Assimilation of tourism satellite accounts and applied general equilibrium models to inform tourism policy analysis

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Abstract

Tourism policy analysis in South Africa has historically posed challenges to accurate measurement. The primary reason for this is that tourism is not designated as an 'industry' in standard economic accounts. This paper therefore demonstrates the relevance and need for applied general equilibrium (AGE) models to be complemented and extended through an integration with tourism satellite accounts (TSAs) as a tool for policy makers (especially tourism policy makers) in South Africa. The paper provides motivation for the need for economic models for policy analysis and other purposes in general, followed by an overview of old and new approaches to tourism policy modelling. The relevance of integrated models to specifically tourism policy analysis both internationally and in the South African context is discussed, followed by an illustrative empirical simulation of an exogenous inbound tourism expansion of 10%, against the background of the relationship between tourism and economic development. Furthermore, the indirect effects of an input-output model are also presented for comparison.

Keywords: Applied general equilibrium model, tourism satellite accounts, integrated model, tourism policy, tourism, economic development, South Africa

JEL classification: C67, C68, D57, D58, I32, N70, N77, O20, O29, O55

1. INTRODUCTION

South African tourism policy makers are currently faced with probably their most acute need for tourism policy analysis and understanding as a result of recent developments in the South African tourism sector. The latter refers to the significant increase in the hosting of major events such as the FIFA Confederations Cup, the 2009 British and Irish Lions tour, the DLF Indian Premier League (IPL), Super 14 Rugby championship, Vodacom Tri Nations, and the 2010 FIFA World Cup, to name but a few. The 2010 FIFA World Cup will be the largest sporting event ever hosted in South Africa and current investment entails the construction of stadiums, improvement of infrastructure and access routes, as well as development of skills. However, the development of the tourism industry is not only spurred by once-off events, it is also part of the South African government's Accelerated and Shared Growth Initiative (ASGISA). This economic strategy has identified tourism as a key sector for driving growth and reducing poverty.

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Tourism policy analysis in South Africa has historically posed challenges to accurate measurement. The primary reason for this is that tourism is not designated as an 'industry' in standard economic accounts. However, as recently as May 2009 South Africa launched its inaugural Tourism Satellite Account (TSA) making it possible to measure the full effect of tourism on the country's economy. The aim of this paper is to follow an integrated approach using TSAs and Applied[3] General Equilibrium (AGE) models as tools for tourism policy analysis in South Africa. The integrated model consists of an innovative integration of tourism analysis within an AGE modelling framework, to assist the formation of government policies relating to tourism. Integrated models are formal economic models that extend, rather than replace, TSAs (Blake *et al.*, 2000). They allow the full potential of the detailed data contained within the TSA to be realised and facilitate the assessment of tourism's overall economic impact, the analysis of tourism policy and tourism forecasting.

The challenge facing economic policy makers at all levels of government (as well as private business institutions operating for profit) is that limited resources must be allocated to areas that are most likely to achieve success in scenarios with the greatest probability of being realised (Cameron, 2009). In order to assist and inform policy makers in this task economic models play an important role. As indicated by Baumol and Blinder (1994:11), "*economic theory does make unrealistic assumptions ... but this propensity to abstract from reality results from the incredible complexity of the economic world ... abstraction from unimportant details is necessary to understand the functioning of anything as complex as the economy.*"

Economic models are mathematical representations of the economy that are designed to be simplifications of a complex reality. They combine those behavioural relationships believed to be responsible for the bulk of macroeconomic fluctuations, while omitting those deemed less important. This process of differentiation allows economists/modellers to make predictions that are reasonably accurate and that can be more easily understood and communicated to policy makers and other stakeholders (Coletti and Murchison, 2002). Moreover, models can provide key perceptions for analysis of comprehensive packages of economic and non-economic policy instruments within a consistent framework. Insights generated by modelling can help in evaluating various policy options. At the same time, however, policy options which seem technically and even economically feasible at the sectoral level may lose their attraction when the policy maker discovers their potential effects on the economy as a whole, or *vice versa*.

According to Dervis *et al*. (1992:131) there is no doubt that the techniques of development planning have acquired a wide field of potential real-world application. Over the years, policy planning, formulation and assessment has been done by relying on unassisted intuition (Jerome, 2004). However, more recently, policy makers have started to integrate the use of quantitative modelling tools in the policy formulation process, in order to account for the 'real-world' effects of their policies. Jerome (2004:2) argued that '*models provide a logical abstract template to sort out complicated chains of cause and effect, and influence between the numerous interacting variables in an economy.*' Because economic models have a logically consistent framework, the policy maker has been provided with a valuable tool, representative of the economic sector with which ideas and policy proposals can be tested (Hazel and Norton, 1986). Economic models have therefore added significant value through qualitative assessments, since they include more structural and institutional features of the economy, and are useful to measure the size of the response to policy initiatives.

Business risk, sector-specific institutional barriers and market imperfections can all frustrate the economic process. When they exist, they certainly will not disappear by themselves. Policies thus should aim

[3] In literature on the topic of general equilibrium models one finds references to both 'Applied' and 'Computable' general equilibrium models used interchangeably. The prior refers to the broader concept of the theoretical framework applied in practice, while the latter more specifically refers to the actual model applied on a computer with a specific piece of software such as GAMS (General Algebraic Modelling System) or GEMPACK (General Equilibrium Modelling PACKage).

to create a framework within which more economic opportunities become market possibilities (Cameron, 2005). Such policies require knowledge (which models can help to provide) of the extent to which these obstacles endure and can be removed cost effectively.

In the longer term, technological evolution, as well as unforeseen changes in consumer behaviour and preferences complicates any economic impact assessment (Cameron, 2009). Ignoring the long-term impact of short-term decisions cannot be cost effective except by accident. The dynamic challenge of sequential decision-making is to link short-term decisions and long-term goals with enough flexibility to cope with the uncertainties (Gorbet 1973; Maxwell 1975, 1976).

Finally, economic models help settle debates that cannot be settled by theory alone. Economic theory often suggests that potentially offsetting influences are at work in the economy. When combined with statistical methods, models help economists/policy makers quantify the relative importance of each factor, thereby providing an estimate of the net impact of these offsetting influences (Coletti and Murchison, 2002).

The paper starts by providing a brief overview of old and new approaches to tourism policy modelling in section 2. Thereafter in section 3 the integrated approach to tourism policy modelling is discussed, while stressing the relevance of integrated models specifically to tourism policy analysis both internationally and in the South African context. Section 4 describes the modelling approach, followed by an illustrative empirical simulation against the background of the relationship between tourism and economic development. Section 5 outlines the policy implications, while concluding comments follow in section 6.

2. TOURISM POLICY MODELLING: A BRIEF OVERVIEW

AGE modelling has been widely used in mixed economies since the 1970s by policy analysts in addressing contemporary policy issues. However, due to the complexity of interaction that characterises tourism policy, there is still considerable debate in the economic profession regarding the value and appropriateness of using broad AGE models for policy analysis. Therefore, in order to contextualise the advantages (or disadvantages) of integrated models (as opposed to broad AGE models), one needs to understand the limitations of current approaches to tourism policy modelling (e.g. cost-benefit analysis, input-output, multiplier methods, etc.), and how an integrated approach can get around them.

2.1 Inadequacies in formal (old) approaches to tourism policy modelling

Tourism is a proven, growing economic catalyst. But to benefit from the ascent of tourism, policy makers (e.g. investors, governments, etc.) must understand the impact of changes, such as shifts in government policy or chance events, on the industry and economy overall. This insight has led to the development of various quantitative modelling tools to assist in identifying the magnitudes of policy impacts on a country's economy. Economic modelling has therefore developed into a critical tool in government policy, planning and budgeting processes.

Economic impact analyses of tourism range from simple comparisons of trends in tourism activities with those of key economic indicators through to cost-benefit analyses (CBA), proportional multiplier methods, input-output models and linear programming models (Wattanakuljarus and Coxhead, 2008:932). Of these techniques, the predominant approach taken to evaluating the economic impacts of tourism has been based on input-output analysis (Briassoulis, 1991; Johnson and Moore, 1993; Fletcher, 1989; 1994; Frechtling, 1999; Crompton, Lee, and Shuster, 2001; Tyrrell and Johnston, 2001). Input-output analysis is an analytical framework with the fundamental purpose to analyse the interdependence of industries in an economy (O'Connor and Henry, 1975:1). In its most basic form, an input-output model consists of a system of linear equations, each one of which describes the distribution of an industry's (e.g. tourism) product throughout the economy (Cameron, 2003).

Despite being a widely accepted and useful means of economic impact analysis, the input-output approach is limited in that it does not reveal the personal income distribution effects across different household income segments (Holland and Wythe, 1993) and gives no consideration to industry occupation, skills and wages and the resulting income effects. Therefore, using this approach to assess economic impacts will not allow for a clear picture of which household income groups are benefiting/suffering and which are not, from the specified issue under review (Cameron, 2003). Moreover, for use in policy making, input-output models may be too simplistic and do not take account of the effect of changes in relative prices, or of structural change (Naudé and Brixen, 1993).

Arguments have also been advanced in favour of using a social accounting matrix (SAM) to generate multipliers (Wagner, 1997). However, this approach is open to the same types of criticisms levelled here against the input-output approach, in that, while they provide a convenient framework to incorporate intersectoral linkages, they suffer from their inability to consider the behavioural responses of producers and consumers with respect to changes in prices (Alavalapati and Adamowicz, 2000). Alternatively, a contingent valuation approach has in the past been employed to examine the effects of tourism (Lindberg and Johnson, 1997). This approach, however, does not account for intersectoral linkages of the economy (Alavalapati and Adamowicz, 2000).

These formal (old) approaches are seriously inadequate as a means of estimating the economy-wide impact of tourism related (policy or other) changes. They are based on extremely unrealistic assumptions, and on incomplete representations of the ways economies work (Briassoulis, 1991), ultimately providing misleading results. In nearly all cases, the changes in economic activity which they come up with are much greater than the net increase in activity in the economy overall, when all of the relevant effects are taken into account (Dwyer, Forsyth, and Spurr, 2004). The results obtained from these (old) models are hazardous to use for policy purposes, because they are systematically biased.

In reality, economies are general equilibrium systems (or integrated wholes), in which an overall balance must be preserved, and in which direct alongside indirect and feedback mechanisms are important (Dwyer, Forsyth, and Spurr, 2004). For that reason, some researchers have used an AGE model to examine the economic effects of tourism (Adams and Parmenter, 1995; Copeland, 1991; Zhou *et al.*, 1997). The AGE approach not only accounts for intersectoral linkages but also permits the prices of inputs to vary with respect to changes in output prices and accommodates the indirect effects of a policy change on the overall economy (Dervis, de Melo, and Robinson, 1985; Shoven and Whalley, 1992). Thus, for use in tourism policy modelling, these dated methodologies have been superseded.

From the above discussion it is clear that the formal (old) approaches to tourism policy modelling are limited in their capability of providing useful insight into important policy problems, since they do not present an especially useful framework for understanding and managing structural change. The implication is that an integrated approach to tourism analysis and forecasting is required, bringing together different methods of examining the future.

2.2 Out with the old, in with the new

Since the mathematisation of economics, which was started in the 17th century by William Petty and Gregory King (Stone, 1985) and which culminated in the 1950s and 1960s in the elegant general equilibrium theories of Arrow-Debreu and Khan and McKenzie (Debreu, 1991), the toolkit of researchers, economists and policy makers has expanded considerably, thereby significantly improving their capacity and role as policy analysts.

A powerful tool for policy analysis is the AGE model (Dervis *et al.*, 1985). This can be described as '*an economy-wide model that includes the feedback between demand, income and production structure and where all prices adjust until decisions made in production are consistent with decisions made in demand*' (Dervis *et al.*, 1985:132). Usually, the behaviour of economic agents is explicitly derived from microeconomic optimisation. Based upon microeconomics, AGE models provide an important tool for answering complex questions about the interactions within an economic system in a coherent and consistent way. Also, AGE models are very effective at describing market inefficiencies and the burdens caused by price distorting measures. Moreover, AGE models can be used to describe the economy at a disaggregated level by detailing many different sectors and markets (Bovenberg and Goulder, 1991:201). Rutten (1991:143) has described AGE models as reflecting '*the heart of economic science.*'

By including relative prices, the feedback effects between demand and income, and the relevant institutional structure of the economy, AGE models are an improvement on the input-output and linear programming models used previously. Shapiro and Taylor (1990:863) argue that planning tools such as social cost-benefit analysis and linear programming have proved unable to blueprint economic development in market economies with individuals and firms attempting to maximise their own objective functions. Subsequently, AGE models have been applied in an increasing number of developed and developing countries (Dixon and Parmenter, 1996). There is, however, a limited literature applying such models to tourism questions (Dwyer, Forsyth and Spurr, 2004).

In tourism policy modelling it is important to recognise the *integrated* or general equilibrium[4] nature of the economy (Dwyer, Forsyth and Spurr, 2004:309). In general equilibrium models, households, firms and markets are synthesised into a model of the equilibrium of the economy as a whole. AGE models are similar, but specified for many households, sectors, factors and are based on data. There are many simultaneous equations using a big database of matrices (see Figure 1). AGE analysis proceeds on the basis that events in one sector of the economy will have flow-on impacts on the other sectors of the economy. In turn, the impacts on these other sectors may have noticeable feedback effects on the original sector. In effect, general equilibrium analysis captures the impacts of a policy change or specific event on all parts of the economy, by incorporating feedback from all those, while recognising economy-wide constraints (Rossouw and Krugell, 2005). Using AGE models not only has the advantage that general equilibrium effects are taken into account, but also that the interaction of different measures can be studied and quantified (Clark, Dent and Watts, 2004). Further, the complexity of micro-macro interrelationships can be relatively better explained through an AGE modelling framework.

In addition, AGE models have become workhorses for policy analysis since they are particularly suited for answering 'what if' questions: What if productivity in agriculture increased, what if foreign tourist expenditures fall, what if emissions were taxed? Policy makers (especially tourism policy makers) are typically interested in the direct and indirect effects of specific policy measures, but often these effects are studied only in partial setting. AGE models have the advantage that the possible effects of specific policy measures can be examined without the excessive simplification and aggregation of partial equilibrium analysis (Iqbal and Siddiqui, 2001).

Since the 1990s, there has been a considerable increase in the use of AGE models in developing as well as developed countries to study a variety of policy issues. The early AGE models were used to examine the issues of the day such as macroeconomic stability and the opening up of a country's economy. Currently, however, the challenges have shifted to the labour market, environmental questions, and policy, social and sub-national issues. The advantages of AGE models for policy analysis, compared to traditional

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[4] For more detail see Arrow and Debreu (1954), Arrow (1951; 1953; 1974), Debreu and Scarf (1963), and Hahn (1973).

macroeconomic models, are now widely acknowledged (e.g. Borges, 1986; Bandara, 1991; Cameron, 2009). General equilibrium models allow for consistent comparative analysis of policy scenarios and they incorporate microeconomic mechanisms and institutional features within a consistent macroeconomic framework, and avoid the representation of behaviour in reduced form (Zalai, 1982). This allows analysis of structural change under a variety of assumptions.

Tourism Satellite Accounts (TSAs) represent another means of measuring the contribution of tourism to the economy, in a manner which is consistent with a country's System of National Accounts (Dwyer, Forsyth and Spurr, 2004; Ahlert, 2009). Since TSAs are based on input-output/SAM structure, they represent a form of static 'snapshot' of the tourism sector with the rest of the economy as a backdrop (World Tourism Organisation, 1999). However, AGE models go much further than TSAs in that with them it is possible to tell what impact a tourism related change will have on variables (e.g. GDP, employment, etc.) in the economy (Blake *et al*., 2001). TSAs alone cannot be used for this purpose. Consequently, there is a demonstrated need for AGE models to be complemented and extended through integration with TSAs as a tool for tourism policy analysis purposes.

More recently, some studies have attempted to combine and integrate the various strands of modelling to capture both the macro- and microeconomic effects of policy changes on the economy as well as on the various role players in the economy (e.g. Agénor *et al*., 2002; Ahmed and O' Donoghue, 2007; Blake *et al*., 2006; Bourguignon *et al*., 2002; Burniaux and Truong, 2002; Coletti and Murchison, 2002; Odoki, Kerali and Santorini, 2001). It has therefore become clear that different combinations or integration of model types are needed when dealing with different issues. At present, AGE models designed to assess the economic impacts of alternative policies in South Africa tend not to incorporate specific linkages with tourism. The next section outlines an approach for constructing this linkage and illustrates the implications of such relations on policy and economic impact assessments.

3. THE INTEGRATED APPROACH

Information about current and forecast levels of tourism and its contribution to the economy is important for policy making by governments and private business institutions. Traditional forecasting methods (given the limitations and problems highlighted above) can provide reasonable forecasts in the context of predictable changes. However, forecasting becomes problematic in the context of both predictable changes and less predictable domestic or international shocks (Blake *et al*., 2006:292). This section demonstrates the ways in which an integrated model, incorporating a conventional tourism satellite account in an applied general equilibrium modelling framework for South Africa, can be used to more successfully examine and evaluate tourism related issues.

3.1 Integrating the TSA within an economy-wide framework

TSAs, which now exist for most countries, provide accurate measures of the size of tourism sectors, the nature of demand for tourism, the nature of supply in tourism sectors, and the direct contribution of tourism to GDP and employment (Blake *et al*., 2001). Furthermore, TSAs provide detailed data on tourism activities that are not generally available in national accounts. This is because national accounts provide data classified according to production activities and commodities, and tourism spans many of these standard classifications. Though TSAs represent a major step forward in the measurement of the economic size of tourism, they do not assess the whole impact of tourism. Moreover, TSAs do not include information on anything other than the tourism industry (Tribe and Airey, 2007:92). Thus there is a need for TSAs to be embodied in an economy-wide framework to capture these wide-ranging effects.

When measuring the economic impact of tourism, input-output models have often been used in the past. While these models successfully capture some of the economic impact of tourism, they do not capture all of the economic impact, leading to estimates that are not only unreliable but heavily biased. AGE models have their historical origins in input-output methodology, but were developed to overcome the many shortcomings of input-output models. In particular, AGE models allow prices to vary and resources to be reallocated between production sectors. Integrated models build upon this framework by including tourism data from TSAs to provide a consistent means of modelling tourism in the entire economy (Blake *et al.*, 2005). TSAs can therefore be complemented[5] and extended by the use of AGE models to study the impact of tourism towards a specific country.

AGE models have a well-established record of providing detailed estimates of the effects of a range of actual or possible tourism related events on economies (e.g. Adams and Parmenter, 1995; Dwyer *et al.*, 2000; Blake and Sinclair, 2003; Blake, Sinclair, and Sugiyarto, 2003). Moreover, AGE models are now well-known in policy modelling and have, since 1993, been used with increased frequency in South Africa (see e.g. Naudé and Coetzee, 2004). These models can quantify the effects of policy changes, such as changes in value added tax or air passenger duty, as well as of a range of optimistic and pessimistic scenarios relating to the future of the economy (Blake *et al.*, 2006:299). One of the major features of AGE modelling is its attempt to combine theory and policy in such a way that the analytic foundation of policy evaluation work is improved. Consequently, integrated models also provide an important tool for policy analysis and can be used to provide additional forecasts of possible but, in some cases, less predictable events that cannot be taken into account by more traditional forecasting models (Blake *et al.*, 2006).

Due to the complexity of interaction that characterises tourism policy, a coherent and systematic approach or mechanism is needed for analysis of the multitude of implications that can arise from tourism policy formulation (Cameron, 2009). Moreover, the complexity of the relationship of tourism to the economy, such as the interaction between the demand and supply side of tourism, government and private business revenue implications, balance of payments, price or inflation levels, consumer welfare and aspects such as pro-poor tourism and environmental implications, would suggest that policy makers take an integrated approach to address many of these aspects and to ensure a richer and more informative analysis. As such, integrated models provide just such a mechanism.

Coletti and Murchison (2002:21) suggest two reasons for following an integrated approach to policy analysis. The first concerns the uncertainty regarding the correct economic hypothesis (Selody, 2001). The second reason for an integrated approach to policy analysis stems from the fact that, being a simplification of a complex reality, no one model can answer all questions. A model's structure varies according to its intended purpose.

Issues related to tourism policy typically require a medium- to long-term perspective. Thus, a clearer representation of the equilibrating forces in the economy is necessary (Poloz *et al.*, 1994). How consumers and producers in the model form their expectations about future economic conditions (such as changes in prices and income levels) is particularly important (Coletti and Murchison, 2002). Pure forecasting models, which typically fail to isolate this path, can yield misleading answers when there is a change in policy framework, particularly when the new framework does not reflect the average behaviour of policy over recent history (Longworth, 2002). Moreover, the integrated models provide the opportunity to assess the potential long-term growth of tourism in response to changes in the economy (such as population growth and

[5] See e.g. Blake, Durbarry, Sinclair and Sugiyarto (2004).

changing education levels) that are highly predictable, as well as the short-term impact of macroeconomic changes such as currency market crises and natural disasters Blake *et al.* (2000:11). A third reason, put forward by Blake *et al.* (2006), for using integrated models in tourism analysis and policy formulation rests partly on what the users of their output wish to learn.

Integrated models include not only those sectors in an economy related to tourism, but also the entire range of sectors in the economy, covering primary and secondary activities as well as services, and are able to take full account of the interrelationships that occur between all of the sectors. They are able to trace the effects of changes in non-tourism activities on tourism related sectors, as well as the effects of changes in tourism on the remainder of the economy. They quantify the macroeconomic impacts of alternative scenarios on income, employment, welfare, the balance of trade and government revenue, as well as on individual sectors of the economy (Blake *et al.*, 2006).

In summation it seems that a broader approach to tourism analysis and forecasting is required, bringing together different methods of examining the future. Therefore, in order to motivate the need for an integrated approach for examining and forecasting tourism in South Africa it is important to understand the relationship between conventional TSAs and modelling techniques that incorporate relative price and/or aggregate economic responses.

3.2 Exploiting synergies and complimentary aspects of TSAs and AGE models

Due to the interest by policy makers in the link between economic growth and development and aspects such as income distribution and pro-poor tourism, especially in the developing and transition countries, the focus of economic modelling therefore needs to include a more comprehensive capability to analyse questions related to these aspects within an economy-wide framework for policy analysis and formulation purposes (Davies, 2004). In this context the application of TSAs combined with other macro and/or AGE models can provide much more insight into the implications of economy-wide policy decisions and the impact of such policies on distributional and tourism related issues, as well as *vice versa*.

TSAs are primarily based on data from Supply and Use Tables, as well as large representative survey based samples (e.g. from annual household surveys to annual, quarterly or monthly industry surveys as well as administrative data from external sources). These same tables and surveys also inform certain parameters and assumptions when constructing SAMs for AGE models. Figure 1 provides a stylised illustration of the relationship between TSAs, input-output, SAM, AGE and other macroeconomic models and common data between the approaches. The shortcoming of the structure of SAMs and AGE models is that it does not embody a defined and detailed tourism sector, whereas TSAs are sets of accounts which provide exactly such detail. The main advantage in this context of TSAs therefore is that they offer the opportunity for consistent definitions and data use and they do much of the disaggregation of tourism related sectors (Tribe and Airey, 2007). On the other hand, where a TSA does not exist, AGE models can provide some of the information on input and output relationships, which can be used in the construction of a TSA (Dwyer *et al.*, 2000).

TSAs take no account of possible factor constraints or the impacts that changing prices and wages might have on other (non-tourism) industries, nor do they contain any behavioural equations specifying how each sector responds to external shocks including shocks normally affecting the sector directly and shocks transmitted through intersectoral linkages, via change in prices, wages exchange rates and other variables. As such, TSAs are of partial equilibrium nature only (Cameron, 2009). SAMs and AGE models in turn track inter-industry relationships, which are ideally based on realistic behavioural assumptions, and allow for resource constraints and prices. Moreover, they can provide fully simulated economic impacts and welfare estimates (Tribe and Airey, 2007). It is therefore apparent that these approaches can complement each other in the quest to understand these issues better in the context of economy-wide as well as macro- and micro-level analysis for less developed and transitional economies.

One can therefore summarise the relationship and context (see Figure 1) between TSAs, input-output tables, SAMs and AGE models as follows (Cameron, 2003:1):

a) Input-output analysis is an analytical framework with the fundamental purpose to analyse the interdependence of industries in an economy and records economic transactions irrespective of the social background of the transactors. A TSA is based on input-output/SAM structure.
b) A SAM comes from input-output tables, national income statistics, and household income and expenditure statistics, and is thus broader than an input-output table and typical national accounts, showing more detail about all kinds of transactions within an economy.
c) An AGE model comes from a SAM, coupled with a conceptual framework that contains the behavioural and technical relationships among variables within and among sets of accounts. The aim of AGE modelling is to convert the abstract representation of an economy into realistic, solvable models of actual economies. In brief one can therefore state that an AGE model has the benefit that it can therefore be used for a more detailed and realistic evaluation of the economy-wide effects of policy changes or other economic impacts than either an input-output analysis or SAM.

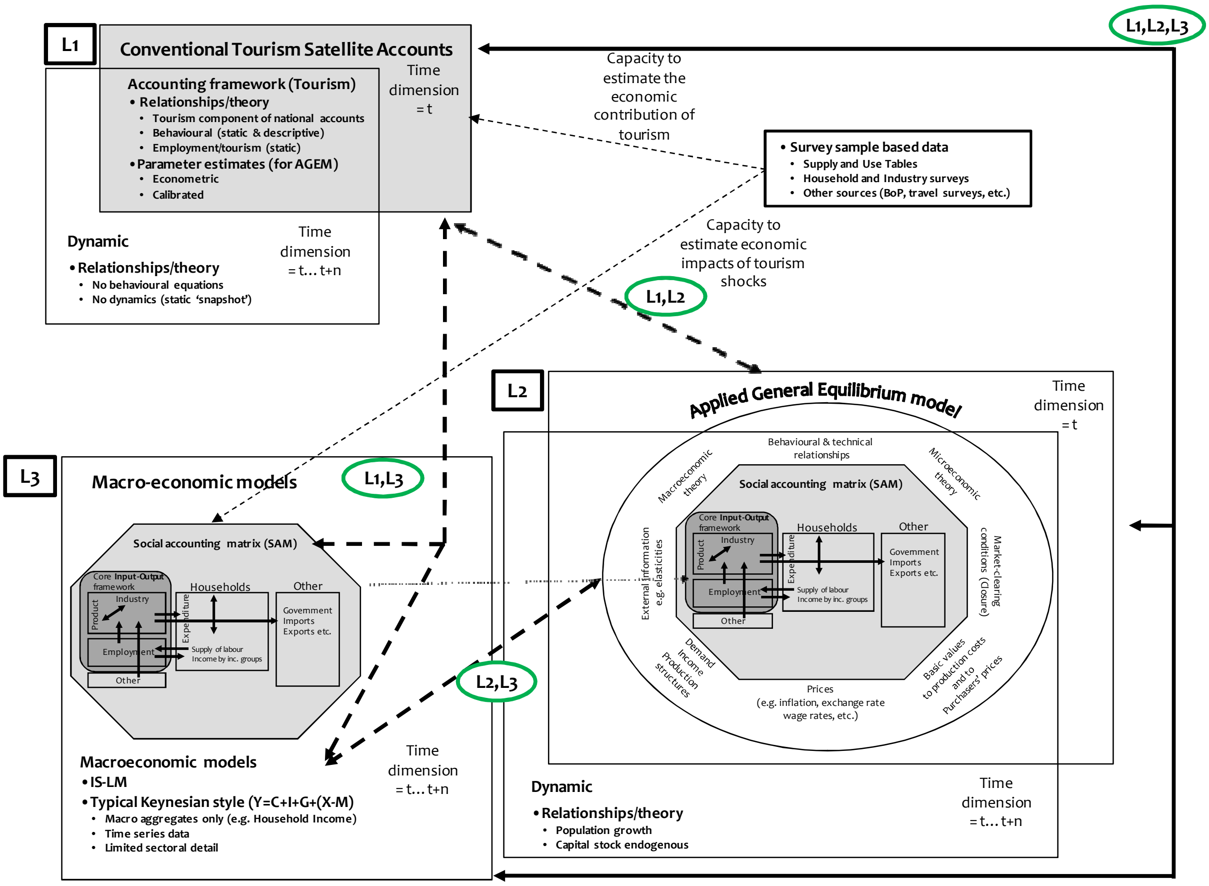

Figure 1: Stylised representation of interaction between TSAs and other (AGE and macro) models
(Source: Adapted from Cameron, 2005:1)

The integration approach used to combine or 'merge' these two techniques implies constructing a single model that consists of all elements of the various layers applied. So e.g. an integrated combination (L1,L2) would mean that one constructs an AGE model with a virtual TSA embedded within it (Blake *et al.*, 2001), and with full capabilities with regards to industries, households, taxes and transfers. As an example, based on the illustration in Figure 1, one can define three combinations of layers indicated by the square blocks [1], [2] and [3]. The TSA is labelled as L1, the AGE model as L2 and the macro-economic block (representing various other macro modelling approaches) as L3.

Therefore one can, for example find an integrated combination indicated in the illustration as (L1,L3), which implies that a TSA will be used in combination with a macro-economic/econometric model to study a specific topic. Although less common, such combinations are found in literature (e.g. Blake *et al.*, 2006; Jackson, Kotsovos and Morissette, 2008). The more general approach would be layer combinations of (L1,L2) and (L1,L2,L3), indicating combining a TSA with that of an AGE and in the last case combining e.g. a macro-econometric, AGE model and TSA. Integration/layering between AGE and macro-economic/econometric models also exists (e.g. Meagher, 1996; Cooper *et al.*, 1985; Bourguignon *et al.*, 1989; Breece *et al.*, 1994) as indicated by combination (L2,L3).

It would seem that integrated models (as opposed to any single model in isolation) appear to be cleaner and more transparent. They may also be more applicable when the aim of the study is to understand the direction and relative magnitude of distributional and other effects in the context of a full microeconomic analysis within an economy-wide framework. A further strength of the integrated models is their flexibility. As demonstrated in Figure 1, the integrated models usually contain certain core components of the model structure, and can be expanded by extending the scope of the model to suit the circumstances of the tourist origin/destination country or region. However, data requirements and rapid structural change in transitional economies pose a challenge to the application of both AGE models and TSAs in these types of economies.

Therefore one can conclude that the relationship between conventional TSAs and other models can be described as complimentary in the sense that no matter how the various techniques are combined/integrated the resulting analysis possible is richer and more informative than what would be possible when conducted as analyses with each type of model in isolation. However, it must be noted that the specific topic for analysis at hand would determine the detail of how this relationship is leveraged, from and individual TSA or macro model, to various combinations/integration of such models. To combine these type of models just for the sake of being able to do so will be an expensive and time consuming undertaking not necessarily providing more insight into the specific questions being analysed.

3.3 Tourism in the South African integrated model

An important consideration for modelling any tourism related issue is to consider the current tourism structure in South Africa based on the underlying framework (databases) used in the integrated model. These databases include a base year SAM, tourism data and parameters (shares and elasticities) associated with production and consumption functions. Accordingly, the integrated model for South Africa combines the tourism demand data provided by the South African TSA (Statistics South Africa, 2009) for 2005 (which specifies 19 and 17 tourism-characteristic and -connected industries and commodities respectively) with the most recent published SAM (benchmark dataset) for South Africa (Statistics South Africa, 2004; 2002), in addition to other sources of data.

Tourism is implicitly already included in the supply and use tables and therefore in the central framework of the SAM. The TSA is developed to make tourism explicit, i.e. to extract the tourism shares from the supply and use table, therefore not interfering with the intermediate consumption part of the use table (Van de Steeg and Steenge, 2008). A most important contribution of the TSA framework is the construction of a final expenditure vector (see Table 1) specific for tourism. The tourism final expenditure vector denotes the consumption of visitors in the economy of reference of all kinds of goods and services from various standard industries.

Fortunately, the benchmark SAM (2002) contains tourism expenditures and demands for tourism by residents and foreign tourists. Furthermore, the data of tourism receipts from residents and foreign tourists recorded in the TSA (2005) are used to disaggregate (see Table 1). Twenty nine of the 103 commodities in the South African SAM are classified as being tourism-related, and both foreign and domestic tourism are classified as being expenditure on these 29 commodities. Table 1 shows the shares of domestic and foreign/tourist expenditure as a percentage of total commodity demand, as well as showing how both foreign and domestic tourism spending is shared across these commodities. Notably, foreign/tourist expenditure is much more heavily weighted towards accommodation, while domestic is more weighted towards the food and services sectors. Column nine shows the final estimated share of tourist expenditure in each sector in the economy. From this column it is evident that the services industry is the largest contributor (50 percent) of tourist expenditure in South Africa. Other large sectors within the economy include petroleum products (9.1 percent), beverages and tobacco products (8.2 percent), and meat, soap and pharmaceutical products (5 percent). By comparing columns three and nine one clearly sees the difference in expenditure patterns of domestic households and that of non-residents/tourists.

Table 1: Estimated share of tourist expenditure for tourism-characteristic and -connected industries in the benchmark SAM

Sectors	Industry type	Share based on domestic household expenditure	Tourist spending on major items					Final est. share of tourist expenditure
			Transport (32.2%)	Accommodation (29.7%)	Food (24.6%)	Entertainment (9.2%)	Gifts (4.2%)	
Agricultural products	food	3.32%			1			2.17%
Meat products		7.72%			1			5.03%
Fish products		0.89%			1			0.58%
Fruit and vegetables products		1.41%			1			0.92%
Oils and fats products		1.14%			1			0.74%
Dairy products		2.43%			1			1.59%
Grain mill products		3.39%			1			2.21%
Bakery products		2.01%			1			1.31%
Sugar products		0.77%			1			0.50%
Confectionary products		0.78%			1			0.51%
Other food products		1.35%			1			0.88%
Beverages and tobacco products		12.60%			1			8.21%
Wearing apparel	hardware	6.35%					1	2.54%
Handbags		0.15%					1	0.06%
Footwear		2.08%					1	0.83%
Published and printed products		1.15%					1	0.46%
Recorded media products		0.18%					1	0.07%
Petroleum products	chemicals	5.63%	1					9.14%
Pharmaceutical products		3.15%		1				4.27%
Soap products		3.67%		1				4.98%
Rubber tyres	spares	0.84%	1					1.36%
General hardware products		0.31%					1	0.12%
Motor vehicles parts		1.14%	1					1.84%
Jewellery		0.37%					1	0.15%
Accommodation	services	4.62%		1				6.26%
Transport services		6.87%	1					11.15%
Communications		5.39%	1					8.76%
FISIM + Insurance services		10.47%		1				14.20%
Other services/activities		9.80%				1		9.16%
Sum of household expenditure		**299539**	**19.86%**	**21.91%**	**37.83%**	**9.80%**	**10.60%**	**100.00%**
Ratio adjusted			**1.62**	**1.36**	**0.65**	**0.93**	**0.40**	

Source of data: authors' own calculations based on South African Tourism Satellite Account (2005) and Statistics South Africa SAM (2002)

A key point about the TSA for South Africa is that unlike TSAs of other countries, it now forms part of a larger, integrated model for tourism, as depicted in Figure 1. Thus, key drivers of tourism that are included in the TSA are included in an integrated model with forecasting capabilities. The integrated model then quantifies the effects of tourism policy (or any other) forecasts on a range of macroeconomic variables for

South Africa, as well as on every sector of the economy. Moreover, the impact of such changes across households, income and employment are included in the results. By this means, each component of the overall model is fully integrated with the others.

4. TOURISM AND ECONOMIC GROWTH IMPLICATIONS: AN ILLUSTRATIVE INTEGRATED ANALYSIS FOR SOUTH AFRICA

In order to illustrate the usefulness of integrated models in the tourism context for South Africa, a scenario was selected that is currently quite topical in South Africa, and of extreme relevance to economic policy makers and infrastructure planners.

As early as June 2010 South Africa will host the FIFA Soccer World Cup, which is expected to bring more than 300,000 soccer fans to the country. This will be the largest sporting event ever hosted in South Africa and current investment entails the construction of stadiums, improvement of infrastructure and access routes, as well as development of skills. Questions have been asked as to the potential implications of such events on the output of the sectors involved and the economy overall. At the same time, the national government has implemented a number of nationally-based macro-economic strategies to address unemployment and poverty, such as the Growth, Employment and Redistribution (GEAR) strategy[6] and more recently the Accelerated and Shared Growth Initiative for South Africa (ASGISA)[7], in which tourism has been identified as a key sector for driving growth and reducing poverty. This policy initiative, alongside government and the private sector's investment in a tourism marketing and development drive, will see the value of the South African Tourism industry receive an extra bounce.

However, this question is not a straight forward one to answer and one can only attempt to do so in a very crude way with a basic AGE model without conducting some extensive expansion to the model and database itself. The whole issue of the hosting of major events in South Africa is a major research topic in itself, and the authors do not want to attempt to go into too much detail as part of this study. However, it does serve to illustrate a relevant tourism economic application of an existing South African integrated model.

Before investigating the potential implications of current policies of tourism promotion in order to help drive growth, reduce poverty and generate new capacity, a brief summary of the relationship between tourism and economic development, in the South African context, is provided in the following section.

4.1 Tourism and economic development

Tourism is characterised by high growth and, with the exception of the airline sector, low protectionism. It provides increasing per capita income, foreign currency and government revenue which can be used to promote the growth of manufacturing. Tourism also generates employment and enables some members of the population to move from the informal sector to higher-paid jobs in the formal sector (Sinclair, 1998).

With regards to the latter, South Africa is a case in point where the formal tourism sector provides major opportunities for the informal sector. Tourist enterprises attract domestic and international tourists and create

[6] The South African Government introduced the GEAR strategy in 1996. The long term vision of GEAR was to create a competitive fast-growing economy; sufficient jobs for all job seekers; to redistribute income; to provide health, education and other services, to all; to secure the home environment; and to create a productive place to work (see e.g. Department of Finance, 1996).

[7] The South African Government introduced the ASGISA strategy in 2004 to become a national shared growth initiative. The core objective of this strategy is to halve poverty and unemployment by 2014, through the achievement of an average Gross Domestic Product (GDP) growth rate of 6% or more (see e.g. Office of the Presidency, 2006).

opportunities for small entrepreneurs and economic linkages, such as agriculture, hunting, handicraft production, and a wide range of service industries. Moreover, a wide range of opportunities for historically disadvantaged groups exist, ranging from small guesthouses, shebeens (local pubs) and restaurants with local cuisine, through community tour guiding, music, dance and story-telling, arts and crafts, traditional hunting and medicine to laundry, gardening and speciality agriculture (Department of Environmental Affairs and Tourism, 2002). Tourism also provides particular opportunities for local economic development in rural areas where it can provide people with an alternative to moving to urban areas.

In an early study of tourism and developing countries, Erbes (1973:4) concluded that '*the development of the tourism sector is, a priori, a no less rational choice, economically speaking, than any other*.' None the less, the question remains as to whether South Africa is obtaining an optimal return from tourism. According to the 2009 edition of WTTC's *The Economic Impact of Travel & Tourism*, tourism, which is the fourth largest and the fastest growing industry in South Africa, directly contributed 8.7% (US$22.9 billion) to GDP and employed more than 1,052,000 people (7.8% of total employment or 1 in every 12.8 jobs) in 2009 and has a projected 12-percent yearly growth rate for the next few years. In addition, export earnings from international visitors and tourism goods are expected to generate 13.1% of total exports (US$14.3 billion) for 2009.

At the micro level, South Africa is going to host the FIFA Soccer World Cup in 2010, an event widely recognised as an especially powerful and efficient stimulant of the tourism industry. According to Zeng and Luo (2008), three outcomes of the Soccer World Cup on South Africa's tourism industry are possible. The first is the 'legacy effect'. The three stages of the 'legacy effect' are: before, during and after the event. 'Before the event' is a preparation stage. 'During the event' generates tourism demand at its peak, whereas 'after the event' is the continuation of attracting more tourists, which can last for some years (Zeng and Luo, 2008:122). The 'legacy effect' of hosting the Soccer World Cup includes the creation of world class sporting facilities, improved infrastructure, and skills development, which will certainly benefit South Africa's tourism industry in the long run.

It can therefore be concluded that although the returns which South Africa has obtained from tourism in the past is limited, with current developments (e.g. hosting of major sporting events and positive macro-economic policy shifts) the country could gain greater and more sustainable returns from it.

4.2 An illustrative integrated analysis of selected tourism policy responses

According to statistics from the World Travel and Tourism Council (WTTC, 2009), the average annual growth rate of inbound tourism to South Africa is around 8.4%. For illustrative purposes the authors simulate the effects of a successful past tourism promotion policy by assuming that inbound tourism grows by an additional 10 percentage points per annum due to the number of major events. Thus we impose an exogenous inbound tourism expansion of 18.4%, by using a modified version of the 'IDCGEM' for illustrative purposes. The IDC-GEM is an AGE model of the South African economy, based closely on the Australian ORANI-F[8] model (Horridge, Parmenter and Pearson, 1993). A very brief outline of the model is given below from Horridge *et al.* (1995).

The integrated model contains 103 single-product industries, 2 margins commodities, 65 categories of labour (13 occupations by (4 races plus migrant workers)) and 24 households (4 races by six income levels). The SAM database used at that time (see Coetzee *et al.*, 1997) was compiled based on the work of Van

[8] ORANI-F is a static economy-wide general equilibrium model augmented with some simple dynamic relationships. Schematically, the model can be represented as $F[Z_1(t), Z_2(t), Z(0)] = 0$, where $Z_1(t)$ and $Z_2(t)$ are vectors of the values of endogenous and exogenous variables at time *t* and $Z(0)$ is a vector of initial conditions (Adams and Parmenter, 1995:986).

Seventer, Eckert and de Lange (1992). Data were also supplied for the occupational and race disaggregation of employment and for the race and income-level disaggregation of the household sector, as well as the provincial sectoral share estimates of GDP.

In addition to the database alteration described above (Section 3.3), the IDCGEM's theoretical structure was also enhanced to cater for the various tourism categories. The enhancements involved both additions and modifications to the behavioural equations in the model, as well as the model parameters used in those equations. The resulting integrated model (modified IDCGEM integrated with the TSA for South Africa) is unique in the way the tourism related industries (see Section 4.2.2) are treated in the model. Within the model, industries pay factors of production in return for factor services, pay taxes and purchase intermediate inputs. Labour is mobile between sectors but capital is specific to the sector in which it is employed. Labour (in total) and capital in each sector is not fixed in supply, as the 'open' nature of the South African economy allows changes in wages (and rental rates of capital) to induce changes in the supply of factors in South Africa. Exports and imports occur for each of the 103 commodities (except where data show these flows to be zero).

A more detailed technical description of the basic model can be found in Horridge, Parmenter and Pearson (1993) as the basis of the model was the ORANI-F model.

4.2.1 Model closure applied and other assumptions

The general closure assumptions for the illustrative short-run comparative-static simulations conducted are:

- the numeraire is the world average price of all goods;
- capital stock is assumed fixed in each industry;
- no relative change in government consumption expenditure is assumed;
- slack labour markets for all labour categories are assumed;
- average real wages are kept constant – so wage rates adjust with inflation;
- household consumption moves with disposable income for all households; and
- the industrial structure of private investment responds to changes in relative rates of return.

The trade balance, current account deficit (or foreign savings), terms of trade and real devaluation are endogenously determined, since the effects on these macroeconomic variables are main concerns of policy makers in South Africa. For the specific scenario to model an exogenous inbound tourism expansion of 10% the authors had to make certain industry-specific assumptions over and above the general closure described above. Therefore the assumptions are that:

- tourism goods and services under these circumstance will continue to be exported – knowing that in practice this is not necessarily the case, but the current treatment of the tourism industry in the model assumes imports and exports for these sectors; and
- tourism consumption can be exogenously set according to a tourism boom or growth – this can, however, be switched to an endogenous variable if the effects on tourism are considered;

As with any attempt to simplify and quantify real world processes and actions with a mathematical representation, one has to make a host of assumptions. This is captured by the well-known broad assumption *ceteris paribus* – all other things assumed constant. Therefore this implies some of the following (non-exhaustive) more detailed assumptions below:

- Assumption of no mitigation: No change in the production technology of tourism for these sectors is effected to mitigate the impacts of the higher consumption from additional tourists.
- Assumption that the addition to the international tourist intake exhibit expenditure patterns and a national distribution identical to those of the existing intake.

4.2.2 Tourism sector treatment

The integrated model's tourism sector(s) is an aggregate sector(s) made up of accommodation for visitors, restaurants and similar services, railway, road, water and air passenger transport services, transport equipment rental, travel agencies and other reservation services, cultural services, sports and recreational services, tourism-connected products, and non-specific products. As such, the tourism detail contained in the sectoral detail of this specific model is not sufficient for an in-depth analysis, but will serve the purpose of illustrating the applicability of integrated models for tourism policy analysis in the current South African context. The structure of the model implicitly does not allow for switching of tourism goods and services. Figure 2 illustrates the type of tourism collectives built into the model to investigate specific tourism related issues.

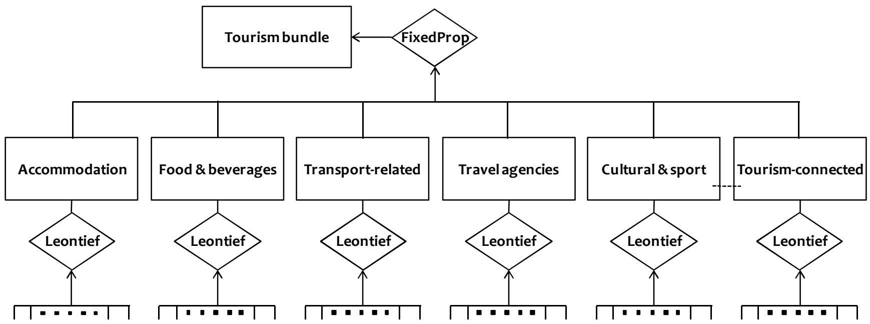

Figure 2: Example of tourism specific model technical adjustments
(Source: Adapted from Wattanakuljarus, 2006:35)

Typically, tourism can be thought of as a bundle of goods and services combined together with a fixed proportion or Leontief technology as depicted in Figure 2. This is because tourists, for instance, cannot substitute transportation for food, hotels or other services. This is the same assumption used by Blake and Gillham (2001). Outbound tourism demanded by households is a function of disposable incomes. Inbound tourism demanded by foreigners is a function of tourism prices and exchange rates (Wattanakuljarus, 2006:13).

4.2.3 Analysis of the national level impacts of the scenario

The national level impacts of the simulation are presented in Table 2 for both the integrated (Column 3) and input-output (Column 2) model. This illustrative analysis mainly focuses on two variables, that of overall economic output measured by GDP and employment. The sectoral effects (of which the aggregates are also included in Table 2) focused on value added and employment and the household effects on their real consumption expenditure. The results are presented in annualised percentage change format.

Table 2 shows that the total effect that additional tourism growth has on the economy is dissimilar for the different models. The main points of difference are:

- Some tourism sectors (as well as for total GDP) have significantly higher increases in value added in the integrated model than the input-output model suggests, the reason for this being that the initial stimulus of foreign tourism expenditures is reinforced by domestic expenditures as firms benefiting from the initial expenditures increase their own expenditures on tourism, and private households which have increases in income spend more on domestic tourism (induced effects).

- Tourism sectors, such as rail and other transport, have a lower value added increase than suggested by the input-output model, the reason being that foreign tourist's expenditures in these sectors constitute relatively small proportions of overall expenditure. Resources are reallocated to other sectors that are able to pay higher wages with the result that these reallocation effects outweigh the induced effects experienced from higher incomes.
- Non-tourism industries have a decline in sector value added that the input-output model completely overlooks, as it does not include price crowding-out effects and resource allocation. In the input-output model there is no direct stimulus from the foreign tourism expenditures. Indirect and induced effects are positive, but are outweighed by resource allocation effects.

The cause-effect logic of the simulation would be that as a result of exogenous inbound tourism expansion, total production increases and is propagated through the inter-industry input-output linkages. Since producers are assumed to maximise profits, employment gain is the result of increased outputs. The employment gain in turn leads to a greater wage bill being paid to labour, with the resulting feedback of increasing household income.

Table 2: Summary of results for Scenario (National & sectoral level impacts)

	Input-output model	Integrated model
Macro-economic effects		
Gross Domestic Product (GDP)	1.42	0.31
Employment	-	0.56
Average Real Wage Rate	1.17	0.00
Domestic Consumption	0.99	0.49
Consumer Price Index	1.47	2.19
Government Consumption	0.00	0.00
Exports (Volume Index FOB)	-	1.69
Export Price Index	1.39	1.47
Imports (Volume Index CIF)	-	2.03
Import Price Index	1.10	0.00
Sector effects		
Value added (Price)		
Natural Resources	1.81	1.00
Manufacturing	1.33	1.67
Services	1.55	2.28
Employment (Volume)		
Natural Resources	0.61	-0.89
Manufacturing	0.58	-1.64
Services	0.65	0.81
Household effects		
Real household consumption	0.96	0.46

Source: Integrated and input-output model simulations conducted by the authors

The increase in household income in turn leads to higher demand for final products due to lower household budget pressures, placing upward pressure on domestic prices. In order to achieve equilibrium in both the demand and supply side of the economy, prices have to increase even further, and the spiral effect leads to even more production, more employment etc. until all endogenous variables reaches equilibrium values. The final result is that GDP ends up at 0.31% higher per annum than compared to the base case, while employment increases even more by 0.56%. Domestic consumption benefits to the extent that it is 0.49% higher and the resulting general domestic price increase that needs to take place is approximately 2.19%.

The combined increase in household income and production output causes imported commodity volumes to increase by approximately 2%, while the imported price index stays constant as South Africa is assumed to be a price taker in the international market. Not only do higher domestic prices provide some competitive advantage on the export front, but the higher domestic prices also feed through to the international market to a significant extent (1.47%) as a result of the increase in output at the same time. The result is a somewhat major (1.69%) gain in export volumes due to the relatively higher domestic price levels.

Table 3 provides some detail on an aggregated (since the model actually has 103 sectors) level. Nominal wages all increase in tandem with the national inflation (2.2% as in Table 2) per the assumption that the real wage rate is kept constant. Since the world price of goods is kept fixed (the numeraire by assumption) no change in national or sectoral level import prices will be observed. From Table 2 it is clear that, at the sectoral level there are losers as well as winners resulting from an increase in tourism. After the chemicals, petroleum and coal products industries (47 to 54) the service industries directly catering for tourists (84, 94 to 96) exhibits the largest increase in output (1.66%). This is possibly due to the relative share of tourist expenditure in the income base of these sectors, as well as the fact that these industries are directly affected by an increase in tourism. In terms of the transport sectors, both air and road passenger transport services experience significant increases (0.1% and 0.16% respectively). A detailed analysis and understanding of the dynamics driving the results in each sector would need to be analysed and is beyond the scope of this paper.

The above scenario and results must be interpreted in the context of the assumptions. In real economic life, firms will adjust to circumstances and may for instance switch to catering to the foreign market, change their efficiency of production processes and various other innovations. All of these innovations and mitigating actions could also be modelled to obtain a better understanding of the potential overall implications for this scenario.

Table 3: Aggregate sectoral level impacts (structural effects for the integrated model only)

Effect of additional tourism growth		**Value Added**		**Exports**		**Imports**		**Employment**	
Sector Annualised % Change	**I-O model**	**Volume**	**Price**	**Volume**	**Price (Rand)**	**Volume**	**Price (foreign currency)**	**Volume**	**Nominal Wage**
Agriculture, forestry and fishing (industry 1)	3.85	0.09	2.62	1.01	2.62	5.09	0.00	0.32	2.19
Mining (2 to 4)	0.44	-0.84	0.19	-1.03	0.26	0.34	0.00	-1.49	2.19
Food, beverages and tobacco (5 to 19)	1.61	0.38	2.13	4.81	2.11	4.95	0.00	0.73	2.19
Textiles, clothing and footwear (20 to 31)	1.53	-1.97	1.66	-2.58	1.64	3.15	0.00	-2.89	2.19
Wood, wood products, paper and paper products (32 to 37)	1.33	-1.85	1.66	-5.58	1.62	1.76	0.00	-2.95	2.19
Chemicals, petroleum and coal products (38 to 46)	2.30	3.27	3.07	13.27	3.10	3.80	0.00	8.50	2.19
Non-metallic mineral products (47 to 54)	1.27	-0.84	1.80	-3.44	1.78	2.36	0.00	-1.36	2.19
Basic and fabricated metal products (55 to 60)	0.72	-2.23	1.04	-4.05	1.04	0.64	0.00	-4.32	2.19
Transport equipment other than aircraft (61 to 73)	0.88	0.50	0.00	0.00	0.00	0.00	0.00	0.00	2.19
Aircraft (74)	0.45	0.07	0.00	0.00	0.00	0.00	0.00	0.00	2.19
Other machinery and equipment (75 to 76)	0.63	-2.41	1.20	-4.14	1.19	0.45	0.00	-3.79	2.19
Miscellaneous manufacturing (77 to 78)	1.49	-1.04	0.80	-3.19	0.81	1.68	0.00	-3.64	2.19
Electricity, gas and water (79 to 80)	1.34	-0.02	1.89	0.00	0.00	0.00	0.00	-0.07	2.19
Construction (81 to 82)	0.84	-0.18	1.68	-3.25	0.85	0.00	0.00	-0.33	2.19
Trade and repairs (83)	1.28	0.23	2.31	-1.43	2.31	0.00	0.00	0.43	2.19
Railway transport (86, 88)	0.05	0.01	0.04	0.19	0.04	0.06	0.00	0.02	2.19
Road transport (87, 89 to 90)	0.95	0.16	0.86	3.15	0.86	0.00	0.00	0.37	2.19
Water transport (91)	0.28	0.08	0.34	1.07	0.33	0.00	0.00	0.25	2.19
Air transport (92)	0.25	0.10	0.22	0.88	0.22	0.34	0.00	0.12	2.19
Other transport (incl. freight) (85, 93)	1.04	-8.05	23.06	2.95	21.57	26.86	0.00	-11.42	2.19
Service industries directly catering for tourists (84, 94 to 96)	2.05	1.66	8.45	21.11	8.49	3.43	0.00	5.29	2.19
Other service industries (97 to 103)	1.08	1.05	2.21	8.95	2.23	3.42	0.00	1.25	2.19
Industry average	**1.17**	**-0.62**	**1.78**	**0.23**	**1.66**	**2.07**	**0.00**	**-0.88**	**2.19**

Source: Integrated model simulations conducted by the authors

4.2.4 Tourism intensity vs. dependency

Although the direct effect of an increase of tourism volumes would impact both economic output (growth) and employment, the reality is that the rest of the economy might be very much dependant on tourism for its continued existence. The question then remains as to what extent the South African economy (including the manufacturing industries) is dependent on the tourism sector for its operation and survival. To this end, the tourism sector should be viewed as an enabling industry without which few other industries would be able to survive.

The launch, in 2009, of South Africa's inaugural TSA (see Statistics South Africa, 2009) has finally provided information regarding tourism dependency for the South African economic sectors. The report indicates that, at the aggregate national level, a decline in tourism might not only have adverse economic impacts in terms of reduction in value added or GDP, but also in terms of reduced growth rates in value added and reduced growth rates in per capita income. At a sectoral level (see Figure 3), the report (and various other sources) indicates that, for example for the year 2005, if tourist figures were to decline the passenger transport services sector could suffer serious losses in value added (GDP) due to the high intensity of and dependence on tourism in this specific sector. The TSA therefore clearly shows the importance of the tourism industry.

Comparing the results obtained in this study with the relative magnitudes found in the draft TSA report for South Africa as well as other sources, it would seem that the findings from the integrated model may well be plausible from a magnitude point of view.

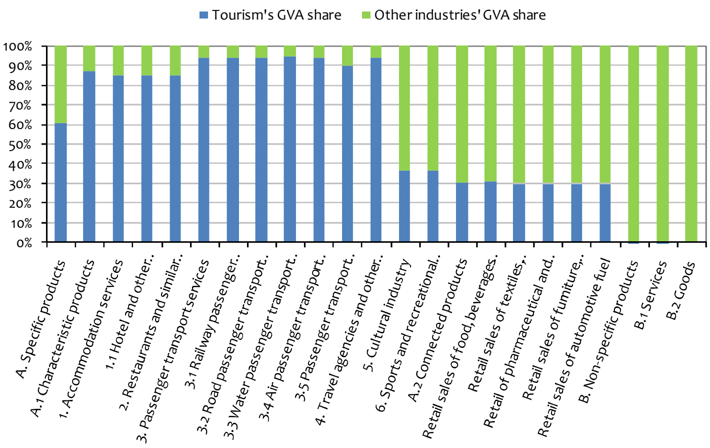

Figure 3: Share (tourism and other) of Gross Value Added by major industry, 2005
(Source of data: Statistics South Africa, 2009:35)

If one investigates the structure of tourism in South Africa, it is evident that tourism and other related categories together account for approximately 30% of total tourism consumed in the national economy. Furthermore, in the modern economy many activities produce relative high value added (economic definition) for relatively low inputs of tourism (i.e. ratio of tourism consumption to value added is low) which would lead us at a superficial level to conclude that such an activity has a low tourism intensity, and therefore large changes in the tourism input will reflect small changes in the value added measurement of output. In reality though, such activities may very well be very dependent on tourism for their operations or survival, and the previous conclusion may actually be totally the opposite, for although using relatively little tourism, if tourism is not available these activities might cease to exist. An example would be the accommodation services and travel agencies and other reservation services sectors. An alternate example could be the road passenger transport services sector. Here, although a shuttle service from the airport is very tourism intensive, the activity has the ability in theory to easily switch from servicing international flights to alternatively servicing domestic flights, which would then imply that although the activity is tourism intensive, it is less tourism dependent than some other cases. Unfortunately the authors do not have readily available quantifications of tourism dependency per sector and tourism intensity per sector is used as a proxy. As illustrated above, this causes us to potentially introduce a bias in the determination of economic costs per sector or activity.

A full analysis of the results of this scenario is not presented in this study. The focus is rather placed on the tourism-economy interaction aspects relevant to the main purpose of this paper, namely the relevance of integrated models to inform tourism policy analysis, while there is a demonstrated and very real need to have such a policy tool – now probably more than ever before in the history of South African tourism planning and development.

5. POLICY IMPLICATIONS

From this research the following implications surfaced:

Firstly, the modelling results (as compared to the input-output method) clearly show that an integrated approach is valid and necessary for policy analysis purposes, since the impact of tourism according to the integrated approach is significantly different to that of the input-output results. The input-output model overestimated the total GDP effect, underestimated the total effect on tourism sectors and completely missed the negative effects on non-tourism sectors. Therefore the integrated approach gives policy makers greater variety and accuracy to work with in terms of forecasting and determining specific events' impact on the economy. Through this approach TSAs can also become a much more effective decision making tool, since this approach increases its application value.

Secondly, based on the discussion of the first implication, it is of the utmost importance that destinations implement a sustainable growth plan and therefore policy. The latter implies a gradual increase in tourist numbers and especially spending. The focus should therefore remain on an increase in spending, for the latter support research by Uys (2003) in this regard. Hence, barriers to growth must be identified and dealt with, especially by the various government agencies. These include political stability, creating proper infrastructure, price competitiveness, improved service, dealing with crime, effective marketing, and increased budgets and marketing campaigns, to name but a few.

Thirdly, from a policy perspective major events can be used successfully to grow and sustain tourism, especially if hosted during off-peak seasons, since major events lead to infrastructure development, marketing spin-offs and media visibility, greater inter-sectoral linkages, income generation and job creation, to name but a few.

Finally, tourism marketers have to be more focused in segmenting markets where markets with a high yield should be targeted since these markets have the greatest impact on growth and poverty alleviation. Again the integrated approach can assist in determining the yield per market.

6. CONCLUSION

This paper illustrated the need for integrated models as tools for policy makers in South Africa through the fact that economic models (and more specifically integrated models) can provide key perceptions for analysis of comprehensive packages of economic and non-economic policy instruments within a consistent framework. Insights generated by this modelling can help in evaluating various policy options. To this end the integrated model represents an innovative and noteworthy means of combining TSAs, input-output tables and economic modelling. The approach expands on the TSA's measurement of tourism's economic size to provide estimates of tourism's economic impact, including many effects that are not captured in input-output models (Blake *et al.*, 2000:18). The integrated model also provides an important tool for policy analysis, enabling the complex interactions in the economy that result from policy actions to be traced through a general equilibrium framework and assessed. The ability to have quantitative estimates of the effects of policy demonstrates the relevance and importance of integrated models for tourism analysis purposes.

The conclusion derived at from this research is that though there are various cost-benefit analyses (CBA), proportional multiplier methods, input-output, AGE and other macro models for the South African economy that have been applied in various areas of economic study since the 1990s, it seems that there is a paucity of applications focusing on tourism interactions for the South African specific context, while recent high-profile developments in the South African tourism sector illustrate the need to have integrated models with a tourism focus available to analyse for example the economic impacts of large sporting events, such as the 2010 Soccer World Cup. One of the reasons for this is that such events have economic impacts on various levels of the economy and policy makers in governmental departments, such as for example the newly established South African Department of Tourism, Department of Trade and Industry (DTI), National Treasury and Department of Transport, to name but a few, could benefit in having the ability to analyse various potential policy responses to, for example mitigate the effects of a potential shortfall in production capacity and resources (which could be exacerbated by such events).

The results presented here for South Africa provide an example of the integrated model's capabilities. The paper illustrated an application of an integrated model in this context by modelling a sustained 10% growth in tourism and attempted to quantify answers to the question of what the potential impacts could be of hosting major events and the associated tourism policy intervention. The results from the simulation indicated that the overall GDP of the country could increase by 0.31%, while employment could increase by as much as 0.56%. The magnitude of these results seems to be supported by similar studies in Thailand, Australia and the United States.

In conclusion, future research should aim to construct or enhance an integrated model for South Africa with a more detailed treatment of tourism sectors (i.e. incorporate dynamics, regional differences, household distributions and different types of labour) would be an interesting and productive development in this area.

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