BULGARIAN NATIONAL BANK

Investment Incentives in Bulgaria: Assessment of the Net Tax Effect on the State Budget

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DISCUSSION PAPERS

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EXECUTIVE SUMMARY: In order to encourage investments in Bulgaria the Foreign Investments Law (FIL) provides tax preferences for special investment projects satisfying certain conditions. The scope of this study is to make an attempt to perform a quantitative analysis of the net tax effect of these investment incentives on the state budget.

The values of natural capital and employment growth rates in Bulgaria should increase after the FIL comes into effect in order that a negative tax effect of investment incentives to be avoided. Break-even analysis is used to compute the required minimum percentages of improvement of natural growth rates so that after the FIL comes into effect the net change of the amount of taxes collected by the government is non-negative.

Sensitivity analysis of the break-even point leads to the conclusion that these minimum percentages of improvement of natural growth rates are in the range (1%, 10%) and are strongly dependent only on the percentage of new investments using tax preferences. In particular, they are almost non-sensitive to the values of natural growth rates of capital and employment. Since their values remain valid for a vast range of natural growth rates, there is no need to estimate the exact natural growth rates of capital and labor in Bulgaria (a difficult task because of the shadow economy).

After the appropriate analysis, it is concluded that the three types of incentives in the FIL seem to be able to achieve the computed minimum percentages of improvement of natural growth rates. Therefore, the net tax effect of investment incentives in the FIL is expected to be non-negative for the state budget.

The model used in the study has been implemented in a MS-Excel spreadsheet, so that it is possible to carry out graphical simulations of the net tax effect for different sets of input parameters. The results of the study are valid only in the framework of conditions used to develop the model.

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I. An Overview of the Problem

The Foreign Investments Law (FIL) came into effect in Bulgaria at the end of 1997. In order to encourage investments in Bulgaria one of the parts of the FIL provides tax incentives for special investment projects satisfying certain conditions, namely a 50% reduction of taxes on profit (ToP) for ten successive years is provided for investment projects satisfying at least one of the following three conditions:

- the amount of the investment is greater than USD 5million;
- the investment creates more than 100 new jobs;
- the investment is in a region with an unemployment rate higher than the country average (such regions are determined by the Council of Ministers).

The need of investment incentives arises primarily from the need of faster capital recovery of the Bulgarian economy and from the inadequate level of investment during the past several years. Many other countries apply different types of incentives to encourage investments when their level is decreasing. For example, in the USA the so-called ‘investment tax credit’ was used prior to 1987 to encourage investments in ‘qualified property’. The Tax Reform Act of 1986 repealed the regular investment credit except for a few special situations and types of property, which had a negative effect on capital-intensive industries.[1]

A common feature of most types of investment incentives is the slight reduction of some of the taxes paid by investors satisfying certain requirements. An increase in the amount of investments is supposed to increase sufficiently the level of production and/or employment so that eventually investment incentives do not cause a decrease of the amount of taxes collected by the government.

The scope of this study is to perform a quantitative analysis of the net tax effect of the FIL in Bulgaria on the state budget.

II. Basic Assumptions

1. The Cobb-Douglas Production Function

We assume that real GDP growth can be expressed by the Cobb-Douglas production function

$$Y = \theta \cdot K^{\alpha} \cdot L^{1-\alpha}$$

[1] The comments regarding the investment tax credit in the USA are presented in G. J. Thuesen and W. J. Fabrycky, *Engineering Economy,* 7th ed. (N. J.: Prentice Hall, Inc, 1989).

where Y is the gross domestic product, K is a measure of capital input and L is a measure of labor input. The coefficients of production are θ and $\alpha \in (0, 1)$. The Cobb-Douglas mathematical expression of the relationship between value added, capital and labor is essential for economic analysis. Consistent with economic reality, it guarantees that any increase of K (due to investments) or L (due to decrease of unemployment) never leads to the same increase of GDP[2].

Since the Bulgarian economy is much more labor-intensive than capital-intensive, $\alpha = 0.25$ has been estimated to be realistic for the Cobb-Douglas production function[3]. As we shall see later, the break-even point of the net tax effect of investment incentives is almost not sensitive to the exact value of α. Therefore, there is no need of a precise estimation of this parameter for the purposes of the study.

2. *Constant Ratio between Taxes Collected and GDP*

Another important assumption is that when the tax system remains unchanged (together with the percentage of success in tax collection), the ratio between taxes collected by the government and GDP also remains almost unchanged. Table 1 contains relevant data for the state budget of Bulgaria reported officially by the tax administration.

Table 1

RATIO BETWEEN TAXES COLLECTED AND GDP FOR 1996 AND 1997

Indicators	Reported as of 31 Dec. 1996 (mln. BGL)	Relative share in GDP (%)	Reported as of 31 Dec. 1997 (mln. BGL)	Relative share in GDP (%)
1. Total tax revenues, incl.	344234.8	19.68	3302480.7	19.31
1.1. Taxes on profit (ToP)	74146.3	4.24	831365.0	4.86
1.1.1. From nonfinancial enterprises	62161.6	3.55	752814.0	4.40
• ToP	47445.6	2.71	543874.0	3.18
• Contr. to municipalities	14716.0	0.84	208940.0	1.22
1.1.2. From financial institutions	11984.7	0.69	78551.0	0.46
• ToP	11984.7	0.69	62894.7	0.37
• Contr. to municipalities			15656.3	0.09

[2] An overview of possible mathematical expressions of value added growth and suitable models for evaluation of tax incentives can be found in A. Fossati, *Equilibrio Generale e Simulazioni* (Milano, Italy: Franco Angeli s. r. l, 1991).

[3] The value has been estimated on an expert basis according to the set of values of α for different economic sectors and countries, presented in D. N. Hyman, *Modern Microeconomics,* 2nd ed. (Boston, MA: Irwin, 1989). It is close to the value of α used by the government, though not yet officially estimated.

Total taxes collected by the Bulgarian government in 1996 and 1997 are about t^{tot} **= 19.5%** of GDP while taxes on profit collected from nonfinancial enterprises are about t^{p} **= 3%** of GDP. The exact values for 1997, t^{tot} **= 19.31%**, t^{p} **= 3.18%**, are used in this study as 1998 is the first year when the FIL is supposed to influence the state budget. Analysis results (based on the sensitivity analysis below) in the conclusion that the break-even point of the net tax effect is not sensitive to small variations of t^{tot} and t^{p}. Therefore, small errors in the values of these two parameters are also admissible.

3. GDP Growth without Investment Incentives

To take into account the specific economic situation in Bulgaria it is natural to assume that even without FIL investment incentives, both capital and employment can only increase (i. e. only growth is possible in the future). The assumption is based on the governmental program "Bulgaria 2001" and implies that investment incentives are supposed to improve growth rather than stop a decline.

4. The Net Tax Effect To Be Measured after the First Year

Another consideration specific to Bulgaria concerns the period to use when the net tax effect of the law is to be measured. On the one hand, tax preferences are given for ten years. On the other hand, if the cumulative net tax effect is negative for the first few years and only after that changes to positive, the law would result in financing present expenditure with future income. Such an alternative seems to be incompatible with the principles of the currency board in Bulgaria. Therefore, we assume that investment incentives should generate a non-negative tax effect as early as one year after they come into effect.

5. The 'Ceteris-Paribus' Rule

Our last assumption is more general and consists in the well-known *ceteris paribus* rule (i. e. other things being equal). Namely, for the analysis of the net tax effect of investment incentives the only thing that counts is whether the FIL comes into effect or not.

III. The Model

1. GDP and Taxes in Year 0 (1997)

By assumption II.1., the 1997 GDP is given by:

$$Y_0 = \theta \cdot K^{\alpha} \cdot L^{1-\alpha}.$$

By assumption II.2., the total amount of taxes T_0 collected by the government in 1997 equals

$$T_0 = t^{tot} \cdot Y_0 .$$

2. GDP and Taxes in Year 1 (1998) and the Net Tax Effect of Investment Incentives

Let Y_1 be the 1998 GDP that will be produced without investment incentives under the FIL and Y_1^{Inc} be the GDP that will be produced with investment incentives into effect. Similarly, let T_1 be the total amount of taxes collected by the government in 1998 without investment incentives and T_1^{Inc} be the amount collected when investment incentives are into effect. Clearly, by the end of 1998 the net tax effect of investment incentives can be expressed as:

$$\text{Net Tax Effect} = T_1^{Inc} - T_1 .$$

3. Derivation of GDP and Taxes in Year 1 without Investment Incentives

Just like T_0, the amount of 1998 taxes T_1 collected without incentives is:

$$T_1 = t^{tot} \cdot Y_1 .$$

By assumption II.3., both capital and employment are not going to decrease even without investment incentives. Therefore, non-negative (natural) growth rates of capital and employment $g_K \geq 0, g_L \geq 0$ can be defined. Thus, the new GDP without investment incentives can be expressed in terms of the old GDP Y_0 as follows:

$$Y_1 = \theta \cdot (K + g_K \cdot K)^{\alpha} \cdot (L + g_L \cdot L)^{1-\alpha}$$

$$Y_1 = \theta \cdot K^{\alpha} \cdot L^{1-\alpha} (1 + g_K)^{\alpha} \cdot (1 + g_L)^{1-\alpha} = Y_0 \cdot (1 + g_K)^{\alpha} \cdot (1 + g_L)^{1-\alpha}.$$

Consequently, the amount of taxes collected without investment incentives equals:

$$T_1 = t^{tot} \cdot (1 + g_K)^{\alpha} \cdot (1 + g_L)^{1-\alpha} \cdot Y_0 .$$

4. Derivation of GDP and Taxes in Year 1 with Investment Incentives in Effect

To obtain the total amount of taxes collected by the government when investment incentives come into effect, it is necessary to subtract part of the taxes resulting from economic activity due to investments using incentives from the relative gross amount of taxes. Let μ be the percentage of investments that use tax preferences when investment incentives come into effect. In the case of the FIL there is a 50% reduction of collected taxes on profit from economic activity resulting from such investments. Therefore,

$$T_1^{Inc} = t^{tot} \cdot Y_1^{Inc} - \mu \cdot \frac{1}{2} t^p \cdot \left(Y_1^{Inc} - Y_0\right)$$

$$T_1^{Inc} = \left(t^{tot} - \mu \cdot \frac{1}{2} t^p\right) \cdot \left(Y_1^{Inc} - Y_0\right) + t^{tot} \cdot Y_0.$$

It is clear that if the given tax preferences do not improve GDP growth rate the resulting net tax effect will be negative (since $Y_1^{Inc} = Y_1$ and $\mu > 0$ imply $T_1^{Inc} < T_1$). In other words, investment incentives *should* somehow improve GDP growth rates in order for the negative net tax effect to be avoided. Let $\lambda_K \geq 0$ be the percentage of improvement of the capital growth rate g_K and $\lambda_L \geq 0$ be the percentage of improvement of the employment growth rate g_L due to investment incentives. Then the new GDP when investment incentives are into effect is related to the old GDP Y_0 as follows:

$$Y_1^{Inc} = \theta \cdot \left(K + g_K \cdot K + \lambda_K \cdot g_K \cdot K\right)^{\alpha} \cdot \left(L + g_L \cdot L + \lambda_L \cdot g_L \cdot L\right)^{1-\alpha}$$

$$Y_1^{Inc} = \theta \cdot K^{\alpha} \cdot L^{1-\alpha} \left(1 + g_K + \lambda_K \cdot g_K\right)^{\alpha} \cdot \left(1 + g_L + \lambda_L \cdot g_L\right)^{1-\alpha} =$$

$$= Y_0 \cdot \left(1 + g_K + \lambda_K \cdot g_K\right)^{\alpha} \cdot \left(1 + g_L + \lambda_L \cdot g_L\right)^{1-\alpha}.$$

Hence, the amount of taxes collected by the government when investment incentives are into effect equals:

$$T_1^{Inc} = \left(t^{tot} - \mu \cdot \frac{1}{2} t^p\right) \cdot \left[\left(1 + g_K + \lambda_K g_K\right)^{\alpha} \cdot \left(1 + g_L + \lambda_L g_L\right)^{1-\alpha} - 1\right] \cdot Y_0 + t^{tot} \cdot Y_0.$$

5. General Formula for the Net Tax Effect of Investment Incentives

The final step is to substitute the expressions obtained in III.3. and III.4. for $\boldsymbol{T_1}$ and $\boldsymbol{T_1^{Inc}}$ into the formula for the net tax effect from III.2.:

$$T_1^{Inc} - T_1 = \left(t^{tot} - \mu \cdot \frac{1}{2} t^p\right) \cdot \left[(1 + g_K + \lambda_K g_K)^{\alpha} \cdot (1 + g_L + \lambda_L g_L)^{1-\alpha} - 1\right] \cdot Y_0 + t^{tot} \cdot Y_0 - T_1 =$$

$$= Y_0 \cdot \left\{ \left(t^{tot} - \mu \cdot \frac{1}{2} t^p\right) \cdot \left[(1 + g_K + \lambda_K g_K)^{\alpha} \cdot (1 + g_L + \lambda_L g_L)^{1-\alpha} - 1\right] - t^{tot} \cdot \left[(1 + g_K)^{\alpha} \cdot (1 + g_L)^{1-\alpha} - 1\right] \right\}.$$

Although the derived general formula for the net tax effect seems to be rather complicated, actually it expresses in a formal way the following sound economic logic:

$$\begin{matrix}\text{Net Tax}\\ \text{Effect}\end{matrix} = \begin{bmatrix}\text{Reduced Taxes}\\ \text{Due to Incentives}\end{bmatrix} \times \begin{bmatrix}\text{Improved Growth}\\ \text{Due to Incentives}\end{bmatrix} - \begin{bmatrix}\text{Normal Taxes}\\ \text{Without Incentives}\end{bmatrix} \times \begin{bmatrix}\text{Normal Growth}\\ \text{Without Incentives}\end{bmatrix}$$

The correspondence between the terms in this expression and the above math formula for the net tax effect is straightforward.

IV. Break-Even Analysis and Sensitivity Analysis of the Break-Even Point of the Net Tax Effect

1. The Break-Even Point of the Net Tax Effect

From the derived formula for the net tax effect, it follows that the higher $\boldsymbol{\lambda_K}$ and $\boldsymbol{\lambda_L}$ are the better the net tax effect on the state budget is. There are critical minimum values of $\boldsymbol{\lambda_K}$ and $\boldsymbol{\lambda_L}$ that cause a zero net tax effect: for higher values the net effect is positive, for lower ones it is negative. These critical values represent the break-even point of the net tax effect (considered as function of $\boldsymbol{\lambda_K}$ and $\boldsymbol{\lambda_L}$). In other words, break-even analysis of the net tax effect determines what the minimum acceptable improvements of the growth rates $\boldsymbol{g_K}$ and $\boldsymbol{g_L}$ are (i. e. the minimum values of $\boldsymbol{\lambda_K}$ and $\boldsymbol{\lambda_L}$) that make *incentives* a more attractive alternative for the state budget than that *without incentives*[4].

[4] Different applications of break-even analysis for comparison of alternatives can be found in G. J. Thuesen and W. J. Fabrycky, *Engineering Economy*, 7th ed. (N. J.: Prentice Hall, Inc, 1989).

2. *Minimum Values of λ_K and λ_L in the Case of Equal Growth Rates and Improvements*

If $g_K = g_L$ and $\lambda_K = \lambda_L = \lambda$, it is not difficult to derive from III.5. the following formula for the break-even point λ_0:

$$\lambda_0 = \frac{\mu \cdot \frac{1}{2} t^p}{t^{tot} - \mu \cdot \frac{1}{2} t^p}.$$

For $\lambda > \lambda_0$ the net tax effect is positive, while for $\lambda < \lambda_0$ it is negative.

Table 2 shows minimum improvements of natural growth rates of capital and labor computed according to the above formula for ten different values of μ (the percentage of investments using tax preferences):

Table 2

MINIMUM VALUES OF λ_K AND λ_L VALID FOR ARBITRARY $g_K = g_L$

(%)

μ	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00
λ_0	0.84	1.68	2.54	3.41	4.30	5.20	6.12	7.06	8.01	8.98

For example, let half of all investments use tax preferences after the FIL comes into effect (i. e. $\mu = 50\%$). Let capital and labor growth rates without investment incentives be $g_K = g_L = 2\%$. In order not to cause a negative tax effect, one year after the FIL comes into effect capital and labor growth rates should be (due to investment incentives) $g_K^{Inc} = g_L^{Inc} = 1.043\ g_K = 2.086\%$. Thus, if the level of employment is 3,200,000 jobs, investment incentives should create 2,752 = 0.086% × 3,200,000 more new jobs than the 64,000 = 2% × 3,200,000 that would be created even without incentives.

3. *Sensitivity Analysis of the Break-Even Point in the General Case*

The exact values of g_K and g_L are difficult to be estimated for Bulgaria due to the shadow economy. Therefore, it is not possible to derive a simple formula for the break-even point in the general case when $g_K \neq g_L$ and $\lambda_K \neq \lambda_L$. A MS-Excel spreadsheet has been developed for the purposes of the study in order to perform systematic sensitivity analysis of the break-even point with graphical simulations of the net tax effect.

The default values of α, μ, t^{tot}, t^{p}, g_K and g_L have been set up to $\boldsymbol{\alpha = 0.25}$, $\boldsymbol{\mu = 50\%}$, $\boldsymbol{t^{tot} = 19.31\%}$, $\boldsymbol{t^{p} = 3.18\%}$, $\boldsymbol{g_K = 2\%}$ and $\boldsymbol{g_L = 1\%}$. Each time ten different cases for the values of α, μ, t^{tot}, t^{p}, g_K and g_L were generated by changing only one of them in a realistic range. Then the net tax effect per BGL 1 million GDP was computed for each one of these ten cases by regularly increasing the values of λ_K and λ_L (according to the derived general formula). The ratio between λ_K and λ_L was assumed constant and equal to the ratio of the weights of impact that investment incentives have for improvement of capital and employment growth rates respectively.

The results of the performed sensitivity analysis can be summarized as follows (see the Appendix):

1. The break-even point is not sensitive to the exact value of α.

Figure 1 represents the net tax effect for ten different cases of α (0.05, 0.15, 0.25, 0.35, 0.45, 0.55, 0.65, 0.75, 0.85 and 0.95).

2. The break-even point is not sensitive to small variations of t^{p}.

Figure 2 represents the net tax effect for ten different cases of t^{p} (2.75%, 2.80%, 2.85%, 2.90%, 2.95%, 3.00%, 3.05%, 3.10%, 3.15% and 3.20%).

3. The break-even point is not sensitive to small variations of t^{tot}.

Figure 3 represents the net tax effect for ten different cases of t^{tot} (18.50%, 18.60%, 18.70%, 18.80%, 18.90%, 19.00%, 19.10%, 19.20%, 19.30% and 19.40%).

4. The break-even point is very sensitive to the value of μ.

Figure 4 represents the net tax effect for ten different cases of μ (10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% and 100%).

5. The break-even point is not sensitive to the exact value of g_K *when* $\lambda_K \approx \lambda_L$.

Figure 5 represents the net tax effect for ten different cases of g_K (0.10%, 0.50%, 1.00%, 1.50%, 2.00%, 2.50%, 3.00%, 3.50%, 4.00% and 5.00%) with $\lambda_K = \lambda_L$.

6. The break-even point is not sensitive to the exact value of g_L *when* $\lambda_K \approx \lambda_L$.

Figure 6 represents the net tax effect for ten different cases of g_L (0.10%, 0.50%, 1.00%, 1.50%, 2.00%, 2.50%, 3.00%, 3.50%, 4.00% and 5.00%) with $\lambda_K = \lambda_L$.

7. The break-even point is more sensitive to the exact value of g_K *when*

$\lambda_K >> \lambda_L$ or $\lambda_K << \lambda_L$ but the worst value of the break-even point is close to its value for $\lambda_K \approx \lambda_L$.

Figure 7 represents the net tax effect for ten different cases of g_K (0.10%, 0.50%, 1.00%, 1.50%, 2.00%, 2.50%, 3.00%, 3.50%, 4.00% and 5.00%) with $\lambda_K = 2\lambda_L$. In the worst case (the rightmost line crossing the abscissa on Figure 7) the break-even value of λ_L (the smaller between λ_K and λ_L) is close to its worst break-even value in Figure 5 where $\lambda_K = \lambda_L$.

8. The break-even point is more sensitive to the exact value of g_L when $\lambda_K >> \lambda_L$ or $\lambda_K << \lambda_L$ but the worst value of the break-even point is close to its value for $\lambda_K \approx \lambda_L$.

Figure 8 represents the net tax effect for ten different cases of g_L (0.10%, 0.50%, 1.00%, 1.50%, 2.00%, 2.50%, 3.00%, 3.50%, 4.00% and 5.00%) with $\lambda_K = 2\lambda_L$. In the worst case (the rightmost line crossing the abscissa on Figure 8) the break-even value of λ_L (the smaller between λ_K and λ_L) is close to its worst break-even value in Figure 6 where $\lambda_K = \lambda_L$.

Now it is clear that small errors in the values of α, t^{tot} and t^p do not reflect on the break-even point of the net tax effect (Figures 1, 2 and 3). However, the value of μ (the percentage of investments using tax preferences) is crucial for determination of the break-even point (Figure 4). In addition, if investment incentives have equal weights for improvement of natural growth rates of capital and employment (i. e. $\lambda_K = \lambda_L$) then the break-even point is almost nonsensitive to the values of g_K and g_L in the vast range (0.1%, 5%) (Figures 5 and 6). The most surprising result is that even when incentives have different weights for improvement of natural growth rates (i. e. $\lambda_K \neq \lambda_L$) then the worst break-even point is better (i.e. stays to the left) than the one computed for $\lambda_K = \lambda_L$ (Figures 7 and 8 compared to 5 and 6).

4. Minimum Values of λ_K and λ_L in the General Case

The results of sensitivity analysis presented in the previous section can be used to compute such minimum values of λ_K and λ_L that are valid for arbitrary values of g_K and g_L in the range (0.1%, 5%). Table 3 contains these minimum percentages of improvement computed in MS-Excel for the usual set of different values of μ:

Table 3

MINIMUM VALUES OF λ_K AND λ_L VALID FOR ARBITRARY g_K AND g_L IN THE RANGE (0.1%, 5%)

(%)

μ	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00
λ_0	0.85	1.71	2.58	3.47	4.37	5.29	6.23	7.18	8.15	9.14

Knowing that the break-even point is almost nonsensitive to the values of g_K and g_L it is not surprising that the minimum values in Table 3 are only a little bit higher than the values in Table 2. Even the minimum values in Table 4 regarding arbitrary g_K and g_L in the range (0%, 30%) are not much different:

Table 4

MINIMUM VALUES OF λ_K AND λ_L VALID FOR ARBITRARY g_K AND g_L IN THE RANGE (0%, 30%)

(%)

μ	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00
λ_0	0.92	1.85	2.80	3.77	4.75	5.75	6.78	7.82	8.88	9.97

V. Conclusions

1. General Conclusion of the Study

The assessment of the sensitivity of the net tax effect of different economic parameters is the main result of the study. Minimum percentages of improvement of natural growth rates of capital and employment in Bulgaria yielding a non-negative net tax effect of investment incentives are computed (Tables 3 and 4). They take relatively small values in the range (1%, 10%) depending on the percentage of investments using tax preferences and are valid for a vast range of natural growth rates of capital and employment. Therefore, there is no need to estimate the exact values of capital and employment growth rates for Bulgaria (a difficult task because of the shadow economy and the recent changes of the asset book values in the accounting system).

In addition, the required minimum percentages of improvement do not change significantly even for small variations of the ratio between total taxes collected and GDP, the ratio between collected taxes on profit and GDP and the value of capital-intensity of the economy. Therefore, small errors of the values of these three parameters are also admissible.

2. Estimation of the Net Tax Effect of FIL Investment Incentives

Appropriate analysis of the three conditions for tax preferences provided by the FIL shows that the investment incentives of the FIL would succeed to generate the minimum necessary percentages of improvement of the natural growth rates given in Table 3. Therefore, a non-negative tax effect of the law on the state budget should be expected.

Each one of these three conditions for tax preferences can be analyzed separately as follows:

a) Condition 1: The amount of the investment is greater than USD 5 million.

Even if almost all investments in Bulgaria are subject to tax preferences, the required improvement of the capital growth rate is only about 9% (see Table 3 for $\mu = 100\%$). For example, if the natural capital growth rate without incentives is $g_K = 3\%$ then with the help of investment incentives it should become $g_K^{Inc} = 3.27\%$ in order for the negative tax effect to be avoided. In reality values of μ higher than 50% are not reasonable. Therefore, if half of the investments in Bulgaria use tax preferences then the natural capital growth rate should increase from $g_K = 3\%$ to only $g_K^{Inc} = 3.13\%$ (see Table 3 for $\mu = 50\%$).

It is a matter of expert estimate whether such an increase of the natural growth rate of capital is easy to be achieved due to the incentives of the FIL. The limit of USD 5 million to use tax preferences seems high enough to achieve this goal because of the specific economic situation in Bulgaria.

b) Condition 2: The investment creates more than 100 new jobs.

According to the governmental program "Bulgaria 2001" the natural growth rate of employment in Bulgaria (even without investment incentives) is expected to be in the range (0.1%, 1%). Even for its highest value $g_L = 1\%$ and $\mu = 50\%$ investment incentives should increase the employment growth rate only to $g_L^{Inc} = 1.0437\%$ (see Table 3 for $\mu = 50\%$). It is useful to express the required increase in the number of employees. By the end of 1997 the number of jobs in Bulgaria was about 3,300,000 according to the officially reported unemployment statistics (see Table 5).

Table 5

UNEMPLOYMENT IN BULGARIA (FIA DATA)

Unemployment	Reported as of 31 Dec. 1996	Reported as of 31 Dec. 1997
Number (thousands)	478.77	524.00
Unemployment rate (%)	12.52	13.7

Therefore, in order for a negative tax effect to be avoided investment incentives should generate 1,442 = 0.0437% × 3,300,000 more new jobs than the 33,000 = 1% × 3,300,000 that would be generated even without them. ***Thus it is clear that the lower limit of 100 new jobs for tax preferences to be used is sufficient to generate the required increase in the number of jobs***.

Actually, values of employment growth rate closer to 0% are much more reasonable for Bulgaria. Therefore, this type of investment incentives is expected to improve much more the natural growth rate of employment than the minimum required for a non-negative tax effect to be generated. ***In addition, each new job created as a result of investment incentives influences in a positive way not only the state budget but also several nonbudget funds due to the social securities paid and unemployment subsidies saved***.

c) Condition 3: The investment is in a region with unemployment rate higher than the country average (these regions are determined by the Council of Ministers).

As officially reported from the tax administration, collected taxes on profit from all these regions in Bulgaria in 1997 account for only 1.85% of the total amount of collected taxes on profit. This amount is less than 0.06% of GDP. ***Therefore, the effect of investments in such regions can only be positive for the state budget***.

The developed MS-Excel worksheet can be used to demonstrate that even the smallest improvements of growth rates due to investment incentives in such regions generate a positive tax effect on the state budget. Furthermore, the positive effect on nonbudget funds from new jobs created in such regions is more significant than the country average. This is because the level of unemployment is higher than the country average and hence the amount of subsidies paid when there are no incentives is higher.

3. Microeconomic Restatement of the Method Proposed in the Study

The method of estimation of the net tax effect of investment incentives proposed in this study is based on macroeconomic aggregates. If these aggregates are substituted by their equivalents for a single company (i. e. the Cobb-Douglas production coefficients are adjusted for the company, GDP is substituted by value added, taxes paid are expressed as percentages of value added, etc.), the model can be used to estimate the direct tax effect caused by a single company. The same idea can be used to estimate the net tax effect for a single region in a country or in a whole economic sector. Such generalizations can be very useful but require much more precision in the calibration of all parameters.

The advantage of the macroeconomic approach consists in the low sensitivity to small variations of almost all input parameters. It is clear that the developed method of estimation can be used for all kinds of investment incentives with tax preferences expressed as a relatively constant percentage of GDP.

4. Indirect Effects of Attracting Foreign Investors

Additional remarks should be added regarding some indirect positive effects of attracting foreign investors not measured in this study: foreign investors are probably more careful in meeting their tax commitments and they also have higher standard of living increasing the aggregate demand in Bulgaria.

Figure 1

SENSITIVITY OF THE BREAK-EVEN POINT TO THE VALUE OF α

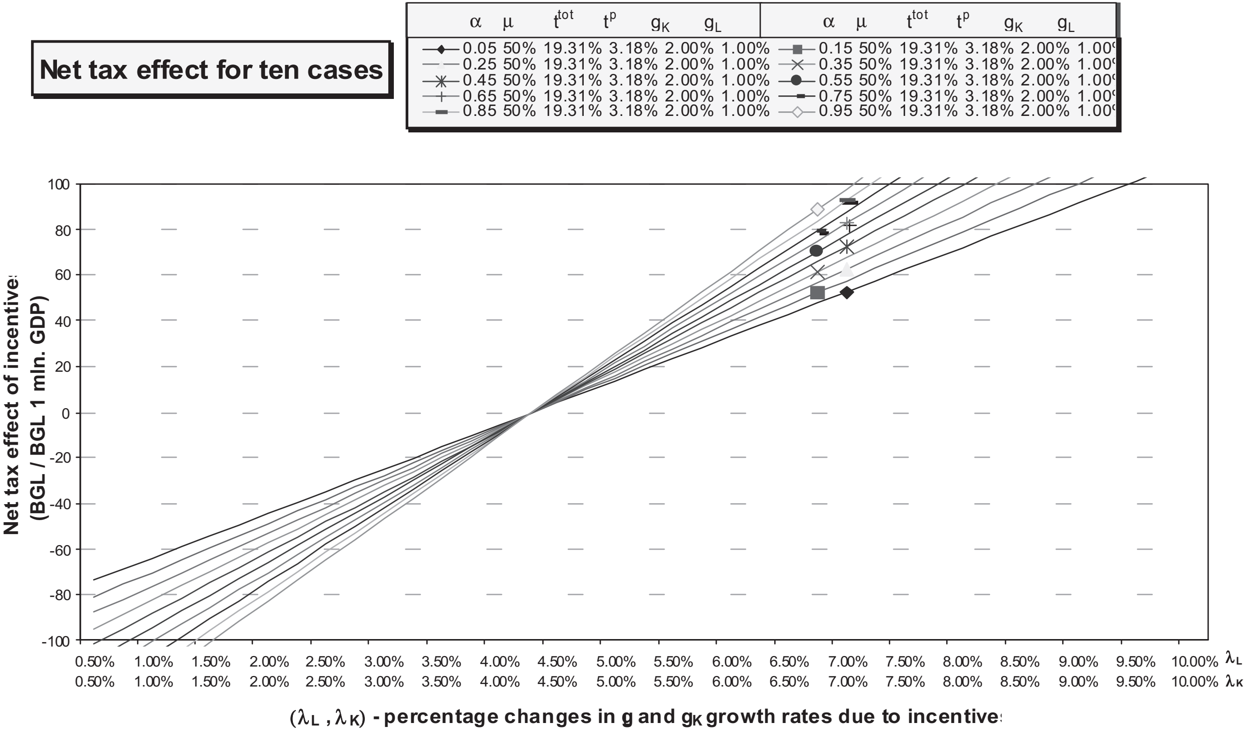

Figure 2

SENSITIVITY OF THE BREAK-EVEN POINT TO SMALL VARIATIONS OF t^p

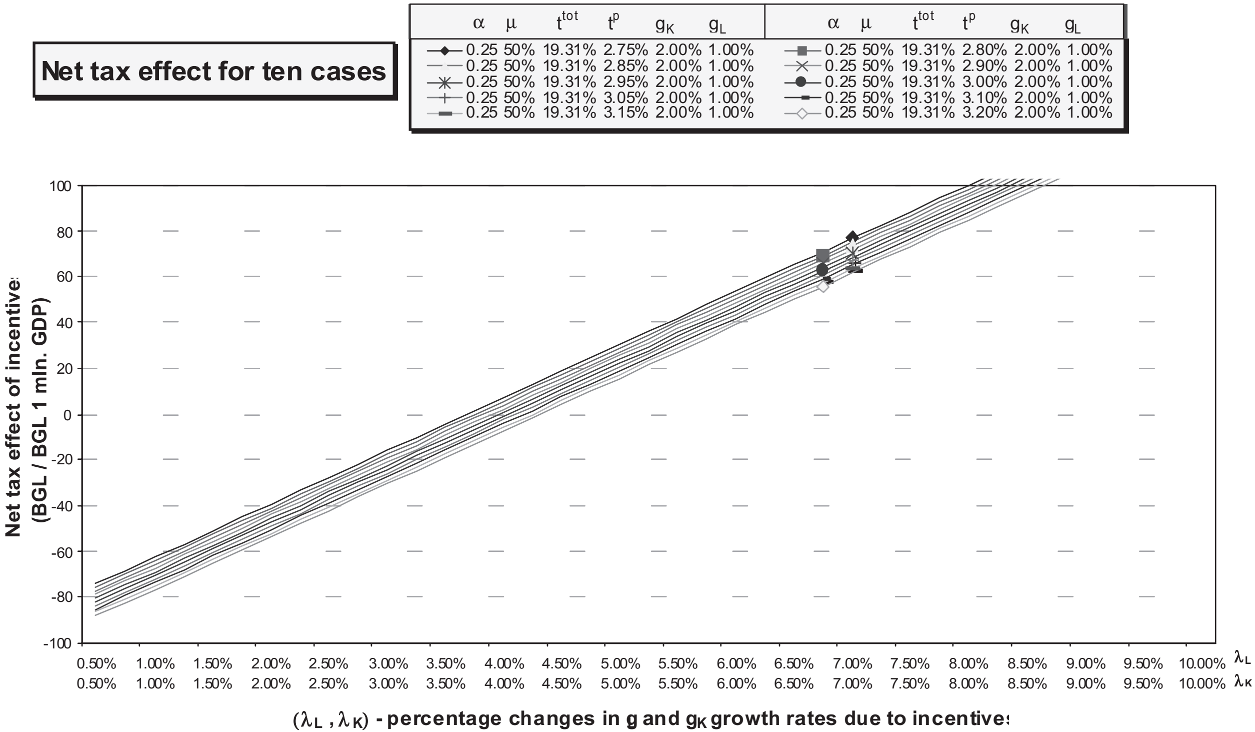

Figure 3

SENSITIVITY OF THE BREAK-EVEN POINT TO SMALL VARIATIONS OF t^{tot}

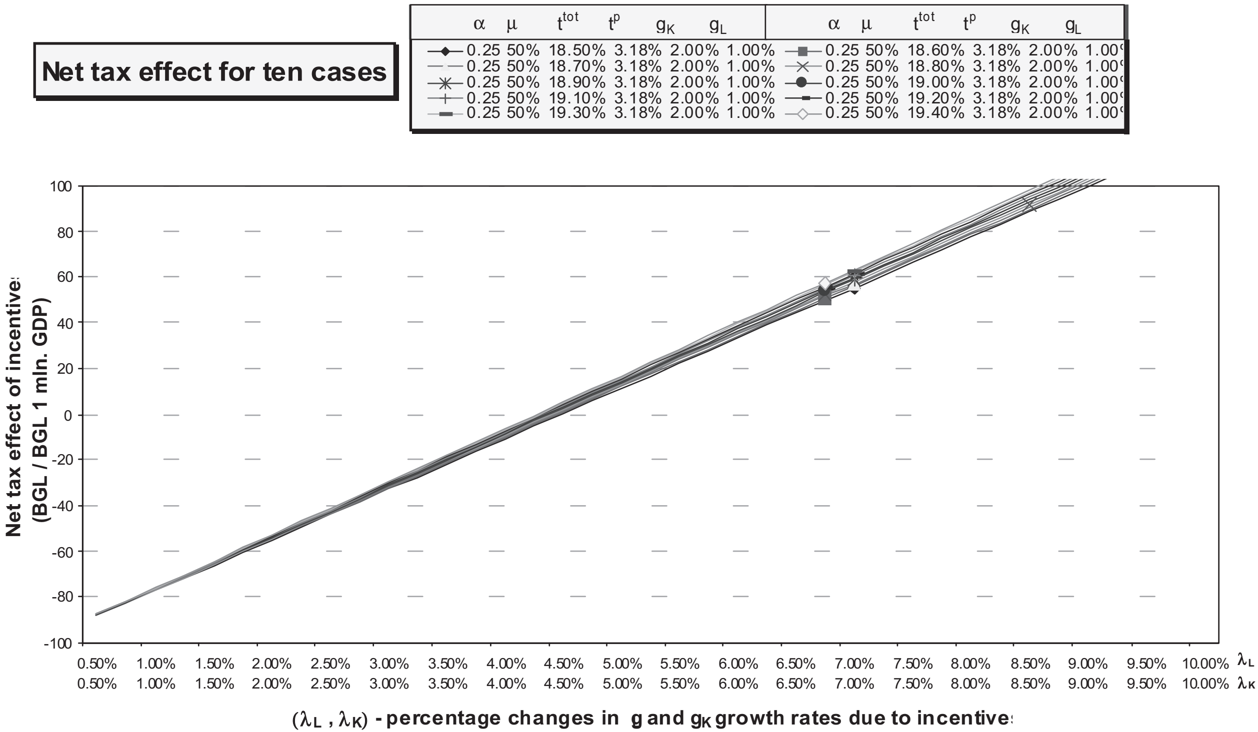

Figure 4

SENSITIVITY OF THE BREAK-EVEN POINT TO THE VALUE OF μ

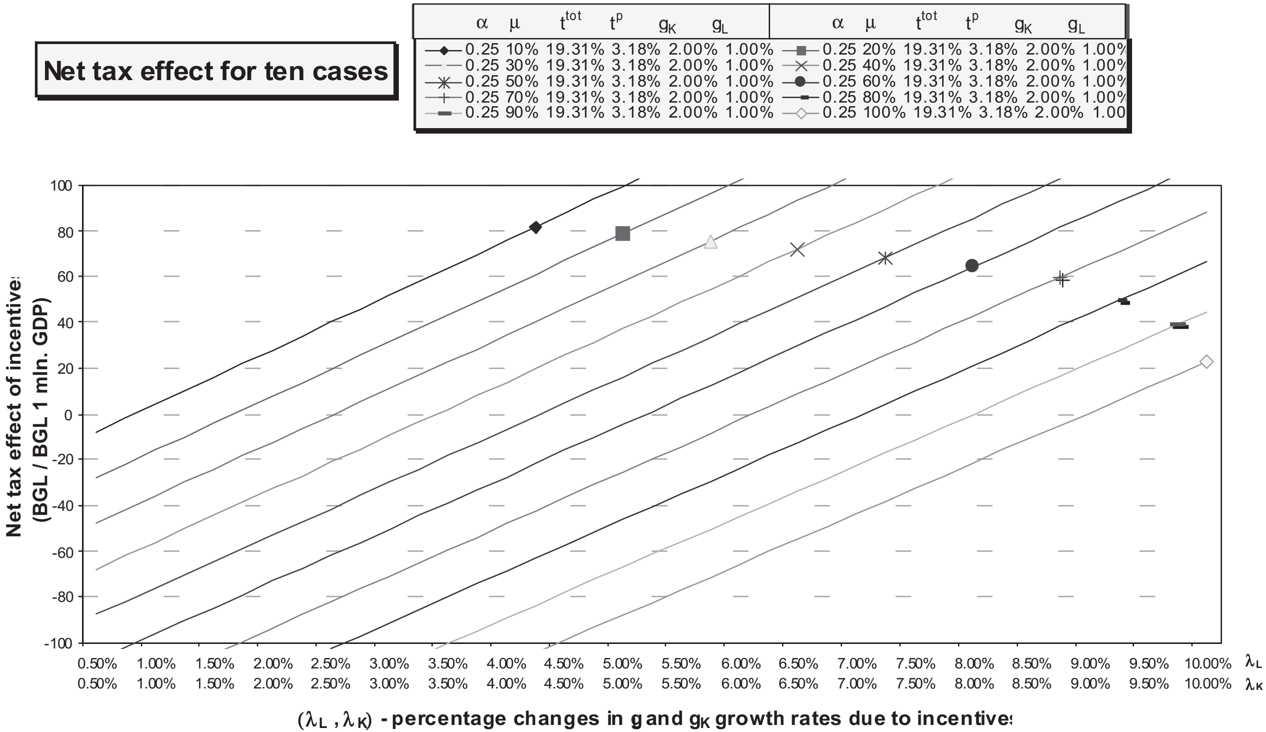

Figure 5

SENSITIVITY OF THE BREAK-EVEN POINT TO THE VALUE OF g_K WHEN $\lambda_K \approx \lambda_L$

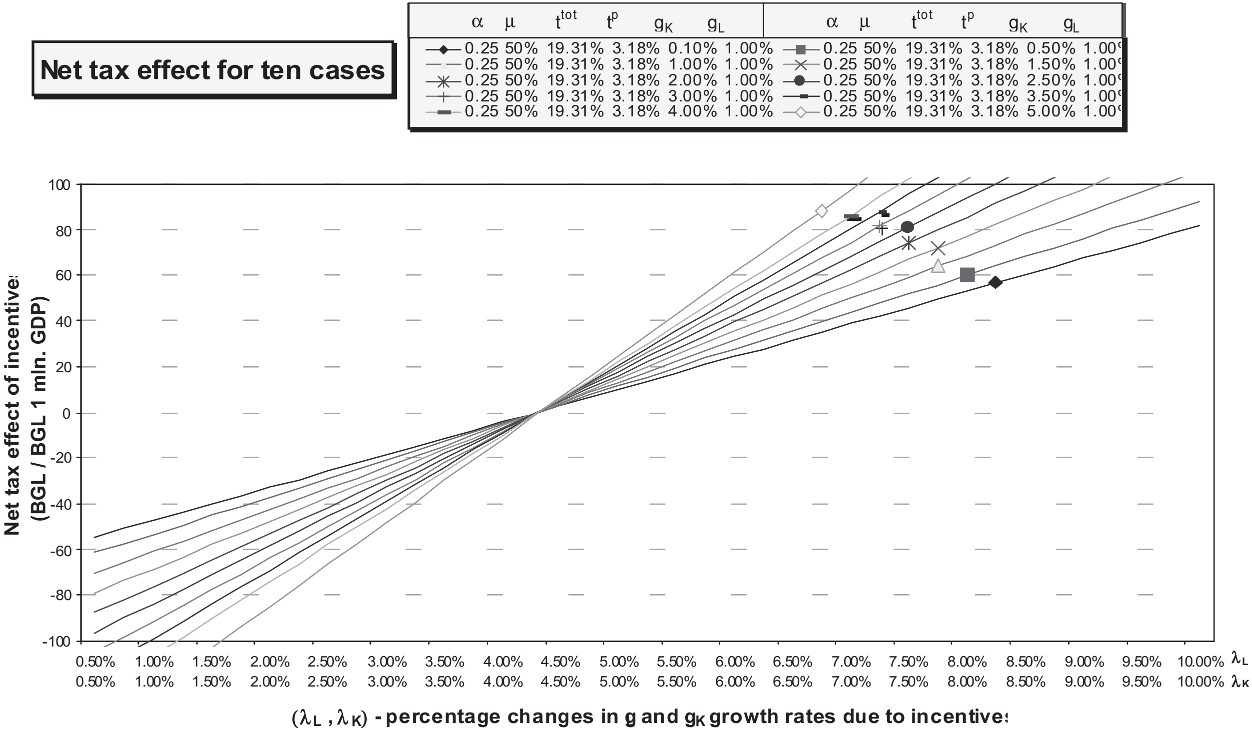

Figure 6

SENSITIVITY OF THE BREAK-EVEN POINT TO THE VALUE OF g_L WHEN $\lambda_K \approx \lambda_L$

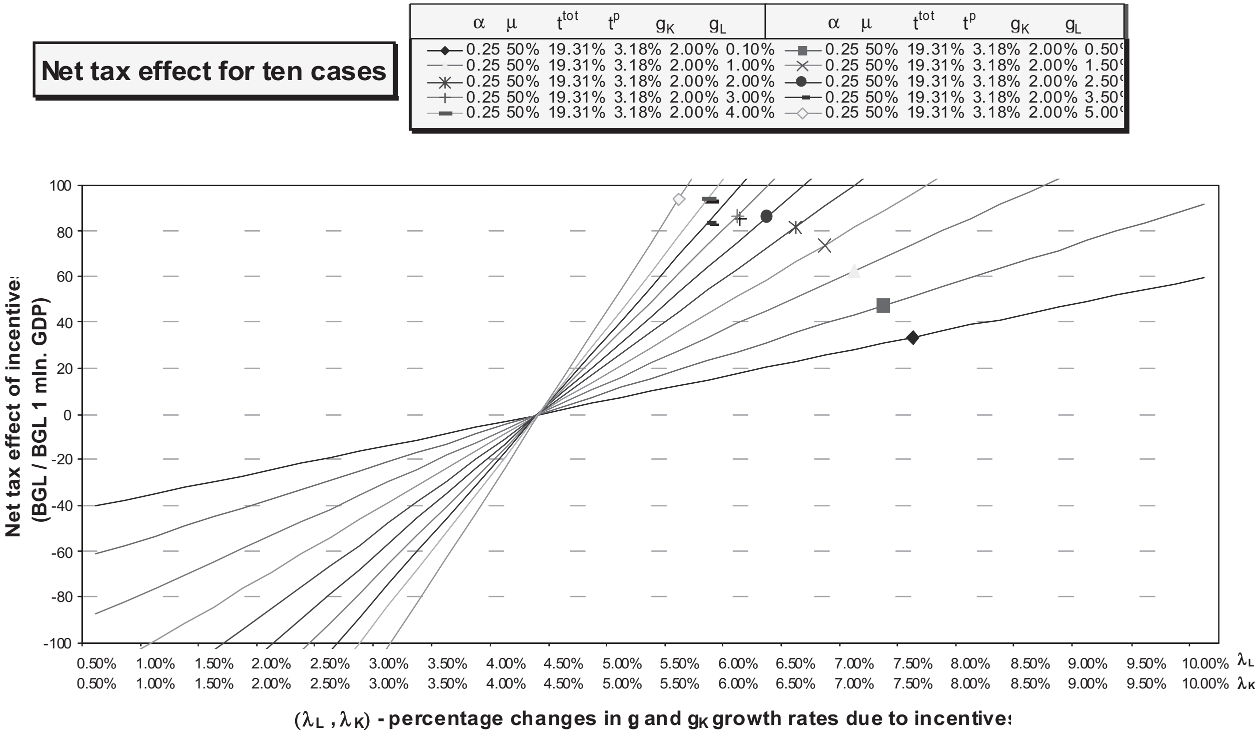

Figure 7

SENSITIVITY OF THE BREAK-EVEN POINT TO THE VALUE OF g_K WHEN $\lambda_K = 2\lambda_L$

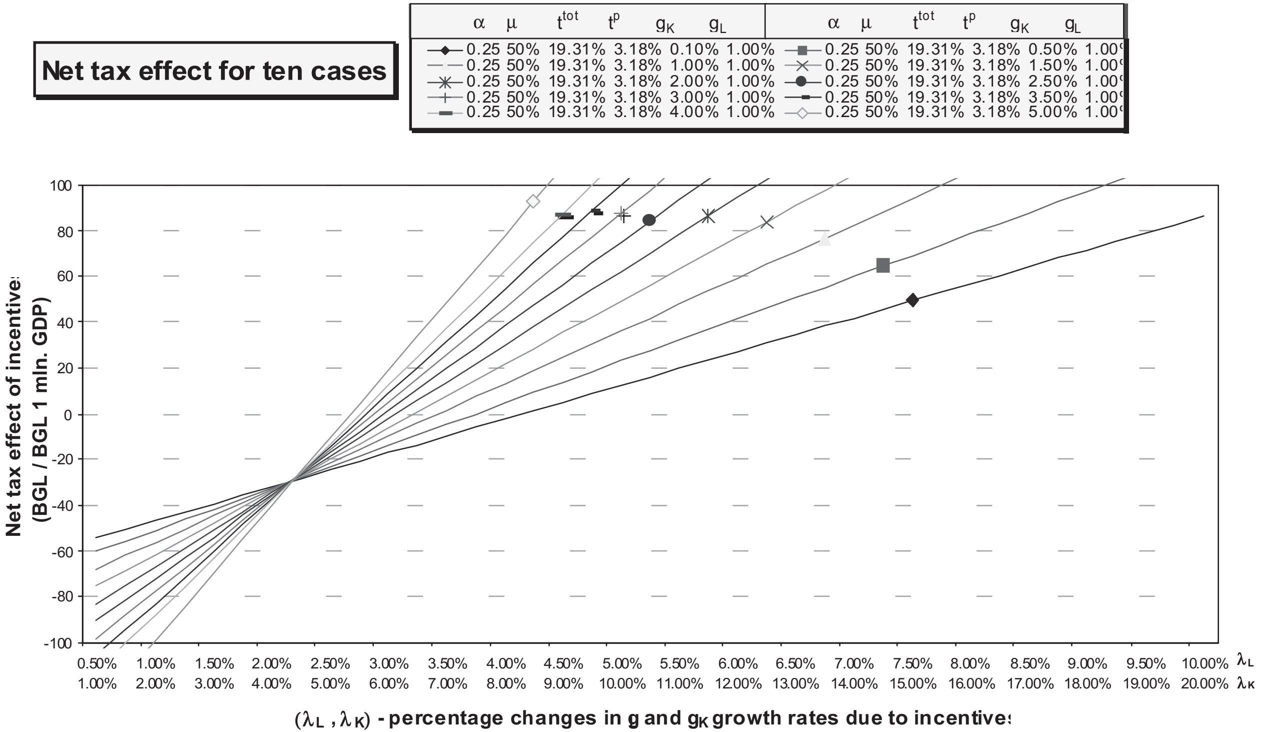

Figure 8

SENSITIVITY OF THE BREAK-EVEN POINT TO THE VALUE OF g_L WHEN $\lambda_K = 2\lambda_L$

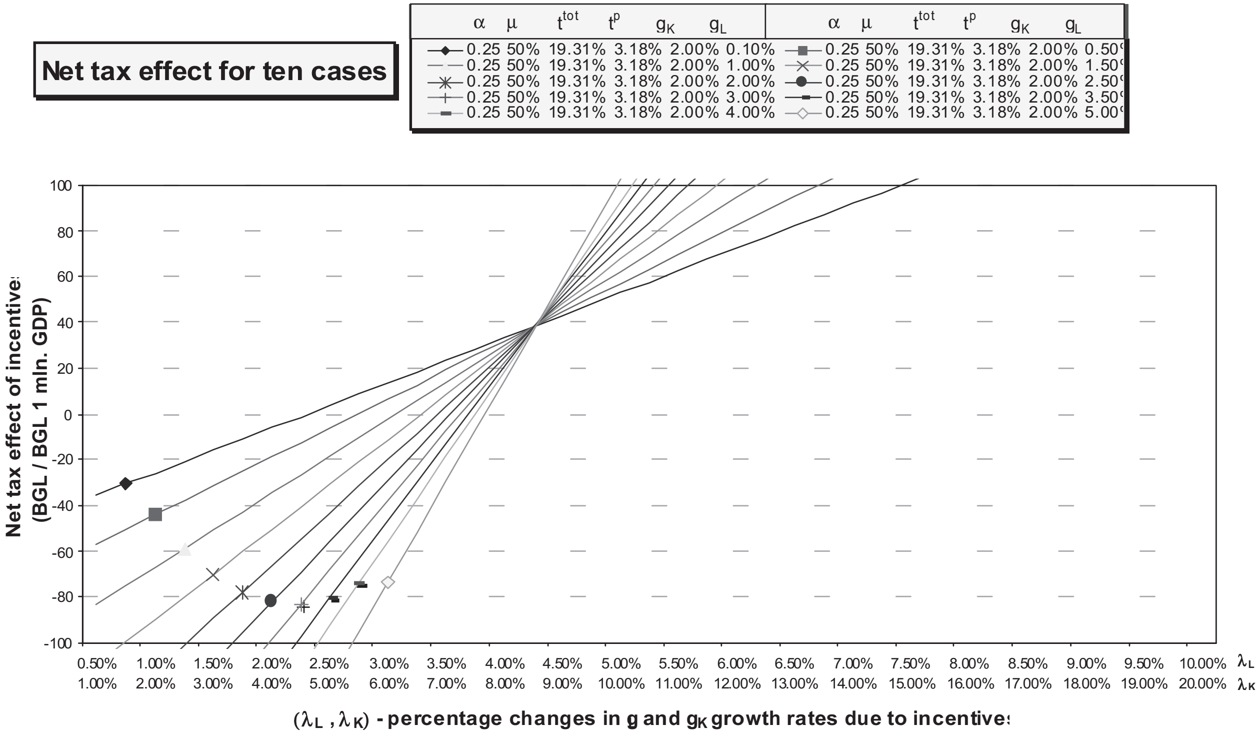

Figure 9

INVESTMENT INCENTIVES IN BULGARIA: NET TAX EFFECT SIMULATION

THE MS-EXCEL SPREADSHEET DEVELOPED FOR THE PURPOSES OF THE STUDY

							λ_K	0.25%	0.50%	0.75%	1.00%	1.25%	1.50%	1.75%	2.00%	2.25%
							λ_L	0.25%	0.50%	0.75%	1.00%	1.25%	1.50%	1.75%	2.00%	2.25%
Case	α	μ	t^{tot}	t^p	g_K	g_L		**Net tax effect (BGL / BGL 1 mln. GDP)**								
1	0.25	20%	19.31%	3.18%	2.00%	0.10%		-15.4802	-12.7817	-10.0834	-7.3851	-4.6870	-1.9889	0.7092	3.4071	6.1050
2	0.25	20%	19.31%	3.18%	2.00%	0.50%		-23.6240	-19.4892	-15.3544	-11.2197	-7.0851	-2.9504	1.1841	5.3186	9.4531
3	0.25	20%	19.31%	3.18%	2.00%	1.00%		-33.7944	-27.8681	-21.9418	-16.0156	-10.0894	-4.1632	1.7630	7.6891	13.6152
4	0.25	20%	19.31%	3.18%	2.00%	1.50%		-43.9543	-36.2410	-28.5277	-20.8144	-13.1011	-5.3878	2.3255	10.0388	17.7521
5	0.25	20%	19.31%	3.18%	2.00%	2.00%		-54.1040	-44.6080	-35.1120	-25.6160	-16.1200	-6.6240	2.8720	12.3680	21.8640
6	0.25	20%	19.31%	3.18%	2.00%	2.50%		-64.2434	-52.9690	-41.6947	-30.4204	-19.1460	-7.8717	3.4026	14.6769	25.9512
7	0.25	20%	19.31%	3.18%	2.00%	3.00%		-74.3725	-61.3241	-48.2758	-35.2274	-22.1791	-9.1308	3.9175	16.9657	30.0140
8	0.25	20%	19.31%	3.18%	2.00%	3.50%		-84.4914	-69.6733	-54.8552	-40.0371	-25.2191	-10.4011	4.4168	19.2347	34.0526
9	0.25	20%	19.31%	3.18%	2.00%	4.00%		-94.6002	-78.0165	-61.4329	-44.8493	-28.2658	-11.6824	4.9009	21.4841	38.0673
10	0.25	20%	19.31%	3.18%	2.00%	5.00%		-114.7876	-94.6853	-74.5831	-54.4811	-34.3793	-14.2777	5.8237	25.9250	46.0260

Parameters of the model:

α – Cobb–Douglas production coefficient of capital intensity

μ – percentage of investments using ToP reduction

t^{tot} – ratio between total tax revenues and GDP

t^p – ratio between ToP revenues and GDP

g_K – natural growth rate of capital (without incentives)

g_L – natural growth rate of labor (without incentives)

λ_K – percentage of improvement of g_K due to incentives

λ_L – percentage of improvement of g_L due to incentives

Y_0 – GDP in the last year before incentives come into effect

Description of the model:

$$T_1^{Inc} \quad T_1 \quad Y_0 \quad t^{tot} \quad \frac{1}{2} t^p \quad 1 \quad g_K \quad {}_K g_K \quad 1 \quad g_L \quad {}_L g_L^{\;\;1} \quad 1 \quad t^{tot} \quad 1 \quad g_K \quad 1 \quad g_L^{\;\;1} \quad 1$$

$T_1^{Inc} - T_1$ – net tax effect

$\left(t^{tot} - \mu \cdot \frac{1}{2} t^p\right)$ – reduced taxes due to incentives

$\left[(1+g_K+\lambda_K g_K)^{\alpha} \cdot (1+g_L+\lambda_L g_L)^{1-\alpha} - 1\right]$ – improved growth due to incentives

t^{tot} – normal taxes without incentives

$\left[(1+g_K)^{\alpha} \cdot (1+g_L)^{1-\alpha} - 1\right]$ – normal growth without incentives

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