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Business Stealing + Economic Rent = Insufficient Entry? An Integrative Framework

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Abstract

Entry in a homogeneous Cournot oligopoly can be excessive if there is business stealing. Since this excessive entry prediction has been established, a variety of circumstances have been identified which allow for insufficient entry, despite the business stealing externality. This paper shows that most of them rely on the same mechanism and, therefore, constitute a special case of a general set-up. To establish this insight, we survey the pertinent contributions and classify the circumstances, which are invoked to establish the possibility of insufficient entry into four categories. Importantly, they all imply that the oligopolists pay a rent, which reduces profits and deters entry. Since rents are welfare-neutral, insufficient entry will occur if the rent is high enough.

Keywords: Business stealing, Cournot oligopoly, Economic rent, Excessive entry, Insufficient entry, Literature survey

JEL codes: D 43, D 62, L 13

1. Introduction

An increase in the number of competitors in an oligopolistic market usually alters each firm's production level. If the output per firm declines with the number of firms, there is business stealing. It is a well-established and robust finding that the business-stealing externality induces (second-best) excessive entry in a homogeneous Cournot oligopoly with economies of scale. The reason is that each potential entrant ignores the repercussion of its decision on other firms' production choices and their profits. Effectively, entry shifts operating profits from incumbents to the entrant. While such a transfer is without direct impact on welfare and, therefore, provides no argument in favour of additional entry from a welfare perspective, it constitutes part of the entrant's private incentives to take up production. Accordingly, the private gains from entering a homogeneous Cournot oligopoly exceed the benefits to society and there are too many competitors in equilibrium.[1]

There are, however, numerous investigations, which derive conditions for entry to be insufficient in the presence of the business-stealing externality. Seminal contributions establishing the possibility that there are too few entrants in such a setting, such as by Ghosh and Morita (2007a, b), assume a vertical structure with imperfectly competitive upstream and downstream markets. In consequence, entry in the upstream market does not only cause an upstream business-stealing effect, but also creates business for downstream firms. Similarly, downstream entry enhances upstream business. Importantly, the prices paid to upstream, respectively, received by downstream firms are not exogenously given, but vary, generally with the output level. In the case of an imperfectly competitive upstream (input) market, higher downstream production may raise the input price. This price increase has no direct welfare consequences but lowers the profits of a potential downstream entrant. Hence, the incentives to start business are reduced. Consequently, the input price impact may give rise to insufficient entry into a downstream Cournot oligopoly. A comparable effect may occur if upstream firms decide on market entry.

In this paper, we generalise this insight and show that insufficient entry in a homogeneous Cournot oligopoly in the presence of business stealing does not require a vertical structure that features imperfect competition in the upstream and downstream market. We demonstrate more generally that incentives to enter may be inadequate if oligopolists pay an economic rent. Such rents constitute transfers and, therefore, have no direct welfare effects. However, the higher the

[1] See Perry (1984), Mankiw and Whinston (1986), Suzumura and Kiyono (1987), and von Weizsäcker (1980) for early analyses, Suzumura (2012) and Etro (2014) for surveys, and Mas-Collel et al. (1995) for a textbook treatment.

rent is, which an oligopolist pays, the lower are its operating profits and the fewer firms, ceteris paribus, enter the market. Accordingly, the magnitude of the rent, relative to the extent of the business-stealing externality, determines whether there is insufficient or excessive entry. We clarify that many analyses of insufficient entry assume at least implicitly the existence of rents and are, therefore, special cases of our more general set-up.[2]

Our findings have far-reaching implications: First, the discussion of excessive or insufficient entry has focused on the impact of externalities due to business-stealing or business-enhancing competition. That is, a main ingredient of many analyses is whether an exogenous increase in the number of competitors raises or lowers output of each active firm. We clarify that in the absence of such demand effects entry decisions can already be inefficient. Second, we demonstrate that the payment of a rent within a contractual relationship is qualitatively the same in terms of its behavioural consequences as a positive externality. Therefore, our findings apply to taxes and subsidies, or other regulatory interventions, which involve transfers as well. Moreover, if input prices are not determined on fully competitive markets but exceed society's marginal cost of producing these inputs, they have qualitatively similar consequences as taxes and subsidies. Consequently, insufficient entry in oligopoly may be more widespread than commonly argued since most input markets are not characterised by perfect competition. Third, our analysis can guideline empirical investigations on the question of excessive or insufficient entry. Finally, from a methodological vantage point, it is sufficient to demonstrate the payment of rents of a sufficient magnitude for establishing insufficient entry. Elaborate analyses of the mechanisms generating a rent payment are not required to classify the required type of government intervention, that is restricting or fostering entry. The yardstick we formulate can help assessing the analytical innovation of future contributions.

The paper proceeds as follows: Section 2 outlines the model, describes the market equilibrium and the second-best optimal situation, and derives a condition for entry to be excessive or insufficient. This section establishes the formal framework, which we use in Section 3 to interpret other contributions through the lens of our paradigm. We initially focus on vertical relationships in Sub-Section 3.1. Subsequently, we also interpret other mechanisms causing insufficient entry through the rent paradigm. We categorise these contributions by considering

[2] While we can interpret most mechanisms generating incentives for insufficient entry in terms of rent payments, there are contributions, which focus on other causes. There can be insufficient entry, for example, if firms are heterogeneous with respect to costs (Mukherjee 2012b, Mukherjee and Tsai 2014) or the timing of entry (Mukherjee 2012a). Moreover, insufficient entry can occur because the firms have different productivities and too few low-cost firms take up production (cf. Vickers (1995a) and Ohkawa et al. (2005), and also Cespa and Vives (2022)).

government interventions in Sub-Section 3.2, incorporating externalities in Sub-Section 3.3, and taking foreign agents into account in Sub-Section 3.4. Because previous contributions have not emphasised the common feature of the mechanisms they investigate or employ, there is some overlap between the sub-sections. Section 4 summarises our findings.

2. Analytical Framework

2.1 Foundations

We consider a market for a homogeneous good in which n profit-maximising firms compete in quantities, taking as given output choices of other firms (Cournot-Nash behaviour). Revenues of firm j, j = 1, 2 , …, n, equal the product of the price, P(Q), and output, q_j, of firm j. Q denotes aggregate output and equals the sum of q_j and output of all other firms, Q_j, $Q := q_j + Q\_j$. The price is decreasing in aggregate output, $P'(Q) < 0$. Direct demand Q(P) is log-concave, such that $P''(Q)Q + P'(Q) \leq 0$ (see, for example, Mizuno 2003, Ara and Ghosh 2016, Ghosh and Morita 2017, and de Pinto and Goerke 2020).

A firm's costs consist of three components: First, there are production costs, $C(q_j)$, which increase with output. Marginal costs are constant, weakly positive and less than the maximum willingness to pay, implying that $C(q_j) = cq_j$, $P(Q \rightarrow 0) > c \geq 0$. Second, there are fixed costs of entry, F, which are sunk and result in economies of scale. The cost components c and F are the same for all firms and reflect the use of resources, which, ceteris paribus, lowers welfare.[3] Third, each firm pays a rent, R, $R \geq 0$. The rent may constitute a payment to the suppliers of inputs, which exceeds their opportunity costs and, thus, the costs to society of using them. This would, for example, be the case if the input is labour and its remuneration exceeds the reservation wage. Alternatively, upstream firms may implicitly pay a rent to downstream enterprises if the latter sell the final product to consumers at a price in excess of their production costs, including the payments to upstream firms. The payment of rent may also signify a transfer to another agent, conceivably the government, which benefits this agent to the same extent as it harms the firm. One could also imagine that the oligopolist faces a situation with asymmetric information leading to ex-ante imperfect observability of the quality or quantity of the input.

[3] Ghosh and Saha (2007) show that excessive entry does not necessarily require economies of scale and symmetric costs. de Pinto and Goerke (2022) clarify that uncertainty about costs tends to aggravate excessive entry. Amir et al. (2014) demonstrate that the outcome obtains for a wide variety of cost functions. Hence, the assumptions that C(q) is linear, and that c and F are the same for all firms and known ex-ante simplify the analysis but do not constitute prerequisites for the prediction.

This requires the firm to pay a rent so that the information is revealed. Irrespective of its source, the rent neither affects welfare directly nor does it have an income effect and, in this way, alters demand.

The rent may depend on the firm's output level, implying that $R = R(q_j)$ holds. To illustrate this possibility, suppose that the rent constitutes a payment to workers in excess of their reservation wage. Consequently, an increase in labour demand by the oligopolist will surely result in higher wages per employee in a model of collective (Nash-) wage bargaining if the shift in the demand curve leaves its slope unaffected (and the labour demand elasticity decreases; cf. Oswald 1985). This would be a situation in which $R'(q_j) > 0$ holds. However, if the labour demand elasticity is high enough and the reservation wage sufficiently low, the rent may fall with additional output. In consequence, and because we do not want to restrict the rent perspective to labour inputs, we do not impose a sign on $R'(q_j)$. This makes our analysis as encompassing as possible. Clearly, a rent payment could also depend on other factors than output. The findings derived in the remainder of this section, for example, obtain as well if the rent depends on aggregate output, $R = R(q_j + Q\_j)$. To simplify our analysis, we focus on $R = R(q_j)$ and refer to more elaborate specifications in Section 3. Moreover, we assume $R''(q_j) \geq 0$ and restrict our analysis to interior solutions for the firm's output choice problem.

Summarising the above, profits of firm j can be written as operating profits less the sum of the rent payment and market entry costs:

$$\pi_j = P\left(q_j + Q\_j\right)q_j - cq_j - \left(R\left(q_j\right) + F\right) \tag{1a}$$

Welfare consists of the sum of aggregate profits, consumer surplus, and rents payments. Simplifying the resulting sum shows that rents do not alter welfare directly since they reflect transfers, and we can express welfare as:

$$W = \int_0^{Q(n)} P(S)dS - c\sum_{j=1}^{n} q_j - nF \tag{2}$$

The sequence of events is as follows: In market equilibrium, in the first stage firms decide whether to enter the market at cost F. A firm will do so as long as entry is (weakly) profitable. In stage two, each firm determines output. In order to evaluate the market equilibrium, we assume that a social planner maximises welfare, W, by determining the number of firms in the first stage. Firms then decide on output. Therefore, the benchmark for assessing the market outcome is a second-best situation.

We solve the model by backward induction. Because most of the contributions looked at in Section 3 treat the number of firms, n, $n \geq 1$, as continuous variable (cf. Seade 1980, Delipalla and Keen 1992, Ghosh and Morita 2007a, inter alia), we also adopt this assumption. Aggregate output can hence be expressed by $Q = qn$. Finally, the resulting equilibrium is unique and symmetric, given our modelling assumptions.

2.2 Market Outcome

The first-order condition for a profit-maximising output choice is given by:

$$\pi_q = P'(Q)q + P(Q) - c - R'(q) = 0 \tag{3}$$

The second-order condition holds, given log-concavity of direct demand and $R''(q) \geq 0$, as the former implies that $0 > P''(Q)Q + P'(Q) = n[P'(Q)q + P'(Q)/n] > n[P'(Q)q + 2P'(Q)]$ holds.

Equation (1b) implicitly defines the equilibrium number of firms, n^*:

$$\pi(n^*) = P\big(n^* q(n^*)\big)q(n^*) - cq(n^*) - F - R(q(n^*)) = 0 \tag{1b}$$

The market equilibrium is stable, as the determinant, D, of the system of equations (3) and (1b) is positive.[4] Moreover, profits decline with the number of firms as $d\pi/dn = D/\pi_{qq} < 0$. Finally, the market described above exhibits business stealing, because an exogenous increase in the number of firms reduces output per firm, that is, $dq/dn = -\pi_{qn}/\pi_{qq} = -q(P''(Q)q + P'(Q))/\pi_{qq} < 0$. The sign of π_{qn} is obvious for $P''(Q) \leq 0$ and is also negative otherwise, as $P''(Q)q + P'(Q) \leq P''(Q)qn + P'(Q)$ for $n \geq 1$ and $P''(Q) > 0$, while $P''(Q)qn + P'(Q) < 0$ holds due to log-concavity of direct demand.

2.3 Optimum

Taking into account that each firm's output choice, q, depends on the number of firms, n, the (second-best) optimal number of firms, n^{SB}, is implicitly determined by:

$$\frac{dW(n)}{dn} = P(Q)\left(q + n^{SB}\frac{dq}{dn}\right) - F - c\left(q + n^{SB}\frac{dq}{dn}\right)$$

$$= \underbrace{P(Q)q - cq - F - R(q)}_{=\pi(q)} + R(q) + (P(Q) - c)n^{SB}\frac{dq}{dn} = 0 \tag{4}$$

[4] Taking into account $Q = qn$ and $P'(Q)q + 2P'(Q) < 0$, we have $\pi_{qq} = P''(Q)Q + P'(Q)(1 + n) - R''(q) < 0$ and $D = \pi_{qq}\pi_n - \pi_q\pi_{qn} = P'(Q)q^2[P''(Q)q + 2P'(Q) - R''(q)] > 0$.

We assume that the second-order condition holds.[5] Since a non-negative level of profits requires $P(Q) > c$,[6] we have:

> Proposition 1:
> Assume a homogenous Cournot oligopoly with business stealing, in which firms face constant marginal costs, c, fixed costs of entry, F, and pay rents, R(q). Entry in market equilibrium will be (second-best) insufficient ($n^* < n^{SB}$) if
>
> $$R(q) > -(P(Q) - c)n^* \frac{dq}{dn}$$
>
> i.e., if the rent is sufficiently high.

Proof: Follows from (4) for $\pi(q) = 0$ and $dq/dn < 0$.▪

Business stealing causes a negative externality. Its magnitude is given by the fall in output due to entry, $n^*(dq/dn)$, evaluated at the difference between the willingness to pay and marginal costs, $P(Q) - c$. This externality implicitly determines the extent of excessive entry in the absence of rents. If firms pay rents, such transfers reduce profitability and deter entry (see equation (1b)). The decline in profits, though, has no direct welfare consequences and no impact on the second-best optimal number of firms, n^{SB}, as the first line of (4) clarifies. Therefore, the size of the rent determines the extent of insufficient entry if there is no business stealing ($dq/dn = 0$). If there is business stealing and the rent exceeds the magnitude of this externality, entry will be insufficient.

Assuming linear specifications for demand and rents, ($P''(Q) = R''(q) = 0$), we obtain $dq/dn = -q/(1 + n)$. In market equilibrium, we have $P(Q) - c = (F + R(q))/q$ from (1b) and the derivative in (4) evaluated at n^* and $\pi(q(n^*)) = 0$ collapses to:

$$R(q) + (P(Q) - c)n^* \frac{dq}{dn} = \frac{R(q) - n^* F}{1 + n^*} \tag{5}$$

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[5] It is given by

$$\frac{d^2W(n)}{dn^2} = \frac{dq}{dn}[2R'(q) + P'(Q)q(n-1)] + P'(Q)\left[q^2 + \left(n\frac{dq}{dn}\right)^2\right] + (P(Q) - c)n\frac{d^2q}{dn^2} < 0$$

We can also write:

$$\frac{d^2W(n)}{dn^2} = (P(Q) - c)\left(2\frac{dq}{dn} + n\frac{d^2q}{dn^2}\right) + P'(Q)\left(q + n\frac{dq}{dn}\right)^2 < 0$$

Ohkawa and Okamura (2003) establish sufficient conditions for the existence of a unique welfare maximum, assuming general demand and cost functions.

[6] This may no longer be the case if marginal production costs increase with output, since this implies that $c'(q)q > c(q)$ may hold. A restriction on $P(Q) - c'(q)$ can be obtained from the firm's first-order condition and requires that $R'(q)$ is not too negative. Hence, the assumption of linear costs does not qualitatively affect our main result.

If, therefore, the rent per firm, R(q), exceeds aggregate entry costs, n*F, there will be insufficient entry. The higher the fixed costs of entry, F, are, the lower the number of entrants and the more pronounced the business-stealing externality will be. Accordingly, aggregate entry costs are an indicator of the externality inducing excessive entry. If the rent payment more than compensates this impact, entry will be insufficient. In consequence, equations (4) and (5) can provide empirical research with a criterion to ascertain whether a market is characterised by excessive entry or too few competitors. The main challenge is to determine the effect of more competition on output per firm, that is, dq/dn.

3. Related Contributions

There are various investigations of free-entry oligopolies, which assume that a firm's entry decision is affected by costs for which the profit consequences and the welfare effects differ. While the subsequent survey is certainly not comprehensive, we have attempted to include contributions, which exhibit the following features:

1. The analysis focuses on a homogeneous Cournot oligopoly with free, but costly entry in the spirit of Mankiw and Whinston (1986). Therefore, a business-stealing externality can occur, which may give rise to excessive entry. In contributions, which, for example, incorporate product differentiation, include cost asymmetries or focus on other types of competition, the rent impact can also be present (see Kuhn and Vives (1999) and Bertoletti and Etro (2016)). However, the additional effects of entry often obscure the opposing consequences of business stealing and economic rents. Accordingly, we discuss settings, for example, assuming asymmetries if we can derive the symmetric outcome as a special case that is comparable to our analytical framework.
2. The private costs associated with market entry exceed the costs incurred by society, and the rent perspective can potentially be applied. As a consequence, we do not, for example, delve into investigations of Cournot oligopolies involving welfare-reducing environmental externalities (see Katsoulacos and Xepapadeas (1995), Requate (1997), and Lee (1999) for some early contributions).
3. Excessive or insufficient entry can be clearly identified and constitutes a major feature of the investigation. Hence, a comparison between the strength of the business-stealing externality and the magnitude of economic rents is feasible.

3.1 Vertical Settings

In a seminal paper, Ghosh and Morita (2007a) assume a fixed number of oligopolistic downstream firms, which sell a final product to consumers. Manufacturing the final good requires intermediate inputs, which are produced by an endogenously determined number of upstream oligopolists. Since downstream firms have market power, the final goods price exceeds the sum of the costs of inputs and their marginal production costs. By choosing output in a profit-maximising manner, upstream firms can appropriate one part of downstream firms' payoff, which they take into account when deciding about entry. The remaining part of downstream firms' payoffs, namely their profits, constitute a "business-creation" (Ghosh and Morita 2007a) or "business-enhancing" (Amir et al. 2014) effect, which upstream firms ignore. Using the standard specification of welfare, being the sum of consumer surplus and aggregate profits (cf. equation (2)), Ghosh and Morita (2007a) show that entry into the upstream market is excessive if the business-stealing externality dominates the impact of a transfer of profits to downstream firms.

From the perspective of our model, the difference between revenues of a downstream firm and the amount paid for the intermediate good to an upstream enterprise is analytically equivalent to a rent which was paid by an upstream to a downstream firm. The magnitude of the rent, as defined by equation (2) in Ghosh and Morita (2007a), rises with output per firm, implying that $R'(q) > 0$ applies. Ghosh and Morita (2007a) also clarify that entry will be excessive if the downstream market is fully competitive, such that no rent payment occurs. This is exactly the finding captured by equation (4), setting $R(q) = 0$.

Antelo and Bru (2006) analyse a set-up in which all upstream oligopolists sell a product to two downstream firms. After entering the market, upstream firms can form a coalition. Each upstream coalition engages in separate (Nash) bargaining over both the quantity and the overall payment with each downstream duopolist. Antelo and Bru (2006) show that upstream entry will be excessive if the bargaining power of coalitions is sufficiently high, while being insufficient if the bargaining power of downstream duopolists exceeds a critical value. The greater a downstream firm's bargaining power is, the higher are its profits and the stronger is the "rent distribution" effect (Antelo and Bru 2006, p. 1288). In contrast to our model, the rent, $R(q)$, depends not only on the output per firm, but additionally on the number of upstream firms and coalitions, the measure of bargaining power and marginal costs. This feature does not affect its role as a welfare-neutral entry deterrent.

Ghosh et al. (2022) present another contribution in which upstream firms implicitly pay rents that have detrimental consequences for entry. More specifically, they analyse the welfare effects of downstream mergers. A merger decreases the price paid by downstream firms for the input good and raises that of the final good. As profits of downstream firms reduce upstream profits, they act as a deterrent to entry into the upstream market. However, the distribution of a given level of profits between up- and downstream firms does not affect the welfare-maximising number of upstream entrants. Therefore, we can interpret downstream profits as rent payments by upstream firms. A merger elevates these welfare-neutral transfers and discourages upstream entry by amplifying the business-creation effect.

Our model can also shed light on settings in which the number of downstream firms is determined endogenously, while entry in the upstream market is not feasible. de Pinto and Goerke (2020) interpret the upstream agent as firm-specific trade union. Since collectively bargained wages exceed their reservation level, firms pay a transfer that does not directly affect welfare but deters entry. de Pinto and Goerke (2020) show that entry will be insufficient if the wage bill, that is the rent obtained by workers, is sufficiently large. de Pinto et al. (2023a) assume asymmetric information about worker effort between the employer and the employee, thus analysing a vertical relationship within a single firm rather than a link between different firms. Given this asymmetric information, the employee obtains an informational rent and the utility exceeds the reservation level. de Pinto et al. (2023a) establish a condition that guarantees insufficient entry, showing that the impact of the informational rent can dominate the influence of the business-stealing externality.[7] Ghosh and Morita (2007b), Mukherjee (2009), and Mukherjee and Zeng (2022) establish similar results for non-labour inputs, assuming either price-setting upstream firms or negotiations over prices and quantities.[8]

Bonazzi et al. (2021) look at a setting in which one upstream manufacturer and one downstream retailer are matched, so that entry decisions always relate to both markets. Retailers have an

[7] de Pinto et al. (2023b) analyse an oligopoly model with adverse selection in which the productivity of employees can either be high or low. They compare a scenario in which firm owners possess knowledge of productivity when deciding on employee remuneration to a situation where this is private information to the employee. They demonstrate that welfare in a world with asymmetric information can be higher than if productivity is observable. For an extension with an endogenously determined number of firms, de Pinto et al. (2023b) further show that the rent paid to employees in a world with asymmetric information can ensure insufficient entry.
Cutler et al. (2010) present a verbal application of the basic idea to the market for coronary artery bypass graft surgery (in Pennsylvania). They argue that the market for such operations resembles an oligopoly with substantial fixed costs of entry. The hospitals hire specialist surgeons upstream. Cutler et al. (2010, p. 53) indicate that "surgeons are a scarce input, available in imperfectly elastic supply. The less elastic is labor supply, the smaller the predicted entry … .". Therefore, any compensation payment to surgeons in excess of their reservation wage constitutes a rent payment to them.

[8] Mukherjee and Zeng (2022) further show that excessive entry becomes more likely the higher the fraction of fixed costs is, which is not sunk but can be recovered if no production takes place.

informational advantage regarding demand and, as a result, they obtain an informational rent. Bonazzi et al. (2021) mainly analyse the welfare consequences of two schemes by which manufacturers can influence quantities sold by retailers, namely a retail price maintenance rule and a price-quantity schedule. In terms of our model, the retail price maintenance rule or a price-quantity schedule ensure that retailers' profits are sufficiently low, such that manufacturers pay a modest rent. If retailers decide on entry and obtain only a small share of overall profits, the large rent they pay to manufacturer can dominate the business-stealing effect and there may be insufficient entry.

Notably, the trade-off between business-stealing and rents also applies in settings with free entry in all markets, i.e., the numbers of upstream and downstream firms are both determined endogenously, as Ghosh and Morita (2007b) clarify. Peitz and Reisinger (2014) confirm this result when considering the effects of taxes, which may differ for up- and downstream firms.

In contrast to the contributions discussed in the previous paragraph, Basak and Mukherjee (2016) do not consider a multitude of upstream agents, but a monopolist. Given a linear production technology, entry will be insufficient. In their setting, the monopolist's profits constitute the total rent, $nR(q)$, paid by all downstream firms. It is straightforward to show that the rent per firm, $R(q)$, exceeds the business-stealing externality, ensuring the fulfilment of the condition stated in Proposition 1.[9] Cao and Wang (2020) and Chen et al. (2022) modify the setting by Basak and Mukherjee (2016) as the downstream market consists of incumbents and entrants. Because the marginal costs of entrants and incumbents differ, entry alters the average production costs. In consequence, the rent each entrant pays is different from the amount in a setting without incumbents. The analyses by Cao and Wang (2020) and Chen et al. (2022) show that the entrants' payments to other firms, which are welfare-neutral, may no longer exceed the business-stealing effect. In terms of our model, the rent $R(q)$ declines since part of the monopolist's profits results from payments by incumbents. If the rent falls sufficiently, the excessive entry prediction will reappear.

Among the many contributions focusing on vertical relationships, there are also analyses in which the upstream firm decides on downstream behaviour, as well. Baye et al. (1996) consider

[9] This finding mirrors the result presented in a largely unnoticed earlier study by Mori et al. (2009) who derive an insufficient entry outcome in a vertical relationship with an upstream monopolist, using the Japanese loan market as illustrative example. Mori et al. (2020) extend the analysis and show that insufficient entry may no longer occur if the upstream monopolist is restricted in its pricing behaviour by a regulator. See also Onishi et al. (2018) who contrast an upstream monopoly, resulting in insufficient downstream entry, with a competitive upstream setting inducing excessive entry. Basak and Mukherjee (2016) furthermore show that the rent paid to the upstream monopolist may not be sufficient to compensate the business-stealing externality if costs are convex.

upstream companies, which set up divisions that independently determine output. This way, upstream firms can commit to higher downstream output levels than if they set the quantity themselves. Moreover, upstream firms partially incorporate the business-stealing externality because they take the effect of additional entry on their own divisions into account. Baye et al. (1996) show for a linear demand schedule that the number of divisions is socially optimal if there are two upstream firms. In a similar spirit, King (1999), building on Vickers (1995b), considers a monopoly network provider, which sells access at a regulated price to downstream firms. In King's (1999) setting, excessive entry will be reduced if the upstream provider can also act on the downstream market and charges its subsidiary a lower price than independent competitors have to pay. Therefore, Baye et al. (1996), King (1999), and Vickers (1995b) clarify that the existence and extent of excessive entry depend not only on the magnitude of the rent paid to upstream firms, but can also be affected through the influence of upstream firms on the business-stealing externality and, this way, on downstream competition.

3.2 Government Interventions

Rents may not only be paid to or by the providers of inputs and, thereby, be related to output. They can also arise when firms face fixed costs, possibly of market entry, which result from government interventions, but do not reflect the use of resources. Therefore, from the perspective of our model these costs are not equivalent to entry costs, F, which, ceteris paribus, lower welfare. Furthermore, rent payments can result from taxation or damage expenditures.

In an early analysis, Brander and Spencer (1985) investigate the case of license fees, which have no direct welfare impact. In a zero-profit market equilibrium, "the optimal license fee is positive if and only if an increase in the (...) fee increases the equilibrium level of output of each" firm (Brander and Spencer 1985, p. 291), i.e., there is business stealing. In terms of our model, this statement is tantamount to the assertion that entry will be excessive if oligopolists have to pay no rents and the optimal number of firms will be attained when the output (business-stealing) effect is balanced by the impact of the rent, which does not vary with output ($R'(q) = 0$). Obviously, license fees are analytically equivalent to entry taxes, such as considered by

Mankiw and Whinston (1986), Ohkawa and Okamura (2003) and Chang et al. (2010).[10] Therefore, welfare-neutral entry fees constitute a special case of our general setting.[11]

Rents can also result from the taxation of output. Besley (1989) has shown that the introduction of a specific tax, t, can raise welfare. The tax distorts a firm's output choice and, ceteris paribus, lowers welfare because output falls with the tax rate. The basis for the positive welfare effect is that the number of firms entering the market declines with the specific tax. Besley (1989) formulates a condition (cf. equation (10)) for such a decline to occur. This condition will always hold for $P''(Q)Q + 2P'(Q) < 0$ and convex variable costs. In the context of our model, the dependence on the tax is not limited to the rent alone, $R = tn(t)q(t)$, but extends to the price and potentially dq/dn. Consequently, the strength of the business stealing externality can vary with the tax rate.[12]

Ara et al. (2020) employ the mechanism explored by Besley (1989) when analysing the ramifications of tariffs. They show that the introduction of a tariff on imports, which downstream oligopolists use as inputs, can raise welfare. The reason for this being that firms pay a rent to the government via the tariff, which deters entry. This positive welfare effect can dominate the negative impact due to the fall in aggregate output resulting from the tariff.[13]

Leiva and Turner (2016) assume that there is one firm, which makes an invention and an endogenously determined number of imitators. These imitators produce at the same constant marginal costs but save on the fixed costs associated with the invention. The imitators illegally utilise the invention and have to pay patent royalty damages with an exogenous probability. Leiva and Turner (2016) show that the fixed royalty and, thus, damage payment, which ensures optimal entry, exactly offsets the business-stealing externality. Per-unit royalty damages can also offer optimal entry incentives but are inferior to the fixed royalty because they distort each oligopolist's quantity choice downwards, which is already too low. In terms of the model

[10] Konishi (1990), Konishi et al. (1990) and Suzumura (1995, chap. 3) analyse the impact of differentiated tax-subsidy scheme and show that optimal entry requires lump-sum taxation, that is, effectively an entry fee.
[11] Amir and Burr (2015) assume that oligopolists have to pay bribes in order to obtain entry licences and show that entry will be second-best if two independent officials compete for bribes. Although bribe payments constitute rents, it is not their level, which allows for insufficient entry in the model by Amir and Burr (2015), but the desire of corrupt officials to maximise bribe income by limiting the number of entry permissions.
[12] de Meza (1982), Delipalla and Keen (1992), and Hamada et al. (2022) additionally consider ad valorem taxation and a change in the structure of commodity taxation. Konishi (1990), Konishi et al. (1990), Suzumura (1995, chap. 3), and Peitz and Reisinger (2014) analyse reforms of more comprehensive tax systems. Basak and Mukherjee (2022) show that insufficient entry may result as well if the tax is determined endogenously. In particular, they assume that separate agents choose a unit tax and entry to maximise welfare. If taxes raise welfare, for given output and entry decisions, the optimal tax rate can be positive and too few firms enter the market.
[13] In an extension, Ara et al. (2020) consider a vertical oligopoly and focus on domestic firms for the computation of welfare. Hence, their contribution also contains elements we discuss in Sub-Sections 3.1 and 3.4.

outlined in Section 2, damages constitute rents since they, ceteris paribus, raise the inventor's profits by an amount equivalent to the decrease in profits by all imitators. Equation (4) above, therefore, implicitly defines the optimal royalty, which Leiva and Turner (2016) consider.[14]

3.3 Externalities

The optimality of entry decisions has also been investigated in settings in which a firm's decisions have direct positive consequences on the revenues of its competitors. Gama and Samano (2021) and Toshimitsu (2020) consider models with positive network effects. This implies that the production level of one oligopolist, ceteris paribus, enhances the unit price obtained by all firms. Accordingly, a firm pays the full costs for an increase in the size of the network, while it only obtains a fraction of the benefits. Since the difference between the oligopolist's and society's benefits from expanding output is analytically equivalent to a rent, which rises with the firm's output level, the set-ups by Gama and Samano (2021) and Toshimitsu (2020) are compatible with $R(q), R'(q) > 0$.[15] There can be insufficient entry if the network externality is sufficiently strong.

Insufficient entry can also result in two-sided markets in the presence of multi-homing and network externalities. If consumers purchase the desired (type of) good from multiple platforms, the latter's opportunities to extract surplus from sellers of the good is restricted (see Adachi et al. 2023). Therefore, we can interpret multi-homing (in the presence of network externalities) as a mechanism, which causes platforms to pay rents to sellers. Therefore, the incentives to entry may be inefficiently low.

Other frameworks have extended the firms' choice set. Chen et al. (2020) take up an idea already pursued by Varian (1995). They focus on production externalities and presume that firms choose output and undertake R&D investments and, thereby, lower marginal production costs of competitors. This setting contrasts with earlier approaches that include R&D activities but do not incorporate spillovers. In these contributions, the excessive entry prediction often holds

[14] Leiva and Turner (2017) employ a similar framework and consider the joint use of a fixed and per-unit royalty. Given two producers, the combination of a positive fixed and negative per-unit royalty, i.e. subsidy, can generate the (constrained) first-best outcome. Ohkawa et al. (2012) analyse a framework in which upstream firms own a property right over a common resource for which they charge a royalty to all downstream firms. There is excessive downstream entry if firms pay no royalties. Positive royalties are equivalent to rents and can give rise to insufficient entry.

[15] Their results contrast with findings by Gama (2019) and Basak and Petrakis (2021, Section 5.1), who assume networks effects to be firm-specific. In a modification, Toshimitsu (2020) considers the case in which consumers anticipate the entire network impact of increasing demand, allowing firms to fully reap the network benefits of expanding production. In both frameworks, excessive entry results in the presence of business stealing. These differences in the specification of network externalities clarify the role of the rent.

(see, for example, Okuno-Fujiwara and Suzumura 1993, Suzumura 1995, chap. 4). However, if the spillover effect is sufficiently large, Chen et al. (2020) show that it can dominate the business-steeling externality.[16] Hattori and Yoshikawa (2016) obtain a similar result in a setting in which firms share common property resources that enhance demand. Since firms bear the full costs of investing into this resource, but only benefit partially due to its public good character, the incentives to enter the market are insufficient if the common property effect is large enough.[17]

The models including positive repercussions of a firm's choices on competitors differ from the approach outlined in Section 2 if these externalities arise because of a second choice variable, such as R&D investments. In this case, the rent varies with the costs of R&D and possibly the investments by other firms, and is not only a function of output, q. Nonetheless, the basic mechanism, giving rise to insufficient entry, can be interpreted on the basis of equation (4).

Positive payoff externalities can also arise if oligopolists pursue other objectives than profits. Suppose that firms exhibit corporate social responsibility (CSR) concerns, and maximise a weighted sum of profits and consumer surplus, while a zero-profit constraint determines entry. In this case, the CSR objective reduces profits and deters entry, while at the same time it enhances welfare due to an increase in output. Hence, the alternative firm objective is analytically equivalent to a payment, which is not necessarily welfare-neutral but may even have positive welfare effects. Accordingly, non-profit objectives can mitigate excessive entry or induce insufficient entry.[18]

3.4 Foreign Firms and Consumers

Insufficient entry in a homogeneous Cournot oligopoly may ultimately result if firms are foreign-owned or if there is cross-border consumption. To elucidate the interpretation of the underlying mechanism in our model, consider a scenario where an exogenous share $1 - \alpha$, $0 \leq$

[16] Haruna and Goel (2011) provide a similar finding, while in Wang et al.'s (2015) analysis R&D activities with spillover effects do not reverse the excessive entry prediction. In Chao et al. (2017), the firm undertaking R&D also creates positive externalities but has already entered the market. Hence, the rent it pays does not affect its entry decision. The insufficient entry prediction in Chao et al. (2017) instead results from the absence of economies of scale. Pal et al. (2023) set-up a model in which oligopolists cause positive environmental externalities, which they do not take into account when deciding about output and entry. Accordingly, entry can become insufficient if the positive externality is sizeable.

[17] Mukherjee (2010) provides an analytically comparable mechanism and according results and interprets a positive effect of the number of firms on each firm's costs as external economies of scale.

[18] See Planer-Friedrich and Sahm (2020) for the analysis of CSR. Suzumura (1995, chap. 8) provides a more comprehensive investigation of alternative firm objectives. These objectives may lead to insufficient entry and often involve a profit-reducing but welfare-neutral transfer, which can be interpreted as a rent payment.

$\alpha \leq 1$, of the oligopolists are foreign-owned. The decisive assumption in the contributions we review in this sub-section is that the government objective W^d only incorporates domestic profits. Given identical firms and the absence of rents, the maximisation of $W^d = W - (1 - \alpha)n\pi$ results in:

$$\frac{dW^d}{dn} = \pi(q) + (P(Q) - c)n^{SB}\frac{dq}{dn} - (1 - \alpha)\left(\pi(q) + n^{SB}\frac{d\pi}{dn}\right)$$

$$= \alpha\pi(q) + (P(Q) - c)n^{SB}\frac{dq}{dn} - (1 - \alpha)n^{SB}\frac{d\pi}{dn} = 0 \qquad (6)$$

In market equilibrium, profits are zero. Since $P(Q) > c$ and $d\pi/dn < 0$ (from (4)), the last line of equation (6) clarifies that entry will be insufficient if there is no business stealing, such that $dq/dn = 0$ holds (see Han et al. 2022). This will also be the outcome if the business-stealing externality is not too strong. Insufficient entry may arise because the costs of expanding the number of firms, as measured by the loss in profits, partly occur abroad. Disregarding the impact of entry on profits of foreign firms implies that the desired number of domestic entrants is higher than their optimal number in a closed economy, while the market outcomes remain unaffected in the absence of trade costs. The greater the share of foreign firms is the more likely it becomes that the business-stealing externality is dominated by the foreign-firm effect and that insufficient entry occurs. In particular, Han et al. (2022) show for a setting with linear demand schedule that there are too few firms if $\alpha < 0.5$. If all firms are foreign-owned, the government will attempt to maximise consumer surplus and entry in market equilibrium will surely be insufficient (see Barros and Cabral 1992 and Jensen and Krishna 1996).[19]

While foreign ownership of firms does not give rise to rents, a comparison of the first line of (6) with the second line of equation (4) clarifies that foreign ownership is analytically equivalent to a setting with solely domestic enterprises, which pay rents. Both features have the same consequences, namely that a society's – perceived – benefit from entry is, ceteris paribus, higher than a firm's gain. Equation (6) also shows that the rent equivalent, $(\alpha - 1)d(n\pi(q))/dn$, does not only depend on output per firm, q, and may also become negative if profits are high enough.[20]

[19] In an open economy, there may also be foreign consumers. If welfare is defined as the sum of payoffs within a jurisdiction, surplus accruing to foreign consumers reduces the optimal number of firms. Accordingly, the greater the share of outside consumers is, the more likely excessive entry becomes (see, Chang et al. (2010) and Han et al. (2022)). Conversely, cross-border shopping by domestic consumers can result in insufficient entry.

[20] Marjit and Mukherjee (2013) assume that there is only one foreign firm and show that foreign ownership together with cost differences can result in insufficient entry. Marjit and Mukherjee (2013) refer to this mechanism as "rent extraction effect". The interpretation proposed in the previous paragraph is also compatible with the approach by Amir et al. (2022) and Goerke (2020) who look at the effects of free trade and FDI, respectively, and assume that the weight of consumer surplus in the government objective differs from that of profits.

Analyses of trade models with oligopolistic product markets can also be interpreted in the light of the rent perspective. The welfare effects of allowing for free trade, of imposing tariffs or taxes, respectively subsidising exports, of regulating entry, fostering or limiting FDI, or and other measures that enhance or restrict trade are often assessed based on their impact on the combined sum of consumer surplus and profits of domestic firms (see, for example, Bhattacharjea 1995, Brander 1995, Richardson 1999, Stähler and Upmann 2008). Therefore, the positive effects of restricting entry on foreign firms are not considered when determining welfare consequences, and the free-entry number of firms may be less than the number desired by the authority shaping trade policy. In terms of our interpretation, such an outcome can occur because the rent payments to foreign agents are neglected.

4. Summary

Entry in a homogeneous Cournot oligopoly with business stealing and economies of scale will be excessive if a firm's costs of inputs reflect the welfare-reducing use of resources. If, however, Cournot oligopolists pay a rent, there is a tendency towards insufficient entry because the rent deters entry but does not directly affect the (second-best) optimal number of firms. We demonstrate that numerous prior analyses, which establish the potential for insufficient entry in the presence of business stealing, either represent specific variants of a more general framework or can be interpreted within it. While we have developed our integrative framework for the simplest feasible setting, the basic idea that rent payments can mitigate or dominate the impact of business stealing on entry also applies in more elaborate frameworks in which, for example, firms face different production costs or produce a variety of commodities, or there is no quantity competition à la Cournot.

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