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# TSA for Germany: database of the satellite account and perspectives for integration into a sectoral disaggregated macro-econometric model

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# TSA for Germany: database of the satellite account and perspectives for integration into a sectoral disaggregated macro-econometric model

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**Abstract**

The Institute of Economic Structures Research (GWS mbH) has developed a tourism satellite account (TSA) for the Federal Republic of Germany relating to the year 2000.[1] In the process of elaborating the TSA the Federal Statistical Office (as an external partner outside the GWS) has been fully integrated and provided partially unpublished data.

In the first part of the paper major steps in calculating the monetary TSA-tables 1 to 6 are presented. It will be shown how this specific information has been used in the process of TSA preparation and what empirical results are obtained to the year 2000 for Germany. In the last part of the paper the structure of the tourism economic simulation and forecasting model VOYAGE is presented. GWS has gained experience in such a theme-specific macroeconomic modelling approach. The model VOYAGE is based on the German TSA for the year 2000 which will be consistently integrated into the German INFORGE model. Its performance is founded on the INFORUM philosophy to build econometric input-output models bottom up and fully integrated. The model YOYAGE with its tourism economic extensions can be used e. g. for analysing the economic impacts of behaviour modifications in tourism or of big events.

Keywords: tourism; multi-sector models; economic forecasting;
tourism satellite accounts

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b *The Institute of Economic Structures Research (GWS ltd.) was founded in 1996 and is a private financed research institute. Its main focus is the analysis of industry structures. It has developed a unique system of macroeconomic forecasting and simulations models that distinguish different industries and regions. The models are estimated econometrically and based on official statistics.*

1 The research project was carried out for the German Federal Ministry of Economics and Labour. The research assignment has been cofinanced by the European Commission.

# 1 Introduction

Measuring the economic role of tourism is very complex, because tourism is an amalgam of industries such as transportation, accommodation, food & beverage service, recreation & entertainment and travel agencies. Unlike output defined industries, such as agriculture or manufacturing, the primarily demand-defined tourism industry (by visitor) is not measured as a sector in its own right of National Accounts. Most of the provided statistical information on the specifics and developments of tourism is primarily based on arrivals and overnight stay statistics as well as balance of payment information. In the past the description of tourism focused on characteristics of visitors, on the destinations they travelled and the conditions they stayed.

The increasing awareness of this deficit has been recognized over a number of years and a number of countries and international organizations. In the late 80th the OECD, UN and WTO pushed the evolution of a tourism specific economic data system. The discussion process generated a tourism economic data system, which measures the economic impact of tourism by associating the purchases of visitors to the supply of these goods and services within a country in a way that is coherent with the concepts, classifications and definitions of national accounting standards.

In the current System of National Accounts (SNA 93) the conceptual basics for measuring the size of specific economic activities by functions in theme specific economic accounts – the so-called satellite accounts – is drafted (United Nations 1993, chap. XXI). The corresponding manual "Recommended Methodological Framework", which has been published by the Commission of the EC, OECD, UN and WTO (2001) is the most important source for studying the conceptual features of the Tourism Satellite Accounts (TSA). Eurostat (2002) has worked out an implementation manual for the EU with the aim to provide operative guidelines for empirical compilation of the tourism satellite account in an efficient procedure.

In a research project, financed by the German Federal Ministry of Economics and Labour, the Institute of Economic Structures Research (GWS mbH) has developed a TSA for the Federal Republic of Germany relating to the year 2000. In the course of elaborating the TSA the Federal Statistical Office as an external partner outside the GWS has been fully integrated and provided partially unpublished data. In the first part of the paper major steps in calculating the monetary TSA-tables 1 to 6 are presented. It will be shown how this specific information has been used in the process of TSA preparation. After presenting some empirical results for the German TSA in the last part of the paper the structure of the tourism economic simulation and forecasting model VOYAGE is presented. The model VOYAGE is based on the German TSA for the year 2000 which will be consistently integrated into the German INFORGE model. The model YOYAGE with its tourism economic extensions can be used e. g. for analysing the economic impacts of behaviour modifications in tourism or of big events.

# 2 Methodological aspects in preparing the German TSA

The Tourism Satellite Accounts (TSA) show the economic dimensions of tourism completely recorded within the framework of the System of National Accounts (SNA)

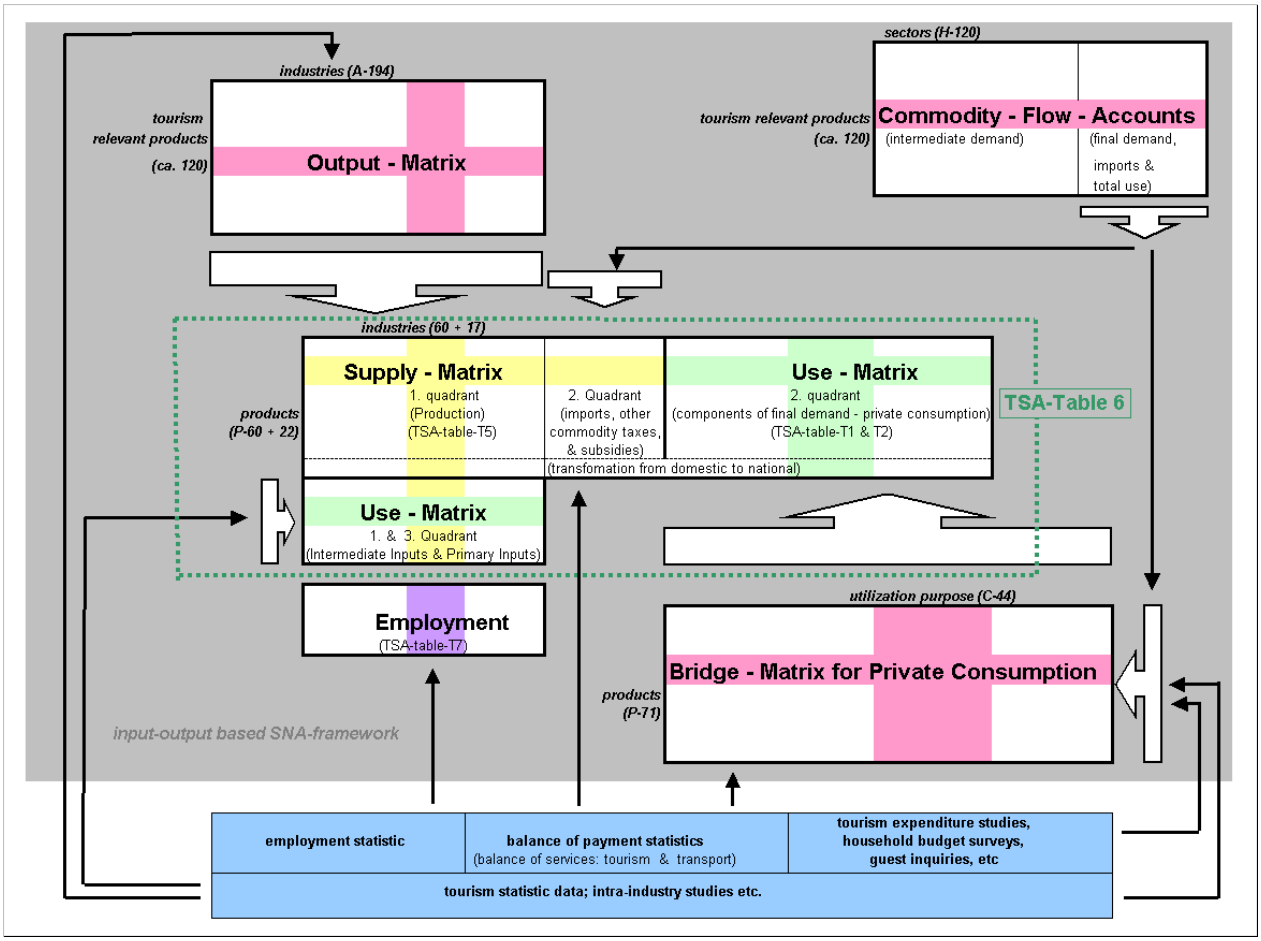
with further reference to complementary tourism related statistics and analyses within a separate system of tables explicitly. In the process of empirical realisation of the TSA-tableau the National Accounts not only serve as central sources of data. Their methods and concepts determine both the basic structure of the satellite system, and the integration of the manifold data into the satellite system.

Besides the recording of the quantitative economic significance of tourism, a central emphasis particularly lay on the calculations carried out in order to draw up the TSA being implemented in correspondence with the performance targets of the "Recommended Methodological Framework" and the recommendations within the "European Implementation Manual" (Commission of the EC et al. 2001, Eurotat 2002). The German TSA has been drawn up completely coordinated with the deeply disaggregated data of the National Accounts, especially the data of the Input-Output accounting framework. Moreover, the calculations carried out were to consistently fit into the corresponding sectorally deeply disaggregated basis tables of the Input-Output accounting framework by the Federal Statistical Office for the reporting year 2000. The basis tables provide the greatest articulation of the economy, providing intermediate inputs and gross output by products and industries, as well as primary inputs by industries and final demand and imports by products.

Figure 1 provides a schematic survey of the basic modus operandi in order to calculate the TSA tableau. The starting point - and within the centre - of the calculations carried out to draw up the tables of both, the supply side and the demand side of the tourism satellite account, was the supply and use-matrix for the reporting year 2000. Being basis tables of the Input-Output accounts, they enable the transfer of results of the disaggregated domestic product accounts into the functional oriented Input-Output tables (and vice versa). In the course of the research project, first these two corresponding tables were drawn up in close cooperation with the Federal Statistical Office.

Apart from few exceptions, the tourism specific data could not be gathered directly from the two basis tables. In order to ascertain them, especially the detailed information of the tourism statistics, surveys on the expenditure behaviour of tourists, and business surveys for specific sectors had to be utilized to secure the identification within the TSA tableau (cf. figure 1, marked blue). The corresponding data formed the basis of the data work. The quality of the calculations is significantly influenced by the information relevant to tourism found there being available and up to date. Therefore, the empirical implementation of the TSA concept in Germany was preceded by an intensive screening of all data sources available. Among those, there were both surveys on the tourism industries, or its associations respectively and surveys on the consumption behaviour of tourists in the course of same-day visits and overnight stays (Harrer et al. 1995, Harrer & Scheer 2002), data of the travel and transport balance by the German Central Bank (Deutsche Bundesbank 2003), data of the tourism statistic department of the Federal Statistical Office (Statistisches Bundesamt 2003b), and especially supplementary, more deeply structured unpublished National Accounts data of the Federal Statistical Office for the reporting year 2000 (cf. figure 1, marked grey). Among the latter, there are especially the results of an extra analysis of the output matrix, an extra analysis of the commodity-flow accounts, and the provision of a bridge-matrix of private consumption. The latter tables are essential elements in the course of the drawing up the Input-Output tables by the Federal Statistical Office (Statistisches Bundesamt 2003a, p. 35ff).

Figure 2: Schematic representation of the data preparation in the course of the drawing up of the German TSA tableau




*Source: own representation.*

In the course of the calculations, the two extra analyses provided, apart from clear-cut allocation and posting instructions, partially very precise reference data in the context of the interlinking with the tourism specific data outside this Input-Output based data framework of the National Accounts. The data relevant to tourism were allocated appropriately both to the correct group of product and industry, and the correct activity (demand for intermediate input by industries, imports, exports, consumption) within the accounting framework. Thus, an incorrect allocation of single transactions or their multiple recording was avoided.

Moreover, for all data relevant to tourism, a splitting-up into a touristically determined and a non-touristically determined share was carried out. This practice of posting made it possible to avoid the economic significance of tourism to be recorded and reported apart from other economic activities. In order to secure the latter point, in addition all calculations were carried out on the level of the deeply disaggregated supply and use matrices displaying 59 products (P60) and 59 industries (A60). Both tables were supplemented by the activities additionally reported within the TSA. In the process of data preparation a strong emphasis lay on the maintaining of the system of double-entry accounting. Only as the last step of the process, the data ascertained within the

extended supply and use-matrix (i. e. a deeply disaggregated linkage matrix of tourism – TSA table T6 – with 93 rows and 97 columns) were transferred to the various TSA tables T1 to T6.

In further course, the realized supply and use-side oriented approach to the empirical determination of the economic significance of tourism will be commented upon a bit. The reporting of the supply side was carried out with reference to the results of the extra analysis of the deeply disaggregated output matrix.[1] Within the extra analysis by the Federal Statistical Office, a provision for more than 120 commodities relevant to tourism was carried out on the level of the 8-digit-level of the central product classification in Input-Output tables. The corresponding lines provide information on the sectoral production of the various products relevant to tourism in the different industries of the national economy on the 3-digit level of the industry classification (NACE). 23 out of the 194 industries can be allocated to the 12 tourism industries included within the TSA.

If available, supplementary sector studies were referred to for a precise recording of single tourism specific activities. As another step, the correspondingly developed data pool was consistently integrated into the deeply disaggregated supply and use matrix of the year 2000 (59 products x 59 industries). On the one hand, in the columns both the 12 tourism industries were allocated to the respective superior industry sectors of the supply table, and the connected and unspecific economic sectors were accounted for. On the other hand, in the rows of the supply matrix the 20 products characteristic of tourism were integrated into the superior product groups of the supply table. As a final step, the calculations were supplemented by the specific intermediate inputs utilized in the production process and the piled up value added.

The entire process of posting was supervised by control routines referring to rows and columns. The result of these calculations is a deeply disaggregated production account of tourism structured by 81 groups of products (22 tourism related products) and 78 industries (including 17 tourism related ones). The recording of the economic relevance of tourism on the demand side is carried out with reference to the results of the extra analysis of the commodity-flow accounts and the consumption bridge-matrix at purchaser prices for 71 products (P71) and 43 purposes of consumption utilizations (SEA43). Within the bridge-matrix of consumption, for each kind of product an allocation to the utilization purposes of the private consumption expenditures is performed.[2] This bridge-matrix of consumption subdivides the vector of consumption by private households reported within the use-matrix into a matrix which explicitly reports the macroeconomic structure of products for the various consumption purposes. The information on the product structure of single consumption purposes was explicitly referred to in order to report the structure of products of the different tourist consumption activities. In the process, apart from the results of the extra analysis of the

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1 In the output-matrix the domestic production by industries is subdivided into the various kinds of commodities generated in the production process. Thus, it forms the 1st quadrant of the make-matrix in deepest detail. It is the starting point in the course of the input respective cost side oriented calculation of the Input-Output tables of the Federal Statistical Office.

2 The consumption utilization is based on the classification of Individual Consumption by purpose (COICOP).

commodity-flow account[1] on the 8-digit level of the central product classification for about 120 products relevant to tourism, especially studies on the expenditure behaviour of tourists were evaluated and allocated appropriately to the respective utilization purposes within the bridge-matrix of private consumption. As a final step, the respective results were aggregated and transferred to the 2nd quadrant of the use-matrix. The result of these calculations is a deeply disaggregated documentation of tourist consumption by foreigners and inlanders in the inland structured by 81 product groups (22 tourism related) and the kind of tourism (same-day and overnight visitors).

In a last step the data ascertained within the extended supply und use-matrix were transferred into the format of the various TSA tables T1 to T6.

# 3 The macroeconomic significance of tourism in Germany

## 3.1 Tourism consumption

The TSA drawn up for the first time for the Federal Republic of Germany shows that a total of 157.9 billion Euro has been spent on internal tourism consumption in cash and in kind. A share of about 19.2 % (30.4 billion Euro) of the internal tourism consumption can be allocated to business trips as intermediate consumption, whilst almost 81 % (127.6 billion Euro) can be allocated to private travelling in Germany.

Diagram 1 provides a survey of the structure of goods and services of internal tourism consumption (in cash and in kind). It becomes evident that in the course of tourist activities, besides the services of accommodation, food & beverages and passenger transport, there is demand for a wide variety of other, non-tourism specific products (about 37.4 %).

With 131 billion Euro, the major share of the internal tourism demand was stimulated by domestic tourism consumption. The inbound tourism related demand on the side of foreigners ranged at a mere 26.9 billion Euro in 2000, making up merely 17 % of the internal tourism related demand.

Ranging at 7.5 billion Euro, at least 28 % of inbound tourism consumption were generated by foreign business travellers as shown in studies on tourism activities by the German central bank (Deutsche Bundesbank 2003). Of course, the major share of the expenditures (19.4 billion Euro) lay on the side of holiday visitors. Moreover, conservative estimates show that with 1.8 billion Euro a mere 7 % of all inbound tourism consumption by non-residents can be allocated to foreign same-day visitors.

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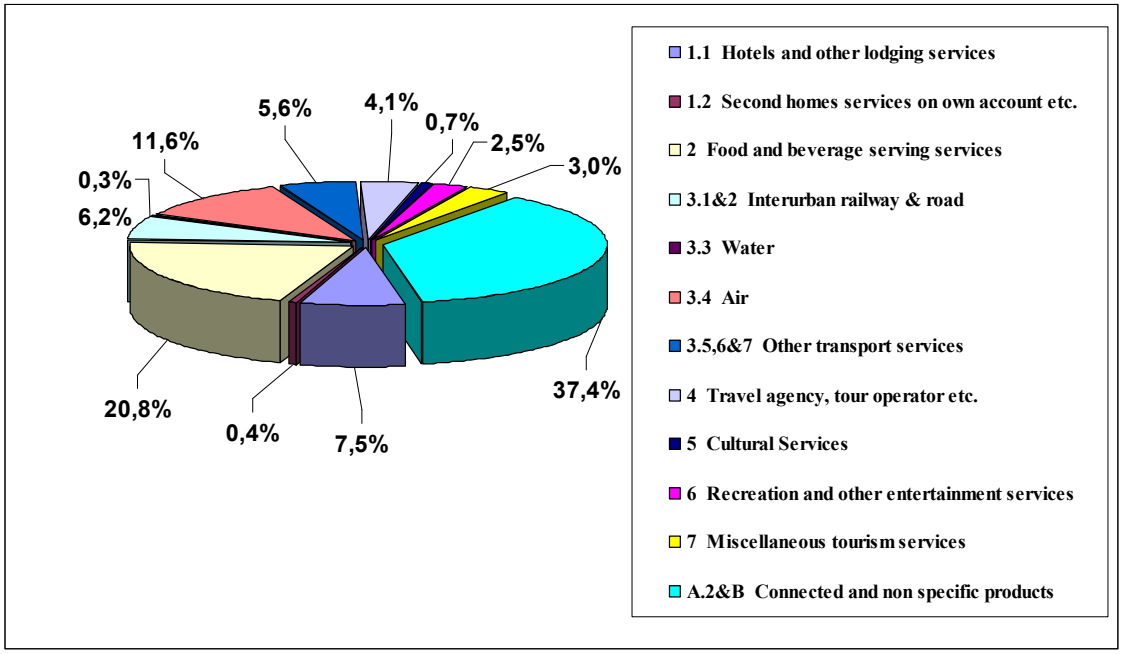
1 The commodity-flow account shows in its rows the complete utilization structures of the domestic supply for specific kinds of products. Within the columns, it provides a detailed documentation of the intermediary utilization of the various commodities structured by sectors of production and their final utilization (consumption by private households, consumption by private organisations, government consumption, capital formation, exports). By the addition of the pertinent imports, it allows the calculation of the product group specific output. The commodity-flow account is the starting point in the course of the demand-side oriented calculation of the Input-Output tables of the Federal Statistical Office.

The major share of their expenditures, the total being more than 25 billion Euro, is spent in the course of more than 42.6 million overnight stays.

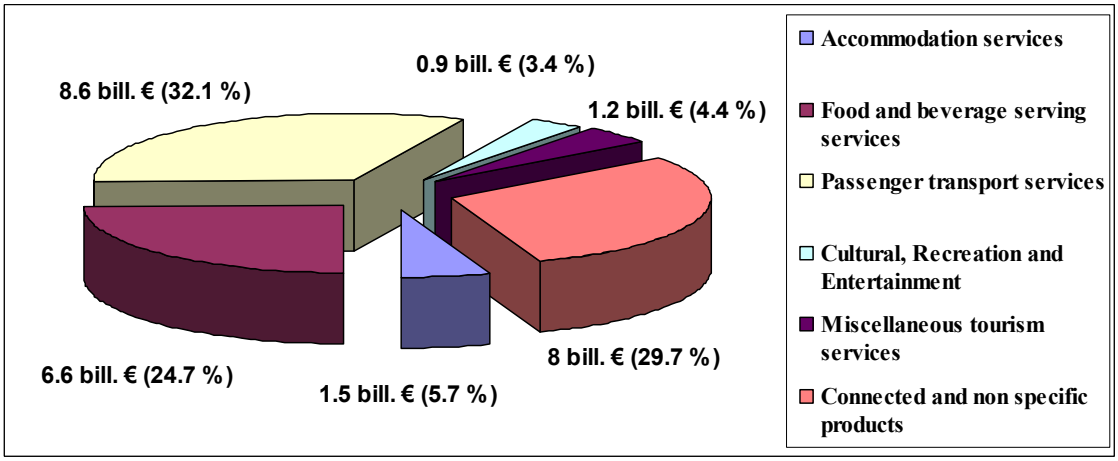
Diagram 1: The product structure of internal tourism consumption in cash and in kind in 2000




*Source: own calculations.*

A look at the structure of the total of inbound tourism consumption (cf. diagram 2) shows that more than 6.6 billion Euro, or 24.7 % of all expenditures respectively benefited the food and beverage serving services with further 1.5 billion Euro benefiting the domestic accommodation services.

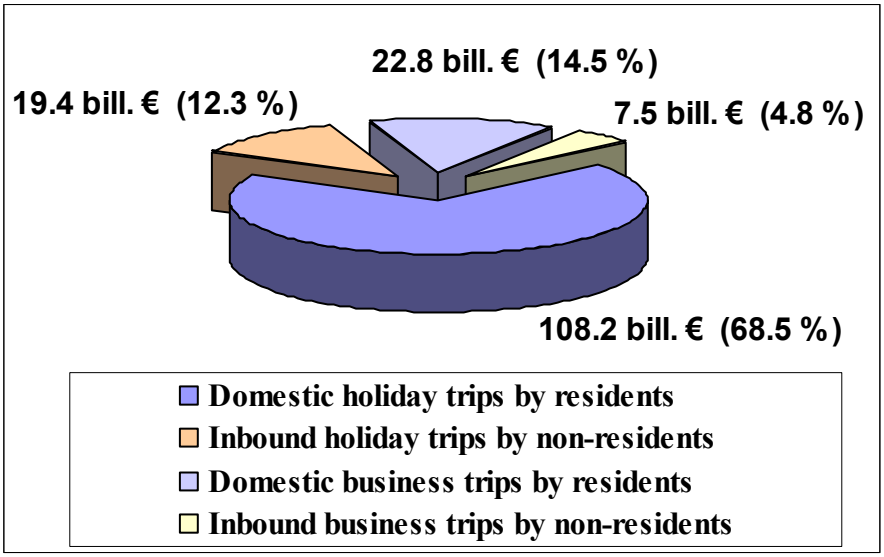
Diagram 2: The product structure of the inbound consumption expenditures by non-resident visitors in 2000




*Source: own calculations.*

More than 8.6 billion Euro were spent by non-resident visitors in the inland on passenger transport services, with 6.3 billion Euro alone, being 23.5 % of all inbound tourism consumption, paid directly to the German air traffic sector. Sectors not directly related to tourism, however, benefit from foreign visitors as well: Calculations show that with nearly 8 billion Euro almost 30 % of all inbound tourism consumption expenditures were spent directly by non-resident visitors in Germany outside tourism specific sectors.

Diagram 3: Internal tourism consumption in cash and in kind dependent on the purpose of visit in 2000




*Source: own calculations.*

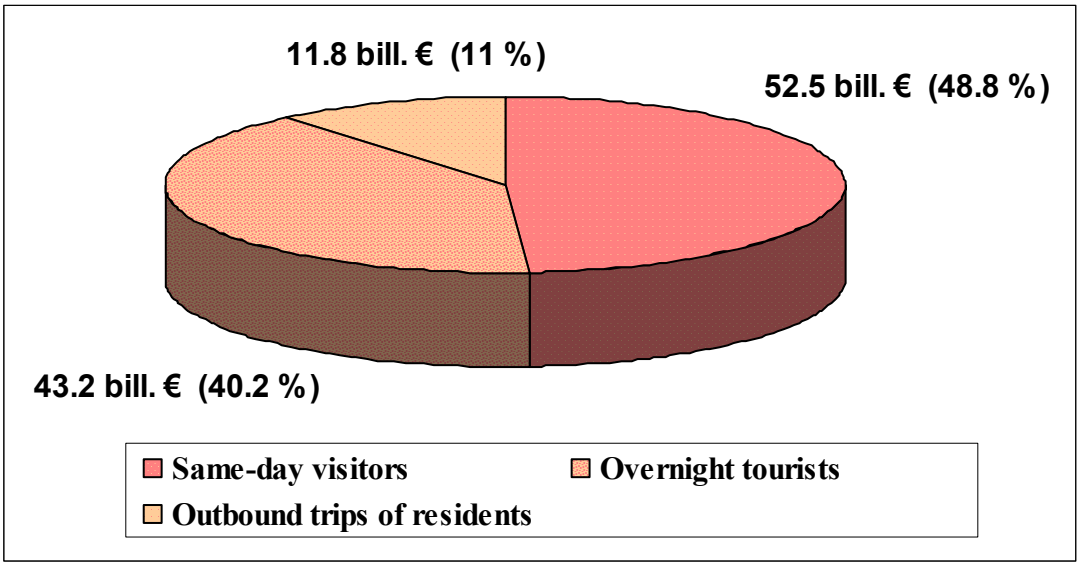
Diagram 3 allocates the internal tourism consumption in cash and kind to the two purposes of visit of business and holiday trips. With nearly 19.4 billion Euro, about 12.3 % of the tourism related inland demand is generated by non-resident holiday visitors, whilst 7.5 billion Euro, or 4.8 % respectively, are generated by foreign business visitors.

Apart from inbound business trips by non-resident visitors, however, business trips of the domestic industry within the inland making up a total volume of estimatedly more than 22.8 billion Euro. With more than 31 million overnight stays, the accommodation services in particular benefits directly from business travellers, earning more than 6.8 billion Euro. Moreover, the air traffic expenditures of the domestic economy related to business travellers range at 7.7 billion Euro, making evident the importance of business travel for the domestic passenger aviation sector.

The internal tourism consumption in cash amounts to more than 134.4 billion Euro, making up a share of nearly 12 % of the overall consumption expenditures of private households in 2000, the total being 1126.3 billion Euro. The two consistent parts of internal tourism consumption in cash are the inbound tourism consumption (26.9 billion Euro) and the domestic tourism consumption of private households in cash (107.5 billion Euro).

By adding the value of the safely estimated expenditures on second homes services on own account or for free, making up about 681 million Euro, to the domestic tourism consumption in cash, you get as the result the domestic tourism consumption of domestic private households in cash and in kind. With more than 108.2 billion Euro, about 68.5 % of this domestic tourism consumption in cash and in kind was allocated to domestic holiday travellers (cf. Diagram 3). As a result, about 9.8 % of all consumption expenditures by domestic private households in 2000 (1104.7 billion Euro) are directly due to tourism related activities by domestic private households such as day trips, visits to friends and relatives, and holiday trips.

Diagram 4: Domestic tourism consumption of private households in 2000




*Source: own calculations*

Expenditures in the course of same-day trips made up a share of about 52.5 billion Euro, being nearly 49 % of the domestic tourism related consumption by inlanders. The big share of same-day tourism, surprising at first sight, shows that in the process of the analysis of the macroeconomic significance of tourism the importance of same-day tourism definitely has to be included. Nearly 20 % of all expenditures in same-day tourism were spent on food and beverages serving services, further 60 % were spent on consumption purposes related to tourism (clothing, leisure products, mineral oil products, etc.).

Apart from day trips, in the course of 53.6 million overnight trips with more than 343.6 million overnight stays, goods and services worth 43.2 billion Euro were bought. The tourism related expenditures by inlanders in the course of overnight trips therefore determine no less than 40 % of all tourism related consumption expenditures by inlanders. Among other things, 5.6 billion Euro were spent on accommodation services, whilst more than 13.2 billion Euro were spent on catering services provided by the catering trade. Moreover, more than 1.2 billion Euro were paid for road and interurban railway passenger transport services as well as recreation and other entertainment services respectively.

Apart from the total of the expenditures by private households on same-day and overnight trips ranging at about 95.6 billion Euro, the expenditures by residents in the course of private outbound trips and their effects on domestic demand, of course, need to be referred to. Of the respective overall expenditures of about 11.8 billion Euro the major share is made up by the expenditures by resident tourists, bearing effects on the inland economy, in the course of more than 74.4 million outbound overnight trips. Nearly 10.4 billion Euro of their travel expenditures bore inland effects. The major share of these expenditures directly benefits the suppliers of travel services. Transport services required, for example, yielded nearly 4.2 billion Euro for air traffic companies and about 4.9 billion Euro for travel agencies and tour operators.

By adding the domestic tourism consumption by resident private households (about 107.5 billion Euro) to the outbound tourism consumption, you get the national tourism consumption by private households. With 158.9 billion Euro, the domestic private households spent about 12.1 % of their disposable income (1310.38 billion Euro) on tourism purposes with about a third (51.4 billion Euro) allocated to outbound private trips. The overall national tourism consumption (comprises the intermediate and final consumption of resident visitors within and outside of Germany) amounted to 186.2 billion Euro in 2000.

## 3.2 Total output and employment of tourism industries

Within the TSA, apart from the tourism demand side the respective supply side is displayed consistently. The total output of the tourism economy stated within the TSA summed up to more than 185 billion Euro, being about 5 % of the total output volume of the Federal Republic of Germany (about 3650.5 billion Euro). This total output of the tourism industries does not only include tourism related production activities as its main activity, but non tourism specific services provided by secondary production are included in the classification scheme as well. In 2000, an estimated number of nearly 1.56 million employees were working in the correspondingly separated economic sectors of the tourism industry.

## 3.3 Gross value added of tourism activities

In 2000, the gross value added of tourism activities in Germany made up nearly 57.5 billion Euro, meaning a share of 3.2 % of the total gross value added (about 1823.5 billion Euro).[1]

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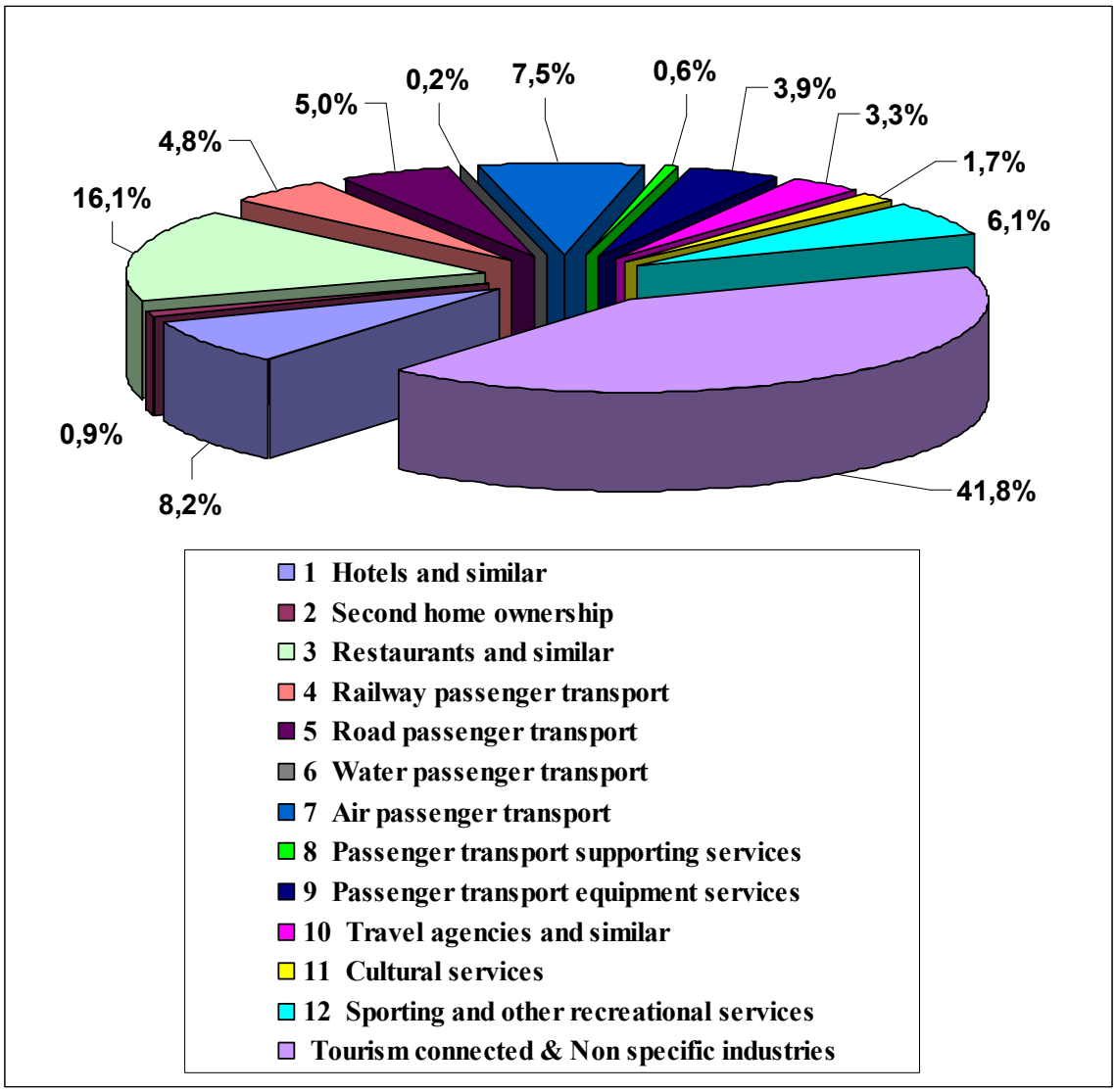
1 By contrast the input-output based tourism account (IOTEA) presented by the DIW in the year 1999 identified that tourism value added amounted to 7.9 % of GDP (Filip-Köhn, Hopf & Kloas 1999, 107p). A thorough comparison of the results of this TSA study and the IOTEA study shows that the identified variance concerning the share of the value added of tourism can be clearly allocated: They are based on conceptual differences and differences in definitions. Besides that the comparison provides evidence of the fact that the two surveys certainly are compatible with each other (Ahlert 2003, 60pp).

Diagram 5: Contribution of the gross value added by the various industries to the total gross value added of tourism




*Source: own calculations*

The TSA concept provides a functionally separated statement due to the calculation procedure of ascertaining the value added of tourism, which mainly is determined by the supply side: On the one hand, it focuses on activities motivated by tourism explicitly, in turn meaning the adjustment of the non-tourism related secondary production, which still has been stated as part of the value added of the tourism industry. A major share of the services provided by restaurants, for instance, is demanded as part of everyday leisure activities. The resulting value added, of course, is not included in the calculation of the tourism related value added which, as a consequence, results in a reduced statement. On the other hand, however, the tourism related secondary production outside the not tourism related, unspecific industries of the national economy is being referred to (cf. Diagram 5). No less than 42 % of the gross value added of tourism activities is generated outside the tourism industries in the various industries of the national economy due to tourism demand.

# 4 Modelling tourism in a macroeconomic model

After discussing the approach of empirical implementation of the TSA-concept for Germany and displaying some results there arises the question why the detailed tourism related statistical information can be used in addition to its original function to measure its direct contribution to GDP in a hierarchically structured additive table system. In our opinion the national tourism satellite accounts can and should be used in the framework of detailed macroeconomic simulation and forecasting models. With such a tourism specific model it is possible to give answers to following aspects for example:

- Calculation of indirect value added and employment effects of tourism to determine the full impact of tourism on the German economy. This additional value added results from tourism through production of the intermediate inputs used in the production of goods and services sold to tourists, although there is no direct relationship between the producer of the intermediate inputs and the tourist.
- Examine the economic effects of existing policies or of proposed tourism policy alternatives. For example to anticipate the possible effects on taxation issues or other policy instruments such as investment incentives and planning regulation which its impacts on tourism industries, prices, tax revenues, public debt, income and employment.
- Quantitative estimates of the effects of other policies or of social developments on tourism (e. g. trade liberalisation, exchange rate changes, general taxation changes, demographic transition, changes in leisure and travel behaviour, etc.).
- Quantitative estimates of international events with its impacts on tourism, especially domestic tourism industries and GDP.

These examples give evidence that the scope for tourism policy analysis in a tourism specific macroeconomic modelling framework is large (Blake et al. 2001). The GWS has gained experience in such theme-specific macroeconomic modelling approaches. The respective models offer the ability to perform "what-if" simulations but they are also used to forecast the future economic effects of specific trends. GWS has constructed the 3-E-Model[1] PANTA RHAI for analysing questions with respect to sustainability on the basis of the German system of environmental-economic accounts (Bach et al. 2002, Meyer & Lutz 2002, Statistisches Bundesamt 2003c). Besides that the sport economic simulation and forecasting model SPORT has been developed, which has a special focus on analysing sport economic activities (Ahlert 2000, Ahlert 2001). It is based on a sport satellite account within an extended Input-Output table (Ahlert & Schnieder 1997, Meyer & Ahlert 2000).

Both theme-specific forecasting and simulation models are based on the INFORGE[2] model (Distelkamp et al. 2003a). This multisectoral macroeconometric forecasting and simulation model for the German economy has been constructed by GWS. The model INFORGE is the German contribution to the linked system INFORUM[3] of international

1 **E**nergy-**E**conomy-**E**nvironment

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macro/interindustry models. For building up the extended versions PANTA RHAI and SPORT in the multisectoral macroeconomic core model INFORGE the theme-specific database enlargements (environment-economic-energy resp. sport-economic) have been consistently integrated.

In the following the structure of the tourism-economic simulation and forecasting model VOYAGE is presented. For a better understanding of the modelling philosophy an overview of INFORGE is given first.

## 4.1 The multisectoral macroeconometric model INFORGE

INFORGE is a simulation and forecasting model for the German economy, that describes the German economy for 59 industries. It has been updated annually since 1996 and has been utilized in a wide range of applications (e. g. Elixmann, Keuter & Meyer 1997; Distelkamp et al. 2000; Ahlert 2001, Lutz et al. 2002, Wolter 2002, Distelkamp et al. 2003b, Meyer 2003). It is based on the „Statistical Classification of Economic Activities in the European Community“ (NACE) of National Accounts. According to the classification of West (1995) it is an “econometric + input-output model” that belongs to the family of national interindustry models of the INFORUM family. In the following sections only a short survey of the model is given.

The particular efficiency of the INFORGE model relies on the INFORUM philosophy (Almon 1991). Its significant factors are the construction principles of bottom-up and complete integration. The *bottom-up construction* principle says that each of the 59 sectors of the national economy bears a detailed structure and that the macroeconomic variables are formed by explicit aggregation in the context of the model. The construction principle of *complete integration* includes a complex and simultaneous modelling describing interindustry interlinking as well as the generation and distribution of income, government redistribution and the use of disposable income by private households for various commodities and services. The disaggregated structure of the INFORGE model is integrated into the fully endogenised System of National Accounts, thus providing especially an endogenous compilation of secondary distribution of income.

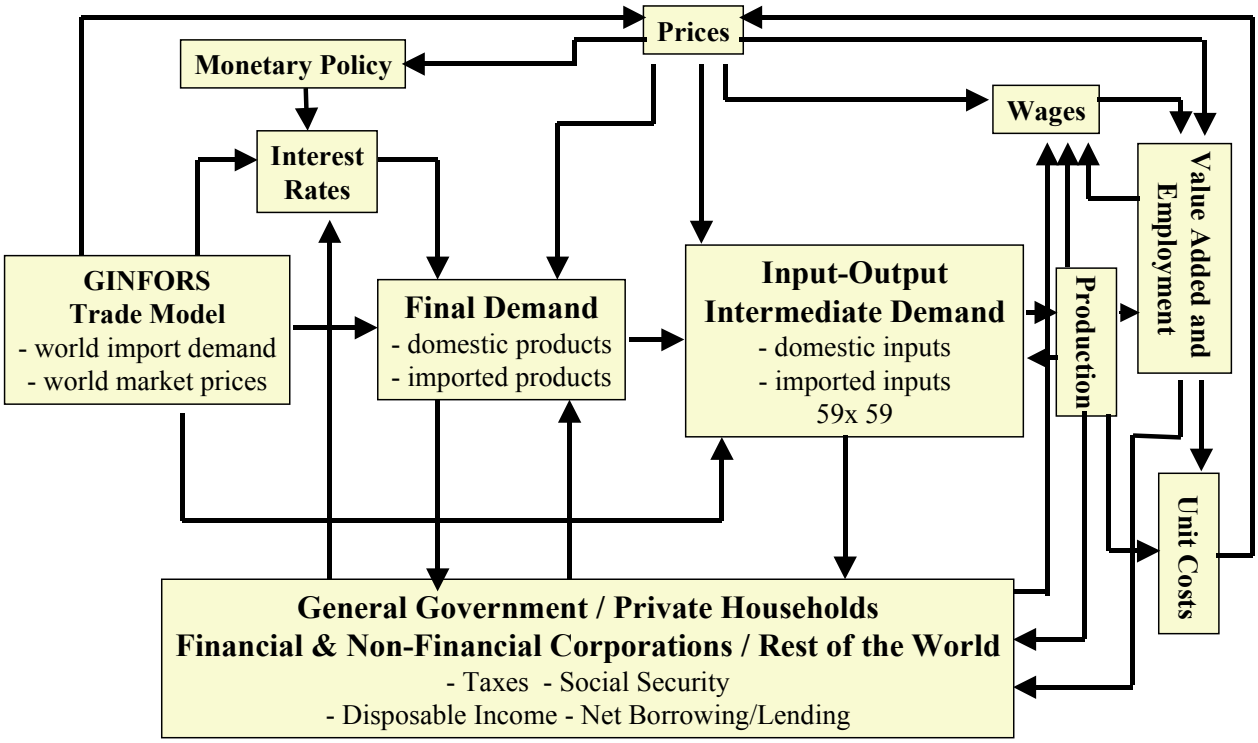
The INFORGE model is primarily based on the system of accounts and a set of supplemented standard tables as part of the SNA and a time series of Input-Output tables of the Federal Statistical Office. Figure 2 gives a rough impression of the structure of the model.

The INFORGE-model is part of the GINFORS[1] International System (Lutz, Meyer, & Wolter 2003). This international trade model, which is a further development of the global COMPASS model, delivers the vector of world import demand as well as the vector of foreign trade prices for product groups (Meyer & Uno 1999a,b; Meyer & Lutz 2002,a,b,c). Besides the goods markets the GINFORS model also represents the international financial markets, though in a less detailed way: American interest rates as

1 **G**lobal **In**terindustry **For**ecasting **S**ystem

indicators for the international capital market condition have a weighty influence on German interest rates and by this means once again on the German goods markets.

Figure 2: The structure of the model INFORGE




*Source: own representation.*

Final demand has the components private consumption, public consumption, equipment, construction, exports, inventories and imports of finished products in the disaggregation of 59 product groups. The most important determinants of final demand are the world trade variables (explaining exports), disposable income of private and public households (explaining private and public consumption), the interest rates and profits (explaining investment) and the relative prices for all components and product groups of final demand.

Intermediate demand of the firms is depicted in great detail: For all intermediate inputs the model distinguishes deliveries from domestic production and imports. In general the input coefficients are variable and depend on relative prices and time trends. Final demand and intermediate consumption less imports are determining the total output. The imports are a function of the development of the import demand calculated within the GINFORS international trade system as well as the development of import prices and domestic prices.

INFORGE is an econometric input-output model, appropriately described as evolutionary. By means of behavioural equations, routines in decision-making processes are simulated which are not derived explicitly from optimisation activities performed by rational agents, but are based on bounded rationality on imperfect markets. Market prices result from mark-up calculation performed by companies. Time within this model

is historic and irreversible. The adjustment of the capital stocks generates path dependency.

Usually, the input-output approach is considered to be a demand-oriented approach. This, however, does not account for INFORGE. While it is correct to say that within INFORGE demand determines production, it needs to be emphasized that all variables concerning demand for commodities and factors depend on, among other things, relative prices with prices, in turn, being set with regard to the unit costs of companies by means of a price-setting hypothesis. The differences between INFORGE and the Computable General Equilibrium (CGE) models in which a competitive market is simulated, concerning this aspect, lies in the presumed market form, not in the emphasis on one side of the market or the other (West 1995, 216). It might as well be said this way: Companies, on the basis of their cost situation and the prices of competitive imported goods, set their sales prices. Potential customers react to that with their decision which in turn determines the rate of production. Therefore, elements of both supply and demand are equally present.

Apart from the context of the input-output calculation deeply structured into 59 manufacturing industries. The model includes the System of National Accounts with its institutional sectors – government, private households and non-profit institutions serving households (NPISHs), financial corporations, non-financial corporations and the rest of the world – as well as the functional accounts of production, generation of income, allocation of primary income, secondary distribution of income, use of disposable income, and capital in order to calculate the SNA of the Federal Republic of Germany. This system comprises the complete redistribution of income including social insurance and taxation between government, private households and corporations, thus allowing the calculation of disposable income which is once more a significant determinant of final demand. Moreover, the financing account balances are ascertained. Therefore, the model includes especially government budget constraints. As a result, the entire fiscal policy is endogenously integrated into this system. Another important outcome of the SNA part of the model are the net lendings/borrowings of the institutional transactors, which have influence on the interest rates. Interest rates are further determined by the US rate of government bonds and monetary policy variables, which react on price signals.

The model shows a very high level of endogenisation and is highly interdependent. Basically, tax rates, labour supply and the global market variables of the international GINFORS system are determined exogenously. It has to be stressed that the whole system is solved simultaneously. Apart from the regular interdependencies of the circular flow, it monitors the volume-price interdependencies as well as the wage-price interdependencies.

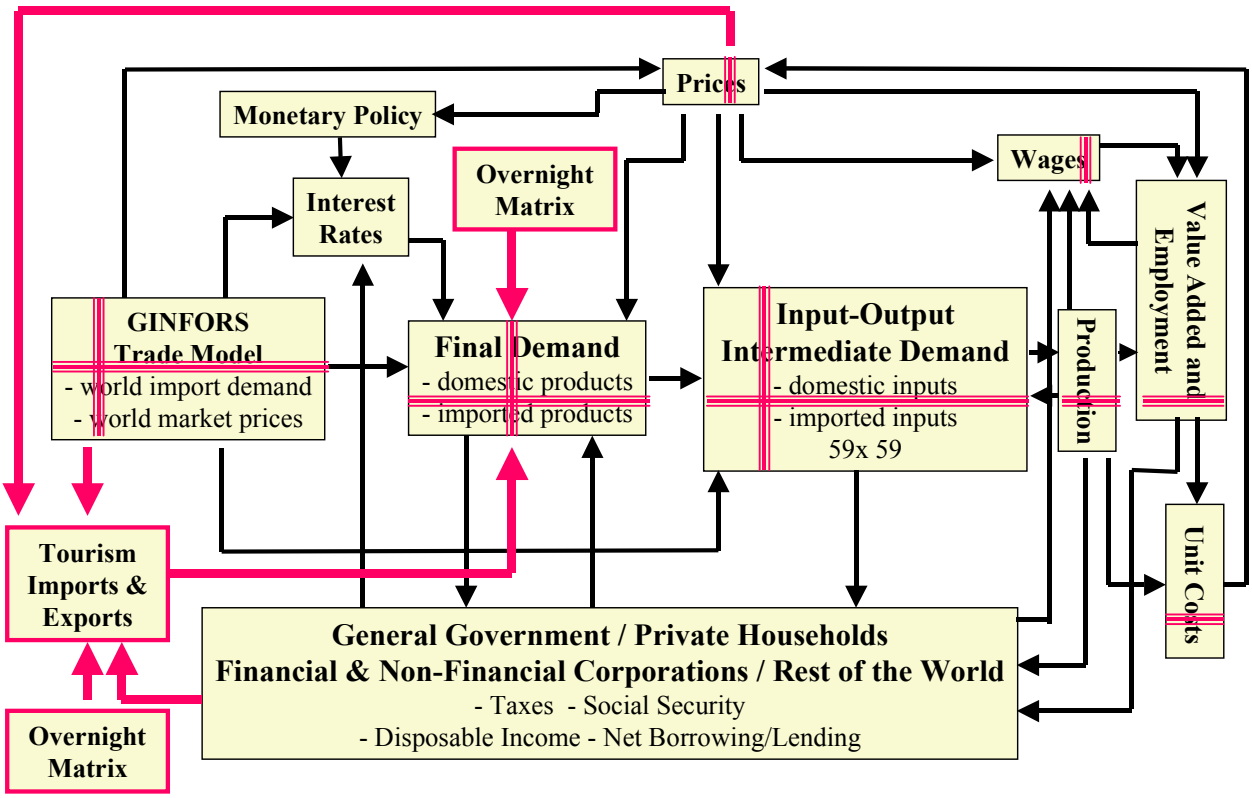
The parameters of the model equations have been econometrically estimated over the period from 1991 through 2001 using the OLS method. In choosing alternative approaches of estimation, first of all a priori information about sign and the order of magnitude of the coefficients to be estimated were utilized. In other words: Results of estimations that were economically nonsensical were dismissed. The remaining estimations were tested both for autocorrelation of residues according to the Durbin-Watson statistics, and for the significance of the estimated parameters by means of the t-test. When, on that basis, a discrimination of competing approaches was not possible,

the coefficient of determination of the estimation was referred to. With regard to the enormous volume of the model, the OLS method appears to be the appropriate, that is, the easiest estimation method.

## 4.2 The tourism economic model YOYAGE

In the following the basic structure of the tourism economic model VOYAGE is explained. It will be also based on the INFORGE model and will comprise the whole information of the TSA for Germany. The tourism related information will be consistently integrated into the model. The following figure 3 gives an impression of the structure of the tourism extended model. The red lines show the tourism specific extensions, which will be explicitly formulated within the tourism economic model VOYAGE.

Figure 3: The structure of the model VOYAGE




*Source: own representation.*

On account of the interindustry structure of the model INFORGE the complete integration of the TSA-information into the model is no problem. Both the tourism specific and the connected respectively non specific activities and industries of the TSA can be identified and consistently implemented into the structure of the model. The system of equations for the additional tourisms related sectors has the same definitions like the non tourism specific sectors. On account of missing time series for the tourism economic activities it is only possible to connect the behaviourial equations of the non

tourism specific sectors by definition via their relative shares to the corresponding tourism related sectors for the year 2000.

The specification of the model VOYAGE can have two degrees of detail. First of all it is possible to realize the model structure of the YOYAGE model on the basis of the developed German TSA. In this variant, which is only a second best solution, the corresponding information for tourism connected respectively non specific products and industries would be only modelled on the level of the aggregate variable. Besides that it is also possible to implement the information of the TSA in the detail of the enlarged tourism specific supply and use-table, illustrate in section 2. In this second variant the linkages of tourism activities to tourism connected respectively non specific products and industries could be modelled in much deeper detail on the level of the corresponding 59 products and 59 industries.

Some tourism specific aggregate variables of the TSA will be explicitly modelled in INFORGE. For these variables time series information are available and thus a tourism specific endogenisation will be possible. Particularly this is relevant to the two macrovariables total inbound and outbound tourism consumption by following the WTTOUR approach and maybe using the GINFORS international system. Besides that it is no problem to integrate the results of the WTTOUR model, which consists of behavioural equations for tourism imports and exports for 25 OECD countries (Franz, Laimer & Smeral 2001).

In addition a tourism related modelling of sector 38 “accommodation and food & beverages services”, of sector 39 “land transport services”, of sector 41 ”aviation services” and of sector 42 “other transport and travel supporting services” is possible. Due to the fact that in INFORGE the consumption of private households is modelled on the level of 43 utilization purposes of the consumption it will be possible to explain some utilization purposes (purpose 27 “passenger transport services”, purpose 32 “leisure and cultural services”, purpose 34 “package tours”, purpose 36 “accommodation services” and purpose 37 “food and beverage serving services”) by tourism specific variables. The development of the sector 38 will be endogenized by the information of the national accommodation statistics. Such an approach will endogenize tourism specific developments to domestic tourism consumption on the level of the corresponding tourism characteristic products.

Within in the extended tourism economic model YOYAGE it is no problem to have a consistent linkage to the different classifications of the TSA (products & industries) because INFORGE distinguishes for all relevant vector variables the adequate classification. On the one hand the vectors of total output, total gross value added and total intermediate inputs are reported both for industries and products. This allows a consistent modelling of TSA table 5 “Production accounts of tourism industries and other industries”. On the other hand the vector of domestic consumption of private households is reported both for utilization purposes and products. The import and export vectors as well as the vector “taxes less subsidies on products of domestic output and imports” are reported in product detail. Finally it is no problem to add these additional vectors to TSA table 5. The result is the complete TSA table 6 “domestic supply and internal tourism consumption by products”. In such tourism economic modelling approach the whole information of the TSA will be implemented into the simulation and forecasting model INFORGE.

## 5 Conclusions

Without doubt, the preceding modelling proposal for the newly tourism economic model YOYAGE as a sub-model of the German multisectoral forecasting and simulation model INFORGE is realizable. It would be a valuable consulting tool for tourism policy, tourism industry and its associations, because the model YOYAGE with its tourism economic extensions could be used for analysing the economic impacts of tourism activities and could give answers to manifold tourism related questions.

In view of the last point we have used the detail result of the German TSA with respect to the identified commodity structure of inbound tourism consumption for a quantification of the potential macroeconomic effects of the German application to host the Olympic Games in 2012 in Germany (Ahlert 2004). A similar calculation has been done with the sport economic simulation model SPORT a few years ago (Ahlert 2001). In different simulations the macroeconomic effects of staging the Soccer World Cup 2006 was analysed from the point of view of alternative financing concepts.

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