

ECONOMIC LINKAGES AND COMPARATIVE ADVANTAGE OF THE UK CREATIVE SECTOR

Zhen Ye
Ya Ping Yin

UHBS2007:2

Dr Zhen Ye
Accounting, Finance and Economics
Business School
University of Hertfordshire
Email: z.1.ye@herts.ac.uk
Telephone: +44(0)1707 284083

Dr Ya Ping Yin – Corresponding author
Accounting, Finance and Economics
Business School
University of Hertfordshire
Email: y.p.yin@herts.ac.uk
Telephone: +44(0)1707 285481

Economic Linkages and Comparative Advantage of the UK Creative Sector

Zhen Ye^a and Ya Ping Yin^{a,b}

Abstract: This paper adopts the industrial capabilities argument and the concept of revealed comparative advantage as the basis for evaluating the competitiveness of the UK creative industries in sustaining export growth. The empirical results have revealed a heterogeneous nature of the economic linkages and comparative advantage positions within the UK creative sector. There is also evidence to support the industrial capabilities argument that the dynamic inter-play within the domestic economy matters for the external competitiveness of industries, particularly for the creative sector. A further finding is that industries with strong backward linkages tend to be positively related, whilst sectors with strong forward linkages negatively related, to their within-country cross-sector comparative advantages.

JEL classification: R15, L52, F14, Z1

Key words: creative industries, economic linkages, comparative advantage, industrial policy

^a Department of Accounting, Finance and Economics, University of Hertfordshire Business School, De Havilland Campus, Hatfield, Herts, AL10 9AB, United Kingdom.

^b Corresponding author (y.p.yin@herts.ac.uk)

Disclaimer: An earlier version of this paper was presented at the International Conference of the European Network on Industrial Policy, 12-14 September 2007, Prato, Italy. Financial support from the Vice Chancellor's Grant in the Social Sciences, Arts and Humanities of the University of Hertfordshire is gratefully acknowledged. We would like to thank Colin Haslam, Jane Hardy, Keith Randle and the EUNIP conference participants for their constructive comments. Any remaining errors are, of course, entirely our own.

With the right long-term decisions Britain can lead in some of the fastest-growing and highest value-added sectors – City and business services, education and health, creative and science-based industries – once small, now one-third of our economy and exports, soon a much higher share of jobs and wealth.

Gordon Brown, Budget speech, March 2006
(quoted in Elliott and Atkinson, 2007, p.71)

1. Introduction

In the industrialised economies, analysts and policymakers are paying increasing attention to the significance of a cluster of “creative industries”. As the dominance of the traditional industrial economy that is based on the intensive or extensive use of the conventional factors of production fades away, a new economy that is based on knowledge and cultural capital is gradually taking its place. Traditionally conceived as a part of the broader cultural industry, creative industries are defined as: “those activities which have their origin in individual creativity, skill and talent, and which have a potential for wealth and job creation through the generation and exploitation of intellectual property” according to the UK Department of Culture, Media and Sports (DCMS, 1998). The UK creative sector, which broadly covers a range of activities such as the design of fashion and other cultural products, advertising, television and film, architectural design and specialised computer services, is one of the fastest growing sectors in terms of output, export and employment within the UK economy (DCMS, 1998; DCMS, 2006a)¹. As the estimates by the UK Office of National Statistics (ONS, 2006) show, between 1993 and 2004, gross value added (GVA) and export in the creative sector grew by an average of 7% and 7.8% per annum respectively, as compared with only 5.5% and 6.4% achieved by the whole UK economy. By 2004, the creative sector shared 8.8% of GVA and 10.3% of total UK export. The creative sector is also creating an increasing number of jobs in the economy (Garnham, 2005). From 1997 to 2005, employment in the creative sector grew on average by 2% per annum (DCMS, 2006b). Direct employment in this sector was estimated to be 1.8 million in the summer quarter of 2005 (Hutton, 2007), with the majority of the creative jobs (around 60%) being concentrated in London and the Greater South East of England.

According to the ONS and the DCMS classification, the UK creative sector is dominated by services activities. From 1992-2004, the services component of gross value added at basic prices grew by 150.9% (from £32.2 billion to £80.7 billion) whereas the manufacturing component grew by a mere 17.0% (from £9.7 billion to £11.4 billion). Thus, the growth in the creative industries is generally consistent with the changes in the industrial structure within a

post-industrial economy. In the literature on economic growth and development, the unbalanced growth between the services sectors and the traditional primary and secondary sectors posits potential problems for the sustainability of economic growth in the long-run (see the original contributions by Baumol (1967, 1985); Baumol et. al. (1989); and the recent debate by Oulton (2001) and Yin (2006)). Barro (2003) also argued that fast-growing sectors are usually victims of their own success in the long run. What lies at the heart of the long-run prospect of economic stagnation is the intrinsic slower productivity growth in the services sectors than in the traditional manufacturing sectors and the assumption of homogeneous consumer preference for all kinds of products. Such mechanisms will result in the services sector absorbing more and more resources and eventually lead to economic stagnation – the essence of Baumol’s “cost disease” argument. However, the creative sector distinguishes itself from the traditional services sectors in that the products of the former embody a high content of skills and value added and is highly desired in an affluent society. Moreover, largely due to the legacy of the British Empire, early industrialisation, high levels of education, sophisticated consumer taste and vast accumulated wealth, the UK traditionally enjoys a comparative advantage in the production and distribution of such products in the international markets. It is little wonder that the UK DCMS regards the creative sector as a key player in the modern knowledge-based economy (Oakley, 2004). What is more, the cultural sub-sectors play an increasingly important role in the re-generation of UK cities and regions in the post-industrial era (Hall, 2000).

Although a relatively recent policy construct by the new Labour government (Roodhouse, 2003), much of recent discussion could be traced back to the theoretical contribution from critical cultural theories developed by the Frankfurt School (see Adorno and Horkheimer, 1997; Adorno, 2001) and the discourse on social and cultural capital (see Bourdieu, 1984). Cultural economics which emerged from the early, predominantly sociological paradigm has established itself as an interdisciplinary field of study (Thorsby, 2007). From the early applied analysis on the arts sector by Baumol and Bowen (1966), Thorsby (1994) and Caves (2003) to other within and cross country comparisons (Lazzeretti, 2003, Power, 2003), economists have been motivated in their pursuit by applying rigorous economic analysis to studying the phenomenon of cultural industries and informing the course of public debate. In the British context, Garnham (2005) argued that the mobilisation of the term “creative industries” rather than “cultural industries” has enabled the new Labour government to achieve a number of important policy goals, such as the inclusion of software industry into the classification which is an important source of knowledge and comparative advantage, and in further legitimising the public support for a “creative” sector².

Nevertheless, despite superior past performance and growing interests in the continued success of this sector (Hesmondhalgh and Pratt, 2005), some unstable patterns and trends have emerged in the most recent past (see Table 1 below, and the discussion by Elliot and Atkinson, 2007; Heartfield, 2000). Therefore, how sustainable is the superior export performance and the momentum of output growth in this sector remains an open question. A sensible answer requires a careful examination of the sector's own productive characteristics, factor contents and intensity as well as its dynamic relationship with the rest of the economy in addition to the historical comparative advantages that the UK enjoys over its main international competitors. Given the short history of interest in this sector by policymakers and analysts in the UK and thus the relative paucity of empirical evidence, especially the lack of comparable world trade data in services, it is still premature to undertake a comprehensive study of the relevant issues. Moreover, the special characteristics of this sector and its products also present fresh challenges to both the conceptual framework and empirical methods for the analysis of its international competitiveness. Thus, the present assessment has to focus on some relevant aspects that can be practically yet usefully analysed with the available information.

Table 1 Export Growth 1992-2004 – Creative Sector vs. the UK as a whole

Unit: %	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
UK Export Growth	13.6	10.4	12.9	10.3	3.9	-0.8	3.3	11.6	2.1	1.2	3.2	4.7
Creative Export Growth	10.1	13.9	8.6	14.2	1.1	5.1	6.1	8.7	0.5	5.9	13.8	5.6

Source: ONS 2006

While various qualitative models and approaches have been proposed by the government and academics to study creative industries (see Thorsby, 2007), it could be argued that very few of these models and approaches have explicitly drawn on a quantitative economic model that is capable of systematically analysing a cobweb of connections between the creative sector and the primary factor markets, upstream business suppliers and downstream business users, as well as the final markets, particularly the export markets. Oakley (2004), for example, argued: “while the UK has made many strides in measuring the size and structure of the creative industries themselves, the relationship between the sectors and the other claims made for it (e.g. growth and export) are largely under-researched and hence poorly understood” (p.71). The concern for “the complete lack of ‘evidence-based policy’ in what is a high profile public policy area” raises the question regarding the sustainability of this sector (ibid. p. 75-76). Thus, in order to assess the real impacts of creative industries against a number of important economic claims, a new empirical approach is deemed necessary to provide a comprehensive

and detailed account of creative industries in the UK. This is especially true if such an approach could provide a systematic understanding of the nature of economic linkages created by creative industries, and more importantly, in answering the crucial question of whether or not, and the extent to which, the industrial capabilities established by creative industries are, indeed, truly capable of creating comparative advantages and sustaining the UK's international competitiveness in creative export.

Recent efforts by the UK ONS and DCMS to publish a range of statistics on this sector according to the SIC2003 input-output classifications of industries, together with the availability of detailed input-output data have greatly facilitated the task. However, the lack of sector specific data on factor inputs into the creative sector in the present exercise, precludes the traditional international trade approach to the sources of industrial competitiveness and trade specialisation. Moreover, the distinct characteristics of the creative sector render the traditional theories of comparative advantage less applicable than in the manufacturing industries where the theories are usually applied and tested. Analysts have become increasingly critical of the conventional approaches in overlooking the institutional, structural, and behavioural factors that affect the performance of business enterprises and industries. In this context, the central purpose of this paper is to adopt the industrial capabilities (or the "home market effect") argument to assess the competitiveness of the creative industries and the sustainability of the superior export growth within the cluster of creative industries. The industrial capabilities argument has a long economic lineage that dates back to Myrdal (1957), Hirschman (1958), Kaldor (1966), Richardson (1972) and has been recently revived by Porter (1998a) and formalised by Krugman (1980, 1991, 1996). In particular, the current study focuses on the linkages between the UK creative sector and the rest of the economy as indicators of the domestic industrial capabilities for the sector to compete on the international market. As such, the approach is complementary to, and indeed a further extension of, cluster analysis developed by Porter (1998b). Moreover, the study also adopts the concept of *revealed comparative advantage* (RCA) that was originally proposed by Balassa (1965) to examine the competitive positions of the UK creative industries vis-à-vis the other domestic industries and the creative industries in the EU15 countries. A final objective is to examine the relationship between sectoral linkages and their comparative advantages.

In order to accomplish the above objectives, the present study constructs a 31x31 UK I-O table with the creative industries explicitly identified³. On the basis of this purpose built I-O table, the productive characteristics of this sector and the structure of demand for the sector's products can be revealed. More formally, alternative measures of sectoral linkages between the creative industries and the rest of the economy are derived and analysed. A somewhat

novel approach in the current study is the derivation of the linkage measures on the basis of a “use” matrix, not the conventional input-output matrix, due to data constraints. The IO tables also enable the derivation of the within-country cross-sector RCAs, but the cross-EU RCAs have to be derived from an OECD data source on trade in services (OECD, 2007).

The remainder of the paper is structured as follows. The next section introduces the economic literature on industrial capabilities, linkages and RCA in general and the existing research on the creative sector in particular. Section three discusses the definition and the literature related to the creative industries, the construction of the 31 x 31 I-O table and some stylised features of the creative sector. The main focus of this section is on the derivation and discussion of alternative measures of linkages and the RCAs as well as their relationship. The final section summarises the main empirical findings and discusses the potential implications for the conduct of industrial policy.

2. Sectoral linkages, industrial capabilities and revealed comparative advantage

There is a large body of theoretical and empirical arguments to challenge the traditional explanation of international competitiveness and trade specialisation in terms of the Ricardian model that is based on the cross-country differences in labour productivity or the Heckscher-Ohlin model that is based on differences in factor endowments (see, e.g., Leontief, 1953; Bowen et. al., 1987; and Krugman, 1996). Such studies tend to show that there is a very low correlation between the endowments of factors and the factor contents embodied in net exports across a large number of countries. The traditional theories also fail to explain the apparently significant two-way flows of very similar types of goods and services between countries that exhibit strong resemblance in factor endowments. What is more, cross-country differences in factor productivity is assumed rather than explained. In the context of the creative sector, the applicability of the traditional theories is particularly limited, as the assumptions of perfect competition, the use of conventional factors of production, similar production technology, homogeneous goods and consumer preferences across countries are especially weak in this sector. As is becoming increasingly clear to analysts, those production processes that are knowledge-intensive in nature, such as the production of creative goods and services, are typically characterised by imperfect competition and give rise to distinctive trade patterns that cannot be explained by the traditional theories (for example, see the discussion in Carr, et. al. 2000, and Brakman¹ and Van Marrewijk, 1996). Moreover, due to the high level of customisation of the products and sophistication of final user taste (Wiesand, 2005), the production process is skilled labour intensive, requires limited physical capital input, and cannot usually enjoy the scale economy. Therefore, unit cost and relative price (terms of trade)

considerations are expected to play a less significant role in shaping the specialisation of production of creative products than the traditional manufacturing products.

An alternative perspective on the competitiveness of industries and nations does not focus on the initial differences in productivity or factor endowments, but the dynamic inter-play by different parts of the economy to generate self-supporting and re-enforcing forces within the domestic economy that enable individual industries to compete on the international market. At the industry or firm level, in addition to factor inputs and production technology, the competitiveness of individual industries and firms depends crucially on their ability to create and sustain a cobweb of connections and reap the benefit of dynamic interplay amongst business as well as final users. This ability forms the core of the firms' industrial capabilities to compete both domestically and externally. The focus of this perspective is on the systems and mechanisms whereby firms can mobilise and deploy various factors effectively, rather than the quantity or intensity of the factors *per se*.

This core industrial capabilities perspective is rooted in development economics and goes back to the original contributions by Myrdal, Hirschman and Kaldor and has been recently revived or formalised by Porter, Krueger and Krugman. In this context, Hirschman (1958) put forward the concept of linkages to capture the dynamic inter-plays between different industrial sectors. In the original Hirschmanian sense, the linkage effects of an industry refer to the new innovations/expansions in the economic system arising from the incentives and driving forces that are provided by the existing industry. Such linkages can be further classified into backward and forward linkages. Backward linkage effects are related to the pulling power that one industry has on the other industries through its demand for the products of the other industries as intermediate inputs in its own production process. Therefore, backward linkage captures the vertical relationship between a particular industry and its upstream suppliers. Forward linkage effects are related to the pushing power that one industry exerts on the other industries through the utilisation of its products by the other industries in their production processes. Therefore, forward linkage captures the vertical relationship between an industry and its downstream business clients. Such linkage effects are directly caused by the interactions between industries in the form of intermediate demand and supply relations. It is worth mentioning that in the original Hirschmanian sense, the linkages effects do not occur automatically. Rather there must exist relevant institutional and technological settings conducive for the linkage effects to materialise.

Hirschman's concept of linkages was originally used for the purpose of identifying "key" sectors that can act as the locomotive for the whole economy, not for measuring the

competitiveness of domestic industries on international markets. The idea that the linkage effects in the domestic economy matters for external competitiveness of domestic industries was put forward by Linder (1961) and further extended by Krugman (1980), Lundvall (1988), Porter (1998b) and Drejer (2000). The basic arguments are as follows. Before a new product is launched for the export market, it is usually tested on the domestic market first. The size and the quality of demand on the domestic market are important not only for the new product to develop and grow, but also for the producers to specialise on its production to take advantage of the economy of scale or scope and the gains from international trade. It must be emphasised that the domestic demand does not just come from the final users, but also from the intermediate business users. Moreover, the dynamic interactions and knowledge and technology spill-over between the industry on the one hand and the domestic users and suppliers on the other hand also give rise to increasing returns to scale or scope, further enhancing the competitiveness of the industry.

Despite its descriptive richness, the concept of Hirschmanian linkage was not practically operational until the input-output based linkage measures that were originally developed by the Danish economist P.Nørregaard Rasmussen (1957) became widely adopted by economic analysts. For each industry, Rasmussen proposed two indices to capture the backward and forward linkage with the remaining industries. The former is termed the *power of dispersion* and the latter the *sensitivity of dispersion*, and the two indices are calculated as follows:

$$PD_i = \frac{\frac{1}{n} \sum_i L_{ij}}{\frac{1}{n^2} \sum_i \sum_j L_{ij}} \quad (1)$$

$$SD_i = \frac{\frac{1}{n} \sum_j L_{ij}}{\frac{1}{n^2} \sum_i \sum_j L_{ij}} \quad (2)$$

In the above expressions, i and j refer to individual industries, n is the total number of industries, $L = (I-A)^{-1}$ is the *Leontief inverse* (A is the input-output coefficients matrix calculated by dividing the intermediate flow of inputs from industry i to industry j , denoted by x_{ij} , by the corresponding sectoral output X_j , i.e., $A = x_{ij}/X_j$). The PD index measures the relative extent to which an increase in final demand for the product of a particular industry is dispersed throughout the rest of the industrial sectors, whilst the SD index measures the relative extent to which the rest of the industrial sectors rely on the product of the given

industry as intermediate inputs. A value above unity is interpreted as an indication of above-average (backward or forward) linkage for the industry in question. In the literature, other closely related measures of backward and forward linkages are also proposed. For example, the most straightforward measures of backward linkage and forward linkage are simply the column sum or the row sum of the Leontief inverse. When measured in this way, the backward linkage for industry i records the total rise in industrial outputs, both directly and indirectly, by all sectors as a result of a unit rise in the final demand for industry i 's product, and the forward linkage records the total rise in industry i 's output as a result of a unit rise in the final demand for all the industries' products. In this sense, such measures have a more intuitive interpretation than the PD and SD indices. In empirical applications, although the numerical values are different, both measures produce identical ranking of the industries in terms of their backward or forward linkages.

However, the afore-mentioned measures of forward linkage have particularly attracted controversy. For example, Jones (1976) argues that it is totally unrealistic to assume that in order to measure the forward linkage of an industry, the final demand for all industries' products, regardless of their size, is to rise by a unit. Thus, Jones proposes to utilise the *output inverse matrix* in the calculation of the forward linkage. The output inverse matrix (also termed the *Ghoshian inverse*) is calculated from output coefficients (x_{ij}/X_i) and the matrix containing these coefficients is termed the B matrix. The Jones' forward linkage is then calculated in the same way as that for the sensitivity of dispersion but using the output inverse matrix $(I-B)^{-1}$. This measure can be interpreted as recording the extent to which all the industrial sectors' outputs increase due to a unit of primary input into industry i . In other words, as a result of a unit increase in the value added that is generated by industry i , all other industries will respond to this innovation in industry i by increasing their production as well.

It is worth mentioning that in the literature on economic development, the various linkage measures have focused exclusively on the industry-to-industry linkages but completely ignored the linkages to the primary factors markets or the final markets. As Yin (2006) illustrates, sectors with strong intermediate linkages do not necessarily act as the locomotive for the overall economic growth – the final market linkages also matter, perhaps even more importantly than the intermediate linkages. After all, the ultimate purpose of production is for the final, not intermediate, consumption. In his analysis of the competitive advantage of nations, Porter (1998a) also places a nation's factor market and demand conditions at the core of a nation's competitive advantage. Therefore, in the literature on input-output analysis, extended measures of linkages have been proposed to endogenise factor income and final demand elements in the I-O flows. A typical procedure is to add a row of wage income and a

column of household consumption in the original I-O flow matrix, and then proceed in the usual way to obtain the backward and forward linkages as mentioned above. The resultant measures are termed *type-II linkages*. Compared with the original (type-I) measures, the type-II linkages capture the additional induced multiplying effects from consumer spending on industrial outputs and income generation. Although it has not been introduced in the literature, there is no reason why household consumption cannot be replaced by exports to capture the additional induced multiplying effects on outputs and income from exports.

Although in theory the various linkages could indicate the potential capabilities for an industry to compete on the global market, there is little empirical evidence to suggest that industries with strong (weak) linkages also have an actual external comparative advantage (disadvantage). Extant theories are particularly lacking in suggesting how industrial capabilities will give rise to distinct patterns of specialisation in production and trade. The myriad of country or industry specific factors and competing theoretical predictions have led analysts to suggest that the issue can only be resolved through empirical investigation (Proudman and Redding, 2000). Therefore, the subsequent discussion and empirical analysis attempt to provide some *prima facie* evidence on the relationship between economic linkages and external comparative advantages. To measure the actual comparative advantages of industries, a widely adopted procedure is based on the concept of revealed comparative advantage (RCA) that was originally proposed by Balassa (1965). RCA pertains to the relative trade performance of individual countries in exporting particular commodities. On the assumption that the commodity pattern of trade reflects the cross-country differences in relative costs as well as in non-price factors, including industrial capabilities, this is assumed to “reveal” the comparative advantage of the trading nations. Balassa’s original RCA index is calculated as follows:

$$RCA_i^c = \frac{X_i^c / XT^c}{\sum_{c=1}^m X_i^c / \sum_{c=1}^m XT^c} \quad (3)$$

In the above equation, X denotes exports in a sector, XT is total exports in a country, c (= 1, ..., m) refers to countries and i (=1, ..., n) refers to sectors. If $RCA > 1$, sector i in country c is said to have a comparative advantage in commodity or industry i, and *vice versa*. Similarly, a sector’s comparative advantage position can also be revealed through the comparison with the other domestic sectors. However, the exclusive focus on exports of the original RCA index has a serious limitation in the contemporary context where a significant

and rising part of international trade takes the form of intra-industry trade (IIT). A sensible measure should reveal a country or a sector's comparative advantage in generating *net* exports. Therefore, the within-country RCA can be calculated as follows:

$$RCA 1_i = \frac{X_i / XT}{M_i / MT} = \frac{X_i / M_i}{XT / MT} \quad (4)$$

Where M and MT denote sectoral and total imports respectively. Again, a value above unity indicates the sector's above-average ability to generate net exports and thus a comparative advantage over the other sectors in the external market.

The concept of linkages and revealed comparative advantages has been employed in numerous empirical studies on many different industrial sectors in the literature (see Balassa, 1977; Yeats, 1985; Laursen, 1998; Ferto and Hubbard, 2003). However, there has been relatively scarce empirical evidence on linkages and comparative advantages in services in general and the creative sector in particular. Porter (1998a) provides mainly qualitative discussion of the competitive advantages enjoyed by several British service industries. As he points out, many industries in which the UK still maintains competitive advantage are related to luxury, leisure, entertainment and wealth. In accordance with Porter's analysis, there are a number of reasons why the UK has so far managed to do well in the creative sector. First, due to the legacy of the British Empire, early industrialisation, and the vast amount of accumulated wealth, the UK enjoys the first mover advantage in many such industries in which established international brand names and distribution channels are hard to mimic or supplant. Moreover, the products of such industries are not very price-sensitive and consumers value traditional methods of production. Thus it is difficult for new comers to replace British firms through technological advancement. Second, the UK has a sophisticated domestic consumer base for cultural and wealth-related goods. Third, the British education system traditionally favours arts and humanities (as well as pure sciences), which provides a substantial skill base for the production of cultural goods. All such factors suggest that an analysis of the domestic industrial capability for the UK creative sector must go beyond the conventional industry-to-industry linkages to incorporate linkages to the factor and final markets. A comprehensive examination of all the factors is beyond the scope of this paper. Nevertheless, some effects can be captured through the type-II linkages as discussed above.

Having reviewed the relevant literature on the connection between linkages and competitiveness, the study proceeds to examine the UK creative sector in the context of a

cobweb of connections between this sector and the primary factor markets, upstream business suppliers and downstream business users as well as the final markets, particularly the export markets.

3. Empirical analysis of the UK creative industries

The purpose of this section seeks to elucidate the process of data collection, development of relevant research methods and empirical analysis. Starting with data collection, the ONS compiled a specific set of accounts for a collection of cultural clusters on the basis of the 123 x 123 input-output use tables (ONS, 2006). The UK DCMS also has a separate but closely related definition for creative industries based on 13 clusters⁴ (DCMS, 2006). Although there are discrepancies in the classifications and output estimates of the creative sector by the two official data sources and the ONS estimate is higher than the DCMS estimate (ONS 2006), the detailed 123 x 123 use table provides an unrivalled source of data for quantifying the linkages across the sector and in relation to the wider economy. On the basis of the detailed 123 x 123 use matrix, a more aggregated 31 x 31 matrix is obtained with ten industries that are classified as belonging to the creative sector explicitly identified. A number of adjustments regarding the treatment of the creative sector and the valuation basis of the I-O table have to be made. Details of the adjustments and the classification of individual industries in the creative cluster are given in the Appendix.

It is worth noting that the ONS only publishes the product by industry use matrix for the most recent years (the latest year is 2004) and no balanced industry by industry or product by product matrix is available. The use matrix distinguishes industries from the commodities that are produced by these industries. For example, tourist service is not only produced by the corresponding tourist industry, but also other sectors such as agriculture. Therefore, the total output of tourist service is not necessarily the same as the total output of the tourist industry. The use matrix depicts each industry as playing a multiple role in the economy, such as employer for primary factors of production (e.g., labour and capital), user of the products by other industrial sectors, and supplier to other industrial sectors and the final markets. What is particularly useful for the current study is the fact that the final markets include a breakdown of the export markets into EU and non-EU markets and further into the export markets for goods and services. On the basis of the information across the rows, it is possible to calculate the percentage shares of the sales of the products by each industry to various users, both intermediate and final, and the results are presented in Table 2. It should be noted that the ten creative industries are listed on the last ten rows (from sector 22-31). Similarly, by reading the information down the columns of the use matrix it is possible to obtain the percentage shares

of each industry's purchases of intermediate and primary inputs. The results are reported in Table 3.

Table 2 Sales destination of UK industrial outputs (2004)

	Sales to intermediate markets (%)			Sales to final markets (%)				
	CI cluster	Other industries	Total intermediate.	C	G	I	EXEU	EXROW
1.Agriculture	0.16	50.59	50.75	41.72	0.00	1.85	4.10	1.57
2.Mining & quarrying	0.05	67.69	67.74	0.63	0.00	0.95	19.22	11.46
3.Food & drinks	0.96	32.08	33.05	59.40	0.00	0.24	4.46	2.86
4.Textile, fabric & leather	6.75	21.46	28.20	56.50	0.00	1.11	7.93	6.25
5.Wood & paper	7.45	67.53	74.99	16.43	0.00	0.67	5.33	2.57
6.Publishing, printing and reproduction of recorded media	12.21	39.12	51.33	38.02	0.00	1.72	4.56	4.37
7.Chemical & materials	0.95	53.46	54.41	20.98	0.00	2.33	13.65	8.63
8.Machinery	0.55	29.95	30.50	13.52	0.00	25.96	16.14	13.88
9.Electric and electronic industry	1.11	39.87	40.98	18.91	0.00	11.51	15.92	12.67
10.Vehicles	0.32	25.65	25.96	33.40	0.00	12.71	15.52	12.39
11.Cultural products	0.07	3.18	3.25	79.11	0.00	6.43	4.38	6.83
12.Other products	1.07	25.54	26.61	53.65	0.00	14.10	3.40	2.24
13.Utility and construction	0.69	45.25	45.94	10.34	0.00	43.49	0.11	0.12
14.Distribution and hotel	1.53	26.53	28.05	56.02	0.00	3.40	6.79	5.74
15.Transport & communication	2.85	62.00	64.85	24.41	0.00	0.53	4.49	5.71
16.Banking & finance	1.45	45.64	47.09	43.54	0.00	1.54	2.93	4.90
17.Computer and related activities	8.13	58.56	66.70	0.00	0.00	21.22	7.21	4.88
18.R&D, legal and accounting services	13.44	67.62	81.06	1.07	0.00	6.22	4.71	6.94
19.Architectural & technical consultancy	16.24	57.23	73.48	0.82	0.00	13.99	4.72	6.99
20.Other business services	15.90	58.75	74.65	1.87	0.00	0.94	8.40	14.13
21.Public & other services	2.01	15.29	17.30	20.08	60.82	0.50	0.47	0.83
22.Knitted goods	1.70	1.54	3.24	76.21	0.00	0.10	12.71	7.75
23.Wearing apparel and fur products	0.54	3.69	4.23	85.52	0.00	1.11	5.29	3.84
24.Footwear	1.06	8.72	9.78	80.40	0.00	0.36	6.08	3.38
25.Printing and publishing	12.21	39.12	51.33	38.02	0.00	1.72	4.56	4.37
26.Retail distribution	1.65	32.50	34.14	44.23	0.00	5.60	9.21	6.82
27.Computer services	8.13	58.56	66.70	0.00	0.00	21.22	7.21	4.88
28.Architectural activities and technical consultancy	16.24	57.23	73.48	0.82	0.00	13.99	4.72	6.99
29.Advertising	14.04	76.59	90.63	0.35	0.00	0.07	3.62	5.33
30.Other business services	15.90	58.75	74.65	1.87	0.00	0.94	8.40	14.13
31.Recreational services	10.87	14.30	25.18	49.58	11.50	3.87	2.96	6.92

Table 3 Purchases of primary and intermediate inputs by UK industries (2004)

	Intermediate consumption (%)			Value added (%)			
	From CI cluster	From other industries	Total intermediate	Tax	Wage	Capital	Total Value added
1.Agriculture	1.32	53.58	54.90	-1.77	15.02	31.85	45.10
2.Mining & quarrying	1.46	30.66	32.12	0.38	8.95	58.55	67.88
3.Food & drinks	3.02	62.31	65.34	0.47	22.21	11.99	34.66
4.Textile, fabric & leather	3.80	56.88	60.67	0.98	30.85	7.50	39.33
5.Wood & paper	2.08	62.95	65.03	0.81	23.44	10.72	34.97
6.Publishing, printing and reproduction of recorded media	14.56	36.52	51.07	0.78	32.05	16.10	48.93
7.Chemical & materials	2.63	63.07	65.69	0.67	25.02	8.62	34.31
8.Machinery	2.66	60.15	62.81	0.54	26.66	9.98	37.19
9.Electric and electronic industry	2.93	57.47	60.40	0.64	28.89	10.07	39.60
10.Vehicles	2.98	68.81	71.80	0.36	22.66	5.18	28.20
11.Cultural products	3.33	55.37	58.69	0.79	22.51	18.01	41.31
12.Other products	2.32	59.42	61.74	0.87	25.13	12.26	38.26
13.Utility and construction	2.62	60.37	62.99	0.83	16.37	19.82	37.01
14.Distribution and hotel	5.26	43.27	48.53	2.54	32.89	16.04	51.47
15.Transport & communication	6.02	47.04	53.06	0.72	32.07	14.14	46.94
16.Banking & finance	5.58	44.24	49.81	0.48	17.31	32.40	50.19
17.Computer and related activities	15.52	25.72	41.24	0.61	42.39	15.76	58.76
18.R&D, legal and accounting services	8.90	28.95	37.85	-0.12	38.60	23.66	62.15
19.Architectural & technical consultancy	13.15	27.26	40.41	0.55	42.36	16.67	59.59
20.Other business services	14.25	30.26	44.51	0.67	34.77	20.04	55.49
21.Public & other services	5.35	37.32	42.67	0.19	47.56	9.58	57.33
22.Knitted goods	6.19	51.74	57.94	1.03	37.29	3.74	42.06
23.Wearing apparel and fur products	5.31	59.09	64.40	0.54	27.60	7.46	35.60
24.Footwear	7.32	42.53	49.85	0.92	20.31	28.92	50.15
25.Printing and publishing	14.56	36.52	51.07	0.78	32.05	16.10	48.93
26.Retail distribution	4.27	34.88	39.15	4.30	35.06	21.49	60.85
27.Computer services	15.52	25.72	41.24	0.61	42.39	15.76	58.76
28.Architectural activities and technical consultancy	13.15	27.26	40.41	0.55	42.36	16.67	59.59
29.Advertising	9.85	31.10	40.94	0.74	32.14	26.17	59.06
30.Other business services	14.25	30.26	44.51	0.67	34.77	20.04	55.49
31.Recreational services	16.81	30.96	47.77	0.89	31.12	20.22	52.23

A careful reading of these tables reveals the following characteristics of the sector:

- i) Sales of fashion design related creative products (sectors 22-24) are primarily for the domestic consumer market, which accounts for over 76%-86% of the total sales of such products. In contrast, the business-oriented creative products such as architectural design and computer services mainly sell to the intermediate markets.
- ii) On average, the creative sector provides a smaller proportion of their products to the export market than the non-creative sectors. Thus, on the basis of this piece of evidence alone it is not possible to establish whether or not the creative industries have comparative advantage in generating exports.
- iii) The creative sector has an average share of value added in total output of 52%, which is higher than the 46% in the non-creative sector. Although there is no difference in the average share of capital income between the creative and non-creative sectors, the share of labour income is significantly higher in the creative sector (34%) than that in the non-creative sectors (28%). This evidence confirms the belief that the creative sector specialises in high value-added and skilled labour intensive products.
- iv) There are significant flows of services within the creative cluster, suggesting the presence of a self-supporting mechanism within the cluster.

To capture the interactions between the different sectors more formally, the next section turns to the derivation of the various linkages. Since the I-O matrix at hand is not a conventional balanced industry by industry or product by product matrix but a product by industry use matrix, the conventional way of deriving the linkages has to be modified. Straightforward algebraic manipulation suggests that the Leontief and Goshian inverse matrices should be modified in the following way:

$$L = (I - A \hat{\alpha})^{-1} \quad (5)$$

$$G = (\hat{\alpha} - B)^{-1} \quad (6)$$

Where $\hat{\alpha}$ is a diagonal matrix with the diagonal elements being the ratios of the total output of each industry to the total output of each product. Table 4 presents the various linkage measures for each industry.

Table 4 Economic linkages for UK sectors (2004)

	Type-I		Type-II (C)*		Type-II (X)*	
	Backward (PD)	Forward (SD)	PD	SD	PD	SD
1.Agriculture	1.14 (4)**	0.73 (22)	0.99 (18)	0.83 (11)	1.08 (12)	0.56 (23)
2.Mining & quarrying	0.85 (26)	1.28 (8)	0.62 (27)	0.78 (12)	0.77 (26)	1.72 (5)
3.Food & drinks	1.04 (13)	0.78 (18)	0.90 (21)	0.99 (8)	0.99 (18)	0.65 (21)
4.Textile, fabric & leather	0.91 (24)	1.14 (10)	0.79 (24)	1.50 (5)	0.86 (24)	1.18 (12)
5.Wood & paper	1.10 (7)	1.30 (6)	0.99 (19)	1.03 (7)	1.06 (15)	1.12 (14)
6.Publishing, printing and reproduction of recorded media	1.27 (3)	0.50 (27)	1.49 (1)	0.47 (27)	1.35 (1)	0.45 (27)
7.Chemical & materials	1.03 (15)	1.16 (9)	0.90 (20)	0.90 (10)	0.99 (19)	1.48 (7)
8.Machinery	0.94 (23)	0.95 (14)	0.80 (23)	0.63 (19)	0.89 (23)	1.49 (6)
9.Electric and electronic industry	0.90 (25)	1.28 (7)	0.77 (25)	0.92 (9)	0.85 (25)	1.94 (2)
10.Vehicles	1.03 (14)	0.77 (19)	0.87 (22)	0.70 (14)	0.98 (22)	1.22 (11)
11.Cultural products	0.75 (29)	1.33 (5)	0.52 (30)	2.18 (4)	0.66 (30)	1.32 (8)
12.Other products	1.08 (8)	0.64 (23)	1.00 (17)	0.70 (13)	1.05 (16)	0.54 (25)
13.Utility and construction	1.29 (1)	0.60 (25)	1.12 (13)	0.38 (30)	1.23 (3)	0.35 (30)
14.Distribution and hotel	1.06 (10)	0.54 (26)	1.14 (12)	0.62 (20)	1.09 (11)	0.56 (24)
15.Transport & communication	1.13 (5)	0.79 (17)	1.23 (8)	0.67 (17)	1.17 (5)	0.75 (18)
16.Banking & finance	1.13 (6)	0.60 (24)	1.04 (14)	0.61 (21)	1.10 (10)	0.52 (26)
17.Computer and related activities	0.99 (18)	0.76 (20)	1.23 (7)	0.50 (26)	1.08 (13)	0.73 (19)
18.R&D, legal and accounting services	0.96 (20)	0.96 (13)	1.14 (11)	0.65 (18)	1.03 (17)	0.93 (15)
19.Architectural & technical consultancy	1.03 (16)	0.81 (15)	1.33 (4)	0.52 (22)	1.14 (6)	0.79 (16)
20.Other business services	0.95 (21)	1.06 (11)	1.03 (15)	0.68 (15)	0.98 (20)	1.22 (9)
21.Public & other services	1.06 (11)	0.36 (31)	1.39 (3)	0.25 (31)	1.18 (4)	0.19 (31)
22.Knitted goods	0.75 (30)	1.35 (4)	0.56 (28)	2.23 (3)	0.68 (28)	1.84 (4)
23.Wearing apparel and fur products	0.75 (28)	1.39 (3)	0.53 (29)	2.44 (2)	0.67 (29)	1.16 (13)
24.Footwear	0.66 (31)	3.84 (1)	0.39 (31)	6.18 (1)	0.56 (31)	3.30 (1)
25.Printing and publishing	1.27 (2)	0.50 (28)	1.49 (2)	0.47 (28)	1.35 (1)	0.45 (28)
26.Retail distribution	1.05 (12)	0.50 (29)	1.23 (9)	0.50 (24)	1.12 (9)	0.57 (22)
27.Computer services	0.99 (18)	0.76 (21)	1.23 (6)	0.50 (25)	1.08 (14)	0.73 (20)
28.Architectural activities and technical consultancy	1.03 (17)	0.81 (16)	1.33 (5)	0.52 (23)	1.14 (7)	0.79 (17)
29.Advertising	0.80 (27)	2.04 (2)	0.71 (26)	1.49 (6)	0.76 (27)	1.90 (3)
30.Other business services	0.95 (22)	1.06 (11)	1.03 (16)	0.68 (16)	0.98 (21)	1.22 (10)
31.Recreational services	1.08 (9)	0.42 (30)	1.21 (10)	0.46 (29)	1.12 (8)	0.37 (29)

* Type-II (C) refers to linkages that incorporate the induced multiplying effects from consumer spending and type-II (X) refers to the endogenised multiplying effects from exports.

** The numbers in brackets indicate the sectoral rankings

Clearly, industries in the creative sector exhibit heterogeneous characteristics in their relationship with the rest of the economy. There is a clear contrast between two broad sub-groups: fashion design related industries such as footwear, wearing apparel and fur products, and knitted goods on the one hand; and business services oriented industries such as printing and publishing, architectural and technical consultancy, and computer services on the other hand. The fashion-related industries (plus advertising) have much stronger industry-to-industry forward linkages than backward linkages – these occupy the top four positions in the ranking of forward linkages, whilst also having the weakest backward linkages among all the industries. These results are not surprising given the special characteristics of these industries. As is discussed earlier, the production of fashion and cultural goods and services requires little inputs of raw materials or physical capital, hence there is limited backward linkage to upstream suppliers. On the other hand, the creative designs and products are incorporated into the production of other goods and services in a wide range of other industries, hence there is a strong downstream linkage to the business users.

In contrast, the business services oriented industries have a more balanced relationship with the other industries, although the backward linkages tend to be stronger than the forward linkages. A general observation is that there is a negative correlation between backward and forward linkages across all industries, especially for the creative industries. In other words, industries that have extensive connections with upstream suppliers tend to have rather limited relations with the downstream users, and *vice versa*. Moreover, a contrast between the traditional primary and secondary sectors and the creative sector has also emerged: whilst the traditional sectors tend to have more balanced linkages in the upstream and downstream directions, the creative sector tends to have asymmetrical linkages to the other parts of the economy, as is already discussed above. Further calculations (results not shown here) reveal that a significant proportion of the backward linkage (between 60%-94%) happens within the creative sector itself, whilst the within-sector forward linkage varies substantially across the individual creative industries (over 90% in the fashion-related industries but around 40% in the business service oriented industries). Therefore, it appears that within the creative sector itself, there is a strong (localised) self-supporting and self-reinforcing mechanism in the backward direction, whereas such a mechanism is weaker in the forward direction with the exception of the fashion-related industries. In other words, when the demand from the final market for one kind of creative product increases, it has a strong pulling power for the demand for the other kinds of creative products. However, with the exception of the fashion-related industries, an innovation in one creative industry has more benefits to other parts of the economy than the other industries within the creative sector itself.

Once the endogenous consumption-induced or export-induced effects on production and income are incorporated into the linkages, as the type-II measures indicate, there are significant changes to both the magnitudes of the linkages and their rankings. In general, the induced effects tend to further suppress the backward linkages whilst boost the forward linkages of the fashion-related creative industries. In contrast, in those business services oriented creative industries, the backward linkages are strengthened whilst the forward linkages are weakened. In short, the induced effects tend to strengthen the already strong and weaken the already weak industrial linkages in the creative sector. Comparing the consumption-induced with export-induced effects on linkages, it is noted that exports have a less accentuated impact on the asymmetry between backward and forward linkages than domestic consumption. In other words, through exports to the international market, the creative industries can achieve a more balanced position between backward and forward linkages than trading in the domestic market only.

Having examined the linkages between the creative sector and the rest of the economy, the focus now is on the revealed comparative advantages of different industries in generating exports. Different data sources are available for calculating the within-country RCAs and the cross-country RCAs. The ONS has published time series data on imports and exports of goods and services for 123 UK industrial products from 1992 to 2004. Moreover, imports and exports are further broken down by EU and non-EU markets. For consistency, the data are aggregated to 31 products and the within country RCAs are calculated for exports to the EU, exports to the rest of the world, and total exports. It is worth bearing in mind that the calculation of RCAs is sensitive towards the level of aggregation of industries and thus the literature has called for a more careful examination of the trends in RCAs over time. Therefore, to have more confidence in the derived RCAs and also to reveal how the sectoral comparative advantages have changed over time, the RCAs are produced for 1995, 2000 and 2004. The results are presented in Table 5.

Looking at the ranking for total exports in the most recent time period (2004), with the exception of mining and quarrying, the services industries dominate the league table of comparative advantage of industries. Within the creative sector, again, there is a stark contrast between the business services oriented industries and the fashion design related industries, with four of the former industries being among the top ten but the latter industries at the bottom of the league table. Comparing the ranking for exports to the EU and exports to the rest of the world, despite the UK's geographical and cultural affinity to the EU, the comparative advantage positions of the business services oriented industries are slightly enhanced in terms of exports to the rest of the world.

Table 5 Revealed comparative advantages of UK industries vis-à-vis the other domestic industries

	RCA (2004)			RCA (2000)			RCA (1995)		
	EU	ROW	Total	EU	ROW	Total	EU	ROW	Total
1.Agriculture	0.40 (28)	0.17 (31)	0.29 (29)	0.43 (28)	0.17 (31)	0.30 (29)	0.33 (29)	0.11 (31)	0.22 (31)
2.Mining & quarrying	13.56 (1)	0.40 (25)	1.09 (15)	10.49 (1)	0.51 (21)	1.29 (13)	9.59 (2)	0.54 (22)	1.40 (12)
3.Food & drinks	0.50 (25)	0.55 (21)	0.51 (24)	0.53 (26)	0.62 (20)	0.56 (24)	0.47 (25)	0.56 (20)	0.49 (24)
4.Textile, fabric & leather	0.77 (19)	0.50 (22)	0.63 (22)	0.68 (22)	0.49 (23)	0.58 (23)	0.46 (26)	0.37 (22)	0.42 (26)
5.Wood & paper	0.36 (30)	0.42 (24)	0.36 (27)	0.34 (30)	0.35 (27)	0.34 (28)	0.24 (31)	0.21 (29)	0.22 (30)
6.Publishing, printing and reproduction of recorded media	1.70 (11)	1.63 (12)	1.67 (10)	1.68 (11)	1.54 (14)	1.61 (11)	1.75 (12)	1.31 (15)	1.52 (11)
7.Chemical & materials	1.19 (13)	1.00 (17)	1.10 (14)	1.27 (13)	1.20 (16)	1.23 (14)	1.06 (17)	1.09 (17)	1.06 (16)
8.Machinery	0.87 (16)	0.88 (19)	0.87 (18)	0.76 (18)	0.63 (19)	0.70 (20)	0.68 (21)	0.67 (19)	0.67 (20)
9.Electric and electronic industry	0.90 (15)	0.66 (20)	0.78 (20)	0.79 (17)	0.48 (24)	0.62 (22)	1.08 (16)	0.55 (21)	0.77 (19)
10.Vehicles	0.73 (22)	1.12 (16)	0.84 (19)	0.75 (19)	1.11 (17)	0.87 (18)	0.77 (20)	1.35 (14)	0.93 (17)
11.Cultural products	0.99 (14)	0.46 (23)	0.61 (23)	0.99 (15)	0.50 (22)	0.63 (21)	0.89 (18)	0.54 (23)	0.66 (22)
12.Other products	0.44 (27)	0.28 (27)	0.36 (28)	0.57 (25)	0.35 (26)	0.46 (25)	0.60 (24)	0.49 (24)	0.55 (23)
13.Utility and construction	0.76 (20)	1.88 (8)	1.07 (16)	0.63 (23)	3.34 (7)	1.07 (16)	0.41 (27)	1.71 (9)	0.66 (21)
14.Distribution and hotel	0.49 (26)	0.96 (18)	0.69 (21)	0.48 (27)	1.08 (18)	0.71 (19)	0.63 (23)	0.99 (18)	0.80 (18)
15.Transport & communication	0.80 (18)	1.79 (11)	1.14 (13)	0.89 (16)	1.75 (12)	1.22 (15)	1.41 (13)	1.27 (16)	1.35 (15)
16.Banking & finance	3.59 (2)	5.06 (1)	4.43 (1)	3.90 (2)	6.28 (1)	5.12 (1)	6.11 (3)	7.60 (2)	7.04 (2)
17.Computer and related activities	3.39 (3)	2.58 (7)	3.00 (3)	3.05 (5)	4.30 (4)	3.43 (5)	5.37 (4)	5.47 (3)	5.36 (3)
18.R&D, legal and accounting services	2.82 (5)	3.35 (2)	3.15 (2)	3.58 (3)	5.05 (2)	4.34 (2)	4.65 (5)	4.74 (4)	4.77 (4)
19.Architectural & technical consultancy	2.13 (7)	2.86 (3)	2.53 (7)	2.84 (6)	4.26 (5)	3.55 (4)	16.34 (1)	21.56 (1)	19.20 (1)
20.Other business services	1.94 (9)	1.85 (10)	1.93 (8)	1.87 (9)	2.09 (9)	2.01 (8)	3.98 (6)	2.69 (7)	3.14 (5)
21.Public & other services	0.86 (17)	1.50 (14)	1.19 (12)	1.11 (14)	1.96 (10)	1.54 (12)	1.10 (15)	1.58 (12)	1.37 (14)
22.Knitted goods	0.69 (24)	0.23 (28)	0.40 (25)	0.60 (24)	0.23 (29)	0.37 (27)	0.65 (22)	0.25 (28)	0.41 (27)
23.Wearing apparel and fur products	0.70 (23)	0.21 (29)	0.36 (26)	0.69 (21)	0.25 (28)	0.40 (26)	0.80 (19)	0.29 (27)	0.47 (25)
24.Footwear	0.39 (29)	0.18 (30)	0.28 (30)	0.37 (29)	0.21 (30)	0.29 (30)	0.35 (28)	0.21 (30)	0.29 (29)
25.Printing and publishing	1.70 (11)	1.63 (12)	1.67 (11)	1.90 (8)	1.74 (13)	1.82 (9)	2.15 (11)	1.60 (10)	1.86 (9)
26.Retail distribution	0.20 (31)	0.32 (26)	0.25 (31)	0.20 (31)	0.38 (25)	0.27 (31)	0.32 (30)	0.44 (25)	0.38 (28)
27.Computer services	3.39 (4)	2.58 (6)	3.00 (4)	3.49 (4)	4.91 (3)	3.92 (3)	3.08 (7)	3.13 (6)	3.07 (6)
28.Architectural activities and technical consultancy	2.13 (8)	2.86 (3)	2.53 (6)	2.34 (7)	3.52 (6)	2.93 (6)	2.59 (8)	3.41 (5)	3.04 (7)
29.Advertising	2.19 (6)	2.79 (5)	2.53 (5)	1.80 (10)	2.52 (8)	2.17 (7)	2.48 (9)	2.49 (8)	2.52 (8)
30.Other business services	1.94 (10)	1.85 (9)	1.93 (9)	1.59 (12)	1.78 (11)	1.72 (10)	2.35 (10)	1.59 (11)	1.86 (10)
31.Recreational services	0.73 (21)	1.28 (15)	1.05 (17)	0.73 (20)	1.23 (15)	1.03 (17)	1.18 (14)	1.47 (13)	1.39 (13)

Table 5 also reports the sectoral RCAs for 1995 and 2000. It is worth noting that a number of services industries such as banking and finance, computer services, R&D, legal and accounting services, and architectural and technical consultancy that were highly competitive in 1995 have seen their competitive strengths significantly eroded over the ten years from 1995 to 2004. For example, although banking and finance has remained its top position in the league table, its RCA index has progressively gone down from 7.04 in 1995, to 5.12 in 2000 and 4.43 in 2004. Not a single industry has gained significantly in its RCA index over the same time period. Thus, the comparative advantage positions of the UK industries have become more evenly distributed over time. Within the creative sector, a number of the business services oriented industries have suffered slight deterioration in their RCA index. Yet despite the changes to the sectoral RCAs over time, the relative rankings of the sectors have remained remarkably stable. The Spearman's rank correlation (SRC) coefficients are calculated to show how the sectoral rankings in different years are correlated. The coefficients are reported in Table 6.

Table 6 Spearman's rank correlation coefficients for sectoral RCA over time

1995 vs. 2000			2000 vs. 2004			1995 vs. 2004		
EU	ROW	Total	EU	ROW	Total	EU	ROW	Total
0.96 (17.91)*	0.98 (24.68)	0.97 (22.87)	0.98 (26.55)	0.98 (24.25)	0.99 (33.20)	0.93 (13.63)	0.97 (20.16)	0.96 (17.47)

* Numbers in the brackets refer to the t-statistic. Thus all coefficients are significant at the 1% level.

If the SRC is close to one, the relative comparative advantage positions have hardly changed from one period to another. Thus, the results in Table 6 suggest that there is very little change to the relative rankings of sectoral comparative advantage positions in the UK over the ten years from 1995 to 2004.

The derivation of the UK creative industries' comparative advantage over their international competitors is much more problematic due to the paucity in comparable international trade statistics on services, especially creative products and services. The present study can only manage to obtain consistent OECD data on international trade in services for the UK and the EU15 member countries as a whole from the 1970s to 2003, although only a few sub-sectors in the OECD data set match closely the definition of the creative industries that are adopted here. Table 7 presents the RCA indices for thirteen UK services industries against the EU15 as a whole in 1995, 2000 and 2003.

Table 7 Comparative advantages of UK services industries against EU15

	RCA (2003)	RCA (2000)	RCA (1995)
1.Transportation	0.71	0.69	0.88
2.Travel	0.58	0.64	0.79
3.Communications	0.88	1.07	1.32
4.Construction	0.05	0.07	0.82
5.Insurance	1.82	2.19	2.19
6.Financial services	2.34	2.25	1.91
7.Computer & information	0.93	1.02	1.56
8.Royalties & license fees	2.07	2.05	2.06
9.Architectural activities and technical consultancy	1.55	1.42	1.02
10.Advertising	1.31	1.10	0.46
11.Other business services	1.10	1.08	0.95
12.Recreational services	1.35	1.36	3.04
13.Government & other services	0.62	0.94	0.57

It is worth noting that only industries 7, 9, 10, 11 and 12 in the table bear some resemblance to the corresponding creative industries as defined in this study. Clearly, over the period from 1995 to 2003, the UK financial services industry, despite weakening its comparative advantage position against the other domestic industries, has managed to maintain and even further enhance its comparative advantage against the EU15 financial industry as a whole. Of the five creative-related industries that are listed, four enjoy a comparative advantage position over the EU15 counterparts in 2003. In particular, advertising and other business services have gained significantly over the nine year period. In contrast, computer and information services and recreational services have suffered significant deterioration in their comparative advantage positions.

Having derived the economic linkages and comparative advantage position for all the UK industries, the present study now examines the relationship between the two aspects. Table 8 reports the sample correlation coefficients between the within-country sectoral RCA for exports to different markets and the type-I and type-II backward and forward linkages.

Table 8 Relationship between RCAs and linkages in UK industries

	Type-I		Type-II (C)*		Type-II (X)*	
	Backward (PD)	Forward (SD)	PD	SD	PD	SD
All industries sample correlation coefficient between RCA (total exports) and linkages	0.17	-0.19	0.42	-0.34	0.32	-0.22
Creative sector sample correlation coefficient between RCA (total exports) and linkages	0.35	-0.27	0.49	-0.52	0.43	-0.30
Non-creative sector sample correlation coefficient between RCA (total exports) and linkages	0.08	-0.23	0.40	-0.37	0.27	-0.21

Several interesting findings have emerged. First, the relationship between industrial linkages and sectoral comparative advantages is stronger in the creative industries than in the non-creative industries. Moreover, when the type-II linkages are used in calculating the correlation coefficients, the correlations become much stronger across the board. This evidence suggests that industrial structure and organisation, which are at the core of the industrial capabilities argument, do matter for the comparative advantages of industries and nations. However, industrial capabilities have a heterogeneous role to play in different industries and may be more applicable in explaining comparative advantages in the creative industries than in the non-creative industries. Moreover, in explaining the comparative advantages of UK industries, the traditional industry-to-industry linkages may have limited explanatory power whilst the extended linkages that encompass the factor market and final market may be playing a more significant role. Second, in general, backward linkages tend to be positively related, whilst forward linkages tend to be negatively related, to the RCAs. Such a finding is rather puzzling. A tentative explanation is offered here. Industries that have strong backward linkages draw an assortment of resources from other industries (in the case of the creative sector from other industries within the same sector or cluster) and are able to internalise the benefits of design and technology embedded in the other products in their own products. Therefore, such industries will be able to build up superior competitive capabilities. On the other hand, industries with strong forward linkages will generate strong spill-over effects to the other industries that cannot be easily internalised. Such industries may produce favourable externality effects on the other parts of the economy, but the effect of their strong forward linkages on their own competitive capabilities may be limited or even detrimental.

4. Discussion and conclusion

The present study presents, for the first time, a systematic and detailed examination of the economic linkages between the UK creative industries and the rest of the economy as well as these industries' comparative advantages in generating net exports. The empirical results have revealed that industries in this sector exhibit distinct patterns in their relationship with the upstream suppliers, downstream clients and the factor and final markets as compared with the traditional industries in the primary and secondary sectors. More specifically, the creative industries tend to have more asymmetric linkages between the backward and forward directions than the other industries. Those industries that have strong backward linkages tend to have weak forward linkages, and *vice versa*. Within the creative sector, there is a clear contrast between two broad sub-groups of industries: fashion and cultural based versus business services oriented. The former group of industries tend to have weak backward linkages but strong forward linkages, whereas the latter group of industries have stronger backward linkages than forward linkages. Once the linkages are extended to embed the

induced multiplying effects on output production and income generation from consumer spending and exports, the differences between the backward and forward linkages are further accentuated. For example, the fashion and cultural related creative industries already have rather weak industry-to-industry linkages in the backward direction. When the induced effects from consumption or exports are taken into consideration, these industries' ability to pull other industries along is further reduced should the final market conditions for fashion and cultural goods improve. On the other hand, should these sectors enjoy a burst in their productivity or innovation, their ability to exert favourable externality effects on the rest of the economy is further enhanced when the induced effects on production and income arising from final consumption are taken into account. It is also revealed that by exporting to the external markets, the UK creative industries managed to achieve more balanced linkages in both directions than in the case of selling to the domestic final market alone.

Analysis of the within-country cross sector comparative advantage positions of the UK industries has again revealed mixed fortunes among the creative industries. While the fashion and cultural related industries generally suffer comparative disadvantages, the business services oriented industries enjoy clear comparative advantages over the other domestic industries. The relative positions in the ranking of sectoral comparative advantages of UK industries have remained remarkably stable from 1995 to 2004. Moreover, the UK business services oriented creative industries also enjoy comparative advantage over their EU competitors.

There is some evidence to support the industrial capabilities argument that industrial structure and organisation matter for industries' comparative advantages, especially in the context of the creative industries. Moreover, within-country cross-sectoral comparative advantages seem to be positively related to the backward linkages but negatively related to the forward linkages. A tentative explanation for this puzzling finding may lie with the industries' ability to internalise and appropriate their dynamic interactions with the rest of the economy.

A number of policy implications may be drawn from the empirical results here. First, given the positive relationship between backward linkages and comparative advantages and the special characteristics of the creative sector, there is a potential role for the government and local development agencies to play in enhancing local competitive capabilities through more targeted approaches. For example, many creative industries have very limited backward linkages and these businesses tend to operate on a small scale. Lack of information, formal business contact with local and international suppliers and expertise may be the underlying reasons. Through information provision and even direct training of local expertise at local

schools and colleges and nationally employing less restrictive immigration policy to attract highly skilled migrants, the government can help to nurture a more formal and dynamic business relationship between the creative industries and local suppliers.

Second, although industries with strong forward linkages seem to be unable to appropriate all the benefits that arise from their innovation, such industries do generate favourable externalities to the rest of the economy. Given their small scales of operation and the prohibitively high costs of pursuing copyright cases individually, the creative industries face an even stiffer challenge than the traditional manufacturing sectors in their effort to reap the full benefits of their enterprise. Therefore, government policies regarding intellectual property rights and selective industrial subsidy may be effective tools in helping such industries to function and prosper.

References

- Adorno, T. W. (2001). The Culture Industry: Selected Essays on Mass Culture, Routledge.
- Adorno, T. W. and M. Horkheimer (1997). Dialectic of Enlightenment, Verso.
- Balassa, B. (1965), "Trade Liberalisation and 'Revealed' Comparative Advantage", The Manchester School of Economics and Social Studies, 33, 99-123.
- Balassa, B. (1977). "Revealed Comparative Advantage Revisited: an Analysis of relative Export Shares of the Industrial Countries, 1953-1971." The Manchester School of Economics and Social Studies 45(2): 327-344.
- Baumol, W J (1967) "Macroeconomics of unbalanced growth: the anatomy of urban crisis", American Economic Review, 57, 415-426.
- Baumol, W J (1985) "Productivity and the service sector", in R.P.Inman (ed.) Managing the Service Economy: Prospects and Problems. Cambridge University Press, New York: Cambridge University Press.
- Baumol, W J, S A B Blackman and E N Wolff (1989) Productivity and American Leadership: the Long View, the MIT Press, Cambridge, MA.
- Baumol, W. J. & Bowen, W. G. (1966) Performing arts-the economic dilemma, Twentieth Century Fund.
- Barro, R. J. (2003) Economic Growth, MIT Press.
- Bowen, H.P., E.E. Leamer and L. Sveikauskas, (1987) "Multicountry, Multifactor Tests of the Factor Abundance Theory", The American Economic Review 77, 791-809.
- Bourdieu, P. (1986). "The forms of capital (R. Nice, Trans.)." Handbook of theory and research for the sociology of education: 241-258.

- Brakman, S. and C. Van Marrewijk (1996) "Trade policy under imperfect competition: The economics of Russian roulette", De Economist, Vol. 144, No.2, pp.223-258.
- Caves, R. E. (2003). "Contracts between Art and Commerce." The Journal of Economic Perspectives 17(2): 73-84.
- Carr, David L.; James R. Markusen and Keith E. Maskus (2001), "Estimating The Knowledge-Capital Model Of The Multinational Enterprise," American Economic Review, 2001, vol. 91 (3, Jun), 693-708.
- DCMS (1998). Creative Industries Mapping Document. London, Department of Culture, Media and Sports.
- DCMS (2006a). Evidence and Analysis: Final Report. Creative Economy Programme, Department of Culture, Media and Sport.
- DCMS (2006b) Creative industries economic estimates statistical bulletin. Department of Culture, Media and Sport.
- Drejer, I. N. A. (2000). "Comparing Patterns of Industrial Interdependence in National Systems of Innovation-A Study of Germany, the United Kingdom, Japan and the United States." Economic Systems Research 12(3): 377-399.
- Elliott, L. and D. Atkinson (2007). Fantasy island: waking up to the incredible economic, political and social illusions of the Blair legacy. London, Constable.
- Ferto, I. and L. J. Hubbard (2003). "Revealed Comparative Advantage and Competitiveness in Hungarian Agri-Food Sectors." The World Economy 26(2): 247-259.
- Garnham, N. (2005). "From cultural to creative industries." International Journal of Cultural Policy 11(1): 15-29.
- Hesmondhalgh, D. (2007). The cultural industries. London, Sage.
- Hall, S. P. (2000) Creative Cities and Economic Development. Taylor & Francis.
- Heartfield, J. (2000) Great Expectations: the creative industries in the New Economy London, Design agenda.
- Heilburn, J. and C. M. Gray (2001). The Economics of Art and Culture. Cambridge, Cambridge University Press.
- Hesmondhalgh, D. & Pratt, A. C. (2005) Cultural industries and cultural policy. International Journal of Cultural Policy, 11, 1-13.
- Hirschman, A. O. (1958) The Strategy of Development, Yale University Press, New Haven.
- Hutton, W. (2007). Staying ahead: the economic performance of the UK's creative industries. The Work Foundation Report. London, DCMS.
- Jones, L.P. (1976), 'The Measurement of Hirschmanian Linkages', Quarterly Journal of Economics, Vol. 90, No. 2, pp. 323-333.
- Kaldor, N. (1966). Causes of the Slow Rate of Economic Growth in the United Kingdom. Cambridge, CUP.

- Krugman, P. (1980). "Scale Economies, Product Differentiation, and the Pattern of Trade." The American Economic Review **70**(5): 950-959.
- Krugman, P. (1991). "Increasing Returns and Economic Geography." The Journal of Political Economy **99**(3): 483-499.
- Krugman, P. (1996). Technological Change in International Trade, in: P. Stoneman (Editor), Handbook of the economics of innovation and technological change Blackwell, Oxford.
- Lazzeretti, L. (2003). "City of art as a High Culture local system and cultural districtualization processes: the cluster of art restoration in Florence." International Journal of Urban and Regional Research **27**(3): 635-648.
- Laursen, K. (1998). Revealed Comparative Advantage and the Alternatives as Measures of International Specialisation, Danish Research Unit for Industrial Dynamics.
- Leontief, W., 1953, Domestic Production and Foreign Trade: The American Position Re-Examined, Proceeding of the American Philosophical Society **97**, 332-349.
- Linder, S.B., 1961, An Essay on Trade and Transformation (Almqvist and Wiksell, Stockholm).
- Lundvall, B. A. (1988). Innovation as an interactive process: from user-producer interaction to the national system of innovation, Printer London: 349-369.
- Myrdal, G. (1957). Economic theory and underdeveloped regions. London, Gerald Duckworth & Co Ltd.
- OECD (June 2007) Services Statistics. ESDS International, (MIMAS) University of Manchester.
- Oakley, K. (2004). "Not So Cool Britannia: The Role of the Creative Industries in Economic Development." International Journal of Cultural Studies **7**(1): 67.
- ONS (2006) Creative sector: 1992-2004. United Kingdom Input Output Analyses. London, ONS.
- Oulton, N (2001) "Must the growth rate decline? Baumol's unbalanced growth revisited", Oxford Economic Papers, **53**, 605-627.
- Porter, M. E. (1998a). The Competitive Advantage of Nations, Free Press New York.
- Porter, M. E. (1998b). "Clusters and the new economics of competition." Harv Bus Rev **76**(6): 77-90.
- Power, D. (2003), "The Nordic 'Cultural Industries': A Cross-National Assessment of the Place of the Cultural Industries in Denmark, Finland, Norway and Sweden." Geografiska Annaler **85**(3): 167-180.
- Proudman, J., Redding, S. (2000), "Evolving patterns of international trade". Review of International Economics, Vol. 8 (3), 373-396.
- Rasmussen, P.N. (1957), Studies in Inter-sectoral Relations, Amsterdam, North-Holland.

- Roodhouse, S. (2003), The new global growth industry: defintional problems in the creative industries - a practical approach. Creative Industries, London, City University.
- Richardson, G. B. (1972). "The Organisation of Industry" The Economic Journal **82**(327): 883-896.
- Throsby, D. (1994). "The Production and Consumption of the Arts: A View of Cultural Economics." Journal of Economic Literature **32**(1): 1-29.
- Throsby, D. (1999). "Cultural Capital." Journal of Cultural Economics **23**(1): 3-12.
- Throsby, C. D. (2001). Economics and Culture, Cambridge University Press.
- Throsby, D. (2007). Modelling the Creative/Cultural Industries. Seminar on "New Directions in Research: Substance, Method and Critique", Royal Society of Edinburgh, Scotland, 11–12 January.
- UKTI (2005) Creative industries international trade strategy 2005-2006. UK Trade & Investment.
- Yeats, A. J. (1985). On the Appropriate Interpretation of the Revealed Comparative Advantage Index: Implications of a Methodology Based on Industry Sector Analysis, United Nations Conference on Trade and Development.
- Yin, Y. P. (2006). Business and financial services: new engine of economic growth? International Conference on Policy Modelling, Hong Kong.
- Wiesand, A. (2005). The "Creative Sector" - An Engine for Diversity, Growth and Jobs in Europe, European Cultural Foundation.

Appendix: Industrial classification and construction of the 31 x 31 product by industry use matrix

Definition of creative sector

Functional Heading	SIC (2003) Industry description	SIC (2003)	Input-Output Group
Clothing	Manufacture of knitted and crocheted hosiery	17.71	27 (part)
	Manufacture of knitted and crocheted pullovers, cardigans etc.	17.72	“
	Manufacture of leather clothes	18.1	28
	Manufacture of workwear	18.21	“
	Manufacture of other outerwear	18.22	“
	Manufacture of underwear	18.23	“
	Manufacture of other wearing apparel and accessories nec.	18.24	“
	Dressing and dyeing of fur; manufacture of articles of fur	18.3	“
	Manufacture of footwear	19.3	30

Publishing	Publishing of books Publishing of newspapers Publishing of journals and periodicals	22.11 22.12 22.13	34 (part) “ “
The Arts	Publishing of sound recordings	22.14	“
Publishing	Other publishing	22.15	“
The Arts	Reproduction of sound recording	22.31	“
Film	Reproduction of video recording Reproduction of computer media	22.32 22.33	“ “
Distribution	Other retail sale in specialised stores nec Retail sale of second-hand goods in stores	52.486 to 52.489 52.5	91 (part) “
Software	Software consultancy and supply	72.2	107 (part)
Architecture	Architectural and engineering activities and related technical consultancy	74.2	112 (part)
Advertising	Advertising	74.4	113
The Arts	Photographic activities	74.81	114 (part)
Clothing	Other business activities nec	74.87	“
Film	Motion picture and video production Motion picture and video distribution Motion picture projection	92.11 92.12 92.13	121 (part) “ “
Radio and TV	Radio and television activities	92.2	“
The Arts	Artistic and literary creation and interpretation Operation of arts facilities Other entertainment activities nec	92.31 92.34 92.4	“ “ “
Publishing	News agency activities	92.4	“
The Arts	Other recreational activities nec	92.72	“

Source: Office of National Statistics (ONS, 2006)

The industrial classification of the creative industries adopted in this study follows the classification scheme of the UK ONS (2006). However, in constructing the 31 x 31 product by industry use matrix for 2004 on the basis of the ONS 123 x 123 use matrix, a number of adjustments have to be made. First, a number of industries in the creative sector are part of a larger industry in the ONS use matrix. Therefore, the relevant rows and columns of the ONS matrix have to be split on the basis of the share of output by the creative sub-industry in the larger industry and the shares are calculated from the ONS estimates of outputs for the creative industries. Second, the original ONS use matrix is valued at purchasers' prices, which means that all the retail and wholesale margins are deducted from the outputs of the retail and

wholesale distribution industries and included in the calculation of the outputs of other industries. A consequence of this treatment is that the input-output relationship and thus the calculations of the linkages are severely distorted. To overcome this distortion, a partial solution is to revalue the use matrix at producers' prices, i.e., to remove all trade margins from the other industries and allocate these to the retail and wholesale distribution industries. Since the ONS publishes all the trade margins on the 123 products, the task is to allocate these margins to different industries for their intermediate inputs and the final users for their final consumption of these products. There is no means by which this can be done accurately. Therefore, a rough method is to use an OECD I-O table for the UK in 1998 (the latest one available) at producers' prices to estimate the trade margins on different industries and final users and then to apply the margins in the present use matrix. Finally, the 31 x 31 use matrix for this study is adjusted and rebalanced. It must be emphasised that although the adjustment of the trade margins in the use matrix affects the magnitudes of the derived economic linkages, it does not alter the main qualitative results of the present study whatsoever. For example, working with the original official use matrix without allocating the trade margins, the main qualitative results such as the negative correlation between forward and backward linkages, the asymmetry between forward and backward linkages in the creative industries, the positive correlation between backward linkages and comparative advantages and the negative correlation between forward linkages and comparative advantages all hold. Due to presentational difficulties, the 31 x 31 use matrix is not reported here but will be made available upon request.

Notes

¹ A detailed classification of the creative sector by the ONS is given in the Appendix.

² Furthermore, the claims that the creative industries are both the key growth sector and sources of future employment growth and export have made it possible to present the creative industries as a much larger and more significant part of the economy (Hesmondhalgh, 2007, p145).

³ The 31 x 31 table is derived from the official 123 x 123 table for presentational convenience.

⁴ These include "advertising, architecture, art and antiques, crafts, design, designer fashion, video, film and photography, music and the visual and performing arts, publishing, software, computer games and electronic publishing, radio and television" (DCMS, 2006b).