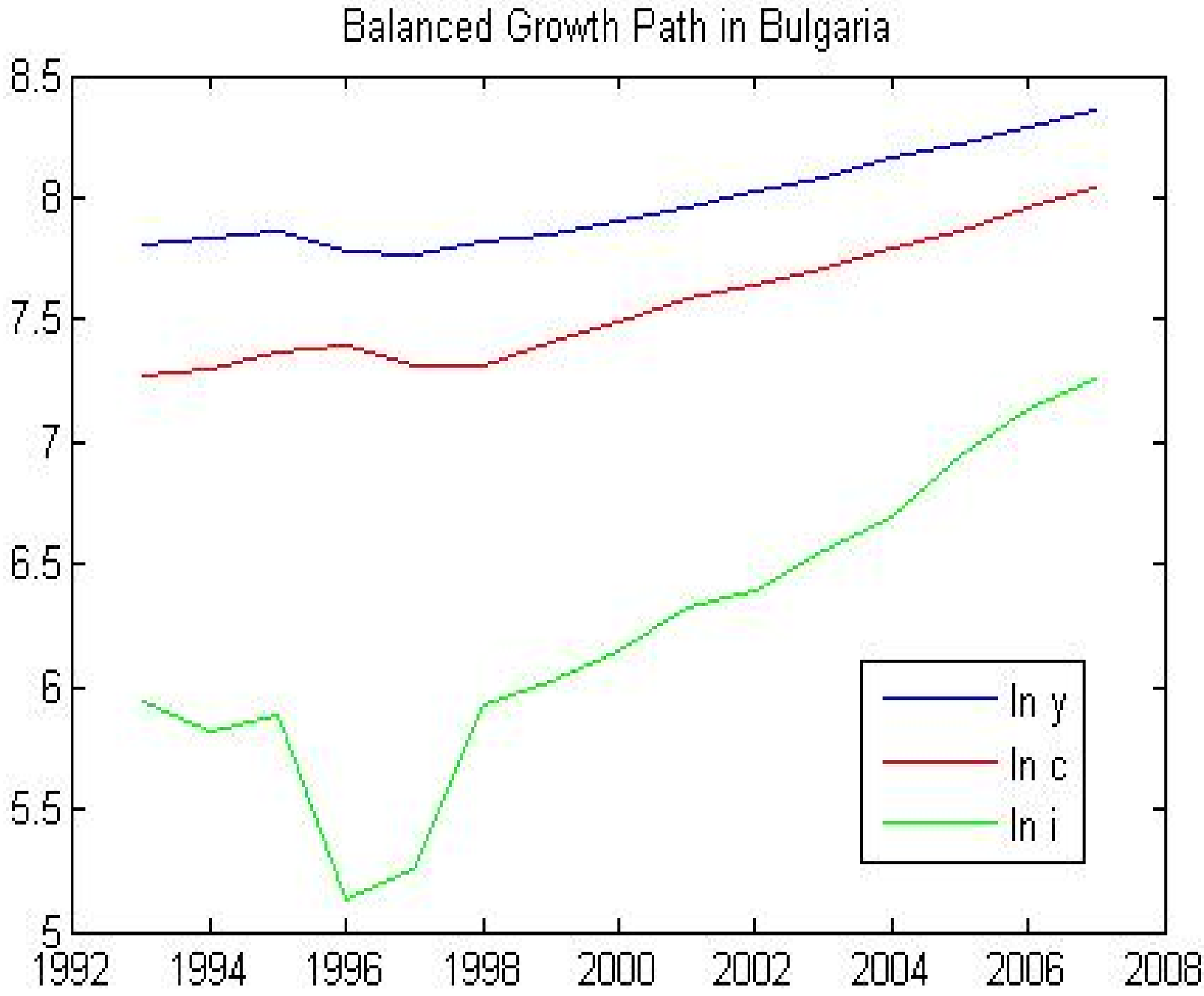
- The share of labor income from the personal income tax is the largest (81%) component of personal income tax receipts has increases substantially over this short period: 10.97% growth in 2008, 8.41% in 2009, 0.30% in 2010, and 4.43% in 2011. The second component, personal income tax revenue from business activities (14%), is decreasing over the period, which reflects the financial crisis, but then rebounds in 2011.

Literature Review

- This paper presents a simplified version of Lucas (1988) endogenous growth model with human capital. The theoretical framework allows for endogenous labor supply, thus extending the work of King and Rebelo (1990).
- The analysis of the effect of fiscal policies in exogenous and endogenous growth models is relatively recent, *e.g.*, King and Rebelo (1990), Lucas (1990), Stokey and Rebelo (1995), Ortigueira (1998), and the references therein.
- More recent treatments on the subject include Funke and Strulik (2003) on Estonia, and Azacis and Gillman (2010) on the tax reform in the Baltic countries: Estonia, Latvia, and Lithuania.
- In their research on the US, King and Rebelo (1990) find that income taxation decreases the return to capital and labor. Rebelo (1991) also uncovers a negative relationship between the tax rate and the growth in a similar setup with both physical and human capital, as the one used in this paper.

Main findings

- The paper utilizes a carefully calibrated theoretical model to match Bulgaria's post-communist behavior.
- The study demonstrates that the effective tax rate during the regime of progressive taxation imposes a bigger distortion by decreasing the return to capital and labor.
- A lower after-tax return to capital decreased the steady-state growth, significantly more so than the corresponding average effective tax rate under the flat income taxation.
- Substantial growth benefits can be realized from the switch to flat income taxation. The magnitude of the computed welfare gain is in line with studies on the Baltics.
- The findings in this paper is also in line with Easterly and Rebelo (1993), who find a statistical relationship between fiscal variables and growth.


Balanced Growth Path in Bulgaria
8.5
8
7.5
7
6.5
6
5.5
5
1992
1994
1996
1998
2000
2002
2004
2006
2008
ln y
ln c
ln i

Representative Household's Problem

There is an infinitely-lived representative household in the model economy, and no population growth. The representative household acts competitively by taking prices $\{w_t, r_t\}_{t=0}^{\infty}$, income tax rate τ, policy variable $\{g_t^T\}_{t=0}^{\infty}$ as given, and chooses allocations $\{c_t, i_t^k, i_t^s, k_t, s_t, h_t\}_{t=0}^{\infty}$ to maximize

$$\sum_{t=0}^{\infty} \beta^t [\ln c_t + \alpha \ln(1 - h_t)],$$

s.t.

$$\begin{aligned} h_t + l_t &= 1, \\ s_{t+1} &= i_t^s + (1 - \delta^s) s_t, \\ c_t + i_t^k + i_t^s &\leq (1 - \tau)[r_t k_t + w_t s_t h_t] + \pi_t + g_t^T, \\ k_{t+1} &= i_t + (1 - \delta) k_t. \end{aligned}$$

Household's Optimality Conditions

The optimality conditions from the household's problem, together with the transversality condition (TVC) for physical capital are as follows:

$$\begin{aligned}
c_t : c_t^{-1} &= \lambda_t \\
k_{t+1} : \lambda_t &= \beta\lambda_{t+1}[(1-\delta^k) + (1-\tau)r_{t+1}] \\
s_{t+1} : \lambda_t &= \beta\lambda_{t+1}[(1-\delta^s) + (1-\tau)w_{t+1}h_{t+1}] \\
h_t : \alpha(1-h_t)^{-1} &= \lambda_t(1-\tau)w_t s_t \\
TVC : \lim_{t\to\infty} \beta^t c_t^{-1} k_{t+1} &= 0,
\end{aligned}$$

where λ_t is the Lagrange multiplier on the household's budget constraint.

Representative Firms's Problem

The representative firm acts competitively by taking prices $\{w_t, r_t\}_{t=0}^{\infty}$, income tax rate τ, policy variable $\{g_t^T\}_{t=0}^{\infty}$ as given, and chooses $k_t, e_t, \forall t$ to maximize firm's static profit:

$$\pi_t = Ak_t^{\theta} e_t^{1-\theta} - r_t k_t - w_t e_t.$$

In equilibrium profit is zero. Note that the firm cannot choose skill level and labor hours separately respectively ($e_t = s_t h_t$). In addition, efficiency labor and capital receive their marginal products, *i.e.*

$$r_t = \theta \frac{y_t}{k_t},$$
$$w_t = (1-\theta)\frac{y_t}{e_t}.$$

Government Sector

The government collects tax revenue from efficiency labor and capital income to finance government transfers, which are then refunded lump-sum to the household. The government budget constraint is then

$$\tau[r_t k_t + w_t e_t] = g_t^T.$$

Government takes prices $\{w_t, r_t\}_{t=0}^{\infty}$ and allocations $\{k_t, e_t\}_{t=0}^{\infty}$ as given. The income tax rate τ will be exogenously set, while government transfers $\{g_t^T\}_{t=0}^{\infty}$ will be residually determined: transfers will adjust to ensure the government budget constraint is balanced in every time period.

Decentralized Competitive Equilibrium (DCE) and Balanced Growth Path (BGP)

- Given the initial conditions for the state variables k_0, s_0, a Decentralized Competitive Equilibrium (DCE) is defined to be a sequence of prices $\{r_t, w_t\}_{t=0}^{\infty}$, allocations $\{c_t, i_t^k, i_t^s, k_t, s_t, h_t, g_t^T\}_{t=0}^{\infty}$, income tax rate $\{\tau\}$ such that (i) the representative household maximizes utility; (ii) the stand-in firm maximizes profit every period; (iii) government budget is balanced in each time period; (iv) all markets clear.
- Given the initial conditions for the state variables k_0, s_0, a balanced growth path (BGP) is a set of sequences of prices $\{r_t, w_t\}_{t=0}^{\infty}$, allocations $\{c_t, i_t^k, i_t^s, k_t, s_t, h_t, g_t^T\}_{t=0}^{\infty}$, and income tax rate τ satisfying the DCE definition such that the paths $\{c_t, i_t^k, i_t^s, k_t, s_t, g_t^T\}_{t=0}^{\infty}$ grow at the same rate γ, while hours $\{h_t\}_{t=0}^{\infty}$ and prices $\{r_t, w_t\}_{t=0}^{\infty}$ remain constant, and the output-physical capital and output-human capital ratio is unchanged.

Model Parameters

Table: Model Parameters

Param.	Value	Definition	Source
β	0.962	Discount factor	Calibrated
θ	0.429	Capital income share	Data Avg.
$1-\theta$	0.571	Labor income share	Calibrated
δ^k	0.047	Depreciation rate of physical capital	Calibrated
δ^s	0.006	Depreciation rate of human capital	Calibrated
α	1.696	Relative weight on leisure in utility function	Calibrated
τ^F	0.110	Average effective income tax rate (flat)	Data avg.
τ^P	0.140	Average effective income tax rate (prog.)	Data avg.
A	1.000	Total factor productivity, steady-state level	Calibrated

Steady-State Results

Table: Data Averages and Long-run solution

	Description	BG Data	Model
c/y	Consumption-to-output ratio	0.672	0.672
i^k/y	Fixed investment-to-output ratio	0.165	0.165
i^s/y	Human cap. inv.-to-output ratio	0.048	0.048
g^T/y	Gov't transfers-to-output ratio	0.159	0.14 (prog.)
g^T/y	Gov't transfers-to-output ratio	0.159	0.11 (flat)
k/y	Physical capital-to-output ratio	3.491	3.491
s/y	Human capital-to-output ratio	N/A	7.610
wh/y	Labor share in output	0.571	0.571
rk/y	Capital share in output	0.429	0.429
h	Share of time spent working	0.333	0.333
$\tilde{r}$	After-tax net return to capital	0.040	0.059 (prog.)
$\tilde{r}$	After-tax net return to capital	0.040	0.062 (flat)

Solving for the balanced growth path

The long-run growth rate can be obtained as follows:

$$1+\gamma=\frac{c_t}{c_{t-1}}=\beta\left[1-\delta^k+(1-\tau)\theta\frac{y_t}{k_t}\right]$$

This produces

$$1+\gamma^{PROG}=1.018$$
$$1+\gamma^{FLAT}=1.022$$

Table: Long-run growth (1992-2007)

	Description	BG Data	Model
γ_y	Avg. growth in output per capita	0.0158	0.0180
γ_c	Avg. growth in consumption per capita	0.0184	0.0180
γ_i	Avg. growth in investment per capita	0.0716	0.0180

Welfare analysis

- We will consider a hypothetical scenario in which Bulgaria starts in 2008 but did not adopt flat income tax rate. To this thought experiment, we will contrast the observed scenario with flat income taxation. This would allow to evaluate the effect of the difference in taxation, holding everything else in the model unchanged.

Table: Welfare gain

Optimization horizon (years)	6	20	50	100	200
Compensatory variation (%)	1.25	3.61	7.13	14.27	28.56

Welfare analysis

- Devereux and Lowe (1994) obtain a welfare gain of 5%, Azacis and Gillman (2010) find similar welfare gains $2.2 - 3\%$ for the case of the flat tax reform in the Baltic countries during 2000-07.
- Using a large-scale life-cycle model, Altig *et al.* (2001) also find significant gains from a flat income taxation in the US.
- Funke and Strulik (2003) find much smaller welfare gains using an exogenous growth model to study the effect of the Estonian 2000 income tax act.

Conclusions

- This paper is a first attempt to provide a quantitative evaluation of welfare gains from the introduction of flat income taxation in Bulgaria in 2008.
- Using a calibrated micro-founded endogenous growth model with physical and human capital accumulation to Bulgarian data, a computational experiment is performed to quantify the dynamic welfare effect of progressive income taxation vis-a-vis flat income taxation.
- The model demonstrates that significant welfare gains, measured in terms of per-period consumption, can be realized with the introduction of flat income taxation.
- In addition, these welfare gains increase proportionally with the length of the time horizon considered.