SUPPLEMENT TO "CAPPING PROFITS FOR EFFICIENCY"

GABRIELE PATETE
Department of Economics, University of the Balearic Islands

6. A BRIEF POLICY DISCUSSION

6.1. *Capital owned by the firm*

The (extended) model used in Section 4 features firms renting the capital used in production. In practice, firms often own equity, which finances productive capital. Therefore, for the implementation of the policy, the correct measure of profits and costs has to internalize the implicit capital cost $(r + \delta)K$ evaluated at the market interest rate r (compensating for depreciation δ). For example, Nimier-David, Sraer, and Thesmar (2023) analyze the case of the mandatory profit-sharing rule in force in France since 1967, in which implicit capital costs are deducted from the accounting profits to be shared, and provide evidence that optimal capital accumulation is not distorted (which happens with a correct capital cost deduction).

6.2. *Mergers and acquisitions*

While vertical integration is not an effective avoidance strategy, horizontal mergers between a high-markup firm and a low-markup firm may decrease their combined profit-to-cost ratio. For conglomerates of firms operating in different sectors, this policy should be implemented at a firm's subdivision level, for which firms record different financial statements. Mergers within a sector, instead, are likely to be less problematic. A within-sector merger favors an increase in the markups of the products sold by the merging firms. This happens because of: (i) the increase in collusion in the sectoral market, and (ii) the technological synergies that develop after the merger. In this sense, a mandate on the profit-to-cost ratio may also favor welfare-improving, within-sector mergers, where no increases in markups accompany the productivity gains from the mergers. As a result, this intervention may also be valuable for competition authorities, not just fiscal authorities, as an additional requirement to be imposed in the context of a merger's conditional approval. Alternatively, this regulation can act as a substitute for competition policy. If the regulation successfully constrains firm markups, firms can merge once it is enforced without requiring additional government interventions.

6.3. *Fixed costs*

I distinguish between two types of fixed costs: observable and unobservable. First, implementing the policy, the relevant measures of profits and costs exclude those (observable) costs reported as fixed in a firm's financial statement, such as R&D, advertising, or executives' pay.[1] However, it is worth noticing that, even when the policy is applied to a measure of profits and costs that also include, for example, R&D costs, the policy still might have a progressive effect on markups if the resulting profit-to-cost ratio of firms is still reliably linked to their markups. For example, De Loecker, Eeckhout, and Unger (2020) suggest that, even though high-markup firms also have higher R&D and advertising as a share of revenues, they also exhibit higher profit rates and markups.

[1]For publicly-listed firms in the US included in Compustat, this implies excluding the costs reported in SG&A (Sales, General, and Administration).

Second, the normative analyses in Sections 3 and 4 rely on a class of models featuring fixed entry costs of production but no residual (unobservable) fixed production cost. As shown in Section 2, in an extended model in which firms are also burdened with residual fixed production costs (as in Melitz (2003)), a cap on the profit-to-cost ratio of firms still has a progressive effect on markups when markups are increasing in firm size.[2] Nevertheless, although this result is robust to introducing an unobservable, homogeneous fixed cost (Section 2) or heterogeneous demand systems (Section 4), introducing both fixed costs and firm-specific demand systems across differentiated products can break the progressivity of its effects.[3]

7. THE OPTIMAL PROFIT-TO-COST RATIO OF FIRMS

In this section, I relax Assumption 1: specifically, Assumption 1.2, which ensures the existence of an inferior of the markup distribution greater than one.

A generalized version of a cap on the profit-to-cost ratio of firms can implement the social optimum without requiring the existence of such an inferior for markups. This generalized version consists of a policy that combines both an upper bound and a lower bound on the profit-to-cost ratio. When markups are not bounded below by a number strictly larger than one, to bind for all firms in the economy, ρ has to approach 0; firm profits, therefore, also approach zero, preventing entry into the market. The generalization avoids this issue. In addition, it also allows the optimal policy mix to employ only two tools: the mandate on the profit-to-cost *level* and a sales tax on consumers, rendering the profit tax redundant.

7.1. *Optimal non-discriminatory policy*

I illustrate the effect of mandating a *level* $\rho \geq 0$ of the profit-to-cost ratio of firms. Moreover, I characterize its optimal level, which restores the social optimum. The setting is the same as in Section 4. Still, the within-sector and the between-sector aggregators are assumed to induce an inverse demand function that satisfies a modified version of Assumption 1:

ASSUMPTION 2: (Firm regularity conditions.)
1. Revenues $\mathfrak{p}(y(c))y(c)$ are strictly concave in quantity and satisfy Inada conditions, i.e., $\lim_{y\to 0}[\mathfrak{p}(y(c))y(c)]' = +\infty$ and $\lim_{y\to +\infty}[\mathfrak{p}(y(c))y(c)]' = 0$.
2. The inverse demand elasticity $\epsilon_p(y(c))$ is bounded between 0 and 1.

This modified assumption does not ensure the existence of an inferior for the *laissez-faire* markups strictly larger than one.

Effect on firm decisions Let $c_{it}(s)$ be the marginal cost of firm i in sector s at time t. The ratio of profits $\pi_{it}(s)$ to costs $c_{it}(s)y_{it}(s)$ must equate a given level $\rho_t \geq 0$. A (intermediate-good) firm, therefore, maximizes $p_{it}(s)y_{it}(s) - c_{it}(s)y_{it}(s)$, subject to $p_{it}(s) \leq \mathfrak{p}(y_{it}(s), y_t(s), Y_t)$,

[2] To the best of my knowledge, I am not aware of models—theoretical and quantitative—that deal at the same time with oligopolistic competition, fixed costs, and entry costs. Edmond, Midrigan, and Xu (2023) retain an *ex-ante* free entry condition and oligopolistic competition but drop firm selection. Atkeson and Burstein (2008) retain fixed costs (with an ex-post free-entry condition determining firm selection) and oligopolistic competition, but drop entry costs. Melitz (2003) retains fixed and entry costs but considers monopolistic competition only.

[3] For example, in a context in which bigger firms also charge higher markups before the introduction of the policy and are subject to an unobservable fixed cost, a necessary condition for the heterogeneity of demand systems to break the progressivity is that the introduction of the policy inverts the sales ranking of firms, so that the ex-ante high-sale, high-markup firm is ex-post smaller in sales than the ex-ante low-sale, low-markup firm.

where $\mathfrak{p}(\cdot)$ characterizes the final-good producer's willingness to pay for firm i's output, and $\pi_{it}(s) = \rho_t c_{it}(s) y_{it}(s)$, which represents the additional constraint implied by the regulation.

Therefore, at the optimum, it holds: $p_{it}(s) = (1+\rho_t)c_{it}(s)$, which characterizes the optimal pricing of firm i in sector s after introducing the policy.[4]

The pricing equation is, therefore, the same as that induced by an upper bound on the profit-to-cost ratio of firms. The crucial difference is that a mandate on the level, different from an upper bound, makes the restriction binding for all firms in the economy rather than just for those with $\mu_{it}(s) > (1+\rho)$. This property is crucial for characterizing the optimal policy that restores the social optimum.

Optimal policy The following theorem characterizes the level of the profit-to-cost ratio of firms in an economy.

THEOREM 3: *There exists a level $\rho_t^* > 0$ and a sales tax $\tau_{s,t}^*$ for all t such that, under $\{\rho_t^*, \tau_{s,t}^*\}_{t=0}^{+\infty}$, the decentralized general equilibrium characterized by Definition 3 is efficient according to Definition 4.*

PROOF: See Appendix A.3. *Q.E.D.*

For example, in the context of monopolistic competition with Kimball demand (with sectors heterogeneous in market concentration $n_t(s)$), the optimal profit-to-cost ratio in the economy is given by $\rho_t^* = \hat{D}_t^* - 1$, with:

$$\hat{D}_t^* - 1 = \frac{\hat{Z}_t^*}{\hat{Z}_{d,t}^*},$$

$$\hat{Z}_{d,t}^* = \left(\int_0^1 (d_t^*(s) - 1) \frac{1}{n_t(s)} q_t^*(s)(z_t^*(s))^{-1} ds \right)^{-1},$$

$$\hat{Z}_t^* = \left(\int_0^1 \frac{1}{n_t(s)} q_t^*(s)(z_t^*(s))^{-1} ds \right)^{-1},$$

$$d_t^*(s) = \left(\int_0^{n_t(s)} \mathcal{A}_q(q_{it}(s)) q_{it}(s) di \right)^{-1},$$

where $d_t^*(s)$ is the planner's demand index for sector s.[5] Intuitively, $\hat{D}_t^* - 1$ is a measure of the optimal flow value of new firms that a social planner wants to enforce, and it ensures that firms have optimal entry incentives.

In this context, the optimal profit-to-cost ratio of firms in an economy is given by a weighted average of the sectoral demand indexes:

[4] The existence of a solution is guaranteed by the Inada conditions on firm revenues.
[5] Starred variable refer to the planner's solution.

$$\rho_t^* = \int_0^1 (d_t^*(s) - 1) \frac{\frac{1}{n_t(s)} q_t^*(s)(z_t^*(s))^{-1}}{\int_0^1 \frac{1}{n_t(s)} q_t^*(s)(z_t^*(s))^{-1} ds} ds.$$

Implementation The tax schedule in Section 2 can be adapted to implement a given level ρ of the profit-to-cost ratio of firms.

LEMMA 2: *Under Assumption 2, a level of the profit-to-cost ratio of a firm is implemented by any additive profit tax* $T(t) = t_1[\varpi(y) - \rho c(y)]\mathbb{1}(\varpi(y) - \rho c(y) \geq 0) + t_2[\rho c(y) - \varpi(y)]\mathbb{1}(\varpi(y) - \rho c(y) < 0)$, *with* $t_1 \in [1/(1+\rho), 1]$ *and* $t_2 \to +\infty$.

To understand how this tax schedule enforces the social optimum, it is helpful to compare it with the equivalent optimal policy in Section 4. For such purposes, I will analyze an optimal mix of this additive profit tax and a uniform sales subsidy s_p to producers, equivalent to a negative sales tax on consumers. In this way, the effects on both the pricing strategies and the entry incentives are apparent all at once.

If we restrict the analysis to the framework of oligopolistic competition in Section 4, the optimal level $\rho^* = \frac{1}{\gamma - 1}$ mandated on firms is equivalent to a cap ρ^*, because this cap binds for all firms in the economy. Because a sales subsidy is in place, the profits of the firm before the excess-profit tax are $\varpi(y) = (1 + s_p)\mathfrak{p}(y)y - cy$, while firm profits after the excess-profits tax are given by

$$\pi_{\text{tax}}(y) = \begin{cases} \varpi(y) - \frac{1}{1+\rho^*}[\varpi(y) - \rho^* c(y)], & \text{if } \varpi(y) - \rho^* cy > 0 \\ \varpi(y), & \text{otherwise,} \end{cases}$$

where $s_p^* = \rho^*$. Note that, under $s_p^* = \rho^*$, $\varpi(y) \geq \rho^* cy$ implies $\mathfrak{p}(y)y \geq cy$. The mandate ρ^* on the profit-to-cost ratio makes it homogeneous across firms, while the constant sales subsidy closes the residual gap between prices and marginal costs.

Note that an alternative, equivalent way to implement the same outcome is the following tax schedule:

$$\varpi_{\text{tax}}(y) = \begin{cases} \varpi(y) - \frac{1}{1+\rho}[\mathfrak{p}(y)y - cy - \rho cy], & \text{if } \mathfrak{p}(y)y - cy - \rho y > 0 \\ \varpi(y), & \text{otherwise,} \end{cases}$$

where $\rho \to 0$. This tax schedule works in the context of oligopolistic competition because markups are bounded below by a number strictly larger than one. The optimal sales subsidy s_p^* is such that *before* the implementation of the cap on the profit-to-cost ratio, but *after* the implementation of the subsidy, all firms still feature $\mathfrak{p}(y)y > cy$. In other words, the sales subsidy pushes no firm below marginal-cost pricing.

In a more general context, however, the introduction of the subsidy, before the implementation of any other policy, pushes some firms (the ones with low *laissez-faire* markups) below marginal-cost pricing, i.e., $\mathfrak{p}(y)y < cy$. As a result, a cap on the profit-to-cost ratio would be ineffective for these firms, as no threat of taxation is in place.

To push all firms toward the same homogeneous markup, therefore, a penalty for the negative gap between profits and $\rho^* c(y)$ has to be implemented, as follows:

$$\pi^*(y) = \begin{cases} \varpi(y) - \frac{1}{1+\rho^*}[\varpi(y) - \rho^* c(y)], & \text{if } \varpi(y) - \rho^* c(y) > 0 \\ \varpi(y) - t_2[-\varpi(y) + \rho^* c(y)], & \text{if } \varpi(y) - \rho^* c(y) < 0 \\ \varpi(y), & \text{otherwise,} \end{cases}$$

where $s_p^* = \rho^*$ and $t_2 \to +\infty$. This extended version naturally nests the one implementing a cap on the profit-to-cost ratio; indeed, it is a double-sided cap.

APPENDIX

A.3. *Proof of Theorem 3*

Following up on the Proof of Theorem 2 in Appendix A.2., I only characterize the effects of the optimal policy mix on the free-entry condition in the decentralized equilibrium and compare it to the socially optimal condition for entry. In particular, I present the case of monopolistic competition with Kimball demand employed in the quantitative exercise of Section 4. The general case follows from the proof of Theorem 2, imposing

$$\rho^* = \frac{dZ_t^*}{dN_t^*} \frac{\frac{\hat{Z}_t^{+,*}}{Z_t^*}}{Z_t^*}.$$

The free entry condition under the policy $\rho_{t+j}^* = D_{t+j}^* - 1$ is :

$$\kappa W_t = \beta \sum_{j=1}^{\infty} (\beta(1-\varphi))^{j-1} \frac{C_t}{C_{t+j}} (D_{t+j}^* - 1) \frac{\Omega_{t+j}}{\hat{Z}_{t+j}} Y_{t+j}.$$

Moreover, the planner's choice of the aggregate number of firms $\{N_{t+j}^*\}_{j=1}^{\infty}$ is given by:

$$\kappa W_t^* = \beta \sum_{j=1}^{\infty} (\beta(1-\varphi))^{j-1} \frac{C_t^*}{C_{t+j}^*} \frac{dZ_{t+j}^*}{dN_{t+j}^*} \frac{1}{Z_{t+j}^*} Y_{t+j}^*,$$

with

$$\frac{dZ_{t+j}^*}{dN_{t+j}^*} \frac{1}{Z_{t+j}^*} = \int_0^1 \frac{dZ_{t+j}^*}{dn_{t+j}(s)} \frac{1}{Z_{t+j}^*} ds = \int_0^1 (d_t(s) - 1) \frac{1}{n_{t+j}(s)} q_{t+j}^*(s) \frac{Z_{t+j}^*}{z_{t+j}^*(s)} ds.$$

From the definition of $D_{t+j}^* - 1$ it follows:

$$\frac{dZ_{t+j}^*}{dN_{t+j}^*} \frac{1}{Z_{t+j}^*} = (D_{t+j}^* - 1) \frac{Z_{t+j}}{\hat{Z}_{t+j}}.$$

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