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South Africa: Sector Study of Effective Tax Burden and Effectiveness of Investment Incentives in South Africa – Firm Level Analysis

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SUMMARY OF ACRONYMS

AETR	Average Effective Tax Rate
GDP	Gross Domestic Product
ETR	Effective Tax Rate
DTI	Department of Trade and Industry
FDI	Foreign Direct Investment
GMM	Generalized Method of Moments
IDZ	Industrial Development Zones
CIT	Corporate Income Tax
VAT	Value-Added Tax
METR	Marginal Effective Tax Rate
PIT	Personal Income Tax
SARS	South African Revenue Service
SBC	Small Business Corporation
SEZ	Special Economic Zone
SME	Small and Medium Enterprises
WBG	World Bank Group

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Acknowledgments

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Sector Study of Effective Tax Burden and Effectiveness of Investment Incentives in South Africa – Firm Level Analysis

EXECUTIVE SUMMARY

South Africa uses investment linked tax incentives known and lower tax rates or tax breaks as they are commonly known, to encourage physical capital investment. These incentives reduce the cost of investment for businesses and it is hoped that by reducing the cost of investment, businesses would then be encouraged to invest more and spur economic activity including creating jobs. However, these tax incentives come with a cost in the form of foregone revenue as a result of lower taxes. Whether tax incentives eventually results in additional investment in South Africa is an empirical question that this paper tests. Recent efforts by the South African Revenue Service (SARS) and the National Treasury of the Government of South Africa to use anonymized data collected from tax returns for policy analysis allows us to answer these questions and has made this research possible.

In the first part of the Report which was released about a year ago, we analyzed the tax system by estimating the Marginal Effective Tax Rates (METR) of the different sectors of the South Africa. We find that the tax system overall is quite competitive internationally. The report concluded that tax incentives reduce the burden on capital investment below the statutory corporate tax rate of 28% for most sectors implying that the tax incentives reduce the burden on businesses of undertaking investments. We also found that the tax incentives are very generous for the mining and the manufacturing sector.

While the first part of the report uses macroeconomic data to estimate sector wide effective tax rates it does not allow us to make causal arguments of the effectiveness of tax incentives, this paper goes further by using individual firm[1] level data from the year 2006 to 2012 to allow us to make such causal arguments. We try to answer two questions, first, do tax incentives reduce the cost of capital for businesses? This question is similar to the question we asked in the first report but now using data at the firm level? and second, whether any lower cost of capital is then translated into more investments by these firms?

The research concludes that the effectiveness of tax incentives is mixed. While tax incentives lower the cost of Capital for all sectors to between 3% and 6.5%, it is only in the Agriculture, Construction, Manufacturing, Trade and Services sectors that we see that lower cost of capital as a result of tax incentives translates into higher investment. On the other hand for the Mining, Real Estate, Transport and Utilities we do not find evidence that tax incentives were effective in encouraging investment. For the firms for which we have observations for all the years, overall tax incentives encourages an additional investment of 2.1 billion rand each year between 2006 and

[1] We use 'firm' to mean any business. It should not be confused with the use of the word 'firm' to mean a partnership firm a use that is common in some countries.

2012. The most additional investment was in the manufacturing sector where on average of 865 million rand in additional investment each year since 2006.

The revenue foregone as a result of the lower tax[2] as a result of the tax incentives is about 4.5 billion rand each year over the seven year period. The revenue foregone was about 4 billion rand in 2012 with about a quarter of that is due to tax incentives for the Small Businesses Corporations. However this is lower than the peak of 6.8 billion rand in 2010. The Transport and Logistics and Utilities constituted most of the revenue foregone primarily as a result of huge investments made in these sectors and not necessarily that these sectors were targeted by the tax incentives. Revenue foregone for the mining and manufacturing sector have been about 400 million rand each over the period.

In terms of jobs, the tax incentives have resulted in 34,000 additional jobs. However it has not come cheap costing an average of about 116,000 rand of revenue foregone for each job. It cost the government nearly 170,000 rand of revenue foregone for each job created in Small Business Corporations. For manufacturing however, the cost was about 54,000 rand for each job.

Overall the message of this paper is that tax incentives may not be effective in all sectors because there may be other fundamental factors that restrict the growth of the sector that the tax incentive on its own cannot fix. However when properly targeted there is positive impact on investment as they lower the cost of investment encouraging investment in those sectors that are primed for growth when fundamental economic factors are conducive.

[2] Obtained by comparing the tax the could be collected using the regular depreciation rates with those that are depreciation rates and tax rates under the tax system

Introduction

In August 2014, the World Bank Group was approached by the Davis Tax Commission to update the 2006 FIAS study to help the commission assess the performance of the tax system with regard to investment.[3] The Davis Tax Commission has been tasked by the Minister of Finance of South Africa, "*to assess our tax policy framework and its role in supporting the objectives of inclusive growth, employment, development and fiscal sustainability.*" Davis Commission and the World Bank Group agreed that a World Bank Group team would update the 2006 study into marginal effective tax system focusing particularly on manufacturing and a select number of sectors, and if data were available, investigate the link with investment outcomes, as well as building local capacity in the MTER methodology.[4]

Part one of the report looked at the Marginal Effective Tax Rate on the principal sectors in South Africa has been submitted. This is part two of the report which looks at the firm level evidence of the impact of tax system on investment.

Methodology of estimating the responsiveness of investment to tax incentives

The introduction of the concept of the user cost of capital and its application to assess its impact on investment decision is due to Jorgenson (1963) and Hall and Jorgenson (1967). According to this approach, the user cost of capital is the minimal rate of return a firm must earn on investment before taxes and equivalent to the discount rate a marginal investor would use in evaluating investment projects. One of the key insights behind the user cost of capital is that because capital investments benefit from some allowances by the tax system, the user cost of capital (and marginal investment decisions) will depend on tax parameters as well as economic variables.

Even though there is robust theoretical and empirical support for a significant (non-zero) response of investment to the user cost of capital, a consensus on the magnitude of the user cost elasticity remains elusive. Hall and Jorgenson (1967) assumed a Cobb-Douglas production function and a fixed rate investment to fit macro data and derive a user cost elasticity close to -1. In a prompt reply, Eisner and Nadiri (1968) used aggregate data to calculate user cost elasticities in the range of -0.16 and -0.33 and to challenge the view that the user cost elasticity is close to unity.

Due to the inherent difficulty in establishing a robust relationship between the capital stock and its user cots at the aggregate level, several studies started using more disaggregated data and changes in tax rules to identify this relationship. Cummings and Hassett (1992) focus on a major tax reform

[3] In 2006, Foreign Investment Advisory Services (FIAS) and joint service of the World Bank and the International Finance Corporation (IFC) conducted a study of marginal effective tax rates in five key sectors of the South African economy to investigate whether these sectors are competitive domestically and internationally, as regards the impact of the tax regime.

[4] See Appendix 1 for the detailed terms of reference.

in the United States and estimate elasticities of -0.93 for equipment and -0.28 for structures. Cummings, Hassett and Hubbard (1994, 1996) use differences in capital asset compositions between industries and tax code reforms as natural experiments to estimate a long-run elasticity of -0.67.

However, Chirinko, Fazzari and Meyer (1999) used a distributed lag model (DLM) with firm-level panel data for 4,905 US manufacturing firms for the period 1981-1991 to obtain a lower long-run user cost elasticity. While recognizing that their results depended to some extent on the specification and econometric technique, the authors reported a preferred elasticity of -0.25.

The availability of large firm-level datasets and increase in computational power in the last decade resulted in new attempts to estimate the user cost elasticity that revised the estimated magnitude upwards. Using a dataset containing 42,406 firms in the manufacturing sector for 7 European countries over the period 1999-2007, Bond and Xing (2013) found user cost elasticities ranging from -0.98 to -1.7. Their most robust specification - in which the user cost is instrumented by its tax component to deal with endogeneity - results in estimated elasticities between -1.3 and -1.7.

In an effort to reconcile the different elasticities found in the literature and trying to explain the low elasticity estimates produced by DLMs, Dwenger (2014) shows that properly accounting for the long term equilibrium relationship among capital, its user cost and sales in an error correction model (ECM) yields larger point estimates of the price elasticity of capital. Using German firm-level panel data, their study finds elasticity of -0.97 when estimating an ECM but it also able to replicate lower elasticity estimates when using a DLM. Dwenger (2014) concludes that because the ECM is a full reparametrization of the DLM, any difference in the estimated long-run elasticities between the DLM and the ECM can be attributed entirely to the neglect of the long term equilibrium relationship among capital and its user cost in DLMs.

In summary, estimation of the user cost elasticity is a difficult endeavor and a precise estimate of its "true" value remains elusive. Elasticity point estimates vary widely based on the model estimated, econometric techniques and number of observations. However, recent studies based on panel data with large number of firm-level observations, error correction models, and GMM estimates tend to suggest that the user cost elasticity is closer to unity. Despite the significant response, most of the literature stops at the estimation of the user cost elasticity without simulating the effect on investment of actual or potential changes in tax variables. Among the few papers that perform these simulations the majority finds that the effects are significant but not that large on the aggregate.

Calculation of the user cost of capital

The purpose of this exercise is to identify the causal relationship between specific tax incentives and investment outcomes. The user cost of capital methodology combines information about tax

rates, capital allowance allowances and tax incentives to estimate the impact of changes in the tax treatment of the firm. In so doing we are able to derive the pre-tax real rate of return on the marginal investment project that is required to earn a minimum rate of return after tax. This will be a function of the general tax system, economic variables and the treatment of investment expenditure in particular.

This approach is flexible enough to deal with differences in the specifics of national schemes and of different types of incentives, but it requires information on the specific investment expenditure and tax incentives at the level of the firm. While the early literature quantified it at the country-industry level, the user cost of capital is best computed at firm level. Firms differ in asset structure (composition of tangible fixed assets), value added, and tax structure. Unlike most empirical studies that assume away these differences between firms, we exploit the firm level variation in the above variables to assess the "tax component" of the UCC specific to each firm. As in Bond and Xing (2013), we follow a two-step approach.

First, we compute the firm-level UCC for each type of asset. The data provided by the South African Revenue Service (SARS) allows the disaggregation of the capital stock (tangible fixed assets) in three types of assets: fixed property (buildings), plant and equipment, and other fixed assets. Assuming investment is totally financed by retained earnings5, the formula for calculating the tax-adjusted user cost of capital relative to a specific type of asset "s" for firm "i" at time "t" is:

$$UCC_{i,s,t} = \sum_s \frac{P^K_{j,t}}{P_{j,t}} \left(r_t + \hat{\delta}_{s,t}\right) \frac{1-(\tau_t A_{s,t})}{(1-\tau_t)} \qquad (1)$$

Where:

$P^K_{j,t}$: price of investment goods
$P_{j,t}$: industry-level price of output
r_t: cost of financial capital
$\hat{\delta}_{s,t}$: economic capital allowance rate
$A_{s,t}$: present value of capital allowances
τ_t: corporate tax rate

Data for the industry-level price of output ($P_{j,t}$) and the price of investment goods ($P^K_{j,t}$) is constructed using implicit price deflator using data from Statistics South Africa and the South

[5] As highlighted in King and Fullerton (1984) the firm's financing costs will depend on the source of finance and generally will differ from the market interest rate. Some studies use a more comprehensive measure of financial costs which include a weighted average of the costs of debt and equity faced by individual firms. However, because we do not have data on firm's financing variables we assume that all investment is financed by equity.

African Reserve Bank, respectively[6]. The values for the economic capital allowance ($\hat{\delta}_{s,t}$) are taken from the CBO and are assumed constant for each type of asset[7]. The present value of capital allowances ($A_{s,t}$) is calculated for all firms using standard tax rules (see below).

In the second step, we compute the overall tax-adjusted, firm specific user cost of capital. Once the indicator in is calculated for each type of capital/asset, the tax-adjusted, firm specific user cost of capital is given by the weighted average of the asset-specific UCCs weighted by the share of the asset type in the firm's total fixed capital expenditures.

$$UCC_{i,t} = \sum_s w_{i,s,t}\ UCC_{i,s,t} \qquad (2)$$

$w_{i,s,t}$: weight of asset type "s" in total assets

The main impacts of the tax system on the user cost of capital are through: (i) tax rate (τ_t); (ii) present value of tax savings due to capital allowances ($A_{s,t}$). With respect to the present value of tax savings due to capital allowances, the main point to retain is that firms make a series of deductions called capital allowances over a specified period of time. The reason is that a firm that invests in new capital cannot deduct the purchases of the investment from its taxable income because the expenditure cannot be listed as an expense against revenue at time t. Therefore the firm cannot deduct the entire investment immediately. Instead, it makes a series of capital allowances over a specified period of time.

The schedule of capital allowances in South Africa are straightforward and use straight line depreciation sometimes combined with initial allowances. For instance, purchases of plant and machinery can be depreciated in 5 years (20% yearly) while buildings can be depreciated in twenty years (5% yearly). In order to account for the fact that capital allowances occur along several years - and following Hall and Jorgenson (1967) - we will assume that the firm immediately recovers the present discounted value of capital allowance deductions when it invests.

$$A_s = IA_s + \sum_{t=0}^{T} \frac{AA_s}{(1+i)^t} \qquad (3)$$

Table 1 shows the various capital allowance for physical capital investment for different sectors that is used to calculate the present value of capital allowance deductions and the User Cost of Capital.

[6] Output prices at the industry level were approximated by the GDP deflator for the primary, secondary and tertiary sectors. The price of investment goods is taken as the implicit fixed capital formation deflators for non-residential buildings (property), Machinery and other equipment - private business enterprises (plant and equipment), and gross fixed capital formation: Private business enterprises (other fixed assets).

[7] Annual economic capital allowance rates used are 3% for property and 8% for plant and equipment and other fixed assets.

Table 1: Special Tax regimes for capital investment for the different sectors

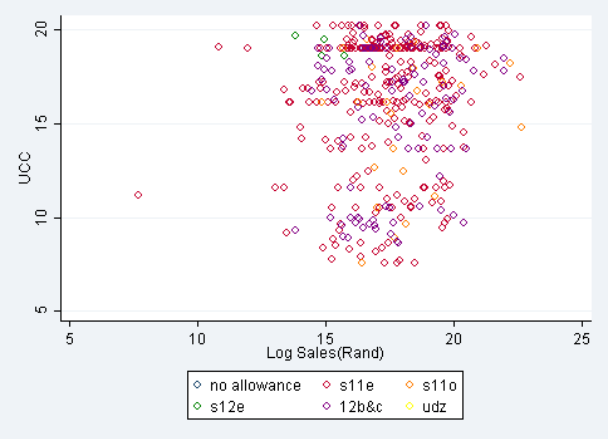
Sector	Special Treatment	Remarks
Manufacturing	Capital allowance of Plant and Machinery of 40%, 20%, 20%, 20%	Additional capital allowance benefits for investments in preferred sectors and IDZs
Agriculture	Capital allowance of Plant and Machinery of 50%, 30%, 20%	
Mining	100% capital allowance of Plant and Machinery; Employee housing are allowed to be depreciated at 10% straight line as compared to 5% straight line for other sectors	
Small Business Corporations (SBC)	100% capital allowance of Plant and Machinery used in manufacturing; Capital allowance of Plant and Machinery of 50%, 30%, 20% for non-manufacturing activities	SBCs are defined as corporations with turnover below a threshold and includes certain restrictions as provided under Section 12E of the Income Tax Act. (1962). In 2006-07 the threshold was raised to 14 million rand.
Manufacturing (administered by Department of Trade and Industry)	Additional investment allowance of 100%, 75%, 55% or 35% depending on whether the investment is in the IDZ or is in a preferred sector	This is over and above those who qualify for the accelerated 40%, 20%, 20%, 20% capital allowance schedule
Sector Wide - Urban Development Zones (UDZ)	The incentive is available for the erection or improvement of commercial or residential buildings in areas in need of urban renewal. The UDZ allowance takes the form of both additional and accelerated depreciation allowances. Depending on the nature of the erection or improvement, such allowance can be as high as 25% per annum on the cost of such erection or refurbishment.	In the case of erection of a new building the allowance is equal to 20% for the first year and 8% of the cost for 10 succeeding years. For improvements the allowance is 20% for five years.

Source: Tax laws, Republic of South Africa (Taken from Table 2 of Part-1 of this report)

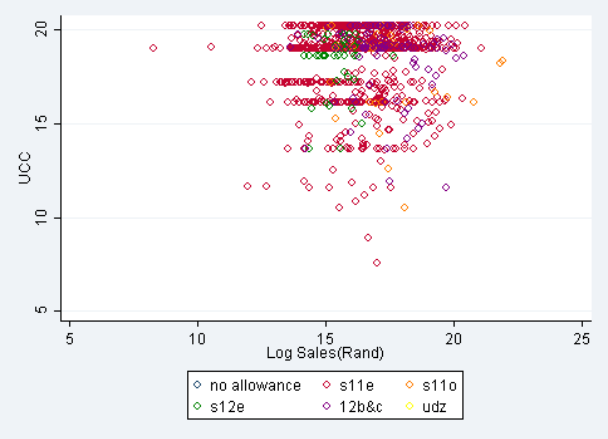
Figure 1 shows the effect that the aforementioned special allowances have on the user cost of capital if firms were able to claim those incentives on all their investments in 2012 for the different sectors. The y-axis shows the user cost of capital and the x-axis shows the size of the firm in terms of (logs of) sales. Each blue dot represents a firm not claiming incentives and the colored dots represent firms claiming one of the main incentives. Four of the main manufacturing industries that benefit from incentives are shown for illustration purposes.

Figure 1: Variation in User Cost of Capital by Sector

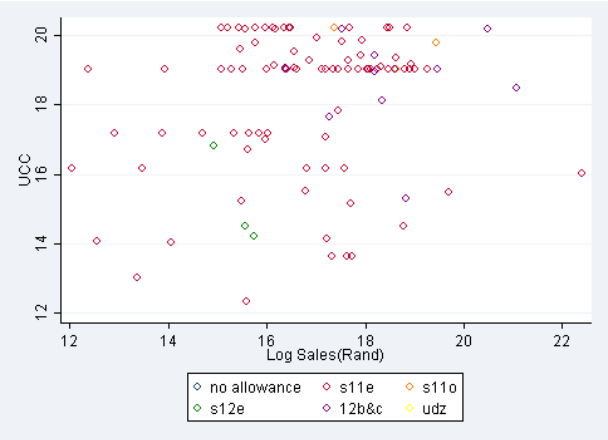
Food products and beverages (SIC 30)



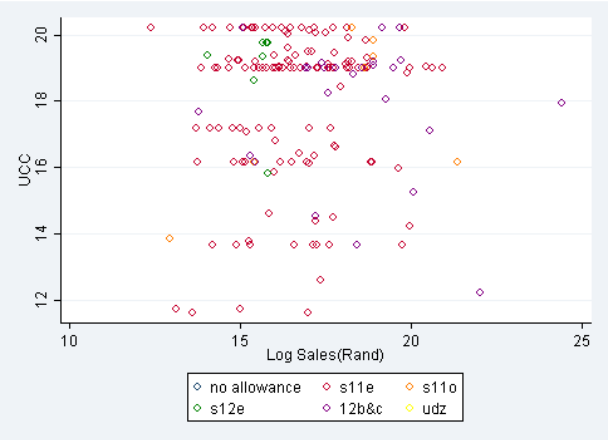
Basic metals, metal products, machinery and equipment (SIC 35)



Electrical machinery and equipment (SIC 36)



Transport equipment (SIC 38)



Theoretical background on estimating the response of investment to the user cost of capital

The goal is to estimate the impact of changes in taxation on the level of capital invested by the firm. Following Dwenger (2014) and Bond and Xing (2013) we arrive at the specification to estimate this empirically as follows:-

The Production Function for firm 'i 'at time 't 'using the Constant Elasticity of Substitution function

$$F(K_{i,t}, L_{i,t}) \stackrel{\text{def}}{=} S_{i,t} = \gamma_t[\eta_i K_{i,t}^{-\rho} + (1-\eta_i)L_{i,t}^{-\rho}]^{\frac{-\nu}{\rho}} \quad (4)$$

where

$\rho = (\frac{1}{\sigma} - 1)$, σ is the elasticity of substitution between Labor and Capital

ν is the degree of the function

η_i and $(1 - \eta_i)$ are the firm specific relative factor shares of Capital and Labor

γ_t is the year-specific production technology

Equating the Marginal Productivity of capital and its Marginal Cost, i.e. the User Cost of Capital

$$F_K(K_{i,t}, L_{i,t}) \stackrel{\text{def}}{=} UCC_{i,t} = \eta_i \nu \gamma_t^{\frac{-\rho}{\nu}} S_{i,t}^{1+\frac{\rho}{\nu}} K_{i,t}^{-(1+\rho)} \quad (5)$$

Hence the Optimal Capital Stock is given by

$$K_{i,t}^* = A_i T_t S_{i,t}^{\beta} UCC_{i,t}^{-\sigma} \text{ where} \quad (6)$$

$$\beta = \sigma + \frac{(1-\sigma)}{\nu}, A_i = (\eta_i \nu)^{\sigma} \text{ and } T_t = \gamma_t^{\frac{\sigma-1}{\nu}} \text{ hence}$$

The optimal level of capital depends on a firm's level of output (or Sales $S_{i,t}$), a firm specific distribution parameter A_i, Technology T_t and the firm's User Cost of Capital UCC

The firm's optimal capital decision from (6) is given by ,

$$K_{i,t}^* = A_i T_t S_{i,t}^{\beta} UCC_{i,t}^{-\sigma}$$

Assuming that productivity terms can be dealt with a time trend (α_t), adding a firm-specific fixed effect (α_i) and a stochastic error term (ε_{it}) and taking logs of the capital decision in (3) we can derive an equation that can be estimated with firm-level data:

$$k_{it} = \alpha - \sigma ucc_{it} + \mu s_{it} + \alpha_t + \alpha_i + \varepsilon_{it}$$

The behavior described in this equation is one of equilibrium in which variable have reached a steady state. However, it is common to assume that firms take some time to reach the long-run equilibrium due to frictions in the capital formation process and thus some form of short-term dynamics can be introduced. Hence the dynamic level of capital at time *t* depends on how far it is from the optimal level of capital. Incorporating this dynamic component gives us the following specification,

$$k_{i,t} = c + a_i + \sum_{h=0}^{H} \phi_h k_{i,t-k} + \sum_{h=0}^{H} \beta_h s_{i,t-h} - \sum_{h=0}^{H} \sigma_h ucc_{i,t-h} + \sum_{t=0}^{T-1} \tau d_t + a_i + \varepsilon_{i,t}$$

The challenge is to estimate the long term elasticity of the parameter σ which is the sum of the individual terms σ_h which gives the short term effects. Using one lag of capital and making some readjustment in the terms gives us the following in the Error Correction format.

$$k_{i,t} = c + \phi k_{i,t-1} + \sum_{k=0}^{H-1} \mu_k \Delta s_{i,t-k} - \sum_{k=0}^{H-1} \alpha_k \Delta ucc_{i,t-k} + \sigma' ucc_{i,t-1} + \beta' s_{i,t-1} + \sum_{t=0}^{T-1} \tau d_t + a_i + \varepsilon_{i,t} \quad (7)$$

The goal is to estimate $\frac{\sigma'}{1-\phi}$ which is the long run elasticity of Investment to the User Cost of Capital (UCC). Theα_k's gives the dynamics of this adjustment of investment to user cost of capital with α_0, α_1, $\alpha_2$being the adjustment of investment to UCC in year 1,2,3 etc..

As we have 7 years of data, the lag representation which is being used in this paper will be (see Appendix-2 for the results):

$$k_{it} = \alpha + \phi k_{it-1} + \sigma' ucc_{it-1} + \sigma_1 \Delta ucc_{it} + \sigma_2 \Delta ucc_{it-1} + \mu_0 s_{it-1} + \mu_1 \Delta s_{it} + \mu_2 \Delta s_{it-1} + \alpha_t + \alpha_i + \varepsilon_{it} \quad (8)$$

Description of the Data and estimation methodology

The data required for the estimation of the user cost elasticity were provided by SARS and includes tax related and accounting data for all corporations that filed their tax returns for the period 2006-2012. Information collected from the tax returns included sales, investment in physical assets under three broad categories, property, plant and machinery and other assets. Further information on the sector that the corporation operates in, the number of employees[8] and the use of tax incentives. Data was cleaned by removing outliers, the top 1% and bottom 1% of assets. As a result of this we are left with a million observations from over 250,000 firms for our baseline estimations. Table 2 shows the descriptive statistics of the data where only firms that have observations for all the seven years are reported. K denotes the physical capital, I is the investment made in a particular year, S denotes Sales and UCC denotes the User Cost of Capital. All figures have been deflated to reflect the values in 2005 rand.

[8] Employment information was only available for 2015

Table 2: Descriptive Statistics of Data*

	All figures in rand are deflated to 2005 rand							
	2006	2007	2008	2009	2010	2011	2012	All Years
$K_{i,t}$ (mean) (in '000 rand)	6,559	5,596	7,059	8,611	10,037	11,608	13,187	8,946
$K_{i,t}$ (median) (in '000 rand)	297	340	379	386	384	391	398	365
$\frac{I_{i,t}}{K_{i,t-1}}$(mean)	-	62%	49%	33%	25%	27%	30%	38%
$\frac{I_{i,t}}{K_{i,t-1}}$ (median)	-	0.0%	0.0%	-2.1%	-4.2%	-2.6%	-1.7%	-1.2%
$S_{i,t}$ (mean) (in '000 rand)	14,252	21,604	20,817	23,396	23,250	25,678	29,572	22,635
$S_{i,t}$ (median) (in '000 rand)	1,717	2,127	2,500	2,730	2,713	2,827	2,981	2,469
$\frac{\Delta S_{i,t}}{S_{i,t-1}}$ (mean)	-	42%	30%	23%	11%	16%	17%	23%
$\frac{\Delta S_{i,t}}{S_{i,t-1}}$ (median)	-	15.0%	13.0%	9.4%	1.5%	6.0%	6.1%	8.3%
UCC (mean)	0.277	0.277	0.292	0.276	0.264	0.218	0.217	0.26
UCC (median)	0.277	0.283	0.295	0.281	0.269	0.218	0.217	0.275
$\frac{\Delta UCC_{i,t}}{UCC_{i,t-1}}$ (mean)	-	2.8%	8.2%	-3.5%	-1.0%	-18.3%	3.4%	-1.4%
$\frac{\Delta UCC_{i,t}}{UCC_{i,t-1}}$ (median)	-	1.5%	6.2%	-5.3%	-4.8%	-19.0%	-0.2%	-2.9%
Number of firms	63,000							

*reporting only for firms for which we have observations for all the seven years.

The mean level of physical capital investment (stock) per firm is 9 million rand for all the years and shows an increasing trend. The median level however much lower than the mean at 0.365 million rand showing a highly skewed distribution. The mean of the investment (flow) as a ratio of capital stock is about 38% of the capital stock, however the median level is small and negative indicating that there is nearly as dis-investment as is investment. The distribution of the sales is also skewed with a mean of 22.6 million rand and a median of 2.5 million rand. The mean and median sales show an increasing trend and the sales growth increase is about 23% on average with a median growth of 8.3%. The distribution of the User Cost of Capital is not very skewed with the mean at 0.26 and a median at 0.28 with changes both positive and negative over the years but the average being negative across all the years. The data comes from 63,000 corporations over the years 2006 to 2012 for which data is available for all the years to enable a comparison across time. However, for the purposes of the analysis we include all the firms.

The capital stock used in the specification (5) at the beginning of the period is the reported book value of capital stock and is assumed to be analogous to the replacement cost of capital at the beginning of the period as in Ohrn (2013). Real sales values are obtained by deflating the nominal

series by the Producer Price Index (PPI) of the corresponding industry as mentioned above. The user cost of capital is constructed as described in the previous section.

Ordinary Least Squares (OLS) estimation would be biased and inconsistent in dynamic panel data models because the lagged dependent variable is correlated with the firm-specific effect. We would hence use firm level fixed effects to estimate the long run elasticity. We are also concerned that some components of the user cost of capital might be endogenous. Therefore, we will use the generalized method of moments (GMM) with lagged levels of dependent and independent variables as instruments for the difference equation (Difference GMM), and including the lagged differences of dependent and independent variables as instruments for the level equation (system-GMM) as in Blundell and Bond (1998).

Appendix-2 shows the regression results for the Large Business Corporations and Small Business Corporations by sectors. Table 11 shows the OLS estimation while Table 12 shows the results under fixed effects and Table 13 shows the results using the difference-GMM estimation for Large Business Corporations while Tables 14 to 16 shows the respective results for Small Business Corporations. A coefficient of the lagged dependent variable k_{t-1} under a GMM estimation with values lying between that under Fixed Effects (lower bound) and the OLS (upper bound) indicates a good Model fit for a GMM. However, it is also important that there be no second order auto correlation in the residuals which would indicate that the first difference would be biased and invalidates their use as an instrument. Further the Sargan test validates the instruments used.

Table 12 shows the results using the difference-GMM estimation for Large Business Corporations. System-GMM does not improve the results in any way so we only report the Difference GMM results. We will use the GMM results when the estimation passes the two critical tests, the Arellano-Bond AR(2) test and the Sargan Test. The Arellano-Bond AR(2) test checks if there is second order auto correlation in the residuals which invalidates the use of second lags as instruments for the difference equation. The Sargan test on over-identifying restrictions on the other hand verifies the validity of using lags as instruments for the difference equation. Both tests require a p-value of more than 0.2 (for a fair degree of comfort) to not reject the Null Hypothesis which is that there is second order auto-correlation and that instruments are correlated to the error term (over-identifying restrictions) respectively. The coefficient of the lagged dependent variable in Tables 13 and 16 are below the OLS and above the Fixed effect indicating that the GMM model is a good fit. However when the GMM estimation does not pass the two crucial tests we shall rely on the Fixed effect estimation.

Column 1 in Table 12 shows the diff-GMM results for all sectors combined. However while it clears the AR2 test, the Sargan test fails. Columns 2 to 10 shows the results for the different sectors. The estimations for the Agriculture, Mining and Utilities sectors clear the AR2 test and Sargan tests while the rest of the sectors do not. As a result we will rely on the results of the Fixed Effect Estimation for the remaining sectors. Among the Agriculture, Mining and Utilities sectors only in the case of the Agriculture sector can we reject with a 95% confidence that Long Run elasticity is

different from zero. In this case the Long Run elasticity is -0.3. While in the case of Mining and Utilities we cannot reject the null hypothesis that the Long Run elasticity is zero.

The Fixed Effects estimation show that the Long Term elasticity is of the correct sign (negative) and statistically significant for the Large Business Corporations in the Manufacturing, Construction, Trade and Services sectors with elasticities of -0.302, -0.494, -0.362 and -0.284 respectively.

It may be surprising that while tax incentives which are primarily targeted at the three sectors Agriculture, Manufacturing and Mining (Table 1) the impact of changes in the user cost of capital is also felt on the physical investment for other sectors. This can be explained by the different factors that affects the User Cost of Capital of firms:-

- Qualification for the different tax incentives which affect the present value of capital allowance benefits of the different assets, buildings and machinery (there are no tax incentives for assets other than building and plant and Machinery). For example some incentives for buildings shown in Table 1 are applied to all sectors;
- Capital allowance on the principal assets for tax purposes which are different from the economic capital allowance hence providing a net benefit (or a disadvantage). This is true for all sectors.
- Different composition of the different assets among the firms. As a result the different tax benefits for investing in the different assets are combined in different ways. Even when two firms have similar incentives but differ in the composition of their physical assets (example greater proportion of buildings as compared to plant and machinery) the UCC overall would be different dues to the different weights applied to the UCC of building and plant and machinery.
- The reduction in the tax rate from 29% to 28% in 2008 and after is applied to all sectors hence the impact on the UCC would be felt for all sectors.

This variation can be seen in Figure 1 and is primarily the variation we exploit to estimate if changes in User Cost of Capital translate into changes in investment in physical assets.

Tables 13 to 15 replicates the same analysis for Small Business Corporations. Here as in the case of the Large Business Corporations, only for the Agriculture, Mining and Utilities sectors does the diff-GMM estimation passes the AR2 and Sargan tests. Here too it is only for the Agriculture sector that the Long Run Elasticity estimate is statistically significant and at -0.304 is very close to the estimate for Large Businesses. For the rest of the sectors we rely on the Fixed Effect estimates. Among these sectors the estimate for the Long Run Elasticity is statistically significant for the Construction, Real-Estate and Services sector (unlike the Manufacturing, Construction, Trade and Services sectors for Large Business Corporations) with elasticities of -0.64 for Construction, -0.625 for Real-Estate and -0.475 for the Services sector.

Using the estimated elasticities and the firm-specific user cost of capital constructed in previous section we can estimate the impact of tax incentives on the capital stock by simulating the effect of the elimination of particular special allowances on investments i.e. we estimate the additional investment ΔK brought about by the change in the UCC at the firm level.

$$\frac{\Delta K}{K} = \varepsilon \frac{\Delta UCC}{UCC},$$

where ε is the elasticity of investment (K) to the User Cost of Capital (UCC).

We estimate the change in the UCC, ΔUCC as follows:-

ΔUCC = UCC obtained by applying the regular tax rates and economic depreciation) – UCC obtained by applying any special tax rates and depreciation rates either special or as allowed by the tax code).

The firm by firm additional investment is then aggregated at the level of the sector to enable a simple cost-benefit analysis. The cost benefit analysis is based on the cost which is the revenue foregone as a result of tax incentives and the benefit which is the additional jobs generated as a result of the additional investment because of the tax incentives.

Implications of the firm level analysis – Cost-Benefit Analysis

The use of tax incentives reduces user cost of capital and results in higher investment in some of the sectors. This is shown in Tables 3 and 4. Table 3 shows the average changes in percent in the User Cost of Capital (UCC) for the different Sectors as a result of the various tax incentives as compared to regular tax treatment. The baseline UCC is calculated by applying the economic depreciation rates (the rates of depreciation of the physical assets which are based on the economic life of the asset) and the actual UCC is calculated by applying the depreciation rates as a result of the application of the tax law including tax incentives.

There are about 250,000 firms and 86% of them are Small Business Corporations (SBCs). For the purpose of the analysis the SBCs are grouped together while the results for the large businesses are shown by sector. Whether a firm is an SBC or not could be obtained directly from the available data, however we have applied the definition of SBCs as per the law using the threshold for turnover. However, there are exceptions for a business to qualify as an SBC even if its turnover is below the threshold such as having less than 20% of gross receipts from investment income and personal services, none of the shareholders/members holding shares/interest in the equity of any other company/close corporation except under certain exceptions, the company not being a personal services provider, etc. Hence it is possible we have over-estimated the number of SBCs as in order to qualify as an SBC firms have to satisfy these additional conditions for which data was not available. Another approximation was used with respect to the taxable income of the SBCs as this specific data was also not available whereby the net profit was used as a proxy. As a result

of this, it is possible that the tax rates applied to SBCs are slightly higher than what they would have been as in most cases the taxable income is typically less than the net profit. All the results shown in the following tables are for businesses for which we have seven years of data both for the capital investment and sales.

Table 3: Changes in User Cost of Capital as a result of tax incentives by Sector (%)

Sector	2006	2007	2008	2009	2010	2011	2012
Large Businesses							
Agriculture	-4.7	-5.0	-4.8	-4.6	-4.4	-4.3	-4.2
Construction	-3.9	-4.0	-4.0	-3.8	-3.6	-3.5	-3.5
Manufacturing	-4.5	-4.9	-4.9	-4.5	-4.2	-4.0	-4.0
Mining	-5.7	-6.5	-6.4	-5.4	-4.1	-4.4	-3.9
Real Estate	-3.3	-3.3	-3.4	-3.2	-3.2	-3.2	-3.2
Services	-3.6	-4.0	-3.8	-3.6	-3.4	-3.3	-3.3
Trade	-3.6	-3.8	-3.7	-3.5	-3.3	-3.2	-3.1
Transport & Logistics	-3.7	-3.8	-4.0	-3.7	-3.3	-3.2	-3.1
Utilities	-3.5	-3.6	-3.5	-3.5	-3.2	-3.2	-3.2
Small Business Corporations	-1.0	-1.3	-1.4	-1.3	-1.2	-1.1	-0.9

The biggest percentage reduction in the UCC for the period 2006-2012 is in the Mining sector with an average reduction for the period 2006-2007 in the UCC of -8.7 % followed by the Manufacturing (reduction of 4.5%) and Agriculture sectors (also a reduction of 4.5%). The reduction in the UCC is modest for the SBCs. This is because the impact of the tax incentives on SBCs has two counteracting effects. While the higher depreciation allowances are beneficial to the firm, however the tax impact of depreciation allowances is higher when the tax rate is higher because the resulting deduction is higher (the deduction is t x Z). However, SBCs benefit from a lower tax rate and hence the net effect on the firm is ambiguous.

Using the elasticity of the investment to the user cost of capital as derived from the GMM and fixed effects estimations and the changes in UCC (the sector wide average of which are shown in Table 3), we can then estimate the change in investment as a result of the reduction of the UCC. Table 4 shows the results aggregated by sector. Despite the lower User Cost of Capital, in the case of Large Business Corporations in the Mining, Transport, Real Estate and Utilities sectors there is no impact on assets based on the firm level analysis because we do not find statistically significant elasticity. Among all the sectors the lower user cost of capital as a result of incentives has the biggest impact on investment in the construction sector (average for the period 2006-2012 being +1.9%) followed by the manufacturing sector (+1.4%). Table 7 shows the sector wide averages of the changes in percentages of the physical assets which is calculated firm-by-firm. Among the SBCs however there is no impact on the Mining, Manufacturing, Trade, Transport and Utilities sectors.

Table 4: Changes in the physical assets due to changes in UCC by Sector (%)

Sector	2006	2007	2008	2009	2010	2011	2012
Large Businesses							
Agriculture	1.4	1.5	1.4	1.4	1.3	1.3	1.2
Construction	1.9	2.0	2.0	1.9	1.8	1.7	1.7
Manufacturing	1.4	1.5	1.5	1.4	1.3	1.2	1.2
Mining	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Real Estate	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Services	1.0	1.1	1.1	1.0	1.0	0.9	0.9
Trade	1.3	1.4	1.3	1.3	1.2	1.2	1.1
Transport & Logistics	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Utilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Small Business Corporations	0.3	0.4	0.4	0.4	0.4	0.4	0.3

These percentage changes in investment in physical capital are then applied on the stock of physical capital firm-by-firm and aggregated sector wise in Table 5. It must be noted that as the elasticity of investment to the UCC refers to the entire stock of investment and hence the changes in the investment is applied on the entire capital stock.

Table 5: Long Run Investment in the physical assets due to changes in UCC (million rand)

Sector	2006	2007	2008	2009	2010	2011	2012
Large Businesses							
Agriculture	123	162	162	185	193	202	217
Construction	85	116	161	300	292	304	310
Manufacturing	578	853	969	876	804	807	882
Mining	-	-	-	-	-	-	-
Real Estate	-	-	-	-	-	-	-
Services	308	378	440	419	447	410	439
Trade	139	167	179	193	189	219	213
Transport & Logistics	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-
Small Business Corporations	231	277	310	329	406	442	449
Total	1,464	1,953	2,221	2,302	2,332	2,385	2,511
Increase in Investment/Capital Stock	0.3%	0.6%	0.5%	0.4%	0.4%	0.3%	0.3%

While it is clear that tax incentives have had some impact in the form of billions of rand of additional investment, these tax incentives also result in revenue foregone for the government.

Investment allowances and accelerated capital allowance and lower tax rates for SBCs reduce the taxes due to the government because they provide more benefit to firms because the deductions which are based on a percentage of the investment are more than what is available under accounting rules (true economic life of the project).

Table 5, shows the impact of the tax incentives on encouraging greater investment to the amount of 2.5 billion rand in 2012 and about 2.4 billion rand in 2011. Overall the long run increase in the physical assets as a percentage of the asset stock is about 0.4% of the all the assets with Large Business Corporations adding 2 billion rand in additional investment with Small Business Corporations adding the rest 500 million rand. While the percentage change in the investment is not high, when applied on the stock of capital, the impact is not insignificant. The impact of tax incentives on SBCs is lower than Large Businesses because the impact of tax incentives in four out of the nine sectors as compared to five sectors in the case of the latter.

Table 6: Revenue Impact of Additional Capital/Depreciation Allowances - Illustration

Year->	0	1	2	3	4	5	6	7	8	9	
Investment	100	100	100	100	100	100	100	100	100	100	
Regular Depreciation Deduction (10% Straight line)	10	10	10	10	10	10	10	10	10	10	
Special Depreciation Deduction (20% Straight line)	20	20	20	20	20	0	0	0	0	0	
Tax impact due to Regular Depreciation Deduction	3	3	3	3	3	3	3	3	3	3	
Tax impact due to Special Depreciation Deduction	6	6	6	6	6	0	0	0	0	0	
Discount Factor	1.00	0.91	0.83	0.75	0.68	0.62	0.56	0.51	0.47	0.42	
Present Value of Reduced Taxes under Regular Depreciation	3.0	2.7	2.5	2.3	2.0	1.9	1.7	1.5	1.4	1.3	**Total** **20.3**
Present Value of Reduced Taxes under Special Depreciation	6.0	5.5	5.0	4.5	4.1	0.0	0.0	0.0	0.0	0.0	**25.0**

Table 6 shows an example why this matters. In the case of special depreciation deductions the present value of the income tax foregone is more than when regular depreciation rates area applied even though in both the cases the total depreciated amount is the same. It is that in the case of the regular depreciation the asset can be depreciated in 10 years while in the special case the asset can be depreciated quicker in 5 years. In this specific example the present value of the deductions go up from 20 to 25 implying an increase in benefit by about a fourth just because of the timing

benefit. In the similar manner we estimate the impact of the tax incentives with and without incentives firm by firm by estimating the change in the present value of the capital allowance deductions from the taxable income arising out of the investment made in a particular year with and without the tax incentive.

Table 7 shows the reduced tax (in cents) as a result of an investment of one rand made in a particular sector in a particular year when applying the investment linked incentives such as capital allowances firm-by-firm. This data is restricted to those firms that are Large Businesses. The revenue impact per rand of investment is most prominent in the Mining sector as a result of the generous investment allowances followed by the agriculture sector and then manufacturing.[9] This per rand impact is then applied to the investment made each year. The results of the revenue foregone are shown in Table 8. Among the large businesses, the revenue foregone is highest for the Trade and Transport sector followed by the Utilities sector. The revenue foregone as a result of the lower rates and higher depreciation rates for SBCs is about 1 billion rand in 2012 while for large businesses it was about 3 billion million rand as a result of the capital allowances. It may look unusual that some sectors result in a lot of revenue foregone which are not typically encouraged by the government, but some of these numbers reflect the very large investments by certain businesses that skew the numbers. For example some businesses in the data report making investments to the tune of tens of billions of dollars in some years.

Table 7: Reduced tax (cents) as a result of capital allowances on 1 Rand invested by Sector (Large Corporations)

Sector	2006	2007	2008	2009	2010	2011	2012
Agriculture	8.1	8.7	8.6	8.2	7.8	7.6	7.6
Construction	7.4	7.7	7.6	7.2	6.9	6.8	6.7
Manufacturing	7.6	7.9	7.9	7.5	7.1	7	6.9
Mining	18.1	19.4	19.6	17.9	16.6	16	15.9
Real Estate	7.4	7.7	7.7	7.4	7.1	6.9	7
Services	7.4	7.7	7.6	7.2	6.9	6.8	6.7
Trade	7.4	7.7	7.6	7.2	6.9	6.8	6.7
Transport & Logistics	7.4	7.7	7.6	7.2	6.9	6.8	6.7
Utilities	7.4	7.7	7.6	7.2	7	6.8	6.7

One could compare Table 8 with Table 5 to get the net impact of the tax incentives. In 2012 for example the revenue foregone was about 4 billion Rand while the impact on the long term run investment was approximately 2.5 billion Rand. One may argue that the government could have directly invested the same amount as the foregone revenue and created the same amount of assets

[9] Note that the impact is not necessarily similar to the reduction in the user cost of capital (Table 4) though the both depend critically on the present value of the capital allowance deductions with and without the tax incentives. This is because the changes in the user cost of capital also includes the inflation impact of the various capital assets while the changes in the present value of capital allowance deductions only estimates the revenue impact for one rand of investment in present value terms.

however there is no direct equivalence between these amounts. The revenue foregone includes revenue foregone on marginal investments i.e. investments that would not have happened without the tax incentive and hence the government does not have the equivalent amount of "cash in the hand" to invest. Secondly, an additional rand invested by the government is not the same as an additional rand invested by the private sector.

Table 8: Overall Revenue Loss as a result of tax incentives by Sector (Mill. Rands)

Sector	2007	2008	2009	2010	2011	2012
Large Businesses						
Agriculture	99.4	85.3	123.2	83.1	79.5	123.5
Construction	63.4	82.3	70.2	46.2	78.2	69.0
Manufacturing	824.7	343.8	313.6	203.1	205.3	375.8
Mining	330.0	500.0	752.9	347.2	364.8	278.5
Real Estate	162.4	197.6	166.3	185.7	258.0	141.1
Services	235.3	295.6	205.0	211.0	129.5	156.7
Trade	91.8	95.0	77.3	73.2	96.9	78.3
Transport & Logistics	110.2	2137.8	677.7	4205.7	1268.0	1037.8
Utilities	312.2	638.8	916.2	632.1	602.4	617.3
Small Business Corporations	799.7	904.6	900.0	863.1	922.4	1055.8
Total	3031.8	5283.9	4206.9	6851.9	4006.6	3936.6

Using the incentivized investment and the revenue foregone, allows us to conduct a simple cost-benefit analysis. The additional investment as a result of tax incentives shown in Table 5 implies additional profits for business. This additional profit can be estimated by applying the firm-wise Return on Investment on this additional investment. We could similarly derive the implied additional taxes by applying the firm-wise tax rates on this additional profits. Table 9 shows that one rand of revenue foregone resulted in 1.6 cents of additional profit and 0.5 cents of additional taxes each year in the long term. If we assume that the investment generates these additional returns in perpetuity, using a 10% discount rate it implies 16 cents in additional profits and 5 cents of additional revenue for one rand of revenue foregone. This implies over the long term, of the one rand of revenue foregone, 5 cents is recovered in additional taxes. Hence the impact in terms of long term increase in taxes as a result of the additional investment is minimal. Hence one needs to look at the indirect impact of these incentives such as jobs.

Table 9: Additional Profits and Taxes generated as a percentage of Revenue Foregone (Benefit-Cost Ratio) of tax incentives for all Sectors

Sector	Additional Profits each year as a percentage of revenue foregone (2007-2012)	Additional Taxes each year as a percentage of revenue foregone (2007-2012)
Large Businesses		
Agriculture	3.3%	0.9%
Construction	6.8%	1.9%
Manufacturing	10.1%	2.8%
Mining	0.0%	0.0%
Real Estate	0.0%	0.0%
Services	9.4%	2.6%
Trade	7.6%	2.1%
Transport & Logistics	0.0%	0.0%
Utilities	0.0%	0.0%
Small Business Corporation	0.9%	0.2%
Overall	1.6%	0.5%

One could calculate the approximate impact of this additional investment in terms of jobs. In order to estimate the impact of the additional investment one could use industry averages of jobs created as a percentage of the investment stock and apply this to the additional investment. Table 10 shows that 6.6 jobs were created on average for every one million rand investment in the Agriculture sector on average while it is as high as 23 jobs for services. On applying these rates to the additional investment we conclude that the additional investment as a result of tax incentives lead to about 33,874 additional jobs in the long run based on the additional investment made in 2012. With 3.9 billion of revenue foregone this implies a 'Cost-per-job created' of 116,213 rand for all the sectors. Hence one could conclude that the Government spent 116,213 rand per year on average to create one job in the Agriculture, Construction, Manufacturing, Services, Trade sectors and the Small Business Corporations. This ranges from an average of 15,639 rand for services in the case of large business corporations to 171,281 rand for SBCs. In the case of four of nine sectors (Mining, Real Estate, Transport and Utilities) the impact on jobs is negligible and the entire revenue foregone had no impact on jobs. The GDP per capita in 2012 was 55,040 rand gives us a benchmark for measuring the cost of the tax incentive which is about two times the per-capita GDP.

Table 10: Implied additional Jobs as a result of Tax Incentives (2012)

	Employment created per million rand in Investment	Additional Investment (in million Rand)	Implied additional Employment	Revenue Foregone	Cost/Job*
Agriculture	6.6	217.4	1,441	123.5	85,701
Construction	10.7	310.3	3,333	69.0	20,704
Manufacturing	7.9	881.8	6,922	375.8	54,293
Mining	3.8	-	-	278.5	HIGH
Real Estate	0.3	-	-	141.1	HIGH
Services	22.8	439.2	10,019	156.7	15,639
Trade	8.7	213.2	1,844	78.3	42,431
Transport & Logistics	1.3	-	-	1037.8	HIGH
Utilities	0.4	-	-	617.3	HIGH
SBCs	13.7	449.1	6,167	1055.8	171,218
All Sectors	13.5	2,511.1	33,874	3936.6	116,213

***** HIGH Cost/Job indicates that there is no or negligible impact of the Tax Incentive implying a high cost per job created

Conclusion

The analysis of firm level data allows us to quantify fairly accurately the impact of tax incentives on investment and its cost. Using this data we find that the impact of tax incentives on raising investment in South Africa is mixed. In the case of large business corporations, the impact is positive in five of the nine sectors (Agriculture, Construction, Manufacturing, Trade and Services) while for Small Businesses the impact is it is positive only for four out of nine sectors. It is important to note that there is no impact of the tax incentives on investment on the Mining sector even while investment responds strongly to sales in this sector. Real Estate, Transport and Logistics and Utilities are the other sector where we have seen no impact of tax incentives on investment.

Overall the impact of tax incentives generates additional investment of about 2 billion dollars constituting approximately 1% of the capital stock in the long term. The additional investment results in approximately 34,000 additional jobs in 2012. These tax incentives cost the government revenue of about 4 billion rand in 2012. Tax incentives to the Small Business Corporations cost the government approximately 1 billion rand largely because of the lower headline rate and this results in the most revenue foregone as compared to all the other sectors with the Manufacturing sector cost the government 158 million rand in revenue. Using the revenue cost and the resulting additional jobs the implied cost per job was an average of 116,000 rand per job year. This amount being roughly two times the per-capita GDP implies that these tax incentives have limited impact on jobs and range from 171,000 rand per job for Small Business Corporations to 15,600 rand per job for Services. The tax incentives especially those on Small Business Corporations cost the

government a lot in terms of revenue while its impact is quite limited in terms of additional investment and jobs. On the other hand the cost per job was about 54,000 rand for the Manufacturing sector which is less than a third as compared to the Small Business Corporations. The implication of this result is that Investment linked incentives (accelerated depreciation) provided to the Manufacturing sector works much more effectively as compared to the lower tax rates provided to the Small Business Corporations. However on another note, even while accelerated depreciation works for the Manufacturing sector these incentives seem ineffective for the Mining sector. The implication of this is that investment linked incentives while being more effective than a generalized reduction in tax rate may not necessarily be effective for all sectors in inducing physical capital investment.

This goes back to fundamental precept that tax incentives may be effective but only at the margins. If there are fundamental factors including weaknesses in the investment climate that limit investors from exploiting full profit making opportunities then tax incentives may be ineffective (James 2009). Hence the government would need to address these fundamental factors before resorting to tax incentives.

The other lesson for governments is that there is a lot of scope for governments to fine tune their tax policies based on evidence of their effectiveness. This study shows that the data collected from tax returns form a very valuable source of data for analyzing the effectiveness of government's tax policies. While such data was always collected their primary purposes was for improving tax compliance and the effectiveness of the tax administration. As a result the design of the tax forms largely reflects this purpose. However when one needs to analyze the different tax policies different kinds of information need to be collected from taxpayers. One such case is the need to provide detailed financial information such as the balance sheet and the profit and loss accounts in electronic form of part of the tax return which is not the case in South Africa. In certain countries such information is routinely asked as part of the tax fling process. These documents are prepared by most businesses in any case (especially for corporations) and hence the requirement to provide such data during tax filing is a small additional cost for taxpayers[10].

It is hoped that this study has provided some answers as to which sectors seem to respond more to investment based tax incentives and may only be the starting point for studies on the effectiveness of South Africa's tax policy in meeting the goals of being an efficient mechanism to collect revenue efficiently and help the government fund critical investments and expenditures needed to meet the economic goals of the country.

[10] In the year 2013, SARS had changed the tax forms and now does not ask for the breakdown of the different capital assets from Small Business Corporations. This implies that the analysis conducted in this paper cannot be done for Small Business Corporations from 2013 onwards.

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Appendix 1: Terms of Reference

The Terms of Reference for 2014 Study of Marginal Effective Tax Rates in South Africa agreed with the Davis Tax commission included to:

- **Calculate the METRs** in the sectors covered by the study and also benchmark it against selected comparator countries.
  - The METRs will be calculated for the principal sectors (Agriculture, Manufacturing, Tourism and Services) based on a desk review of these sectors. However, the team shall do field work and in-depth analysis of the Manufacturing sector.
- **Analyze the results of the METR analysis** and their implication on tax and incentive policies.
- In addition to these and conditional on the availability of the tax return data, the team will **analyze the impact of the tax incentives on investment using tax return data**.
- **Assess the strengths and weaknesses of tax policy** and the implications for attracting FDI, comparing the country with competing locations for FDI as relevant such as Brazil, India, South Africa, Russia, etc).
- Conduct **a capacity building exercise** with the local counterpart team; transferring knowledge on what METR analysis is used for, how to use it, and how to interpret the results. This could be done through a formal workshop and through participation of identified counterpart team members in construction of the analysis.
  - The team will include an academic from University of Stellenbosch with the University covering all related time, travel, hotel and per diem costs
  - The team may also include staff members from SARS and the National Treasury which shall cover on its own all related time, travel, hotel and per diem costs
  - The team will be bound by confidentiality clauses of the World Bank Group and cannot use the material until we publish first.
- The team shall **conduct in-depth field studies** including meetings with the tax and sector experts (**mainly the manufacturing sector**).
- The team shall **meet with the private sector, both national and foreign**, documenting the tax policy and tax administration constraints to growth

Appendix 2: Regression results

Table 11: Regression of Log of Capital (k_{it}) for Large Business Corporations – Ordinary Least Squares

		Large Business Corporations								
VARIABLES	**All Sectors**	**Agriculture**	**Mining**	**Manufacturing**	**Utilities**	**Construction**	**Trade**	**Transport**	**Real-Estate**	**Services**
k_{it-1}	0.937***	0.938***	0.929***	0.922***	0.906***	0.919***	0.906***	0.965***	0.923***	0.936***
	(0.00389)	(0.0184)	(0.0253)	(0.0115)	(0.0342)	(0.0167)	(0.00907)	(0.0111)	(0.0196)	(0.00693)
s_{it-1}	0.0698***	0.0295**	0.0871***	0.100***	0.102***	0.0664***	0.102***	0.0236**	0.0445	0.0638***
	(0.00407)	(0.0141)	(0.0317)	(0.0130)	(0.0381)	(0.0171)	(0.00856)	(0.0118)	(0.0271)	(0.00723)
ucc_{it-1}	-0.198***	-0.0233	-0.107	-0.168***	-0.187*	-0.214***	-0.198***	0.0128	-0.568***	-0.144***
	(0.0137)	(0.0505)	(0.115)	(0.0332)	(0.0999)	(0.0525)	(0.0264)	(0.0479)	(0.150)	(0.0273)
$\Delta k_{i,t-1}$	-0.0936***	-0.0618	-0.118	-0.0709***	-0.0828	-0.0258	-0.0911***	-0.148***	-0.139*	-0.0944***
	(0.00971)	(0.0402)	(0.0800)	(0.0232)	(0.0517)	(0.0265)	(0.0171)	(0.0519)	(0.0711)	(0.0182)
$\Delta s_{i,t}$	0.319***	0.111***	0.423***	0.401***	0.436***	0.330***	0.325***	0.338***	0.108***	0.319***
	(0.0123)	(0.0311)	(0.101)	(0.0295)	(0.124)	(0.0291)	(0.0309)	(0.0447)	(0.0417)	(0.0192)
$\Delta s_{i,t-1}$	0.161***	0.0508*	0.236***	0.138***	0.132	0.120***	0.176***	0.194***	0.0852***	0.170***
	(0.0104)	(0.0291)	(0.0567)	(0.0251)	(0.121)	(0.0306)	(0.0251)	(0.0300)	(0.0223)	(0.0155)
$\Delta ucc_{i,t}$	-0.196***	0.0275	-0.1000	-0.172***	-0.0748	-0.307***	-0.215***	-0.0465	-0.788***	-0.194***
	(0.0190)	(0.0710)	(0.159)	(0.0387)	(0.130)	(0.0651)	(0.0372)	(0.0662)	(0.225)	(0.0385)
$\Delta ucc_{i,t-1}$	0.00182	-0.118*	-0.0251	-0.0263	0.199	0.0332	-0.0176	-0.101	-0.0134	-0.0216
	(0.0157)	(0.0663)	(0.102)	(0.0308)	(0.142)	(0.0535)	(0.0300)	(0.0718)	(0.100)	(0.0311)
Observations	107,712	5,097	1,662	21,085	1,723	8,266	34,019	5,313	2,183	26,825
R-squared	0.856	0.860	0.920	0.885	0.789	0.820	0.781	0.890	0.901	0.846
Number of firms	33,405	1,589	555	6,095	539	2,858	9,799	1,652	897	8,761
Long Run Elasticity	-3.124	-0.376	-1.504	-2.144	-1.995	-2.645	-2.114	0.365	-7.408	-2.250
Long Run Elasticity t-statistic	-21.08	-0.499	-0.866	-7.165	-1.694	-4.619	-9.405	0.266	-7.070	-6.559

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 12: Regression of Log of Capital (k_{it}) for Large Business Corporations - Fixed Effects Approach

VARIABLES	All Sectors	Large Business Corporations								
		Agriculture	Mining	Manufacturing	Utilities	Construction	Trade	Transport	Real-Estate	Services
k_{it-1}	0.226***	0.190*	0.241***	0.230***	0.155	0.294***	0.240***	0.153*	0.161	0.206***
	(0.0161)	(0.105)	(0.0868)	(0.0453)	(0.117)	(0.0461)	(0.0267)	(0.0794)	(0.138)	(0.0268)
s_{it-1}	0.464***	0.475***	0.430***	0.463***	0.551***	0.398***	0.508***	0.494***	0.350**	0.446***
	(0.0213)	(0.0922)	(0.111)	(0.0460)	(0.164)	(0.0535)	(0.0488)	(0.0916)	(0.140)	(0.0380)
ucc_{it-1}	-0.219***	0.1000	-0.273	-0.233***	-0.0795	-0.349**	-0.275***	0.106	-0.299	-0.226***
	(0.0393)	(0.174)	(0.264)	(0.0840)	(0.265)	(0.147)	(0.0751)	(0.131)	(0.559)	(0.0814)
$\Delta k_{i,t-1}$	0.0723***	0.125*	-0.0169	0.106***	0.122*	0.0371	0.0681***	0.0538	0.0230	0.0765***
	(0.0108)	(0.0715)	(0.0901)	(0.0275)	(0.0724)	(0.0250)	(0.0181)	(0.0444)	(0.0491)	(0.0205)
$\Delta s_{i,t}$	0.326***	0.295***	0.265***	0.346***	0.241**	0.288***	0.313***	0.440***	0.286***	0.328***
	(0.0149)	(0.0715)	(0.0841)	(0.0321)	(0.0950)	(0.0388)	(0.0371)	(0.0630)	(0.101)	(0.0285)
$\Delta s_{i,t-1}$	-0.0491***	-0.110***	-0.0351	-0.0700***	-0.217***	-0.0494**	-0.0435**	-0.0130	-0.0119	-0.0319**
	(0.00943)	(0.0406)	(0.0518)	(0.0240)	(0.0781)	(0.0247)	(0.0198)	(0.0368)	(0.0521)	(0.0160)
$\Delta ucc_{i,t}$	-0.151***	0.0910	-0.185	-0.104**	-0.0984	-0.206**	-0.207***	-0.0104	-0.230	-0.185***
	(0.0244)	(0.105)	(0.177)	(0.0487)	(0.157)	(0.0902)	(0.0471)	(0.0834)	(0.323)	(0.0520)
$\Delta ucc_{i,t-1}$	0.0298*	-0.131	-0.0524	0.0713*	0.118	0.0924	0.0216	-0.107	0.151	0.00621
	(0.0177)	(0.0849)	(0.0992)	(0.0369)	(0.152)	(0.0703)	(0.0333)	(0.0661)	(0.148)	(0.0340)
Observations	107,712	5,097	1,662	21,085	1,723	8,266	34,019	5,313	2,183	26,825
R-squared	0.106	0.120	0.102	0.138	0.103	0.126	0.106	0.102	0.070	0.105
Number of firms	33,405	1,589	555	6,095	539	2,858	9,799	1,652	897	8,761
Long Run Elasticity	-0.283	0.123	-0.360	-0.302	-0.0941	-0.494	-0.362	0.125	-0.357	-0.284
Long Run Elasticity t-statistic	-5.642	0.586	-1.045	-2.865	-0.302	-2.389	-3.711	0.810	-0.537	-2.818

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 13: Regression of Log of Capital (k_{it}) for Large Business Corporations – Diff-GMM Approach

		Large Business Corporations								
VARIABLES	**All Sectors**	**Agriculture**	**Mining**	**Manufacturing**	**Utilities**	**Construction**	**Trade**	**Transport**	**Real-Estate**	**Services**
k_{it-1}	0.373***	0.329***	0.266***	0.403***	0.396***	0.426***	0.340***	0.242***	0.523***	0.376***
	(0.0151)	(0.0566)	(0.0584)	(0.0333)	(0.0563)	(0.0401)	(0.0236)	(0.0450)	(0.0567)	(0.0252)
s_{it-1}	0.153***	0.269***	0.467***	0.337***	0.212*	-0.00637	0.0921	0.401***	-0.278***	0.156**
	(0.0337)	(0.0838)	(0.110)	(0.0530)	(0.125)	(0.0832)	(0.0639)	(0.110)	(0.0765)	(0.0683)
ucc_{it-1}	0.0448	-0.200**	0.0328	-0.0747	0.00422	-0.0664	0.137**	-0.101	-0.375*	0.265***
	(0.0334)	(0.0813)	(0.152)	(0.0867)	(0.321)	(0.131)	(0.0555)	(0.126)	(0.196)	(0.0658)
$\Delta k_{i,t-1}$	0.00794	-0.0195	0.0436**	-0.0229	-0.0117	-0.0194	0.0130	0.0103	-0.111***	0.0124
	(0.00975)	(0.0179)	(0.0220)	(0.0195)	(0.0309)	(0.0172)	(0.0149)	(0.0155)	(0.0249)	(0.0162)
$\Delta s_{i,t}$	0.200***	0.123**	0.309***	0.332***	0.390***	0.0840	0.132***	0.336***	-0.0813*	0.173***
	(0.0226)	(0.0546)	(0.0947)	(0.0383)	(0.0907)	(0.0555)	(0.0443)	(0.0808)	(0.0493)	(0.0443)
$\Delta s_{i,t-1}$	0.0527***	-0.0709***	-0.0290	-0.0209	0.0792	0.0219	0.0755***	0.00130	0.149***	0.0368**
	(0.0103)	(0.0217)	(0.0228)	(0.0149)	(0.0529)	(0.0193)	(0.0211)	(0.0240)	(0.0286)	(0.0146)
$\Delta ucc_{i,t}$	-0.0456**	-0.0226	-0.295***	-0.0866*	0.0363	-0.237***	0.00844	-0.0723	-0.578***	0.0619*
	(0.0196)	(0.0601)	(0.113)	(0.0448)	(0.145)	(0.0715)	(0.0336)	(0.0740)	(0.146)	(0.0371)
$\Delta ucc_{i,t-1}$	-0.0408**	0.00892	-0.170**	0.00499	0.149	-0.0450	-0.0602**	0.00249	-0.131*	-0.107***
	(0.0167)	(0.0489)	(0.0726)	(0.0377)	(0.120)	(0.0539)	(0.0278)	(0.0499)	(0.0743)	(0.0319)
Observations	107,712	5,097	1,662	21,085	1,723	8,266	34,019	5,313	2,183	26,825
Number of firms	33,405	1,589	555	6,095	539	2,858	9,799	1,652	897	8,761
LR Elasticity	0.0714	-0.299	0.0446	-0.125	0.00699	-0.116	0.207	-0.134	-0.787	0.425
LR Elasticity t-stat	1.331	-2.649	0.216	-0.868	0.0132	-0.511	2.409	-0.812	-2.201	3.926
A-Bond Test AR1	0	4.87e-05	0.166	1.64e-08	0.000112	1.58e-06	0	0.00497	0.0579	0
A-Bond Test AR2	0.358	0.402	0.309	0.504	0.310	0.243	0.271	0.472	0.913	0.708
Sargan Test	0	0.715	0.162	2.19e-09	0.241	0.000190	0	0.144	9.26e-06	1.66e-05

Table 14: Regression of Log of Capital (k_{it}) for Small Business Corporations – Ordinary Least Squares

		Small Business Corporations								
VARIABLES	**All Sectors**	**Agriculture**	**Mining**	**Manufacturing**	**Utilities**	**Construction**	**Trade**	**Transport**	**Real-Estate**	**Services**
k_{it-1}	0.909***	0.904***	0.272***	0.877***	0.849***	0.865***	0.891***	0.893***	0.940***	0.900***
	(0.00280)	(0.0166)	(0.0562)	(0.0104)	(0.0338)	(0.0129)	(0.00719)	(0.0185)	(0.00671)	(0.00441)
s_{it-1}	0.0929***	0.0869***	0.00152	0.159***	0.248***	0.174***	0.121***	0.135***	0.0699***	0.106***
	(0.00272)	(0.0125)	(0.208)	(0.0135)	(0.0468)	(0.0137)	(0.00860)	(0.0213)	(0.00614)	(0.00478)
ucc_{it-1}	-0.564***	-0.412***	0.0828	-0.408***	-0.267**	-0.541***	-0.354***	-0.226***	-0.355***	-0.596***
	(0.0123)	(0.0593)	(0.250)	(0.0428)	(0.108)	(0.0473)	(0.0290)	(0.0685)	(0.0279)	(0.0196)
$\Delta k_{i,t-1}$	-0.0822***	-0.0920***	0.0607***	-0.0539***	-0.0684	-0.0574***	-0.0653***	-0.0110	-0.191***	-0.0714***
	(0.00537)	(0.0285)	(0.0207)	(0.0172)	(0.0469)	(0.0181)	(0.0120)	(0.0280)	(0.0213)	(0.00802)
$\Delta s_{i,t}$	0.255***	0.134***	0.0226	0.409***	0.587***	0.338***	0.300***	0.395***	0.143***	0.283***
	(0.00727)	(0.0215)	(0.127)	(0.0359)	(0.0865)	(0.0223)	(0.0247)	(0.0491)	(0.0108)	(0.0130)
$\Delta s_{i,t-1}$	0.128***	0.0493**	-0.00989	0.141***	0.146*	0.152***	0.200***	0.188***	0.0515***	0.132***
	(0.00616)	(0.0212)	(0.0656)	(0.0221)	(0.0781)	(0.0204)	(0.0203)	(0.0377)	(0.00836)	(0.0115)
$\Delta ucc_{i,t}$	-0.372***	-0.178*	-0.0476	-0.290***	-0.335**	-0.392***	-0.142***	-0.0814	-0.659***	-0.354***
	(0.0201)	(0.0958)	(0.191)	(0.0676)	(0.146)	(0.0721)	(0.0516)	(0.122)	(0.0557)	(0.0321)
$\Delta ucc_{i,t-1}$	0.126***	0.00414	0.137	0.0935*	-0.145	0.150***	0.0552	-0.131	-0.0613**	0.124***
	(0.0155)	(0.0661)	(0.134)	(0.0551)	(0.194)	(0.0550)	(0.0430)	(0.106)	(0.0287)	(0.0259)
Observations	250,995	9,757	1,370	18,424	2,173	16,310	38,224	5,826	61,036	92,786
R-squared	0.800	0.783	0.697	0.749	0.729	0.707	0.712	0.739	0.868	0.767
Number of firms	99,901	1,589	581	6,095	539	2,858	9,799	1,652	897	8,761
Long Run Elasticity	-6.185	-4.298	-3.064	-3.325	-1.768	-4.001	-3.238	-2.119	-5.948	-5.953
Long Run Elasticity t-statistic	-56.65	-8.078	-3.496	-10.87	-2.563	-12.35	-13.93	-3.649	-9.605	-36.73

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 15: Regression of Log of Capital (k_{it}) for Small Business Corporations - Fixed Effects Approach

VARIABLES	All Sectors	Small Business Corporations								
		Agriculture	Mining	Manufacturing	Utilities	Construction	Trade	Transport	Real-Estate	Services
k_{it-1}	0.119***	0.00575	0.0962	0.0628**	0.0918	0.0784**	0.148***	0.151**	0.0813**	0.123***
	(0.00998)	(0.0692)	(0.0888)	(0.0320)	(0.101)	(0.0350)	(0.0214)	(0.0613)	(0.0341)	(0.0146)
s_{it-1}	0.425***	0.332***	0.786***	0.603***	0.358**	0.531***	0.592***	0.499***	0.195***	0.474***
	(0.0174)	(0.0667)	(0.232)	(0.0606)	(0.182)	(0.0586)	(0.0579)	(0.130)	(0.0227)	(0.0318)
ucc_{it-1}	-0.375***	-0.0849	-0.137	-0.195	-0.394	-0.590***	-0.136	-0.207	-0.574***	-0.417***
	(0.0458)	(0.231)	(0.454)	(0.136)	(0.372)	(0.192)	(0.128)	(0.340)	(0.0926)	(0.0775)
$\Delta k_{i,t-1}$	0.104***	0.184***	0.139**	0.144***	0.121	0.0661***	0.109***	0.131***	0.0210	0.115***
	(0.00686)	(0.0496)	(0.0537)	(0.0216)	(0.0745)	(0.0198)	(0.0149)	(0.0434)	(0.0240)	(0.00997)
$\Delta s_{i,t}$	0.229***	0.146***	0.560**	0.331***	0.256***	0.248***	0.276***	0.212**	0.133***	0.259***
	(0.0108)	(0.0368)	(0.219)	(0.0439)	(0.0792)	(0.0357)	(0.0365)	(0.0944)	(0.0138)	(0.0198)
$\Delta s_{i,t-1}$	-0.0871***	-0.105***	-0.0631	-0.132***	-0.0596	-0.134***	-0.112***	-0.140***	-0.0179*	-0.103***
	(0.00797)	(0.0298)	(0.0931)	(0.0276)	(0.152)	(0.0284)	(0.0292)	(0.0518)	(0.0109)	(0.0143)
$\Delta ucc_{i,t}$	-0.208***	0.0630	-0.0451	-0.0648	-0.273	-0.283**	0.0225	-0.0271	-0.518***	-0.194***
	(0.0289)	(0.152)	(0.346)	(0.0881)	(0.219)	(0.118)	(0.0729)	(0.181)	(0.0756)	(0.0468)
$\Delta ucc_{i,t-1}$	0.0634***	-0.0442	0.289	0.113*	-0.0593	0.171**	0.0634	-0.127	0.0102	0.0787**
	(0.0191)	(0.0834)	(0.346)	(0.0597)	(0.154)	(0.0685)	(0.0573)	(0.120)	(0.0289)	(0.0323)
Observations	250,995	9,757	1,370	18,424	2,173	16,310	38,224	5,826	61,036	92,786
R-squared	0.063	0.060	0.128	0.066	0.071	0.047	0.079	0.098	0.037	0.072
Number of firms	99,901	4,225	581	7,463	928	7,555	14,834	2,612	21,699	37,432
Long Run Elasticity	-0.425	-0.0854	-0.152	-0.208	-0.434	-0.640	-0.160	-0.244	-0.625	-0.475
Long Run Elasticity t-statistic	-8.228	-0.368	-0.303	-1.433	-1.062	-3.094	-1.067	-0.609	-6.191	-5.423

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 16: Regression of Log of Capital (k_{it}) for Small Business Corporations – Diff-GMM Approach

VARIABLES	All Sectors	Small Business Corporations								
		Agriculture	Mining	Manufacturing	Utilities	Construction	Trade	Transport	Real-Estate	Services
k_{it-1}	0.379***	0.218***	0.269***	0.282***	0.315***	0.370***	0.342***	0.469***	0.441***	0.368***
	(0.0104)	(0.0538)	(0.0566)	(0.0302)	(0.0543)	(0.0355)	(0.0232)	(0.0423)	(0.0332)	(0.0149)
s_{it-1}	0.237***	0.340***	-0.00315	0.453***	0.556***	0.607***	0.554***	0.699***	0.389***	0.360***
	(0.0246)	(0.0888)	(0.208)	(0.119)	(0.210)	(0.114)	(0.0979)	(0.142)	(0.0369)	(0.0434)
ucc_{it-1}	0.139***	-0.238**	0.0693	0.174	-0.107	-0.132	0.548***	-0.182	-0.118***	0.430***
	(0.0311)	(0.1000)	(0.248)	(0.153)	(0.304)	(0.158)	(0.0953)	(0.203)	(0.0445)	(0.0557)
$\Delta k_{i,t-1}$	0.0201***	0.0704**	0.0619***	0.0869***	0.0143	-0.000549	0.0153	-0.00810	-0.0806***	0.0250***
	(0.00682)	(0.0327)	(0.0207)	(0.0200)	(0.0324)	(0.0178)	(0.0149)	(0.0290)	(0.0210)	(0.00970)
$\Delta s_{i,t}$	0.214***	0.171***	0.0204	0.363***	0.550***	0.408***	0.397***	0.470***	0.257***	0.288***
	(0.0135)	(0.0409)	(0.127)	(0.0742)	(0.123)	(0.0609)	(0.0550)	(0.0878)	(0.0212)	(0.0242)
$\Delta s_{i,t-1}$	0.0166*	-0.0539*	0.00214	-0.00590	0.0241	-0.0175	0.0562**	-0.0449	-0.0198*	-0.00667
	(0.00849)	(0.0280)	(0.0656)	(0.0292)	(0.0717)	(0.0324)	(0.0271)	(0.0477)	(0.0108)	(0.0145)
$\Delta ucc_{i,t}$	-0.0684***	0.0375	-0.0820	0.0507	-0.205	-0.160*	0.297***	0.0453	-0.236***	0.0979***
	(0.0177)	(0.0798)	(0.195)	(0.0851)	(0.154)	(0.0866)	(0.0509)	(0.105)	(0.0331)	(0.0303)
$\Delta ucc_{i,t-1}$	-0.101***	0.0177	0.130	-0.0586	-0.145	0.0385	-0.145***	0.00515	-0.0308	-0.165***
	(0.0196)	(0.0628)	(0.133)	(0.0627)	(0.131)	(0.0724)	(0.0538)	(0.0904)	(0.0316)	(0.0317)
Observations	250,995	9,757	1,370	18,424	2,173	16,310	38,224	5,826	61,036	92,786
Number of firms	99,901	4,225	581	7,463	928	7,555	14,834	2,612	21,699	37,432
LR Elasticity	0.223	-0.304	0.0948	0.242	-0.156	-0.210	0.833	-0.343	-0.211	0.680
LR Elasticity t-stat	4.420	-2.428	0.279	1.128	-0.350	-0.845	5.526	-0.896	-2.641	7.417
A-Bond Test AR1	0	1.70e-07	0.00582	0	0.00761	0	0	2.25e-07	0	0
A-Bond Test AR2	0.578	0.405	0.507	0.220	0.572	0.543	0.108	0.311	0.234	0.0683
Sargan Test	0	0.124	0.372	1.10e-08	0.254	0.00167	0	0.0380	4.69e-07	0

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1;
Instruments for differenced equation: GMM-type: L(1/6).L.k_r L(1/6).L.s_r L(1/6).L.ucc