

## THE ECONOMIC CONTRIBUTION OF COPYRIGHT BASED INDUSTRIES IN SINGAPORE

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ABSTRACT. Started in November 2003, the study is the first in Asia to adopt the new comprehensive WIPO framework for measuring the economic magnitude of copyright-based industries. Singapore's copyright-based industries generated in 2001 an output of S\$30.5 billion and value added of S\$8.7 billion which was equivalent to 5.7% of GDP. The 29 copyright-based industries provided employment to 118,600 persons or 5.8% of Singapore's workforce in 2001. Through linkages with the rest of the economy, the combined nine core copyright industries are found to have greater-than-average impact on the economy as reflected in their higher output, value added and employment multipliers than that for the whole economy.

### 1. INTRODUCTION

Since its enactment in 1987, Singapore's Copyright Act has undergone several amendments. Its provisions presently meet or exceed the minimum standards set out in the TRIPS Agreement. For instance, the duration of copyright protection under the US-Singapore Free Trade Agreement is 20 years longer than that under TRIPS.<sup>1</sup>

Fundamentally a bundle of rights granted to the creators of works allowing them to control the commercial exploitation of their works during a specified period, copyright may subsist in two broad categories of works. In the first category, "authors' works" comprise original literary (including computer programs and compilations), dramatic, musical and artistic works. In the second, "entrepreneurial works" encompass sound recordings, cinematographic films, cable programs, television & sound broadcasts, and published editions of works. These entrepreneurial works are not subject to the requirement of originality. From 16 April 1998, "copyright-like" protection has been extended to performances (including improvisations).

The 1999 amendments to Singapore's Copyright Act pertained to the "use of copyright material in the digital environment".<sup>2</sup> Copyright protection was extended

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This paper is based on a research project of the same title undertaken for IP Academy, Singapore. The research team included Dr Lee Kee Beng former Associate Professor of NUS Business School; Associate Professor Loy Wee Loon of NUS Law Faculty; and Mr Ong Chin Huat, former Project Manager of NUS Consulting. The opinions, figures and estimates expressed in this report are the responsibility of the authors, and do not constitute an endorsement of IP Academy, Singapore.

<sup>1</sup>The protection periods remain unchanged for broadcasts and cable programs (50 years from publication of the broadcast or program), and for published editions of works (25 years from the first publication).

<sup>2</sup>Quote taken from Ng-Loy Wee Loon, "New Paradigms of Copyright Law in the Information Society: The Report on Singapore", 14 April 2004. This paragraph draws heavily on the report.

to compilations such as multimedia works. Reproduction right of authors' works included storage by electronic medium and making a copy for some other use of the work. A "user caching" defence (permitting a transient or electronic copy required for viewing, listening or utilization) was introduced and so was civil remedies for protection of Rights Management Information. Network service providers were given exemption from copyright liability where they act to enable access or under direction.

From 1st January 2005, copyright infringement to obtain a commercial advantage or to a significant extent became regarded as a criminal offence. Refinements and clarifications were made recently following feedback from specialists on interpretation and implementation difficulties. For instance, a transient reproduction made incidentally for communication purpose is not an infringement of copyright provided the communication itself is not an infringement. For a Network Service Provider (NSP) to take down or disable access to infringing materials, a notice that is "substantially in accordance with the prescribed form will suffice".<sup>3</sup> Other clarifications included liability issues for NSPs, counter-notice on a NSP and time period to restore or restore access to the electronic copy, and the element of private financial gain added to criminal liability for circumvention of technological measures. A Minister is empowered to make regulations for charging of fees.

To raise awareness on the importance of copyright activities in Singapore, IPA (Intellectual Academy of Singapore) and IPOS (Intellectual Property Office of Singapore) initiated in November 2003 the first pilot study applying WIPO's new framework for estimating the economic contribution of copyright-based industries in Singapore. The study was conducted with the technical assistance of Professor J J M Theeuwes of the Netherlands and Senior Counselor Dimiter Gantchev of WIPO (World Intellectual Property Organization).

## 2. OBJECTIVE AND SCOPE

The study aims to measure the relative importance of copyright activities in Singapore in terms of economic size and impact. It attempts to measure the contribution of copyright-based activities to Singapore output, value added and employment over a 15-year period from 1986 to 2001, and to compare the findings with that of other studies. The linkages of core copyright industries with the rest of the economy are estimated through inter-industrial analysis as given by the latest input-output table.

## 3. CLASSIFICATION OF COPYRIGHT-BASED ACTIVITIES

Based on WIPO's definitions, a total of 29 Singapore industries (by Singapore Standard Industrial Classification 2000 codes) are identified in WIPO's four categories of copyright-based industries.<sup>4</sup> The four categories, in descending order of intensity of copyright involvement, are as follows:

(i) *Core Copyright Industries*

Primarily involved in the creation, manufacture, production, broadcast and distribution of copyrighted works, these industries are fully engaged in copyright activities. They could be considered as industries that would not be in existence if not

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<sup>3</sup>Introduction to Copyright (Amendment) Bill 2005 at [www.ipos.gov.sg](http://www.ipos.gov.sg)

<sup>4</sup>See World Intellectual Property Organization (2003, pp. 73-80)

for the copyright subject or matter. Included in this group of nine industries are the press & literature, software & databases, and motion picture & video industries.

(ii) *Interdependent Copyright Industries*

These industries can be viewed as inputs or facilitators to the manufacture, performance, broadcast and communication of copyrighted works and other protected subject matter. An example would be the transmission of entertainment programs through television. The level of copyright activities in these interdependent copyright industries is substantial. Examples of the seven industries in this group are the computers & equipment and tv & radio sets industries.

(iii) *Partial Copyright Industries*

A portion of the activities of these industries contains copyright works. Among the group of ten industries in the partial copyright group are the furniture, architecture, engineering & surveying, and jewelry & coins industries.

(iv) *Non-Dedicated Support Industries*

This group comprises industries where part of the activities are related to broadcast, communication, distribution and sales in protected subject matter and not included in the core copyright industries. Also known as the distribution industries, the three industries in the non-dedicated support group are the general wholesale & retail trade, general transportation, and telephony & internet industries.

The appendix lists the industries and segments under the four categories. Except for the core copyright industries where the output is 100% copyrighted, copyright factors<sup>5</sup> are used to apportion the share of copyright in each of the non-core copyright industries.

#### 4. METHODOLOGY

A combination of methods were used to derive data for the estimation. Secondary data were purchased from official sources while primary data were obtained from a mail survey and interviews to capture indications on the magnitude of copyright involvement in non-core industries to determine the appropriate copyright factors. Supplementary information from relevant studies were also used in deriving the factors. The various methods are detailed below.

**4.1. Data.** Official data series were purchased from Singapore's Department of Statistics (DOS), and Economic Development Board (EDB). These main sources of secondary data were supplemented by primary data from the project's industry survey.

The analysis covers five years, namely 1986, 1990, 1995, 2000 and 2001. The year 1986 forms the base year as the Copyright Act of Singapore was incorporated in 1987. The final year of the analysis period, 2001, is the year for which the latest data were available at the start of the project.

**4.2. Industry Survey.** Data and information for the estimation of the degree of copyright activities in the interdependent and partial copyright industries were obtained in a survey of firms from a wide spectrum of industries. The survey questionnaire requested both quantitative and qualitative information, the major aspects of which are:

- Principal type of business engaged by the firm;

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<sup>5</sup>Copyright factors are ratios that reflect the percentage of copyright activities in the industry's output and are estimated through the combination of interviews, surveys and formulas.

- Turnover in 2002 and number of creative full and part-time employees;
- Receipts/payments for intellectual property in the form of royalties, patents, license fees, and their proportion in turnover/expenditure; and
- Significance of copyright activities to firm's daily activities.

A total of 115 out of 2,887 firms (excluding non-delivered cases) responded to the survey, giving a response rate of 4%. In light of the level of knowledge required in addressing questions related to copyright activities and the paucity of quantitative information available in most organizations, a third round of the survey was deemed impracticable. Instead interviews were conducted to obtain additional insights.

**4.3. Interviews.** Ten personal interviews were conducted during the two months of May and June 2004, focused on large companies, especially, those in the group of interdependent copyright industries. An in-depth understanding of the level or degree of copyright activities in these firms was obtained through the companies' responses to major issues, such as technology and design intensity, R&D climate, size of creative workforce, and significance of copyright activities in course of business.

#### 4.4. Estimation of Copyright Factors for Non-Core Copyright Industries.

Quantitative methods were utilized in combination with the interviews and surveys to derive the copyright factors for non-core copyright industries. A prudent approach, as highlighted in the WIPO framework, was adopted in applying conservative copyright factors for apportioning the involvement of copyright activities in non-core industries. Consequently the significance of copyright-based industries in the Singapore economy is likely to be underestimated.

##### (i) *Interdependent Copyright Industries*

The copyright factors for these industries were estimated mainly from the survey returns and interviews. References were made of other studies in assessing the estimated copyright factors.<sup>6</sup>

##### (ii) *Partial Copyright Industries*

The U.S. study was used as a basic reference.<sup>7</sup> An IP intensity scorecard was developed to determine the IP intensity of 20 core innovator countries.<sup>8</sup> The overall scoring system accounted for the current average IP intensity in 2001 and 2002 and respective IP growth potential between 1998 and 2001. These 20 countries were then ranked based on the overall score as against a U.S. score of 1000 points.

Firstly, measures of IP activities consist of both soft (qualitative) and hard data (quantitative) selected from the World Competitiveness Yearbook for the years 2002, 2001 and 1998. These indicators are listed in Table 1.

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<sup>6</sup>See World Intellectual Property Organisation (2003, p. 59) and Watt (2004).

<sup>7</sup>See Siwek (2002), and Toh et al. (2003, pp. 51-75).

<sup>8</sup>The core innovator countries are defined as nations with more than 15 U.S. utility patents per million population for the year 2000. The group comprises 24 countries but only 20 are selected based on full availability of data.

Soft data	Hard data
1. Basic research	1. Patents in force per 100,000 population
2. Entrepreneurship	2. R&D as percentage of GDP
3. Creation of firms	3. GDP per capita
4. Technology support	
5. Economic literacy	
6. Protectionism	
7. Patent and copyright protection	

Table 1: IP indicators

Next, the standard deviation for each variable is calculated with the following formula:

$$\text{standard deviation} = \sqrt{\frac{\sum_{i=20}(x_i - \bar{x})^2}{N}}$$

where  $x_i$  is the score for country  $i$ ,  $\bar{x}$  is the twenty-country average,  $N$  is the number of countries.

The variables are then converted to standardized scores or  $SC$  to measure the relative dispersion from the mean as follows:

$$SC_i = \frac{(x_i - \bar{x})^2}{\text{standard deviation}}$$

The standardized scores are then converted into intuitive scores, for easy comparison with corresponding variables of the U.S. (score set at a benchmark of 100), by applying the following procedures:

$$Z_i = \left( \frac{e^{SC_i}}{1 + e^{SC_i}} \right) \times 100$$

$$NR_i = \frac{Z_i}{Z_{US}} \times 100$$

where  $Z_i$  is the  $Z$  rating for country  $i$ ,  $Z_{US}$  is the  $Z$  rating for US, and  $NR_i$  is the Normalized rating for country  $i$ .

The IP scores for each country are the aggregation of the individual normalized ratings for all ten variables. The overall soft and hard data are then re-weighted at 300 marks and 700 marks respectively to reduce the extent of over-reliance on qualitative indicators obtained from surveys. These are carried out for the years 2001 and 2002 respectively. The IP growth score is calculated in the same way for changes in both soft and hard data between 1998 and 2001.

For each core innovator country, the overall IP score is determined by the following formula:

$$\text{overall IP score} = w_1 \text{IPscore}_{2001} + w_2 \text{IPscore}_{2002} + w_3 \text{IPgrowth}_{1998-2001}$$

where the weights are  $w_1 = 0.35$ ;  $w_2 = 0.35$ ; and  $w_3 = 0.3$ .

The above weights are based on the following observations:

- Any performance indicator should be based on a current score in tandem with a potential growth factor. This would provide a more complete overview of each nation's performance.
- It provides a necessary adjustment that is not reflected in the current data as qualitative data could be drastically affected by any change in macro-economic policies implemented between 2001 and 2002. The turnover of

technology in today's world economy is fast which accounts for the relatively low weight of 0.3 for the growth factor.

The copyright factor for each partial copyright industry is then derived from the U.S. copyright factors<sup>9</sup> as follows:

$$SCF = \frac{IP_{\text{sin}}}{IP_{US}} \times USCF$$

where  $SCF$  is the Singapore Copyright Factor,  $USCF$  is the U.S. Copyright Factor,  $IP_{\text{sin}}$  is the Singapore IP Score,  $IP_{US}$  is the U.S. IP Score (1000 marks).

<b>Interdependent copyright industries</b>	<b>Copyright factors 1998-2001</b>				
1. TV sets, radios, VCRs, CD and DVD players, Electronic game equipment	35%				
2. Computers and equipment	35%				
3. Musical instruments	20%				
4. Photographic and cinematographic instruments	30%				
5. Photocopiers	30%				
6. Blank recording material	25%				
7. Paper	25%				
<b>Partial copyright industries</b>	<b>Copyright factors 1998-2001</b>				
1. Apparel, textiles and footwear	0.4%				
2. Jewelry and coins					
a. jewelry	8.3%				
b. costume jewelry	42%				
3. Other crafts	42%				
4. Furniture					
a. furniture and fittings	8.3%				
b. furnishings	1.7%				
5. Household goods, china and glass	0.6%				
6. Wall coverings and carpets	1.7%				
7. Toys and games	42%				
8. Architecture, surveying and engineering	8.3%				
9. Interior design	8.3%				
<b>Non-dedicated support industries</b>	<b>Copyright factors 1986-2001</b>				
	<b>2001</b>	<b>2000</b>	<b>1995</b>	<b>1990</b>	<b>1986</b>
1. General wholesale and retail	5.8%	6.4%	6.2%	5.6%	5%
2. General transportation	5.8%	6.4%	6.2%	5.6%	5%
3. Telephony and internet	5.8%	6.4%	6.2%	5.6%	5%

Table 2: Copyright Factors for Non-Core Copyright Industries, 1986-2001

(iii) *Non-Dedicated Support Industries*

Estimation of the copyright factors for the non-dedicated support or distribution industries is based on the assumption that the proportionate contribution of the copyright-based industries to the distribution industries would be the same as the

<sup>9</sup>We are extremely grateful to Mr Stephen E. Siwek of the Economists Incorporated from the US for supplying us with the US copyright factors.

percentage contribution of the copyright industries to the total non-distribution industries. This means that the copyright factors<sup>10</sup> to be derived in the non-dedicated support industries are the aggregate of the value added in core, interdependent, and partial copyright industries as a ratio of the non-distribution GDP of Singapore which is total GDP less the transportation and wholesale & retail sectors. The formula is:

$$\text{copyright factor for NDSI} = \frac{\text{value added (core + interdependent + partial)}}{\text{non-distribution GDP of Singapore}}$$

The estimated copyright factors are presented in Table 2.<sup>11</sup>

**4.5. Interindustrial Analysis.** An input-output (I-O) model is adopted to capture the linkages of core copyright industries with the rest of the economy and to estimate the group's multiplying effects. The latest I-O table pertains to the year 2000 and is updated from the 1995 benchmark table compiled by DOS. The table comprises 155 production sectors of goods and services in Singapore. The nine core copyright industries are covered by 13 Singapore I-O sectors.<sup>12</sup>

#### 5. ESTIMATED DIRECT ECONOMIC CONTRIBUTION

Industry	Output	Value Added		Employment	
	S \$m	S \$m	% GDP	number	% work-force
1. Core copyright	12,249.8	4,390.3	2.85	74,434	3.64
2. Interdependent copyright	14,212.4	2,713.3	1.76	25,293	1.24
3. Partial copyright	339.9	138.1	0.09	3,737	0.18
4. Non-dedicated support	3,712.6	1,488.2	0.97	15,153	0.74
<b>Total copyright-based industries</b>	<b>30,514.7</b>	<b>8,729.9</b>	<b>5.67</b>	<b>118,617</b>	<b>5.80</b>
<b>Singapore economy</b>	<b>N/A</b>	<b>154,078</b>	<b>100</b>	<b>2,046,700</b>	<b>100</b>

Table 3: Direct Economic Contribution, 2001

The copyright-based industries contributed the following to the Singapore economy in the year 2001 (Table 3):

- S \$30.5 billion output<sup>13</sup>
- S \$8.7 billion value added (5.7% of GDP)
- 118,600 jobs (5.8% of national employment).

<sup>10</sup>All variables required to generate the copyright factors by applying the above-mentioned formula are also based on real values using 2001 constant dollars.

<sup>11</sup>Copyright factors were assumed to remain constant in the interdependent and partial copyright industries from 1986 to 2001.

<sup>12</sup>I-O sectors comprise groups of industries generally of similar production functions.

<sup>13</sup>There is no publicly available data for output of the economy in 2001.

In other words, one dollar out of every S \$17.5 of Singapore's GDP was generated by copyright-based industries in 2001. Also, one worker out of every 17 workers was engaged directly in the copyright-based industries.

In terms of output, the interdependent copyright industries constitute the largest group, accounting for almost half (47%) of the total estimated output of copyright-based industries in Singapore in 2001. In second place is the core copyright group of industries, generating two-fifths (40%) of total copyright output.

The core copyright industries are, however, the largest group in terms of value added and employment. The group contributed 2.9% to Singapore's GDP in 2001 and provided employment to 3.6% of the workforce. The share of interdependent copyright industries in GDP at 1.8% is slightly lower than the group's share in employment of 1.2%, suggesting that the group's value added per worker is above the average of all copyright-based industries. The same phenomenon is observed in the non-dedicated support industries which contributed almost 1% to GDP but 0.7% to employment in 2001.

The smallest group is the partial copyright industries. With an output of only 1% of total output of copyright-based industries, the group contributed less than 0.1% to GDP and almost 0.2% to employment.

How labour intensive are copyright-based industries? The group of partial copyright industries is the most labour-intensive, with a workforce of 11 persons per million dollars of output or 27 persons per million of value added (Table 4). This is followed by the core copyright industries and non-dedicated support industries. The group of interdependent copyright industries is the least labour-intensive, employing almost 2 workers per million dollars of output or 9 persons per million dollars of value added. Overall, the labour intensity of copyright-based industries in 2001 stood at 13.6 persons per million dollars of value added, which was marginally above that of the national average of 13.3 persons.

Industry	Employment	
	per \$m output	per \$m value added
1. Core copyright	6.06	16.95
2. Interdependent copyright	1.78	9.32
3. Partial copyright	10.99	27.06
4. Non-dedicated support	4.08	10.18
<b>Total copyright based industries</b>	<b>3.89</b>	<b>13.59</b>

Table 4: Labour intensity, 2001

When compared to other industries in Singapore in 2001, the copyright-based industries with a total value added of S \$8,729.9 million, i.e. 5.7% of Singapore's GDP, was larger than both the chemical & chemical products and hotels & restaurants industries (Figure 1). It was almost as large as the construction industry which accounted for 6% of Singapore's GDP in 2001 with S\$9,280 million in value added.

A comparison of value added per worker shows that the average productivity<sup>14</sup> of a worker in the copyright-based industries in 2001 at S \$73,597 was higher than

<sup>14</sup>The average productivity statistics in the other industries were estimated by dividing the value added in these industries by their employment. Source: Singapore Department of Statistics, Yearbook of Statistics Singapore (2003).



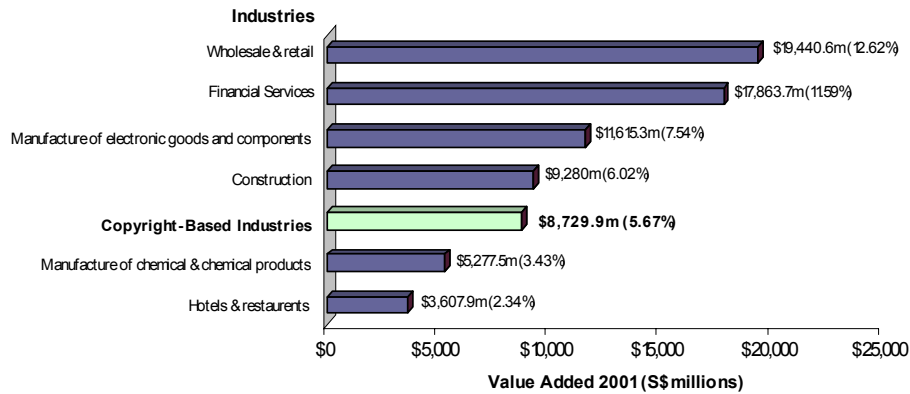


FIGURE 1. Relative Size of Copyright-Based Industries, 2001  
 (Note: Figures in parentheses are percentage share of sector in GDP).

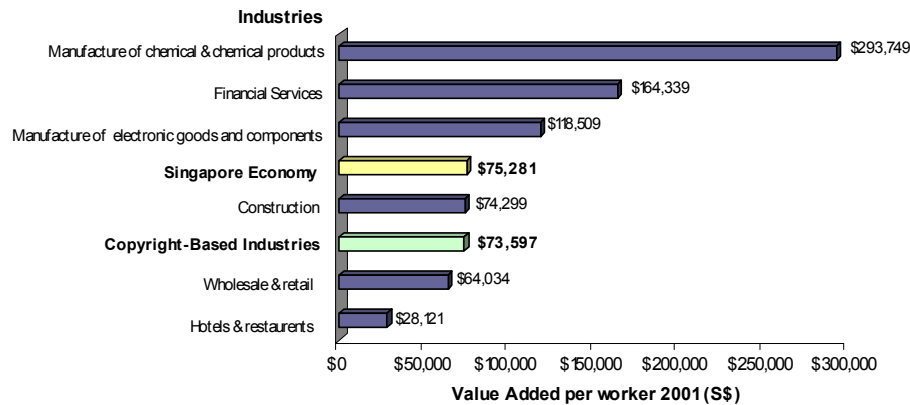


FIGURE 2. Worker Productivity in Selected Industries, 2001

the wholesale & retail industry's S \$64,034 and very close to the economy's average of S \$75,281 (Figure 2). It was lower than the worker productivity levels of the electronic goods & components (S \$118,509) and chemicals & chemical products industries (S \$293,749). This was due probably to the manufacturing industries being more capital-intensive on average than services industries and hence registered higher value added. Moreover, copyright-based industries are a composite of manufacturing, wholesale & retail trade and services industries thereby resulting in an overall lower value added on a per worker basis compared to manufacturing industries.



FIGURE 3. Growth in Value Added of Copyright-Based Industries, 1986-2001

#### 6. GROWTH IN COPYRIGHT-BASED INDUSTRIES, 1986-2001

The value added of copyright-based industries grew in real terms at 8.9% per annum between 1986 and 2001.<sup>15</sup> On an annual basis, this was 1.3% points higher than the 7.6% GDP growth experienced by the Singapore economy over the same period (Figure 3). High growth was predominant between 1986 and 1990 with the copyright-based industries expanding at 13.8%, which was 3.8% points higher than the 10% average growth attained by the economy. Slower growth occurred between 1995 and 2000 for both copyright-based industries and the economy at 6.6% and 6.4% per annum respectively. Apparently, copyright-based industries may be more susceptible to short-term cyclical changes than the economy as witnessed by the 9.5% decline in copyright-based value added compared against the 1.9% drop in overall GDP between 2000 and 2001.

Employment in the copyright-based industries more than doubled between 1986 and 2001, equivalent to an average growth rate of 5.2% per annum. This was higher than the 3.5% annual growth in national employment during the same period (Figure 4). Between 2000 and 2001, the copyright-based industries were still employing more workers as employment grew by 0.2% despite an overall 2.3% decline in employment in the whole economy.

Combining value added and employment, worker productivity in copyright-based industries grew at 3.5% annually between 1986 and 2001 (Figure 5). This was close to the average 3.9% productivity growth in the economy over the same period.<sup>16</sup> Productivity growth in copyright-based industries was higher than that of the economy between 1995 and 2000 at 4.2% a year against 2.1% per annum for the economy. But because employment was still increasing in 2001, copyright-based productivity declined by 9.7%, as against a marginal increase of 0.4% in the economy.

<sup>15</sup>The values for early years were converted to 2001 market prices.

<sup>16</sup>Between 1986 and 2000, productivity growth in the copyright-based industries surpassed that of the economy as the rate was 4.5% per annum compared with 4.2% achieved by the economy.

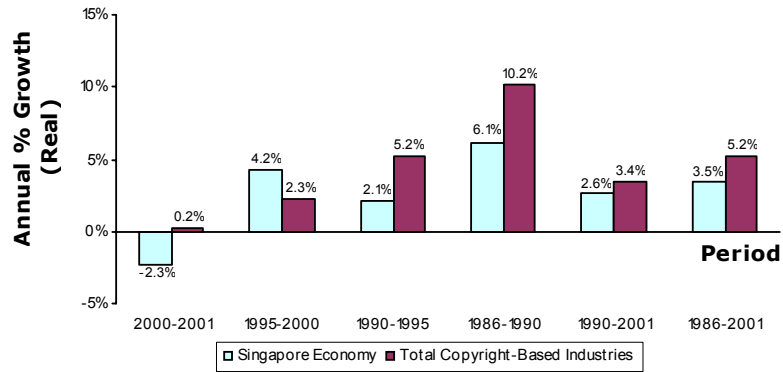


FIGURE 4. Growth in Employment of Copyright-Based Industries, 1986-2001

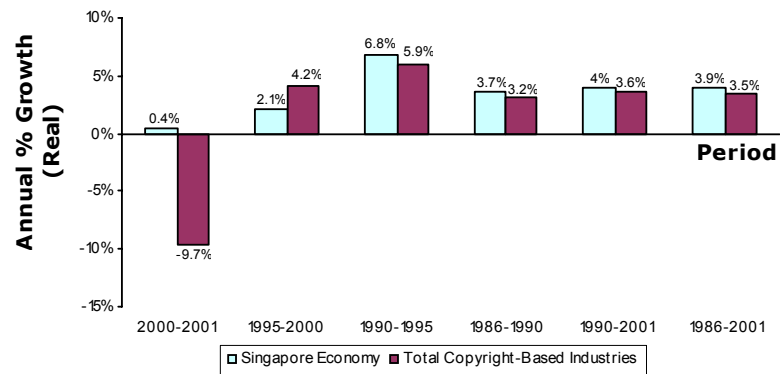


FIGURE 5. Copyright-Based Industries Productivity Growth, 1986-2001

Overall, the growing importance of the copyright-based industries in the Singapore economy is reflected in the expanded GDP size of the industries from 4.7% to 5.7% between 1986 and 2001. Similarly, the share of national employment also increased from 4.6% to 5.8% during the same period.

Analysis of copyright-based industries across countries, based on research findings of national or international studies, is difficult due to differences in methodology

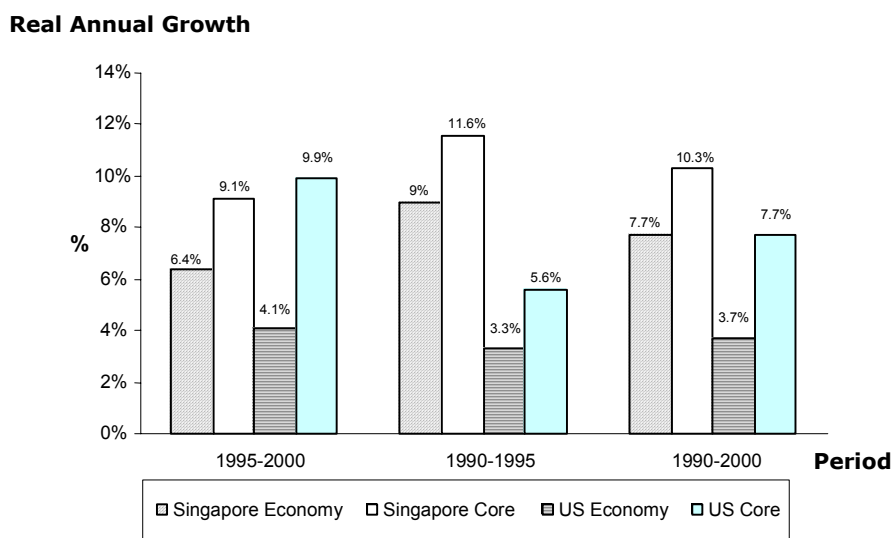


FIGURE 6. Comparison of Growth in Core Copyright Industries, Singapore vs US

employed in these studies. The United States study is perhaps the closest to the WIPO framework and hence a comparative analysis is presented below.<sup>17</sup>

Real value added growth in the core copyright industries in Singapore and in the U.S. outgrew the rate of expansion in their respective economies for each of the periods reviewed in the decade ending 2000 (Figure 6).<sup>18</sup> The pace of growth in the U.S. core copyright industries at 7.7% was double that of GDP at 3.7% for the period 1990-2000. In comparison, Singapore's core copyright industries achieved 10.3% annual growth, outperforming the overall economy's 7.7% annual expansion by 1.34 times during the same ten-year period.

## 7. LINKAGES WITH THE ECONOMY

**7.1. Backward Linkages and Indirect Impact.** An industry's backward linkages with the rest of the economy arise from its requirements of domestic inputs for its output. For instance, according to the I-O table, the advertising & exhibitions sector requires S \$24,800 of services from banks and finance companies in order to produce S \$1 million of the sector's output. The banks and finance companies in turn require input of crane and container services of S \$8 for every S \$1 million of output. Hence though the advertising and exhibitions sector does not require any input of crane and container services, it indirectly requires S \$0.2 of such services through its direct requirement of services from banks and finance companies for

<sup>17</sup>The United States has been analyzing its copyright-based industries on an annual basis for a relatively long period of time thus permitting a comparison of real value added growth of core copyright industries between the U.S. and Singapore.

<sup>18</sup>A common pattern among the various studies showed that growth in core copyright industries generally outpaced that in the overall economy.

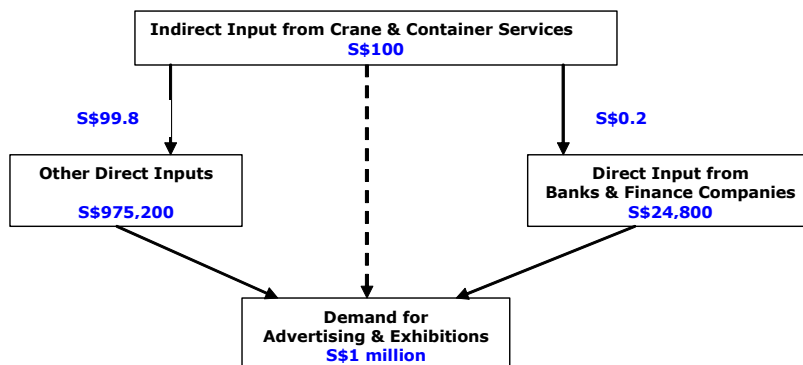


FIGURE 7. Direct and Indirect Impact

every S \$1 million of its output. (Figure 7 depicts the direct and indirect relationships.) Eventually, because its other inputs require crane and container services, the advertising and exhibitions sector would need indirectly S \$100 of crane and container services for an output of S \$1 million. In other words, the indirect impact comprises all the upstream goods and services that need to be produced to support the direct inputs to a sector.

SIO	Sector	Input coefficient		
		Direct	Indirect	Total
35	Other printing	0.0156	<i>0.1422</i>	0.1578
69	Disk drives	0.0709	0.0417	0.1126
111	Wholesale and retail trade	0.0565	<i>0.1250</i>	0.1815
112	Food and beverage services	0.0164	0.0069	0.0233
127	Communications	0.0157	0.0108	0.0265
130	Banks and finance companies	0.0265	0.0254	0.0519
132	Real estate	0.0435	0.0315	0.0750
135	Information technology	0.0073	<i>0.3425</i>	0.3498
139	Advertising & exhibitions	0.0069	<i>0.1481</i>	0.1550
149	Broadcasting & entertainment services	0.0180	<i>0.1582</i>	0.1762
151	Personal & household services	0.0251	0.0267	0.0518
154	Domestic services & non-profit bodies	0.0166	0.0167	0.0333
	<b>Total (of all sectors)</b>	<b>1.0000</b>	<b>0.7661</b>	<b>1.7661</b>

Table 5: Major Inputs of Core Copyright Industries, 2001 (Note: Coefficients in italics signify indirect coefficients exceeding direct coefficients by more than 0.1).

Table 5 shows the estimated major inputs of the combined core copyright industries, the input coefficients are for one unit of output. Of the 12 large input sectors, five had indirect coefficients that were significantly larger than the respective direct coefficients. These five sectors are other printing (with an indirect coefficient 9.1 times larger than the direct coefficient), wholesale & retail trade (2.2 times larger), information technology (48 times larger), advertising & exhibitions (21 times larger) and broadcasting & entertainment services (8.7 times larger). This

implies very strong backward linkages of these sectors with the rest of the economy. In other words, the core copyright industries would have large multiplying effects. The coefficients show that if the core copyright industries as a group were to increase output by S \$1 million, it would require, for instance, other printing to expand output directly by \$0.0156 million and indirectly by S \$0.1422 million to meet both direct and indirect demand. The sum of all indirect output to support the S \$1 million increase in core copyright industries would amount to S \$0.7661 million. That is the core copyright industries had an overall output multiplier of 1.7661. And almost half of the indirect output would be from the information technology sector.

**7.2. Multipliers.** The output multipliers of each core copyright industry are detailed in Table 6 together with the estimated direct and indirect output values.

Industry	Direct output (\$ m)	Indirect output (\$ m)	Total output (\$ m)	Output multiplier
1. Press & literature	3,329.6	2,255.8	5,585.4	1.6775
2. Music, theatrical productions, opera	856.2	928.1	1,784.3	2.0840
3. Motion picture and video	285.9	290	575.9	2.0145
4. Radio and television	1,257.5	1,497.2	2,754.7	2.1906
5. Photography	142.1	123.3	265.4	1.8676
6. Software and databases	4,323.9	2,797.1	7,121	1.6469
7. Visual and graphic arts	268.1	158.2	426.3	1.5902
8. Advertising services	1,755.6	1,312	3,067.6	1.7473
9. Copyright collecting societies	31.1	23	54.1	1.7380
<b>Core copyright industries</b>	<b>12,249.8</b>	<b>9,384.7</b>	<b>21,634.5</b>	<b>1.7661</b>

Table 6: Output multipliers, 2001 (multiplier = total output  $\div$  direct output)

The direct output of S \$12.2 billion from the core copyright industries in 2001 would generate an additional S \$9.4 billion of output owing to the backward linkages. Every dollar of output from the core copyright industries would require the economy to produce another 77 cents of output to support the production of the one-dollar output. The three highest multipliers (measuring 2.0145 to 2.1906) were from radio & television; music, theatrical production & operas; and motion picture & video. An increase in demand for the output of goods and services from any of these three industries would stimulate total output of goods and services in Singapore to rise by twice that demand. Seven of the nine core copyright industries have output multipliers above the national average (1.6474), resulting in a higher-than-average output multiplier of core copyright industries.

The value added multipliers, given in Table 7, show that every dollar increase in output from the group of core copyright industries in 2001 would result in an increase in value added (or GDP) of 66.85 cents. In other words, the value added multiplier of core copyright industries in 2001 was 0.6685. The direct value added constituted 0.3584 while the indirect value added generated was 0.3101 (or the indirect value added was equivalent to 87 percent of the direct value added). The highest value added multiplier belonged to music, theatrical productions and operas at 0.8630.

Industry	Direct value added (\$ m)	Indirect value added (\$ m)	Total value added (\$ m)	Value added multiplier
1. Press & literature	1,452.2	1,005	2,457.2	0.7380
2. Music, theatrical productions, opera	304.4	434.4	738.8	0.8630
3. Motion picture and video	74.8	129.9	204.7	0.7160
4. Radio and television	223	493.9	716.9	0.5701
5. Photography	41.3	34.7	76	0.5349
6. Software and databases	1,872.2	1,273	3,145.2	0.7274
7. Visual and graphic arts	96.7	48.9	145.6	0.5430
8. Advertising services	312.6	370.3	682.9	0.3890
9. Copyright collecting societies	13	8.1	21.1	0.6787
<b>Core copyright industries</b>	<b>4,390.3</b>	<b>3,798.2</b>	<b>8,188.5</b>	<b>0.6685</b>

Table 7: Value Added Multipliers, 2001 (multiplier = total value added  $\div$  direct output).

The core copyright industries directly employed some 74,400 persons in 2001 and indirectly provided jobs for another 61,000 persons (Table 8). Every million of output of core copyright industries would require an employment of 6 persons directly and 5 persons indirectly, resulting in an employment multiplier of 11.1 persons per million of output. The music, theatrical productions & operas industry had the largest employment multiplier of 26.

Industry	Direct empl.	Indirect empl.	Total empl.	Empl. multiplier
1. Press & literature	23,662	23,662	39,422	11.8
2. Music, theatrical productions, opera	10,062	12,184	22,246	26
3. Motion picture and video	2,004	2,909	4,913	17.2
4. Radio and television	5,460	9,524	14,984	11.9
5. Photography	1,589	526	2,115	14.9
6. Software and databases	23,092	12,456	35,549	8.2
7. Visual and graphic arts	2,723	1,005	3,728	13.9
8. Advertising services	5,555	6,485	12,040	6.9
9. Copyright collecting societies	286	121	407	13.1
<b>Core copyright industries</b>	<b>74,434</b>	<b>60,969</b>	<b>135,404</b>	<b>11.1</b>

Table 8: Employment Multipliers, 2001 (multiplier = total employment  $\div$  direct output in S \$m).

SIO	Sector	Multiplier		
		output	value added	employment (per \$m output)
073	Semiconductors	1.3308	0.3348	3.13
068	Computers and computer peripheral equipment	1.4021	0.3345	2.08
130	Banks and finance companies	1.4191	0.8104	3.19
143	Producers of government services	1.5597	0.7277	9.75
109	Building construction	1.6345	0.6594	17.05
110	Other construction	1.6574	0.6551	11.63
145	Education	1.7240	0.8547	18.02
069	Disk drives	1.8040	0.3225	3.79
002	Nursery products	1.8507	0.6486	20.22
038	Petrochemicals and products	1.8542	0.3324	2.80
004	Aquarium fish	1.8574	0.6499	23.90
039	Polymers and man-made fibres	1.9398	0.4298	4.23
103	Jewelry	2.1276	0.4326	8.38
094	Repairing of ships and boats	2.2618	0.6193	13.51
	<b>Core copyright industries</b>	<b>1.7661</b>	<b>0.6685</b>	<b>11.1</b>
	<b>Average of all I-O sectors</b>	<b>1.6474</b>	<b>0.5561</b>	<b>10.17</b>

Table 9: Multipliers of Selected Sectors

**7.3. Comparison.** At 1.7661, the output multiplier of core copyright industries is higher than the average of 1.6474 for the whole economy (Table 9). It is also higher than some major industries in Singapore, for example, semiconductors, banks & finance companies, and construction. But it is lower than that of petrochemicals, aquarium fish, ship repairing, and jewelry for instance.

The value added (0.6685) and employment multipliers (11.1) of core copyright industries are also above the national averages (0.5561 and 10.17 respectively). Hence the group of core copyright industries generated more output, GDP, and more jobs than the average industry in the economy. The group stimulates the economy more in terms of expansion in output, value added and employment than two I-O sectors in table 9 – semiconductors and computer & computer peripheral equipment. The education sector has a smaller output multiplier than the group of core copyright industries but higher value added and employment multipliers. Though the petrochemicals & products sector has a larger output multiplier than the core copyright industries, its value added and employment multipliers are less than half that of core copyright industries.



**7.4. Economic Impact.** In summary, through their backward linkages to the rest of the economy, the core copyright industries would generate upstream activities that amount to about 80% of the core copyright output, value added and employment. An increase in demand for core copyright goods & services of S \$1 million would result in:

- an additional output in the whole economy of S \$0.7661 million, giving an output multiplier of 1.7661;
- an increase in value added of S \$0.3584 million directly in the core copyright industries and S \$0.3101 million indirectly in the rest of the economy, with a value added multiplier of 0.6685;
- an increase in employment of 6 persons directly in core copyright activities and 5 persons indirectly in supporting activities, associated with an employment multiplier of 11.0535.<sup>19</sup>

As a group, the core copyright industries have a greater impact on the economy – in terms of generation of output, GDP and jobs – than an average industry as reflected in their multipliers above the national averages. Among the core copyright industries, the industry encompassing music, theatrical production and operas has the second highest output multiplier (2.0840), and the highest value added (0.8630) and employment (26) multipliers.

## 8. CONCLUSION

Copyright-based industries are significant to Singapore's economy in contributing S \$8,729.9 million in value added and employing 118,600 workers in 2001. These industries accounted for 5.7% of GDP and 5.8% of national employment. The economic size of copyright-based industries was almost equivalent to the construction industry, which contributed 6% to GDP in 2001, and was larger than the chemical & chemical products and hotels & restaurants industries.

Real value added growth of the entire copyright-based industries over the long term, between 1986 and 2001, was 8.9% per annum, which was on average 1.3% points higher than the 7.6% average GDP growth. Consequently, the relative GDP size of these industries increased from 4.7% to 5.7% during this period. Employment expanded at 5.2% per annum, which was above the average 3.5% annual growth in national employment, resulting in the share of copyright-based employment rising from 4.6% to 5.8%. On the other hand, the copyright-based industries may be more volatile than the economy as GDP dipped 1.9% while the copyright-based industries declined 9.5% in value added between 2000 and 2001.

Worker productivity in the copyright-based industries in 2001 was estimated at S\$73,597 which was very close to the economy's average of S\$75,281. It was higher than that of wholesale & retail trade but lower than overall manufacturing industries which are of higher capital intensity.

The importance of copyright-based industries to the Singapore economy is also reflected in the output, value-added and employment multipliers of the nine core copyright industries which are all above the national averages. With an output multiplier of 1.7661 of which 0.6685 is value added, and an employment multiplier of 11 jobs for every S \$1 million of core copyright output, core copyright activities

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<sup>19</sup>Details of the economic impact estimates and multipliers are in Tables VIC.7-9, pp 81-86 under Technical Notes of the project report.

are strongly linked to the rest of the Singapore economy and produce greater impact on Singapore's output, GDP and employment than an average industry.

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**Appendix 1:** Composition of Singapore Copyright-Based Industries (WIPO Methodology)

- (1) CORE COPYRIGHT (9)
  - (a) *Press & Literature*
    - (i) Authors, writers, translators
    - (ii) Newspapers
    - (iii) News & feature agencies
    - (iv) Magazines/periodicals
    - (v) Book publishing
    - (vi) Cards, maps & other published materials
    - (vii) Pre-press printing of books, magazines, newspapers, advertising materials
    - (viii) Wholesale & retail of press and literature (bookstores & newsstands)
    - (ix) Libraries
  - (b) *Music, Theatrical Productions & Operas*
    - (i) Composers, lyricists, arrangers
    - (ii) Printing & publishing of music
    - (iii) Production & manufacturing of music
    - (iv) Wholesale/Retail of music
    - (v) Artistic/literary creation & interpretation
    - (vi) Performance & allied agencies
  - (c) *Motion Picture & Video*
    - (i) Writers, directors, actors
    - (ii) Motion Picture & Video production & distribution
    - (iii) Motion Picture exhibition
    - (iv) Video rental & sales
    - (v) Allied services
  - (d) *Radio & Television*
    - (i) National Radio & broadcasting companies
    - (ii) Other Radio & Television broadcasters
    - (iii) Independent producers
    - (iv) Cable television (systems & channels)
    - (v) Satellite television
    - (vi) Allied services
  - (e) *Photography*
    - (i) Studio & Commercial Photography
    - (ii) Photo agencies & libraries
  - (f) *Software & Databases*
    - (i) Programming, development & design, manufacturing
    - (ii) Wholesale/Retail of prepackaged software
    - (iii) Database processing & publishing
  - (g) *Visual & Graphic Arts*
    - (i) Artists
    - (ii) Art galleries & other wholesale & retail
    - (iii) Picture framing & other allied services

- (iv) Graphic Design
  - (h) *Advertising Services*
  - (i) *Copyright Collecting Societies*
- (2) INTERDEPENDENT COPYRIGHT (7)
- (a) *TV sets, Radios, VCRS, CD Players, Cassette Players, Electronic Game Equipment & other similar equipment*
    - (i) Manufacture of television, radio receivers & associated goods
    - (ii) Wholesale of radio & television sets, sound reproducing & recording equipment except electrical & electronic components
    - (iii) Retail sale of radio, television sets, sound reproducing & recording equipment
  - (b) *Computers & Equipment*
    - (i) Manufacture of computing & data processing equipment, accessories, & peripheral equipment
    - (ii) Wholesale of computer hardware & peripheral equipment
    - (iii) Wholesale of computer accessories
  - (c) *Musical Instruments*
    - (i) Wholesale of musical instruments, record albums, cassette tapes & laser discs
    - (ii) Retail sale of musical instruments, record albums, cassette tapes & laser discs
  - (d) *Photographic & Cinematographic Instruments*
    - (i) Manufacture of optical instruments & photographic equipment
    - (ii) Wholesale of photographic equipment & supplies
    - (iii) Retail sale of cameras & other photographic goods
  - (e) *Photocopiers*
    - (i) Manufacture of photocopying equipment
    - (ii) Wholesale of office machines & equipment
  - (f) *Blank Recording Material*
    - (i) Manufacture of blank magnetic tapes, diskettes & cds chemical products
    - (ii) Retail sale of blank recording material in household appliances & equipment
  - (g) *Paper*
    - (i) Manufacture of pulp, paper & paperboard
    - (ii) Wholesale of other intermediate products, waste & scrap
    - (iii) Retail sale of paper & other crafts
- (3) PARTIAL COPYRIGHT (10)
- (a) *Apparel, textiles & footwear*
    - (i) Manufacture of wearing apparel except fur apparel
    - (ii) Manufacture of made-up textile articles except apparel
    - (iii) Manufacture of footwear
    - (iv) Wholesale of textiles, clothing, footwear & leather goods
    - (v) Retail sale of textiles, clothing, footwear & leather goods
  - (b) *Jewelry & coins*
    - (i) Manufacture of jewelry & related articles except custom jewelry
    - (ii) Wholesale of other household goods

- (iii) Other retail sale in specialized stores
  - (c) *Other crafts*
    - (i) Retail sale of paper & other crafts
    - (ii) Wholesale of handicrafts & fancy goods
  - (d) *Furniture*
    - (i) Manufacture of furniture & fixtures
    - (ii) Wholesale of furniture & fittings
    - (iii) Renting & leasing of furniture & other household equipment
  - (e) *Household goods, china & glass*
    - (i) Manufacture of household goods & glass
    - (ii) Manufacture of knitted & crocheted fabrics & articles
    - (iii) Manufacture of rattan processing & other products of wood
  - (f) *Wall coverings & carpets*
    - (i) Manufacture of wall coverings & carpets
    - (ii) Manufacture of other articles of paper & paperboard
    - (iii) Other retail sale in specialized stores
  - (g) *Toys & games*
    - (i) Manufacture of toys & games
    - (ii) Wholesale of toys & games
    - (iii) Retail sale of toys & games
  - (h) *Architecture, engineering, surveying*
    - (i) *Interior design*
    - (j) *Museums*
- (4) NON-DEDICATED SUPPORT (3)
- (a) *General wholesale & retailing*
    - (i) Wholesale trade & commission trade, except of motor vehicles & motorcycles
    - (ii) Wholesale of household goods
    - (iii) Wholesale of machinery, equipment & supplies
    - (iv) Other wholesale
    - (v) Retail trade, except of motor vehicles & motorcycles; repair of personal & household goods
    - (vi) Non-specialized retail trade in stores
    - (vii) Other retail trade of new goods in specialized stores
    - (viii) Retail trade not in stores
  - (b) *General transportation*
    - (i) Transport via railways
    - (ii) Other land transport
    - (iii) Water transport
    - (iv) Air transport
    - (v) Cargo handling
    - (vi) Storage & warehousing
    - (vii) Other supporting transport activities
    - (viii) Activities of travel agencies & tour operators
    - (ix) Activities of other transport agencies
    - (x) National post activities
    - (xi) Courier activities other than national post activities
  - (c) *Telephony & internet*

(i) Telecommunications

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