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Implicit GDP Deflators

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Introduction

This article provides a brief introduction to the concept of the implicit GDP deflators (IGDs), which are indirect price indices derived from the national accounts. It also discusses recent trends in the expenditure-based and production-based IGDs.

Deriving the Implicit GDP Deflators

IGDs provide a broad measure of the change in the overall level of prices of the goods and services that make up GDP between the base year and any other period. An IGD is derived from the following :

- current price GDP, an indicator of changes in quantity and price, as it measures the value of goods and services in the prices prevailing in the current period.
- constant price GDP, an indicator of changes in quantity, as it measures the value of goods and services in the prices prevailing in the base year.

Illustration

The IGD is derived by dividing the current price value of a component of GDP by its corresponding constant price value, and multiplying the result by hundred, as illustrated in Table 1.

- Current price GDP for each year is obtained by summing the current year's quantities at the current year's prices. For example in Year 2, this is obtained by summing (80 x 300) and (60 x 400) to obtain 48,000.
- Constant price GDP is obtained by summing the current year's quantities at the base year's prices. For example in Year 2, this is obtained by summing (70 x 300) and (50 x 400).
- The IGD for Year 1 and Year 2 are 100 [(29,000 / 29,000) x 100] and 117 [(48,000 / 41,000) x 100] respectively. Price has risen by 17 per cent in Year 2.

TABLE 1 DERIVING THE IMPLICIT GDP DEFLATOR

	Year 1 (Base Year)	Year 2	Percentage Change from Year 1
Prices			
Goods 1	70	80	14
Goods 2	50	60	20
Quantities			
Goods 1	200	300	50
Goods 2	300	400	33
Current Price GDP	29,000	48,000	66
Constant Price GDP	29,000	41,100	41
Implicit GDP Deflator	**100**	**117**	**17**

The IGDs are important indicators in the national accounts as they reflect how much of the change in current price GDP from the base period to another year is driven by changes in the price level. To illustrate, current price GDP increased by 66 per cent in Year 2, reflecting a 41 per cent change in quantity (as shown by the change in constant price GDP) and 17 per cent in price (as shown by the change in the IGD).

Differences between the IGDs and the Consumer Price Index (CPI)

The IGDs and the CPI are both measures of price changes. While the IGDs serve as a measure of *overall* price changes in the economy, the CPI is a measure of *consumer* inflation, reflecting price movements in goods and services consumed by households.

In addition, as with other Paasche[1] price indices, IGDs reflect the quantity weights of the current period instead of the base period. The implicit weights of an IGD are updated each period with the changing composition of GDP. Thus, the IGDs do not provide a measure of pure price movements, as they also incorporate changes in the composition of goods and services. The CPI, on the other hand, is a direct Laspeyres[2] price index which reflects the quantity weights of the base period. It is designed to measure the change in the price of a fixed basket of goods and services commonly bought by the majority of households. The differences between the IGDs and CPI are summarised in Table 2.

1 The Paasche price index for period n is computed as $P_{paasche} = (\Sigma P_n Q_n) / (\Sigma P_o Q_n)$ where P_n and P_o are prices in period n and base year respectively, and Q_n refers to quantities in period n.

2 The Laspeyres price index for period n is computed as $P_{laspeyres} = (\Sigma P_n Q_o) / (\Sigma P_o Q_o)$ where P_n and P_o are prices in period n and base year respectively, and Q_o refers to quantities in the base year.

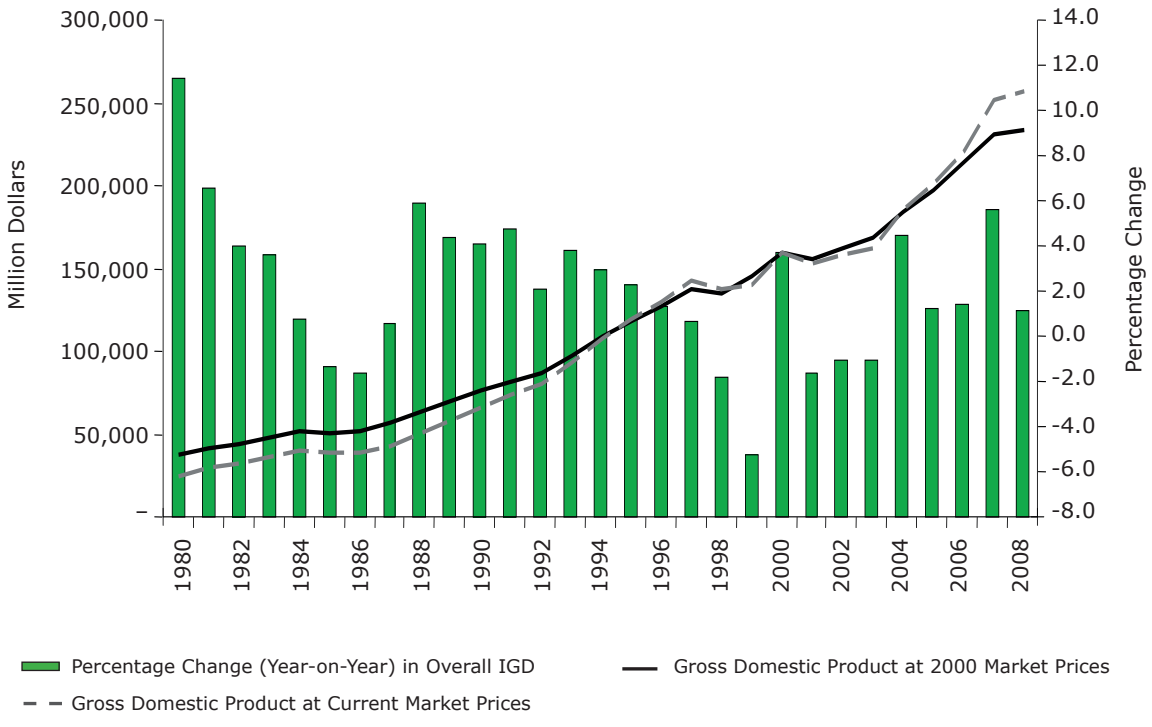
TABLE 2 COMPARISON BETWEEN THE IGDs AND CPI

	IGDs	CPI
Coverage	A broad measure of price changes. The overall IGD reflects price movements of the overall economy. It is derived from current price and constant price values of GDP estimates.	A measure of consumer inflation. The CPI reflects price movements in goods and services consumed by households.
Characteristics	Implicit Paasche price index, i.e. weighted by quantities in the current year. Changes in the IGD could be due to movements in price and/or changes in the composition of goods and services.	Laspeyres price index, i.e. weighted by quantities in the base period. Compares the prices of a constant basket of goods and services between any two periods.

Trends in the Overall IGD

Chart 1 shows Singapore's GDP at current and constant (year 2000) market prices, and the year-on-year percentage changes in the overall economy IGD. The overall economy IGD may be inferred as the gap between GDP at current and constant prices. As expected, movements in the IGD are not smooth, reflecting changes in prices in addition to changes in the composition of goods and services.

CHART 1 GROSS DOMESTIC PRODUCT AT CURRENT AND 2000 MARKET PRICES, 1980-2008



Expenditure-Based and Production-Based IGDs

GDP estimates can be compiled by both the expenditure and production approaches. GDP by the expenditure approach is the sum of these components : gross capital formation, private consumption expenditure, government consumption expenditure and net exports (exports–imports). GDP by the production approach is the sum of gross value added of all industries and taxes on products. Therefore, the IGDs can either be expenditure-based or production-based.

Comparison of the Private Consumption Expenditure IGD and CPI

Private consumption expenditure (PCE) measures the final purchase of goods and services by households. As shown in Chart 2, the trends of the PCE IGD and the CPI are broadly similar, since the CPI is a measure of consumer inflation. Over the period 1995-2008, the average growth rate of both indices is less than 1.5 per cent.

The Production-Based IGDs

Production-based IGDs, which are derived from production-based GDP estimates, reflect the implicit price changes of the various industries. Changes in the overall IGD and IGDs of the goods and services producing industries and ownership of dwellings for the period between 1995 and 2008 are shown in Chart 3.

CHART 2 CHANGES IN THE PRIVATE CONSUMPTION EXPENDITURE IGD AND CPI, 1995-2008

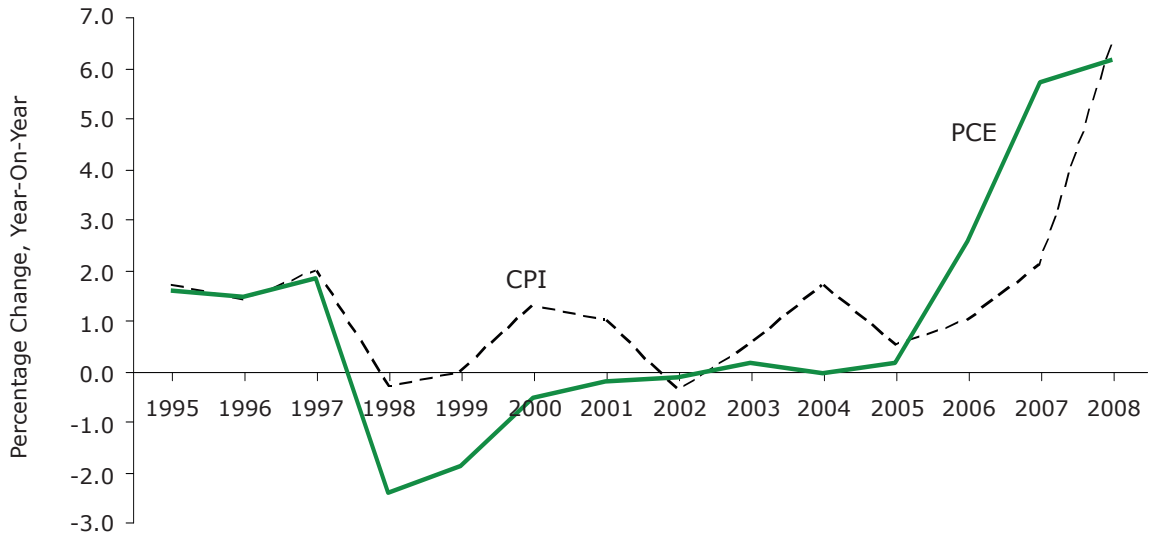
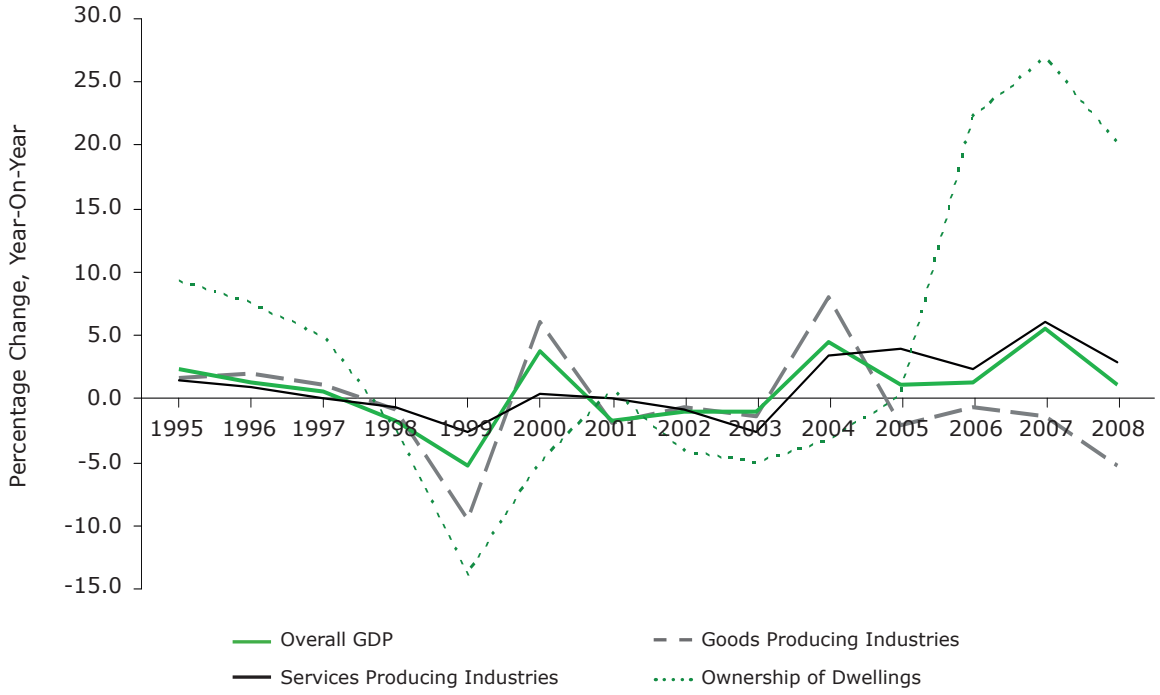


CHART 3 CHANGES IN THE OVERALL IGD AND IGD FOR THE GOODS AND SERVICES PRODUCING INDUSTRIES AND OWNERSHIP OF DWELLINGS, 1995-2008



The goods producing industries' IGD declined by 0.6 per cent from 1995 to 2008. This was mainly due to the manufacturing industry, as the prices of electronics products fell over the same period.

The services producing industries' IGD recorded an average growth of 1.0 per cent from 1995 to 2008. In 2008, growth of the total services IGD moderated from 6.1 per cent in 2007 to 2.9 per cent. The IGD of the transport and storage industry declined by 1.0 per cent, in line with falling freight rates in 2008. The IGD for the wholesale and retail trade industry also fell by 0.5 per cent on the back of slowing global trade.

The IGD of ownership of dwellings, which refers to housing services provided by owner-occupiers and individuals who let out their residential properties, recorded an average growth of 3.1 per cent between 1995 and 2008. In particular, the IGD rose by 27 per cent and 20 per cent in 2007 and 2008 respectively, consistent with the buoyant property market during that period.

Concluding Remarks

Singapore's economy, being small and open, is influenced greatly by external factors. Movements in the IGDs are pronounced, reflecting changes in price and the composition of goods and services in the economy, especially in significant periods such as the Asian Financial Crisis in 1998-99, and the global economic crisis in 2008.

References

- UK Office for National Statistics : "Economic and Labour Market Review June 2008", pages 53-56.