Winners and Losers: How Corporate Tax Reforms Reshape the Firm Distribution*

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Abstract

We study how corporate tax reforms affect the distribution of resources across firms. Using a model with firm heterogeneity, motivated by a Dutch fiscal reform, we test whether a lower tax rate and reduced investment deductibility improve allocative efficiency. We find that aggregate productivity rises and misallocation falls, driven by a reallocation of capital from medium-large firms to the largest and most productive. The tax cut benefits top firms most, enabling their expansion, while the deductibility reduction disproportionately burdens medium-large firms, which invest more intensively, on average, than other firms.

Keywords: Corporate Taxation, Investment, Distribution, Allocation
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1 Introduction

Corporate tax reforms serve as a central policy instrument through which governments influence firms' investment decisions. For example, tax rate cuts or more generous investment deduction allowances may lower the cost of doing business, encouraging firm growth and investment, stimulating firm entry, and attracting foreign capital.[1] This paper studies the long-run, cross-sectional impact of corporate taxation on allocative efficiency.

We present a model that features firm heterogeneity in productivity, size, and investment. Firms produce a homogeneous good using labour and capital, and operate under perfect competition with free entry. Firms pay taxes on profits and can deduct a portion of current and past investment expenditures from their tax base. Furthermore, investment is subject to capital adjustment costs and an irreversibility constraint. We use the model to compare capital misallocation and aggregate productivity under different corporate tax policies. Because many corporate tax reforms entail changes to statutory tax rates and investment deductibility, we study the joint and separate effects of changes to both.[2] Finally, we link the changes in allocative efficiency to the reallocation of capital across firms.

We ground our quantitative analysis in a targeted tax policy; in our main exercise, we calibrate and apply the model to a major corporate tax reform implemented in the Netherlands in the mid-2000s. The reform significantly lowered the statutory corporate tax rate from 34.5% to 25.5% to encourage the entry of both multinational and domestic firms, and stimulate investment and growth. To conserve budget neutrality, the annual tax deductibility of investment costs was reduced from 100% to 20%, broadening the taxable income of firms and diluting the tax benefits of investment over time.

We calibrate the model with exceptionally rich Dutch administrative data that cover the full population of tax-paying, non-financial firms. Our model reproduces several

[1]Extensive empirical evidence shows sizeable short-run investment responses of firms to both tax policy levers; see Ohrn (2018) and Zwick and Mahon (2017).

[2]Examples include the 2005-2007 'Wet werken aan winst' reform in the Netherlands, our running example in this paper, or the 2017 Tax Cuts and Jobs Act in the US, see Clausing (2024) and Chodorow-Reich, Zidar, and Zwick (2024) for a survey.

untargeted features of the data, notably the cross-sectional distribution of capital and the inverse correlation between firm size and investment rates (investment over capital).

We measure allocative efficiency in two complementary ways: input misallocation á la Hsieh and Klenow (2009) and aggregate productivity. Our model predicts that allocative efficiency improves under the full reform (rate cut and deduction cut): aggregate productivity increases by 1.3% and capital misallocation falls by 4.3%. Decomposing the separate effects of the two tax policy levers, we find that the deduction cut, not the tax rate cut, drives the majority of the efficiency gains. This finding is robust: we show that the deduction cut dominates even if the reform had been implemented in a completely budget-neutral way.

The improvement in allocative efficiency in the full reform is generated by the reallocation of capital toward the top 5% of firms by size and productivity. The pattern is evident in all three tax regime simulations: the baseline scenario, as well as in counterfactual studies in which we lower only the tax rate or the tax deductibility of investment. In each case, the top 5% expand their share of aggregate capital by 0.3–2.2 percentage points. Nearly all that increase comes at the expense of medium-large firms in the 50th-95th percentile of size and productivity.

Through the lens of our model, two mechanisms underpin the observed capital reallocation. First, the lower tax rate increases after-tax profits for every firm, but the most profitable firms gain disproportionately from the windfall. Because size, productivity, and profitability are tightly correlated in the model equilibrium, the top firms expand following the reform, drawing capital away from other firms. Second, the reduced investment deductibility raises the effective cost of investment for all firms, but especially burdens those that invest intensively. In both the data and our calibrated model, medium-large firms invest aggressively to grow. Their average investment rate is around twice as high as that of the top 5% largest firms. Pulling back immediate expensing defers their tax benefits, causing them to contract. Capital consequently reallocates towards the largest and most productive incumbents, whose lower investment intensity insulates them from the deductibility change. Both mechanisms reinforce each other in the full reform, jointly triggering the reallocation of capital in the cross-section.

Finally, we simulate a revenue-neutral version of the full reform. We find that setting the deductibility cap at 23.8%, rather than the actual 20%, would have preserved budget neutrality with the same statutory tax rate cut. The allocative efficiency improvements are virtually unchanged. Capital misallocation declines by 3.9% instead of 4.3%, and aggregate productivity increases by 0.9% rather than 1.3%. By simulating a budget-neutral reform, we show that our allocative efficiency and reallocation results are not caused by general equilibrium effects in an unbalanced reform, and we cross-validate our model's tax revenue predictions.

The remainder of the paper proceeds as follows. Section 2 presents an overview of the Dutch reform we study. Section 3 introduces our model, which we calibrate in Section 4. Section 5 describes the main results of the paper, together with the budget-neutral version of the reform, while Section 6 concludes.

Related literature

Our model is closely related to Hopenhayn and Rogerson (1993). We add several features to their model, in particular, capital and corporate fiscal policy. Moreover, we focus on frictions in the allocation of capital, while they focus on labour. Erosa and González (2019) study optimal fiscal policy in a similar setting to ours and analyse its effect on aggregate growth. We complement their analysis by including partial tax deductibility of investment, focusing on its predominant role in affecting the misallocation of resources.

Sedlacek and Sterk (2019) and Baley and Blanco (2021) also study the long-run effects of corporate tax reforms in heterogeneous firm models. They study how business dynamism, capital valuation, and the economy's adjustment speed vary under different corporate tax rate regimes. In contrast, our focus is on general measures of allocative efficiency, including aggregate productivity and allocative efficiency. Furthermore, we analyse changes to the tax deductibility schedule that firms face. Lastly, we highlight that the mechanisms under which allocative efficiency changes following a tax rate cut or a tax deduction cut differ.

Colciago, Lewis, and Matyska (2023) show the response of productivity and business dynamism to a corporate income tax cut in a New Keynesian model. While they focus on cleansing at the extensive margin, we study the allocation of resources within incumbent firms.

We also relate to a large empirical literature that examines how firms respond to tax policy changes. Zwick and Mahon (2017) find that increased expensing raises investment in eligible capital. We complement the result by examining how the reform (in our case, an expensing reduction) unfolds in the cross-section in a general equilibrium model. Furthermore, Zwick and Mahon (2017) find that the smallest firms respond more strongly than the largest firms. Similarly, in our model, the reallocation that follows the deduction cut is generated by medium-large (specifically not the largest) firms responding the strongest. Ohrn (2018) finds that lower effective tax rates increase firms' investment. Using our model, we also find that lower tax rates stimulate investment, but we can analyse how allocative efficiency and the distribution of resources change in the cross-section.

Bilicka, Güçeri, and Koumanakos (2025) study the impact of dividend taxation on firms. Using differences in legal status to causally identify the effect, they find that affected firms reduce payouts in response to an increase in dividend taxation. Lichter et al. (2025) find that firms reduce R&D spending and patenting when taxes on profits increase. Finally, Link, Menkhoff, Peichl, and Schüle (2023) show that firms decrease planned investment following an unexpected increase in corporate tax rates. All of these responses are consistent with the endogenous dynamics we uncover with our theoretical framework.

2 Institutional Background

The quantitative framework we introduce in the next section captures general economic mechanisms relevant across a wide range of advanced economies. However, we choose to ground our analysis in a specific historical tax reform episode to provide empirical structure. We focus on a sequence of corporate tax reforms implemented in the Netherlands between 2005 and 2007. The reforms, detailed further below, were introduced against the backdrop of rising international tax competition, particularly within Europe, to attract multinational investment and retain successful domestic firms (Tweede Kamer der Staten-Generaal, 2006).

The core feature of the reform was a reduction in the statutory corporate tax rate from 34.5% to 25.5%. By increasing after-tax profits, the government aimed to encourage investment and firm entry, especially from multinationals. Additional changes in the reform concerned loss carryforwards, interest deductibility, preferential tax rates for small and medium-sized enterprises, and deductions for patent-related innovation (Eerste Kamer, 2006).

To offset the tax revenue loss from the rate cuts and exemptions, the reform simultaneously broadened firms' tax base by reducing the tax deductibility of fixed asset investment. Before the reform, firms were able to fully expense eligible investment in the year it occurred. After the reform only 20% of costs could be deducted annually, spreading out the tax benefits of investment.

Our quantitative analysis focuses solely on the headline tax rate cut and fixed asset investment deductibility parts of the Dutch reform. We do not attempt to model any other features for two reasons. First, simultaneous changes to the tax rate and deductibility of investment headline various other corporate tax reforms, such as the 2017 Tax Cuts and Jobs Act in the US and several reforms in the 2010s in the UK. Attempting to model all components of the Dutch reform would reduce the relevance of our model and results to broader policy contexts. Second, isolating just two tax policy levers ensures tractability and highlights mechanisms with direct and well-documented effects on firm-level investment incentives, e.g. Ohrn (2018) and Zwick and Mahon (2017).

Accordingly, analysis should not be interpreted as a full policy evaluation of the Dutch reform. Rather, we combine the reform and our access to exceptionally rich firm-level data to discipline our model and test the allocative implications of a targeted tax policy. In the final section of the paper, we implement a revenue-neutral counterfactual reform and find that its effects on allocative efficiency are quantitatively similar to those of the actual reform.

3 The Model

Our model is based on the framework from Winberry (2021), augmented by endogenous entry and exogenous exit of firms in the spirit of Hopenhayn and Rogerson (1993). The supply side of the economy incorporates an endogenous mass of heterogeneous firms, which produce using capital and labour. Firms pay taxes on their profits and can deduct a portion of their capital investment costs for tax purposes. Furthermore, investment is subject to capital adjustment costs and an irreversibility constraint. The model is closed by a representative household, which consumes, supplies labour and invests in the creation of new firms; and by a government that levies taxes on firms and transfers the revenue back to the household.

3.1 Firms

3.1.1 Production, Investment, and Profits

Time is discrete and indexed by t. A mass of length $\mathcal{M}_t$ of heterogeneous firms populates the economy. Each firm is indexed by the subscript j. At time t, firm j produces output y_{jt} using two inputs, labour l_{jt} and capital k_{jt}. Firm j owns its capital stock - it is not rented from the household. The production function is given by a constant-returns-to-scale Cobb-Douglas technology:

$$y_{jt} = z_{jt} l_{jt}^{1-\alpha} k_{jt}^{\alpha}, \tag{1}$$

in which α represents the output elasticity of capital in the production function. z_{jt} denotes the idiosyncratic productivity level, which follows an AR(1) process in logs, with mean reversion:

$$\log z_{jt+1} = \rho^z \log z_{jt} + (1-\rho^z) \log \bar{z}_{jt} + \omega_{jt}^z, \quad \text{with} \quad \omega_{jt}^z \sim N(0, \sigma^z). \tag{2}$$

The stationary distribution of the productivity process in levels is given by a log-normal distribution, which we call $G(z)$. Upon entering a period t, firms observe a new productivity draw, their pre-existing stock of capital k_{jt}, and their tax deduction allowance d_{jt}, which we define below. Within each period, firms hire l_{jt} workers at the aggregate wage w_t to produce. The labour choice is fully static. Firms also choose investment into new capital i_{jt}.[3] The investment choice is dynamic. Given that investment choice i_{jt}, firm j's capital evolves according to the following law of motion:

$$k_{jt+1} = (1-\delta)k_{jt} + i_{jt}. \tag{3}$$

Whenever investment is non-zero, firms incur a convex adjustment cost $\mathcal{C}_{jt}$. The cost is measured in terms of output, and is defined in more detail below.

We move on to corporate taxation. To mimic real corporate tax codes, labour and investment are subject to differential tax treatment. While labour costs are fully deductible in the period in which they occur, only a fraction $\hat{\delta}$ of investment costs are deductible. We assume a geometric deduction scheme: the fraction of investment that is not deducted in period t is carried over to the following period, together with any remaining pre-existing allowance d_{jt}.[4] Therefore, the deduction allowance evolves with the following law of motion:

$$d_{jt+1} = (1-\hat{\delta})\left(d_{jt} + i_{jt}\right). \tag{4}$$

Then, firm profits π_{jt} are equal to disposable income $\mathcal{I}_{jt}$, i.e. *before-tax* profits, minus taxes paid on taxable income $\mathcal{T}_{jt}$ and adjustment costs $\mathcal{C}_{jt}$:

$$\pi_{jt} = \mathcal{I}_{jt} - \tau\mathcal{T}_{jt} - \mathcal{C}_{jt}. \tag{5}$$

$\mathcal{I}_{jt}$ denotes the disposable income, which is defined as revenues net of period-t costs:

$$\mathcal{I}_{jt} = y_{jt} - w_t l_{jt} - i_{jt}.$$

[3]When simulating the model, we assume investment is irreversible, i.e. $i_{jt} \geq 0$, although results are similar if we allow for direct disinvestment.

[4]Although in the data depreciation schemes are often linear, working with a geometric scheme comes with computational advantages and does not diverge significantly from the data. For a futher discussion, see Furno (2021) and Winberry (2021).

$\mathcal{T}_{jt}$ represents the taxable income, which is taxed at the linear corporate tax rate τ:

$$\mathcal{T}_{jt} = y_{jt} - w_t l_{jt} - \hat{\delta}\left(i_{jt} + d_{jt}\right).$$

Taxable income is equal to output net of fully deductible labour costs $w_t l_{jt}$ and partially deductible investment costs $\hat{\delta}\left(i_{jt} + d_{jt}\right)$. We assume the adjustment costs are convex and given by the following function form, as in Winberry (2021):

$$\mathcal{C}_{jt} = \frac{\psi}{2}\left(\frac{i_{jt}}{k_{jt}}\right)^2 k_{jt} \equiv \mathcal{C}\left(i_{jt}, k_{jt}\right).$$

Note that we assume that the price of output (consumption) is the numeraire, so revenues $p_t y_{jt}$ are equivalent to output y_{jt}.

For the remainder of this subsection, it is easier to formulate the firm maximisation problem in a recursive way. Let x' indicate the next-period value of a variable x. The state variables for a firm are then given by current productivity z, the existing capital stock k, and the deduction allowance d, which together fully indentify each firm j. Therefore, we represent the state variables for a firm with the triplet $\{z, k, d\}$ and express the Bellman equation as:

$$V(z, k, d; \mu) = \max_{i,l}\{\pi(\mu) + (1-\gamma)\,\mathbb{E}\left[\Lambda(\mu)V(z', k', d'; \mu')|z, k, d, \mu\right]\}.$$

μ represents the aggregate distribution of firms over the individual states, $\Lambda(\mu)$ stands for the stochastic discount factor, and γ is the probability of receiving an exit shock in between periods. We discuss entry and exit futher below. Substituting in the production function, adjustment cost function and the two laws of motion, the Bellman equation can be rewritten as:

$$\begin{aligned} V(z, k, d; \mu) &= \tau\hat{\delta}d + (1-\tau)\max_{l}\{\left[z l^{1-\alpha} k^{\alpha} - w(\mu) l\right]\} + \\ &+ \max_{i}\{-\left(1-\tau\hat{\delta}\right) i - \frac{\psi}{2}\left(\frac{i}{k}\right)^2 k + (1-\gamma)\,\mathbb{E}\left[\Lambda(\mu)V(z', k', d'; \mu')|z, k, d, \mu\right]\}, \end{aligned} \tag{6}$$

such that:

$$\log z' = \rho^z \log z + (1-\rho^z)\log\bar{z} + \omega^z, \quad k' = (1-\delta)k + i \quad \text{and} \quad d' = (1-\hat{\delta})(d+i).$$

The rewritten Bellman equation makes it clear that the firm maximisation problem leads to two policy functions. The first maximisation shows the optimal labour demand choice $l^* (z, k, d; \mu)$ is static and chosen such that the marginal product of labour $(1-\alpha)z\,(l/k)^{-\alpha}$ equals the aggregate wage $w(\mu)$. Second, the dynamic optimal investment chice $i^* (z, k, d; \mu)$ will equate the current marginal costs to future marginal benefits of investment.

Higher investment now leads to an increase in current costs due to foregone profits and adjustment frictions. On the other hand, higher investment increases a firm's value by accumulating more future capital and tax deduction allowance. An increase in capital raises future profits through both increased revenues and lower adjustments costs, while an increase in the deduction allowance increases future (after-tax) profits, since it lowers tax payments by raising the tax shield.

3.1.2 Entry, Exit, and the Distribution of Firms

Entry is endogenous. An unbounded mass of potential entrants is prepared to join the economy in every period t. Entry occurs up to the point where the expected value of the entry equals entry costs $w_t c_e$, which we assume are paid in terms of labour. We denote the mass of entrants in period t by M_t. Entrants learn their productivity only after paying the entry cost, which they draw from the stationary distribution $G(z)$. Entrants immediately start producing with an initial level of capital k_0 and zero deduction allowance.[5] Hence, the free entry condition is given by:

$$\int V(z, k_0, 0; \mu_t) dG(z) = w_t c_e. \tag{7}$$

On the other hand, we assume exit is exogenous. Exit occurs between periods with probability γ. To support of our assumption, we appeal to Kindsgrab (2022), who finds that tax rate changes only affect entry and not exit of firms.

[5]Entrants start with a low but non-zero level of capital to avoid numerical complications that arise when capital is zero, i.e. output would remain at zero and adjustment costs would tend to infinity. An interpretation of this assumption is that a fraction θ of entry costs can be immediately turned into capital or that paying the entry cost raises equity to begin operating.

Given entry, exit, and firms' optimal policy functions, the evolution of the distribution $\mu(z_t, k_t, d_t)$ satisfies:[6]

$$\mu(z_{t+1}, k^*(z,k,d;\mu_t), d^*(z,k,d;\mu_t)) = (1-\gamma)\mu(z_t,k_t,d_t)F(z_{t+1}|z_t), \tag{8}$$

for $d_t > 0$ and $k_t \neq k_0$. $F(z_{t+1}|z_t)$ represents the transition probability from productivity z_t to z_{t+1}, $k^*(z,k,d;\mu_t)$ and $d^*(z,k,d;\mu_t)$ represent, respectively, the optimal capital and deduction chosen for period $t+1$ by a firm with type (z,k,d) in period t.[7] Moreover, we have:

$$\mu(z_{t+1}, k^*(z,k_0,0;\mu_t), d^*(z,k_0,0;\mu_t)) = (1-\gamma)\left[\mu(z_t,k_0,0) + M_t G(z)\right] F(z_{t+1}|z_t), \tag{9}$$

for $d_t = 0$ and $k_t = k_0$, as entrants must be included in the transition as well.

3.2 Households

We close the model with a representative household and a government. The representative household consumes, supplies labour, and invests in the creation of new firms.[8] By choosing labour supply N_t^s and consumption C_t, the household maximizes expected, discounted lifetime utility:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(\log C_t - \nu N_t^s\right), \tag{10}$$

subject to:

$$C_t + M_t w_t c_e = w_t N_t^s + \Pi_t + T_t, \tag{11}$$

in which Π_t represents total profits earned by firms and T_t are government transfers. Combining the first-order conditions (F.O.C.s) of labour and consumption we get the standard optimal intra-temporal condition between consumption and labour supply:

$$\nu C_t = w_t., \tag{12}$$

[6] For ease of notation, here we represent the transition in a discretized state-space, in which transition probabilities for productivity are described by a discrete Markov process, similarly to our numerical solution method. The logic is the same in continuous space.

[7] This implies $k^*(z,k,d;\mu_t) = (1-\delta)k_t + i^*(z,k,d;\mu_t)$ and $d^*(z,k,d;\mu_t) = (1-\hat{\delta})(d_t + i^*(z,k,d;\mu_t))$

[8] Alternatively, we could load the payment of entry costs directly on firms, such that the profits of entrants are lower due to the payment of entry costs. Since the household owns all firms, in the aggregate this is the same.

3.3 Government

The government levies taxes on firms. The proceeds T_t are then transferred lump-sum to households. T_t is given by:

$$T_t = \tau \left(\underbrace{Y_t - w_t N_t}_{\text{Net revenues}} - \underbrace{\hat{\delta} \left(D_t + I_t \right)}_{\text{Tax deductions}} \right). \tag{13}$$

Y_t represents aggregate production, N_t is the total labour used in production, and D_t and I_t indicate the aggregate stock of deduction allowances and investment, respectively.

3.4 Aggregation and Market Clearing

Total labour demanded from households by firms is either used in production or to cover entry costs:

$$N_t^d = M_t c_e + N_t = M_t c_e + \int l^*(z, k, d; \mu_t) \mu(dz, dk, dd).$$

In equilibrium, labour demanded equals labour supplied:

$$N_t^d = N_t^s.$$

Total production, net of investment and total resources *dissipated* for adjustment costs (AC_t), is used for consumption by the household:

$$C_t = Y_t - I_t - AC_t = \int \left[y^*(z, k, d; \mu_t) - i^*(z, k, d; \mu_t) - \mathcal{C}^*(z, k, d; \mu_t) \right] \mu(dz, dk, dd). \tag{14}$$

Finally, total profits Π_t earned in the economy are equal to:

$$\Pi_t = \int \pi^*(z, k, d; \mu_t) \mu(dz, dk, dd).$$

in which $\pi^*(z, k, d; \mu_t)$ refers to the profit a firm earns under the optimal policy functions.

3.5 Equilibrium

In the exercises we present below, we solve for the stationary equilibrium and compare different steady-state equilibria. The steady states differ because we vary the corporate tax rate τ and the deduction allowance parameter $\hat{\delta}$. Given a collection of exogenous parameters, the stationary equilibrium is defined as:

(1) A distribution of firms $\bar{\mu}$ such that $\bar{\mu}(z_{t+1}, k_{t+1}, d_{t+1}) = \bar{\mu}(z_t, k_t, d_t)$, for all z, k, d.

(2) An equilibrium wage $\bar{w}$ which solves the free entry condition in (7),

(3) A mass of entrants $\bar{M}$ which solves market clearing from equation (14).

(4) A steady-state stochastic discount factor $\bar{\Lambda} = \beta$.

(5) A collection of policy functions $\bar{l^*}$ and $\bar{i^*}$, which solve the firms' maximization problem, given $\bar{\Lambda}$, $\bar{\mu}$ and $\bar{w}$,

(6) An aggregate $\bar{T}$ from (13), and $\bar{\Pi}$, $\bar{I}$, $\bar{C}$, $\bar{N}$, $\bar{N^s}$, $\bar{N^d}$ which solve the aggregation conditions in section 3.4.

4 Calibration

To analyse the effect of the corporate tax reform through the lens of our model, we calibrate the model parameters using balance sheet information covering the universe of tax-paying, non-financial Dutch firms from 2000 to 2004. The data are provided by Statistics Netherlands.

First, though, we set several parameters externally. The top panel of Table 1 shows we set $\{\alpha, \beta, \gamma\}$ to match the labour share, real interest rate, and firm exit rate in the Dutch economy. We assign the economic depreciation rate δ and the persistence of the productivity process ρ^z with standard values from the literature, such as the calibration in Winberry (2021). Lastly, we use the balance sheet data of firm-level value-added, capital stock, and employment to estimate the mean and the median of the productivity distribution, following Ackerberg, Caves, and Frazer (2015). The estimation method is applied in numerous studies of firm-level productivity in the Netherlands and other countries, such as Bartelsman, Dobbelaere, and Mattioli (2024) and De Loecker, Eeckhout, and Unger (2020). We then back out the remaining AR(1) parameters, σ^z and $\bar{z}$, by calibrating them such that the implied stationary distribution, given ρ^z, displays the observed median and mean.

The three remaining parameters $\{\psi, c_e, \nu\}$ are calibrated internally by matching two targets and making a normalisation. Recall, ψ represents the coefficient on the capital quadratic adjustment cost $\mathcal{C}$. We calibrate ψ to match the pre-reform investment to GDP ratio of 0.16. Next, to calibrate c_e (the entry cost scaled by $1/w_t$), we exploit the fact that the balance sheet data allows us to differentiate between production and non-production costs. Unfortunately, we cannot distinguish between production and non-production labour (costs), which is the model equivalent. We acknowledge the mapping from the data to the model is imperfect, but still target the 7% ratio of non-production to total production costs to calibrate c_e. Note that c_e and ψ are jointly calibrated to match the two targets above. Lastly, ν represents the disutility of labour from the household's perspective. By combining the household's FOC in equation (12) and aggregate market clearing in equation (14), we set ν such that the mass of entrants in the pre-reform steady-state is normalised to 1. The bottom panel of Table 1 shows the calibrated values for $\{\psi, c_e, \nu\}$.

Once calibrated, our model reproduces several untargeted moments from the data. Table 2 shows we match the empirical tax to GDP ratio and the effective tax rate that firms pay. Then, Table 3 shows we match the cross-sectional distribution of capital across firms. For example, we match the high Gini coefficient and share of aggregate capital held by the 0-50th, 50-95th, and 95th+ percentiles of the firm capital distribution. We match the employment distribution less closely because employment is more equally distributed in the data than in our model. Therefore, we only focus our results section on the misallocation and reallocation of capital, leaving the discussion for labour to the appendix. Lastly, our model replicates the empirical pattern that the investment rate (investment over capital) decreases with firm size.

Table 1: **Calibration (internal and external).**

Parameter	Description	Value	Target
External			
α	Capital output elasticity	0.32	Labour share 0.68%
γ	Exit rate	0.10	Annual exit rate 10%
β	Discount factor	0.99	Annual real interest rate $\approx$ 1%
δ	Depreciation	0.03	Standard, Winberry (2021)
ρ^z	AR(1) persistance	0.90	Standard, Winberry (2021)
σ^z	AR(1) volatility	0.36	ACF (2015) estimation
$\log \bar{z}$	AR(1) uncond. mean	-0.24	ACF (2015) estimation

Parameter	Description	Value	Target	Model	Data
Internal					
ψ	Adjustment cost	0.05	Investment / GDP	0.15	0.16
c_e	Entry cost	8.93	Fixed / total costs	0.07	0.07
ν	Disutility of labour	0.01	Mass of entrants	$M = 1$	Normalisation

Notes: This table shows externally and internally set parameters and indicates the moments we target in our estimation. The 'External' panel shows parameters we set externally, following values from the literature or our own productivity estimation. The 'Internal' panel shows the parameter values that result from our own calibration using the targets from the data. All data moments are measured using data from 2000 to 2004, before the tax reform.

5 Quantitative Results

We now use the calibrated model to explore how changes in corporate tax parameters affect allocative efficiency and the firm size distribution. In practice, we estimate and compare four different long-run steady states of the economy: the pre-reform economy, the post-reform economy, and a counterfactual version of the economy in which we reduce only the tax rate τ or only the deductibility parameters $\hat{\delta}$. Table 4 shows the four sets of tax parameters we use for each equilibrium.

We evaluate allocative efficiency through two complementary lenses: i) misallocation, measured as the cross-sectional variance in the logarithm of the marginal product of capital, as in Hsieh and Klenow (2009); and ii) aggregate productivity, defined as the Solow residual of aggregate output. Concretely, the misallocation of capital is given by:

$$\mathrm{M}_k = \mathrm{Var}\left(\log\left(\alpha z k^{\alpha-1} l^{1-\alpha}\right)\right). \tag{15}$$

Table 2: **Untargeted moments of the pre-reform economy.**

	Tax-to-GDP ratio	Effective tax rate
Data	0.05	0.18
Model	0.04	0.15

Notes: This table shows the data and model moments of the tax-to-GDP ratio (taxes paid / sum of value-added) and the effective tax rate (taxes paid / taxable income before investment deductions). All data moments are measured using data from 2000 to 2004, before the tax reform.

Drawing on Hsieh and Klenow (2009), in a frictionless and perfectly competitive economy, all firms face the same input prices, which equalises marginal products across firms. The presence of convex adjustment costs and irreversible investment in our model leads firms to over- or under-invest relative to the frictionless benchmark, resulting in the misallocation of resources. For example, after a favourable productivity shock, a small firm may want to quickly scale up by investing, but the convex adjustment makes the cost prohibitive, and so the firm stays below its optimal size.

Next, we define aggregate productivity as the Solow residual of aggregate output:

$$Z = \frac{Y}{K^{\alpha} L^{1-\alpha}} \tag{16}$$

in which $Y = \int y^* (z, k, d; \mu) \, \mu \, (dz, dk, dd)$, $K = \int k^* (z, k, d; \mu) \, \mu \, (dz, dk, dd)$, and $L = \int l^* (z, k, d; \mu) \, \mu \, (dz, dk, dd)$. Since we assume the stationary productivity distribution $G(z)$ does not change across steady states, any changes in aggregate productivity reflect resources moving towards more or less productive firms. Table 5 shows that the full reform raises aggregate productivity by 1.3%, and reduces capital misallocation by 4.3%, relative to the pre-reform benchmark.[9]

In the last two columns of Table 5, we see that the deductibility cut alone raises productivity by 1.1% and reduces capital misallocation by 2.9%, accounting for the bulk of the aggregate effect. The rate cut by itself has a negligible direct effect on productivity (−0.0%) and modestly reduces capital (−2.0%). Our model suggests the

[9] All discussions about labour misallocation can be found in Appendix A.

Table 3: **Untargeted moments of the pre-reform economy.**

	Capital	Employment	
Gini			
Data	0.95	0.84	
Model	0.92	0.91	
	Share of agg. capital	Share of agg. employment	Investment rate
Top (95 pct.)			
Data	88.47	69.25	0.11
Model	81.43	91.78	0.08
Middle (50-95 pct.)			
Data	10.82	26.41	0.20
Model	17.52	4.19	0.35
Bottom (0-50 pct.)			
Data	0.71	4.35	0.26
Model	0.01	4.02	0.98

Notes: This table shows the data and model moments of several measures of the firm distribution for capital, labour, and the investment rate (investment over capital). 'Gini' represents the cross-sectional Gini measure of inequality across firms. 'Top (95 pct.)' panel shows the share of aggregate capital and employment, and the average investment rate held by the largest 5% of firms. The same applies to the 'Middle (50-95% pct.)' and 'Bottom (0-50% pct.)' panels. The 'Investment rate' variable corresponds to the average investment rate for firms within each of the size bins, based on capital. All data moments are measured using data from 2000 to 2004, before the tax reform.

base-broadening element of the reform, not the rate cut, is primarily responsible for improved allocative efficiency. In a robustness exercise in subsection 5.2, we show that the finding is not purely an artifact of the Dutch reform. We implement a budget-neutral version of the Dutch reform and show that the deduction cut still dominates the rate cut. The allocative efficiency results are also unchanged.

Before turning to the mechanisms behind the allocative efficiency gains, we examine how the reform reallocates capital across firms of different sizes and productivity levels. The reallocation is a key channel through which the efficiency improvements arise.

To illustrate the redistribution of capital, we split firms into three bins based on their capital stock (i.e. size). Because each steady state in our quantitative analysis represents a distinct equilibrium, we cannot track firms' transitions. However, comparing the

Table 4: **Four simulated steady states**

Steady state	Corporate tax rate (τ)	Deduction allowance ($\hat{\delta}$)
Pre-reform	0.345	1
Post-reform	0.255	0.2
Tax-only	0.255	1
Deduction-only	0.345	0.2

Notes: This table shows the values for the corporate tax rate τ and tax deduction parameter $\hat{\delta}$ in each of the four long-run equilibrium we simulate. They correspond to the pre- and post-reform Dutch parameters and two steady-states in which we vary only τ or $\hat{\delta}$.

Table 5: **Percentage change in variable, relative to pre-reform economy.**

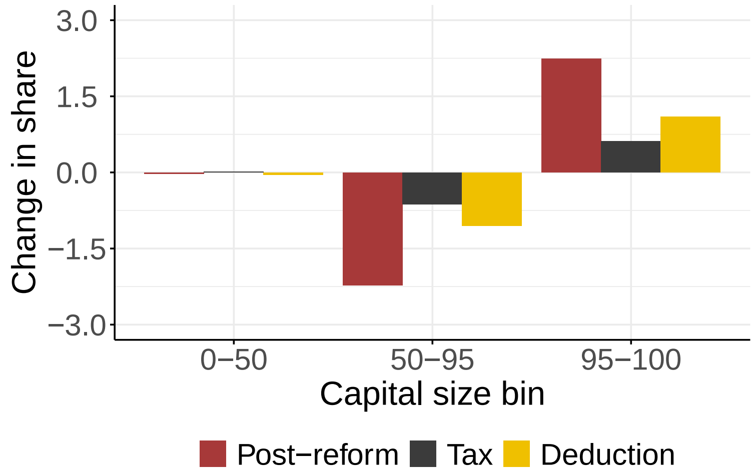
Variable	Post-reform	Tax-only	Deduction-only
Aggregate productivity	1.3	−0.0	1.1
Capital misallocation	−4.3	−2.0	−2.9

Notes: This table shows the percentage change in aggregate productivity and capital misallocation, relative to the Pre-reform steady-state, for each of the other steady-states.

share of aggregate capital held by each size group provides equivalent insights into the reallocation of capital. Figure 1 groups firms into the smallest 50%, the largest 5%, and the remainder ('medium-large' firms), following the same bins used for the data analysis in Table 3. Each bar shows by how much the share of aggregate capital held by firms in each size bin changes relative to the pre-reform economy. In all three tax regimes, almost all of the reallocation of aggregate capital occurs between medium-large firms and the largest 5%. The largest 5% gain 2.2 percentage points (pp) of the aggregate capital stock in the full reform. Medium-large firms lose nearly all of that share. In the Tax-only reform, the reallocation effect is more muted (+0.6pp) compared to the Deduction-only reform (+1.1pp).

Figure 2 replicates the reallocation analysis, now sorting firms into productivity bins. The top 5% most productive firms increase their share of aggregate capital by 1.5pp in the post-reform steady state. Therefore, in all three tax reform scenarios, capital shifts toward the largest and most productive firms, which reduces capital misallocation and raises aggregate productivity. In the next section, we examine the mechanisms

Figure 1: **Change in share of capital, by capital size bin.**



Notes: This graph shows the change in the share of aggregate capital held by the smallest 50%, middle 50-95%, and top 5% largest firms based on their capital stock, k. All bars are relative to the share of capital held by firms in each size bin in the pre-reform economy.

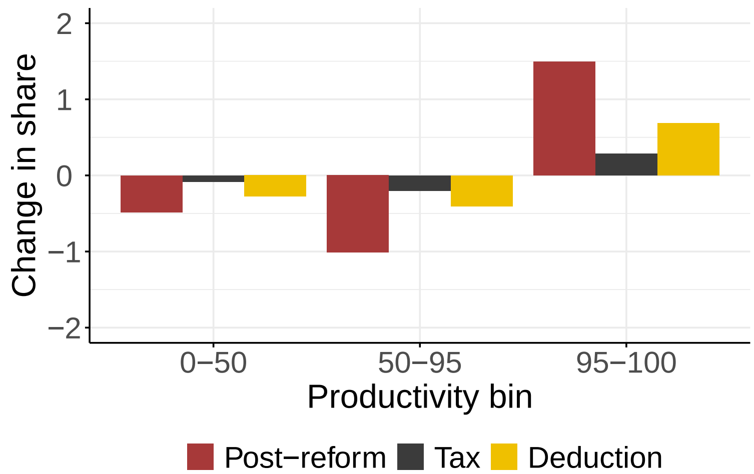
driving these effects.

5.1 Mechanisms Behind the Reallocation

The full reform triggers two reinforcing mechanisms that reallocate capital toward the largest and most productive firms. The lower tax rate in the reform increases after-tax profits for all firms. The largest windfall gains go to the most profitable firms, which, in our model, are also typically the largest and most productive. Therefore, the windfall gains accrue disproportionately to the largest and most productive firms. Then, these firms expand, pulling resources away from smaller and less profitable competitors.

A lower deduction allowance reduces all firms' tax shield and delays the tax benefits of investment. Medium-large firms, whose growth strategies rely on aggressive capital investment, are disproportionately burdened by the reduction in investment tax benefits. Recall, as shown in Table 3, medium-large firms invest more intensively than the top 5% largest firms. In the pre-reform economy, the average investment rate

Figure 2: **Change in share of capital, by productivity bin.**



Notes: This graph shows the change in the share of aggregate capital held by the least 50%, middle 50-95%, and top 5% most productive firms. All bars are relative to the share of capital held by firms in each productivity bin in the pre-reform economy.

for medium-large firms is 35%, compared to just 8% for the largest firms, who invest primarily to maintain their existing scale. Therefore, the deduction cut leads medium-large firms to retrench by reducing their capital investment relative to the top 5%.

5.2 Budget-Neutral Reform

In the previous sections of the paper, our goal was to study the effects of a targeted corporate tax policy change. Even though the reduced investment deduction component was meant to compensate for the expected loss in revenue due to the tax rate cut, we did not impose the policy to be budget-neutral in our simulations. By simulating a budget-neutral reform, we show that our allocative efficiency and reallocation results are not caused by general equilibrium effects in an unbalanced reform, and we cross-validate our model's tax revenue predictions.

Practically, to implement the budget-neutral reform, we conduct the following thought-experiment. Imagine the goal of the government is still to impose the same tax rate cut as in the full reform, then to what value does the deduction parameter $\hat{\delta}$ need to be set to keep the tax revenue the same as in the pre-reform steady state?

First, we find that the value for $\hat{\delta}$ is 0.238, rather than $\hat{\delta} = 0.2$ as it was actually implemented, which confirms the validity of our framework in matching the actual trade-offs of Dutch policymakers. Second, in Table 6, we show that the change in misallocation and aggregate productivity in the budget-neutral reform mimics the one in the full reform: relative to the pre-reform, the slightly smaller reduction in $\hat{\delta}$ leads to similar, but smaller, increases in productivity and decreases in capital misallocation. We view these results as a further validation of our calibrated model and our application to capture realistic firm dynamics.

Table 6: **Percentage change in variable in the full reform and the budget-neutral reform.**

Variable	Post-reform	Budget-neutral reform
Aggregate productivity	1.3	0.9
Capital misallocation	−4.3	−3.9

Notes: This table shows the percentage change in aggregate productivity and capital misallocation, relative to the pre-reform steady-state, for the full reform and the budget-neutral reform.

6 Conclusion

How do allocative efficiency and the distribution of capital across firms respond to corporate tax reforms? We present and calibrate a quantitative heterogeneous firm model to answer the question. We simulate a Dutch corporate tax reform that reduced the corporate tax rate and the tax deductibility of investment simultaneously. Our model predicts that the full reform led to a 1.3% increase in aggregate productivity and a 4.3% decline in capital misallocation, as a result of significant reallocation of capital to the largest and most productive firms, away from medium-large firms. On the one hand, the lower tax rate generates the biggest after-tax windfall for the most profitable (the largest) firms, allowing them to expand the most. On the other hand, the lower tax deductibility represents a cost for all firms, but because medium-large firms invest aggressively relative to their size, they experience the largest drop in investment and capital.

The results are robust to an alternative experiment in which we constrain the reform to be budget neutral.

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Appendix A

In this section, we complement our results on capital misallocation and reallocation with the corresponding results for labour. We opt to do so in the appendix because our calibrated model matches the cross-sectional employment distribution less closely than the capital distribution. First, we highlight how the tax reforms changed entry and wages. Second, we analyse the effect of the three tax simulations on labour misallocation, and we show the reallocation of employment between size bins. Finally, we show the labour misallocation results for the budget-neutral reform.

Before evaluating changes in labour misallocation, the top two rows in Table 7 reference the percentage change in the mass of entrants and wage relative to the pre-reform economy. In both the Post-reform and Deduction-only economy, capital investment becomes more expensive since the (real) wage falls. In the Tax-only reform, the entry and labour demand grow, and so the wage rises.

Table 7: **Percentage change in variable, relative to pre-reform economy.**

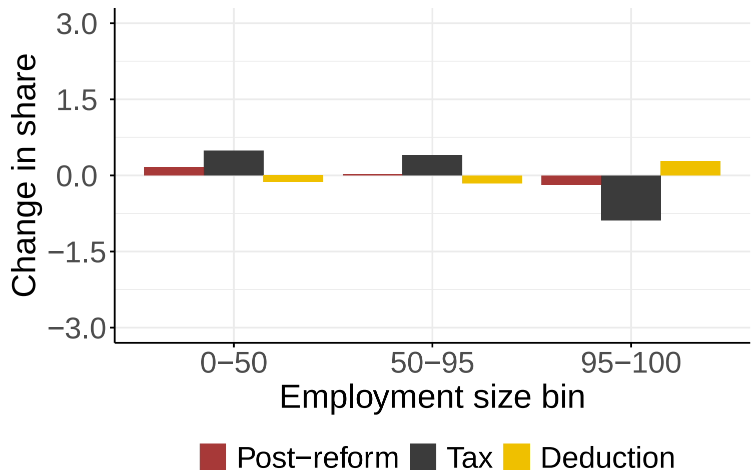
Variable	Post-reform	Tax-only	Deduction-only
Entrants	3.7	12.8	−1.9
Wage	−0.7	1.7	−2.7
Labour misallocation	−1.1	−0.1	−1.4

Notes: This table shows the percentage change in the number of entrants, the wage, and labour misallocation, all relative to the pre-reform steady-state, for each of the other steady-states.

To illustrate the reallocation of labour across firms, Figure 3 shows the change in the share of aggregate labour held by firms in three size bins. We split firms into the smallest 50%, the largest 5%, and the remaining ('medium-large') firms based on labour. In contrast to the similar figure based on capital in Figure 1, labour substitutes towards small and medium-large firms in the post-reform economy. The reason is that when the aggregate wage falls, the firms substitute towards using labour. Therefore, we see in the third row of Table 7 that labour misallocation falls only by 1.1%, much less than capital misallocation, which falls by 4.3%.

Lastly, Table 8 shows that the decline in labour misallocation is larger in the budget-

Figure 3: **Change in share of employment, by employment size bin.**



Notes: This graph shows the change in the share of aggregate labour held by the smallest 50%, middle 50-95%, and top 5% largest firms based on their labour, l. All bars are relative to the share of labour held by firms in each size bin in the pre-reform economy.

neutral reform compared to the full reform. The reason is that the aggregate wage does not fall by as much as in the full reform compared to the budget-neutral reform. Therefore, unproductive, small, and medium-large firms substitute capital less for labour, which strengthens the decline in misallocation.

Table 8: **Percentage change in variable in the full reform and the budget-neutral reform.**

Variable	Post-reform	Budget-neutral reform
Labour misallocation	−1.1	−1.4

Notes: This table shows the percentage change in aggregate productivity, and capital and labour misallocation, relative to the pre-reform steady-state, for the full reform and the budget-neutral reform.