How to improve Singaporean Economy and Tourism after 2008 Global Financial Crisis

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Abstract

The 2008 global financial crisis had strong negative economic effects worldwide, particularly on tourism. Determining appropriate policy responses to mitigate these negative effects is important. Accordingly, this study employs recent Singaporean tourism survey data, updated Singaporean input-output tables, and a Computable General Equilibrium (CGE) model to gauge the short-run negative effects of the 2008 global financial crisis on the Singaporean tourist sector and to simulate the effects of policy responses. The simulation results suggest that a GST deduction policy would be more effective than an industrial subsidy policy. However, if the latter is used by government, then a tourism focused subsidy policy is recommended since it is more effective than the economy-wide industrial subsidy in terms of both tourism and the aggregate economy.

Introduction

The 2008 global financial crisis (GFC) had a dramatic impact on the world economy, especially on the tourism industry. In Singapore, for example, tourism declined by 13.5 per cent in the first half of 2009 compared with the first half of 2008 (STB, 2009). As a consequence of the global crisis, the Singapore economy contracted by 2.0 per cent in 2009 (MTI, 2009). An important question in this regard is how Singaporean authorities should have reacted to the crisis in terms of effective policy responses to forestall, not only the GFC's impact on the aggregate Singaporean economy, but also, specifically, the tourist sector. The present paper investigates this question empirically by considering three public policy options. Employing the recent Singaporean tourism survey data, updated input–output tables and contemporary CGE modelling techniques, this study estimates the effects of 2008 GFC on Singapore's tourism sector and the aggregate economy, and compares the effects of different policy options.

The paper is divided into four main parts. Section 2 provides a synoptic review of previous empirical work in the area. Section 3 describes the nature of the model employed, the database and simulation design of the research. Section 4 provides an analysis of the results of the simulation exercises. The paper ends in section 5 with some brief concluding comments.

Previous Empirical Studies

There are many studies applying CGE modeling to tourism. However, for the purpose of this study, only empirical work on the effect of catastrophic negative events and/or on policy effects is reviewed. In the present context, the estimation of the event effect

normally consists of two discrete parts: (a) the effect of an event on tourism demand is estimated, and then (b) a CGE model is employed to gauge the resultant economic effects of the change in tourism demand.

Working in, this tradition, Adams et al. (2002) estimated the impact of the 11th September 2001 terrorist attacks on tourism in Australia and, more broadly, on the Australian economy. They used a Monash Dynamic CGE model to generate both macro and sectoral base-case forecasts on pre-11th September assumptions and alternate simulations, including the downturn caused by the event. Through comparison of the base-case forecast and the alternate simulation, the study estimated that the terrorism event resulted in a sharp downturn in the international tourism industry, which had negative impacts on real GDP, aggregate consumption and aggregate imports; it reduced Australia's terms of trade and caused serious adverse effects on employment in some heavily tourist-dependent regions and sub-regions. However, the model showed the overall reductions in employment would be not much more than 10 per cent.

Blake and Sinclair (2003) used a 98-sector CGE model of the US economy to estimate the impact of the 11th September attacks in the absence of any offsetting policy response as well as its impact under different policy responses. In the absence of offsetting policies, the model suggested that the terrorist attacks would have had severe effect: the fall in tourism expenditure reduced GDP by $30 billion and worsened the federal government budget by over $7 billion; and the loss of employment would have been as high as 383,000 full time equivalent jobs. Among the total estimated 559,000 jobs lost, 203,000 were in the aviation industry and 174,000 were in accommodation. The model also showed that the implementation of crisis management policies would have been very effective in reducing the adverse effects of the terrorist attacks, but the relative effectiveness of different policy responses varied considerably. Moreover, directing subsidies to the sector most severely affected by the crisis is the most efficient policy response in terms of both GDP and the total number of jobs saved.

Blake et al. (2003) used a CGE model to analyse the impact of Foot and Mouth Disease (FMD) on tourism and the British economy. A micro regional tourism simulation model was employed to estimate the reduction of tourism expenditures due to FMD. The model estimated a fall of almost £7.5 billion in total tourism revenue in 2001. A CGE model was then used to estimate the economic impact of a tourism contraction. The results indicated that the economic impact of a tourism contraction is much bigger than the effect of reduction in affected agricultural products. The total fall in GDP due to the FMD crisis was an estimated £2.5 billion, of which the fall in GDP as a consequence of tourism expenditure decreases accounted for £1.93 billion. Moreover, the model suggested that FMD would affect tourism and the economy for several years.

Narayan (2003) applied a CGE model to estimate the long-term economic impact of the May 2000 coup in Fiji. The study used post-coup statistical data as the basis for modelling. For example, following the coup, visitor arrivals fell by 39.4 per cent, investment decreased by 33.1 per cent, private transfers aboard increased by F$36.6 million, government expenditure increased by 9.9 per cent and the real interest rate increased by 3.5 per cent. Since the focus of the study concerned long-run effects, the CGE model assumed that capital is mobile across the sectors and the capital stock is

adjusted to a fixed rate of return to capital. The main findings of the study were that real GDP fell by around 8.2 per cent, exports declined by around 14.9 per cent, the BOP deficit increased by F$4.8 million and government revenue fell by around 4.8 per cent. At the sectoral level, the real outputs of the hotel, transportation, commerce, and business services industries were among the worst affected, largely due to the sharp fall in visitor arrivals.

Finally, Gooroochurn (2004) used both the Ramsey model of optimal commodity taxation and a single country static CGE model to investigate the efficiency and equity effects of tourism taxation in Mauritius. Gooroochurn (2004) established that both analyses confirmed that taxing tourism was more efficient than taxing other sectors and had positive equity effects. The reason for this finding was that taxing tourism related sectors was relatively more efficient than taxing other sectors because of the relatively less elastic demand of tourists and the irrelevance of the loss of consumer surplus of international tourists in measuring social welfare. In addition, taxing tourism had positive equity effects because most tourism products are classified as luxury goods and domestic consumption of these goods comes mostly from individuals in the higher income brackets.

Model, Data and Simulation Design

CGE modelling involves a number of assumptions, the use of disaggregated data and the specification of supply and demand functions, behavioural-parameter values, and simulation shocks. This section briefly considers each in turn.

CGE model for Singapore tourism and the Singapore economy

The model developed for this study is a static CGE model based on ORANI G (Horridge 2000) and it belongs to the Johansen class of CGE models. TABLO language is used to build the model and GEMPACK 10 is employed to implement the simulations. The model employs standard neoclassical economic assumptions: a perfectly competitive economy with constant returns to scale; cost minimisation for industries and utility maximisation for households; continuous market clearance; labour is perfectly mobile across industries while capital is treated as industry-specific. In addition, zero profit conditions are assumed for all industries because of perfect competition in the economy. Since Singapore is a small open economy, it is assumed that it is a price taker in the world market.

The Singapore economy is represented by 34 industries which produce 34 goods and services, one representative investor, one household sector, one government and eight occupation groups. Tourism shopping and non-shopping demands are extracted from exports as independent final demands for the purposes of the present study. The production function is a 4-level nested CET-Leontief-CES function: the top level is a CET function allowing for firms to change products with some flexibility; the second level is a Leontief function reflecting fixed proportions among the composite intermediate inputs and composite primary factors; the third level is a CES function reflecting the substitution effect between import and domestic inputs and between labour and capital; and the bottom level is a CES function reflecting the substitution effect among different labour groups. The household demand function is a 2-level nested LES-CES function. The LES

function at the top reflects the ability of households to adjust their combination of consumption in response to income changes. The CES function at the bottom reflects the flexible choice between imported and domestic goods in household consumption. The tourism non-shopping demand is a 2-level nested Leotief-CES function and the tourism shopping demand is a 2-level nested CD-CES function.

Data and parameters

Data needed for this study are mainly input-output data and tourism expenditure data. The input-output data are readily available from the 2000 Singapore I-O tables. These data are adjusted for use in this CGE model in two ways. Firstly, the data are updated to a base year of 2006 by employing the RAS method. Secondly, the 152 industries and commodities in the Singapore input-output table are aggregated to fit the purposes of the present study.

The tourism expenditure data are taken from the Singapore tourism survey. Since shopping expenditure represents the bulk of total tourism spending, we break down the data according to the tourism shopping pattern in the Singapore tourism survey.

The behavioural parameters in this paper mainly consist of inport-domestic substitution elasticities (Armington elasticities), factor substitution elasticities, product transformation elasticities, consumer demand elasticities and export demand elasticities. The Armington elasticities, factor substitution elasticities, household demand elasticity and expenditure elasticity are adopted from the GTAP 6 database. Following the practice of Siriwardana and Schulze (2000), the elasticities of substitution between different labourer types were assigned a value of 0.5 for every industry. There are no econometric estimates for product transformation elasticities for Singapore. However, estimates of CRETH transformation parameters in the ORANI model for the Australian economy have values between 0.06 and 4.55, with most of the estimates around 0.3-0.5 and 1.3-1.6 in value. We adopt 0.4 as an estimate for the agriculture sector in Singapore and 1.5 for other sectors.

A value of -20.0 was assigned to the foreign demand elasticity for Singapore's non-manufactured exports. In the case of manufactured goods, Singapore has huge capacity in the production of oil products, non-metal chemical products and electronic goods. Hence, values of -5.5 were assigned to those sectors and -10.0 for the other manufacturing sectors.

Model closure and simulation scenarios

Since the total number of variables in the model is more than the number of equations, some variables need to be determined exogenously. For the purposes of this study, the following variables were specified as exogenous for all simulations: technical changes, consumer taste changes, tax rates, exchange rates, government spending, tourism demand, and inventory. Since this paper only considers the short-run effects, investment, real wages and real private consumption were also specified as exogenous.

According to the STB, Singaporean tourism receipts in the first half of 2009 were estimated at 6.4 billion Singapore dollars; a decline of 13.5 per cent compared with the

first half of 2008. Consequently, a 13.5 per cent negative shock to Singapore tourism demand was chosen for the baseline case. The policy options considered in this study are based on the previous empirical work and several different policy approaches were considered. From a demand-side perspective, although the policy tool of tourism tax is suggested by some researchers, it is not practical for use since it is very hard to differentiate between tourists and local people when they are purchasing goods and services (unless sellers adopt the draconian practice of checking buyer identity). Thus, for a consumer-side policy, this study excludes this option and only considers a broader sales tax deduction: 1 per cent decrease in the power of GST (one plus GST rate); for a 10 per cent GST rate, this means that the power of GST becomes 1.1-0.011=1.089, so the GST rate is 8.9 per cent, which is a 1.1 per cent decrease from the original rate). For a supply approach, two options were considered. One is a 1 per cent subsidy (i.e. a 1 per cent decrease in the production tax rate) to all producers, which is also a broad policy alternative to GST deduction. The other is a 4 per cent subsidy to tourism industries, which represents the tourism-focused approach. The subsidy rate to tourism industries is chosen so that the total loss of tax revenue in this policy is approximately equivalent to that in the GST deduction policy. Thus, the following four scenarios were simulated.

Scenario (I): 13.5 per cent decrease in total tourism expenditure in the short run;
Scenario (II): Scenario I plus 1 per cent decrease in the power of GST;
Scenario (III): Scenario I plus 1 per cent subsidy to all industries;
Scenario (IV): Scenario I plus 4 per cent subsidy to tourism industries.

Simulation Results

The four policy options set out in the above section were simulated using a CGE model and GEMPACK version 10 software. It is possible that the resultant empirical estimates may be sensitive to parameter specification, so sensitivity tests were performed for each simulation by doubling the elasticity parameter values one by one. The results (available upon request) were found to be reasonably insensitive to the specification of these parameters. The simulation results are shown in Tables 1 to 4. With a few exceptions, values are shown as percentage changes compared with the baseline case.

Macroeconomic effects

Table 1 displays the projected macroeconomic effects of all policy simulation scenarios. From Table 1 we can see the main features of the macroeconomic effects of a 13.5 per cent negative shock to tourism demand in Singapore, with and without policy responses. Firstly, the tax revenue loss (that is, the first three rows) is different for each simulated policy scenario. Without a policy response, the total tax revenue (tariff, indirect tax and production tax) decreased by less than 50 million dollars, the bulk of which comes from the decrease in indirect tax revenue. The GST deduction policy response will lead to a decrease of almost 6 billion dollars in indirect tax revenue. Other tax revenue (i.e. tariff and production tax) actually increases by a small amount. The 1 per cent indiscriminate industrial subsidy results in not only a loss of 4 billion dollars of production tax income, but also a more than 4 billion loss of indirect tax revenue.

Although the tariff revenue increases slightly, the total tax revenue loss amounts to more than 8 billion. The 4 per cent subsidy to the tourism industry leads to negative growth in all three components of tax revenue. The total loss is around 6 billion—similar to that under the GST policy.

Table 1: Macroeconomic effects of negative shocks and policy responses

Macros	13.5% decrease in total tourism expenditure in the short run (I)	Scenario (I) plus 1% decrease in the power of GST (II)	Scenario (I) plus 1% subsidy to all industries (III)	Scenario (I) plus 4% subsidy to tourism industry (IV)
Tariff revenue*	-5.411	22.953	8.938	-3.999
Indirect tax*	-29.955	-5940.023	-4133.783	-3115.321
Production tax*	-12.261	68.813	-4074.508	-3047.964
GDP deflator	-0.131	-1.657	-1.033	-0.743
Nominal wage (CPI)	-0.114	-0.972	-0.576	-0.708
Tourism shopping price	-0.297	-0.962	-0.703	-1.31
Tourism service price	-0.319	-1.833	-1.527	-4.253
Real devaluation	0.131	1.68	1.042	0.748
Terms of trade	-0.037	-0.538	-0.338	-0.19
Employment	-0.191	6.517	4.61	5.626
Payment to capital	-0.154	5.303	3.791	3.149
Payment to labour	-0.305	5.492	4.011	4.884
Primary factor payment	-0.226	5.393	3.896	3.976
Nominal GDP	-0.263	1.083	0.903	1.575
Real GDP	-0.132	2.778	1.953	2.333
Nominal imports	-0.105	3.548	1.931	0.779
Real imports	-0.105	3.548	1.931	0.779
Nominal exports	0.488	5.612	3.7	3.113
Real exports	0.526	6.178	4.049	3.308
BOT contribution to GDP (real)*	0.766	3.678	2.851	3.225
BOT/GDP (nominal)*	0.008	0.028	0.023	0.028

*Nominal change: Singapore dollars (million).

Secondly, note the effects on prices are shown in the second panel of Table 1: At first glance it would appear that all prices are affected negatively under all scenarios (since positive real devaluation also means the depreciation of domestic currency) and that all policy responses tend to aggravate this negative effect. In the baseline case, both the CPI and GDP deflator decrease by more than 0.1 per cent, and it can be readily appreciated that this is due to the contraction of final demand (that is, the antithesis of

demand-pulled inflation). Accelerated deflation under the GST policy is explained by increased efficiency due to the decreased tax distortion to the economy (more specifically, a sales tax deduction will reduce the tax payment burden not only on consumers but also on producers). The subsidy policy decreases domestic prices by reducing the production costs. When we turn to the different price indexes, we find that the GDP deflator decreases more than the CPI, which may suggest that the prices induced by falling intermediate demand and investment demand decrease far more than prices faced by consumers. Prices faced by tourists drop more than the CPI, which is explained by the negative shock in tourism demand. By the same reasoning, it is not a surprise that the tourism-focused subsidy will lead to much bigger decreases in prices faced by tourists, which is especially true for tourism services prices.

The immediate effects of drops in domestic prices are the devaluation of local currency and worsening of terms of trade. The decrease in domestic price level means the local currency has greater purchasing power, so it should thus appreciate. But this is hampered by the fixed exchange rate assumed in the simulation. Accordingly, at the current fixed exchange rate, the local currency is actually devaluated. Since the calculation of real devaluation is based on a GDP deflator, the value of real devaluation follows that of the GDP deflator closely. Under the assumption that the world prices do not change, a decreased domestic price level leads to a lower domestic/world price ratio, and therefore the terms of trade worsen.

Third, employment is significantly and negatively affected by the global financial crisis and all three policy responses seem very effective in improving employment. As a result of the negative tourism demand shock, the production of goods and services will contract and thus unemployment will go up. The GST policy improves the employment by more than 6 per cent, which can be explained by the increase in final demand induced by a GST deduction. The subsidy policies stimulate employment through two channels: reducing production costs and passing the benefit to consumers through lower prices and thus stimulates final demand. However, the simulation results show that the GST policy is the most effective. In considering the two subsidy policies, the tourism-focused policy improves employment more significantly with much less loss in tax revenue.

These effects on employment are confirmed by payments to primary factors and to GDP. Without a policy response, payments to both labour and capital decrease. The GST policy increases the return on both factors to the greatest extent, followed by the tourism focused subsidy policy. It is worth noting that, compared with baseline case, the payment to labour increased more under all policies, especially for the tourism subsidy policy. The change in GDP is interesting. The performance of real GDP seems much better than that of nominal GDP due to the deflation in all scenarios. Although the tourism subsidy policy performs best according to nominal GDP, the GST policy is superior according to real GDP. This may be explained by the higher degree of price decreases under the GST policy.

Finally, international trade improves under all policy options, as shown in the last panel in Table 1. Due to the decrease in tourism demand, imports will decrease. Since the prices of imports are based on world prices and the world price level is assumed

unchanged in the model, the change in both real imports and nominal imports are the same. All three policies reverse this change in imports. GST policy encourages importation most, followed by the indiscriminate subsidy policy. The performance of exports under the impact of the negative tourism demand shock is significantly positive. This effect may result from two channels: (a) tourists tend to buy products in Singapore, which they take home, and these products would otherwise be part of exports; and (b) the real devaluation of the Singapore dollar makes domestic prices relatively lower than world prices and thus stimulates exports. Under all policy responses, real and nominal exports increase remarkably. Since exports increase much faster than imports under all scenarios, whereas imports decrease in scenario (I), the contribution of balance of trade to GDP increases under all scenarios. The real contribution is much more significant than the nominal impact because of the decrease in the domestic price level.

Sectoral effects

There are 34 sectors in the model, but for simplicity purposes and space constraints only twenty-two sectors are shown in Table 2, half of which are tourism related. Similarly, we only display the output and the gross rate of return on capital for each sector in Table 2, although there are many variables describing the sectoral effects. Sectoral employment is considered in the next section.

With respect to scenario (I), it is clear that the tourism related sectors (i.e. the first eleven sectors in Table 2) are generally hit much harder than the other sectors. This result is explained by the source of shock. However, the specific effects on sectors, both within and outside tourism industry, are different. In the tourism industry, the Accommodation sector, the Clothing sector and the Drink & Tobacco sector are hit hardest. Their outputs fell by 11.12 per cent, 7.01 percent and 3.48 percent respectively. The Sightseeing, Food & Beverage (F&B), Health Care, Wood and Print, and Local Transport sectors are also affected adversely, whereas the other two sectors are affected very mildly. For example, output in the trade sector decreases by only 0.32 per cent. It is surprising to note that the Recreation sector is hardly affected. For the non-tourism sectors, most are affected very mildly, such as the Electronics, Utilities, Finance, and Real Estate sectors. But the Precise Engineering sector was hit fairly hard; 1.94 per cent decrease in its output. This result may suggest that it is closely linked to the tourism sector. For example, some high value souvenirs may come from this industry. Other sectors even showed slight positive growth in output. For instance, the Storage Service and Other Manufacture sectors increased output by 0.79 per cent and 0.89 per cent, respectively. This may suggest that these sectors are tourism-competing industries.

Under scenario (II), some sectors show a significant increase in output. The Food Manufacture and Trade sectors in tourism industry, for example, expand production by 10.15 per cent and 4.64 per cent respectively, while many tourism sectors only increase their output mildly. In the non-tourism industry, the IT sector increases its output by as much as 14.55 per cent. Some other sectors such as the Oil Manufacture, Electronics, Other Manufacture, Storage Service and Finance expand their output by between 4 per cent to 6 per cent. These different growth rates may be explained by the volume of output in each sector. Due to the ad valorem nature of GST, the sectors with a high volume of output would benefit more from the GST deduction. Although most sectors show positive growth, some tourism sectors struggle in contraction; for example, the Accommodation, F&B, Wood and Print, and Drink and Tobacco.

Table 2: Sectoral effects of a negative tourism demand shock and policy responses

Sector	13.5% decrease in total tourism expenditure in the short run (I)		Scenario (I) plus 1% decrease in the power of GST (II)		Scenario (I) plus 1% subsidy to All industry (III)		Scenario (I) plus 4% subsidy to tourism industry (IV)	
	Output	Gross rate of return on capital	Output	Gross rate of return on capital	Output	Gross rate of return on capital	Output	Gross rate of return on capital
Food Manufacture	-1.074	-1.337	10.153	12.329	6.695	8.038	30.375	35.976
Drink & Tobacco	-3.479	-6.56	-2.697	-4.871	-2.605	-4.869	-1.262	-2.879
Clothing	-7.006	-8.727	-2.992	-3.529	-4.041	-4.999	5.26	5.994
Wood & Print	-0.998	-1.463	1.841	2.767	1.406	1.975	6.559	8.671
Trade	0.317	0.297	4.637	5.525	3.687	4.264	8.672	9.373
Food & Beverage	-2.33	-2.047	-1.184	-0.798	-1.423	-1.108	0.17	-0.34
Accommodation	-11.116	-7.064	-10.062	-6.136	-10.351	-6.45	-10.018	-6.769
Local transport	-0.886	-1.375	0.977	1.658	0.547	0.908	3.401	4.52
Sight seeing	-2.52	-2.758	0.352	0.575	-0.448	-0.424	0.054	-0.441
Health care	-1.311	-1.271	0.741	0.866	0.279	0.263	3.406	2.589
Recreation	-0.069	-0.134	1.76	2.243	1.394	1.786	3.618	3.647
Oil manufacture	0.015	-0.015	6.382	18.992	3.439	10.109	-0.069	-0.663
Electronics	-0.004	-0.079	3.639	11.316	2.171	6.591	0.169	-0.012
Precise engineering	-1.937	-3.839	1.861	3.852	1.26	2.482	4.477	8.32
Other manufacture	0.886	1.535	5.449	10.182	4.754	8.702	6.939	12.176
Utility	-0.118	-0.568	1.504	7.01	1.218	5.737	1.055	4.261
Storage service	0.788	0.564	6.328	5.234	5.224	4.201	8.942	6.549
Communication	0.049	0.089	1.751	5.935	1.317	4.317	0.904	2.417
IT	0.273	0.191	14.548	14.055	9.293	8.87	0.602	0.055
Finance	-0.022	-0.109	3.836	7.189	2.916	5.315	5.129	8.819
Real estate	-0.046	-0.261	0.764	3.393	0.582	2.448	0.596	1.968
Other business service	0.22	0.31	2.752	4.953	2.292	3.986	2.757	4.234

The output in scenario (III) tells a similar but much milder story. Although most sectors expand their output, growth rates are much lower. For instance, the IT and Food Manufacture sectors grew at 9.29 per cent and 6.70 percent respectively, instead of 14.55 per cent and 10.15 per cent as under the GST policy. However, more tourism sectors are in recession and the degree of contraction is slightly greater than under GST policy with the exception of The Drink and Tobacco sector.

Scenario (IV) provides a substantial improvement in all tourism sectors. The Food Manufacture sector is the biggest winner, increasing its output by 30.38 per cent. Most tourism sectors expand their output in the range 3.40 per cent to 8.67 per cent. However, Sightseeing and F&B show only marginal growth and Accommodation, and Drink and Tobacco are still in recession—the Accommodation sector experiences a 10.02 per cent decrease in output. The sluggishness of these core tourism sectors manifests itself in the vitality of tourism demand for them. Although no subsidies are paid to the non-tourism sectors, most of them experience significant growth; Precise Engineering grows by 4.48 per cent, Other Manufacture by 6.94 per cent, Storage Service by 8.94 per cent and Finance by 5.13 per cent. This shows the linkage between the tourism industry and these industries. However, Oil Manufacture experiences a slight contraction, which confirms the fact that it competes with the tourism industry.

The behaviour of the rate of return on capital largely follows that of output for much the same reasons. However, two features are worth noting. Firstly, not all changes in the return to capital are in the same direction as that of corresponding output. For example, in the Oil Manufacture sector under scenario (I), the F & B, Sightseeing and Electronics sectors under scenario (IV), return on capital decreases insignificantly while the output increases slightly. This may derive from the behaviour of firms under recessionary conditions. In order to avoid the costs of change (such as compensation packages for fired workers, idleness machinery and loss of skilled workers), firms tend to keep output growing at the expense of a temporary loss in profit.

Secondly, in some sectors, the rates of change of output are higher than those on return to capital while other sectors exhibit the opposite. This may be explained by returns to scale and fixed costs in each sector. Many manufacturing sectors (such as Food Manufacture, Drink and Tobacco, Clothing, Oil Manufacture, Electronics, Precise Engineering and Other Manufacture), the Utility sector and the Finance sector have high fixed costs and enjoy increasing returns to scale. Thus the return to capital increases faster as output increases. Some other sectors, like Accommodation, F&B, Health Care, Storage Service, are labour intensive so there are relatively low fixed costs but high variable costs. Accordingly, as output decreases, the return on capital falls less because firms can reduce variable costs (by firing workers and reducing input stocks).

Effects on labour market

Since the real wage is fixed and the nominal wage is fully indexed to the CPI in the short-run simulations, we only consider the change in employment under the different scenarios. Because employment affects output, we list output when tabulating employment by sectors, as shown in Table 3.

Table 3: Sectoral employment under negative shocks and policy responses

Sector	13.5% decrease in total tourism expenditure in the short run (I)		Scenario (I) plus 1% decrease in the power of GST (II)		Scenario (I) plus 1% subsidy to All industry (III)		Scenario (I) plus 4% subsidy to tourism industry (IV)	
	Output	Employ-ment	Output	Employ-ment	Output	Employ-ment	Output	Employ-ment
Food Manufacture	-1.074	-1.424	10.153	13.642	6.695	8.96	30.375	41.684
Drink & Tobacco	-3.479	-7.249	-2.697	-5.638	-2.605	-5.447	-1.262	-2.653
Clothing	-7.006	-10.81	-2.992	-4.653	-4.041	-6.271	5.26	8.302
Wood & Print	-0.998	-1.753	1.841	3.256	1.406	2.484	6.559	11.736
Trade	0.317	0.615	4.637	9.083	3.687	7.208	8.672	17.136
Food & Beverage	-2.33	-3.317	-1.184	-1.688	-1.423	-2.029	0.17	0.243
Accommodation	-11.116	-11.526	-10.062	-10.435	-10.351	-10.734	-10.018	-10.389
Local transport	-0.886	-2.198	0.977	2.44	0.547	1.363	3.401	8.567
Sight seeing	-2.52	-3.383	0.352	0.474	-0.448	-0.603	0.054	0.073
Health care	-1.311	-1.513	0.741	0.856	0.279	0.322	3.406	3.939
Recreation	-0.069	-0.1	1.76	2.529	1.394	2.002	3.618	5.211
Oil manufacture	0.015	0.055	6.382	24.056	3.439	12.656	-0.069	-0.245
Electronics	-0.004	-0.013	3.639	14.163	2.171	8.341	0.169	0.637
Precise engineering	-1.937	-4.732	1.861	4.631	1.26	3.126	4.477	11.28
Other manufacture	0.886	2.027	5.449	12.709	4.754	11.057	6.939	16.281
Utility	-0.118	-0.654	1.504	8.548	1.218	6.892	1.055	5.957
Storage service	0.788	1.063	6.328	8.574	5.224	7.071	8.942	12.141
Communication	0.049	0.199	1.751	7.275	1.317	5.445	0.904	3.723
IT	0.273	0.329	14.548	17.7	9.293	11.27	0.602	0.726
Finance	-0.022	-0.05	3.836	8.877	2.916	6.721	5.129	11.93
Real estate	-0.046	-0.242	0.764	4.049	0.582	3.077	0.596	3.151
Other business service	0.22	0.476	2.752	6.022	2.292	5.007	2.757	6.034

A noteworthy feature of Table 3 is that the changes in employment and output are always in the same direction, with no exceptions. This is not surprising. The change in

output results from changes in labour, capital and technology. In the short run closure, we assume that there is no technological change and that capital is immobile between sectors. Since the change in capital input is very limited, the increase in output largely relies on the increase in labour inputs. Thus they should move in the same direction.

A second interesting feature of Table 3 is that the change in employment is generally greater than that of output, but the degree of difference varies in different sectors. The greater change in employment is the result of homogeneity assumption of the model. Based on this assumption, the same percentage change of capital, employment and technology level should give rise to the same percentage change in output. However, since the technology level is not changed, and capital input is barely changed under our simulation assumptions, the change of labour input has to be greater. The degree of the employment changes depends on the labour and capital shares of the sector. For a sector which has a very high capital share, such Oil Manufacture and Precise Engineering, the labour input must change more to compensate for the limited change in capital inputs. On the other hand, industries with a high labour input share, such as Accommodation, F & B, and Health Care, demonstrate much less difference between the changes in output and labour input.

Finally, Table 3 describes the different effects on employment of the different policy options. The GST policy significantly improves employment in manufacturing sectors. For example, there is a 24.06 per cent increase in Oil Manufacture, 13.64 per cent in Food Manufacture, 14.16 per cent in Electronics and 12.71 per cent in Other Manufacture. Many services sectors also benefit a great deal: 17.7 per cent increase in employment in the IT industry, 9.08 per cent in Trade, and 8.88 per cent in the Finance sector. The indiscriminate subsidy policy affects employment in a similar way to GST policy. However, with much greater government expenditure (or tax revenue loss), it improves employment more mildly than GST policy. The tourism subsidy policy makes a decisive positive difference to the employment in tourism sectors: a 41.68 per cent increase in Food Manufacture, 17.14 per cent in Trade, 11.74 per cent in Wood & Print and 8.57 per cent in Local Transport. Some non-tourism sector also exhibit significant improvements (16.28 per cent in Other Manufacture, 12.14 per cent in Storage Service, 11.93 per cent in Finance and 11.28 per cent in Precise Engineering). However, even with this tourism focused policy, the Accommodation sector and Drink & Tobacco sector still contract and the Sightseeing and F&B experience only very slight improvements.

Employment by occupation reveals another facet of the labour market, as shown in Table 4.

Table 4: Occupational employment under negative shocks and policy responses

Macros	13.5% decrease in total tourism expenditure in the short run (I)	Scenario (I) plus 1% decrease in the power of GST (II)	Scenario (I) plus 1% subsidy to All industry (III)	Scenario (I) plus 4% subsidy to tourism industry (IV)
Managers	-0.027	7.345	5.293	7.136
Professionals	-0.088	6.24	4.418	4.472
Technicians	-0.116	6.474	4.624	5.348
Tradesmen	-0.15	6.585	4.711	6.152
Clerks	-0.985	3.983	2.74	6.8
Sales men	-0.207	5.465	3.597	2.103
Plant workers	-0.213	9.169	6.233	5.067
Other Labourers	-1.224	1.989	1.077	1.817

A noteworthy aspect of Table 4 resides in the fact that skilled occupation groups (that is, the first 4 rows) are better positioned under all scenarios: under negative tourism demand shocks, employment in these groups declined much less, and their employment generally improved more under all policy responses. Specifically, without a policy in position, employment in the Clerks group and Other Labourers group decreases much more than other groups. Under the GST policy, they benefit the least. However, one type of low skilled workers, Plant Workers, benefit most, which can be explained by the fact that, in common with Table 3, the manufacturing industry is one of the biggest beneficiaries of the GST policy because if its high volume of output. The indiscriminate subsidy policy has a similar effect to the GST policy, but its effects are much milder. The tourism focused subsidy policy improves employment in many sectors at a magnitude similar to that under the GST policy. However, under this policy, the Clerks group will benefit more while the Salesmen and Plant Workers groups will benefit less. Accordingly from the point view of occupation, no employment group will be in favour of the indiscriminate subsidy policy, while Managers, Tradesmen and Other Labourers should be indifferent between GST policy and tourism subsidy policy. Professionals, Technicians and Salesmen will prefer the GST policy; Plant Workers will prefer the GST policy and Clerks the tourism subsidy policy.

Conclusion

Based on the CGE model simulations, this paper has analysed the macro, sectoral and employment effects of three different policy responses to the 2008 global financial crisis. Our analysis has shown that all policy options considered—the GST deduction, the indiscriminate industrial subsidy and the tourism focused subsidy—are effective in terms of the change in GDP, employment and return on capital. However, the results of these policies are quite different in a number of ways.

First, the GST deduction policy is the most effective policy overall. With least tax revenue loss, the GST deduction policy achieves the highest increase in employment, real GDP and payment to primary factors. Real exports and imports increase much more significantly under the GST deduction policy than under the other polices. The 1 per cent economy-wide industrial subsidy policy (with the highest tax revenue loss), achieves an effect similar to, but much milder than, the 1 per cent GST deduction policy. With equivalent government expenditure (or tax revenue loss), the 4 per cent tourism focused subsidy policy achieves a result which is not as good as GST policy, but nonetheless much better than the indiscriminate subsidy policy. In fact, it achieves the highest increase in nominal GDP due to its lower impact on the GDP deflator. Given the ease of implementation of a GST policy, and with the least government revenue loss, the GST deduction is the most advisable policy response to the global financial crisis. However, if a government prefers the subsidy policy, then the tourism focused subsidy policy is much better than the indiscriminate subsidy policy.

Second, different sectors may have different preferences for the three proposed policies according to the simulation results with respect to sectoral output, capital return and employment. The GST deduction policy seems in favour of industries with high volume of output, especially the manufacturing sectors and the IT sector. This result is readily explained by the ad valorem nature of GST. The economy-wide subsidy policy will bring

more benefit to high production cost industries, which, in most cases, are also industries with a high volume of products. However, the Oil Manufacture, Food Manufacture and IT sectors will benefit much less than under the GST policy. The tourism focused subsidy policy will bring extraordinary positive change to the tourism industry. Non-tourism sectors with close linkage to tourism industry, like Precision Engineering, will also benefit significantly even if they have not received any subsidies. The core tourism industry such as Accommodation and F&B sectors show little improvement, even under the tourism focused subsidy policy.

Finally, highly skilled workers (that is, managers, professionals, technicians and tradesmen) seem less affected by the global financial crisis and would benefit most from any of the three policy options, while the Other Labour group featured worst under all scenarios. However, the Salesmen and Plant Workers would benefit strongly from the GST deduction policy, while the Clerks would be better off under the tourism focused subsidy policy. All other groups would prefer the GST deduction policy.

We conclude this paper by drawing some putative lessons of this type of policy modelling from this study for policy makers. In the first place, policy options proposed should be feasible and comparable. Second, the selection of parameter value and simulation closure is important to CGE modelling results. The parameter values should reflect the reality of the economy in question. If no estimated parameter values are available, then sensitivity tests have to be performed or the modelling results will not be reliable. Moreover, the choice of exogenous variables should be based on the characteristics of the particular economy and the scenarios proposed. Finally, the modelling results should be interpreted in line with economic theory and the reality of the economy under consideration. Any inconsistent and unjustifiable result may indicate an implausible model assumptions or even errors in the model and/or in the database.

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