

Economics of Joint Production and Implications for the Media and Cultural Industries: The Necessity of Application and Research

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Keywords: Media and Cultural Economics; Joint Production and Products;
Shut-Down Point; Split-Off Point; Timeline Analysis

Abstract

This article addresses an issue of joint production arising from the media and cultural industries. Joint production is a production process that yields two or more products simultaneously. In the media and cultural industries, the application of digital technology has made it possible for producers to generate products both online and offline, therefore, a common production process can yield outcome for multiple platforms. This changing feature has brought with it many implications – from the managerial perspective, it has altered economic rationales guiding managers' decision making on whether or not to cease production on the traditional platforms. The current study explores why different types of analysis are required in the joint production. This study introduces the concepts of shut-down, split-off and tipping points that need to be considered. The authors also propose an approach of timeline analysis that may move the investigation of joint production forward for the next steps.



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Introduction

Media and cultural industries are important sources of employment and economic growth globally. Much attention has been paid to the economics and management of media and cultural products in the recent years; the current article addresses an issue arising from such industries – with the increasing consumption of media and cultural products online, due to the accelerated advancement of digital technology – an issue of joint production.

Joint production is a production process that yields two or more products simultaneously. In the media and cultural industries, the application of digital technology has made it possible for producers to generate media and cultural products both online and offline, thus a common process can yield outcome for multiple platforms. This changing feature of production has

brought with it many implications. From the managerial perspective, it has altered economic rationales guiding managerial decision-making on whether or not to end production on the traditional platforms, as with the proliferation of digital technology, more people are migrating from offline to online.

In view of these, the article aims to investigate the economics of joint production. It discusses why different types of analysis are required in joint production and introduces the concepts of shut-down, split-off and tipping points that need to be considered. The article explains the rationales for managerial decision-making in the media and cultural industries; it also proposes an approach of timeline analysis that can move the investigation of joint production forward for the next steps.

A Concern of the Legacy Media in the Contemporary Digital Era

In the contemporary digital era, consumers' behaviours are changing dramatically, legacy media are facing severe challenges of losing customers in their traditional platforms; consequently, an increasing number of companies have chosen to shut down their traditional operation or even exit the market.

At a fundamental level, firms shut down their business when costs exceed revenue, capital is unavailable or too expensive, or when consumers no longer wish to consume their products (Picard, 2011). They don't quit merely because a better technology is available. Companies in the newspaper industry, for example, particularly in the mature North American and European markets, have responded to changing conditions by reorganizing, downsizing, and cutting costs, by creating joint products (Picard, 2014) and by implementing renewal strategies based on offering digital news products as well as print products (Kung, 2015).

These joint products are important as they alter the traditional economics rationales for media and cultural companies and require different types of economic and business analyses. In business economic terms, a joint product is one produced with one or more other products using a common input or process with undifferentiated joint costs (Hirschey, 2009).

In the media and cultural industries, many companies are rapidly adapting to digital distribution and its business opportunities and increasingly implementing strategies

to give primacy to digital distribution. These developments are addressing the short-term challenges of many legacy media firms that led to forecasts of their imminent exit from the market.

These developments also require different analyses when trying to consider whether to end traditional production and when. For newspaper companies, for instance, because papers are operating in both print and digital spaces, the economically rational point for ending print publication will likely extend past the point at which print product losses occur, because the print and digital offerings are operating as joint products rather than discrete, independent products (Picard, 2003, 2008).

Therefore, the issue of a joint product should be analyzed in line with the specific characteristics of media and cultural products, considering challenges faced by the legacy media in a digital era. The text below will explore how the joint product nature of many firms in the media and cultural industries are addressed in determining whether and when one traditional product should be ended based on the concepts of shut-down point, split-off point, and tipping point. It will also examine the implications of those concepts and analysis to the tipping point in the process of digital products operations.

“Companies in the newspaper industry (...) have responded to changing conditions by reorganizing, downsizing, and cutting costs, by creating joint products and by implementing renewal strategies based on offering digital news products as well as print products”

The Roles of Shutdown and Spin-Off Points

In economics, the shut-down and spin-off point concepts provide the means for assessing when products are no longer viable and a company should consider ending production. Although uses of the two are related, they are not substitutable concepts for decision-making but apply to specific circumstances: the first for single products and the second for joint projects.

Shut-Down Point

When a company producing a single product¹ can no longer minimize losses and maximize profits, it reaches what is called as the "shut-down point", that is, the point at which it is no longer rational to continue with production. The shut-down point is based on neoclassical economics that asserts rational behaviour guides business decisions (Himmelweit, Roberto & Andrew, 2001).

A *shut-down* refers to an organizational decision not to produce anything during a specific period of time because current market conditions are not appropriate for the continuation of production. After a short-run shutdown decision, companies may also make decisions to exit the market, whereas *exit* refers to a long-run decision to leave the market permanently. In normal conditions, firms usually make decisions to shut down if the revenue that it would get from producing is less than its variable costs of production.

What determines a shut-down decision is a crucial question for firms to consider. The neoclassical economics believes that a firm makes the shut-down decision if the total revenue is smaller than the variable costs, that is, $TR < VC$. If further dividing both sides of this inequality by the quantity Q , it can be written as:

$$\text{Shut down if } TR/Q < VC/Q.$$

As the average revenue for any firm is simply the good's price P , and VC/Q is the average variable cost AVC . Therefore, the firm's shut-down criterion is also noted as:

$$\text{Shut down if } P < AVC.$$

This shows that a firm chooses to shut down if the price of the good is less than the average variable cost of production. When deciding whether or not to produce, the firm compares the price it receives to the average variable cost. If the price doesn't cover the average variable cost, the firm is better off stopping production, it may reopen in the future if conditions change and the price exceeds the average variable cost.

These are neoclassical economics rationales guiding managerial decision-making in a competitive market's profit-maximizing strategy. Despite it, however, new institutional and behavioural economics research has shown that many firms aren't fully rational and tend to hang on to failing products too long because executives put off tough decisions and psychologically dismiss evidence of failure (Horn, Lovallo & Viguerie, 2008). Nevertheless, the shut-

1 - A newspaper or a television program, for example. Single product in this context should not be confused with the concepts of dual products or 2-sided products that describe the conditions such as selling circulation and then selling that audience to advertisers (Picard, 1998 and 2011).

down point concept provides the theoretically correct point at which product shut-down should occur.

Determining whether and when to end production also requires a clear understanding of the costs of production inputs, capital invested, and productivity. These are sometimes analyzed using the Cobb-Douglas production function, which is adapted to examine the impact of inputs on output at the macro level (Saito, 1975; Douglas, 1976). The Cobb-Douglas production function presents a simplified model of the economy in which production output is determined by the amount of labour involved and the amount of capital invested (Aigner & Chu, 1968).

The Cobb-Douglas function can help managers to determine whether additional input will produce additional output and if the additional investment is rational. It can also determine price efficacy when combined with cost data. The function

can be used as the bases of a basic macro-level decision on whether or not to continue production and allows managers to understand where their product is on the different potential outcomes (Zellner, Kmenta & Drèze, 1966; Goldberg, 1968; Coelli et al, 2005).

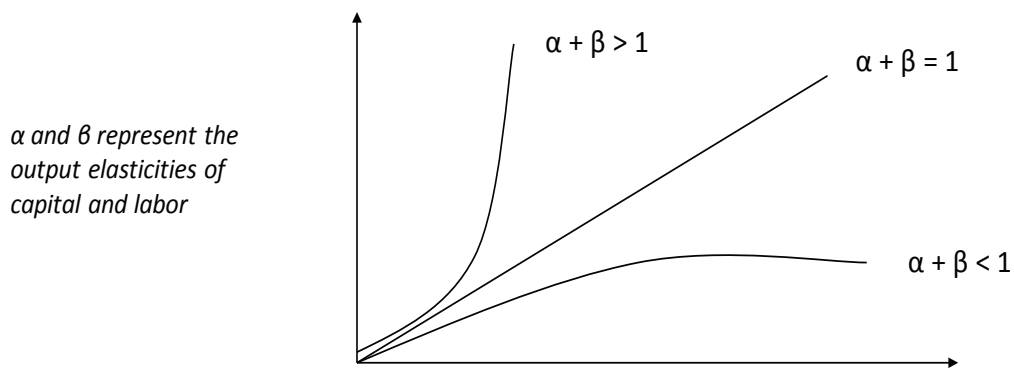
The Cobb-Douglas formula is expressed as:

$$Q = AL\alpha K\beta \quad (0 < \alpha, \beta < 1)$$

Where,
 Q = total production
 L = labor input
 K = capital input
 A = total factor productivity

α and β are the output elasticities of capital and labour, respectively, these values are constants determined by available technology

Figure 1: The Cobb-Douglas Model (Original)



The Tinbergen–Solow equation is a modified version of the Cobb–Douglas production function, which incorporates technological change that is not reflected in the latter one (Day & Boserup, 1992). The Tinbergen–Solow equation proposes that at a fixed time noted as t , economic output is still a function of labour and capital, but as technological progress grows at a rate of $r > 0$, the attainable economic outputs increase (Day, 1999; Wu, Yu & Wang, 2014). The Tinbergen–Solow equation is also called as an adjusted Cobb–Douglas formula, which is expressed as:

$$Y_t = A_t L^\alpha K^\beta$$

Y_t Productivity at certain time

If $\alpha + \beta = 1$,
the production function
has constant returns to scale.

If $\alpha + \beta < 1$,
returns to scale are decreasing,

and **If $\alpha + \beta > 1$,**
returns to scale are increasing.

Both Cobb–Douglas and Tinbergen–Solow production function consider the relationship of output to input to help managers determine whether additional input will produce additional output and if the additional investment is rational. These equations provide theoretical models for managers to understand shut-down decisions, mainly at the macro level. However, when it is used at the micro level, the production function requires further adjustment, especially when more than one product is involved. Therefore, at the company-level, combined with cost data, a breakeven point (BEF) analysis can also help managers to determine the level of production for optimal efficiency (Render & Stair, 2006; Cafferky & Wentworth, 2010).

“When a company is involved in producing joint products (...) the concepts of split-off points and cost allocation must be considered in determining the efficacy of each product.”

The breakeven point is the sales volume at which a business earns exactly no money. It is useful to determine the amount of remaining capacity after the breakeven point is reached, which indicates the maximum amount of profit that can be generated. Usually, managers constantly monitor the breakeven point, particularly in regard to the last item, in order to reduce the breakeven point whenever possible. Ways to monitor the breakeven point include cost analysis, margin analysis, outsourcing, pricing and etc.

All the above classic explanations of how companies maximize returns are significantly complicated, however, when the issue of joint products is involved because companies incur and share production processes and costs for two or more products, thus providing benefits of economies of scope. In these setting, producers must optimize output and price for all products individually and collectively.

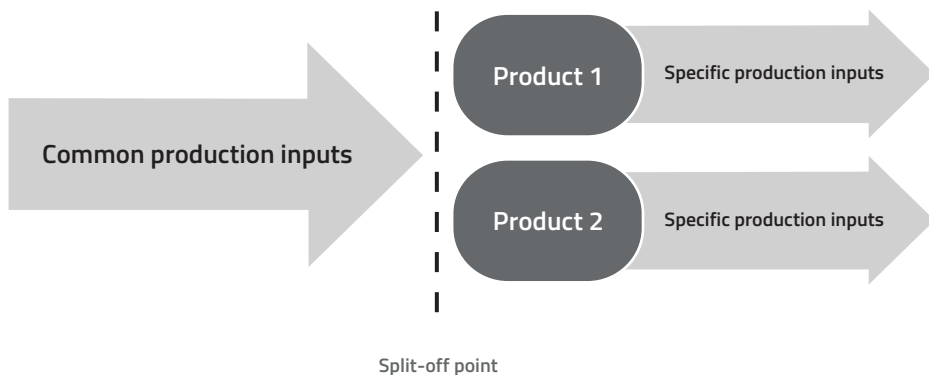
Product Split-Off Point and Cost Allocation

When a company is involved in producing joint products – such as print and digital news products – the concepts of split-off points and cost allocation must be considered in determining the efficacy of each product.

To pursue efficiency of joint products, managers require a clear understanding of costs and attribution of costs to the separate products is required because all costs of the enterprise are rarely shared equally (Horngren, Datar & Rajan, 2011). To do this, business accountants and economists employ the concept of *split-off point*, that is, the point at which common production ends (Hartley, 1971). Prior to a split-off point the costs are common; subsequent to the split-off point, the costs

can be separated and directly allocated to a product (Schneider, 1986). In practice, fixed costs (buildings, basic administrative functions, etc.) are held constant and only variable costs are allocated to the separate products. The joint production costs in question then involve inputs, including labour. Individual product costs include the portion of joint costs for which each product is responsible, plus costs incurred after the split-off point.

Figure 2: The Split-Off Point Concept



To allocate costs prior to the split-off, two primary methods are employed. The first is based on physical measurement of the output, such as weight or volume, and the second is based on a measurement of market value. The first is appropriate for commodities, such as steel, and not appropriate for consideration of many media and cultural products because they involve both physical and non-physical products. Market value measurement is thus the appropriate means for allocating costs, and allocations must comply with domestic accounting principles and international financial reporting standards.

The two most commonly employed market measurements are to allocated costs based on sales value as of the split-off point or based on gross margin of each product (Bragg, 2014). Most firms employ the first because it is the simpler of the two; the second is typically employed when it is not possible to establish sales value at split-off. In the second method, all costs after split-off are calculated for each product and these are subtracted from the revenue each product earns.

In the case of media and cultural products, especially for traditional media production, such as newspapers production

then, using split-off point analysis would require identifying income associated with the print and digital products and then separating basic administrative, managerial, facilities and IT costs as joint fixed costs, allocating additional fixed costs for printing facilities and physical distribution to the print product, allocating additional fixed costs for IT and digital distribution to digital product(s), and proportionally allocating editorial and advertising costs to the print and digital products. Only then could a determination be made whether one or the other was profitable and whether a shutdown of one would be possible given the need of the surviving product to cover not only its individual product costs but the joint fixed costs as well.

Tipping Points

In strategy and decision-making literature, points of change are often referred to as “tipping points.” These points represent the moments at which social, economic and other environmental factors create an overwhelming impetus that produces change or effects (Gladwell, 2000). The concept was derived from research in virology and evolutionary biology and has since been applied in a number of disciplines and to a variety of social, health and political issues (Bissell & Caiado, 2015; Campbell, Einhorn & Reiss, 2004).

In business and economics, it is typically evidenced by the point at which a technology, product or industry standard become dominant, creating irreversible change that renders alternatives unsustainable or when certain ideas or things become market highly successful (Berger, 2013).

Discrete individual changes combine overtime to bring the system or market to the tipping point. In a business setting, this is the point by which company managers must make decisions to change or risk losing their enterprises altogether. Often requires doing something significantly different from in the past or to make a choice they would prefer not to make.

Tipping points are thus linked to change and the evolution of products and industries because they cause demand changes and create new economies of scale and scope in production and/or distribution that affect the abilities of producers to continue efficient and profitable operation.

When considering what is happening to the media and cultural industries, several identifiable tipping points are relevant:

1 - When most consumers have requisite technology to use the competing innovative product – in the case digital media and cultural products, for example, it can be measured by PC penetration, Internet access, and smartphone penetration. This tipping point has been reached in most developed nations and most other nations.

2 - When content income exceeds advertising income, thus making consumers the more important customer of the media and cultural products. This can be measured by content revenue and advertising revenue. In the newspaper industry, for example, this tipping point was passed in 2014, when it received \$92.6 billion in circulation revenue and \$87 billion in ad income (WAN-IFRA, 2015). In many countries, however, the point has not yet been reached.

3 - When digital income exceeds traditional income, making the digital product(s) more important to the company. The indicators

for determining whether the tipping point has been reached are the comparison between online and offline revenues. This point has not yet been reached on the industry level in most media and cultural industries.

4 - When mobile use exceeds desktop tablet use, meaning that smartphones and connected tablets have become the primary digital product and greater attention must be paid to them. The Indicators will be the proportions of the audience using desktops, smartphones and tablets to access content.

5 - When time spent consuming media and cultural content online matches or exceeds that of offline. At this point, the exposure of readers to both products equalizes or changes.

6 - When the traditional offline income no longer pays offline costs. At this point, companies need to make shutdown point and split-off point analyses, combined with other assessments such as brand importance, to determine whether to keep traditional offline operations alive.

What Does This Mean to the Media and Cultural Products?

The concepts presented here indicated that determining when to shut down traditional operations is not a simple task and that significant analysis needs to be done at the individual firm and industry level before decisions are made with significant credence.

The joint product issue is central to the traditional media and cultural industries – including print, newspapers, magazines, books, video, art, exhibition etc. – today, because most major producers also offer digital products that are based on their offline products. The managerial economic challenges in determining the futures of the traditional media and cultural products confuse many managers and industry observers because many do not comprehend the economic and financial aspects of joint products. That confusion is compounded because many media and cultural enterprises do not merely joint products, but multi-sided products as well.

Decisions of whether and when to shut down are not merely ones of technology and the cost benefits they may produce, but involve firms reaching shutdown point for a product *and* the implications of costs for joint products evidenced through split-off analysis.

This leads to the questions of what is happening in that regard and where are we now. We cannot answer those questions without using aggregate average industry data, and future research agenda is needed to gain better understandings.

This, of course, leads to the questions of what is actually happening in that regard and where are we now. Operational data from an individual company is required for an enterprise-level analysis and aggregate average industry data is required to answer those questions at the industry level. Thus, significant future research is needed to undertake such analysis, apply techniques outlined here, and gain a better understanding of the contemporary condition of newspaper firms.

A Research Agenda Ahead

A further research agenda is firstly built at the production level to understanding joint production and the shifting roles of traditional offline and digital products in the composite. There are joint products in fixed and variable proportions, media and cultural industries provide a variety of examples in both cases. However, the joint production of media and cultural online and offline products usually adopts variable proportions, and the role of online and offline products in the production is transforming in response to the changing market conditions.

In the early stage of joint production, usually traditional offline products are major outputs from the manufacturing process, and costs allocated mostly on the offline, whilst digital offerings are only secondly (minor) products in the production, receiving much fewer allocations of joint costs. Yet, with the advancement of digital technology and changing consumption patterns increasingly migrating online, demand for digital products exceeds the traditional offline products, and digital overpasses offline to become major products, receiving more resource allocation. This is the case in many western markets with mature media and cultural industries. Digital products are increasingly competing for resources, and the offline business has been declined in proportion for costs allocation.

Therefore, to project the future of the media and cultural industries, the first step is to find out the turning point where online replaces offline to become major products in the joint production. This is an important turning point as decision-making on resource allocation is primarily based on the profits realization of major products. The shifting role between offline and online

depicts a changing strategic core in the production and a new pattern of business. The turning point where online surpasses offline in joint production can be found empirically from investing cost allocation in media and cultural enterprises and studying the profits margin of production.

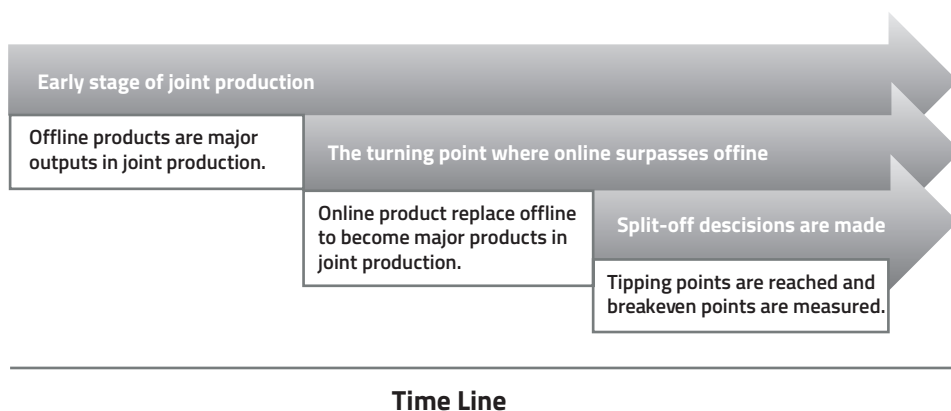
After this turning point, the traditional offline business may continue to decline, reaching a second point where a split-off decision needs to be made. Thus, the second step of investigation is to find out the split-off points that end the joint production. Measurements based on market value can be applied, sales value or a gross margin of each product are variables to employ. To conduct such analysis, the economic logic is to compare an output with an input to ensure profit, and the accounting principles propose a breakeven point (where Total Revenue = Total Costs) to consider, in order to make rational decisions. However, the major challenge here is to separate costs and profits between online and offline, in regard to administrative, managerial, editorial and other supporting activities. And also, the multi-sided nature of media and cultural products adds the complexity of analysis. Therefore, to move the empirical study forward, aggregate industry data can be employed for the next step, and investigation for tipping points at macro-level can be made.

“With the advancement of digital technology and changing consumption patterns increasingly migrating online, demand for digital products exceeds the traditional offline products.”

The tipping points are identifiable when, for example, the majority of consumers use digital products, content income exceeds advertising, online income exceeds offline, mobile use exceeds desktop, time spent consuming content online exceeds offline, and when traditional income does not pay costs. These points can be projected using industry data, and a timeline analysis

technique can be employed to visualize the trend. The Timeline Analysis (TA) supports future prediction, situation assessment, event projection and Indications. Figure 3 below provides an example of timeline analysis of tipping point, spin-off point and the point where digital surpasses offline in joint production.

Figure 3: Timeline Analysis of Split-off Points and Tipping Points (Original)



When the issues of shut-down, split-off and tipping point are considered in the media and cultural industries, there are a couple of special features of media and cultural products need to be considered, as well as geographic market differences in producing such products.

First of all, the issue of duality matters when the shut-down and split-off decisions are made in the media and cultural companies. Media firms operate in a dual-product market (Picard, 1989), and duality is an important feature of media and cultural products, which means that on the one hand, these products generate economic profits and on the other hand, they also promote social value. So, in order to safeguard positive ex-

ternality from media and cultural products, social optimal in the supply-demand equilibrium needs to be considered rather than market optimal. This dual character of economic and cultural good poses challenges to decision-making for media managers.

Meanwhile, producing media and cultural content is a creative process, requiring artistic inspirations and intuitive inputs, different from other industrial firms, where the production is organized with structured forms and formalized process. Therefore, the decision on shut-down and split-off of media and cultural production should be made in line with the special features of the creative production.

Also, even if the growth of media and cultural industries is a global phenomenon, geographic market differences are obvious: the emerging countries still have a large potential for traditional offline business, and developed nations are migrating to digital in a faster pace. Therefore, traditional media maintain a longer life circle in the developing nations, reaching the tipping point of print and digital in a later stage. China, for instance, provides such a striking example: the traditional newspaper companies still embrace great potential to grow, and print business remains to be a cash cow for media firms, especially in many government-owned media and cultural organizations.

Moreover, with the advancement of digital technology, nowadays, an increasing number of media and cultural firms produce multiple products, not merely joint products. It is getting to be more common for the firms to have one production yielding to multiple end products, in electronic, mobile and other social media forms, hence the issue of joint production is becoming more complicated, and economics rationales analyzing shut-down, split-off and tipping points need to be further modified in order to address the sophistication of media and cultural multiple products production.

To sum up, tipping points occur differently in different product lines and different sectors of the media and cultural industries. Thus, analyses on shut-down, spin-off and tipping points vary, and more industry evidence from different markets are needed for further steps of the investigation. A future research agenda will be built on more comprehensive empirical data at both industry and company levels. Evidence of the cost of production and other organizational accounting information are also needed for the decision-making on shut-down, spin-off and tipping points in the media and cultural firms. The current study has discussed the necessity of application of economics theories for media and cultural production, providing an analytical preparation for future research endeavours, later empirical explanations together with industry investigations will further enhance our understandings on the economics of joint production in the media and cultural industries.



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