

# **Impacts of Major Transportation Project on the Transition of Service Industry in Taiwan—An Empirical Study of Taipei-Yilan Highway**

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## **Abstract**

National Highway No. 5 (Taipei-Yilan Highway) connects Taipei and Yilan; and since its opening to traffic in June 2006, the traveling time between these two locations has been reduced to 40 min. In addition to improving convenience in travel, this major transportation construction has already induced changes in the service industries of Yilan. This study applies Location Quotient (LQ) method to analyze the industrial transition of 8 service categories by the longitudinal analysis of the past 8 years. The purposes of this study include (1) testing the significance difference between before and after the operation of Taipei-Yilan Highway for service industries and (2) analyzing the changes and trends of the service industries of Yilan County. This study found that wholesale and retail businesses count the highest percentage amount the service industry in Yilan County; additional, the hospitality industry has LQ value bigger than one since 2006, which indicate that it is an important basis industry comparing with other service industries in Yilan. The study also revealed professional/scientific/technical services has the most significant changes in LQ values, following the services industries of hospitality, and real estate service.

keywords: Location Quotient, Taipei-Yilan Highway, Longitudinal analysis, Service industry

## **1. Introduction**

Yilan County leans against hills and faces the ocean, and only a mountain separates it from Taipei City, the capital of Taiwan. However, traveling from Yilan to Taipei, or vice versa, takes 2 hours. The long transportation time limits the

development of the service industries of Yilan. According to the data from the Accounting and Statistics Department in Executive Yuan in the year 2011, farming counted 1.72% of the GDP, while industries counted 29.57% of GDP, in which manufacturing industry counted 24.83 % of GDP and service industry counted 68.71% of GDP. According to the data of recent years, Taiwan has moved toward a new economic era with service industry as the leading trend. Based on the data in the year 2011, service industry counted big percentage of GDP and employment population, therefore, can have significant impact to the nation's economic condition, as shown in Table 1 and Table 2.

Table 1. Percentage of GDP in Taiwan

Unit : %

Year	Agricultural	Manufacturing industry	Service industry
2003	1.71	31.20	67.08
2004	1.68	31.75	66.57
2005	1.67	31.26	67.08
2006	1.61	31.33	67.06
2007	1.49	31.38	67.12
2008	1.60	29.05	69.35
2009	1.73	28.92	69.35
2010	1.64	31.12	67.24
2011	1.72	29.57	68.71

Source: Accounting and Statistics Department of Taiwan's Executive Yuan

Table 2. Percentage of employment population in Taiwan

Unit : %

Year	Agricultural	Manufacturing industry	Service industry
2003	7.27	35.49	57.24
2004	6.56	35.90	57.54
2005	5.94	36.40	57.67
2006	5.48	36.59	57.92
2007	5.28	36.80	57.92
2008	5.14	36.84	58.02
2009	5.28	35.84	58.87
2010	5.24	35.92	58.84
2011	5.06	36.34	58.60

Source: Accounting and Statistics Department of Taiwan's Executive Yuan

Based on the data from Yilan county government in the year 2010, compare to the year 2005, the population of those who visited the county for sight-seeing had increased 50.61%. The heavy traffic or traffic jam of Taipei-Yilan Highway (TYH) has been a common phenomenon during weekends, and the increasing visiting population brought a big business to the county especially for tourism industry. The purpose of the study is to investigate the impact of TYH on service industries and the trends of service via an illustration in Yilan county.

## **2. Literature Review**

According to Executive Yuan of Taiwan in the year 2011, there are 13 types of service industries, which includes “wholesale and retail trade”, “transportation and warehouse industry”, “information and communication industry”, “financial and insurance industry”, “real estate industry”, “professional, science, and technical service industry”, “Support services industry”, “public administration and defense”, “education service industry”, “Health care and social work services”, “Art, entertainment, and leisure services”, and “other services”.

Huang *et. al.* (2010), investigated the changes in population structure before and after the completion of TYH. The study indicated that the labor force has been mainly based on commercial areas. Hsu and Tsao (2007) investigated the residents’ perception in Su-Ao Township regarding the impact of TYH in tourism industry. The study found that most of the residents agreed that there are significant impact of the economic condition, the living condition, and the social cultural changes.

Gülcan *et. al.* (2009) tried to find out the important industry in the area of Aegean Sea in Turkey and the impact on the value-added of tourism industry from the government investment. The study revealed that tourism industry, especially for the hotel service, is the basic industry in the area of Aegean Sea by the analysis of LQ during 1995 to 2001.

Wang and Ma (2004) studied the difference between Taipei city and Kaohsiung city by Location Quotient (LQ) analysis and location factor analysis. Their study indicated that Taipei city has changing to be a place which depended more on the service industry with low pollution and high added value while Kaohsiung county relied more on highly polluted manufacturing industry.

Ma and Chen (2007), compared the industrial development of Taipei city, Taichung city, Tainan city, and Kaohsiung city. The study showed that the overall development of Taipei and Taichung city depended a lot on service industry. In the mean time, the development of Kaohsiung relied more on manufacturing industry, and Tainan city shown a more balanced development.

### **3. Research Method**

Haig (1928) used Economic base analysis to describe the economic condition of New York and divided the economic activities into two parts which are basic industry and non-basic industry. The theory assumed that by making arrangement of the city's basic industry, we can, therefore, predict of employment opportunities of non-basic industry, and find out the future economic development of the city.

LQ is an useful instrument to compare the local features and measure the contribution of particular place for the whole area. Moineddin *et. al.* (2003) compared the difference of employment ratio between local county and whole nation. The value of LQ more than 1 indicated that basic industry is more emphasized, there are more labor force for this industry, the employment opportunities or industry cluster is better than expected and the extra works are provided, the goods and services can be distributed to other areas to bring profits. As the result, this industry plays a significant impact for the local area.

LQ can be applied to reveal the importance of specific industry in a particular place. Miller *et. al.* (1991) indicated that LQ has been widely used in studying economic geography and local economic. The data can be used to determine the number of work force, factories, productivity, or operating income. This particular industry can attract more businesses for investments and can be considered as an important industry if its productivity value is more than one. LQ is a relative measurement instead of absolute measurement, it should be considered as a concept to indicated the expertise or development of a particular industry in related to other areas in the nation (Huang, 2011).

### **4. Empirical Study and Discussion**

The labor force in Yilan county has mainly focused on service industry with 45.5% of working population since 1991. In 2010, the percentage of working population belong to service industry has increased to 62.86%, as shown in Table 3.

Besides, there were 154,021 households in Yilan county in the year 2010. Nowadays, the population for Yilan is 460,486, with an average of 2.99 persons per household. In addition, there are 21,787 businesses registered with the capital investment of 4,204,988 thousand dollars. There are 4,972 incorporations registered with the capital investment of 67,049 million dollars.

Table 3. Percentage of employment population in Yilan

Unit : %

Year	Agricultural		Manufacturing industry		Service industry	
	Taiwan	Yilan	Taiwan	Yilan	Taiwan	Yilan
1998	8.85	10.13	37.92	37.87	53.23	52.00
1999	8.27	9.97	37.21	35.75	54.52	54.28
2000	7.79	9.12	37.23	36.23	54.98	54.65
2001	7.54	8.63	36.00	36.50	56.46	54.87
2002	7.50	9.56	35.24	35.15	57.25	55.28
2003	7.27	9.99	34.83	33.12	57.90	56.89
2004	6.56	9.02	35.21	34.32	58.23	56.65
2005	5.95	7.26	35.79	34.12	58.27	58.63
2006	5.49	6.18	36.02	32.64	58.49	61.17
2007	5.28	6.60	36.80	33.46	57.92	60.10
2008	5.14	7.03	36.84	32.81	58.02	60.17
2009	5.28	6.64	35.85	31.31	58.87	62.06
2010	5.24	6.10	35.92	31.04	58.84	62.86

Source: Accounting and Statistics Department of Taiwan's Executive Yuan

The study calculate the LQ value of Yilan before and after the complement of TYH in the year 2003 to 2010, gathering the data of those who work for service industry, the number of incorporations and the number of commerce who registered in Yilan country, number of profit-business, and sales of total business (shown in Table 4 and Table 5).

Table 4. LQ of Yilan County before the operation of TYH

Year	Service industry type	Employed Persons by Industry	Number of incorporations Registered	Number of commerce Registered	Number of profit-business	Sales of total business
2003	Wholesale and retail	0.96	0.78	n/a	0.92	<b>1.07</b>
	Hospitality	<b>1.07</b>	0.94	n/a	<b>1.11</b>	<b>2.33</b>
	Transportation/warehouse/communications	0.88	<b>1.12</b>	n/a	<b>1.06</b>	<b>1.25</b>
	Finance and insurance	0.71	0.33	n/a	0.33	0.50
	Real Estate and Rental Leasing	0.40	<b>1.51</b>	n/a	<b>1.27</b>	0.64
	Professional/scientific/technical services	0.76	0.75	n/a	0.51	0.22
	Health care and social welfare services	<b>1.08</b>	n/a	n/a	<b>1.22</b>	0.05
	Cultural/sporting/ leisure services	0.75	0.72	n/a	0.83	0.83
2004	Wholesale and retail	0.98	0.78	0.97	0.92	<b>1.10</b>
	Hospitality	<b>1.01</b>	0.94	<b>1.06</b>	<b>1.13</b>	<b>2.29</b>
	Transportation/warehouse/communications	0.95	<b>1.19</b>	0.38	<b>1.12</b>	<b>1.57</b>
	Finance and insurance	0.70	0.34	0.36	0.33	0.38
	Real Estate and Rental Leasing	0.63	<b>1.55</b>	<b>1.77</b>	<b>1.31</b>	0.92
	Professional/scientific/technical services	0.62	0.71	0.71	0.49	0.21
	Health care and social welfare services	<b>1.08</b>	<b>14.78</b>	n/a	<b>1.18</b>	0.08
	Cultural/sporting/ leisure services	0.87	0.80	0.80	0.81	0.81
2005	Wholesale and retail	<b>1.06</b>	0.79	0.98	0.92	<b>1.13</b>
	Hospitality	<b>1.09</b>	0.98	<b>1.04</b>	<b>1.04</b>	<b>2.48</b>
	Transportation/warehouse/communications	0.99	<b>1.19</b>	0.36	<b>1.13</b>	<b>1.43</b>
	Finance and insurance	0.73	0.34	0.41	0.33	0.25
	Real Estate and Rental Leasing	<b>1.20</b>	<b>1.55</b>	<b>1.82</b>	<b>1.31</b>	0.96
	Professional/scientific/technical services	0.51	0.70	0.73	0.52	0.19
	Health care and social welfare services	<b>1.08</b>	<b>14.90</b>	n/a	0.92	0.08
	Cultural/sporting/ leisure services	0.97	0.85	0.71	0.82	0.84
2006	Wholesale and retail	0.96	0.74	0.98	0.92	1.14
	Hospitality	<b>1.28</b>	<b>1.18</b>	<b>1.04</b>	<b>1.01</b>	<b>2.62</b>
	Transportation/warehouse/communications	<b>1.13</b>	<b>1.20</b>	0.36	<b>1.16</b>	<b>1.62</b>
	Finance and insurance	0.81	0.34	0.44	0.33	0.45
	Real Estate and Rental Leasing	<b>2.10</b>	<b>1.55</b>	<b>1.82</b>	<b>1.27</b>	0.91
	Professional/scientific/technical services	0.57	0.71	0.74	0.52	0.19
	Health care and social welfare services	<b>1.20</b>	<b>1.78</b>	n/a	<b>1.06</b>	0.14
	Cultural/sporting/ leisure services	0.87	0.98	0.70	0.86	0.85
average	Wholesale and retail	0.99	0.77	0.98	0.92	<b>1.11</b>
	Hospitality	<b>1.11</b>	<b>1.01</b>	<b>1.05</b>	<b>1.07</b>	<b>2.43</b>
	Transportation/warehouse/communications	0.99	<b>1.18</b>	0.37	<b>1.12</b>	<b>1.47</b>
	Finance and insurance	0.74	0.34	0.40	0.33	0.40
	Real Estate and Rental Leasing	<b>1.08</b>	<b>1.54</b>	<b>1.80</b>	<b>1.29</b>	0.86
	Professional/scientific/technical services	0.62	0.72	0.73	0.51	0.20
	Health care and social welfare services	<b>1.11</b>	<b>10.49</b>	n/a	<b>1.10</b>	0.09
	Cultural/sporting/ leisure services	0.87	0.84	0.74	0.83	0.83

Table 5. LQ of Yilan county after the operation of TYH

Year	Service industry type	Employed Persons by Industry	Number of incorporations Registered	Number of commerce Registered	Number of profit-business	Sales of total business
2007	Wholesale and retail	0.89	0.72	0.98	0.92	<b>1.14</b>
	Hospitality	<b>1.07</b>	<b>1.46</b>	0.39	<b>1.15</b>	<b>1.55</b>
	Transportation/warehouse/communications	<b>1.31</b>	<b>1.30</b>	<b>1.02</b>	<b>1.01</b>	<b>2.78</b>
	Finance and insurance	0.72	0.54	0.37	n/a	n/a
	Real Estate and Rental Leasing	0.73	0.39	0.57	0.33	0.41
	Professional/scientific/technical services	<b>1.33</b>	<b>1.76</b>	<b>2.32</b>	<b>1.21</b>	0.80
	Health care and social welfare services	0.82	0.60	0.79	0.54	0.25
	Cultural/sporting/ leisure services	<b>1.15</b>	<b>1.40</b>	<b>1.29</b>	n/a	n/a
2008	Wholesale and retail	<b>1.17</b>	<b>4.81</b>	—	<b>1.04</b>	0.31
	Hospitality	<b>1.47</b>	<b>2.86</b>	0.85	0.86	0.48
	Transportation/warehouse/communications	<b>1.00</b>	0.71	0.98	0.91	<b>1.12</b>
	Finance and insurance	<b>1.01</b>	<b>1.48</b>	0.38	<b>1.13</b>	<b>1.35</b>
	Real Estate and Rental Leasing	<b>1.27</b>	<b>1.42</b>	<b>1.03</b>	<b>1.02</b>	<b>2.69</b>
	Professional/scientific/technical services	0.65	0.51	0.35	0.40	0.60
	Health care and social welfare services	0.78	0.41	0.58	0.31	0.46
	Cultural/sporting/ leisure services	<b>1.08</b>	<b>1.71</b>	<b>2.16</b>	0.88	0.58
2009	Wholesale and retail	0.81	0.63	0.80	0.65	0.41
	Hospitality	0.90	<b>1.36</b>	<b>1.24</b>	<b>1.04</b>	<b>1.17</b>
	Transportation/warehouse/communications	<b>1.13</b>	<b>5.51</b>	n/a	0.72	0.14
	Finance and insurance	<b>1.36</b>	<b>2.71</b>	0.86	<b>1.03</b>	<b>1.61</b>
	Real Estate and Rental Leasing	<b>1.03</b>	0.70	0.97	0.91	<b>1.12</b>
	Professional/scientific/technical services	<b>1.08</b>	<b>1.50</b>	0.38	<b>1.12</b>	<b>1.46</b>
	Health care and social welfare services	<b>1.42</b>	<b>1.45</b>	<b>1.02</b>	<b>1.02</b>	<b>2.77</b>
	Cultural/sporting/ leisure services	0.66	0.47	0.35	0.38	0.61
2010	Wholesale and retail	0.70	0.40	0.54	0.31	0.44
	Hospitality	<b>1.05</b>	<b>1.67</b>	<b>2.01</b>	0.80	0.44
	Transportation/warehouse/communications	0.81	0.60	0.80	0.65	0.35
	Finance and insurance	0.69	<b>1.33</b>	<b>1.24</b>	<b>1.01</b>	<b>1.05</b>
	Real Estate and Rental Leasing	<b>1.31</b>	<b>4.73</b>	n/a	0.67	0.10
	Professional/scientific/technical services	<b>1.16</b>	<b>2.67</b>	0.88	<b>1.09</b>	<b>1.40</b>
	Health care and social welfare services	<b>1.05</b>	0.70	0.97	0.91	<b>1.13</b>
	Cultural/sporting/ leisure services	<b>1.20</b>	<b>1.42</b>	0.38	<b>1.14</b>	<b>1.38</b>
average	Wholesale and retail	<b>1.40</b>	<b>1.47</b>	<b>1.03</b>	<b>1.04</b>	<b>3.22</b>
	Hospitality	0.67	0.43	0.37	0.40	0.66
	Transportation/warehouse/communications	0.75	0.42	0.52	0.32	0.47
	Finance and insurance	<b>1.13</b>	<b>1.73</b>	<b>2.37</b>	0.86	0.50
	Real Estate and Rental Leasing	0.77	0.59	0.81	0.63	0.32
	Professional/scientific/technical services	0.77	<b>1.36</b>	<b>1.23</b>	<b>1.02</b>	0.99
	Health care and social welfare services	<b>1.44</b>	<b>6.79</b>	n/a	0.86	0.08
	Cultural/sporting/ leisure services	0.96	<b>2.54</b>	0.95	<b>1.15</b>	<b>1.63</b>

Based on the data of employed persons by industry, before the complement of the highway in the year 2003 to 2006, hospitality, medicare and social work service industries, public administration service, and other service industries of Yilan county shown the LQ value of more than one. After the complement of the highway in the year 2007 to 2010, transportation, warehousing, hospitality, real estate, health care and social work service industries and other service industries shown the LQ value of more than one. Among these businesses, the industry of real estate has the most dramatic changes.

Based on the data of registered commerce in Yilan county, before the complement of the highway in the year 2004 to 2006, hospitality, real estate and renting, education, and other service industries shown the LQ value of more than one. After the complement of the highway in the year 2007 to 2010, hospitality, real estate, supporting services, education and other service industries shown the LQ value of more than one.

Based on the data of Sales of total business in Yilan county, before the complement of the highway in the year 2003 to 2006, wholesale and retail, hospitality, transportation/warehousing and communication, and other service industries shown the LQ value of more than one. After the complement of the highway in the year 2007 to 2010, wholesale and retail, transportation and warehousing, hospitality, arts/entertainment and leisure service, and other service industries shown the LQ value of more than one.

The test of the changes in LQ values before and after the complement of TYH has revealed that the service industries which Professional/scientific/technical services has the most significant changes in LQ values, following the services industries of hospitality, real estate, art/entertainment/leisure service. Table 6 showed the significant difference in LQ between before and after the operation of TYH, the sign of \* and \*\* showed the significance difference in the significant level of 0.05 and 0.01 respectively.



Table 6. Test of the significance in LQ before and after the complement of TYH

significance	wholesale and retail	Transportation and warehousing	hospitality	Finance and insurance	Real estate	Professional/scientific/technical	Health care and social welfare	art/entertainment/leisure
Employment population			**			**	*	*
Incorporation registered	**	**	**	**	**	**		**
Commerce registered		*		**	**	**		**
No. of Profit-business	*			*	**	**	*	**
Sales of total business			*		*	**		

## 5. Conclusions and suggestions

The increasing amount of cars and population are brought to Yilan county because of the convenience in traffic after the complement of TYH in the year 2007. This works focus on the development of service industry in Yilan County, and use LQ analysis to investigate the changes of the service industry in Yilan county before and after the complement of the TYH. The study found that wholesale and retail businesses count the highest percentage amount the service industry in Yilan County. The study also revealed the hospitality industry has LQ value bigger than one since 2006, which indicate that it is an important basis comparing with other service industries in Yilan.

Looking at the profit gained for business and incorporations in the filed of hospitality in Hualien County during 2003 to 2010, the statistical data from Accounting and Statistics Department of Taiwan's Executive Yuan showed that the businesses in the county are gradually gaining profit during the year 2003 to 2010. The result indicates that the complement of Taipei-Yilan Highway brings positive effect in the field of hospitality both for Yilan county and Huallien county (Rey and Montouri, 1999).

The convenience in traffic can bring better chances for the locals. How to keep a good competitiveness is an influential factor for the businesses' future development.

Finding key factors which affect the service quality and a solution to promote better quality are the direction for future research of the study.

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