CHANGES IN TAX NEUTRALITY OF EFFECTIVE TAX RATES IN THE CZECH REPUBLIC IN 2010–2018[1]

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ABSTRACT

The presented paper builds on previous research in this area (Holečková, 2013) and aims to examine the tax neutrality in the Czech Republic (i.e., the extent to which the given tax leaves corporate decisions as to investments or sources of financing unchanged). A tax system that seeks to raise revenue without distortive effects is considered a neutral tax system. This aspect is of great importance as it defines one of the aims of modern tax systems and points towards one specific criterion by which they may be assessed. Our approach adopts effective tax rates on different types of capital assets and sources of financing and based on the calculation of the tax wedges it assesses the degree to which taxation affects the incentive to undertake investments in the Czech Republic. The precise methodology used to calculate effective tax rates on marginal investments is based on the approach developed by King and Fullerton (1984), whose methodology became the most widely accepted method adopted to calculate effective tax rates (tax wedges). The method appeals to both academics and practitioners to this day (e.g., Florio, 2007). The tax wedge will vary according to the type of asset: machinery, buildings, inventory (because of different capital allowance rates relative to the assumed true economic depreciation rates) and the type of financing sources: new equity, debt and retained earnings (since the tax treatment of debt, dividends and retained earnings differs). Effective tax rates take into account not only the statutory corporate tax rate, but also other aspects of the tax system which determi-

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ne the amount of taxes paid and profitability of investment, including personal taxes. The paper finds out that, based on the calculations for 2018, businesses need to ensure the rate of return higher by 1.33 percentage points for the retained earnings (and by 1.80 percentage points for new equity, respectively) compared to the final post-tax rate of return which investors actually get. The adopted analysis suggests that Czech tax system tends to favour investments in machinery on the expense of buildings and, particularly, inventories. With this respect, our results correspond to outcomes of other, similar country-specific studies, such as, for example, de Almeida–Paes (2013). The tax system also lacks neutrality when considering alternative sources of finance, i.e., the debt finance tends to be favoured over equity and retained earnings.

Key words: *effective tax rates, tax wedges, tax neutrality, type of asset, type of finance sources, taxable profit.*

JEL classification: H210

1 INTRODUCTION

Profit taxes adopted by the developed market economies distort the types of investments which companies undertake, i.e., the way they finance those investments and the overall level of investment. All these issues get worse the higher the level of inflation because no corporate tax system adjusts fully for the effects of inflation (Heady–Pearson–Rajah–Smith, 1993, p. 35). However, inflation, important as it may be, is only one issue. Other features of the corporate tax system, particularly its effects on corporate decisions as to the undertaken investments and sources of finance, matter as well and at any inflation rate (King–Wookey, 1987, p. 6).

The tax system that seeks to raise revenue in ways that avoid distortionary substitution effects regarding decisions on investments or sources of finance is considered a tax neutral one. This does not imply that the tax system has no impact upon behaviour but instead suggests that high marginal tax rates should be avoided and there should not be different tax rates on essentially similar activities (Heady–Pearson–Rajah–Smith, 1993, p. 25).

The goal is tax neutrality; that is, to a tax that leaves corporate decisions regarding investments or sources of financing unchanged (King–Wookey, 1987, p. 7).

Taxes impose a real cost to the economy inasmuch as they create distortions to the market allocation of resources. However, not all tax systems are equally distortive, and one obviously attractive objective is to minimise the impact of the tax structure on behaviour as far as possible. A corporate tax that achieves this

with regard to decisions on investments or sources of financing is described as the neutral tax (King–Wookey, 1987, p. 13).

Suppose there were no corporate taxes, and consider a company appraising an investment project. The company will assess the returns earned on the project after rewarding its suppliers of capital with the required return. To make a profit, the project has to generate at least this return for the company. Now we can measure the effect of introducing a corporate tax in terms of such an investment decision. For it may be that the corporate tax raises the pre-tax required return the project needs to earn for the company to be worthwhile above of what was needed in the absence of any corporate tax. If it does this, the tax drives a "wedge" between the pre-tax return and the post-tax required rate of return, and will have a disincentive effect on the corporate investment. In other words, it will not be neutral. For a fully neutral tax, this wedge will be zero (King–Wookey, 1987, p. 7).

The difference between the pre-corporate tax rate of return earned by companies and the post-tax receipts an individual gets is the measure of the total distortion (the total tax "wedge") caused by taxes. The size of the "wedge" can be a rather accurate indication of the degree of neutrality in the corporate tax system. The tax wedge provides an extremely useful tool to investigate this aspect of different tax regimes, and it is used in the empirical analysis of this paper. The tax wedge also represents one of the forms of how to calculate effective tax rates.

Effective tax rates are tax rates which take into account not only the statutory corporate tax rate, but also other aspects of the tax system which determine the amount of the tax paid and the profitability of an investment, such as capital allowances and stock relief. Effective tax rates may also require a consideration of personal taxes and the manner (if any) in which the corporate and personal tax systems are integrated (classical, split-rate or imputation). Inflation will also alter effective tax rates in various ways, depending on how the given tax system calculates taxable profits in the presence of inflation.

Effective tax rates (rather than statutory tax rates) can give us an idea of the level of distortion imposed on investments by the tax system. Therefore, it makes sense to consider the effective taxation of different types of capital assets and sources of financing when evaluating the distortedness of the tax system. Statutory tax rates measure the tax burden as imposed by the government on the

specified income (or expenditure) streams. These statutory tax rates do not take into account depreciation or other deductions, nor do they consider the effects of inflation on the actual amount of tax paid relative to the value of the income stream. Effective tax rates are designed to correct for these facts.

As noted above, there are various factors that are of essential significance using the idea of the tax wedge:

- statutory corporate tax rate
- system of depreciation and its rates
- capital structure
- system of personal taxation
- manner of the corporate and personal tax systems integration
- rate of inflation
- capital allowances

There are in total three rates of return that are useful to focus on when discussing effects of the tax system on investments decisions:

- Real pre-corporate tax rate of return to companies (p),
- Real interest rate, which is the return that can be earned on a government bond or a bank deposit before personal taxes are charged (r – usually 5%, reflecting the typical real interest rate) and
- Real post-personal tax rate of return received by the ultimate financiers of the investment (s).

The relation between the nominal interest rate (i) and the post-tax real return (s) can be simply stated:

$$s = \frac{1 + i\,(1 - ti)}{1 + \pi} - 1, \tag{1}$$

where:

π is the rate of inflation,

i is the nominal interest rate, equal to $(1+ r)\cdot(1+\pi) - 1$, and

t_i is the personal tax rate on interest income.

Given the specified relationships between the pre-corporate tax return (p), the interest rate (r), and the post-personal tax return (s), various effective tax rates or wedges can be calculated (on capital assets – such as machinery, buildings, inventories, or sources of financing – e.g. new equity, retained earnings, debt). The difference between p (the pre-tax rate of return to companies) and s (the post-tax rate of return to individuals) reflects the overall size of the market distortion caused by corporate and personal taxes.

There are three relevant measures of effective tax rates on businesses:

1. First, it is the (p) which is required to get the particular value of (r),
2. Second, it is the tax wedge – the percentage difference between (p) and (s),
3. Third, it is the tax rate – the tax wedge (p–s) divided by (p). The tax rate as such is not always a particularly useful figure, since the tax wedge may be similar in two different cases, but (p) may vary, giving substantial differences in the tax rate.

The main objective of the King–Fullerton approach is to derive the difference between the pre-tax and post-tax real rate of return required from an investment project. In the absence of the corporate tax, these will, of course, be equal to each other and also equal, by assumption, to the prevailing real interest rate (r). However, corporate taxes may cause the pre-tax required real rate of return, also termed the cost of capital, (p), to diverge from the interest rate. In addition, personal taxes may reduce the post-tax real return to the individual investor (s) below the interest rate.

The methodology and calculations of tax wedges include the corporate tax rate, depreciation allowances, valuation of dividends, personal tax rates on the dividend income, interest income and capital gains, and the rate of inflation.

Three forms of financing the company are considered:

– Retained earnings (RE)
– New equity (NE)
– Debt (borrowings) (D)

Investments in three assets that are distinguished in the balance sheet:

– Machinery (M)

– Buildings (B)
– Inventory (I)

The precise methodology used to calculate effective tax rates on investments in this paper is closely based on the approach developed by King and Fullerton (1984), which allows modelling complicated provisions of the tax codes in a rigorous manner.

2 ANALYSIS OF THE TAX NEUTRALITY THROUGH TAX WEDGES IN THE CZECH REPUBLIC

As noted above, there are various factors of essential significance when using the idea of the tax wedge.

Assumptions and parameters used in the calculation:

Sector	Manufacturing
Sources of finance	Retained earnings (RE), new equity (NE), debt (D)
Types of asset	Machinery (M), buildings (B), inventories (I)
The weights[4] used for finance	55% RE, 10% NE, 35% D
The weights for assets	50% M, 28% B, 22% I
Length of life for tax purposes	Machinery 6 years (tax rate 16.67%), buildings 30 years (tax rate 3.33%)
Economic depreciation rate	Machinery 12.3%, buildings 3.6%
Inventories	Assumed not to be depreciated
The real interest rate	5%
The inflation rate	1.5% in 2010, 2.3% in 2018 (expected)
Personal tax rates of individual investors	Rate on interest (t_i = 15%), rate on dividends (t_d = 15%), rate on capital gains (z = 15%)
Statutory corporate tax rate t	19% in both years (no change)

[4] Weights for the sources of finance by OECD (1991) and Clark (2010, online version, p.4), respectively.

Factor	Year 2010	Year 2018
Inflation	1.5%	2.3%
Tax rate on capital gains	15%	15%
Tax rate on dividends	15%	15%
Corporate tax rate	19%	19%
Number of year for machinery depreciations	6 years	6 years
Number of years for building depreciations	30 years	30 years

We may distinguish seven main steps in calculating the tax wedges as listed within separate subheadings below.

2.1 NOMINAL RATE OF INTEREST

Nominal rate of interest [i] is given by the following formula:

$$i = (1 + r)\cdot(1 + \pi) - 1$$
$$\text{i} = (1 + 0.05)\cdot(1 + 0.015) - 1 = (1.05 \cdot 1.015) - 1 = 0.0657 \quad (2)$$

i = nominal interest rate,
r = real interest rate (5%, i.e. 0.05),
π = inflation rate.

2.2 DISCOUNT RATE OF INDIVIDUAL TYPES OF FINANCE

The discount rate for each type of finance [p'] is calculated as follows.

(a) Retained earnings:

$$p'_{RE} = \frac{(1 - ti)\cdot i - z \cdot \pi}{1 - z} \quad (3)$$

t_i = tax rate on interest,
t_d = tax rate on dividends,
z = tax rate on capital gains.

The capital gains tax rate Z is the accrual equivalent rate applied to the nominal capital gain. To calculate this rate, it is necessary to make some assumptions regarding the time at which the shareholder sells his or her shares, realises the gain and hence faces the tax liability. The approach of King (1997) is followed in assuming that the shareholder sells a constant proportion α of his or her stock of assets in each period, normally taken to be 10 %. In this case, the accrual equivalent capital gain tax rate is simply the present value of taxes due on the capital gain of one period t, that is:

$$z = \frac{\alpha \cdot z_r \cdot (1 + j)}{\alpha + j} \tag{4}$$

$j = i \cdot (1 - t_i)$, i.e. shareholders' discount rate,
z_r = statutory tax rate on capital gains after sale,
α = proportion of stock of assets realised each year.

$$z = \frac{0.015 \cdot (1 + 0.0657 \cdot 0.85)}{0.1 + (0.0657 \cdot 0.85)} = \frac{0.0158}{0.1559} = 0.1016$$

$$p'_{RE} = \frac{(1 - 0.15) \cdot 0.0657 - 0.1016 \cdot 0.015}{1 - 0.1016} = 0.0605$$

(b) New equity:

$$p'_{NE} = \frac{(1 - t_i) \cdot i - z \cdot \pi}{1 - t_d} \tag{5}$$

$$p'_{NE} = \frac{(1 - 0.15) \cdot 0.0657 - 0.1016 \cdot 0.015}{1 - 0.15} = 0.0640$$

(c) Debt:

$$p'_D = (1 - t) \cdot i \tag{6}$$

t = corporate tax rate.

2.3 PRESENT VALUE OF DEPRECIATION ALLOWANCES

The formula for calculation of the present value of depreciation allowances [A] can be used for declining balance and straight line (linear) depreciation schedules.

For the straight line schedule it is as follows:

$$A_S = \frac{o \cdot t \cdot (1 + p')}{p'} \cdot \left[1 - \frac{1}{(1 + p')^N} \right] \tag{7}$$

N = number of years for ($N = 1 / o$),
o = tax depreciation rate,
o_m = 0.1667 for machinery (in the CR),
o_b = 0.033 for buildings (in the CR),
p' = discount rate for each type of finance,
t = corporate tax rate.

For the declining balance schedule it is as follows:

$$A_D = \frac{o \cdot t \cdot (1 + p')}{p' + o} \tag{8}$$

In this calculation, the straight (linear) schedule (prevailing in the Czech Republic) will be considered according the Formula (6).

It must be calculated for each class of machinery and building (inventories do not receive any allowance). In each case, the present value depends on the company's discount rate, which, as we have seen in step 2, in turn depends on the source of finance.

The present value of depreciation for **machinery**:

There are three possible values of the discount rate p' corresponding to the values given above. We take each in turn:

$$A_{M,\,RE} = \frac{0.1667 \cdot 0.19 \cdot (1 + 0.0605)}{0.0605} \cdot (1 - \frac{1}{1.0605^6} =$$
$$= 0.5550 \cdot 0.2971 = 0.1649$$

$$A_{M,\,NE} = \frac{0.1667 \cdot 0.19 \cdot (1 + 0.0640)}{0.0640} \cdot (1 - \frac{1}{1.0640^6} =$$
$$= 0.5268 \cdot 0.3106 = 0.1636$$

$$A_{M,\,D} = \frac{0.1667 \cdot 0.19 \cdot (1 + 0.0533)}{0.0533} \cdot (1 - \frac{1}{1.0533^6} =$$
$$= 0.6262 \cdot 0.2675 = 0.1675$$

The present value of depreciation for **buildings**:

Buildings are depreciated over 30 years. Using (7) we again need to take each of the sources of financing in turn:

$$A_{B,\,RE} = \frac{0.0333 \cdot 0.19 \cdot (1 + 0.0605)}{0.0605} \cdot (1 - \frac{1}{1.0605^6} =$$
$$= 0.1110 \cdot 0.8284 = 0.0919$$

$$A_{B,\,NE} = \frac{0.0333 \cdot 0.19 \cdot (1 + 0.0640)}{0.0640} \cdot (1 - \frac{1}{1.0640^6} =$$
$$= 0.1054 \cdot 0.844 = 0.0889$$

$$A_{B,\,D} = \frac{0.0333 \cdot 0.19 \cdot (1 + 0.0533)}{0.0533} \cdot (1 - \frac{1}{1.0533^6} =$$
$$= 0.1252 \cdot 0.7891 = 0.0988$$

Thus, in each case the present value of depreciation allowances rises as the discount rate falls, since the future allowances are not discounted so heavily.

Except for the rate of depreciation, the present value of depreciation allowances depends also on:

1) The discount rate of the company for the particular type of financing,

2) The source of financing.

Since inventories are not depreciated, their present value is not calculated.

2.4 REQUIRED REAL PRE-TAX RATE OF RETURN (P)

There are altogether nine individual required real rates of return [p] to be calculated, corresponding to an investment in the three assets, each funded from one of the three sources of financing. Again, we consider these in turn.

This step requires introduction of four additional parameters that were not yet considered: the economic depreciation rate *d* for machinery, buildings and inventories, which are assumed to be 12.25% (i.e., 0.1225) and 3.61% (i.e., 0.0361) and zero, respectively, and the proportion of inventories valued using the FIFO method v, which in the Czech Republic is nearly 100% (i.e., 1.0). The LIFO method is not allowed.

The calculation for machinery and buildings uses the following formula:

$$p = \frac{1 - A \cdot i}{(1 - t) \cdot (1 + \pi)} \cdot [p' - \pi + d \cdot (1 + \pi)] - d \qquad (9)$$

d_m = 0.1225 for machinery,
d_b = 0.0361 for buildings.

The formula for inventories is as follows: (10)

$$p = \frac{1 - A \cdot i}{(1 - t) \cdot (1 + \pi)} \cdot [p' - \pi + d \cdot (1 + \pi)] + \frac{v \cdot t \cdot \pi}{(1 - t) \cdot (1 + \pi)} - d$$

The expression (10) shows the calculation for the cost of capital when the inflationary increase in the value of inventories is taxed. With v=1, calculations are therefore as follows: if the inflation rate is high, then it implies an increase in the tax wedge for inventories.

Now we can calculate the real required pre-tax rate of return (p) that also represents the cost of capital.

Machinery (according to Formula 9)

Retained earnings:

$$p_{M,RE} = \frac{1 - 0.1649}{(1 - 0.19) \cdot (1 + 0.015)} \cdot [0.0605 - 0.015 + 0.1225 \cdot$$

$$\cdot (1 + 0.015)] - 0.1225 = 0.0500 = 5.00\%$$

New equity:

$$p_{M,NE} = \frac{1 - 0.1636}{(1 - 0.19) \cdot (1 + 0.015)} \cdot [0.0640 - 0.015 + 0.1225 \cdot$$

$$\cdot (1 + 0.015)] - 0.1225 = 0.0538 = 5.38\%$$

Debt:

$$p_{M,D} = \frac{1 - 0.1675}{(1 - 0.19) \cdot (1 + 0.015)} \cdot [0.0533 - 0.015 + 0.1225 \cdot$$

$$\cdot (1 + 0.015)] - 0.1225 = 0.1225 = 4.21\%$$

Buildings (according to Formula 9)

Retained earnings:

$$p_{B,\,RE} = \frac{1 - 0.0919}{(1 - 0.19) \cdot (1 + 0.015)} \cdot [0.0605 - 0.015 + 0.0361 \cdot$$

$$\cdot (1 + 0.015)] - 0.0361 = 0.0546 = 5.46\%$$

New equity:

$$p_{B,\,NE} = \frac{1 - 0.0890}{(1 - 0.19) \cdot (1 + 0.015)} \cdot [0.0640 - 0.015 + 0.0361 \cdot$$

$$\cdot (1 + 0.015)] - 0.0361 = 0.0588 = 5.88\%$$

Debt:

$$p_{B,D} = \frac{1 - 0.0988}{(1 - 0.19) \cdot (1 + 0.015)} \cdot [0.0533 - 0.015 + 0.0361 \cdot$$

$$\cdot (1 + 0.015)] - 0.0361 = 0.0460 = 4.60\%$$

Inventories (according to Formula 10)

Retained earnings:

$$p_{I,RE} = \frac{1 - 0}{(1 - 0.19) \cdot (1 + 0.015)} \cdot [0.0605 - 0.015 + 0 \cdot (1 + 0.015)] +$$

$$+ \frac{1 \cdot 0.19 \cdot 0.015}{(1 - 0.19) \cdot (1 + 0.015)} - 0 = 0.0588 = 5.88\%$$

New equity:

$$p_{I,NE} = \frac{1 - 0}{(1 - 0.19) \cdot (1 + 0.015)} \cdot [0.0640 - 0.015 + 0 \cdot (1 + 0.015)] +$$

$$+ \frac{1 \cdot 0.19 \cdot 0.015}{(1 - 0.19) \cdot (1 + 0.015)} - 0 = 0.0630 = 6.30\%$$

Debt:

$$p_{I,D} = \frac{1 - 0}{(1 - 0.19) \cdot (1 + 0.015)} \cdot [0.0533 - 0.015 + 0 \cdot (1 + 0.015)] +$$

$$+ \frac{1 \cdot 0.19 \cdot 0.015}{(1 - 0.19) \cdot (1 + 0.015)} - 0 = 0.0500 = 5.00\%$$

2.5 POST-TAX RETURN TO INVESTORS

Next, we calculate the post-tax return to investors [s]

$$s = \frac{1 + i \cdot (1 - t_i)}{1 + \pi} - 1 \tag{11}$$

$$s = \frac{1 + 0.06575 \cdot (1 - 0.15)}{1 + 0.015} - 1 = 4.03\%$$

2.6 AVERAGE REQUIRED REAL PRE-TAX RATES OF RETURN

Step 4 yielded nine different values of the cost of capital. These are combined into weighted averages [p] (see Table 1). Weights for the individual asset types are 50% for machinery, 28% for buildings and 22% for inventories. The weights for sources of financing are 55% for retained earnings, 10% for new equity and 35% for debt. These weights yield in the following table:

Tab. 1 » Weights yield

P	RE	NE	D	Weighted average
Buildings (B)	5.46%	5.88%	4.60%	5.20%
Machinery (M)	5.00%	5.38%	4.21%	4.76%
Inventory (I)	5.88%	6.30%	5.00%	5.62%
Weighted average	5.33%	5.72%	4.49%	

2.7 WEIGHTED AVERAGE TAX WEDGE

The weighted average tax wedge is calculated as $[p - s]$, $s = 4.03\%$.

Tab. 2 » Weighted average tax wedge for 2010

Wedges (p-s)	RE	NE	D	Weighted average
Buildings (B)	1.44%	1.85%	0.57%	1.17%
Machinery (M)	0.97%	1.35%	0.19%	0.74%
Inventory (I)	1.85%	2.27%	0.97%	1.59%
Weighted average	1.30%	1.69%	0.47%	**1.05%**

Note: Model with calculations in Annex 2.

Tab. 3 » Weighted average tax wedge for 2018

Wedges (p-s)	RE	NE	D	Weighted average
Buildings (B)	1.44%	1.93%	0.58%	1.19%
Machinery (M)	0.99%	1.44%	0.20%	0.76%
Inventory (I)	1.97%	2.47%	1.09%	1.71%
Weighted average	1.33%	1.80%	0.50%	**1.09%**

Note: Model with calculations in Annex 3.

3 RESULTS, DISCUSSION AND CONCLUSIONS

Calculation has been done for the years 2010 and 2018. When comparing the values of tax wedges in 2018 with the values calculated for 2010 as indicated in the tables above, we can interpret the results.

The values of the tax wedges for 2018 in Table 3 can be interpreted as follows: e.g., line 2 shows that a company which needs to guarantee an investment into machinery financed from the combination of retained earnings, new shares and borrowings (debt), must ensure the rate of return 0.76 percentage points higher than the investor really receives after taxation, in 2010 it was 0.74 percentage points – a slightly negative change. The difference will be paid to the government in the form of taxes. Tax wedge in buildings and other constructions has also risen in 2018 (from 1.17 percentage points in 2010 to 1.19 percentage points in 2018).

If we look at the sources of financing, we can see that combined investment into machinery, buildings and stocks is taxed in the case of financing from both retained earnings and new equity. The difference between these two methods shows that in 2018, a company has to ensure the rate of return which is higher by 1.33 percentage points for retained earnings, resp. 1.80 percentage points for new equity, than the final post-tax rate that the investor actually gets. The analysis in this paper suggests that Czech tax system tends to favour investment in machinery over buildings and, particularly, over inventories. With this respect, our results correspond to outcomes of other, similar country-specific studies, such as, for example, de Almeida–Paes (2013), who conclude that in the case of Brazil, machinery and buildings receive a better tax treatment than inventories.

The tax system is also not neutral with regard to alternative sources of corporate finance. The data indicate that debt finance tends to be favoured over equity and retained earnings.

On average, the total rate of return (total tax wedge) of a company before taxation is 1.09 percentage points higher than the rate of return after tax actually received by the investor. This total tax wedge is much lower than the OECD average, which is 2.4 resp. 2.1 (OECD, 1991). Even partial tax wedges are similar to the values in OECD countries. They are even lower in some cases. Shortening the depreciation period has got a major influence on lowering the tax wedge within the category of machinery and buildings.

When comparing the values from 2018 and 2010, we can see a slight worsening in the calculated values (an increase both in the values of partial tax wedges and the total average from 1.05 to 1.09 percentage points). This negative change has been mainly caused by the increase in inflation from 1.5 % in 2010 to 2.3 % in 2018 (projection by the Czech Statistical Office).

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ANNEX 1

Assumptions and variables of the model		2010	2018
Real interest rate	R	5%	5%
Inflation	π	1.5%	2.3%
Tax rate on interest	ti	15%	15%
Tax rate on dividends	td	15%	15%
Tax rate on capital gains	zr	15%	15%
Corporate tax rate	t	19%	19%
Alpha	α	10%	10%
Tax depreciation rate on buildings	ob	3.33%	3.33%
Tax depreciation rate on machinery	om	16.67%	16.67%
Proportion on inventories valued by FIFO	v	100.0%	100.0%
Economic depreciation rate on buildings	db	3.61%	3.61%
Economic depreciation rate on machinery	dm	12.25%	12.25%
Weight for retained earnings	RE	55%	55%
Weight for new equity	NE	10%	10%
Weight for debt	D	35%	35%
Weight for buildings	B	28%	28%
Weight for machinery	M	50%	50%
Weight for inventories	I	22%	22%
Derived assumptions		2010	2018
Nominal interest rate	i	7%	7%
Shareholders' discount rate	j	6%	6%
Length of depreciation of buildings (years)	Nb	30	30
Length of depreciation of machinery (years)	Nm	6	6
Required post-tax return to investors	s	4.03%	3.91%

ANNEX 2

TAX WEDGES 2010

Discount rates

p'	RE	NE	D
p' (B, M, I)	0.0605	0.0640	0.0533

Present value of depreciation allowances

A	RE	NE	D
Buildings (B)	0.0919	0.0890	0.0988
Machinery (M)	0.1649	0.1636	0.1675

Required pre-tax rate of return

P	RE	NE	D	Weighted average
Buildings (B)	5.46%	5.88%	4.60%	5.20%
Machinery (M)	5.00%	5.38%	4.21%	4.76%
Inventory (I)	5.88%	6.30%	5.00%	5.62%
Weighted average	5.33%	5.72%	4.49%	

Tax wedges

Wedges (p-s)	RE	NE	D	Weighted average
Buildings (B)	1.44%	1.85%	0.57%	1.17%
Machinery (M)	0.97%	1.35%	0.19%	0.74%
Inventory (I)	1.85%	2.27%	0.97%	1.59%
Weighted average	1.30%	1.69%	0.47%	**1.05%**

ANNEX 3

TAX WEDGES 2018

Discount rates

p'	RE	NE	D
p' (B, M, I)	0.0674	0.0715	0.0601

Present value of depreciation allowances

A	RE	NE	D
Buildings (B)	0.0862	0.0830	0.0924
Machinery (M)	0.1624	0.1610	0.1650

Required pre-tax rate of return

P	RE	NE	D	Weighted average
Buildings (B)	5.36%	5.84%	4.49%	5.10%
Machinery (M)	4.90%	5.35%	4.11%	4.67%
Inventory (I)	5.88%	6.38%	5.00%	5.62%
Weighted average	5.24%	5.72%	4.41%	

Tax wedges

Wedges (p-s)	RE	NE	D	Weighted average
Buildings (B)	1.44%	1.93%	0.58%	1.19%
Machinery (M)	0.99%	1.44%	0.20%	0.76%
Inventory (I)	1.97%	2.47%	1.09%	1.71%
Weighted average	1.33%	1.80%	0.50%	**1.09%**