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Anticompetitive (financial) leverage: revisiting the strategic use of debt

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Abstract

Capital structure and financial policies can raise anticompetitive concerns to the extent that they induce rival firms to compete less aggressively. In contrast to common ownership, anticompetitive concerns triggered by financial leverage being ratcheted up in parallel across rival firms can be the result of legitimate prudent underwriting standards that mechanically steer managers to adopt a softer competitive stance in order to secure debt refinancing. By the same token, increasing leverage in parallel can be opportunistically deployed by rival firms to coordinate and sustain a tacitly collusive agreement. A close scrutiny of the existing theoretical and empirical literature is supportive of this antitrust theory of harm.

***JEL* classification**: D21; G32; L13; L41

Keywords: capital structure; financial leverage; oligopoly; product market interaction; collusion

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I. Introduction

The celebrated (first) Modigliani – Miller (M-M) theorem posits the irrelevance of the degree of financial leverage to the value of a firm, so that a higher degree of financial leverage (ie, more debt funding relative to equity resources) should not affect its valuation, which instead ought to be solely based on the expected stream of operating free cash flows discounted at the appropriate rate for the firm's risk class. This controversial claim prompted a multitude of scholars to challenge this tenet of modern financial theory by relaxing its underpinning assumptions (Pagano, 2005). On the one hand, the fiscal benefits due to the deductibility of debt interest payments point towards higher level of financial leverage. On the other hand, in contrast to the simplifying assumption that there are complete and perfect financial markets, as the level of financial leverage goes up the cost of debt would tend to increase to take account of the increased risk of bankruptcy penalties when operating free cash flows turn out to be too low for the firm in question to be able to serve its debt (ie, in a bad state of the world). The resulting trade-off vindicated the advocates of the traditional approach which posited that there is an optimal level of financial leverage that maximises firm's value whereby the incremental tax shield benefits are exactly offset by the increased costs due to financial distress in case of default (Robichek and Myers, 1966; and Kraus and Litzenberger, 1973). Therefore, far from being constant and the same as the unlevered equity cost of capital, the weighted average cost of capital used to discount the future stream of operating earnings is minimised at the optimal level of financial leverage (Berk and DeMarzo, 2017).

From an economist perspective, perhaps the most intriguing among the simplifying assumptions underpinning the M-M theorem to come under intensive scrutiny is the absence of information asymmetries between external financiers and managers (Tirole, 2006). Alas, insiders tend to have a better grasp as to how well the firm in question is doing; an advantage which could be exploited to the detriment of either shareholders or debtholders. Therefore, the level of financial leverage can be tweaked in order to mitigate this risk of moral hazard by firms' managers. Here, a different type of trade-off motivates the optimisation of financial leverage. However, in this case the degree of financial leverage affects the firm's value through the impact on the distribution of expected operating free cash flows, rather than the cost of capital. On the one hand, a higher level of financial leverage may help spur managers to pursue efficiencies and

develop the business in order to be able to serve the debt and make a profit (Jensen, 1986). On the other hand, a high level of debt might skew managers' incentives and prompt them to select riskier projects (ie, so called 'asset substitution') in order to maximise the expected residual claim after servicing the debt (Jensen and Meckling, 1976), thus exposing debt holders to a greater risk of a costly bankruptcy.

By the same token, a higher propensity to take on risk may be thought of as adopting a more aggressive strategic stance vis-à-vis competitors (eg, producing a higher level of output and/or increasing capacity) so that competitive rivalry is intensified overall (Brander and Lewis, 1986; Maksimovic, 1988). Under these circumstances, firms are said to be trapped into a prisoners' dilemma, in the sense that rivals would be collectively better-off without taking on debt, but the decision not to do so is not credible as it is really tempting to unilaterally take on debt (ie, in order to credibly commit to an aggressive strategic stance) when rivals abstain from reciprocating. This theoretical insight, however, is not empirically corroborated; quite the opposite indeed, with a number of studies showing how firms with a higher level of debt adopt a softer strategic stance (Chevalier, 1995; Phillips, 1995; Kovenock and Phillips, 1997; Parson and Titman, 2008; Cookson, 2017; and Billett et al., 2017).[1]

This is not so puzzling once it is considered that lenders would want to condition future disbursement of funds on the basis of past observable performances (i.e., as in Bolton and Scharfstein, 1990). Accordingly, it can be shown that a higher degree of financial leverage would prompt firms to compete less aggressively, to the extent that a more aggressive competitive stance would increases the risk profile of firms' cash flows (ie, due to the resulting squeeze on operating profit margins) which would in turn make it more expensive for financially constrained firms to continue to fund their operations with debt (Faure-Grimaud, 2000). Under this line of argument, taking on debt when competing against unlevered rivals does not make business sense, unless, that is, the firm in question is financially constrained. Nevertheless, it is plausible to expect that rival firms would all want to achieve what is considered to be the optimal level of financial leverage for the corresponding risk class. This could be particularly the case where firms'

[1] Campello (2006) provides evidence that the relationship between relative level of financial leverage (ie, compared to rivals) and market performance (measured in terms of sales growth) is not monotonic. Specifically, moderate debt taking by a firm may yield market share gains, whereas after some point additional indebtedness leads to significant sales underperformance.

financial corporate structures are benchmarked by external investors. Because competitive rivalry tends to erode pledgeable income, a common high level of (optimal) financial leverage could only be reached and maintained if lenders could be persuaded that the stream of operating free cash flows is stable enough (ie, thanks to soft competitive rivalry).[2]

The idea that competitive rivalry may be sacrificed in order to meet expectations of external financial investors is reminiscent of the concerns about 'common ownership'. The fact that the same large institutional investors, in particular asset managers specialised in passive funds (eg, Blackrock, Vanguard, State Street and Fidelity), are the largest equity shareholders across oligopolistic rivals might distort competition to the extent that the managers of the commonly owned firms are persuaded not to compete too hard with each other in order to maximise the return across the entire portfolio of these large institutional investors (Azar et al. 2018; and Philippon and Gutierrez, 2017).

In this respect, it is easy to see how a similar web of financial exposures between a small set of lenders and a small set of oligopolistic rival borrowers could strengthen the softening-of-competition effects outlined above. This is even more so given that, in contrast to equity holders, debt holders would not even benefits from the return upside in case a firm outcompetes rivals. Similarly, it has been argued that incumbent firms might be sheltered from the threat of potential competitors thanks to the fact that existing lenders are already exposed to the incumbents and are therefore unwilling to sponsor a new entrant, whereas potential new lenders are disadvantaged in that they lack industry knowledge (Cestone and White, 2003).[3]

Nevertheless, common exposure among lenders across competitors is arguably not necessary for the softening effect of financial leverage to arise. Having said that, it is

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[2] Indeed, it is well known that operating and financial leverage are substitutes, so that the presence of the former makes it difficult for firms to pursue the latter: see, for example, Ferri and Jones (1979); and Mandelker and Rhee (1984).

[3] Cetorelli and Strahan (2006) showed how increase in banking competition in US states following deregulation is associated both with more (non-financial) firms in operation and with a smaller average firm size. By the same token, Comaggia et al. (2015) reported an increase in innovation by small private firms that are typically more dependent on external finance (ie, in comparison to public corporations) and that had limited access to credit from local banks. Giannetti and Saidi (2018) documented how lenders that have a large market share in an industry extend disproportionately more credit than other banks to firms in that industry during periods of distress in comparison to normal times. Aghion et al. (2018) found that better credit access allows less efficient incumbent firms to remain longer on the market, thereby discouraging entry of new and potentially more efficient innovators.

important to stress how such an effect would be very unlikely to be material, if at all, in markets where competitive dynamics are robust to start with, that is, where the pursuit of a lasting competitive advantage is feasible. This can typically be the case, for example, in markets subject to 'winner-takes-all' dynamics, whereby the first firm able to reach a 'critical mass' can henceforth benefit from an unassailable first-mover-advantage, thanks to the fact that consumers coordinate their adoption choices in order to benefit from expected network effects.

In contrast, in markets where consumers exhibit a low preference for variety, in the sense that competitive products are perceived to be closely substitutable (ie, commoditised), and where firms do not face strong capacity constraints, there may be a strong desire to escape the ensuing intense competitive rivalry. Arguably, this is particularly the case for firms with a high degree of operating leverage (ie, a front-loaded cost structure with high fixed costs and low marginal costs) so that viability in the long-term relies on the ability to sustain adequate levels of price-cost mark-ups.

The main intuition underpinning the posited anticompetitive effect driven by increasing levels of financial leverage relies on the observation that debt investors would be disinclined to allow firms to take on more debt unless they are reassured that the risk of default is mitigated thanks to weaker competition;[4] otherwise they would want to charge a high premium reflecting the higher risk (i.e., in line with the M-M paradigm). This legitimate prudent underwriting policy in turns lead rival firms to adopt a softer competitive stance, thus resulting in a generalised reduction of competition, in order to persuade lenders to allow them to take on more debt without being subject to a sharp increase in interest rates. From the lender standpoint, this is thanks to the fact that the reduction in competition orchestrated through a parallel increase in financial leverage has reduced the risk profile of firms' operating streams of earnings (ie, lower volatility, more like a utility business).[5] Notably, although in principle this line of argument doesn't

[4] Valta (2012) showed that the cost of debt is higher in more competitive industries (based on HHI values) and that cash flow volatility is significantly higher in more competitive industries. With respect to the reversed causational order, Aghion et al. (2018) found that better credit access allows less efficient incumbent firms to remain longer on the market, thereby discouraging entry of new and potentially more efficient innovators.

[5] In addition, in contrast to the 'common ownership' theory of (anticompetitive) harm, it is interesting to point out that this posited 'transmission channels' does not raise the kind of questions as to how feasible it is for representatives of institutional shareholders to (collectively) dictate the conduct of investee firms' managers (Gilje et al., 2018).

rest on an assumption that lenders have market power, the adoption of prudent underwriting standards might be undermined under intense competition among lenders and with frothy debt capital markets.

It is helpful to refer to the canonical formula that links return on equity (ROE) to return on assets (ROA) and the degree of financial leverage: $ROE = ROA + (ROA - i(1 - \tau))\frac{D}{E}$, where i is the interest expense on debt, τ is the tax rate on ordinary income and D,E are the book values of the stocks of debt and equity respectively. Increasing leverage will lead to a higher ROE if the pre-interest, after-tax ROA exceeds the after-tax interest rate paid on debt. Of course, merely focussing on the ROE can prove to be short-sighted, in that this simple valuation formula ignores the risk that operating earnings can be volatile, so that the risk of default is heightened when leverage is high. Nevertheless, a reduced degree of operating risk thanks to a weakened competitive rivalry and resulting higher and more stable ROA would persuade lenders to allow firms to increase financial leverage (eg, as with leveraged shares buyback operations) without charging punitive interests rates. This way firms are able to increase their corresponding ROE, also on a risk adjusted basis, that is, thanks to the improved operating risk profile.

The next section reviews the relevant theoretical and empirical literature. Section III explains how financial leverage could be strategically used to weaken competition. Section IV concludes by discussing policy implications.

II. Literature review

a. Theoretical

In broad terms, there are two opposing strategic effects induced by the agency conflict faced by debt investors under information asymmetry and when firms differ in their degree of financial constraint. First, Brander & Lewis (1986) argued that taking on debt can amount to a commitment device to adopt an aggressive strategic stance, thanks to the fact that shareholders benefit from the limited liability protection in case the market performance gets worse in bad states of the world,[6] as captured by an (idiosyncratic)[7]

[6] In general terms, Jensen and Meckling (1976) argued that with limited liability the residual claim of the firm's assets by equity-holders or managers is a call option, in that the downside risk is capped whilst the upside gain is not. Hence debt overhang can distort investment via asset substitution (ie, risk shifting).

[7] The authors, however, argued that the results would not change qualitatively with correlated shocks across rival firms.

exogenous shock (eg, a higher marginal cost or a lowed demand intercept). In a duopoly setting, under quantity competition the leveraged firm expands output and the unlevered rival accommodates by reducing output (ie, quantities as strategic substitutes); whereas, as showed by Showalter (1995), under price competition both types of firms increase prices (ie, prices as strategic complements).[8]

In a symmetric scenario, the authors showed how this strategic effect would lead oligopolistic firms to take on at least some positive level of debt, which results in a common more aggressive competitive stance (and thus lower profits) than without debt (ie, a prisoner's dilemma). This is so even when debt-holders are foresighted. This is because at very low levels of debt the conflict between debt holders and equity holders (due to limited liability protection for the latter) is immaterial. However, the same analysis entails that the debt holders would not be willing to be exposed to an industry where firms (symmetrically) have higher levels of debt where the conflict with equity holders would dominate over the strategic competition effect. In this respect, the authors speculated that this result suggests that if the supply of credit to firms was centralised or very concentrated, lenders would have incentives to act as facilitating agents for collusion, presumably by reducing the level of debt in the industry in order to soften firms' strategic competitive stance. By the same token, the authors also observed that equity holders in the industry would collectively be better off by giving control to debt holders who would adopt a softer competitive stance.

In Brander & Lewis (1986)'s setting, however, although lenders are foresighted they cannot design the debt contract strategically in order to mitigate default risk by effectively conditioning their exposure to the competitive stance adopted by the borrowing firm. With strategically savvy debt investors, Bolton and Scharfstein (1990) argued that the leveraged firm is at risk of predation as the unlevered rival anticipates

[8] It is worth nothing, though, that Showalter (1995) also showed that when the uncertainty is about costs, firms do not want to take on debt strategically, since that would lead the firm in question to lower its price as it focusses on states of the world where realised costs are low. However, since prices are strategic complements, the rival firms will react by also lowering prices, so that profits end up being lower than without debt. Glazer (1994) extended the Brander and Lewis (1986)'s setting over two periods, assuming that firms can take on long term debt strategically and pay it back over the two periods with operating profits. The author showed how long-term debt induces firms to behave collusively by lowering their quantities in the first period so that the rival first period profit is higher, which entails that the outstanding debt carried over to the second period is smaller. This in turn would make the rival less aggressive in the second period which increases firms' overall profits.

that external funding could be withdrawn in response to poor market performance. This is because the external investor cannot tell whether poor profitability of the levered firm is the result of a genuine predatory attack (in which case it would be worth supporting the prey in order to outlast the phase of predation) or the relative inefficiency of the investee. Hence, under quantity competition, the levered firm cautiously shrinks its output (ie, in order to avert a fall in profitability in bad states of the world) which then leads the unlevered rival to react by expanding in contrast (whereas, under price competition, both firms lower their prices).

Faure-Grimaud (2000) extended the Brander and Lewis (1986) setting of duopolistic Cournot competition among financially constrained firms by allowing for the strategic design of the optimal debt contract which envisages a contingent reward paid by the lender to the borrower (ie, as in Bolton and Scharfstein, 1990). This contract design can be thought of as the lender having the discretion to renew the loan at the beginning of another period. The author showed that debt financing induces a reduction in the quantity produced. As in Brander and Lewis (1986), a higher quantity entails that the expected cash-flow is riskier due to greater volatility in the presence of an (idiosyncratic) risk factor (ie, a parameter which linearly affects firm's profit so that, for example. a higher value entails a comparatively lower marginal cost). Therefore, because firms are financially constrained they have an incentive to reduce the quantity produced in order to reduce the risk profile of their cash flow and thus increase the likelihood that the lender will renew the loan (ie, will disburse the reward as in Bolton and Scharfstein, 1990). Accordingly, in a symmetric scenario where all competitors are levered the product market equilibrium is closer to the monopoly outcome than when all rival firms are unlevered. Nevertheless, the author concluded that in the absence of financial constraints firms should not (strategically) want to take on debt unilaterally (ie, in the expectation that rival firms would not follow suit).

Clayton (2009) revisited Brander and Lewis (1986) limited liability effect under symmetric competition by developing a three stage model where firms decide the level of financial leverage first, then choose a level of investment aimed at lowering marginal costs which will then determine the level of quantity in the final competition stage, subject to a random (common) shock determining the level of demand for the homogenous product. In the final stage a higher level of investment and debt always lead to a more aggressive stance, that is, as in Brander and Lewis (1986). However, an increase

in debt exacerbate the agency conflict between debt holders, who would benefit from higher level of investments aimed at making the firm in question more competitive, thus increasing the residual profitability under bankruptcy, and shareholders, who disregards state of the world where the firm goes bankrupt. Hence, all in all, higher levels of debt may reduce firms investments so that they have higher marginal costs in the final competition stage, which tends to offset the more aggressive stance induced by the Brander and Lewis (1986) limited liability effect. The author makes the standard assumption that the profitability of the firm is independent of the firm's leverage choice.

Khanna and Schroder (2009) extent the Bolton and Scharfstein (1990) framework by using a linear Hotelling setting to model the competition stage (ie, firms set prices and sell horizontally differentiated products rather than setting quantities for homogenous products), and also modelling the possibility that the existing levered firm (ie, the other duopolist is not financially constrained in that it has 'deep pockets'/'long purse') can be replaced by a new levered firm that is either more or less efficient. In the former case, the unlevered competitor has an incentive to be less aggressive by raising prices in order to secure loan renewal, which will tend to soften competition in the following period. The debt-holder exploits this incentive by making the probability of loan renewal more profit sensitive. Whereas in the latter case, the competitor has a strong predatory incentive to oust the levered firm in order to compete with the less efficient replacement in the following period. This in turn induces the lender to make the probability of loan renewal less profit sensitive.

Besides the impact of financial leverage on non-coordinated competition, very little theoretical research has been done looking at the impact that higher levels of financial leverage can have on the sustainability of a coordinated outcome (ie, joint monopolisation). Maksimovic (1988) analysed the impact that debt has on the sustainability of a collusive agreement (ie, over an infinite time horizon) among a number of symmetric firms that compete by setting quantities (à la Cournot) and adopt so-called 'grim-trigger strategies' to discipline rivals, whereby firms threaten to punish a deviation (ie, a unilateral increase in the quantity sold) by reverting to the non-coordinated (Nash) equilibrium strategy forever (Friedman, 1971). Therefore, the sustainability of the collusive agreement relies on the fact that, when compared to the collusive profit, the short-run gains from deviation are lower than the perpetual losses from punishment. Initially, colluding firms' owners can (simultaneously and symmetrically) cash in from an

increase in financial leverage by issuing perpetual bonds that promise to pay a constant coupon at every subsequent period. As long as the coupon repayment is lower than the Nash equilibrium profit level that is earned under the punishment phase, the sustainability of the collusive agreement is unaffected. Whereas, when the coupon repayment is higher, all firms know that they will lose control of the firm to the debt holder, given that none will be able to meet the debt repayment under the Nash equilibrium static solution. Therefore, equity holders only take into consideration the fact that the higher repayment burden squeezes the pay-off from sticking to the collusive agreement which tend to comparatively undermine its stability.[9]

Stenbacka (1994) pretty much derived the same insight into the role of debt with respect to the sustainability of collusion, but from a setting where firms compete by setting prices (à la Bertrand), with demand volatility and also interest rates tax deductibility. As shown in Rotemberg and Saloner (1986), in order to sustain collusion, when demand is strong firms fall short of the monopolistic price in order to make deviation (ie, through price undercutting) less attractive. Taking on debt would tend to amplify the extent to which firms have to give up on fully-fledged jointly monopolistic profits in order to sustain collusion. The intuition is that increased debt levels reduce the long term gains from sticking to the collusive agreement, but does not affect that gains from deviation. Nevertheless, the author proved that, with tax deductibility of interest rates, there are parameters configurations where firms choose to take on positive levels of debt.

b. Empirical

From an empirical point of view, the theoretical literature quoted above (ie, which confuted the claim in Brander and Lewis (1986) that debt makes firm more aggressive) is focussed on asymmetric setting where levered firms compete against unlevered rivals. Nevertheless, Phillips (1995) and Chevalier (1995) produced evidence indicating that, under price competition (ie, à la Bertrand), an increase in financial leverage leads the firm

[9] Spagnolo and Piccolo (2014) extends Maksimovic (1988)'s framework by considering the possibility that shareholders delegate to self-interested managers who faced personal (reputational) costs from bankruptcy, so that they have a tendency of setting a more conservative competition stance, thus offsetting the limited liability effect at the core of Maksimovic (1998)'s finding that debt reduces the sustainability of collusion. Here too debt providers do not behave strategically, whereas firms' owners issue debt strategically in order to provide incentives to self-interested managers not to deviate from collusion.

in question to subsequently raise its prices (ie, in line with Showalter, 1995, as argued in Riordan, 2003); a move that is reciprocated by rival firms (ie, prices as strategic complements), the more so when they too are leveraged. Here the sequence of events is that the change in capital structure triggers the change in competition rivalry; whereas what the main tenet of this paper is that the softening of competitive rivalry is instrumental to accommodating an increase in financial leverage.[10]

This line on argument is reminiscent of the standard prediction under the static trade-off theory of capital structure that more profitable firms should exhibit a higher degree of leverage as higher operating profit margins entails higher debt serviceability and the resulting lower borrowing costs together with the tax deductibility advantage should increase the incentives to take on debt. The available empirical evince, though, points in the opposite direction (French and Fama, 2002; Frank and Goyal, 2009; and Graham and Leary, 2011), with more profitable firms tending to have lower leverage ratios, a finding more in line with the 'pecking order' theory of capital structure whereby firms prefer to finance their operations with internal funds first (Myers, 1984, 1993).

In contrast, Ovtchinnikov (2010) showed how firms respond to an increase in competition by lowering their leverage. The author studied industries where incumbents faced increased competition due to deregulation aimed at lowering entry and exit barriers and also removing price floors. The main finding is that previously regulated incumbent gradually adjusted their leverage downwards (towards the levels for new entrants) as their profitability declines, and earning volatility increases, in response to increased competition.[11] Similarly, Xu (2012) provided evidence of how domestic incumbents react to increased import competition by reducing their leverage (both in book and market value terms) through more equity issuance and debt repayment. In

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[10] Thakor and Lo (2018) showed how in R&D intensive industries an increase in competition for the current generation of products push firms to spend more on research to develop new products rather than to defend their current market position (ie, escape competition effect). To this end, firms rely more on internally generated funds and lower their debt. This is because increased competition reduces the pledgeability of existing assets and R&D investments are more uncertain and opaque.

[11] Parise (2018) showed how US (full service) incumbent airlines under the threat of new entry by (no-frills) low cost carriers increase their debt maturity, in particularly by switching to banks loans (ie, as opposed to bonds). The increase in debt maturity is aimed at reducing the risk of refinancing/roll-out failure in case the borrower's future financial performance disappoints because of intensified competition. The author argued that banks are better placed to accommodate this response to a imminent competitive threat thanks to their superior ability to monitor the borrower, that is, in order to avert 'risk-shifting' when expected profitability worsen.

addition, Dasgupta and Žaldokas (2018) analysed how firms change their leverage in response to the introduction of leniency programmes, which provide immunity to firms that help antitrust authority detect cartels, thus entailing an intensification of competition rivalry going forward. The authors found that firms reduce their leverage, which is consistent with the idea that financial flexibility (ie, needed to accommodate a future output expansion) is valuable under more intense competition (ie, in line with Bolton and Scharfstein, 1990).

With respect to the impact of operating leverage on financial leverage depending on the intensity of competition, Reinartz and Schmid (2016) reported how in US energy retail markets subject to (entry) deregulation, thus where incumbents are exposed to increased competition and ensuing risk of default, firms with a lower degree of production flexibility (ie, higher run-up time and ramp-up cost) had a lower degree of financial leverage.

More generally, Danis et al. (2014) and Frank and Goyal (2015) pointed out that previous studies, arguing that a finding of a negative correlation between profitability and leverage contradicted the (static) trade-off theory, failed to take into account the fact that firms do not want to continuously adjust their leverage due to financial frictions such as issuance costs. As firms, thus, prefer to wait to move to their target leverage until the expected gains are large enough to offset the adjustment costs, there can be periods where leverage appears (ie, based on a cross-sectional estimation) not to keep track with increasing profitability.[12] That is to say, under this dynamic approach to the trade-off

[12] Eckbo and Kisser (2018) rerun Danis et al. (2014) estimations and showed how the finding of a positive profitability-leverage association is driven by cash-based refinancing events, where firms adjusted their leverage upwards by reducing cash holdings in order to distribute more dividends and/or repurchase equity shares. The authors argued that this is not supportive of the theoretical prescription under the dynamic trade-off theory as firms do not incur transaction costs when using cash holdings (ie, as opposed to issue new debt). However, firms presumably still face costs when repurchasing equity shares, so that it makes sense to accumulate enough cash holdings in order to buy back shares in batches rather than adjusting their leverage continuously over time.

theory of optimal capital structure,[13] rising profitability is a forerunner of leverage increases (ie, based on a time-series estimation).[14]

Similarly to the theoretically literature on how debt affects the sustainability of collusion, the empirically literature is quite scant. Ferrés et al (2017) looked at how financial leverage for US firms caught participating in cartels changed around the detected period of collusion. The main finding is that colluding firms reduced their (book) leverage, notwithstanding lower operating cash flow volatility, in particular during the early years of the cartel. The authors claimed that this pattern is consistent with the main prescription in Maksimovic (1988) that debt undermines collusion stability, whereas it contradicts the positive association between profitability and leverage under the trade-off theory.

However, the drop in leverage is concentrated in the first two years of the cartel period (which lasts 6 years on average) and primarily involves the firms with a high degree leverage to start with. In addition, firms on average recover almost 60% of this reduction by the time they reach the fourth cartel year. It is also worth noting that the drop in leverage is preceded by a fall in profitability in the year prior to the formation of the cartel, which suggests how these are typically 'crisis cartel' where firms agree to collude in order to recover from a fall in fall in profitability.

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[13] See Strebulaev and Whited (2012) for a review of this class of models, whereby managers maximise the unlevered value of firms with the operating cash flow following a geometric Brownian motion process with positive drift. Hence, in line with the standard 'real option' setting developed by Dixit (1993), managers factor in the value of a wait-and-see option when deciding whether to incur transaction costs to adjust towards the leverage target. Abel (2018) developed a model based on a Markov process in which the operating profit stays the same until a random shock governed by a Poisson process changes it to a new random (ie, independently and identically distributed) value. The optimal level of debt (which has instantaneous maturity – ie, is continuously refinanced) is set independently of current profitability, given that the probability of default (which offsets the tax shield benefits) is based on the expected profitability at the time of the next Poisson arrival. Therefore, the author obtained that the optimal leverage target can fall with rising profitability, as the value of the firm grows with current profitability, whereas the optimal level of debt stays the same.

[14] In this respect, Frank and Goyal (2015) found that the adjustment in terms of debt issuance falls short of fully offsetting the increase in the value of equity (both market and book values) in response to the increase in profitability. The authors speculated that this is due to the presence of variable adjustment costs (ie, on top of fixed adjustment costs) which would make a fully-fledged adjustment (ie, in order to reach the optimal leverage target) too costly. In addition, in line with the findings in Parise (2018), the authors showed how leverage adjustments tend to involve long-term debt maturities rather than short-term ones.

Arguably, this patter is very consistent with a setting where lenders adopt a simple adaptive (expectations) approach, tightening up credit supply following a drop in profitability and lessening it back again gradually as profitability is recovered.[15] Accordingly, this evidence would neither be supportive of Maksimovic (1988), nor contradict the trade-off theory.

Finally, this narrative of (anticompetitive) harm also ties in with more recent emerging evidence that links the secular decline in competition (and resulting increase in corporate profits) to the decrease in corporate investment (De Loecker and Eeckhout, 2017; and Díez et al., 2018) and also higher reliance on external debt (Gutiérrez and Philippon, 2017).[16]

III. Discussion

From a theoretical perspective, the strategic role of debt hinges, broadly speaking, on whether firms are subject to refinancing events and the extent of tax shield benefits. Regarding the latter, the ability of lender and debt holders to condition the renewal of their credit risk exposure on the basis of current and past performance in the product market reverts the prediction regarding the strategic effect of debt from procompetitive (ie, in the absence of refinancing event) to anticompetitive (ie, as in Bolton and Scharfstein, 1990), in the sense that induces the borrowing firm to adopt a softer competitive stance. Therefore, in the absence of tax deductibility of interest rates paid on debt, debt is taken on only insofar as firms are financially constrained.

However, in the presence of tax-shield benefits firms are expected to take on some positive level of debt (ie, as shown in Stenbacka, 1994 with respect to a collusive setting). This common practice entails that, in a non-coordinated setting, firms no longer need to

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[15] In this respect, the claim that such an explanation is rebutted by the observation that collusion appears to have no adverse effect on firms' cost of debt financing seems flawed. This is because the authors cannot observe the relevant counterfactual, that is, the cost of debt that would have prevailed had the firms in question not immediately reduced their leverage ratio. In other words, the observed reduction in leverage during the two years following the drop in profitability is the remedial action firms had to take in order to avoid a sharp increase in their cost of debt financing.

[16] As argued in the introduction, it is important to note that the posited causal relationship between competition and financial leverage would not apply to markets where the incentives to maintain a lasting competitive advantage over rivals is strong, a consideration that would tend to exclude those industries where high market power and profitability is driven by 'superstar firm' effects (see Autor et al., 2017), where industries are increasingly characterized by 'winner take most' competition, leading a small number of highly profitable firms to command growing market share.

choose their level of debt under the conjecture that unlevered rivals will take full advantage of the ensuing softer competitive stance. Instead, firms can to some extent anticipate that the softer competitive stance will be reciprocated, thus yielding a less competitive outcome with higher profitability across the board (ie, as speculated in Faure-Grimaud, 2000). This in turn would tend to mitigate the risk of financial distress and improve the chances of refinancing, thus tilting the balance further towards more debt in order to benefit from higher tax-shield benefits. Ultimately, rival firms (symmetrically) choose to take on positive levels of debt, with the result that competition is weakened in comparison to a counterfactual scenario where firms are unlevered.

In a coordinated setting, the strategic incentives to take on debt can be even stronger (ie, above and beyond considerations around tax-shields). In order to successfully collude, rival firms need to solve two issues: reaching a mutual understanding on whether and how to collude (ie, coordination problem); and, once reached, sticking to the collusive agreement (ie, sustainability problem). Regarding the former, under competition law there is a distinction between a (spoken) cartel and (unspoken) tacit collusion, depending on whether firms are able to somehow communicate in order to address the initial coordination hurdle. Ferrés et al (2017) looked at cartels, in particular the kind of 'crisis cartels' where coordination is motivated by the urge to bounce back by a drastic fall in profitability across the board.[17]

In contrast, lack of communication makes it more difficult for tacitly colluding firms to coordinate. Hence, this is why debt can be used strategically as a facilitating practice, in that firms can credibly signal to each other their intention to adopt a soft strategic stance by gradually ratcheting up their financial leverage in parallel (ie, thanks to the fact that capital structures can be observed by rivals), as lenders/debt investors become more accommodative of firms taking on more debt, that is, in light of the improving market performance resulting from the generalised weakening of competition rivalry. This is particularly so when debt maturity is short.

Nevertheless, the theoretical insights from Maksimovic (1988) and Stenbacka (1994) indicate that debt undermines the sustainability of collusion. Arguably, though,

[17] Although in economic models communication between allegedly colluding firms is considered to be 'cheap talk' - that is, uninformative as it cannot be binding on parties (ie, because cartels are not legally enforceable) – the risk of being caught and face large fines and, in some jurisdictions, even criminal prosecution counterintuitively adds credibility to those exchanges.

this is primarily the result of the assumption adopted in those models that debt has infinite maturity and pays a fixed coupon forever, or until the firm defaults.[18] Although this standard modelling choice is perfectly justifiable within the context of the trade-off literature, where profitability is not affected by capital structure and is actually outside the control of firms (ie, profitability evolves according to an exogenous probabilistic process), the lack of refinancing events can be too restrictive when researching firms strategic interaction. To provide an intuition as to why, what follows briefly revisits the main result in Maksimovic (1988) by assuming that firms have to renew their debt at the end of every period over the infinite horizon typically adopted in this class of games developed to study the sustainability of collusion.[19]

There are n identical firms selling a homogenous product with common marginal cost normalised to zero and without capacity constraints. Time is discreet and future profits are discounted at a common discount rate r. In the absence of coordination, firms play the only Nash equilibrium of the one-shot game in each period earning the same profit π_{NC} (where the subscript NC stands for non-coordination). If they manage to collude they earn the higher profit π_C; whereas the firm that deviate earns the highest profit π_D, with the others earning the lowest profit π_{ND}, so that $\pi_D > \pi_C > \pi_{NC} > \pi_{ND}$. This configuration conforms with the strategic setting of a prisoner's dilemma, in that firms would be collectively better-off by sticking to collusion, but there is an unilateral incentive to deviate, which in turn forces every firm to err on the side of cautious by playing the non-coordinated response, in order to avert being exposed to (comparative) losses due to misplaced trust in rivals.

As explained in the previous section, firms can overcome this impasse by committing to playing 'grim-trigger strategies', that is, to the extent that the short-run gains from deviation are not large enough to compensate for the losses from the permanent break-down of collusion, specifically: $\pi_C + \frac{\pi_C}{r} \geq \pi_D + \frac{\pi_{NC}}{r}$, which can be readjusted as $\pi_D - \pi_C \leq \frac{\pi_C - \pi_{NC}}{r}$. This inequality entails the following standard condition for the sustainability of collusion with respect to the common discount rate: $r \leq r^* =$

[18] In addition, both models assume that debt is risk-free until deviation occurs.
[19] The exposition that follows is based on Section 2.1 in Spagnolo (2000).

$\frac{\pi_C-\pi_{NC}}{\pi_D-\pi_C}$. In words, firms have to be patient enough to care more about losses from the break-down of collusion going forward.

Provided that collusion among unlevered firms is stable, in Maksimovic (1988) firms symmetrically take on the same level of long term debt with constant coupon d,[20] so that the previous inequality becomes: $\pi_C - d + \frac{\pi_C-d}{r} \geq \pi_D - d + max\left\{\frac{\pi_{NC}-d}{r}, 0\right\}$, which again can be rearranged as $\pi_D - \pi_C \leq \frac{\pi_C-d}{r} - max\left\{\frac{\pi_{NC}-d}{r}, 0\right\}$. When $d \geq \pi_C$, the corresponding sustainability condition is $r \leq r^{**} = \frac{\pi_C-d}{\pi_D-\pi_C}$, which is tighter than the one with unlevered firms, entailing that debt makes collusion less sustainable (ie, $r^* \geq r^{**}$). This is the main result in Maksimovic (1988).

Suppose instead that firms issue short-term debt that must be paid back at the end of each period. Debt holders are strategically savvy in that they take into consideration the outcome of the previous stage game when setting the coupon for the current period. Therefore, whilst they may be happy to accept a lower coupon $\underline{d}$ as long as collusion lasts, the coupon required (ie, given the same stock of debt)[21] after an episode of deviation would be increased to $\overline{d}$ to reflect to expected fall in profitability (ie, during the retaliation phase), so that $\underline{d} \leq \pi_{NC} \leq \overline{d}$.[22] Under these circumstances, the inequality becomes $\pi_C - \underline{d} + \frac{\pi_C-\underline{d}}{r} \geq \pi_D - \underline{d}$, which entails $r \leq r^{***} = \frac{\pi_C-\underline{d}}{\pi_D-\pi_C}$. As a result, and in contrast to the main finding in Maksimovic (1988), the use of (short-term) debt would tend to improve the sustainability of collusion (ie, $r^{***} \geq r^* \geq r^{**}$).

The understand the basic intuition underpinning this result consider first that whilst in Maksimovic (1988) taking on high levels of debt increases the cost of deviation, due to the permanent subsequent phase of punishment (ie, the loss of the stream of non-

[20] In case of default when the profit is lower than the coupon, it is assumed that the firm in question doesn't exit the market but is taken over by a new owner; otherwise the game would turn into a predation one.

[21] As standard in these models, the debt raised is distributed to equity owners, as well as all the residual profit after the coupon is paid. In addition, equity owners consume all their income, so that they would not be able to inject more equity in case it is not possible to refinance with debt.

[22] This is a drastic simplification, in that there ought to be a source of uncertainty (eg, about the level of demand as in Rotemberg and Saloner, 1986) so that banks face a risk of default under the non-coordinated outcome (ie, whereas the risk is remote as long as the collusive agreement holds). However, this would greatly complicate the exposition without adding much additional insight to the fundamental intuition.

coordinated profits π_{NC}), it also reduces collusive profits to a greater extent (ie, $d \geq \pi_{NC}$). In contrast, in the amended version presented above, the reduction of collusive profits is comparatively lower (ie, $\underline{d} \geq \pi_{NC}$) as long as firm stick to the collusive agreement, so that taking on debt effectively amounts to a commitment device, as the loss of the future stream of non-coordinated profits (ie, $\pi_{NC} \leq \overline{d}$) is relatively preponderant.

IV. Conclusions

Under the mainstream trade-off theory of optimal capital structure, firms incentive to take on debt, in order to shield operating income from corporate tax, is mitigated by the fact that debt holders are wary of financial distress costs caused by agency problems due the combination of information asymmetry and limited liability in favour of equity holders. By the same token, debt would induce firms to adopt a more aggressive competitive stance, if it wasn't for the need to secure refinancing, so that firms end up competing less aggressively than absent debt instead, to err on the side of caution in case, for example, demand turns out to be lower than expected. Therefore, considering that all rival firms would want to have some positive level of debt to start with, this strategic effect would tend to be amplified, thus yielding a less competitive outcome.

In addition, debt could be used to collude tacitly. As the common adoption of debt triggers a generalised softening of competitive rivalry, debt holders have reasons to be less concerned about financial distress costs, thus naturally accommodating a generalised ratcheting of the leverage ratio and ensuing further weakening of competition. Furthermore, debt can make collusion more sustainable, as the anticipated increase in the interest rate under more intense competition during the punishment phase may trigger default and thus cause the loss of the future stream of non-coordinated profits (ie, which are lower than the collusive profits, but still higher than the debt servicing costs as long as the collusive agreement holds).

For these anticompetitive effects to emerge, one has to assume that firms are subject to periodic refinancing events and that debt holders adopt an adaptive approach, that is, looking at current and recent performance in the product market in order to come to a view of how profitability will be going forward. This approach is eminently sensible, particularly in (oligopolistic) markets where rival firms find it hard to gain a lasting competitive advantage and their operating profit margins can be greatly eroded when competitive rivalry is intense.

This theory of (anticompetitive) harm entails a positive association between profitability and financial leverage, where, in particular, the former is a forerunner of the latter. This posited pattern is consistent with the available empirical evidence from different literature strands.

In terms of policy implications, it would be wrong to argue that lenders or debt investors are conniving with borrowing firms to weaken competition. This is to the extent that the former merely adopt prudential underwriting standards in taking into account recent profitability during refinancing events. Nevertheless, the observation that leverage is being ratcheted up in parallel across rival firms should raise alarms in particular if accompanied by weakening competition (ie, as inferred from increasing price-cost mark-ups). In the worst possible scenario, such a patter could signal the establishment of tacit collusion, which is why antitrust authorities may want to add it to their diagnostic tools for detecting suspicious conspiracies.

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