What are Research Joint Ventures (RJVs)? Are they good for Innovation and for Economic Welfare?

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1 Introduction

Research and Development (R&D) investments help industries to innovate, reduce costs and become more competitive. However, R&D investments are plagued by an externality problem as innovation is a public good - Cassiman (2000) which means that innovators are often not the only ones to gain from their costly new knowledge. Consequently, the private incentives to conduct R&D are lower than those socially desirable - Röller *et al.* (1997). However, with the rise of globalisation giving international sellers - with comparative advantages - access to world markets, innovation is key to ensuring monopolists and market competitors remain profitable. According to Röller *et al.* (1997), the cooperative nature of production in the Japanese technology sector threatened firms through their

comparative advantage gains. Therefore, firm cooperation in R&D gained popularity worldwide to exploit any possible market gaps or cut costs low enough to gain market power. Also, joint firm commitments internalise any spillovers to avoid the free-rider problem.

This essay aims to explain what Research Joint Ventures (RJVs) are and the motivation for joining one. We give some examples of recent RJVs. Furthermore, we aim to examine if they are beneficial for innovation and whether they have a positive effect on economic welfare.

2 What are Research Joint Ventures (RJVs)?

Research Joint Ventures (RJVs) have substantially gained popularity in recent years. RJVs are defined by Caloghirou *et al.* (2003) as "organisations, jointly controlled by at least two participating entities, whose primary purpose is to engage in cooperative research and development (R&D)". RJVs combine resources from multiple firms to speed up the process of innovation, reduce the likelihood of failure and thus reduce costs involved in R&D. Subsequently, they improve technical efficiency in the market – Adams and Link (2017).

Fundamentally, the concept of RJVs contrasts the typical theory of R&D, which a firm conducts to gain a monopoly advantage over competitors. RJV membership involves sharing innovative information; thus, firms involved do not gain a competitive advantage over one another. Typically, for a monopolist, the incentive to spend on R&D comes from one of two conflicting effects: the pure efficiency effect or the replacement effect. The pure efficiency effect says that the incumbent monopolist's incentive to innovate to prevent the

loss of profit from competition is greater than a possible entrant's incentive to innovate and become a duopolist. The replacement effect says that monopolists have little incentive to innovate as they will gain less than a perfectly competitive firm. This is due to the loss in existing profits as the monopolist uses a share of its profits for the cost. The pure efficiency effect will dominate over the replacement effect when there is likely to be non-drastic innovation. Whereas the replacement effect will dominate when there is likely to be dramatic innovation.

The process of R&D aims to create new technology with one of two main objectives: either product innovation or process innovation. Product innovation is the invention of a new product or an increase in an existing goods quality (for example, the mobile phone or the COVID-19 vaccine). It can be thought of as reducing the costs of producing this good from infinity to feasible. On the other hand, process innovation involves a change to how a good is produced, typically with lower production costs, through technological advancements.

2.1 Motivation to Join an RJV

So why would a firm, especially a monopolist, wish to join an RJV? Röller *et al.* (1997) discuss four main reasons why firms may join an RJV. First, firms may join agreements to internalise the spillovers and overcome the free-rider problem from conducting R&D investment. Without RJVs, the free-rider problem disincentivises firms to spend on R&D. In an extreme case, for example, if all firms were to join together in an RJV, all spillovers would be internalised. This would cause investment in R&D to increase, which in turn would increase welfare – Röller *et al.* (1997). Another benefit of RJVs, which Röller *et al.* (1997) suggest is the biggest incentive to form an RJV is the cost savings achieved by

firms sharing the R&D costs. R&D is a very risky investment, and it is very costly. Working together would reduce the individual spending by firms on R&D investment as firms avoid 'duplicating their efforts'. This is when firms hoping to achieve the same goal may be using similar methods, duplicating one another's efforts into innovation. So, working together lessens the burden of duplication of effort; thus, the cost of R&D is lower per firm. Röller *et al.* (1997) expand on the existing literature by suggesting that 'product market complementarities' and 'firm heterogeneity' may provide a motive for firms to enter an RJV. They find that large firms have minimal incentive to form an RJV with small firms to increase their market power; hence industries as a result become more asymmetrical. They also find that the formation of RJVs is significantly more likely with vertically related firms of a similar size to one another.

2.2 Notable Examples of Research Joint Ventures

In a bid to encourage the cooperative nature of business, policymakers in the US, enacted in 1984 the National Cooperative Research Act (NCRA). They also provided government support to joint ventures - Röller *et al.* (1997). In Europe, under EU competition laws, RJVs were granted exemptions in a bid to encourage such ventures.

As a result, we saw the number of joint firm ventures increase. Firms producing complementary products - such as in the electronic equipment and communications industries – are the most likely to form an RJV. And in fact we observe that the majority of inter-firm research relationships now occur within these high-technology industries. They account for about 80 per cent of all cooperative partnerships (Caloghirou *et al.,* 2003). In the 1990s, 80

per cent of all the technology partnerships occurred in the US, the European Union and Japan.

Some notable examples of RJVs in recent years include Ford and Toyota – who formed an RJV for the development of hybrid trucks in 2011. They shared their access to expertise and intellectual property to achieve this goal. Most recently, in 2020, GSK and Sanofi, two of the world's biggest pharmaceutical giants, joined forces and shared their knowledge and resources to try and create a COVID-19 vaccine. Moreover, in June 2012, BMW and Toyota embarked on cooperative research into hydrogen fuel cells and ultra-lightweight materials in the car manufacturing sector to achieve zero emissions. BMW and Toyota agreed to share their comparative advantages with hopes of developing industry-leading technology.

3 Innovation and RJVs

With individual firms, there is under-investment in R&D as the private incentive to invest is less than the social value of innovation. RJVs help firms diversify their risk and mitigate the uncertainty involved with R&D projects which in turn spurs on innovation due to of entrepreneurial behaviour. – Audretsch and Link (2019). Firms share the risk of the project as both make a monetary contribution, so if it goes bad, both firms lose. Hence, the moral hazard problem is lessened as firms are more likely to undertake R&D that successfully results in innovation. Therefore, Audretsch and Link (2019) argue that RJVs engage in riskier and more uncertain activities due to the cost-sharing and can be better for innovation as a result. However, they find these effects to be limited as there remains the risk that the RJV

must remain a viable entity from start to completion. If it does not, then a single member may take the innovation to the market as their own to make a profit. Despite this, there is still an improvement in the likelihood of innovation with RJVs compared to more informal arrangements.

Röller *et al.* (1997) quote Link (1996) to say that nearly 60% of RJVs filed under in the National Research Joint Venture Database (NRJVD) in the US cases are concerned with process innovation. This confirms the case that most RJVs are useful for drastic innovation that would lower the costs faced by consumers.

4 The Welfare Effects of Research Joint Ventures

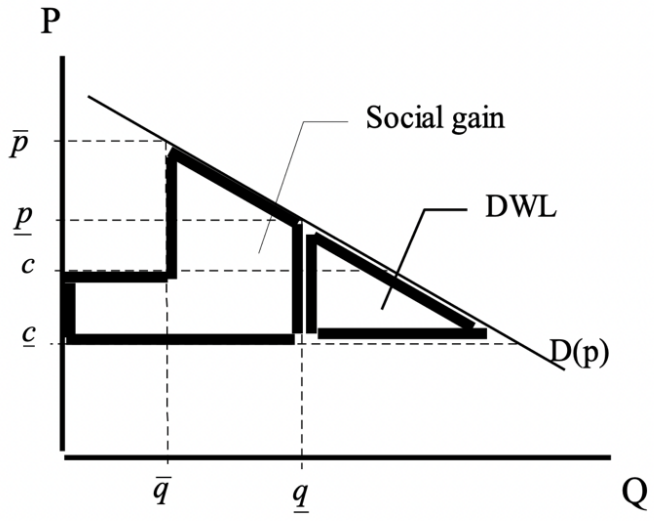
Moving forward from the discussion on innovation, the economic literature finds that RJV's also have scope to increase overall economic welfare. Poyago-Theotoky (1997) investigated a range of theoretical papers based on R&D development and the welfare effects. They show that RJVs lead to a higher degree of social welfare when there are 'high' levels of quality improvements as a result. On the other hand, Poyago-Theotoky (1997) say there is a possibility of reducing social welfare. This is because as firms internalise any externalities associated with R&D and help avoid the duplication of efforts, they subsequently spend less on R&D. Firms are able to cooperatively share scarce resources and work together to innovate, which reduces overall R&D expenditure.

Similarly, Ishii (2004) found that, in particular, Vertical RJV cartels are the ones to yield the largest social welfare gain when vertically related firms coordinate their research by

sharing their knowledge. Samano *et al.* (2017) argue that firms in Bertrand Competition can increase the long-run welfare if they join an RJV focusing on process innovation.

Figure 1, below, shows the social gain from a drastic process innovation which causes a lower marginal cost for the firm. This lowers the price that the monopolist will charge. Thus, both the monopolist gains by earning a higher monopoly profit and consumers get a higher consumer surplus (they face a lower cost and therefore consume more). The social gain area show the societal gains in Figure 1. The deadweight loss area shows that there are still unrealised gains to innovation. This analysis emphasises Poyago-Theoroky (1997)'s point that the most significant societal welfare gains come when there are drastic changes in innovation. An RJV may help to achieve this as being a part of an RJV means that a firm is more likely to invest in R&D, which increases the likeliness of innovation. Also, considering that most RJVs focus on process innovation (60%), this provides evidence to suggest that most RJVs should result in a high welfare gain for society.

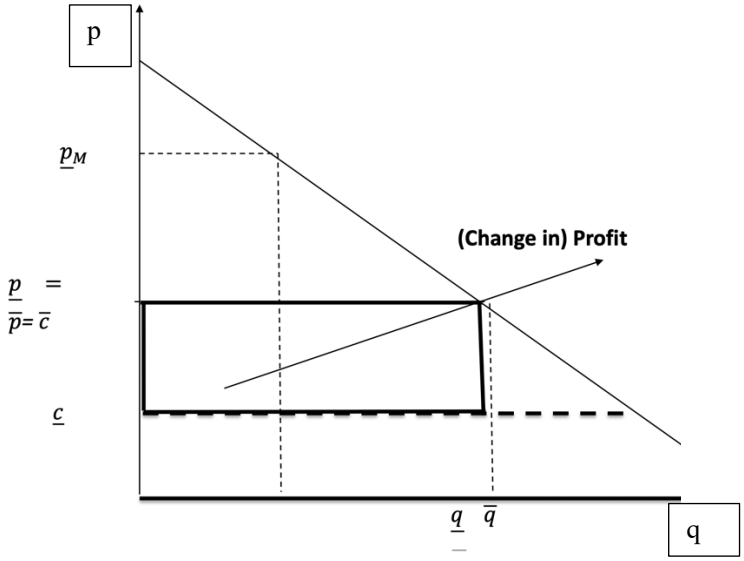
Figure 1: Welfare Gains with a Drastic Change in Innovation



Source: EC365 Lecture 6

If, in contrast, there was only a minor change to innovation, this could result in the new monopoly price being greater than the original marginal cost - as shown in Figure 2. This would mean that the innovator must charge the original marginal cost (the perfect competition market price) in order to capture any of the market. Hence, the price in the market is unchanged as a result of the innovation. This means that there is no change in consumer surplus, and there is only a small change in profits for the innovator. Society will still benefit more under this minor innovation than under no innovation, but the gains are smaller.

Figure 2: Welfare Gains with a Non-Drastic Change in Innovation



Source: EC365 Lecture 6

Both cases show that some innovation is better than no innovation; however, a dramatic change is best for society. Moreover, RJV membership incentivises firms to invest in R&D; hence it is beneficial to the welfare of society.

5 Conclusion

To Conclude, the aim of this paper was to investigate Research Joint Ventures (RJVs). They are joint ventures taken on by at least two firms (often competitors) who agree to invest in cooperative research and development (R&D). We then evaluated their impact on innovation and economic welfare. When firms process innovate, in particular, social welfare increases substantially – Poyago-Theotoky (1997). Without RJVs, the private incentives to invest in R&D of monopolists are very low through the replacement effect. By joining a cooperative agreement, firms lower their individual cost and risk, and the probability of successfully making drastic innovations is higher. Hence, more innovation is likely through the higher incentive to spend on R&D.

However, RJVs do trigger the need for careful policy planning as their nature may not always be great for competition. For example, Caloghirou *et al.* (2003) suggest that RJVs may need to face restrictions based on anti-trust principles should they be deemed to restrict competition. On the other hand, policy may wish to encourage such ventures if they build competitive advantages without changing the competitive market structure while doing so.

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