TAXATION AND CORPORATE PERFORMANCE: LESS IS MORE

Péter Juhász, Ph.D.[1]
Kata Váradi, Ph.D.[1]

[1]Department of Finance
Corvinus University of Budapest
H-1093, Budapest, Hungary
E-mail: peter.juhasz@uni-corvinus.hu; kata.varadi@uni-corvinus.hu

KEYWORDS

Taxation, firms, growth, optimal tax rate, GDP, simulation.

ABSTRACT

This paper is focusing on how different forms of tax effect the performance of individual companies, the whole economy, and the total tax income of the government. We test fixed, sales-linked and profit taxes under changing circumstances: first we will examine the effect of taxes when the growth rate and the uncertainty is zero, then we will take growth opportunities into account, finally we add uncertainty, too. The main result of this paper are the following. (1) Not only total tax amount but also the form of tax matters. Different types of taxes will influence the business activity in various ways. (2) The extremes are not the best choice: there could be one optimum level of taxation. (3) Increase of nominally fixed taxes near the maximal sustainable level should be lower than the expected growth of the economy; and (4) too high tax burden is more harmful in less stable countries.

LITERATURE REVIEW

The literature on the effect of taxation is quite widespread, since it can be analysed from several aspects. For example the research in this field can be grouped to two main classes, one that are dealing with individuals (eg. Feldstein, 1995, or Surrey, 1970), while the other part is analysing the effect of taxes on corporations (eg. Nielson et al., 2010). This paper will focus only on this later one.
Also this class of research is too broad, since it incorporates questions of the effect of taxation on optimal capital structure (eg. DeAngelo and Masuris, 1980); tax incentives (eg. Graham and Rogers, 2002); tax policy issues (eg. Hall and Jorgeson, 1967). Our research question is more focused, we are not analysing the taxation in general, but we focus on the relation between taxation and corporate performance, and its effect on the whole economy.
Research on this topic states that taxation of corporations has a large impact on the economy as a whole. For example Djankov et al. (2008) states by analysing mid-sized firms, that corporate tax has a large impact on aggregate investment, foreign direct investment and also on entrepreneurial activity. Also Hall and Jorgeson (1967) found the tax policy had a significant effect on investment behaviour, which cannot be disregarded.
The relation between taxation and company performance, or investment decisions are not as clear, since there are researches that could prove also empirically and theoretically that tax policy is not effective to influence the growth in the long run (Mendoza et al., 1997). While on the other hand it was shown by Levine (1991) that the taxation of financial markets has a large effect on the future growth of the economy.
Greenwood and Huffman (1991) states that government has a crucial role in treating business cycles, since with an effective tax policy the state would be able to stabilize economic cycles. Other papers dealing with the effect of the tax policy on business cycles and growth (eg. Cooley and Hansen, 1992, Mendoza et al., 1994) came to similar conclusions.
Based on the literature taxation has a crucial role in the growth of the economy, and economic cycles. Based on this, the focus of our research is to analyse the effect of corporate taxation of different types on the company performance, and how it effects the economy as a whole in a simple model.

MODEL DESCRIPTION

In our model the behaviour of firms are simulated. All of them are completely equity (E) financed and the only source of additional capital is their own retained profit.
Firms would extend their activity only once the achieved after-tax profit over equity (ROE – return on equity) is higher or equal to the required rate of return of the owners (rE). If return is less than required, owners are not satisfied and usually are hesitating to reinvest the profit. Of course they know that fluctuations in market and efficiency measures are normal.
This is why, in our model shareholders consider the three year average ROE and compare that to the required rate. Once being above that level they intend to increase the business as that generates positive net present value (NPV).

Proceedings 30th European Conference on Modelling and Simulation ©ECMS Thorsten Claus, Frank Herrmann, Michael Manitz, Oliver Rose (Editors)
ISBN: 978-0-9932440-2-5 / ISBN: 978-0-9932440-3-2 (CD)

If the given firms are willing to grow they will set the amount of reinvestment in line with the expected growth of the market. The market is dominated by the firms included in the simulation so in period t they compare their expected growth rate (g') in period t-1 (that is a prediction for this given period change) for the local market with the percentage increase of the total local market sales (g) of the companies in the model. It is the average of those two quantities that firms will use as a prediction for the next period according to Equation 1:

$$g_{Local}'_t = \frac{g_{Local}'_{t-1} + g_{Local\,t}}{2} \tag{1}$$

At the start of the simulation, g'0 (expected growth for next period) is given as a parameter.
If the company is profitable, but average ROE falls below the required, owners withdraw all earnings as dividend. Once the firm is in the red, loss will decrease the amount of equity that is equal to the total invested capital (IC) as no debt is used in the model. (In real life unhappy owners can even decrease invested capital further by selling assets and repurchasing shares, but in this model they cannot do so.) Once its equity reaches zero, the firm stops its operation.
In any period the operation of the firm is simulated as follows. Based on the start of period E using a pre-set Sales/IC (asset turnover) ratio Sales is calculated. Costs of manufacturing is described by the Labour cost/Sales and Material cost/Sales ratios. All three of these ratios follow a normal distribution with given average and standard deviation.
Beside these expenses, different taxes are also deducted from sales. The so calculated operational profit (earnings before interest and taxes – EBIT) is equal to profit before tax (PBT) as no debt is used. If PBT is positive, the firm has to pay a proportional corporate tax, and the leftover quantity is called profit after tax (PAT). Dividing that by the start of period equity we get return on equity we use for to decide whether owners want to grow the business further.
In this model we included three different taxes:
(1) Firms may be required to pay fixed amount taxes that may grow independently form the business activity of the companies. Some real life example on that could be yearly fees of public registration, statistical reports, publishing financial statements, or costs of legal actions required by the state. In our model, this nominally fixed tax is increased by steady percentage (bigger or equal to zero) each period.

(2) Some taxes are proportional to the business activity but not its profitability. Those are modelled by including a tax on sales. Real life examples include special fees imposed on trucks for using public highways (proportional to the distance used), environmental duties on packaging materials (proportional to the quantity used), or state authority supervisory fees linked to production or sale of certain goods (e.g. food, gasoline, livestock) There is also an explicit sales tax of 2 percent applied in Hungary.

(3) Taxes on profit are paid by firms generating a PAT more than zero. In our model a fix percentage charge is applied, while in many countries you may see different tax rates applied for SMEs and bigger firms or offering corporate tax reduction to some industries or to firms performing specific activities like huge investments or employing handicapped. Firms with a PAT lower than zero pay no tax but contrary to what is common in many countries in the model these losses cannot be used to decrease tax base in the following years.

In this model, all firms are under the same tax regime so tax rates do not differ across them.

Our model simulates the behaviour of individual firms that might be different both in productivity (Sales/IC) and efficiency (Labour expenditure/Sales, Material expenditure/Sales). For each of these periods the total amount of sales, and tax collected are recorded together with total added value generated (Sales-Material expenses), called as GDP at macro level. We also keep a records of how expected and realised market growth rates developed.

COMPARING TAX TYPES IN A NON-GROWTH ECONOMY

As presented in the model description part, we have three types of taxes in this simulation. We may sum up the effect of those on ROE by the following formulas of Equation 2 and Equation 3.

$$ROE = \frac{PAT}{Equity} = \frac{IC}{Equity} * \frac{Sales}{IC} * \tag{2}$$

$$* \frac{EBIT}{Sales} * \frac{PBT}{EBIT} * \frac{PBT * (1 - corp.\ tax)}{PBT}$$

$$EBIT = Sales * \tag{3}$$

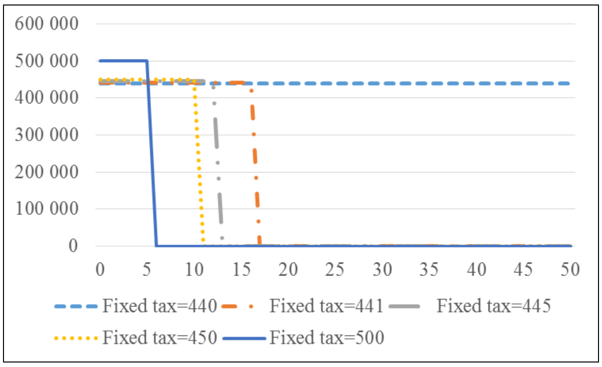
$$* \left(1 - \frac{Sales\ tax}{Sales} - \frac{Material\ exp.}{Sales} - \frac{Labour}{Sales} - Fixed\ tax\right)$$

To compare their effect on the economy we set up a hypothetical country with firms only focusing on a single market, and use no foreign capital. Start-up parameters are shown in Table 1.
First, to eliminate fluctuations, standard deviations are set to zero just as expected growth for the markets. In that case, firms do not have the opportunity to grow, so fixed tax creates a constant inflow for the state and can be increased up to the level of PAT without all taxes (in this case 440 units).

Table 1. Start-up parameters for comparing effects of taxes

N of firms	1000
Equity/firm	1000
IC/Equity	100,00%
r_E	10,00%
Sales/IC average	110,00%
Sales/IC std. dev.	0,00%
Labour exp./Sales average	20,00%
Labour exp./Sales std. dev.	0,00%
Material exp./Sales average	40,00%
Material exp./Sales std. dev.	0,00%
Local Sales/Sales	100,00%

Above that the equity decreases due to the negative PAT and companies soon stop operating as it can be seen in Figure 1.



Figures 1: Tax income across periods at different fixed tax levels

All other forms of taxes reduce ROE and once pushing that below zero the destroying of the tax base starts. For the given case any sales tax above 40 percent will have similar effect, but the destruction will show somewhat different pattern according to Figure 2.

We get very similar figures when charting for different levels of corporate tax. For corporate tax at all possible inputs the critical level is 100 percent.

Of course political decision makers should not focus on maximising state income rather than (at least within the frame of this model) on maximising GDP (total added value). Note that for the previous cases as growth was not possible GDP remained the same until reaching the destruction level of the given tax, and taxation was only about redistributing GDP. (Tax decreases income of shareholders and boost the income of those receiving governmental transfers.)

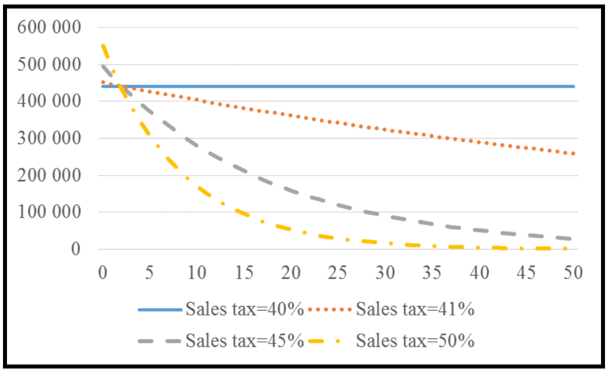


Figure 2: Tax income across periods at different sales tax levels

TAX AND GROWTH

Now, let us add a 5 percent expected growth opportunity on the local market. In this case firms would reinvest a part of their profit once ROE>=r_E. For the shake of this model r_E equals 10 percent.

The no-tax ROE is 44 percent, which is more than enough to finance a 5 percent growth. So any tax system that keeps after-tax ROE above 10 percent, would keep maximum growth and not jeopardize the long term existence of the firm. (The critical value for that is 340 in case of fixed tax.) After-tax ROEs between 0 and 10 percent end up with a zero growth economy, while negative shareholder return will destroy the companies.

Growth adds also another dimension to the optimal taxation problem. Fixed tax may mean an increasing or decreasing burden for firms depending on whether the growth of the firm is higher or lower than that of the tax amount. Figure 3 illustrates the effect of fixed tax starting from 340 and growing at different rates.

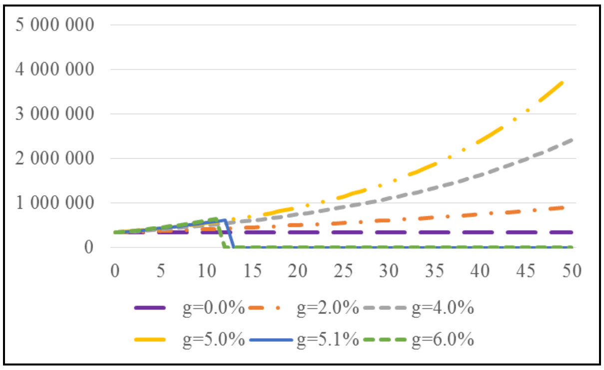


Figure 3: Tax income across periods at different fixed tax growth levels

As here taxation only limits economic growth when fixed amount grows faster than the firms themselves, GDP is maximised with any tax growth rate not higher than 5 percent. The exact value below that level is just a decision about redistribution.

Still, we have to notice that there could be a potential pitfall of taxation once the start-up level of fixed tax is less than the maximum (e.g. here 340). For some years even with growth rates above 5 percent the economy grows, but ROE decreases. So at a certain point, the whole systems collapses all of a sudden according to Figure 4.

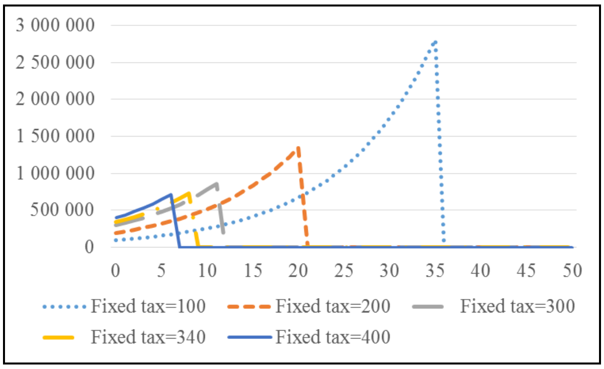


Figure 4: Tax income across periods at fixed tax levels with a yearly growth of 10 percent

The lower the initial level the later this happens so in a real world a government may go on for years with unsustainable taxation before noticing. When focusing on GDP we may have a chance to track the problem earlier, as Figure 5 shows.

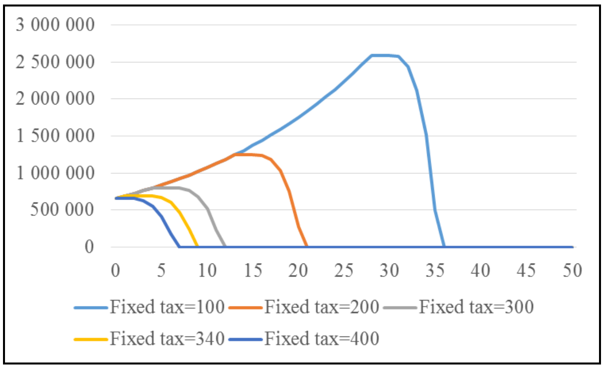


Figure 5: GDP across periods at fixed tax levels with a yearly growth of 10 percent

As other kind of taxes use quantities indexed to growth as tax base, we have no such a kind of problem: if rates are not too high at start-up, the economy will not collapse. Putting it differently: these kind of taxes do not allow politicians to overtax firms and stay unnoticed for years. That might be a reason for decision makers suffering from myopia to prefer duties not proportional to the business activity rather manually indexed.

Until now in all our examples r_E was higher than the maximal growth rate available on the market (g) due to which we either have seen companies growing at the maximum possible rate ($ROE>=r_E$) or not at all, or sometimes even decreasing in sales if losing their equity. The problem is slightly more complex once the market growth rate is higher than r_E. Under this condition depending on the ROE achieved firms may grow at any rate between g and r_E. So fine tuning of the tax system (not applying maximum charge) has a radical effect on the performance of the economy.

.

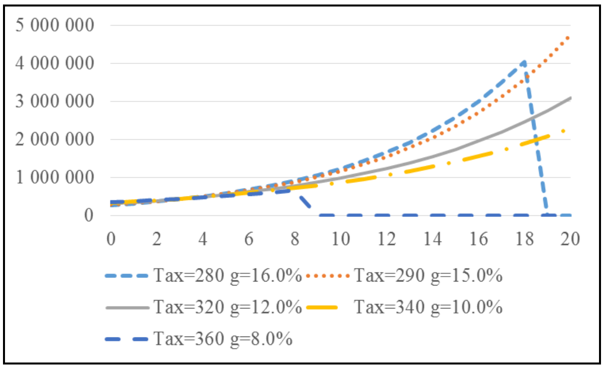


Figure 6: Tax income across periods at different fixed tax levels and yearly growth rates

Imagine the market offers a growth opportunity of 15 percent per period. Figure 6 demonstrates how more moderate fix tax amounts end up with far higher total tax income over time. (To assure maximum growth fixed tax may not be higher than 290 at initiation and to be sustainable a higher amount can only grow at lower rate.) Any duty above 340 would immediately decrease ROE below r_E, while any growth rate above 15 percent will sooner or later make the given tax amount to push future ROE below future r_E

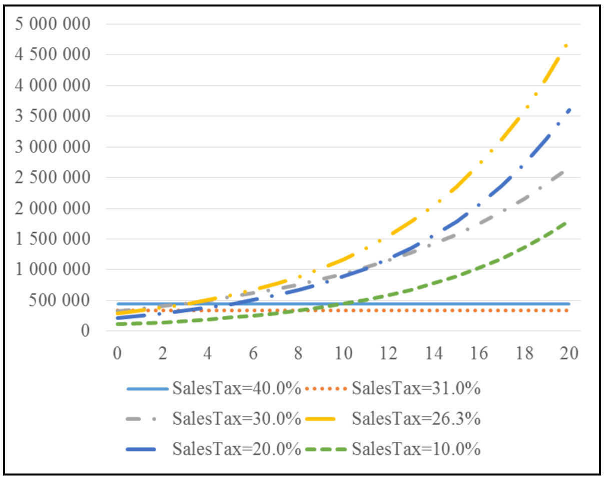


Figure 7: Tax income across periods at different sales tax levels

When considering sales tax, any rate above approximately 26.3 percent would leave less than 15 percent ROE with the firm, so it cannot use the total growth potential offered by the market, while any rates above 40 percent would make the companies to lose money. It is at around 31 percent that ROE equals r_E, and firms stop to grow.

As seen on Figure 7 we have here the same problem as in case of fixed duties: it is not the long term optimum tax rate that would provide the highest income in the short run.

As for corporate tax we see similar patterns (Figure 8). The two critical values are 65.8 percent (leaving enough ROE to use the total growth opportunity) and 77.3 percent (lowering ROE to 10 percent, blocking growth completely). Of course above 100 percent, due to the continuous decrease of equity the economy will collapse.

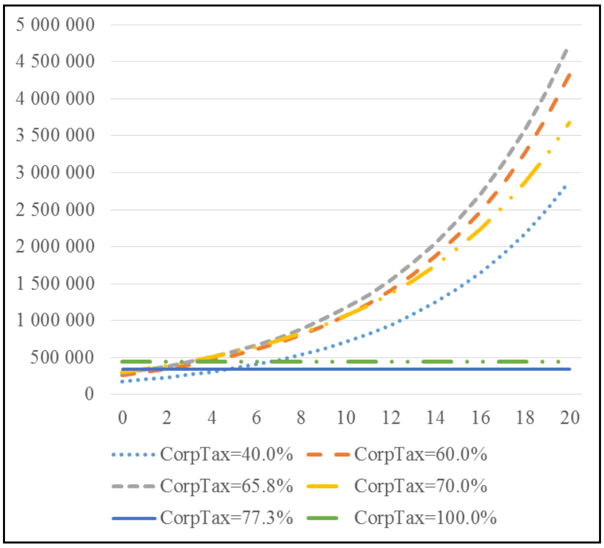


Figure 8: Tax income across periods at different corporate tax levels

UNCERTAINTY AND TAXES

As a next step we introduce some uncertainty in to the model. Three ratios: Sales/IC, Material expenses/Sales, and Labour expenses/Sales follow a normal distribution with the same expected values used until now. Relative standard deviation (std. dev./average) was set to 2 percent. Simulation is done at firm level, so the expected growth of the whole economy is 15 percent and more smooth that of the individual firms.

Without uncertainty the critical values were 290 (ROE=g) and 340 (ROE=r_E). But once we add uncertainty, applying the former with 15 percent yearly growth will not lead to a sustainable economy anymore. If individual performance of a firm falls short of the expected, it will be unable to grow because of the tax reducing ROE below the required level. What is more, one single event like that will kill the given firm sooner or later as the tax keeps on increasing at the same rate while the company will not grow in that given year, so the tax charge for the firm will be higher next year. But market conditions will not allow to boost growth above the expected level so it will be impossible to push back the tax charge to the original level. After some unsuccessful periods, ROE will have nearly no chance to reach r_E. Due to this phenomenon only a taxation system with a tax amount growth far lower than that of the economy would be sustainable as illustrated on Figure 9. Note that for a 50 period time interval only a tax of 265 could grow at 15 percent – an amount 8.6 percent less than the theoretical maximum but still providing the maximum tax income over the long run.

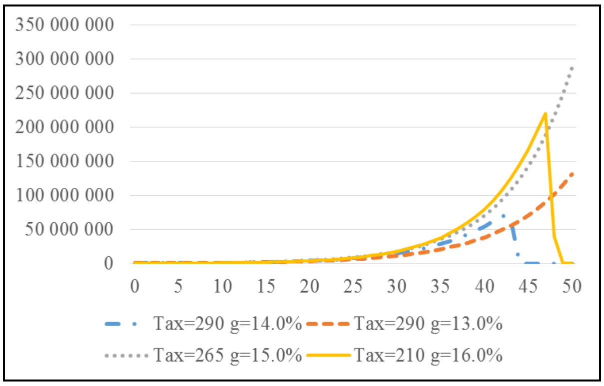


Figure 9: Tax income across periods at fixed tax levels with different yearly growth rates with uncertainty

Figure 9 demonstrates that tax systems generating higher income in the sort run may be less effective in the long run. The best long term option in our example produces less state income in each of the first five years than a tax of 290 with any growth rate between 13 and 30 (!) percent. So the time horizon using which politicians optimise their decisions (e.g. the length of government term) may have a dramatic effect on the probability of introducing optimal taxation schemes.

Considering Sales tax, the critical value without uncertainty was 31 percent reducing ROE to the minimum required level and 26.3 to keep maximum growth potential. In Figure 10 under uncertainty rates not allowing room for growth slowly destroy the economy (lowering GDP) while tax income stagnates. Not using the maximum tax rate to leave room for performance fluctuations and keep maximum growth pays off in the long run. A rate of 24 percent even generates more income than the theoretical maximum rate of 26.3 percent from the 13th year on.

Finally, let us take a look on how different corporate tax rate perform under uncertainty. Previously, critical values were 65.8 and 77.63 percent. Under the given level of uncertainty even a rate of 60 percent performs better than that of 65.8 percent, and 63 percent over-performs both of those in Figure 11.

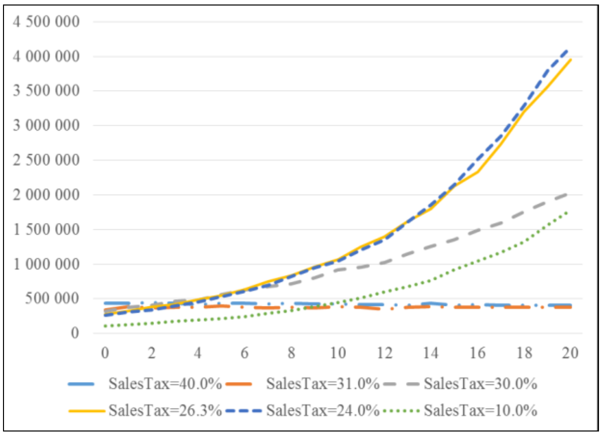


Figure 10: Tax income across periods at various sales tax levels under uncertainty

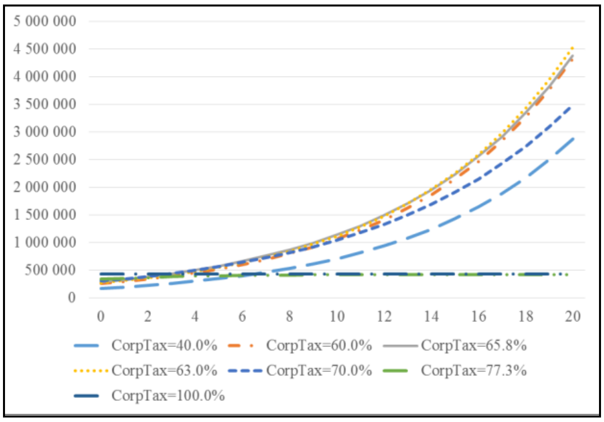


Figure 11: Tax income across periods at different corporate tax levels under uncertainty

It is worth noting that in the long run (after period 10) the tax income produced by the rate of 77.3 percent is only by 3 percent less than that with a 100 percent rate while GDP is 20 percent higher. That is due to the 50 percent probability of ending up with a rate above the required and so with at least a slight growth. Actually a rate of 77.25 percent already produces more state income from period 12 on while the GDP is higher in any period after the second adding already more than 30 percent from period 12 on.

CONCLUSION

For this paper we modelled the growth decisions of individual firms that could be hit by two types of tax: one of them being nominally fixed and increased at a steady rate, the other being proportional to sales (under model conditions similar to classic corporate tax on profit). Using our simple model we may draw at least four very important conclusions.

(1) Our simulation has highlighted that different types of taxes will influence the business activity in various ways. When politicians decrease one rate and increase another to keep budget balanced it is far more than redistribution and may make a huge difference even if the current total tax collected remains the same.

(2) We also showed that there could be one optimum level of taxation, though without using the classic argumentation about high rates increasing tax evasion or decreasing willingness to start new business. While higher than optimum tax rates may generate extra income for the state in the short run, due to cutting back on growth rates the whole economy will suffer in the long run.

(3) When deciding about the increase of nominally fixed taxes near the maximal sustainable level (this may happen even at a given combination of different taxes), decision makers have to use a considerably lower index rate than the expected growth of the economy, a result that might be counterintuitive. Due to uncertainty regarding e.g. efficiency, material costs, and labour prices highly taxed firms may not have enough earning to retain to take profit of the market growth. In such a case sooner or later the ever growing tax will ruin them.

(4) Generally, in an economy with companies of more fluctuating performance government should leave more room for efficiency fall-backs when setting tax rates of any kind to maximise economic growth (and tax income) in the long run. In other words too high tax burden is more harmful in less stable countries.

Further research opportunities include introducing other types of taxies in the model, simulating an economy with firms of different productivity and efficiency, various leverage rates, or facing differences in growth opportunities due to focusing on different markets.

LIMITATIONS

In the real economies there is much more room for a tailor made taxation system than offered in this model. Taxes applied were very simple and only used one kind of tax with flat rate for all firms. In contrast to that, most tax schemes use several rates, tax base reduction options, and allowances, e.g. some duties and taxes may not be to be paid by firms under a given size, in specific industries or operating in underdeveloped areas.

The effect of taxation on the number of newly established companies was not considered and in our model there was no other exit for the owners but to wait until their equity completely evaporated. In real life owners would liquidate investments that are not likely to be profitable enough ($ROE>=r_E$) in the future (GDP would decrease sooner), and in such an industry none would start new business either. Of course also decision maker may notice their mistakes earlier than the complete collapse of the economy, also thanks to macro analysts, academic researchers or the protest of entrepreneurs and business people.

REFERENCES

Cooley, T.F. and Hansen, G.D. (1992): Tax distortions in a neoclassical monetary economy. *Journal of Economic Theory*, 58(2), pp.290-316.

DeAngelo, H. and Masulis, R.W. (1980): Optimal capital structure under corporate and personal taxation. *Journal of financial economics*, 8(1), pp.3-29.

Djankov, S., Ganser, T., McLiesh, C., Ramalho, R. and Shleifer, A, (2008): *The effect of corporate taxes on investment and entrepreneurship* (No. w13756). National Bureau of Economic Research.

Feldstein, M. (1995): The effect of marginal tax rates on taxable income: a panel study of the 1986 Tax Reform Act. *Journal of Political Economy*, pp.551-572.

Graham, J.R. and Rogers, D.A. (2002): Do firms hedge in response to tax incentives?. *The Journal of finance*, *57*(2), pp.815-839.

Greenwood, J. and Huffman, G.W. (1991): Tax analysis in a real-business-cycle model: On measuring Harberger triangles and Okun gaps. *Journal of Monetary Economics*, *27*(2), pp.167-190.

Hall, R.E. and Jorgenson, D.W. (1967): Tax policy and investment behavior. *The American Economic Review*, *57*(3), pp.391-414.

Levine, R. (1991): Stock markets, growth, and tax policy. *The Journal of Finance*, *46*(4), pp.1445-1465.

Mendoza, E.G., Milesi-Ferretti, G.M. and Asea, P., 1997. On the ineffectiveness of tax policy in altering long-run growth: Harberger's superneutrality conjecture. *Journal of Public Economics*, *66*(1), pp.99-126.

Mendoza, E.G., Razin, A. and Tesar, L.L. (1994): Effective tax rates in macroeconomics: Cross-country estimates of tax rates on factor incomes and consumption. *Journal of Monetary Economics*, *34*(3), pp.297-323.

Nielsen, S.B., Raimondos-Møller, P. and Schjelderup, G. (2010): Company taxation and tax spillovers: separate accounting versus formula apportionment. *European Economic Review*, *54*(1), pp.121-132.

Surrey, S.S. (1970): Tax incentives as a device for implementing government policy: A comparison with direct government expenditures. *Harvard Law Review*, pp.705-738.

AUTHOR BIOGRAPHIES

PÉTER JUHÁSZ is an Associate Professor of the Department of Finance at Corvinus University of Budapest (CUB). He holds a PhD from CUB and his research topics include business valuation, financial modelling, and performance analysis. His e-mail address is: peter.juhasz@uni-corvinus.hu

KATA VÁRADI is an Assistant Professor at the Corvinus University of Budapest (CUB), at the Department of Finance. She graduated also at the CUB in 2009, and after it obtained a PhD in 2012. Her main research area is market liquidity, bonds markets and capital structure of companies. Her e-mail address is: kata.varadi@uni-corvinus.hu