Research article

Two Agency Problems in Subcontracting Systems: The Case of Japan's Content Industry

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Abstract:

Purpose: A closed *keiretsu* subcontracting network is a key feature of Japan's manufacturing industry. While subcontracting systems have been observed in various fields, including the content industry, the literature largely focuses on the assembly industry, where the contribution of these systems to high productivity has been appreciated. Except industrial and government reports addressing unfair trade and inefficiency problems, there is a dearth of systematic analyses on subcontracting systems in Japan's content industry. Thus, this study aims to theoretically examine why subcontracting systems work efficiently in some sectors but not in others, particularly Japan's content industry.

Methodology: This study applies multitask agency and common agency theories to models that attribute issues in the content industry to inefficiencies in the overall subcontracting system and the asymmetric distribution of benefits. It is proved that certain characteristics of the content industries appear to worsen agency problems under the subcontracting system.

Findings/Contribution: The important characteristics are that products have ambiguous quality attributes which are difficult to verify in contracts, and that subcontractors in Japan traditionally work with multiple contractors. The findings highlight the importance of recognizing the essential features of the abovementioned problems to vitalize Japan's content industry. Thus, this study contributes to the literature that has yet to thoroughly address these factors.

Keywords: Japan's content industry, subcontracting system, multitask agency, common agency

1.   Introduction: Conditions for Subcontracting Systems to Work

A closed vertical cooperation system, or the so-called *keiretsu* subcontracting network, is a key feature of the Japanese manufacturing industry. Studies have largely attributed subcontracting systems to the success of assembly industries in Japan, ignoring their role in various other fields, including the content industry. With the exception of industrial and government reports on unfair

trade and inefficiency problems[1], there is a lack of systematic analyses on subcontracting systems, particularly in the context of Japan's content industry. This study aims to theoretically explore why subcontracting systems work efficiently in some sectors but not in others. The functions of subcontracting systems starkly differ between the assembly and content industries, alluding to the conditions under which subcontracting systems operate. Hereinafter, this section discusses various industrial and governmental reports on Japan's content industry and highlights how the circumstances detailed in the reports differ from those in the literature on assembly industries.

Most studies on Japan's subcontracting systems in the last decades of the 20th century focus on the assembly industry. These works often attribute high productivity and competitiveness in the assembly industries to subcontracting systems. Empirical research highlights a positive correlation between the technical efficiency of various industries and the intensity of their subcontracting systems[2]. Scholars have theoretically analysed the contribution of subcontracting systems using concepts to describe their attributes, including relation-specific skills (Asanuma, 1989, 1998), voice strategy (Helper, 1991), face-to-face competition (Itoh & Matsui, 1989), and delegation of work (Fujimoto, 1998). These concepts and hypotheses are based on observations from the automobile and electric appliance industries, and thus, may not be appropriate to comprehensively analyse subcontracting systems in other industries. While these theories can help explain the workings of the subcontracting systems, they do not identify the conditions necessary for them to exist and function. The slump and declining competitiveness in Japan's assembly industry following the 1990s turned researchers' focus toward production management theories, during which more developed production systems such as *extended enterprises* emerged[3]. As a result, studies on the Japanese subcontracting system remain confined to the assembly industry.

In this analysis, subcontracting is a long-term, close, and robust relationship between a producer and its suppliers, as in *keiretsu*.[4] In most cases, a subcontracting system is a multi-tiered hierarchy, observed in not only the assembly industry but also various industrial sectors in Japan. The Small and Medium Enterprise Agency under the Ministry of Economy, Trade and Industry (METI) formulated guidelines applicable to 18 fields to prevent prime contractors from abusing their superior bargaining position under the Subcontracting Act[5]. Among the 18 fields, these guidelines have been mandated in Japan's broadcasting content production and animation production[6]. The guidelines for the two industries are based on case studies conducted by competent research committees and are constantly updated. The case studies are on the infringements of the Subcontracting Act, such as abuse by those in dominant positions during transactions. The cases also include examples such as

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[1] Freeman (2000) and Uesugi (2008) discuss the role of *keiretsu* in the media industry. However, their studies focus on the hierarchical ownerships of newspaper companies, and thus, ignore *keiretsu* subcontracting systems.

[2] Torii (1992, 2001) estimated and analysed technical efficiencies in industries in 1977 and in 1995 respectively. In addition, Japan's SME Agency reports that in 1995, the average technical efficiency of industries that depend on subcontractors for more than 30 percent of their supplies was 79.2 percent, while the equivalent efficiency of industries that depend on subcontractors for less than 30 percent of their supplies was 65.1 percent. See *1998 White Paper on Small and Medium Enterprises*, The Small and Medium Enterprise Agency. Available online: http://www.chusho.meti.go.jp/pamflet/hakusyo/H10/index.html. (accessed 25/09/2019)

[3] Extended enterprises apply information technology to supply chain management and customer relation management (Dyer, 2000).

[4] The literature uses the term subcontracting to denote the purchase of parts or processing services. Similar to Asanuma and Kikutani (1992), most studies analysing Japan's assembly industry apply the term to the purchase of customized or 'Drawing Supplied' parts. This study adopts the traditional definition of Japan's content producers.

[5] http://www.chusho.meti.go.jp/keiei/torihiki/guideline.htm, (accessed 25/09/2019)

[6] http://www.chusho.meti.go.jp/keiei/torihiki/2014/140313shitaukeGL10.pdf (accessed 25/09/2019) and http://www.chusho.meti.go.jp/keiei/torihiki/2014/140313shitaukeGL9.pdf (accessed 25/09/2019)

unfair demand for price cuts and refusal to receive work from a subcontractor without reasons attributable to the subcontractor.

According to METI, TV stations and film distribution companies are highly concentrated, and thus, content producers must depend on them for financing and marketing, which leads to the unfair distribution of value-added benefits[7]. Japan's Fair Trade Committee (JFTC) reports that among 281 companies, 35 broadcast programme producers work with third-tier or below subcontractors, 120 companies engage with second-tier subcontractors, and 102 associate with primary subcontractors. Further, 39.4 percent admit to experiencing abuse by those in dominant positions at broadcasting stations. Of the typical cases of abuse, 20.2 percent producers report experiencing unfair demands for price cuts [8] and 19.7 percent have been forced to transfer the copyrights of an on-air-ready programme they produced with little or no compensation. Iwade and Yamaguchi (2017) suggest that while the total box-office revenue of the animation industry is expanding, the share of content producers' sales remains at a low 11 percent[9].

The content industry is well known for its low wages. In 2005, the Japan Institute for Labor Policy and Training reported the severe working conditions and the high rate of personnel turnover in the animation production industry[10]. According to the Japanese Animation Creators Association, the mean annual revenue of animation creators was 3,328 thousand yen in 2015, which is 24 percent lower than the average salary in the private sector reported in the Statistical Survey of Actual Status of Salary in the Private Sector[11]. Iwade and Yamaguchi (2017) define Japan's animation industry as exhausted and struggling to catch up with the new 3DCG technology. While low wages in artistic industries is not a structural problem specific to Japan (Yuugami, 2006), Japanese workers continue to earn wages lower than those of workers doing similar work in other countries (Ohashi, 2006).

This seemingly unfair distribution in the content industry is in strong contrast to the cooperative relationships in the assembly industry, where assemblers and suppliers engage in risk-sharing activities to mitigate the effects of economic fluctuations. Risk-sharing activities are a key function of subcontracting systems (Kawasaki & McMillan, 1987; Asanuma & Kikutani, 1992). These activities serve as a base to nourish trust and vertical collaboration between assemblers and suppliers and enable the proliferation of new technologies (Suzuki, 1993).

The contribution of supplier systems in Japan is not based on factors specific to the assembly industry. For example, TV stations subcontract the production of ready-to-air programmes and this entails the delegation of the entire task. The skills required for subcontractors are contingent on the manner in which a station employs current technologies, which is relation specific; alternatively, subcontractors can implement voice strategies (Helper, 1991). Close vertical relationships work well in some industries but not in some others, making it imperative to explore the conditions necessary

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[7] See the Ministry of Economy, Trade and Industry's *N Report: Toward a New Industrial Structure* (p.82), Research Institute of Economy, Trade and Industry, June 2004. Available online: https://www5.cao.go.jp/keizai-shimon/minutes/2005/0613/item4.pdf (accessed 25/09/2019)

[8] See the Japan Fair Trade Committee's Survey Report on Transactions of TV Program Production Japan Fair Trade Committee, 2015. Available online: http://www.jftc.go.jp/houdou/pressrelease/h27/jul/150729.html (accessed 25/09/2019)

[9] In 2015, while the total box-office revenue was 1,826 billion yen, the total sale of content producers was 201 billion yen.

[10] The Japan Institute for Labor Policy and Training, Employment and Human Resource Development in Contents Industries – Report of Research in Animation Industry –, March 2005 Available online: http://www.jil.go.jp/institute/reports/2005/documents/025.pdf (accessed 25/09/2019)

[11] Japan Animation Creators Association, *Survey of Animation Creators 2015*, (in Japanese). Available online: http://www.janica.jp/survey/survey2015Report.pdf. (accessed 25/09/2019). Ohashi (2006) also details the poor working conditions in Japan's animation production.

for such subcontracting systems to work. Inferior outcomes from vertical relationships imply the failure to deal with transaction costs. The theories previously enumerated in this section demonstrate the possibilities of dealing with such transaction costs, although they are inductions from cases in the assembly industry. This raises the question of whether the content industry incurs unmanageable transaction costs. The literature suggests that the factors affecting transaction costs include complex and uncertain transactions, unverifiability, specificity of assets, and asymmetric information. However, does this imply that content products are more complex than parts supplied to the assembly industry[12]?

This study employs the multitask agency and common agency theories to address these questions, particularly why a closed vertical cooperation system works in some industries and not in others, and to determine ways to enhance the performance of the content industry. Multitask agency and common agency problems are two major issues examined in a principal-agent model[13]. In fact, certain characteristics of the content industries appear to worsen these problems under the subcontracting system. The remainder of this paper is organized as follows. Section 2 explains the multitask agency problem and Section 3 details the common agency problem. Section 4 concludes the study.

2. Multitask Agency Problems in the Content Industry

Agency problems fall into two categories, adverse selection and moral hazard. An agent is delegated a task or tasks by a principal and then, allocates resources to an activity or activities. The process results in outcomes that benefit the principal. Adverse selection arises when the principal has to contract an agent without adequate information about the agent's attributes (e.g. abilities). The efficient performance of the activities depends on the agent's attributes. The agreed-upon contract, however, is not implemented to reflect the precise attributes required of the agent, giving the agent the opportunity to earn rent from this private information. Thus, the activity inspired by the incentives in the contract does not coincide with the optimal possibility, which results in inefficiency in the transaction outcome. On the other hand, a moral hazard arises when the principal cannot observe the activity. Here, activities are assumed as the effort level chosen by the agent. While the benefit for the principal depends on the activity, its level cannot be directly controlled. The contract specifies a reward for the agent that is linked with the final outcome because the result is observable. However, because the result reflects the activity imperfectly given the presence of noise, or the agent chooses risk-avoiding options, the activity chosen departs from the optimal possibility, resulting in inefficiency.

The multitask agency problem is a type of moral hazard that arises when an agent is simultaneously assigned multiple tasks by the principal[14]. The agent must allocate his/her resources among these multiple activities to achieve these tasks. In general, the outcomes of the chosen activities are multidimensional and result in stochastic noise, such that they do not directly reflect the allocated resources. While the outcomes are supposed to be correlated with the allocated resources, the results of multiple activities often depend on each other. This makes it increasingly difficult to tackle the multitask agency problem. Another factor contributing to the complexity of this situation is that the principal may be able to easily observe outcomes in some situations but may find it difficult to do so in some others (e.g. product quality). If an important factor determining the performance of the

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[12] In addition to these factors, Minetaki and Motohashi (2007, 2008) highlight that competitive pressure among prime contractors affect transaction costs in the content industry. Terrestrial TV stations, for example, are protected by entry regulations in Japan.

[13] The first literature that investigated content industries with concepts of agency problems and transaction cost is Caves (2000).

[14] See Holmstrom and Milgrom (1991), Dewatripont, Jewitt and Tirole (2000).

principal's payoff is not reflected in the agent's reward, this leads to biased resource allocation and thus, inefficient system performance. The model analysis highlights that contracts should not be designed to reward only easily observable outcomes because this compels the agent to engage in biased resource allocation towards activities expected to result in the desired outcome more directly[15].

Consider a content industry in which the content distributor delegates production to the subcontractor. To strengthen the present analysis, I focus on TV programmes as a content example. The principal is the programmes distributor (i.e. TV stations) and the agent is the programmes producer. As the principal, the TV station requires the producer under a subcontracting scheme to supply a high audience-rating programme that attracts a large number of viewers. In addition, the TV station may require the agent to produce a high-quality programme because it perceives this to be an overall concern for viewers or at least a concern for the relevant authority.

The viewers, as end consumers, evaluate the content through their watching activities, that is, the amount of consumption. In addition to the number of viewers, programmes are evaluated for their quality, although programme quality is difficult to define. Some studies employ the term 'programme quality' to indicate the extent to which viewers consider a programme attractive—this approach is no different from evaluating programmes on the basis of the number of viewers (Motta & Polo, 1997; Nilssen & Sørgard, 2000). By contrast, some others use the term to evaluate programmes as merit goods (Musgrave, 1959). Cabizza and Fraja (1998) argue that TV authorities, and not viewers, evaluate quality. Viewers, nevertheless, express concerns about the broadcast of low-quality programmes, particularly those targeted at children[16]. This study uses 'quality' to refer to content attributes prioritized by viewers but not fully reflected in the actual numbers of viewers. In addition, it assumes programmes that are produced and broadcasted can be assigned two attributes: *attractiveness*, which is directly reflected in the number of viewers, and *quality*, which is appreciated by viewers but less intensely reflected in the number of viewers. In other words, producers gain a smaller audience when investing a given amount of effort into quality as opposed to attractiveness.

Supplying a high-quality programme, thus, becomes another task to be achieved by the agent delegated by the TV station. However, while the number of viewers can be easily estimated, this is not the case for quality. Given the definition of quality adopted in this study, quality level is only partially reflected in the TV station's profits. Nevertheless, the station may gain in reputation among the public and this reputation boost could contribute to profits in the long run. Since the supplier's efforts to produce high-quality programmes are only partly evaluated, programme quality is allocated fewer resources. If the total surplus of the TV broadcasting system is assumed to be the sum of the total utility of viewers, which includes quality evaluations, and the profits of the TV station and producer, the system as a whole suffers from inefficiency owing to biased resource allocation.

The same resource allocation bias exists even if programme production is not delegated to suppliers but executed by the TV station itself to maximize profits. The subcontracting system, however, plays two critical roles. First, when programme production is delegated by TV stations, quality evaluations may differ between the TV stations and producers. Consider a case in which viewers' request for high-quality programmes is recognized more by TV stations than by producers. TV stations are in closer contact with viewers than are producers and thus, they regularly encounter viewer requests or claims and may better understand the importance of quality. Consequently, the

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[15] Holmstrom and Milgrom (1991) proved the reason why cost efficiency should not be rewarded as 'Missing Incentive Clause in Contracts.' Cost efficiency is relatively easy to observe while the high quality is difficult, then incentive provision on cost efficiency devastates the quality. The optimal contract is a fixed reward.

[16] See Walsh, Laczniak and Carlson. (1998). In addition, see Graham and Davies (1997) and the Department For Culture, Media And Sport (1999), *Market Failure in Broadcasting*, Annex 8,
Future Funding of the BBC. Independent Review Panel, available online:
http://news.bbc.co.uk/hi/english/static/bbc_funding_review/annex8.pdf (accessed 25/09/2019)

delegation of production results in less efficient resource allocation than does in-house production, unless the quality is clearly specified in the contract. On the other hand, producers may better understand the importance of quality because it is intrinsic to the production process. In such cases, viewers' requests for high-quality programmes align with the producers' ethics. However, producers' efforts to supply high-quality programmes receive low evaluations by TV stations. Thus, content producers face a trade-off between relinquished profits and self-respect, and eventually, incur expenses that are not compensated by the TV station.

Second, the subcontracting system may suffer from the opportunity to 'hold up', which occurs when one party is heavily invested in the relationship and thereby locked in. Programmes produced by subcontractors generally exhibit the attributes of quality. However, the quality of a programme is unverifiable. Traded products with unverifiable attributes generally incur higher transaction costs because this situation gives the principal the opportunity to hold up the contractor. TV stations may claim the programme to be too low in quality to pay the contracted price or too high in quality to compensate for the production cost. Low quality is the most frequent pretext used by principal parties to justify unfair price cuts in the case of animation production producers[17]. Costs that are not specified in the initial contract are difficult to compensate, even when the customer orders changes in the specifications[18].

In the assembly industry, the quality of parts supplied is undoubtedly important. Given the simultaneous demand for cost efficiency, the assembly industry is likely to face a similar multitask agency problem. However, the quality of assembled parts is observable if greater investments are made in inspections since quality can be captured through physical specifications and thus, described in the contract if necessary. Moreover, there is little discrepancy in evaluations between consumers and assembling companies because consumer evaluation is reflected in profits earned from product sales. Lower-quality parts degrade the quality of the end product, affecting profits and thus, assemblers are concerned with the quality of parts supplied by their subcontractors. Assembling companies can design optimal incentive schemes with quality standards to maximize profits, although they must consider noise and correlations among multifactor performance observations. While the system's efficiency is controllable, it is somewhat impaired depending on the magnitude of the noise and its correlations. Thus, the multitask problem is less severe in the assembly industry than in the content industry.

The content industry does not always suffer failures caused by multitask agency problems. NHK-BS, a satellite TV broadcasting channel operated by Japan Broadcasting Corporation (NHK), has avoided this problem and succeeded in providing high-quality programmes. NHK is the public broadcasting service (PBS) in Japan and NHK-BS is a platform that uses broadcasting satellites (BS) to air programmes. The service was launched in 1989 and acquired satisfactory and increasing viewership throughout the 1990s[19]. The subscription fee for NHK is termed a receiving fee (paid equally by all households and businesses with a TV set) in the NHK budget that must be approved

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[17] Among the reasons cited by producers for not being paid as initially contracted, 'lower quality than the standard' accounts for 83.3 percent. See Report of Contents Industry Support Project, 2015, p.108 (*Survey Project on Structural Change and Overseas Deployment Strategy Analysis in Content Industry*), Mitsubishi UFJ Research and Consulting Co. Available online: http://www.meti.go.jp/meti_lib/report/2016fy/000709.pdf (accessed 25/09/2019)

[18] There are numerous cases reported in the *Survey Report on Transactions of TV Program Production*, Japan Fair Trade Committee, 2015. Available online: http://www.jftc.go.jp/houdou/pressrelease/h27/jul/150729.html (accessed 25/09/2019)

[19] The Ministry of Internal Affairs and Communications describes steady increases throughout the 1990s. See *Research Report of Optimal Number of Channels held by NHK Satellite Broadcasting*, Ministry of Internal Affairs and Communications, 2008. Available online: https://search.e-gov.go.jp/servlet/PcmFileDownload?seqNo=0000037673 (accessed 25/09/2019)

by the Diet. NHK was faced with the requirement of increasing its revenue without raising the fee and met this requirement by introducing the NHK-BS service[20]. Satellite broadcasting was limited to NHK-BS and a private station prior to expanding the number of its channels by introducing digitized broadcasts through BS in 2000, when private companies began broadcasting their channels. However, private BS channels faced several difficulties in acquiring viewers. Consequently, they began reporting deficits and took a decade to generate positive cash flow.

Prior to launching BS channels, NHK produced all its programmes in-house. Thereafter, they began outsourcing their production because of limited resources. At the time, free-to-air private terrestrial TV stations that depended on advertisement revenue tended to air fewer documentary programmes owing to the excessive costs. This prompted NHK to emphasize documentary programmes, subcontracting their production to producers with significant experience in delivering such content to private channels. Consequently, NHK-BS was offering new attractive channels full of high-quality programmes[21].

NHK-BS, thus, managed to avoid the multitask agency problem by introducing broadcasting channels they expected would serve as a revenue source in the long run. Simply put, the pressure to provide high-quality programmes pushed the national broadcaster to provide high-quality programmes, which is reflected in the ultimate payoff to the principal. In such a situation, the parties succeed in collaborating with one another and the principal has no reason to hold up the producers[22].

3. Common Agency Problems in the Content Industry

3.1. Common Agency

Common agency refers to a case in which multiple principals trade with one agent. A typical example is when more than one manufacturer enjoys a monopoly in each product trade with the same product distributor. The manufacturers delegate the decisions related to sales amounts or retail prices to the distributor. This process warrants coordination and results in collusive outcomes (Bernheim & Whinston, 1985).

This section considers a case in which an adverse selection problem is caused by asymmetric information between the principals and the agent. The adverse selection problem requires a contract design in which the incentive mechanism induces the agent to select expected activities. However, the principal incurs an incentive mechanism cost in the form of additional rent for the agent. Therefore, the principal designs the contract such that the gap between the optimal and induced activities remains, although this results in inefficiencies.

If the principals do not employ a common agent, they delegate the tasks to separate agents. Each relationship is the same as the simple principal–agent relationship, although the agents compete with each other in differentiated markets. This competitive relationship between the two principal–agent pairs is described as exclusive agency. Martimort (1996) evaluates the outcome of common agency in comparison with that of exclusive agency. The author concludes that if the principal's products are substitutes for each other, then the competition between the agents under exclusive agency reduces

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[20] For details on the cost and revenue structure of NHK, see the report by the Ministry of Internal Affairs and Communication cited in the previous footnote.

[21] The Association of All Japan TV Program Production Companies (ATP), The Future of NHK-BS, mimeo, presented at Research Committee of Optimal Number of Channels held by NHK Satellite Broadcasting.
Available online:
http://www.soumu.go.jp/main_sosiki/joho_tsusin/policyreports/chousa/nhk_ch/pdf/080229_2_si1.pdf
(accessed 25/09/2019)

[22] See the previous footnote.

the amount of information rent they acquire, indicating inefficient common agency. However, if the variance in the agents' attributes is not as large, then the reduced information asymmetry may make common agency the dominant strategy. On the other hand, if the principals' products are complementary to each other, the importance of coordination makes common agency more efficient than exclusive agency.

3.2. Multiple Contractor Strategy

If the close vertical relationship in Japan's industries is considered a principal-agent relationship, then common agents represent subcontractors who trade with multiple contractors, while exclusive agents in Martimort (1996) are subcontractors who belong to a closed *keiretsu* relationship. *Keiretsu* is a hierarchical system similar to a pyramid, and thus, subcontractors can trade with only one contractor (Fujita, 1965). *Keiretsu* subcontracting systems were particularly common in the 20th-century assembly industry[23]. In the current content industry, producers do not belong to keiretsu and are considered to operate under common agency[24]. JFTC reports that a majority of the producers have contracts with several contractors[25]. Intuitively, subcontractors with multiple contractors have greater bargaining power than those who depend on a single contractor. In general, if an agent has many external options for trade, the agent can enjoy a stronger position in the transaction.

This raises the question of why subcontractors in Japan's content industry suffer disadvantages in surplus distribution. A possible hypothesis is the common agency problem. Subcontractors have multiple principals and are simultaneously engaged in close vertical relationships with each principal, a situation not specific to the content industry. In Japan, subcontractors are encouraged to engage with multiple contractors or diversify their trading partners to modernize their production systems or to discard obsolete keiretsu subcontracting systems[26]. The *2006 White Paper on Small and Medium Enterprises* reports that the number of trade partners has increased over the past decade[27]. In the decade leading up to 2006, more than half the companies in every industry have relied on their top three customers—sales to these customers account for 61 percent of the companies' total revenue. In 2006, however, the rate of companies depending on their top three customers was less than half,

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[23] In the 1970s, the rate of firms in Japan that heavily depended on one contractor was 54 percent among subcontractors (see *1979 White Paper on Small and Medium Enterprises*, Part 1, Chapter 2, Section 6. Available online: https://www.chusho.meti.go.jp/pamflet/hakusyo/S54/index.html (accessed 25/09/2019). Firms that rely on one contractor generally (i) depend on one contractor (ii) rely on two contractors but one contractor accounts for more than 75 percent of the work, or (iii) depend on three contractors but one contractor accounts for more than 50 percent of the work.

[24] In a survey conducted by the Ministry of Internal Affairs and Communications, 95 producing firms state they have no *keiretsu* relationship and 81 firms mention having a parent company. See *Survey Report on Producers of Programs Broadcast*, Ministry of Internal Affairs and Communications, 2006. Available online: http://www.soumu.go.jp/johotsusintokei/statistics/pdf/HK200600_001.pdf (accessed 25/09/2019)

[25] Among the participating producers, 87.6 percent rely on subcontracting work whose share is more than 50 percent in sales. Of the 340 producers, 13.8 percent contract with one contractor and 29.4 percent have contracts with 1–5 contractors, which is a typical case. See *Survey Reports of the Subcontracting in TV Program Producing Industry and the Amendment of the Subcontracting Law*, Japan Fair Trade Committee, 2004. Available online: http://warp.da.ndl.go.jp/info:ndljp/pid/998203/www.jftc.go.jp/pressrelease/04.february/040213-02-hontai.pdf (accessed 25/09/2019)

[26] See *2015 White Paper on Small and Medium Enterprises*, Part 2, Chapter 1, Section 1, available online: http://www.chusho.meti.go.jp/pamflet/hakusyo/H27/download/2015hakusho_eng.pdf (accessed 25/09/2019), and *2006 White Paper on Small and Medium Enterprises*, Part 2, Chapter 3, available online: http://www.chusho.meti.go.jp/pamflet/hakusyo/h18/download/2006hakusho_eng.pdf. (accessed 25/09/2019)

[27] *2006 White Paper on Small and Medium Enterprises*, p.114. available online: http://www.chusho.meti.go.jp/pamflet/hakusyo/h18/download/2006hakusho_eng.pdf. (accessed 25/09/2019)

except in the automobile industry. Another noteworthy mention in the *White Paper* is that enterprises that 'increase open transactions through standardization of products and parts' and with 'weakened affiliations or cooperation with specific enterprises' perform worse than other enterprises in terms of both sales and profit ratios.

3.3. Model Analysis

This section constructs a model to test the hypothesis that issues faced by subcontractors in the content industry are attributable to the common agency problem. Martimort (1996) proposes a similar model, although it is not directly applicable to the case considered in this study. Martimort's model is based on manufacturers delegating their product sales to agents and the basic structure can be applied to analyse the delegation of parts supplies to subcontractors. A key feature of Martimort's model is the substitutive or complementary nature of demands; however, this study focuses on the delegation of production and not sales. Thus, I reconstruct the model to adjust to a situation in which the principal delegates production to the agent. The model analyses the substitutive and complementary relationships in the cost structure. Substitutability in cost is another way of describing the convexity of the cost function in a multiproduct firm, while complementarity is represented by concavity. Since the validity of Martimort's (1996) result in this construction is uncertain, I conduct a simple model analysis.

First, consider a case in which one principal trades with one agent. Hereinafter, the principal is denoted by P and the agent is A. P is a TV station and A is a programme producer. P needs q programmes to broadcast. The number of programmes required, q, is assumed to be constant. A enters into a subcontracting contract with P for programmes production. The production cost per programme is a constant $c - i$ if A invests i prior to the production, where c is assumed to be constant, and investment i costs A the amount $\theta i^2 / 2$. θ is a parameter and is A's private information. This parameter is known to A prior to entering into the contract, although this is not the case for P. P only knows θ has a probabilistic distribution with a uniform distribution on $[\theta_0, \theta_1]$. On the other hand, P can observe variable i from the communication with A beforehand or through some value analysis. P offers payment (i) , which is a function of investment i by A. The timing of the game is as follows: (1) A knows the own-investment parameter θ. (2) P offers A contract $w(i)$. (3) A accepts or refuses the offer; if A refuses, the payoff for A is 0 and the game ends. (4) If A accepts the offer, A invests i. (5) Trades are executed and a payment is made. In this model, q is assumed to be constant and describe the subcontracting relationships. This assumption differs from those in typical adverse-selection models, wherein A has an incentive to induce an expected effort. Note that the investment cost does not depend on q as a fixed cost in this model.

A's payoff from accepting the offer, denoted as π_A , is

$$\pi_A(i, \theta) = w(i) - (c - i)q - \frac{\theta i^2}{2}.$$

The first best outcome which minimizes total cost $(c - i)q + \theta i^2 / 2$ is attained by the investment of $i = i^F \equiv q / \theta$.

The problem to be solved by P is

$$\min_{w(\cdot)} E\left(w\big(i^*(\theta)\big)\right) \text{ s.t. } i^*(\theta) = \operatorname*{argmax}_i \pi_A(i, \theta), \ \pi_A(i^*(\theta), \theta) \geq 0.$$

A standard procedure applied to the problem with a revelation principle gives us the following solution:

$$i^*(\theta) = \frac{q}{2\theta - \theta_0},$$

$$w(i) = \left(c - \frac{i}{2}\right)q + \frac{1}{4}\left(\theta_0 i^2 - \frac{q^2}{2\theta_1 - \theta_0}\right).$$

Under the optimal contract, efficient investment i^F is attained when A's attributes are the lowest ($\theta = \theta_0$); otherwise, the reward for A induces insufficient investment compared to the optimal contract ($i^* = q/(2\theta - \theta_0) < q/\theta = i^F$).

Next, consider a case with two Ps, P_1 and P_2. Each P requires a fixed number of q_i programmes ($i = 1,2$). This model does not assume competition between programmes and thus, coordination does not generate profits. In contrast to Martimort's (1996) model, which assumes a substitutive or complementary relationship in demand, the present model assumes complementarity in the cost structure. The effects of investment in production appear for both Ps because the technologies required are the same. Thus, if A invests i, the unit production costs for both Ps are $c - i$.

P_1 and P_2 independently offer A $w_1(i)$ and $w_2(i)$. A decides whether to accept one of them, to accept both, or to refuse both[28]. When A refuses both offers, the game ends with zero payoff for all. When A selects only one offer, the outcome is the same as the previous case of the one-to-one contract. When A accepts both offers, A chooses i. The assumptions are the same: c is a constant, investment i requires cost $\theta i^2/2$, and θ has a uniform distribution on $[\theta_0, \theta_1]$. The timing of the game is also the same: offers are made simultaneously, as are the decisions to accept or refuse, and Ps are unaware of the other party's offer.

The payoffs of A when A accepts both offers and when A accepts the offer by P_j, denoted as π_A^{12}, π_A^j ($j = 1,2$), are as follows:

$$\pi_A^{12}(i, \theta) = w_1(i) + w_2(i) - (c - i)(q_1 + q_2) - \frac{\theta i^2}{2},$$

$$\pi_A^j(i, \theta) = w_j(i) - (c - i)q_j - \frac{\theta i^2}{2}.$$

The problems to be solved by P_j ($j = 1,2$) are

$$\min_{w_j(\cdot)} E\left(w_j\left(i^*(\theta)\right)\right), \quad \text{s.t. } i^*(\theta) = \text{argmax}_i \, \pi_A^{12}(i, \theta),$$

$$\pi_A^{12}(i^*(\theta), \theta) \geq \pi_A^{j'}(i, \theta), \, \pi_A^{12}(i^*(\theta), \theta) \geq 0, \, (j, j' = 1,2, \, j \neq j').$$

The optimal solution to this problem is

$$i^*(\theta) = \frac{q_1 + q_2}{3\theta - 2\theta_0}, \qquad w_j(i) = \frac{i\left(\theta_0 i - 2(q_1 + q_2)\right)}{6} + \alpha_j, (j = 1,2)$$

Where

$$\alpha_j \in \left[cq_j - \frac{9(2q_j - q_{j'})q_{j'}\theta_1 - \left(q_j^2 - 10q_j q_{j'} + 7q_{j'}^2\right)\theta_0}{6(3\theta_1 - 2\theta_0)(3\theta_1 - \theta_0)}, cq_j - \frac{(2q_j - q_{j'})^2}{6(3\theta_1 - 2\theta_0)} \right]$$

$$(j, j' = 1,2, j \neq j'), \qquad \alpha_1 + \alpha_2 = c(q_1 + q_2) - \frac{(q_1 + q_2)^2}{6(3\theta_1 - 2\theta_0)}.$$

Thus, the optimal solution exists continuously[29].

Then, consider a case in which each P contracts with different As to evaluate the solution under common agency compared with the solution with exclusive agents. Since I do not introduce competitive relationships, the solution does not differ from that in the case with one P and one A. As explained above, investment is

$$i^*(\theta) = \frac{q_j}{2\theta - \theta_0} \; j = 1,2.$$

The common agent is assigned a lower incentive for investments $(q/(2\theta - \theta_0) > q/(3\theta - 2\theta_0)$ for $\theta > \theta_0)$, rendering the system's performance less efficient. Martimort (1996) demonstrates the relative inefficiency of common agency for the case of complementary demands. In this study, complementarity exists in the cost structure, rather than in demand, and thus, the property of the solution differs. In Martimort's model, when demand is complementary, coordination between the principals is critical, which is advantageous to common agency. However, when costs are complementary as in the present model, the contractors do not coordinate with each other but play a blame game to force their rivals into paying an investment cost. The difference in the minimization problems between exclusive agency and common agency is in the effective inequality constraints. In the case of exclusive agency, the effective constraint is a participation constraint which secures a non-negative profit for the subcontractor, while in the case of common agency, it is the incentive constraint which requires no less profits for an additional contract. A prime contractor of a common agent designs the payment such that it compensates only the incremental cost of the offered job. Thus, both prime contractors offer less payments and provide fewer incentives for the subcontractor to investment, resulting in less efficient outcomes for the overall subcontracting system.

Note that complementarity in the cost structure is assumed to be an extreme case. If A engages in cost-reducing investments, the investment affects production for both Ps. Thus, in this model, it is not surprising that the case in which exclusive As invest is less efficient than the case with a common agent because of the duplicated investments. However, inefficiency intrinsic to common agency may sometimes be so severe that it overwhelms the inefficiency of duplicated investments. That is, there are cases in which the total efficiency of a system with exclusive agency is higher than that of a system with common agency despite duplicated investments. Region $(\theta_1, q_2/q_1)$ in Figure 1, depicted using oblique lines, indicates that the total cost is higher with a common agent than that with two exclusive agents when $c = 1$ and $\theta_0 = 1$. Thus, when there is considerable heterogeneity among contracts for the agent, the inefficiency with a common agent may exceed the inefficiency from duplicated investments.

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[29] According to Martimort (1992), it is not possible to obtain a solution by simultaneously applying revelation principles to both the principals. Here, a solution is obtained by fixing one of the first-order conditions for its rival, as in Martimort (1996).
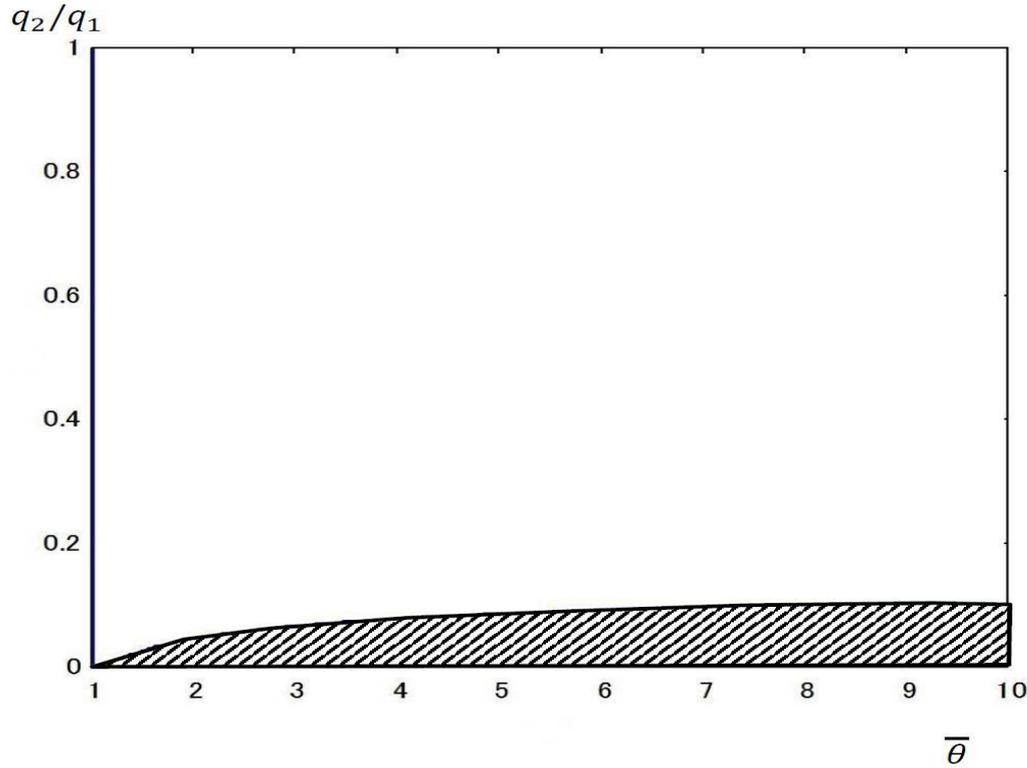
q_2/q_1

Figure 1. Region where inefficiency with a common agent exceeds that of duplicated investments

Another difficulty with common agency can be demonstrated in the optimal solution. The optimal solutions continuously exist and the information of the offer made by rival P is required to determine a solution. The remainder of this section explains the problem using a simpler and more intuitive example. I assume $q_1 = q_2 = 1$ and no cost-reducing investments. Further, the cost to produce one product is 10 and that to produce two products is 15 under a complementary cost structure. The conditions for offers by both Ps to be accepted are

$$w_1 + w_2 - 15 \geq w_1 - 10 \,,\, w_1 + w_2 - 15 \geq w_2 - 10, w_1 + w_2 - 15 \geq 0,$$

where $w_i, (i = 1,2)$ is the offer by P_i. Cost minimizing of both Ps provides the following solution:

$$w_1 + w_2 = 15, \; w_1 \geq 5, \; w_2 \geq 5.$$

The solutions continuously exist depending on the distribution of gains obtained through savings from joint production. If one solution is attained by some negotiation among the Ps, the solution becomes a Nash equilibrium on the condition of a rival offer.

Then, consider a case in which the costs are substitutes of each other. Assume the cost to produce one product is 10 and that to produce two products is 25. The conditions for offers by both Ps to be accepted are

$$w_1 + w_2 - 25 \geq w_1 - 10 \,,\, w_1 + w_2 - 25 \geq w_2 - 10, w_1 + w_2 - 15 \geq 0,$$

and cost-minimizing of both Ps provides the following solution:

$$w_1 = w_2 = 15.$$

Thus, when the costs are substitutes of each other, the common agent can acquire profits if not information rent [30]. This result is in contrast to that for the abovementioned case of cost complementarity, where the rents acquired by A are exhausted in the cost-minimizing offer by both Ps.

The distribution of benefits from transactions exhibits the same nature in the solutions of both the model with cost-reducing investments and the simple model with cost complementarity. The rent acquired by A is also exhausted in the cost-minimizing offer by the Ps if A is a common agent. Then, the rent for the common agent reduces compared with that for the exclusive agent. In fact, if the profits acquired by an exclusive agent and a common agent have the same attributes θ and order of products q, denoted as $\pi^E(\theta)$ and $\pi^C(\theta)$, then

$$\pi^E(\theta) = \frac{q^2(\theta_1 - \theta)}{2(2\theta_1 - \theta_0)(2\theta - \theta_0)} > \frac{q^2(\theta_1 - \theta)}{2(3\theta_1 - 2\theta_0)(3\theta - 2\theta_0)} = \pi^C(\theta).$$

In this section, the inefficiency incurred under common agency is considerable enough to overwhelm the inefficiency of duplicated investments. Moreover, the complementarities in the cost structure may render surplus distribution more difficult in the content industry. In this industry, the surplus of agents in contracts with multiple principals is likely to be squeezed. In other words, when the same technology acquired to trade with a given contractor is effective when used with other contractors, the producers' cost-minimizing activity extracts a larger part of the gains. During the late 20th century, *keiretsu* was a common approach to subcontracting in the assembly industry, and particularly the automobile and electric apparatus industries. Thus, subcontractors typically had one parent contractor and could avoid common agency problems. The healthy growth of subcontractors contributes to that of their parent assemblers. By contrast, when programme broadcasters delegate production to several producers, the advanced technologies of subcontracting producers may be used in productions for rival broadcasters. This information can considerably reduce producers' profits.

Taguchi (2011) examines Japan's die industry and offers key implications for the present model. The author reports that typical die manufacturers trade with 4–5 contractors. In the past three decades of the 20th century, die manufacturers have earned sufficient profits to invest in their plants. Since the know-how required to produce dies includes numerous complicated factors, even small-scale manufacturers have been able to secure stable orders with sufficient cash flow, allowing them to make active investments to keep pace with new technologies. However, even with technology levels remaining high, now the trade is barely profitable due to competition from emerging countries that have also caught up with the new technologies. Meanwhile, numerically controlled machine tools, data accumulation, and systematization have replaced skilled labour. This transition is considered a change from increasing marginal cost (employment of skilled labour) to decreasing marginal cost, or a complementary cost structure (versatile technology from digitalization). This change in the common agency system reduces rents for die manufacturers and deprives them of funds for replacement investments.

4. Conclusions

This study attempts to theoretically explain a content industry with a hierarchical subcontracting system. More specifically, it analyses the multitask agency problem and the common agency problem as key sources of difficulties. Both theories explain the inefficiencies caused in the overall subcontracting system and particularly, the asymmetric distribution of benefits. The characteristics of the content industry further contribute to the severity of these problems in the subcontracting systems.

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[30] Martimort (1996) shows that common agency is selected even when exclusive agents are desired. Note that this, however, possibly leads to inefficiency when costs are substitutes.

First, the content industry's products have ambiguous quality attributes that are difficult to verify or define in contracts. This results in discrepancies between the evaluations of contractors and the efforts of subcontractors, which further results in inefficient resource allocation (i.e. multitask agency problem). The asymmetric distribution of benefits between contractors and subcontractors discusses in Section 1 may result from a 'hold up': prime contractors use the evaluation of unverifiable quality as a pretext to exploit subcontractors.

Second, subcontractors in Japan's content industry traditionally work with multiple contractors. The model analysis in this study shows that when the costs for contractors are complementary, inefficiency caused by adverse selection is intensified in common agency because contractors play a blame game to force their rivals into incurring the subcontractors' investment cost. In addition, the inefficiency of common agency may overwhelm that of duplicated investments when there is considerable heterogeneity in the contracts for an agent. As a result, the surplus for the common agents lose a considerable portion of their surplus to prime contractors.

These factors have yet to be fully addressed in the literature, which largely focuses on problems caused by imperfect competition between contractors and subcontractors and on differences in firm sizes between contractors and subcontractors. Contrary to previous works highlighting the unfair distribution of benefits, this study finds that the significant inefficiency problem in the content industry can be attributed to the subcontracting system. In the long run, the weakened competitiveness of Japan's content industry is likely to worsen. Moreover, industrial policies may further contribute to this issue as seen in the case of strategies to promote the diversification of trade partners. To revitalize the industry, it is necessary to recognize the essential features of the problem. First, contracts in the content industry should recognize the importance of product quality. Second, when an offer by a prime contractor requires investments by a subcontractor, the expenses should be shared even if the technology is versatile. A noteworthy conclusion of this study is that the hierarchical subcontracting system is not suitable for the content industry.

4.1. Research Limitations

This study aims to explain possible inefficiencies using two models of agency theories. The models are not comprehensive to describe the industry. Each are prepared to point out one feature of the industry. It is yet to be proved that inefficiencies observed in content industries in Japan have such characteristics predicted in models here. Note that most industry reports introduced in the first section stresses inequality problems in distribution of surplus. The relation between the inequality and the inefficiency in the industry is tried to be analysed here, but not fully.

4.2. Theoretical Implications

When the total surplus in a supply chain is limited and to be curtailed by increased competition, the distribution fairness is important for keeping the system active. Therefore, the issue analysed here is not limited to the industry in Japan, where the problem is exhibited in an intensified way. The literature on analyses on media industries might have paid little attention to transaction cost or agency problem. If collaboration of various agents or fusion of industries becomes crucial in media industries, these concepts may help to understand problems in the performance of the industry.

4.3. Suggestions for future researches

Further research is needed especially in detailed case studies on the industry. The inefficiency should be identified by empirical studies comparing the productivity in Japan with that in other countries. To estimate the level of technical inefficiency relative to a frontier productivity is another method to identify the inefficiency. There are other industries under subcontracting system in Japan. Performance of those industries has not been evaluated although the same problems were pointed

out, for example, in construction industries. The possible inefficiency in those industries should be investigated and compared with inefficiency analysed here.

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