Effectiveness of the Research and Development Incentive in encouraging Research in South Africa

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Executive Summary

South Africa uses a generous Research & Development (R&D) Tax Incentive (11D incentive) to encourage businesses to increase investment in scientific and technological R&D, advance scientific knowledge and increase the positive spillover to the rest of the society. However, this tax incentive comes with a cost in terms of revenue. This paper seeks to answer if the objectives were achieved in a cost-effective manner. The question that we are trying to answer is whether this tax incentive helps the government meet these goals in a cost-effective manner.

In order to answer this question, we need data on the R&D incentives granted to each company and also the outcomes of the R&D in the form of patents, knowledge spillovers, new technologies, etc. However, we do not have company-wise data on the outcomes, though we do have data on the intermediate outcomes which is company-wise spending on R&D and tax incentives claimed from the National Treasury tax returns dataset.

Thus, while the paper does not have answers to the wider impact of the R&D because of the R&D incentive, it attempts to answer if the 11D incentive increased R&D spending. By exploiting the fact that while many companies do invest in R&D, a subset of them apply for the 11D incentive with a further subset of them finally being granted the incentive, we can use a simple methodology to estimate the its impact. We find that companies that get the 11D incentive spend an additional 4 million on R&D as compared to those who do not get the R&D incentive. This positive impact is true for most of the sectors while among certain prominent sectors in the South African economy (autos and mining) we do not see any positive impact of the incentive. The paper also finds that while revenue for foregone as a result of the 11D Tax Incentive is nearly R7 billion between 2008 and 2015, the additional R&D spending is nearly 13 million. This implies that for every one rand of revenue foregone, companies spent an additional R 1.83 into R&D. In this regard the 11D incentive may be seen as a successful tax incentive.

This result comes with the caveat that the methodology used to estimate the impact of the 11D incentive relies on the fact that the R&D spending for which the 11D incentive has been approved is significantly different and more expensive that that R&D spending that has not been approved. In such a case the result shown here is indicative of the type of the R&D and not the availability of the incentive. Short of a random assignment of the 11D incentive there is no accurate way to estimate its impact. However, we may take advantage of the fact that a wide range of activities that may constitute R&D do not qualify for the incentive. Further, we may also exploit any variation that comes from an (imperfect) approval process that may reject the incentive application by a company that should have qualified because the definition of what constitutes R&D is imprecise, lastly, there may be companies that did not apply for the incentive due to the uncertainties in the approval process or the cost in time and money of doing so. Despite these caveats, this paper is a small contribution to answering the difficult but important question for policy makers – does the R&D incentive encourage spending in R&D.

I.   Introduction

The aim of government when it introduced Section 11D R&D tax incentive was to encourage South African companies to invest in scientific or technological research and development. The Incentive allows enterprises to claim

- ➢ a deduction of 150% of expenditure incurred directly for Research and Development and, in addition,
- ➢ an accelerated depreciation deduction (50% in year 1, 30% in year 2 and, 20% in year 3) for capital expenditure incurred on machinery or plant used for R&D.

According to the Department of Science and Technology (DST), between 2005/06 and 2013/14 a total of 2588 applications have been received from 962 companies. An estimated R36.1 billion in R&D expenditure was supported by this incentive and the foregone revenue was approximately R6 billion[1].

Section 11D was introduced in 2006 (replacing the earlier section 11B) and applicable for all R&D activities that were undertaken after the 2nd of November 2006. This section allows the deduction of 150% of operational expenditure on R&D. The definition of R&D activities that qualifies for such a deduction is quite wide and having being amended several times since then includes,

- ➢ Discovering non-obvious scientific or technological knowledge;
- ➢ Creating or developing an invention, functional design, computer program and the knowledge essential to the use of such invention, design or program;
- ➢ Making a significant and innovative improvement to an invention, functional design or computer program;
- ➢ Creating or developing a multisource pharmaceutical product;
- ➢ Conducting clinical trials;

However, certain activities would not qualify as R&D for deduction under 11D such as:-

- ➢ Routine testing, analysis and collection of information or quality control in the normal course of business;
- ➢ Development of internal business processes for own use;
- ➢ Market research, market testing or sales promotion;
- ➢ Oil and gas mineral exploration or prospecting;
- ➢ Creation of development of financial instruments or products;
- ➢ Creation of enhancement of trademarks or goodwill.

The definition of what qualifies as R&D that would be allowed a 11D deduction is not precise and there have been litigation on this. Prior to 2012, companies claimed the 11D incentive and SARS administered the incentive as part of their audit process. In 2011, a significant change was made

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[1] Research and Development Tax Incentive Programme, Report to Parliament, 2015/16, Department of Science and Technology, Government of South Africa.

to the procedure to avail of the R&D incentive and applicable from the 1st of October 2012 whereby the R&D activity on the basis of whuch the 11D incentive was being claimed needs to be approved by an Adjudication Committee that includes representatives of the Ministry of Science and Technology, SARS and the National Treasury.

While a deduction of 150% of the operating expenditure is allowed, an additional incentive is also available for capital expenditure in the form of accelerated depreciation on investment in plant and machinery that was used for the purpose of R&D. From 2006 until 2011, such investment benefited from accelerated depreciation of 40% in the first year and 20% for the three years following it. In 2011, the law was amended whereby plant and machinery brought into use on or after 1 January 2012 for the purpose of R&D would be benefit from an even more generous accelerated depreciation of 50%, 30% and 20% for the first, second and third year respectively.

The policy question this paper seeks to answer is whether these incentives have had the effect of increasing research and development activities. A follow-on question is whether the revenue foregone through these tax breaks was more than made up by the economic benefits that the R&D encouraged by it has generated. Answering these questions accurately is dependent on the availability of data and clean policy changes that could isolate the impact of tax incentives as compared by the other policy changes that could affect R&D activities. In this paper, we use data collected from corporate tax returns that capture both the expenditure incurred in R&D as well as the tax deduction claimed along with other company characteristics. Further due to the paucity of time, the analysis is limited to the data available through the tax returns and no company level data on the outcomes of the R&D such as number of new patents and inventions was available and hence used. The results of this study it is hoped would spur further studies using a broader company level data on the outcomes of R&D.

I. Data

Data used for this study was the National Treasury dataset consisting of company tax returns from 2008 until 2015. However, coverage for 2015 is not complete as all the tax returns had not been filed when the current dataset was compiled and there were only 6 companies that claimed the 11D incentive in 2008. The tax return data is further augmented by data from customs and payroll tax data. The company tax return includes information from the balance sheet as well as the profit and loss account such as the sales, investment in fixed assets, expenditure on R&D, 11D deduction claimed on R&D, sector in which it operates, etc. Table 1 shows the summary statistics of 11,792 corporations that have spent a non-zero amount on R&D during the years under study.

Table 1: Descriptive Statistics of Data

	2009	2010	2011	2012	2013	2014	2015*	All Years
					All values in million rand and deflated to 2015 rand			
Sales (mean)	103.31	336.28	410.61	514.05	974.17	754.73	636.76	457.45
Sales (median)	3.98	6.86	6.80	14.34	62.12	75.80	98.37	13.45
Property, Plant and Equipment (mean)	54.12	185.10	235.80	200.39	433.10	209.99	66.64	208.68
Property, Plant and Equipment (median)	0.39	0.55	0.39	0.54	2.95	3.69	4.00	0.67
Number of Employees (mean)	113	291	362	407	638	516	399	369
Number of Employees (median)	14	26	31	35	71.5	82.5	99.5	34
R&D Expenditure (mean)	0.54	1.52	1.40	1.71	3.57	2.14	1.68	1.62
R&D Expenditure (median)	0.03	0.04	0.04	0.05	0.14	0.16	0.18	0.05
R&D Deduction 11D (mean)	1.07	2.10	0.98	1.15	7.89	9.87	3.95	1.89
R&D Deduction 11D (median)	-	-	-	-	0.50	0.88	0.83	-
Number of company-years	11,792							

* Coverage for 2015 is not complete

On average, the corporations that spend on R&D are much larger firms with average sales nearly 31 times and fixed investments nearly 26 times that of firms who did not invest in R&D. Firms who invest in R&D also employ nearly nine times as much labour as those who don't. Overall the number of company years are 11,792 with the ranging from 2,123 in 2009 to 71 in 2015 for which incomplete data was available.

The number of employees directly employed by these corporations for all the years was 369 with the number of employees showing an increasing trend over the years. Mean R&D expenditure has also been rising. However mean R&D deduction under 11D fluctuated during the years 2009 to 2011 after which it shows an increasing trend. In describing these trends the year 2015 has not been included because of the availability of only partial data.

Table 2 shows the breakdown of the 11,792 tax returns (some companies claim the 11D incentive for multiple years) between 2008 and 2016 where some R&D has been recorded (which is about 0.2% of all records). This starts from a low of 6 cases in 2008 when the R&D incentive started kicking in. Table 3 shows that out of the 11,792 tax returns, in 3,391 cases the 11D exemption was claimed starting from one case in 2008 peaking to 751 returns in 2011. The percentage of cases where R&D expense was incurred and where 11D was claimed was a maximum of 45% in 2013.

Table 2: Records with R&D and 11D deduction

Year	Total Records	Either R&D expenditure or 11D Incentive claimed
2008	848,595	6
2009	903,521	2,123
2010	940,321	2,658
2011	925,339	2,714
2012	898,335	2,285
2013	873,755	1,097
2014	781,085	838
2015	242,906	71
2016	13,074	0
Total	6,426,931	11,792

Table 3: Records with R&D and 11D deduction

Year	Either R&D expenditure or 11D Incentive claimed	11D Incentive claimed	% of returns showing R&D expenses where Incentives were claimed
2008	6	1	17%
2009	2,123	409	19%
2010	2,658	671	25%
2011	2,714	751	28%
2012	2,285	711	31%
2013	1,097	489	45%
2014	838	333	40%
2015	71	26	37%
Total	**11,792**	**3,391**	**29%**

Table 4 summarizes the data for all the years where R&D Expenses were recorded in the tax returns as well where 11D exemption has been claimed. Out of the total records, 1,627 tax returns show both R&D expenditure as well as a 11D claim while there are 10,165 tax returns where R&D expenditure is claimed but there is no claim of 11D incentive. This probably is because the taxpayer did not qualify for the tax incentive or where they were not aware of the tax incentive. More discussion on this issue will be done later in the section on the methodology of estimating the impact of the tax incentive. Interestingly, there has been 1,764 tax returns where the tax return did not record an R&D expenditure while a 11D incentive was claimed which appears that this is either a data error or a patently illegal deduction. However, there is an explanation for this.

Prior to 2013 the tax return format was the same for both Small Business Corporations (SBCs) as well as Large and Medium Business Corporations. However, starting from 2013, the format of the corporate tax return was changed whereby balance sheet data of Small Businesses was not captured however the same was captured for Large and Medium Businesses. On the other hand, the 11D deduction was captured in the tax return for all taxpayers. This meant that the data of R&D spending was not captured in the tax returns for Small Businesses from 2013 onwards even while the 11D deduction was. As a result, these observations were not included in the analysis.

Table 4: Records with R&D and 11D deduction (all years)

	No R&D Expenditure recorded in Tax Returns	R&D Expenditure	Total
No 11D Claim	6,413,375	10,165	6,423,540
11D Claim	1,764	1,627	3,391
Total	6,415,139	11,792	6,426,931

The 11D incentive results in loss of revenue for the government. The revenue foregone for the years 2008 to 2015 was 7.3 billion (Table 5). The number of companies that claimed the 11D incentive was 3,391 higher than that shown in the report by the DST[2] which is 2,588 cases. This is likely because prior to 2012, the DST did not pre-approve the R&D incentive and the reporting was only retrospective as the incentive was administered only by SARS. It is possible that not all companies reported their R&D activity to DST. The amount of revenue foregone peaked at 2014 (note that the data for 2015 is incomplete). However, the number of companies claiming the 11D incentive has been dropping between 2011 and 2014 though the size of the exemption has risen. This may reflect the tightening as well as the uncertainty associated with the approval process post 2012.

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[2] Ibid. 1, 2.

Table 5: Revenue Foregone due to 11D incentive

	Number of Companies claiming 11D deduction	Revenue Foregone	Revenue foregone per Company
2008	1	314,964	314,964
2009	409	453,975,951	1,109,966
2010	671	1,184,221,398	1,764,861
2011	751	598,298,586	796,669
2012	711	626,414,470	881,033
2013	489	2,182,372,897	4,462,930
2014	333	2,205,041,132	6,621,745
2015*	26	78,547,158	3,021,045
Total	**3391**	**7,329,186,556**	

* Data for 2015 is incomplete

II. Methodology

In an ideal case, the impact of any policy change, such as the 11D incentive on R&D outcomes, can be measured by comparing the impact on a randomly selected group of participants on whom the policy change is applied with those on whom it is not applied. In the case of our policy question the measurement of the impact would be as follows:

Figure 1: Identification of Causal Effect of 11D Incentive

Experimental Design

P   : Firms that have filed tax returns

t   : 11D Incentive claimed

c   : No 11D Incentive Claimed

S   : S=t or c

Variables Measured:

Y   : R&D spending

X   : Sales/Sector/Capital Investment

Where, P: Population of units; S: Experimental Manipulation (S=t or c); t: Treatment; c: Control; Y: Outcome variable; X: Concomitant Variable.

In order to estimate the causal impact of the 11D incentive on R&D spending from the discussion in Box 1, under perfect randomization, the causal effect of the treatment (has 11D incentive) over control (does not have 11D incentive) can be estimated by just taking the average of the outcomes (spending in R&D) of the units (i.e. companies) assigned to treatment and subtract from that the amount the average of the outcomes of the units assigned to control.

i.e. the Causal effect $= E(Y_t - Y_c) = E(Y_t|S = t) - E(Y_c|S = c)$

i.e.

The effect of R&D incentive on R&D spending	=	Average R&D spend among those who opted for 11D	−	Average R&D spend of those who did not opt for 11D	(1)

Hence if we assume that companies were randomly assigned to be given the 11D incentive, the causal effect of the 11D incentive can be estimated by just by using equation (1).

However, in our case the companies were not randomly assigned the incentive but applied for it. This means that pure randomization cannot be assumed and the average causal effect measured in this way would be incorrect if the population who claimed the 11D incentive are systematically different from those who did not claim the incentive.

If the assignment to treatment or control is not independent, we would get biased estimates of the causal effect. To deal with this issue, we could lower the strict randomization condition with one of **conditional randomization** where by the **randomization is conditional on covariates** (See Appendix - II for the detailed model). For example, we could assume that conditional on turnover, the 11D incentive is allocated randomly or that two businesses with the same turnover are equally likely to be apply for the 11D incentive or not. Similarly, we could include other covariates such as the investment in fixed assets, profit, etc. The only issue we may face is if the claim of the incentive is based on firm specific factors that are not measured.

As shown in Appendix – II, the causal effect shown in equation (1) can be estimated by estimating $\hat{\beta}$ from the regression,

$$Y_i = \hat{\alpha} + \hat{\beta} \, T_i + e_i$$

Where $T_i = 1$ if unit 'i' is assigned to treatment and $T_i = 0$ if unit 'i' is assigned to control. Y_i is the outcome variable we are measuring and e_i is the error term for the sample.

When we include randomization conditional on a covariate 'X', we could estimate the average causal effect $\hat{\beta}$ by including 'X_i' in the regression, i.e.

$$Y_i = \hat{\alpha} + \hat{\beta} \, T_i + \hat{\gamma}_i \, X_i + e_i$$

III. Analysis

There are several departures from the ideal scenario mentioned above because,

1. It is not possible to provide the tax incentive to a randomly selected sample of companies and we are limited to using the data on companies that have claimed the tax incentive or otherwise. The companies who claimed the tax incentive may be very different from those who do not, which would give us a biased result of the true impact of the tax incentive on R&D spending. However, if we know the characteristics of companies who claim the incentive we may be able to correct for this bias.
2. We do not have data on R&D outcomes and must rely on R&D expenditure. We are thus assuming that R&D expenditure is directly correlated to R&D outcomes.

The analysis comes with the caveat that the methodology used to estimate the impact of the 11D incentive relies on the fact that the R&D spending for which the 11D incentive has been approved is not significantly different and more expensive that that R&D spending that has not been approved. In such a case the result shown here is indicative of the type of the R&D and not the availability of the incentive. Short of a random assignment of the 11D incentive there is no accurate way to estimate its impact. However, we may take advantage of the fact that a wide range of activities that may constitute R&D do not qualify for the incentive. Further, we may also exploit any variation that comes from an (imperfect) approval process that may reject the incentive application by a company that should have qualified because the definition of what constitutes R&D is imprecise, lastly, there may be companies that did not apply for the incentive due to the uncertainties in the approval process or the cost in time and money of doing so. These are an important and significant assumptions.

Thus, we have a scenario where the population could be placed in the following four categories as follows where Y is the amount of expenditure incurred in R&D:

Figure 2: Methodology for accessing impact of 11D incentive

	Did not Invest in R&D	Invested in R&D
Did not claim Tax Incentive	$Y = 0$ A	$Y(T=0)$ B
Claimed Tax Incentive	Not possible as not eligible for tax incentive C	$Y(T=1)$ D

To measure the impact of the tax incentive on R&D we will hence compare the investment in R&D for those who claimed the tax incentive from those who did not claim the tax incentive. Which is average of all tax returns in Box B less the average of all the tax returns in Box D. This may be compared to the data in Table 4. Thus, we compare the average R&D spend (shown in Table 4) for the 1,627 companies which did claimed the 11D incentive with those 10,165 companies which did not claim the tax incentive.

It may seem surprising that there are companies who have invested in R&D but have not claimed the tax incentive. It may be possible that either the R&D investment they made do not qualify for the tax incentive or, they were not aware of the tax incentive. For example, as mentioned earlier, certain kinds of R&D such as those management or internal business services, trademarks, market research, sales or marketing promotion, do not qualify for the tax incentive. Data from the report on research and development incentive submitted to parliament by the Department of Science and Technology gleans some of these differences. Between November 2006 and February 2016, 292 companies were granted approval while 307 companies did not get approval (Figure 3). During the same period, 2,588 applications that were received by the Department of Science and Technology with estimated R&D expenditure of R53.8 billion while among the approved applications, an estimated R36.1 billion was supported.

Figure 3: Data on R&D incentive applications
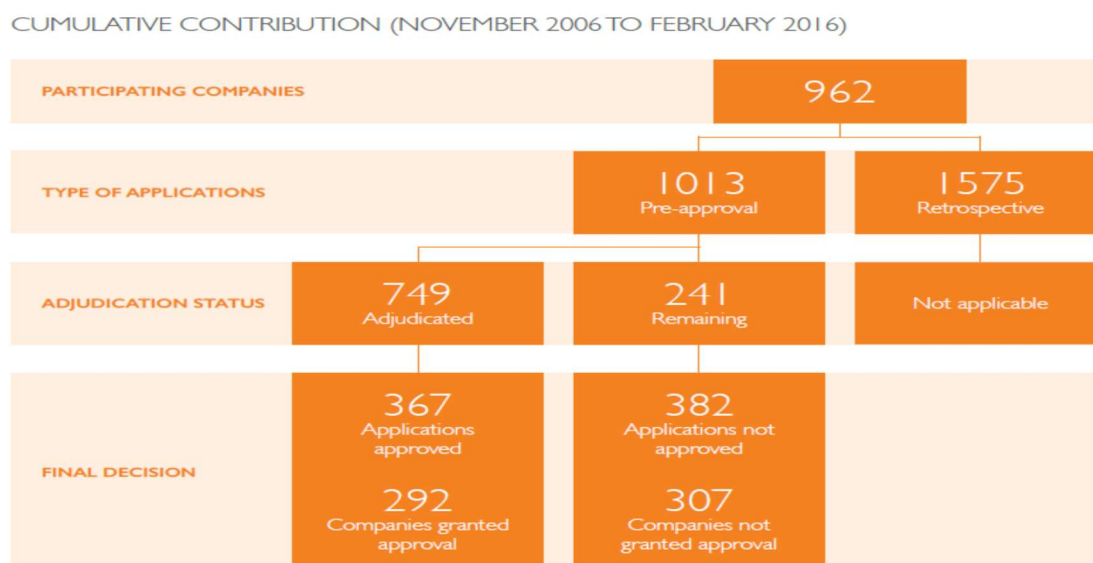
Source: Research and Development Incentive Programme- Report to Parliament 2015/16, Department of Science and Technology, Government of South Africa

As shown in Figure 1, the treatment group includes those companies that claimed the 11D incentive and also spent money on R&D while the control group are those who only spent money on R&D (and did not claim the 11D incentive).

Table 6 shows that the R&D spending of the companies that claimed the 11D incentive was considerably larger than those that did not claim the 11D incentive. The mean causal effect of the 11D incentive on R&D spending is 6,117,452 rand on average for all years and all sectors. The causal effect on the median company is 627,797 rand. The average causal effect of the 11D incentive on R&D spending is about is about 2% of the average expenditure (of the companies that invested in R&D). The causal effect of the 11D incentive can also be estimated for each of the years from 2008 to 2015 Table 7.

Table 6: Causal Effect of 11D incentive on R&D spending – Without Correction

Group	Median R&D Spend (Rand)	Mean R&D Spend (Rand)
(Did not claim 11D incentive) Control	25,974	478,635
(Claimed 11D incentive) Treatment	653,771	6,596,087
Average Causal Effect	627,797	6,117,452

Table 7: Causal Effect of 11D incentive on R&D spending (2018-2015) – Without Correction

	Mean R&D Spending (Rand)		
	Control	Treatment	Mean Causal Effect
2008	17,196	187,477	170,281
2009	236,919	1,714,804	1,477,885
2010	343,727	7,049,912	6,706,185
2011	363,449	6,091,517	5,728,068
2012	611,418	6,296,805	5,685,387
2013	861,449	11,356,307	10,494,858
2014	1,120,595	6,439,629	5,319,034
2015	845,120	7,434,753	6,589,633
Overall	478,635	6,596,087	6,117,452

The difference between R&D spending among those who claimed the 11D incentive as compared to those who did not, varies by sectors (Table 8). The (uncorrected) impact is the highest for the auto sector where the mean causal effect of the 11D incentive is 142 million for the Oil Sector and second highest for the Aircraft and Ships Sector at 41 million rand. The lowest impact is seen for the Rubber and Textile and Leather Sectors.

Table 8: Causal Effect of 11D incentive on R&D spending (Sectors) – Without Correction*

Sector	Mean R&D Spending (R mill.)		
	Control	Treatment	Average Causal Effect
Paper & Printing	0.45	13.24	12.79
Chemicals	0.55	1.37	0.82
Rubber	0.21	0.34	0.13
Wood & Misc.	0.83	3.96	3.12
Primary Metals	0.40	2.48	2.07
Fabricated Metals	0.25	1.55	1.30
Machinery	0.36	3.92	3.56
Electrical Machinery	0.28	7.62	7.34
Autos	1.94	5.62	3.68
Aircrafts & Ships	0.71	41.98	41.27
Textile & Leather	0.20	0.70	0.51
Pharmaceuticals	1.67	9.54	7.87
Food	1.53	9.51	7.98
Computers & Instruments	0.39	6.08	5.69
Oil	0.16	142.60	142.44
Agriculture	0.41	5.29	4.88
Mining	3.79	21.30	17.50
Electricity, Gas and Water	0.89	10.79	9.90
Construction	0.20	3.17	2.97
Services and Other	0.28	5.31	5.02

| All Sectors	0.48	6.60	6.12

*See Table 11 for the corrected causal effect

Comparability between the Control and Treatment

Estimating the causal effect by taking the difference between the average of the treatment and controls is valid only when the two groups are comparable and the treatment is randomly assigned as discussed above. This randomization can be tested by comparing the populations under each group. Comparing the treatment and control is not valid when there is no or little overlap between the two populations. Clearly such an analysis cannot verify hidden variables.

Table 9: Mean and Medians of Treatment and Control populations

	Mean		Median	
	Control	Treatment	Control	Treatment
Sales	187,723,328	1,514,639,744	7,685,852	44,723,160
Fixed Assets	78,995,112	1,189,442,048	775,521	3,081,331
Value Added	78,266,200	725,277,632	3,683,753	19,481,684
Export Intensity	22.60%	66.20%	4.30%	7.90%

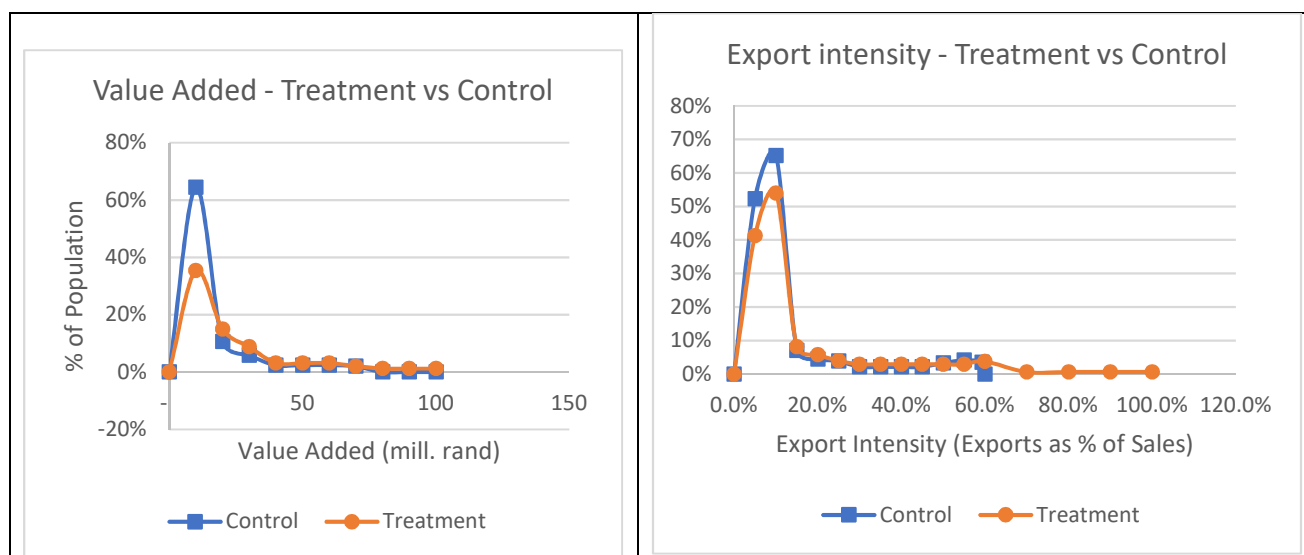**Figure 2: Population distribution - Treatment and Control**
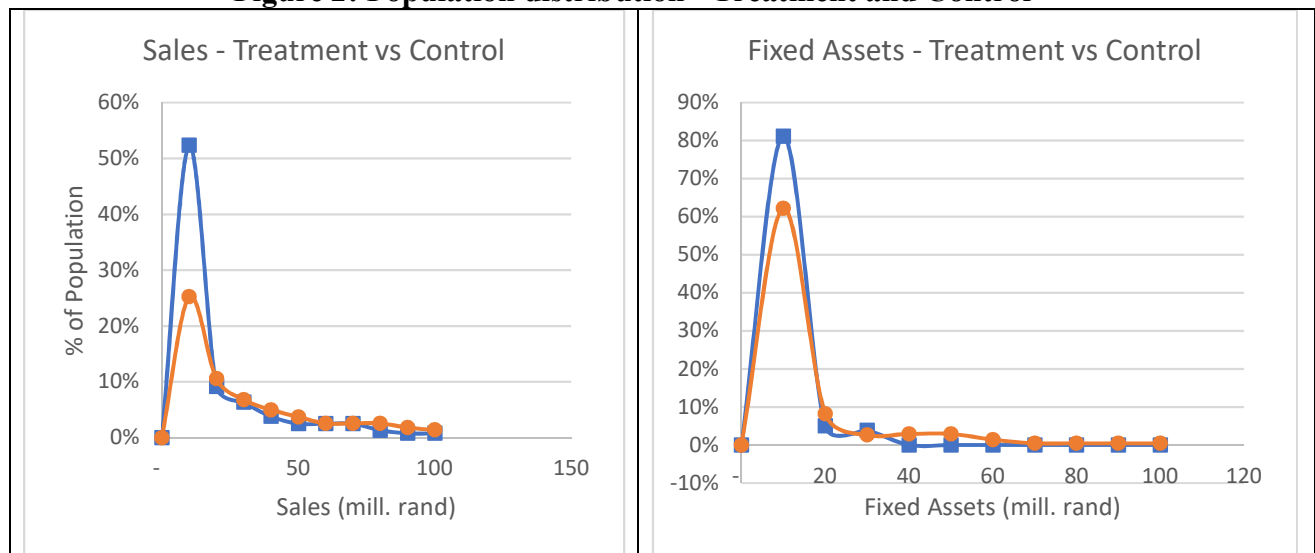
Table 9 shows the mean and medians of the key parameters while Figure 2 shows the distribution of the key company characteristics, sales, fixed assets investment, value added and export intensity between treatment and control. While the figures show considerable overlap between the two populations, the median and means indicate that the distribution of the population under treatment is skewed more to the right as compared to the control population. Despite this, the significant overlap in the populations allows the comparability of the two populations. In any case, even with such an overlap it would be best for robustness sake to include these key parameters as covariates to estimate the causal effect conditional to the other key parameters of the companies.

Regression estimates and controlling for population variation

As discussed earlier, the use of regression allows us to estimate the average causal effect and allows to control for covariates that corrects for any inherent differences in the treatment and control populations. When we control for characteristics such as sales, fixed assets, value added and size of the company, we find that the average causal effect is lower at 3.9 million and is statistically significant at the 1% level (Table 10). Note that regression results indicate that the size of the company in terms of sales and the physical capital investment and value added are predictors of R&D spending.

Table 10: Causal Effect of 11D Incentive on R&D spending (with Correction)

(Regression Results)

Variables	Base Case	With Controls
Treat	6.117***	3.948***
	(0.304)	(0.312)

Sales		405.6***
		(62.0)
Fixed Assets		-58.8**
		(31.5)
Value Added		2549.1***
		(118.4)
Medium/Large		0.770***
		(0.228)
Observations	11,792	9,719
R-squared	0.0331	0.2536
Robust standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$		

We could do similar regressions for the different sectors to correct for selection bias in the claim for the 11D incentive (see Appendix - I for the detailed regression results). As compared to Table 8 we see huge corrections to the causal effect estimates. We find that the 11D incentive does not have a statistically impact on the R&D spending in the Chemical, Rubber, Auto, Oil and Mining sectors (Table 11). Compare this to the large positive effects when we do not correct for the treatment and control populations (Table 8). Interestingly the 11D incentive is associated with negative spending in the Paper and Printing Sector when we correct for the selection bias. For all other sectors the impact is positive and statistically significant at the 1% level (except in the case of Agriculture where it is significant at the 5% level). The biggest impact of the 11D incentive is for the Aircraft and Ships sector followed by the Pharmaceutical, Computers and Services sectors.

Table 11: Causal Effect of 11D Incentive on R&D spending - With Correction

(Regression Results)

Sector	Causal Effect R&D Spending (mill. R)
ALL SECTORS	3.948
Paper & Printing	-3.373
Chemicals	-
Rubber	-
Wood & Misc.	1.887
Primary Metals	1.544
Fabricated Metals	0.916
Machinery	2.390
Electrical Machinery	2.020
Autos	-
Aircrafts & Ships	24.000
Textile & Leather	0.521
Pharma	6.389

Food	4.183
Computers & Instruments	5.347
Oil	-
Agriculture	1.083
Mining	-
Electricity, Gas and Water	3.098
Construction	1.976
Services and Other	4.605

Cost-Benefit of the R&D Incentive

The government aims to encourage Research and Development spending by allowing such spending to be deducted at 150% thereby providing a major incentive for companies. We have shown that companies who opted for the 11D incentive on average spend an additional R3.9 million in R&D as compared to those who did not opt for the 11D incentive. While the revenue foregone during 2008-2015 was R 7.3 billion, the additional spending as a result of the incentive was to the tune of R 13.3 billion (Table 12). This implies that each rand of revenue foregone translated into R 1.83 of additional spending in R&D. This is a positive impact of the 11D incentive as the goal of the government was to encourage additional R&D spending. The secondary question is whether this additional R&D spending translated into outcomes such as new discoveries, patents or bodies of knowledge. Such an analysis is beyond the scope of the paper as company wise data on R&D outcomes was not available. However, it would be useful to augment the tax dataset with such additional information.

Table 12: Cost-Benefit Analysis of the 11D Incentive

	Amount
Revenue foregone because of R&D Incentive (2008-2015)	R 7,329.19 mill.
Average Impact of 11D incentive on R&D Spending for each company (all sectors)	R 3.95 mill
Number of companies claiming 11D incentive (2008-2015)	3,391
Total Impact of 11D Incentive on R&D Spending (2008-2015)	R 13,387.67 million
Additional R&D Spending for 1 Rand of Incentive (Multiplier)	**R 1.83**

IV.   Conclusion

The objectives of the R&D Tax Incentive were to encourage business to increase investment in scientific and technological R&D, advance scientific knowledge and increase the positive spillover

to the rest of the society. This paper seeks to verify if the objectives were achieved in a cost-effective manner. While the paper does not have answers to the wider impact of the R&D as a result of the 11D incentive it did find that the 11D incentive increased R&D spending to the tune of nearly 4 million per company and the impact was positive for most of the sectors. The paper also finds that while revenue for foregone as a result of the 11D Tax Incentive, for every one rand of revenue foregone, companies spent an additional R 1.83 into R&D. In this regard the 11D incentive may be seen as a successful tax incentive. Despite the caveat of lack of a randomized allocation of the 11D incentive, this paper is a small contribution to answering the difficult but important question for policy makers – does the R&D incentive encourage spending in R&D.

Annex – I – Regression Results of Causal Effect of 11D Incentive on R&D Spending by Sectors

VARIABLES	BASE Case	Paper & Printing	Chemicals	Rubber	Wood & Misc.	Primary Metals	Fabricated Metals	Machinery	Electrical Machinery	Autos	Aircrafts & Ships
Treat	3.948***	-3.373***	0.345	0.144	1.887***	1.544***	0.916***	2.390***	2.020**	1.417	24.000**
	(0.312)	(1.076)	(0.269)	(0.113)	(0.565)	(0.333)	(0.27)	(0.426)	(0.815)	(1.264)	(11)
Sales	406***	1,064***	-5	2,306***	8,027***	1,199***	-3,234***	4,724***	-1,681	8,192***	22,207
	(62)	(197)	(420)	(405)	(805)	(331)	(560)	(1094)	(1322)	(929)	(30709)
Fixed Assets	-59**	649***	2,408***	80	-4,974***	-3,859***	-1,567	-654	-36,006***	-86,424***	-78,001
	(32)	(180)	(585)	(1055)	(1212)	(897)	(1058)	(8908)	(6896)	(5503)	(110547)
Value Added	2,549***	952***	1,737	-4,861***	-7,833***	357	24,553***	4,691	37,575***	25,117***	92,235
	(118)	(246)	(1257)	(990)	(1023)	(939)	(1947)	(3747)	(5922)	(2905)	(63218)
Medium/Large	0.8***	-0.02	0.5	0.1	0.4	0.4	-0.2	0.3	-0.2	0.7	-5.9
	(0.2)	(0.3)	(0.2)	(0.1)	(0.5)	(0.3)	(0.3)	(0.4)	(0.7)	(1.4)	(9.1)
Observations	9,719	117	334	136	860	149	250	337	91	202	49
R Squared	0.254	0.891	0.159	0.516	0.244	0.330	0.462	0.471	0.761	0.816	0.403
Robust standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$											

VARIABLES	BASE Case	Textile & Leather	Pharma	Food	Computers & Instruments	Oil	Agriculture	Mining	Electricity, Gas and Water	Construction	Services and Other
Treat	3.948***	0.521***	6.389***	4.183**	5.347***	-20.800	1.083**	4.867	3.098***	1.976***	4.605***
	(0.312)	(0.092)	(2.203)	(1.629)	(1.515)	(17.2)	(0.466)	(4.621)	(0.975)	(0.422)	(0.434)
Sales	406***	1,227**	29,296***	3,483***	14,605	-1,145	-1,424*	2,455**	-5,636***	-1,101***	225***
	(62)	(543)	(6077)	(434)	(10300)	(728)	(843)	(1002)	(1595)	(232)	(67)
Fixed Assets	-59***	5,063	-56,641***	2,361*	-77,435*	17,264***	-8,711***	1,632	1,297***	73	705***
	(32)	(3461)	(17440)	(1417)	(44535)	(2566)	(1225)	(1150)	(455)	(223)	(77)
Value Added	2,549	-2,943*	-17,848	-4,607***	5,625	-5,567***	45,262***	-1,346	6,913***	7,330***	-702***
	(118)	(1529)	(17382)	(774)	(16904)	(2004)	(2385)	(1046)	(1033)	(1302)	(183)
Medium/Large	0.8***	0.2**	-0.7	-0.3	1.2	0.5	-0.1	0.2	2.5**	0.3	1.0***
	(0.2)	(0.1)	(3.4)	(1.1)	(1.7)	(17.3)	(0.4)	(5)	(1)	(0.3)	(0.3)
Observations	9,719.0	145.0	61.0	415.0	77.0	37.0	383.0	183.0	193.0	192.0	5,508.0
R Squared	0.254	0.287	0.680	0.386	0.217	0.916	0.696	0.336	0.938	0.345	0.054
Robust standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$											

Annex – II - Measuring the Causal Effect of a Policy on Outcomes

(Taken from the paper "On the Lord's Paradox, Holland and Rubin 1983")

Causal Effect under Randomization

We are interested in the average causal effect of the 11D incentive on the R&D spend, i.e

$$E(Y_t - Y_c) = E(Y_t) - E(Y_c)$$

Where E(.) is the expected value (or more loosely, the average) and Y_t is the outcome (R&D spend) of the company when it claims 11D incentive and Y_c is the outcome on the same company when 11D incentive is not claimed. However, both these outcomes are never observed at the same time as we observe Y_t only for those units that have been given the treatment while Y_c is observed that have been given the control. In that sense Y_t and Y_c are '*potential outcomes*'.

When we apply the manipulation S (treatment or control) we apply treatment to a subset of the units (companies) and apply control to the rest.

$E(Y_t|S = t)$ then is the expected value (or average) of the potential treatment outcomes Y_t only for those units on whom the treatment is applied. Similarly,

$E(Y_t|S = c)$ is the expected value (or average) of the potential treatment outcomes Y_t only for those units on whom the control is applied.

When we say the statistical manipulation 'S' of assigning some units to the treatment and others to the control is independent of the outcomes we mean that,

$$E(Y_t|S = t) = E(Y_t|S = c)$$

i.e. is it should not matter which of the units are applied to the treatment and which are applied to the control, the expected value of the treatment outcome should remain the same. Further,

$$E(Y_t) = E(Y_t|S = t) = E(Y_t|S = c)$$

because $E(Y_t)$ is the expected value of all the units being given the treatment.

In the same way, if S is independent of the outcomes of units that are put in the control Y_c,

$$E(Y_c) = E(Y_c|S = t) = E(Y_c|S = c)$$

Thus, even when we are unable to observe

$$E(Y_t) - E(Y_c)$$

because as mentioned earlier, some of the outcomes are never as we either apply treatment or control to them but not both, based on the discussion above, when the assignment to treatment or control 'S' is independent of the outcomes, we can write,

$$E(Y_t) - E(Y_c) = E(Y_t|S = t) - E(Y_c|S = c)$$

Which means that, when the **allocation to either treatment or control is independent of the outcomes**, we can get the **causal effect of treatment relative to control** by averaging the *observed* outcomes of the units that have been *treated* and subtracting from that the average of the *observed* outcomes of the units that have been *controlled*.

Randomization based on a covariate

Suppose the concomitant X is a covariate so that $X = X_t = X_c$. When a covariate is observed before treatment conditions are selected, it can be used to select units into treatment conditions. For example. let X be a pretest, and suppose students with low scores of X are assigned with high probability to take a special educational program, those with middle scores are assigned with equal probability to the special and regular programs, and those with high scores are assigned with high probability to the regular program.

In such a case,

$$E(Y_t|S = t) \neq E(Y_t|S = c) \text{ and hence, } E(Y_t) \neq E(Y_t|S = t) \neq E(Y_t|S = c), \text{ similarly,}$$

$$E(Y_c) \neq E(Y_c|S = t) \neq E(Y_c|S = c)$$

Hence we cannot use (A.3) to estimate $E(Y_t - Y_c)$.

However, it is possible that for the same covariate X, the conditions (A.1) and (A.2) are satisfied, or conditional on X, the conditions are satisfied, i.e. the randomization is a function of the observed value of X, and it follows that S and Y_t, Y_c are conditionally independent given X. Hence analogous to (A.1) and (A.2).

$$E(Y_t|X) = E(Y_t|S = t, X) = E(Y_t|S = c, X) \quad \text{-----------------------------} \rightarrow \text{(A.9)}$$

and,

$$E(Y_c|X) = E(Y_c|S = t, X) = E(Y_c|S = c, X) \quad \text{---------------------------→ (A.10)}$$

The importance of equations (A.9) and (A.10) is that from the observed data $(Y_S, S. X)$ we may estimate these regressions:

$$E(Y_t|S = t, X) \quad \text{and} \quad E(Y_c|S = c, X)$$

From (A. 9) and (A.10) it follows that these regressions equals $E(Y_t|X)$ and $E(Y_c|X)$, respectively.

Now suppose that $E(Y_t|X)$ and $E(Y_c|X)$ are linear, say

$$E(Y_t|X) = \alpha_t + \beta_t X \quad \text{-----------------------------→ (A.11)}$$

and

$$E(Y_c|X) = \alpha_c + \beta_c X \quad \text{-----------------------------→ (A.12)}$$

Then the least squares regression of Y_t on X for the treatment group units estimates equation (A.11), and the least squares regression of Y_c on X for the control group units estimates equation (A.12). Of course, there are other ways to estimate these conditional expectations when they are linear and more generally when they are not (e.g., see Rubin. I977).

Suppose that we have estimated $E(Y_t|X)$ and $E(Y_c|X)$: how can we estimate the average causal effect

$E(Y_t - Y_c)$ in in population 'P'. Let P(X) represent the distribution of X in P. Then

$$E(Y_t - Y_c) = \sum_X [E(Y_t|X) - E(Y_c|X)]P(X) \quad \text{-----------------------------} \rightarrow (A.13)$$

That is, the average causal effect of t versus c on Y in P is simply the average value of the difference between the conditional expectations of Y_t and of Y_c at X, where the average over X is weighted to reflect the proportion of units at each value of X. If

$$E(Y_t|X) - E(Y_c|X) = K \text{ for all } X \quad \text{-----------------------------} \rightarrow (A.13)$$

then the causal effect of t versus c is the same for all X. and equals the causal effect of t versus c in P. When (A.14) holds. the averaging in (A.13) is irrelevant. Assumption (A.14) (i.e . parallel regressions), when combined with the linearity assumptions (A.11) and (A.12), yields the mode! underlying the usual covariance adjusted estimator. That is, if

$$E(Y_t|X) = \alpha_t + \beta_t X$$

and

$$E(Y_c|X) = \alpha_c + \beta_c X$$

then

$$E(Y_t - Y_c) = \alpha_t - \alpha_c$$

Thus, the standard analysis of covariance estimator is appropriate when (a) assignment into treatment group is based on X, and (b) the t and c regressions of Y on X are linear and parallel. Rubin (1977) discusses this case and more complicated ones.

Using Regressions to calculate the average treatment effect

In order to estimate $E(Y_t - Y_c)$ or, $E(Y_t) - E(Y_c)$ we could easily estimate this using a simple linear regression.

Say we estimate α and β using the following regression specification, for the population

$Y_i = \alpha + \beta\, T_i + \varepsilon_i$ and we estimate $\hat{\alpha}$ and $\hat{\beta}$ using our sample of observations,

$Y_i = \hat{\alpha} + \hat{\beta}\, T_i + e_i$

Where $T_i =1$ if unit 'i' is assigned to treatment and $T_i =0$ if unit 'i' is assigned to control. Y_i is the outcome variable we are measuring and ε_i is the error term for the population specification while e_i is the error term for the sample. As usual estimate $\hat{\alpha}$ and $\hat{\beta}$ are estimated by minimizing the sum of the mean square error, i.e.

$$\underset{\alpha,\beta}{\text{Min}} \sum_{i=1}^{n} [Y_i - (\hat{\alpha} + \hat{\beta}\, T_i)]^2$$

Note that when $T_i=0$, we have

$Y_{ci} = \hat{\alpha} + e_{ci}$ and taking expectations across all units which are assigned to control we have

$$E(Y_i|S = c) = E(Y_c) = \hat{\alpha} + E(e_i|S = c)$$

When the assignment into control is random, we have $E(e_i|S = c) = 0$

Hence,

$$E(Y_c) = \hat{\alpha}$$

Note that when $T_i=1$, we have

$Y_{ti} = \hat{\alpha} + e_{ti}$ and taking expectations across all units which are assigned to control we have

$$E(Y_i|S = t) = E(Y_t) = \hat{\alpha} + \hat{\beta} + E(e_i|S = t)$$

When the assignment into treatment is also random, we have as before $E(e_i|S = t) = 0$

Hence,

$$E(Y_t) = \hat{\alpha} + \hat{\beta}$$

Substituting from above,

$$E(Y_t) = E(Y_c) + \hat{\beta}$$

Hence the estimated $\hat{\beta}$ is just the average causal effect of the treatment over the control, i.e.

$$\hat{\beta} = E(Y_t) - E(Y_c)$$

Hence we can estimate the average causal effect of treatment over control buy estimating $\hat{\beta}$ from the regression,

$$Y_i = \hat{\alpha} + \hat{\beta} \, T_i + e_i$$

When we include randomization conditional on a covariate 'X', we could estimate the average causal effect $\hat{\beta}$ by including 'X' in the regression, i.e.

$$Y_i = \hat{\alpha} + \hat{\beta} \, T_i + \hat{\gamma}_i \, X_i + e_i$$

Annex III – Text of Section 11D of the South Africa Income Tax Act, 1962

(Source: Lexis-Nexis)

11D.   Deductions in respect of scientific or technological research and development.—
(1) For the purposes of this section **"research and development"** means systematic investigative or systematic experimental activities of which the result is uncertain for the purpose of—

(*a*) discovering non-obvious scientific or technological knowledge;

(*b*) creating or developing—
(i) an invention as defined in section 2 of the Patents Act;
(ii) a functional design—

(*aa*) as defined in section 1 of the Designs Act, capable of qualifying for registration under section 14 of that Act; and

(*bb*) that is innovative in respect of the functional characteristics or intended uses of that functional design;

[Sub-para. (ii) substituted by s. 18 (1) (*a*) of Act No. 43 of 2014 with effect from
1 January, 2015 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(iii) a computer program as defined in section 1 of the Copyright Act which is of an innovative nature; or

(iv) knowledge essential to the use of such invention, functional design or computer program other than creating or developing operating manuals or instruction manuals or documents of a similar nature intended to be utilised in respect of that invention, functional design or computer program subsequent to the research and development being completed; or

(*c*) making a significant and innovative improvement to any invention, functional design, computer program or knowledge contemplated in <u>paragraph (*a*)</u> of (*b*) for the purposes of—

(i) new or improved function;

(ii) improvement of performance;

(iii) improvement of reliability; or

(iv) improvement of quality,

of that invention, functional design, computer program or knowledge;
[Para. (*c*) amended by s. 18 (1) (*b*) of Act No. 43 of 2014 deemed to have come into operation on 1 October, 2012 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(*d*) creating or developing a multisource pharmaceutical product, as defined in the World Health Organisation Technical Report Series, No. 937, 2006 Annex 7 Multisource (generic) pharmaceutical products: guidelines on registration requirements to establish

interchangeability issued by the World Health Organisation, conforming to such requirements as must be prescribed by regulations made by the Minister after consultation with the Minister for Science and Technology; or

[Para. (*d*) inserted by s. 18 (1) (*c*) of Act No. 43 of 2014 deemed to have come into operation on 1 October, 2012 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(*e*) conducting a clinical trial as defined in Appendix F of the Guidelines for good practice in the conduct of clinical trials with human participants in South Africa issued by the Department of Health (2006), conforming to such requirements as must be prescribed by regulations made by the Minister after consultation with the Minister for Science and Technology.

[Para. (*e*) inserted by s. 18 (1) (*c*) of Act No. 43 of 2014 deemed to have come into operation on 1 October, 2012 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

Provided that for the purposes of this definition, research and development does not include activities for the purpose of—

> *(a)* routine testing, analysis, collection of information or quality control in the normal course of business;
> *(b)* development of internal business processes unless those internal business processes are mainly intended for sale or for granting the use or right of use or permission to use thereof to persons who are not connected persons in relation to the person carrying on that research and development;

[Para. (*b*) substituted by s. 18 (1) (*d*) of Act No. 43 of 2014.]

> *(c)* market research, market testing or sales promotion;
> *(d)* social science research, including the arts and humanities;
> *(e)* oil and gas or mineral exploration or prospecting except research and development carried on to develop technology used for that exploration or prospecting;
> *(f)* the creation or development of financial instruments or financial products;
> *(g)* the creation or enhancement of trademarks or goodwill; or
> *(h)* any expenditure contemplated in section 11 (*g*B) or (*g*C).

[Sub-s. (1) substituted by s. 13 (1) (*a*) of Act No. 8 of 2007, amended by s. 19 (1) (*a*) of Act No. 35 of 2007 and by s. 19 (1) of Act No. 60 of 2008 and substituted by s. 32 (1) of Act No. 24 of 2011 and by s. 29 (1) (*a*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(2) (*a*) For the purposes of determining the taxable income of a taxpayer that is a company in respect of any year of assessment there shall be allowed as a deduction from the income of that taxpayer an amount equal to 150 per cent of so much of any expenditure actually incurred by that taxpayer directly and solely in respect of the carrying on of research and development in the Republic if—

> (i) that expenditure is incurred in the production of income;

(ii) that expenditure is incurred in the carrying on of any trade;

(iii) that research and development is approved in terms of subsection (9); and

(iv) that expenditure is incurred on or after the date of receipt of the application by the Department of Science and Technology for approval of that research and development in terms of subsection (9).

[Para. (*a*) amended by s. 18 (1) (*e*) of Act No. 43 of 2014 deemed to have come into operation on 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

 (*b*) No deduction may be allowed under this subsection in respect of expenditure incurred in respect of—

(i) immovable property, machinery, plant, implements, utensils or articles excluding any prototype or pilot plant created solely for the purpose of the process of research and development and that prototype or pilot plant is not intended to be utilised or is not utilised for production purposes after that research and development is completed;

(ii) financing, administration, compliance and similar costs.

[Sub-s. (2) substituted by s. 13 (1) (*b*) of Act No. 8 of 2007, amended by s. 11 (*a*), (*b*) and (*c*) of Act No. 3 of 2008 and substituted by s. 16 of Act No. 17 of 2009, by s. 32 (1) of Act No. 24 of 2011 and by s. 29 (1) (*a*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(2A) . . . . . .

[Sub-s. (2A) inserted by s. 20 (1) of Act No. 7 of 2010 and deleted by s. 32 (1) of Act No. 24 of 2011 with effect from 1 October, 2012 and applicable in respect of expenditure incurred in respect of research and development on or after 1 October, 2012 but before 1 October, 2022 (Editorial Note: effective date in s. 32 (2) of Act No. 24 of 2011 as substituted by s. 168 (1) of Act No. 22 of 2012).]

(3) . . . . . .

[Sub-s. (3) substituted by s. 13 (1) (*b*) of Act No. 8 of 2007, amended by s. 19 (1) (*b*) and (*c*) of Act No. 35 of 2007, substituted by s. 16 of Act No. 17 of 2009, by s. 32 (1) of Act No. 24 of 2011 and deleted by s. 29 (1) (*b*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

 (4) Where any amount of expenditure is incurred by a taxpayer to fund expenditure of another person carrying on research and development on behalf of that taxpayer, the taxpayer may deduct an amount contemplated in subsection (2)—

(*a*) if that research and development is approved by the Minister of Science and Technology in terms of subsection (9);

(*b*) if that expenditure is incurred in respect of research and development carried on by that taxpayer;

(*c*) to the extent that the other person carrying on the research and development is—

(i) (*aa*) an institution, board or body that is exempt from normal tax under section 10 (1) (*c*A); or

(*bb*) the Council for Scientific and Industrial Research; or

(ii) a company forming part of the same group of companies, as defined in section 41, if the company that carries on the research and development does not claim a deduction under subsection (2); and

[Sub-para. (ii) substituted by s. 29 (1) (*d*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(*d*) if that expenditure is incurred on or after the date of receipt of the application by the Department of Science and Technology for approval of that research and development in terms of subsection (9).

[Sub-s. (4) substituted by s. 16 of Act No. 17 of 2009, by s. 32 (1) of Act No. 24 of 2011 and amended by s. 29 (1) (*c*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(5) Where a company funds expenditure incurred by another company as contemplated in subsection (4) (*c*) (ii), any deduction under that subsection by the company that funds the expenditure must be limited to an amount of 150 per cent of the actual expenditure incurred directly and solely in respect of that research and development carried on by the other company that is being funded.

[Sub-s. (5) amended by s. 13 (1) (*c*) of Act No. 8 of 2007 (English only) and substituted by s. 32 (1) of Act No. 24 of 2011 and by s. 18 (1) (*f*) of Act No. 43 of 2014 deemed to have come into operation on 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(5A) . . . . . .

[Sub-s. (5A) inserted by s. 13 (1) (*d*) of Act No. 8 of 2007, substituted by s. 19 (1) (*d*) of Act No. 35 of 2007 and deleted by s. 32 (1) of Act No. 24 of 2011 with effect from 1 October, 2012 and applicable in respect of expenditure incurred in respect of research and development on or after 1 October, 2012 but before 1 October, 2022 (Editorial Note: effective date in s. 32 (2) of Act No. 24 of 2011 as substituted by s. 168 (1) of Act No. 22 of 2012).]

(5B) . . . . . .

[Sub-s. (5B) inserted by s. 13 (1) (*d*) of Act No. 8 of 2007, substituted by s. 19 (1) (*e*) of Act No. 35 of 2007 and deleted by s. 32 (1) of Act No. 24 of 2011 with effect from 1 October, 2012 and applicable in respect of expenditure incurred in respect of research and development on or after 1 October, 2012 but before 1 October, 2022 (Editorial Note: effective date in s. 32 (2) of Act No. 24 of 2011 as substituted by s. 168 (1) of Act No. 22 of 2012).]

(6) For the purposes of subsections (2) and (4)—

(*a*) a person carries on research and development if that person may determine or alter the methodology of the research;

(*b*) notwithstanding paragraph (*a*), certain categories of research and development designated by the Minister by notice in the *Gazette* are deemed to constitute the carrying on of research and development.

[Sub-s. (6) substituted by s. 13 (1) (*e*) of Act No. 8 of 2007, by s. 32 (1) of Act No. 24 of 2011 and by s. 29 (1) (*e*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022. Para. (*b*) substituted by s. 18 (1) (*g*) of Act No. 43 of 2014 deemed to have come into operation on 1 October, 2012 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(7) Where any amount is received by or accrues to a taxpayer from—

(*a*) a department of the Government of the Republic in the national, provincial or local sphere;

(*b*) a public entity that is listed in Schedule 2 or 3 to the Public Finance Management Act; or

(*c*) a municipal entity as defined in section 1 of the Local Government: Municipal Systems Act, 2000 (Act No. 32 of 2000),

to fund expenditure in respect of any research and development, an amount equal to the amount that is funded must not be taken into account for purposes of the deduction under subsection (2) or (4).

[Sub-s. (7) substituted by s. 11 (*d*) of Act No. 3 of 2008, by s. 32 (1) of Act No. 24 of 2011 and by s. 29 (1) (*f*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(8) . . . . . .

[Sub-s. (8) substituted by s. 32 (1) of Act No. 24 of 2011 and deleted by s. 29 (1) (*g*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(9) The Minister of Science and Technology or a person appointed by the Minister of Science and Technology must approve any research and development being carried on or funded for the purposes of subsections (2) and (4)having regard to—

(*a*) whether the taxpayer has proved to the committee that the research and development in respect of which the approval is sought complies with the criteria contemplated in the definition of "research and development" in subsection (1); and

[Para. (*a*) substituted by s. 29 (1) (*i*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(*b*)
. . . . . .

[Para. (*b*) deleted by s. 29 (1) (*j*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(*c*) such other criteria as the Minister of Finance in consultation with the Minister of Science and Technology may prescribe by regulation.

[Sub-s. (9) substituted by s. 13 (1) (*f*) of Act No. 8 of 2007 and by s. 32 (1) of Act No. 24 of 2011 and amended by s. 29 (1) (*h*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022. Para. (*c*) substituted by s. 29 (1) (*k*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(10) If research and development is approved under subsection (9) and—

(*a*) any material fact changes which would have had the effect that approval under subsection (9) would not have been granted had that fact been known to the Minister of Science and Technology at the time of granting approval;

[Para. (*a*) amended by s. 29 (1) (*l*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(*b*) the taxpayer carrying on that research and development fails to submit a report to the committee as required by subsection (13); or

[Para. (*b*) amended by s. 29 (1) (*m*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(*c*) the taxpayer carrying on that research and development is guilty of fraud, or misrepresentation or non-disclosure of material facts which would have had the effect that approval under subsection (9) would not have been granted,

[Para. (*c*) added by s. 29 (1) (*n*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

the Minister of Science and Technology may, after taking into account the recommendations of the committee, withdraw the approval granted in respect of that research and development with effect from a date specified by that Minister.

[Sub-s. (10) substituted by s. 32 (1) of Act No. 24 of 2011 with effect from 1 October, 2012 and applicable in respect of expenditure incurred in respect of research and development on or after 1 October, 2012 but before 1 October, 2022 (Editorial Note: effective date in s. 32 (2) of Act No. 24 of 2011 as substituted by s. 168 (1) of Act No. 22 of 2012).]

(11) (*a*) A committee must be appointed for the purposes of approving research and development under subsection (9) consisting of—

(i) three persons employed by the Department of Science and Technology, appointed by the Minister of Science and Technology;

(ii) one person employed by the National Treasury, appointed by the Minister of Finance; and

(iii) three persons from the South African Revenue Service, appointed by the Minister of Finance.

(*b*) The Minister of Science and Technology or the Minister of Finance may appoint alternative persons to the committee if a person appointed in terms of paragraph (*a*) is not available to perform any function as a member of the committee.

(*c*) If any person is appointed as an alternative in terms of paragraph (*a*), that person may perform the function of any other person from the Department of Science and Technology, or the South African Revenue Service in respect of which institution that person is appointed as alternative.

[Sub-s. (11) substituted by s. 3 (1) (*a*) of Act No. 9 of 2007 and by s. 1 (1) of Act No. 25 of 2011 with effect from 1 October, 2012 and applicable in respect of research and development on or after 1 October, 2012, but on or before 1 October, 2022 (effective date in s. 1 (2) of Act No. 25 of 2011 as substituted by s. 35 (1) of Act No. 21 of 2012). Para. (*c*) added by s. 18 (1) (*h*) of Act No. 43 of 2014 with effect from 1 January, 2015 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(12) (*a*) The committee appointed in terms of subsection (11) must perform its functions impartially and without fear, favour or prejudice.

(*b*) The committee may—

(i) appoint its own chairperson and determine the procedures for its meetings;

(ii) evaluate any application and make recommendations to the Minister of Science and Technology for purposes of the approval of research and development in terms of subsection (9);

(iii) investigate or cause to be investigated research and development approved under subsection (9);

(iv) monitor all research and development approved under subsection (9)—

(*aa*) to determine whether the objectives of this section are being achieved; and

(*bb*) to advise the Minister of Finance and the Minister of Science and Technology on any future proposed amendment or adjustment of this section;

(v) for a specific purpose and on the conditions and for the period as it may determine, obtain the assistance of any person to advise the committee relating to any function assigned to that committee in terms of this section; and

(vi) require any taxpayer applying for approval of research and development in terms of subsection (9), to furnish any information or documents necessary for the Minister of Science and Technology and the committee to perform their functions in terms of this section.

[Sub-s. (12) substituted by s. 1 (1) of Act No. 25 of 2011 with effect from 1 October, 2012 and applicable in respect of research and development on or after 1 October, 2012, but on or before 1 October, 2022 (effective date in s. 1 (2) of Act No. 25 of 2011 as substituted by s. 35 (1) of Act No. 21 of 2012).]

(13) A taxpayer carrying on research and development approved under subsection (9) must report to the committee annually with respect to—

(*a*) the progress of that research and development; and

(*b*) the extent to which that research and development requires specialised skills,

within 12 months after the close of each year of assessment, starting with the year following the year in which approval is granted under subsection (9) in the form and in the manner that the Minister of Science and Technology may prescribe.

[Sub-s. (13) substituted by s. 1 (1) of Act No. 25 of 2011 and by s. 29 (1) (*o*) of Act No. 31 of 2013 with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(14) Notwithstanding Chapter 6 of the Tax Administration Act, the Commissioner may disclose to the Minister of Science and Technology information in relation to research and development—

(*a*) as may be required by that Minister for the purposes of submitting a report to Parliament in terms of subsection (17); and

(*b*) if that information is material in respect of the granting of approval under subsection (9) or a withdrawal of that approval in terms of subsection (10).

[Sub-s. (14) substituted by s. 1 (1) of Act No. 25 of 2011, by s. 271 read with para. 34 (*a*) of Sch. 1 of Act No. 28 of 2011 and by s. 29 (1) (*p*) of Act No. 31 of 2013 (Editorial Note: as substituted by s. 123 (1) of Act No. 43 of 2014) with effect from 1 January, 2014 and applicable in respect of expenditure incurred in respect of research and development on or after that date, but before 1 October, 2022.]

(15) The members of the committee appointed in terms of subsection (11) and any person whose assistance has been obtained by that committee may not—

(*a*) act in any way that is inconsistent with the provisions of subsection (12) (*a*) or expose themselves to any situation involving the risk of a conflict between their responsibilities and private interests; or

(*b*) use their position or any information entrusted to them to enrich themselves or improperly benefit any other person.

(16) The Minister of Science and Technology or the person appointed by the Minister of Science and Technology contemplated in subsection (9) must—

(*a*) provide written reasons for any decision to grant or deny any application for approval of any research and development under subsection (9), or for any withdrawal of approval contemplated in subsection (10);

(*b*) inform the Commissioner of the approval of any research and development under subsection (9), setting out such particulars as are required by the Commissioner to determine the amount of the deduction in terms of subsection (2) or (4); and

(*c*) inform the Commissioner of any withdrawal of approval in terms of subsection (10) and of the date on which that withdrawal takes effect.

(17) The Minister of Science and Technology must annually submit a report to Parliament advising Parliament of the direct benefits of the research and development in terms of economic growth, employment and other broader government objectives and the aggregate expenditure in respect of such activities without disclosing the identity of any person.

(18) Every employee of the Department of Science and Technology, every member of the committee appointed in terms of subsection (11) and any person whose assistance has been obtained by that committee—

(*a*) must preserve and aid in preserving secrecy with regard to all matters that may come to their knowledge in the performance of their functions in terms of this section; and

(*b*) may not communicate any such matter to any person whatsoever other than to the taxpayer concerned or its legal representative, nor allow any such person to have access to any records in the possession or custody of the Department of Science and Technology or committee, except in terms of the law or an order of court.

(19) The Commissioner may, notwithstanding the provisions of sections 99 and 100 of the Tax Administration Act, raise an additional assessment for any year of assessment with respect to a deduction in respect of research and development which has been allowed, where approval has been withdrawn in terms of subsection (10).

(20) (*a*) A taxpayer may, notwithstanding Chapter 8 of the Tax Administration Act, apply to the Commissioner to allow all deductions provided for under this section in respect of research and development if—

(i) expenditure in respect of that research and development was incurred on or after the date of receipt of an application by the Department of Science and Technology for the approval of that research and development;

(ii) that expenditure was not allowable in respect of a year of assessment solely by reason of the absence of approval of that research and development under subsection (9); and

(iii) that research and development is approved in terms of subsection (9) after that year of assessment.

(*b*) The Commissioner may, notwithstanding the provisions of sections 99 and 100 of the Tax Administration Act, make a reduced assessment for a year of assessment where expenditure incurred during that year in respect of research and development would have been allowable as a deduction in terms of this section had the approval in terms of subsection (9) been granted during that year of assessment.