

Household Expenditure Survey 2012/2013 - Observations on Prevalence of Online Purchases

By

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Introduction

The Singapore Department of Statistics (DOS) conducts the Household Expenditure Survey (HES) once in every five years. The latest HES 2012/13 was conducted from October 2012 to September 2013. The HES collects detailed information on households' consumption expenditure, income and socio-economic characteristics. Data on ownership of consumer durables, which reflect households' standards of living, are also captured.

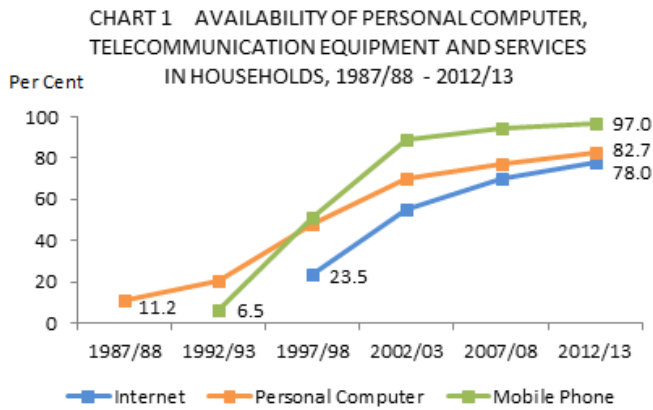
Results from the HES are used in household expenditure and income studies. They are also used to update the weighting pattern and the basket of goods and services for the compilation of the Consumer Price Index (CPI). Besides providing information on households' expenditure levels, the HES also gives insights into their consumption patterns and the changes over time.

Emergence of Online Shopping

Facilitated by technological developments and availability of online shopping, shifts in households' consumption habits in recent years are observed. Electronic retail is growing rapidly. Some traditional brick and mortar retail stores are also offering consumers the option of going online to meet their shopping needs. Increasingly, more households are making purchases over the Internet¹. These come on the back of greater access to computing and mobile equipment, growing Internet connectivity and computer literacy.

The past two decades have witnessed a rise in households' ownership of personal computer, mobile phone and access to the Internet. Findings from the HES have shown the proportion of households with personal computer climbing steadily from 11 per cent in 1987/88 to 83 per cent in 2012/13 (Chart 1).

¹ The Infocomm Development Authority of Singapore reported in the 2012 Annual Survey in Infocomm Usage in Households and by Individuals that the proportion of online shoppers among Internet users aged 15 years and over increased between 2008 and 2012.



Households with Internet subscription/access increased from 24 per cent in 1997/98 to 78 per cent in 2012/13. Most notably, the proportion of households with mobile phone increased steeply from 6.5 per cent in 1992/93 to almost universal at 97 per cent in 2012/13. Besides basic phone service, mobile services with Internet data access are also becoming more common.

The improved ease and accessibility to the virtual world supported the adoption of online activities, including online shopping. In this article, we take a closer look at the prevalence of online purchases reported by households in the latest HES 2012/13.

Information on Online Purchases Collected in HES 2012/13

In anticipation that purchases made over the Internet could become more prevalent among households over time and potentially impact their consumption patterns, the HES piloted the capturing of households' expenditure on online purchases in 2012/13.

Besides detailing the descriptions of items purchased and the amounts paid for in their expenditure records, respondents were also asked to indicate if the items were purchased online. Such distinction was not made in HES conducted prior to 2012/13.

For the purpose of the HES, an "online purchase" is defined as the purchasing or ordering of goods or services via the Internet, regardless of whether payment was made online and independent of the

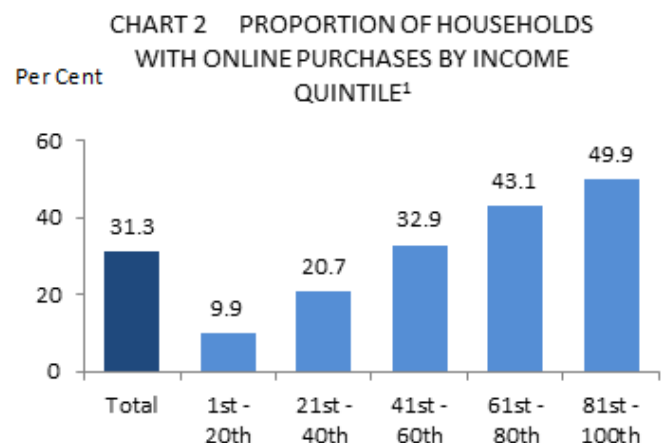
mode of delivery for the goods or services. Orders placed through email are considered online purchases.

In collecting the required information, breakdown into online and other modes of purchases was asked for day-to-day expenses captured in the respondents' expenditure recording over 2 weeks. In addition, online purchases of selected big ticket items that were ad-hoc in nature and less likely to be incurred on a day-to-day basis were also captured via a 12-month recall. Examples include overseas holidays and purchase of durable goods.

Prevalence of Online Purchases among Households

By Income Quintile

In 2012/13, almost a third of all households made at least one purchase over the Internet. The prevalence of online purchases among households in the higher income quintiles was greater compared to those in the lower income quintiles. Among households in the 81st to 100th income quintile, one in two households made purchases over the Internet compared to about one in ten among those in the 1st to 20th quintile (Chart 2).



¹ Based on ranking of all resident households by their monthly household income from all sources (including employer CPF contributions) per household member.

By Type of Dwelling

The proportion of households reporting to have made online purchases was higher among households living in condominiums, other apartments and landed properties than those living in HDB flats. Among households in HDB flats, 29 per cent made at least one online purchase, with lower proportions reported among those in smaller flat types (Chart 3). The corresponding proportions among households staying in condominiums and other apartments and landed properties were 44 – 45 per cent.

By Age of Household Members

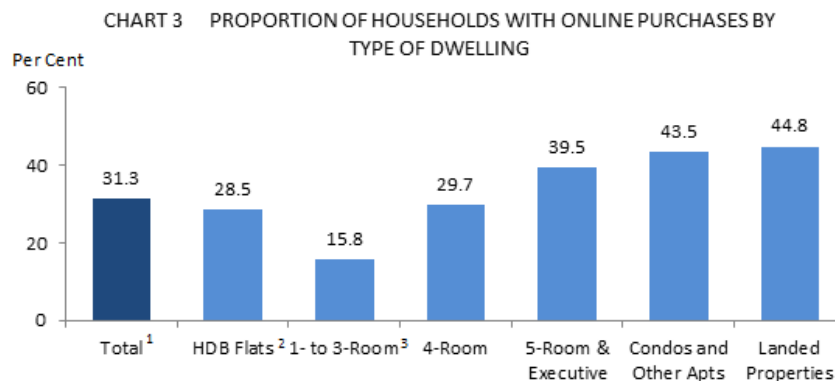
Households comprising younger adults had a higher tendency to make online purchases. Among households with at least one member aged 25 to 44, about 36 to 41 percent had made online purchases (Chart 4). In contrast, households comprising of only older members aged 45 and over observed a much lower proportion making online purchases.

By ownership of computers and Internet access

As expected, online purchases were more prevalent among households with access to the Internet and personal computer at home. Among households with Internet access, 38 per cent made at least one online purchase as compared to 8.9 per cent among those without (Chart 5). A similar trend is observed among households owning a personal computer, where a significantly higher proportion of households made at least one online purchase as compared to households without. Although households may still be able to make an online purchases without access to Internet or computer at home, online purchases were far less common among households with no access.

Average Expenditure on Online Purchases

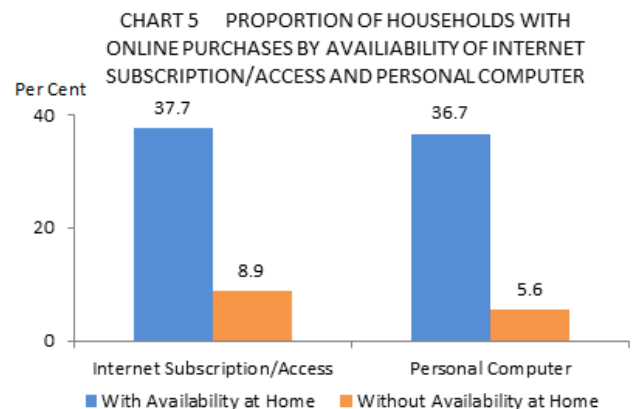
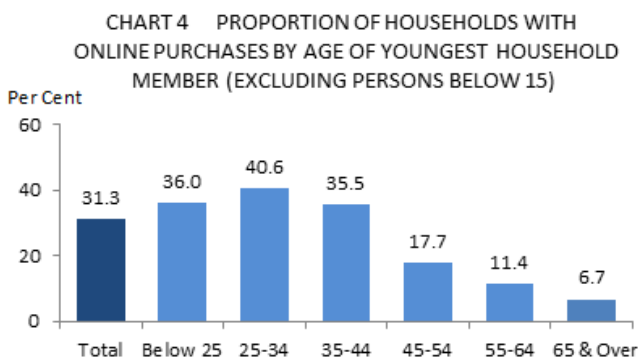
The average monthly household expenditure of all resident households was \$4,720 in 2012/13. Of this, an average of \$82 (or 1.7 per cent of household



¹ Total includes other types of dwellings not shown, e.g. non-HDB shophouses, etc.

² HDB flats include non-privatised Housing and Urban Development Corporation (HUDC) flats.

³ HDB 1- to 3-Room includes HDB Studio Apartments.



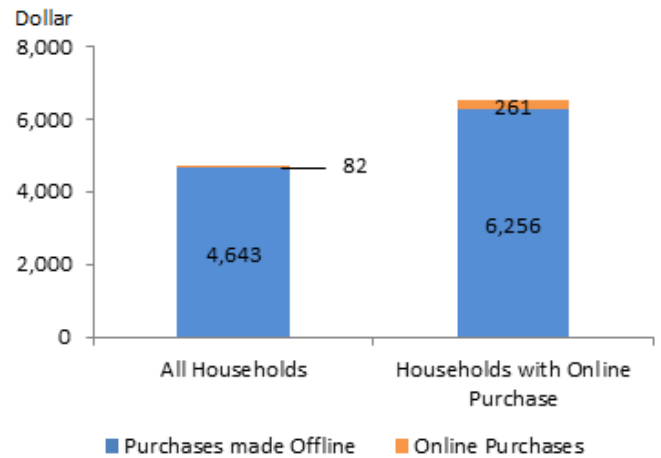
expenditure) was spent online (Chart 6). Among households who reported at least one online purchase in the survey, their average monthly household expenditure and online spending were higher at \$6,520 and \$260 respectively.

By Income Quintile

The share of online spending ranged from less than 1 per cent among households in the lower income quintiles (1st to 20th and 21st to 40th) to 2.3 per cent for the top quintile (Chart 7A). In dollar terms, monthly spending online ranged from \$15 to \$180 on average per household across income quintiles.

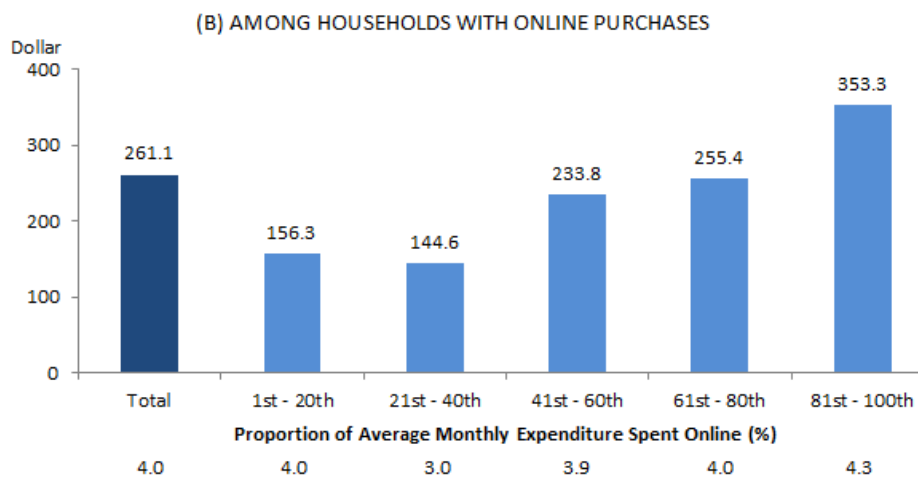
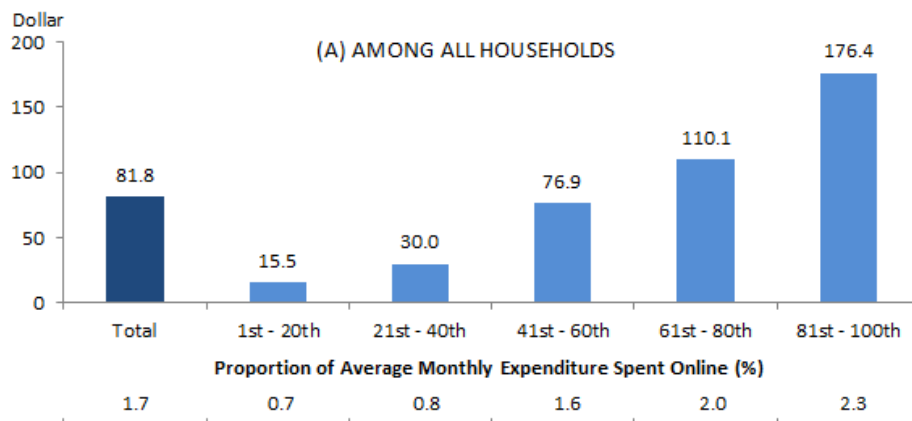
Among households who made at least one online purchase in the survey, average monthly spending online ranged from \$140 to \$350 per household (Chart 7B).

CHART 6 AVERAGE MONTHLY HOUSEHOLD EXPENDITURE¹ AMONG ALL RESIDENT HOUSEHOLDS AND HOUSEHOLDS WITH ONLINE PURCHASES BY MODE OF PURCHASE



¹ Expenditure data exclude imputed rental of owner-occupied accommodation.

CHART 7 AVERAGE MONTHLY HOUSEHOLD EXPENDITURE¹ ON ONLINE PURCHASES AND SHARE OF ONLINE SPENDING OF HOUSEHOLD EXPENDITURE BY INCOME QUINTILE²



¹ Expenditure data exclude imputed rental of owner-occupied accommodation.

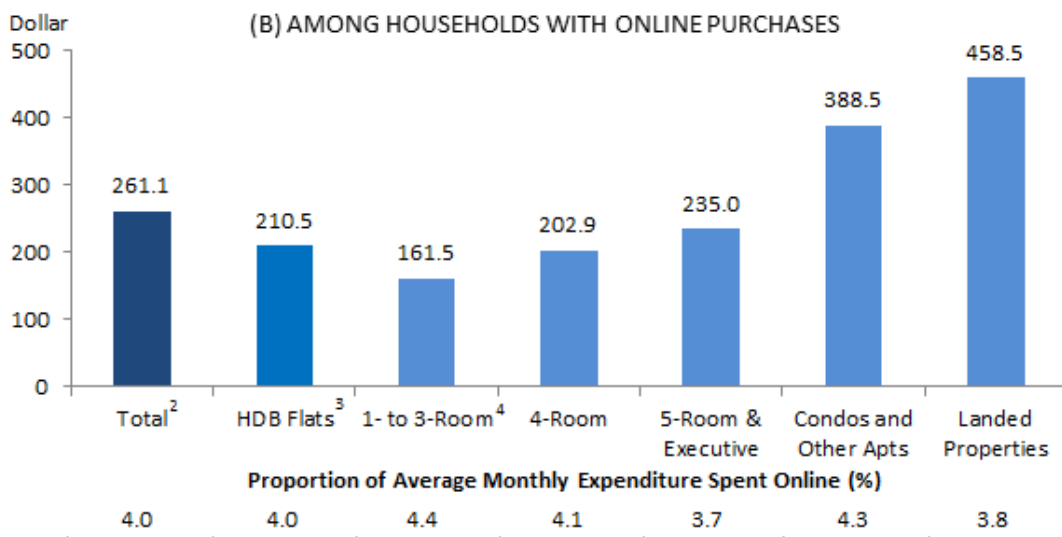
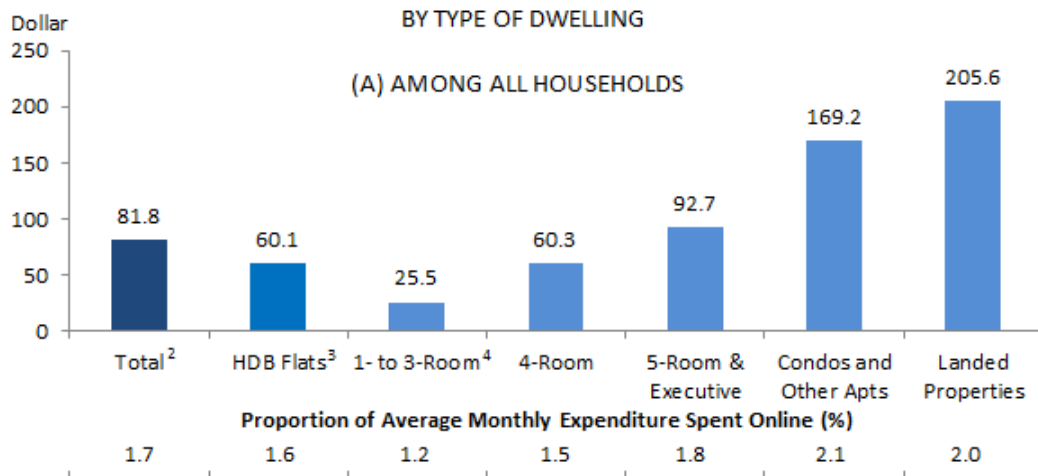
² Based on ranking of all resident households by their monthly household income from all sources (including employer CPF contributions) per household member.

By Type of Dwelling

For households staying in different types of housing, between 1.2 and 2.1 per cent of households' expenditure was spent online (Chart 8A). This amounted to some \$26 among households in the smaller HDB flats and \$210 among households residing in landed properties.

Among overall households, those staying in 1- to 3-room HDB flats incurred a small share of their expenditure online (1.2 per cent). In comparison, for households who made online purchases, the share of expenditure spent online for households staying in 1- to 3-room HDB flats at 4.4 per cent of their monthly household expenditure, was highest across all dwelling types (Chart 8B).

CHART 8 AVERAGE MONTHLY HOUSEHOLD EXPENDITURE¹ ON ONLINE PURCHASES AND SHARE OF ONLINE SPENDING OF HOUSEHOLD EXPENDITURE BY TYPE OF DWELLING



¹ Expenditure data exclude imputed rental of owner-occupied accommodation.

² Total includes other types of dwellings not shown, e.g. non-HDB shophouses, etc.

³ HDB flats include non-privatised Housing and Urban Development Corporation (HUDC) flats.

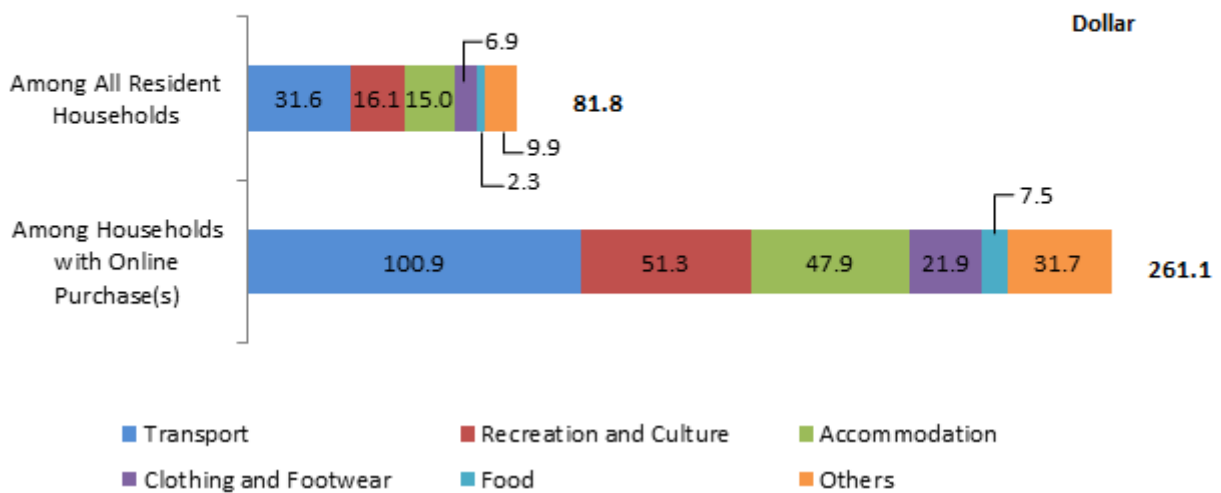
⁴ HDB 1- to 3-Room includes HDB Studio Apartments.

Travel and Clothing Accounted for the Largest Shares of Online Expenditure

Among broad types of goods and services, transport, recreation and culture, and accommodation services accounted for the largest shares of households' online expenditure. Together, they constituted 77 per cent of online expenditure reported by households (Chart 9).

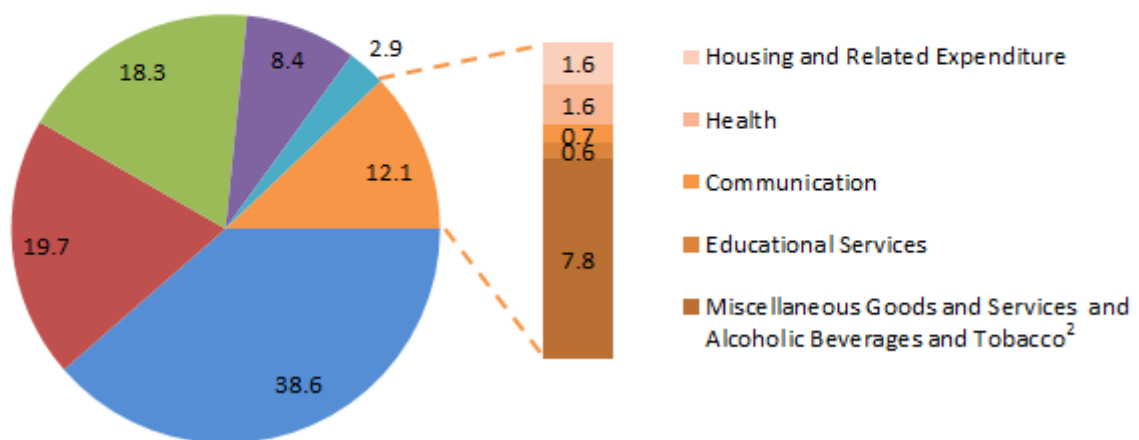
The ease and convenience of purchasing flight tickets and booking of hotel stays on the Internet contributed to the significant proportion of online purchases on transport and accommodation. Under recreation and culture, the main expenditure item incurred online was for overseas packaged holidays. Apart from travel and holidays-related expenses, clothing and footwear made up the next most significant purchases online.

CHART 9 AVERAGE MONTHLY EXPENDITURE¹ ON ONLINE PURCHASE BY BROAD TYPES OF GOODS AND SERVICES



Distribution of Online Purchases (%)

Distribution (Percent)



¹ Expenditure data exclude imputed rental of owner-occupied accommodation.

² Miscellaneous goods and services include personal care services such as hairdressing, social support services and insurance.

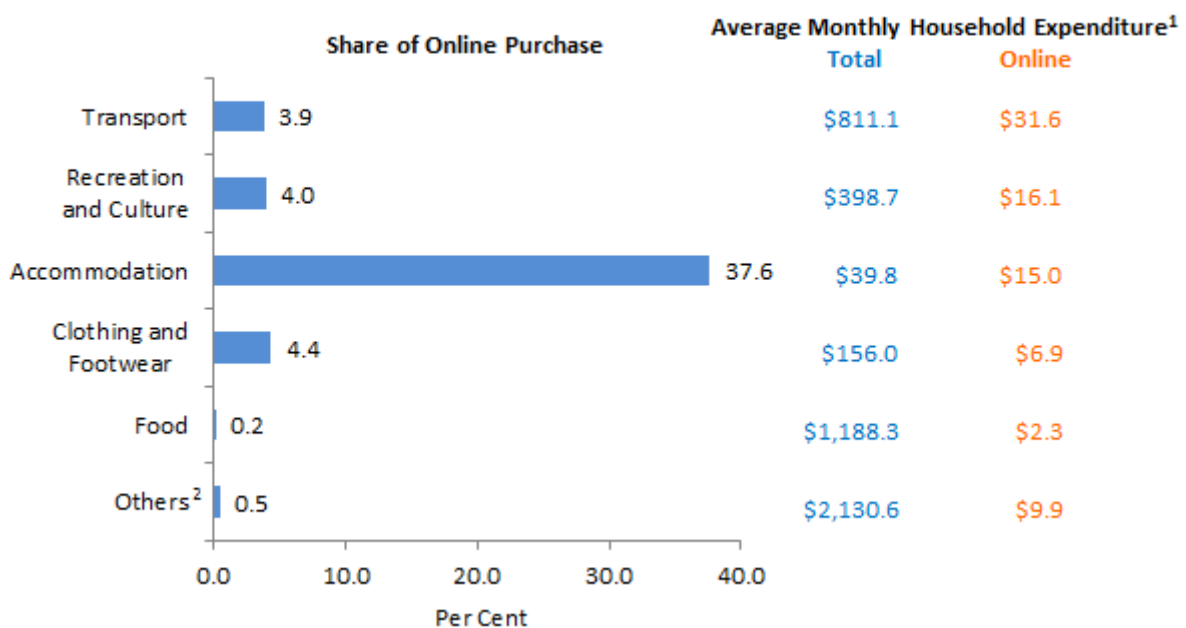
Online Purchases by Types of Goods and Services

Although the value of online purchases may not be significant relative to the households' overall expenditure, the share of online expenditure is considerable for selected items. Notably, 38 per cent of the households' expenditure on accommodation, largely attributed by hotel bookings, was made online (Chart 10).

Concluding Remarks

As online purchases were captured for the first time in the HES in 2012/13, comparison over time is currently not available. The relevance of the information and the way data are captured will be further evaluated and fine-tuned in future HESs while balancing the potential response burden for reporting households.

CHART 10 ONLINE PURCHASE BY BROAD TYPES OF GOODS AND SERVICES



¹ Expenditure data exclude imputed rental of owner-occupied accommodation.

² Others include housing and related expenditure, health, communication, educational services, miscellaneous goods and services and alcoholic beverages and tobacco.



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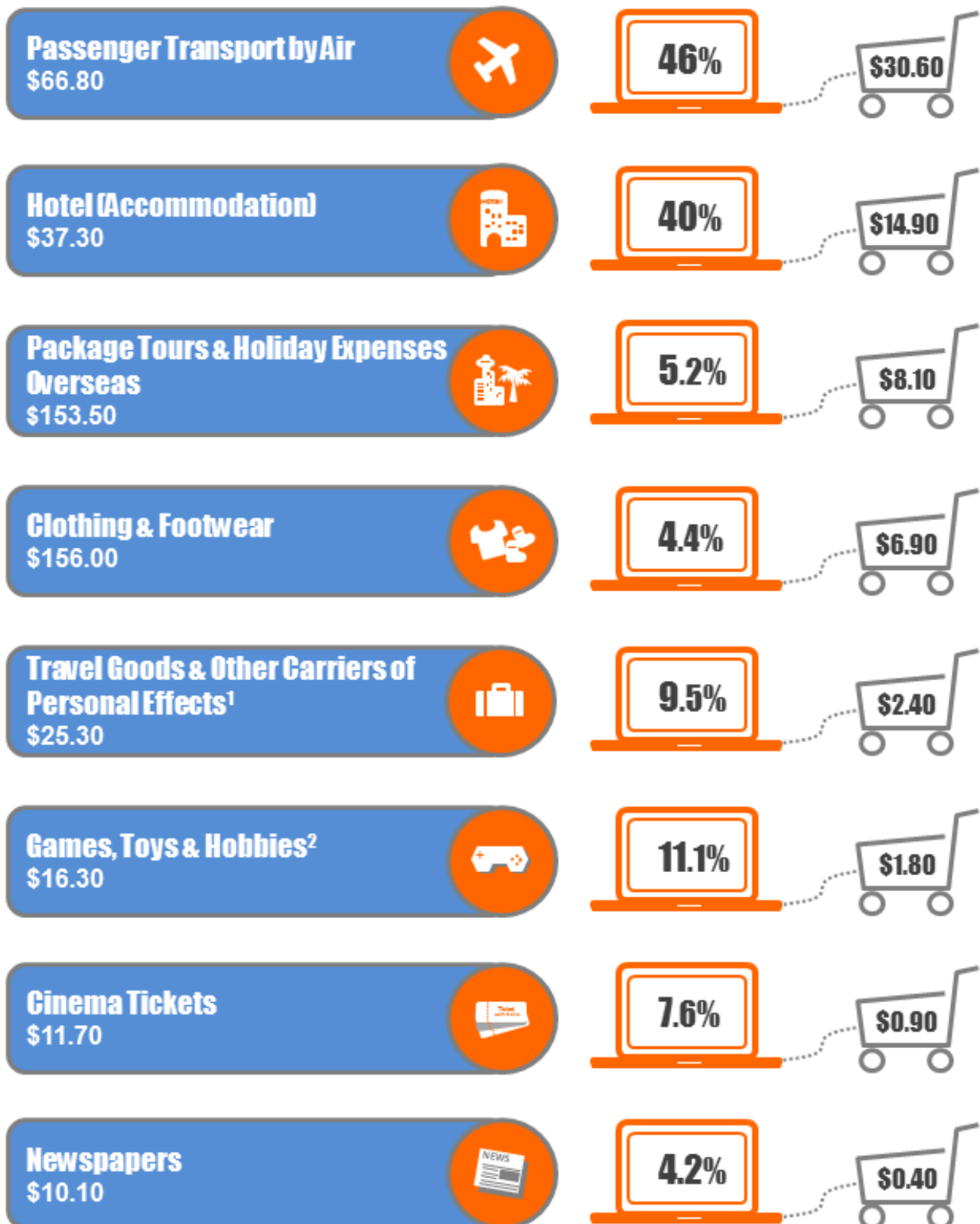
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Online Purchases by Types of Goods and Services, 2012/13

AVERAGE MONTHLY HOUSEHOLD EXPENDITURE

ONLINE PURCHASES



¹ "Travel Goods & Other Carriers of Personal Effects" include handbags, wallets, purses, school bags, suitcases, travel bags, etc.

² "Games, Toys & Hobbies" include electronic/ video games, soft/plush toys, toy car/train/figurines, building set, blocks and models, etc.

Using Input–Output Tables in Simulation

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Introduction

Input-Output (I-O) tables can be used to study the interdependence of industries in an economy and simulate the impact of various changes on the economy as they provide detailed information on the industrial structure. This article introduces the use of I-O tables for simulation and illustrates the application using two case studies.

Overview of I-O Tables

For the purpose of this article, the I-O tables are presented in terms of two industries: *Goods* industry and *Services* industry.^{1,2} The Industry by Industry Flow matrix (Table 1) records the transactions between the

two industries and final consumers, and other production requirements of the two industries in 2010.

Based on the relationships between producers and consumers, an I-O model can be constructed to estimate the change in output resulting from changes in final demand. The latter may come from changes in household spending, government spending, investment in new building, machinery and software, or exports to the rest of the world.

The intuition behind the I-O model is that a change in production activity of an industry will have impact on other industries. Hence, an increase in final demand for an industry’s output will stimulate production of output in other industries. This is also known as the output multiplier effects (Chart 1).

TABLE 1 INDUSTRY BY INDUSTRY FLOW MATRIX, 2010

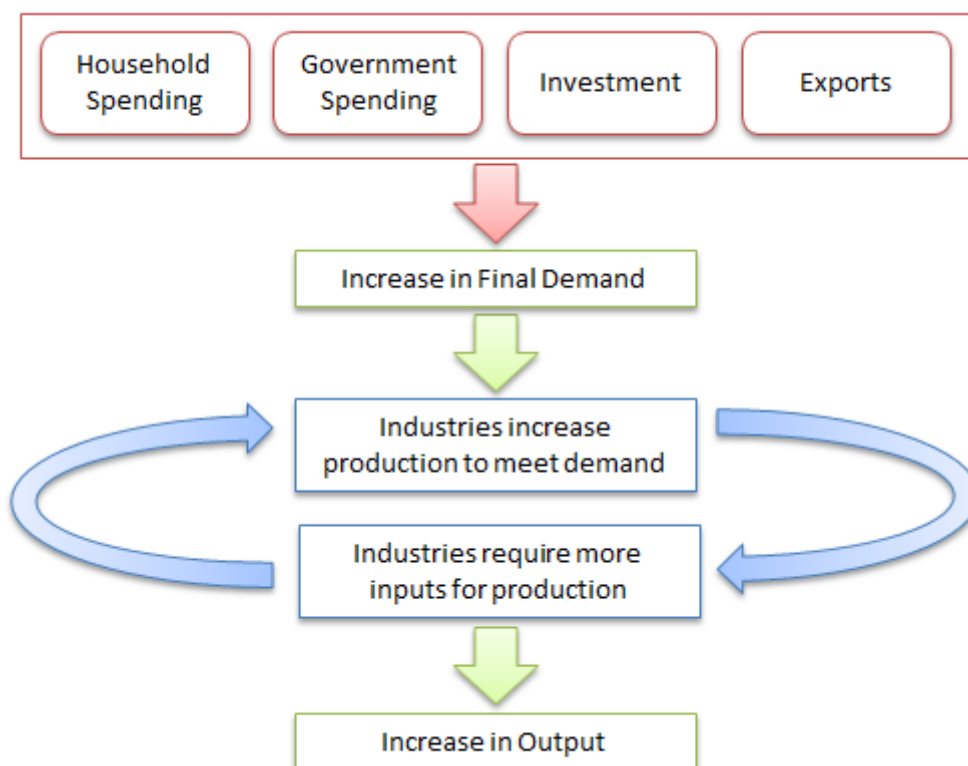
	Billion Dollars			
	Goods	Services	Final Demand	Total Output
Goods	88.8	25.7	245.4	359.8
Services	33.0	125.0	317.7	475.7
Imports	153.5	104.2	44.6	302.4
Taxes on Products	0.2	0.7	17.0	17.9
Value-added	84.3	220.1	-	304.4
Total Input	359.8	475.7	624.7	1,460.2

Note: Figures may not add up to the total due to rounding.

¹ The I-O tables are generated from the 2010 Singapore Supply and Use Tables, which are compiled at 127 I-O industries/ products codes.

² For this article, the “*Goods* industry” refers to the goods-producing industries comprising manufacturing, utilities, other goods and construction while the “*Services* industry” refers to the service-producing industries comprising the remaining industries, including wholesale and retail trade, accommodation and food services, transportation and storage, information and communications, finance and insurance, business services, and other services.

CHART 1 OUTPUT MULTIPLIER EFFECTS



In the I-O framework, the relationships between the producers and consumers are represented by the following equations:

$$\begin{aligned}
 \text{Output of Goods industry: } X_1 &= X_{11} + X_{12} + F_1 \\
 &= a_{11}X_1 + a_{12}X_2 + F_1 \\
 \text{Output of Services industry: } X_2 &= X_{21} + X_{22} + F_2 \\
 &= a_{21}X_1 + a_{22}X_2 + F_2
 \end{aligned}
 \tag{1.1}$$

where

- X_i = the value of output produced by industry i
- X_{ij} = the value of output produced by industry i and sold to industry j
- F_i = the value of output produced by industry i and sold to final consumers (Final Demand)
- $a_{ij} = \frac{X_{ij}}{X_j}$, the value of intermediate inputs³ from industry i required by industry j to produce \$1 of output

The a_{ij} from equations (1.1), also known as the direct requirement coefficients of industries, are computed from Table 1 and presented in Table 2.

³ Intermediate inputs are goods and services used by industries for production of other goods and services.

TABLE 2 DIRECT REQUIREMENT COEFFICIENTS, 2010

	Goods	Services
Goods	0.247	0.054
Services	0.092	0.263
Imports	0.427	0.219
Taxes on Products	0.001	0.002
Value-Added	0.234	0.463
Total	1.000	1.000

Note: Figures may not add up to the total due to rounding.

By substituting the direct requirement coefficients into equations (1.1), we obtain:

$$\begin{aligned}
 \text{Output of } \textit{Goods} \text{ industry: } X_1 &= 0.247 X_1 + 0.054 X_2 + F_1 \\
 \text{Output of } \textit{Services} \text{ industry: } X_2 &= 0.092 X_1 + 0.263 X_2 + F_2
 \end{aligned}
 \tag{1.2}$$

Using linear algebra, equations (1.2) can be expressed in the following form:

$$\begin{aligned}
 \text{Output of } \textit{Goods} \text{ industry: } X_1 &= \theta_{11}F_1 + \theta_{12}F_2 \\
 &= 1.340 F_1 + 0.098 F_2 \\
 \text{Output of } \textit{Services} \text{ industry: } X_2 &= \theta_{21}F_1 + \theta_{22}F_2 \\
 &= 0.167 F_1 + 1.369 F_2
 \end{aligned}
 \tag{1.3}$$

where

θ_{ij} = the value of output produced by industry i due to \$1 increase in final demand for the output of industry j

In equations (1.3), output can be expressed as a function of final demand which allows us to estimate the output for both industries X_1 and X_2 corresponding to final demand F_1 and F_2 .

Further, equations (1.3) can be multiplied by the direct requirement coefficients to estimate other variables of interest such as value-added corresponding to the final demand F_1 and F_2 . Equations (1.4) show the computation for value-added. Other variables can be computed in a similar fashion.

$$\begin{aligned}
 \text{Value-added generated in } \textit{Goods} \text{ industry: } VA_1 &= a_1^{VA} \times (\theta_{11}F_1 + \theta_{12}F_2) \\
 &= 0.234 \times (1.340 F_1 + 0.098 F_2) \\
 \text{Value-added generated in } \textit{Services} \text{ industry: } VA_2 &= a_2^{VA} \times (\theta_{21}F_1 + \theta_{22}F_2) \\
 &= 0.463 \times (0.167 F_1 + 1.369 F_2)
 \end{aligned}
 \tag{1.4}$$

where

VA_i = the value-added generated in industry i

a_i^{VA} = the value-added generated to produce \$1 of output in industry i

Simulation of Economic Impact using I-O Tables

Assumptions of the I-O Tables

While I-O tables are useful tools for simulation in economic impact studies, users need to bear in mind the following three basic assumptions underlying the use of the I-O model, and the extent to which they can be met.

1. **Homogeneity** - All companies classified in the same industry have the same production process and inputs requirements.

If a new company uses new production technologies which require significantly fewer inputs from other companies, then the actual impact of the new company will be lower than the simulated impact. This is because the I-O model assumes the new company will stimulate the same level of production in other companies, which is not the case.

2. **Fixed proportion** - Industries have fixed input requirements proportion relative to output. If an industry doubles its output, its input requirements such as intermediate inputs, imports and employment for production must also double.

If an industry is operating at below capacity with under-utilised inputs and can increase its output without increasing its inputs proportionately, the direct requirement coefficients used for the I-O model may not be applicable. In such a case, the actual impact will be lower than the simulated impact.

3. **No supply constraint** - There are limitless supplies of intermediate inputs and labour for production, at a fixed price.

If there are limited supplies of resources, industries may have to consider alternatives such as raising imports. In such a case, the actual impact of an increase in final demand will be lower since local

production is unable to fully satisfy the demand and hence the multiplier effects will be correspondingly lower.

Case Studies

The following two case studies illustrate how I-O tables can be used for simulation.

(A) When Final Demand is known

A company announces the decision to set up a new manufacturing plant in Singapore. The new plant is expected to manufacture \$100 million worth of goods that will be exported to an overseas manufacturing plant for further processing.

In this case, the value of the final demand is \$100 million and the relevant industry is the *Goods* industry. Hence, $F_1 = 100$ and $F_2 = 0$.

Using the equations (1.3) with $F_1 = 100$ and $F_2 = 0$, \$150.7 million of additional output is expected to be produced in the economy, comprising \$134.0 million from the *Goods* industry (which includes the initial \$100 million or F_1) and \$16.7 million from the *Services* industry.

The additional output produced by the two industries can be found in the last column of Table 3 which shows the total economic impact of the new manufacturing plant. The table also shows the value of inputs required to produce these additional output, which are computed based on the direct requirement coefficients.

For example, the *Goods* industry requires \$33.1 million of intermediate inputs from its own industry, \$12.3 million of intermediate inputs from the *Services* industry, and \$88.7 million of factor inputs (comprising \$57.2 million of imports, \$0.1 million of taxes on products and \$31.4 million of value added).

$$\begin{aligned} \text{Output of Goods industry: } X_1 &= 1.340 \times 100 + 0.098 \times 0 \\ &= 134.0 \end{aligned}$$

$$\begin{aligned} \text{Output of Services industry: } X_2 &= 0.167 \times 100 + 1.369 \times 0 \\ &= 16.7 \end{aligned} \quad (1.5)$$

$$\text{Total output produced in the economy} = X_1 + X_2 = 150.7$$

TABLE 3 TOTAL ECONOMIC IMPACT OF THE NEW MANUFACTURING PLANT

	Million Dollars			
	Goods	Services	Final Demand	Total Output
Goods	33.1	0.9	100.0	134.0
Services	12.3	4.4	0.0	16.7
Imports	57.2	3.7	-	60.8
Taxes on Products	0.1	0.0	-	0.1
Value-added	31.4	7.7	-	39.1
Total Input	134.0	16.7	100.0	

Note: Figures may not add up to the total due to rounding.

(B) When Final Demand is unknown

When final demand is unknown, I-O tables may be utilised to simulate the economic impact using other information such as employment or income.

Suppose a services company decides to hire an additional 200 workers for production and the output of the services company will be sold to households. Assuming that the homogeneity and fixed proportion assumptions are applicable, the increase in output of the services company can be estimated since any increase in the inputs will result in a proportionate increase in output.

In 2010, the *Services* industry hired approximately 2,182,700 workers⁴ to produce \$475.7 billion of

output. Hence, with the additional 200 workers, the services company is expected to produce an additional \$43.6 million of output to meet final demand from households.

With the estimated final demand, $F_1 = 0$ and $F_2 = 43.6$, the economic impact of hiring an additional 200 workers can be similarly computed as in case study (A).

The \$43.6 million increase in final demand will generate \$64.0 million of additional output, comprising \$4.3 million from the *Goods* industry and \$59.7 million from the *Services* industry (which includes the initial \$43.6 million or F_2). The total economic impact of the increased employment in the *Services* industry is presented in Table 4.

⁴ Source: Ministry of Manpower, "Table C.1, Employment by Industry", *Singapore Yearbook of Manpower Statistics 2014*

$$\begin{aligned}
 \text{Output of services company} &= \text{Increase in workers} \times \frac{\text{Output of Services industry}}{\text{Number of workers in Services industry}} \\
 &= 200 \times \frac{\$475.7 \text{ billion}}{2,182,700} \\
 &= \$43.6 \text{ million}
 \end{aligned}
 \tag{1.6}$$

TABLE 4 TOTAL ECONOMIC IMPACT OF THE INCREASED EMPLOYMENT IN THE SERVICES COMPANY

	Million Dollars			
	Goods	Services	Final Demand	Total Output
Goods	1.1	3.2	0.0	4.3
Services	0.4	15.7	43.6	59.7
Imports	1.8	13.1	-	14.9
Taxes on Products	0.0	0.1	-	0.1
Value-added	1.0	27.6	-	28.6
Total Input	4.3	59.7	43.6	

Note: Figures may not add up to the total due to rounding.

Conclusion

I-O tables are useful tools for economic impact studies as they provide detailed information on the structure of the economy. This article introduces how I-O tables can be used for simulation. Although policy changes may not be as straight-forward as illustrated

in the case studies, simulation using I-O tables can be extended to more industries to analyse the economic impact in greater detail.

Technical details on the applications of I-O tables can be found in the publication on "[Singapore Supply and Use, and Input-Output Tables 2010](#)", available for free downloading from the SingStat website.

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Singapore in Brief, 1965 – 2014

		1965	2014
	Gross Domestic Product (at 2010 market prices)	\$10,047 million	\$380,585 million
	Per Capita GNI	\$1,631	\$69,168
	Gross National Saving	\$367.1 million	\$182,278.9 million
	Inflation Rate	0.3%	1.0%
	Total Trade	\$6.8 billion	\$982.7 billion
	Singapore's Population	1.89 million	5.47 million
	Land Area¹	581.5 sq km	718.9 sq km
	Total marriages	8,993	28,407 ^P
	Old-Age Dependency Ratio²	5.9	16.7
	Doctors Per 10,000 Total Population	5	21

¹ Data are as at December of each year.

² Refers to persons aged 65 years & over per hundred population aged 20-64 years.

^P Preliminary