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Effective tax rates, endogenous mark-ups and heterogeneous firms☆

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ABSTRACT

We provide a new explanation why the effective tax rate is smaller for larger firms, even in the absence of common channels such as profit shifting and lobbying activities. This result emerges in a heterogeneous firms model with endogenous markups based on Melitz & Ottaviano (2008). Our framework features imperfect pass-through of corporate taxes into prices and partial deductibility of production costs. Corporate taxes reduce mark-ups and hence pre-tax profits, especially for high cost firms. As production costs are only partially deductible, low productivity firms are relatively more responsive to tax policy than high productivity firms. We further show that shocks which affect mark-ups through the toughness of competition, such as trade liberalization, reinforce the heterogeneity in effective tax rates across firms.

1. Introduction

There is an ongoing and controversial public debate on the relatively low tax payments of large companies. In the period 2008–2015, the statutory corporate tax rate in the US was 35 percent. However, the most profitable companies out of the Fortune 500 paid on average an effective tax rate of only 21.2 percent on their profits (Institute on Taxation and Economic Policy, 2017). Typical explanations for this observation are profit shifting of large multinational firms (Desai et al., 2006; Gumpert et al., 2016; Davies et al., 2018) and better coordinated lobbying activities (Bombardini, 2008; Richter et al., 2009).

In this paper, we provide a new explanation why the effective tax rate is smaller for larger firms even in the absence of profit-shifting or lobbying. All we need for our argument is that mark-ups are endogenous and production costs are only partially tax deductible. We argue that this channel should be taken into account in empirical research and in the debate on policy measures addressing tax evasion.

To derive our results, we introduce tax policy in a general equilibrium model with firm heterogeneity and endogenous mark-ups following Melitz and Ottaviano (2008). Tax policy is determined by two instruments: a tax rate on profits and a share of production costs that is tax deductible.[2] With linear demand, there is only imperfect pass-through of taxes into prices which reduces mark-ups in particular for high cost firms. As the latter face more price sensitive consumers and can only deduct a fraction of their large production costs, they respond stronger to changes in tax policy. Consequently, the tax burden relative to pre-tax profits is larger for small firms.

Importantly, this result hinges on the demand structure that features endogenous and firm-specific mark-ups. Empirical evidence shows indeed that more productive firms charge higher mark-ups (De Loecker and Warzynski, 2012; Bellone et al., 2016). However, the existing literature on firm heterogeneity and corporate taxation typically builds on CES preferences (Baldwin and Okubo, 2009; Davies and Eckel, 2010; Krautheim and Schmidt-Eisenlohr, 2011; Bauer and Langenmayr, 2013; Haufler and Stähler, 2013; Bauer et al., 2014). In such a framework, prices are set as a constant mark-up over marginal costs and our result would not emerge as firms perfectly pass on taxes to consumers.

In the public debate, globalization is perceived as an important driving force for the heterogeneity in effective tax rates across firms as it facilitates profit-shifting of large companies. We provide a new explanation for this observation by showing how general equilibrium effects change the effective tax payments of heterogeneous firms. Shocks which affect mark-ups through the toughness

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[2] These measures have been used in recent tax-rate-cut-cum-base-broadening reforms in OECD countries (Haufler and Langenmayr, 2015).

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of competition, such as trade liberalization, reinforce the heterogeneity in relative tax payments across firms. The reason behind this result is that a larger market enhances firm entry which at the same time increases competition and hence, compresses mark-ups in particular for small firms.

2. The model

We introduce corporate tax policy in a heterogeneous firms model à la Melitz and Ottaviano (2008) and highlight novel results compared to an alternative framework with CES preferences (see Appendix).

2.1. Consumers

We consider an economy that is endowed with L consumers each holding one unit of capital which is the sole production factor. Consumers maximize utility over a continuum of differentiated varieties indexed by $i \in \Omega$, and a homogeneous outside good q_0^c which is chosen as numeraire. Utility is given by:

$$U = q_0^c + \alpha \int_{i\in\Omega} q_i^c di - \frac{1}{2}\gamma \int_{i\in\Omega} \left(q_i^c\right)^2 di - \frac{1}{2}\eta \left(\int_{i\in\Omega} q_i^c di\right)^2, \quad (1)$$

where γ indexes the degree of product differentiation between the varieties. If $\gamma = 0$, products are perfectly substitutable and consumers only care about total consumption $Q^c = \int_{i\in\Omega} q_i^c di$. Moreover, α and η determine the substitutability between the outside good and the differentiated varieties. Utility maximization leads to inverse demand:

$$p_i = \alpha - \gamma q_i^c - \eta Q^c. \quad (2)$$

By aggregating demand of L consumers, we derive direct market demand q_i

$$q_i = \frac{\alpha L}{(\gamma + \eta N)} - \frac{L}{\gamma} p_i + \frac{\eta N}{\gamma + \eta N} \frac{L}{\gamma} \overline{p}. \quad (3)$$

We define $\Omega^* \subset \Omega$ as the subset of varieties for which $q_i > 0$, consisting of N varieties with average price $\overline{p} = (1/N) \int_{i\in\Omega^*} p_i di$. Eq. (3) shows that demand for variety i falls to zero if

$$p_i = p^{\max} = \frac{1}{(\gamma + \eta N)} (\alpha\gamma + \eta N \overline{p}). \quad (4)$$

This is an important difference to CES demand systems and implies that the price elasticity of demand $\varepsilon_i \equiv \frac{\partial q_i}{\partial p_i} \frac{p_i}{q_i} = \left(\frac{p^{\max}}{p_i} - 1\right)^{-1}$ is not constant. Eq. (4) shows that tougher competition (increase in N or decrease in $\overline{p}$) increases the price elasticity for a given price level p_i.

2.2. Firm behaviour

Producing one unit of the numeraire q_0 requires one unit of capital. The market for this good is perfectly competitive and it is sold at $p_0 = 1$, which fixes the returns to capital to unity. The differentiated sector is characterized by monopolistic competition. Firms pay fixed costs f_E to enter the market and draw marginal costs c from a distribution $G(c)$ with support on $[0, c_M]$. Hence, the productivity of a firm is determined by $\frac{1}{c}$. Given that the payment of f_E is sunk, all firms that generate non-negative after-tax profits survive and produce.

We follow Bauer et al. (2014) and introduce two policy instruments: (i) the tax rate t and (ii) a tax deductibility parameter $\beta < 1$. The latter determines the tax base which is given by the firm's revenue less a tax-deductible share β of the variable production costs. We assume that tax revenues are redistributed to consumers.[3] After-tax profits $\pi(c)$ of a firm with cost draw c are given by

$$\pi(c) = \underbrace{(p(c) - c) q(c)}_{\text{Pre-tax profits}} - t \underbrace{(p(c) - \beta c) q(c)}_{\text{Tax base}}. \quad (5)$$

Eq. (5) can be rewritten as follows:

$$\pi(c) = (1-t)[p(c) - \Psi c] q(c), \quad (6)$$

where we denote $\Psi = \frac{(1-t\beta)}{(1-t)}$ as the tax factor which represents effective capital costs. We assume partial deductibility of production costs $\beta < 1$ implying that the tax factor is larger than one and rises in the corporate tax rate.[4]

Given the existence of a choke price $p^{\max}$, all firms with effective costs Ψc larger than $p^{\max}$ have to exit the market. We denote c_D as the cost draw of a firm that breaks even, i.e. $p^{\max} = \Psi c_D$.[5] All firm performance measures can now be written as a function of the cost draw c and the endogenous cost cutoff c_D:

$$p(c) = \frac{\Psi}{2}(c_D + c), \quad (7)$$

$$\mu(c) = \frac{\Psi}{2}(c_D - c), \quad (8)$$

$$q(c) = \frac{L\Psi}{2\gamma}(c_D - c), \quad (9)$$

$$\pi(c) = (1-t)\frac{L\Psi^2}{4\gamma}(c_D - c)^2, \quad (10)$$

whereas $\mu(c) = p(c) - \Psi c$ denotes the mark-up of a firm with cost c.

More productive firms set lower prices and earn higher revenues as well as profits than less productive firms. Importantly, and in contrast to a framework with CES preferences, more productive firms do not pass on all of their lower production costs to consumers but set higher mark-ups than firms with larger costs. Firm performance measures in Eqs. (7)–(10) are affected by tax policy in two ways: (i) a direct effect through Ψ and (ii) an indirect effect via changes of the cost cutoff c_D. We discuss these effects in the next section.

2.3. Free entry and equilibrium

The equilibrium is determined by two conditions. Following Eq. (4), the zero profit condition relates the cost cutoff $c_D = \frac{p^{max}}{\Psi}$ to the endogenous number of firms and is given by:

$$c_D = \frac{1}{\Psi(\gamma + \eta N)}(\alpha\gamma + \eta N \overline{p}), \quad (11)$$

whereas the average price is $\overline{p} = \frac{1}{N}\int_0^{c_D} p di = \Psi \frac{c_D + \overline{c}}{2}$, and average costs can be written as $\overline{c} = \frac{1}{G(c_D)}\int_0^{c_D} c dG(c)$. From Eq. (11) follows that:

$$N = \frac{2\gamma(\alpha - \Psi c_D)}{\Psi\eta(c_D - \overline{c})}. \quad (12)$$

At the entry stage, firms pay fixed entry costs f_E and draw a cost parameter c from the distribution $G(c)$. We assume that a fraction β of entry costs is tax deductible. Free entry ensures that expected

[3] Because of the assumption of quasi-linear preferences, all income effects are absorbed by the outside sector.

[4] We assume parameter values such that $\Psi > 0$. Note that $\beta > 1$ would imply that production costs are subsidized by the government such that $\Psi < 1$.

[5] We assume that $c_M > c_D$ such that some firms are exiters.